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Herder and the Philosophy and History of Science

H. B. NISBET

MODERN HUMANITIES RESEARCH ASSOCIATION

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Volume 3

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(*Germanic*)

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Herder and the Philosophy and History of Science

HERDER AND THE PHILOSOPHY AND HISTORY OF SCIENCE

by

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Da meine Absicht ist, einige Verhältnisse und Wirkungen der Natur in ein helleres Licht zu setzen, so kann mir nicht um *eine* Hypothese zu tun sein: man wird mir also erlauben, daß ich mich aller, als verschiedener Vorstellungsarten, bediene, je nachdem das, was ich denke, sich durch eine oder die andere besser ausdrücken läßt. Es scheint dieses ein gefährlicher Weg zu sein, auf welchem man teils undeutlich zu werden, teils alle Parteien gegen sich aufzubringen fürchten muß.

Goethe, *Vorarbeiten zur Morphologie*

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For any errors I am myself responsible.

H. B. NISBET

Bristol
January 1970

NOTE

To prevent any confusion of titles, I should like to point out that the volume *Herder and Scientific Thought* (MHRA Dissertation Series, 3a), which is being issued simultaneously by the same publishers, in paper covers, is a shorter version of this book. It contains in full the more general chapters (Chapters I and II) of the present volume.

PREFACE

Apart from the large corpus of writing, much of it hagiographical in character, on Goethe's scientific activities, comparatively little has been done towards defining the place of science in the great era of thought and letters which filled the second half of the eighteenth century in Germany. That Kant's critical philosophy owed much to his preoccupation with Newtonian physics is generally acknowledged, but it is less often remembered that both Lessing and Schiller studied medicine (in Schiller's case to the stage of producing a dissertation), or that Lichtenberg and Haller devoted more of their energies to science than to literature. And the time-honoured practice of identifying Herder with Hamann's irrationalistic revolt against the Enlightenment has stamped Herder, at least by implication, as an adversary of all that science stands for. The present study aims to contribute at least something towards rectifying this situation.

In their classical phase, both Goethe and Schiller believed that scientific pursuits are perfectly compatible with the growth of a full and balanced personality. Goethe spent many years on his attempts to reconcile the principles of science with his aesthetic and philosophical ideals, and although Schiller was deeply troubled by the untoward psychological, social and political effects of increasing specialization in life and knowledge — a process which science had already done much to accelerate — it was never his intention to make war on science itself, but rather to promote a mode of existence within which science might flourish without prejudice to the proper development of individuals, society, and the state.

Their greatest immediate precursor in these endeavours was Herder. Far from underwriting Hamann's anti-scientific irrationalism, Herder, at almost all stages in his career, vigorously contested those attitudes which would divide science off from other areas of thought and experience, and he repeatedly affirmed its value as a positive factor in human history.

All of the thinkers hitherto mentioned were fully familiar, however, with the doctrine of the French materialists that the principles of mechanics are in themselves sufficient to account for all observed and observable phenomena, including those of life and of mental activity. But by the later eighteenth century, the hegemony of mechanics was by no means unchallenged, especially in Germany; Goethe's disenchantment with Holbach's machine-like universe and his later onslaught on Newton are only two of the more familiar examples of a widespread anti-mechanistic reaction. Scientific speculation, which had always been more at home in that country than had practical experimentation, entered a new phase, and the model of the organism, already to hand in the neo-Platonic tradition and now more than ever vindicated by the rise of biology as a science, gradually replaced that of the machine in German reflections on the natural world. The vitalism of seventeenth-century medicine gained new currency, and with the *Naturphilosophen* of the early nineteenth century, an obsession with occultism and mysticism became the main characteristic of scientific thinking in the German Romantic movement.

Herder, and indeed Goethe, did not accompany this reaction to its ultimate conclusions. Herder's attitude to knowledge as a whole, apart from a few more extreme utterances in the early years of the Storm and Stress movement, displays a concern with harmony and balance which is entirely classical in spirit: he neither tried, as Hamann had done, to set his face against physical science, nor to make of it, as the Romantics were to do, an esoteric lore remote from everyday experience. And while many of his scientific ideas were inherited by the Romantics, others again were absorbed by later movements of a very different colouring.

Herder has suffered the fate of all great innovators. The novelty of his ideas, especially of his early ideas on art and history, has blinded many of his admirers to his associations with long-established traditions, with countries outside his own, and with disciplines other than those in which he made his most startling pronouncements. The nationalistic literary historians, whose influence is not yet extinct, have extolled a figure largely of their own creation.

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In the notes to the text, which are to be found at the end of each chapter, the name of the author or first word of the title referred to is given first, followed by the number of the relevant work as listed in the bibliography at the end of the volume. Where a work consists of several volumes, the appropriate volume number appears in Roman numerals after the bibliography number, and the page number is given last. Thus a reference to p. 249 of the eighth volume of Goethe's scientific writings, in the Weimar edition, would be:

Goethe 274 VIII, 249

References to Herder's works, however, are to the Suphan edition (unless otherwise stated), and are prefixed by the letters SW (*Sämmtliche Werke*). Herder's manuscripts in Tübingen and Weimar are referred to as follows.

Those in Tübingen are deposited in the:

Stiftung Preussischer Kulturbesitz,
Depot der Staatsbibliothek. Tübingen.

This is abbreviated to S.P.K. D.S.T.

The manuscripts are ordered by 'Kapseln' and 'Nummern'. Thus a reference to MS number one, 'Kapsel' number twenty-five, in Tübingen, runs:

Herder's MSS S.P.K. D.S.T. Kapsel XXV Nr.1

The MSS in Weimar are kept in the:

Nationale Forschungs- und Gedenkstätten, Weimar (Goethe- und Schiller-Archiv).

This is abbreviated to N.F.G. (G.S.A.)

The title of the catalogue of Herder's library (*Bibliotheca Herderiana*) is abbreviated to *Bibl. Herd.*

For the full names of those writers who are referred to in the text by their surnames only, readers should consult the Index of Names at the end of the volume.

PART I

PHILOSOPHY AND THEORY OF SCIENCE

CHAPTER I : INTRODUCTION

1. Herder's intellectual personality

There is something to be said for the image of the young Herder[1] as one torn between the empiricism of the early Kant and the transcendentalism of Hamann, or indeed between the rationalism of the Enlightenment and the irrationalism of the Storm and Stress movement. It distinguishes him at least as a personality full of internal conflict. Whatever the psychological origins of such conflicts and of Herder's attempts to overcome them may have been, they have again and again been noticed, and most writers who have discussed his fundamental attitudes to learning and to experience have agreed that a desire to reconcile conflicting elements is at work throughout his thought. They have often described it, in highly abstract terms, as a desire to reconcile Unity and Variety, General and Particular, Synthesis and Analysis, or Absolute and Relative[2] – although the list of equivalents to these pairs of words can be extended almost indefinitely, according to the point of view from which his works are considered.

Not that Herder is by any means unique as a thinker in constantly seeking to reconcile traditionally opposed standards. His distinctive quality is that he exhibits in an unusual measure both a relativistic sense for the concrete details of experience and a rationalistic preoccupation with abstract and absolute principles. The conflict of these two elements is the productive source of much of his work. The one side of the man has too often been emphasised to the detriment of the other, be it the irrational at the expense of the rational, the religious at the expense of the scientific, or even vice versa. In the most striking syntheses of ideas within his thought, and especially when he tries to relate the empirical world investigated by science to other zones of his experience, both the Uniformitarian and Diversitarian (to borrow A. O. Lovejoy's terms)[3] phases are equally, or almost equally, represented.

This is not for a moment to deny that one or other of these phases may gain the ascendency at any particular time in Herder's career or in any particular context within his works. To deny this would be to deny all possibility of development in his thought. Each period of his intellectual development, in fact, is characterised by its own peculiar accommodation of conflicting elements, before his perennial dissatisfaction leads him to abandon it in turn. Moreover, it is understood that any comprehensive solution to his problems at any one time may encompass numerous subordinate solutions, similar in character but applying to more limited areas of his thought. That many of these are mutually contradictory (for instance his several conflicting attempts to reconcile the real and the ideal in history) adds not a little to the richness, as well as to the ambiguity of his ideas. And finally, while religious elements, to take one example, may predominate on some occasions, the overall tendency in his development is to accommodate conflicting sets of values while seeking, against all odds, to preserve the integrity of each. When any distortion to traditionally antagonistic principles occurs, as it often does, it is a distortion which affects *both* sides, and is rarely a case of one overshadowing the other: in this way, his religious beliefs quickly became suspect to the orthodox, while conversely, the empirical basis of his secular philosophy was infiltrated by religious or idealistic values. Thus Herder is neither a mere religious apologist nor an early scientific positivist, as has alternately been claimed, for beyond both the religious and the scientific components of his thought lies an unqualified desire to reconcile opposing standards.

Thus in philosophy, to cite a more specific example, he advocates and employs both synthesis and analysis (in the technical sense of these terms as used in post-Wolffian German philosophy, whereby synthesis denotes the extension of knowledge by generalising from empirical premises, and analysis the *a priori* process of breaking down any given general concept in order to arrive at fundamental concepts). On the one hand, as Haym[4] and others long ago noticed, the young Herder, influenced here by the lectures of the early Kant on logic, often recommends an analytical approach, saying: 'Die wahre und einzige Methode der Philosophie ist also die analytische'.[5] Indeed, despite his frequent attacks on *a priori* rationalism, he again and again starts from concepts obtained by *a priori* analysis, as with his fundamental metaphysical triad of time, space and force ('Raum, Zeit, und Kraft') which he postulates in various works throughout his career; he constructs this triad by analysis of general concepts, beginning with that of Being, as in his *Metakritik* of 1799.[6] And on the other hand, it is recognised[7] that from the early years in which he first became interested in the psychology of the senses and rebelled against the abstractions of the German Enlightenment, he repeatedly recommends and employs an empirical and synthetic method, in his philosophical writings as well as in his more informal reflections on man and nature. Thus, in the logical sense, both analysis and synthesis are well represented in Herder's thought. Empirical generalisation, for Herder, is necessarily complemented by an *a priori* analysis of general concepts, at least in philosophical contexts. He accordingly affirms in 1775 that both methods are equally necessary,[8] and again writes in 1799:[9]

> In der Philosophie fängt die wahre synthetische Methode von Erfahrungen, als dem Gegebnen an und steiget hinauf; die Analyse von allgemeinen Begriffen steiget hinunter; jede dieser Lehrarten ist an Stelle und Ort gut, ja keine kann ohne die andre lange ihr Werk treiben.

In Herder's thought as a whole, the main syntheses (the word is now used in its non-technical sense)[10] produced by his efforts to reconcile disparates are of several kinds.

Firstly, he endeavours to reduce distinct elements of reality, as he envisages it, to some ultimate content or intrinsic quality which they supposedly share in common. The resulting concept is presented both as an inductive generalisation based upon observation, and as an absolute metaphysical principle. Easily the most far-reaching of such concepts is that of a universal 'Kraft' or force, closely resembling Leibniz's notion of a universe of monads, yet which Herder also uses as an empirical generalisation to cover phenomena such as electricity, magnetism and gravitation. Another concept which behaves in a somewhat similar manner is that of 'Humanität' as used by Herder in the 1780's[11]: it purports both to describe man's natural constitution and to provide a normative ideal to which man ought constantly to approximate.

Secondly, he endeavours to find some formal property shared in common by what are traditionally regarded as heterogeneous entities or spheres. Such are his idea of an 'Analogie'[12] between the laws of the physical world and those of the ethical world, his descriptions of ethical situations in mathematical terms, and his idea of a ladder of related forms[13] comprising both natural organisms and a celestial hierarchy. Such formulations as these are more frequent in his mature period, when he becomes more preoccupied with formal properties or laws than with intrinsic qualities or essences.

Finally, Herder's desire to reconcile opposites reveals itself in a disconcerting love of compromise, which frequently generates ambiguity, paradoxes, and even outright contradictions in his writings. This tendency becomes obvious, for example, in two letters to his friends Hamann and Sömmering concerning the import of science in his greatest work, the *Ideen zur Philosophie der Geschichte*; for, on the one hand, he tells Hamann[14] that the scientific passages in this work are merely a concession to current tastes, yet he informs Sömmering[15] that Book V, whose content is largely metaphysical and religious, could be omitted from the work without in any way altering his plan. There is no need to imply[16] that either of these statements involved conscious dissembling on Herder's part. He wished to preserve both conflicting attitudes within his own mind, defending each one separately for the benefit of two individuals (a religious mystic and a scientist) for each of whom only one attitude could be valid, as he well knew. Where he could not conceal a contradiction from his own eyes, he was prepared to ignore it. He would simply live with latent or even manifest contradictions rather than eliminate them at the cost of sacrificing any one of the contradictory elements. Besides, he had an almost boundless ability to put himself into the minds of others, so long as he had conceived an initial liking or respect for them. He could thus look at his own work from more angles than most of his readers could, and can, do. But paradoxical ideas and phrases occur again and again, as when he advocates a 'geistigen physiologischen Weg'[17] of studying man and his nature.

Some further aspects of this general ambivalence in Herder's thought must be mentioned before its relationship to the philosophy of science can be appreciated.

Herder stands in the history of philosophy between the rationalism of Leibniz[18] and his followers and the relativism and positivism of the nineteenth century, just as he stands in the history of literary criticism between the Enlightenment and later contrasting movements such as Romanticism. Within his philosophy of science, he combines an approach at times reminiscent of the early Greek thinkers, in seeking for some simple, sweeping formula to account for the entire workings of nature, with more empirical methods in which exact description of parts and details comes first. Similarly, he might be said to share the attitude of the physical scientist, with his concern for general laws, and that of the natural historian, who is content to describe and classify the individual forms he encounters.

The same characteristic antithesis can alternatively be envisaged in terms of form and content, the former increasingly predominating as the older Herder, partly under Goethe's influence, moves further and further away from his earlier intuitive, empathetic interest in the multifarious forces or 'Kräfte' supposedly at work in history, art and nature, and begins to search for formal, harmonious principles in nature and history alike. The earlier of these attitudes, so productive in his youthful studies of the arts, proved a weakness in his scientific thought, encouraging as it did an excessive subjectivity and a belief in intangible agencies, whose qualities were as much chimerical as objectively determinable, behind all natural forms. But his attempts to unite both preoccupations led him to achieve, in his mature years, a delicate balance between them, with his most comprehensive unifying concepts rising above the main body of his thought.

From this point of view, it is easy to appreciate that Herder was by nature predisposed in favour of some sort of philosophical monism. He was always inclined to envisage the whole universe as an ultimate unity. But while later (materialistic) monists have affirmed the oneness of everything by denying, within the traditional dualism, that one of its two poles (in this case, mind or spirit) has any separate existence, Herder preserves both matter and spirit by reducing them to the higher common factor of 'Kraft'.

Out of this metaphysical monism, there inevitably arose a host of contrived and pseudo-scientific theories,[19] far too speculative to be even compared with those of present-day science. But the methods themselves which evolved out of this monistic attitude, the resultant patterns of thought, are in many cases common to mystical or subjective monism on the one hand, and to later varieties of scientific monism on the other, by virtue simply of their common aim of furnishing unitary explanations. Herder was a synthesising mind *par excellence*, and he helped in this way to elaborate methods of generalisation adopted by later philosophers and theorists of science. Here again, he was neither merely a theologian imposing his values upon scientific thought, nor an early scientific positivist.

These, then, are some general aspects of Herder's intellectual personality. By themselves, they are too unspecific to provide much information about his philosophy, far less about his philosophy of science. They are at all events enough to confirm what his friend Jean Paul said in a letter to him:[20]

> so findet jeder in Ihrem weiten System leichter seines als Ihres. Niemand ist verständlicher als der Einseitige, und dem Kurzsichtigen glaubt man am ersten, weil seine Gegenstände vor uns liegen.

2. Herder scholarship and the history of scientific thought

In evaluating the scientific thought of earlier centuries, it is helpful, and indeed necessary, to distinguish between the methods associated with scientific enquiry and the results which such enquiry produces. In its most comprehensive sense, the term 'scientific methods' can designate, firstly, the techniques of practical investigation; secondly, the methods employed in the immediate theorising activity by which the data of observation are classified, grouped into regular patterns, or integrated into a conceptual framework; or thirdly, the methods employed in making more general pronouncements on the structure and content of the reality investigated by science and on the scope of scientific knowledge. These are, in short, the techniques of observation, the methods of scientific theory, and those of the philosophy of science. Since Herder was not primarily a scientific observer, the second and third senses of the term are more obviously applicable to his case.

Conversely, the 'results' of scientific enquiry can signify the data of observation, which may, if they are new, constitute a 'discovery'; secondly, scientific hypotheses, theories or laws (as distinct from the methods by which they were arrived at); or thirdly, general pronouncements upon the nature of the universe and of science itself. Statements of this third variety, especially in earlier periods, may go well beyond the province of science as we know it today, and are frequently highly speculative in character. Once again, the second and third senses are more relevant in the case of Herder, who was a theorist and philosopher of science rather than a practical investigator.

In what sense is it justifiable to compare the results of past scientific thought, such as found in Herder's works, with those attained in later ages or indeed today? This question at once raises the eternal problem of anticipation or 'prophecy'.

A minimum of empirical evidence can give rise to a bold hypothesis (as for example the atomic theory in ancient Greece). Such notions may be taken up by non-scientists (in this case, by a series of thinkers from Lucretius to Gassendi), publicised, and so become part of the general climate of ideas. They may then provide ready-made hypotheses to account, *ex post*, for new empirical observations, sometimes even expressly encouraging the scientist to test conclusions he has heard of as speculations. In the latter case, it would be correct to speak of a direct influence of non-scientists on the progress of science; if, however, scientists were to adopt such ideas only after new observations, which the ideas might explain, became available, the influence would be indirect and fortuitous.

For the number of ideas of non-scientific origin which do provide a direct influence, there are many more whose influence is coincidental, and many more again which prove fantastic by later standards, and are speedily forgotten.

Ideas which do anticipate or influence those of later scientists must never be regarded as marvellous foreshadowings, implying some undefined superior insight or prophetic faculty. They are often daring and imaginative guesses, inspired even by aesthetic considerations in their concern with harmony or symmetry (as with those aesthetic reflections on the universe which induced Kepler to formulate his laws of planetary motion), and, as such, are merely examples of Bacon's *idola tribus*: 'for the human understanding is of its own nature prone to suppose the existence of more order and regularity in the world than it finds. . . Hence the fiction that all celestial bodies move in circles; spirals and dragons being (except in name) utterly rejected'.[21]

It would be interesting to study the role of such *idola* or erroneous conceptions in furthering, despite themselves, the progress of science; but these are rather the exceptions than the rule, since careful observation and exact calculation have always provided the solid ground upon which hypotheses, however inspired, must eventually rest.

How then can a thinker such as Herder influence the results of scientific enquiry? Firstly, the influence can be such as that just described, for eminent men of letters, by their prestige, are in an excellent position to publicise ideas, including second-hand ones, which may prove useful as hypotheses in the further development of science. And secondly, as one theorist of biology observes, 'the beginnings of every science, physics included, often were rather philosophical, general, anthropomorphic, even metaphysical',[22] so that the influence of non-specialised thinkers, in Herder's day, upon the emergent sciences such as geology, physiology, biology, psychology and anthropology, was by no means insignificant. In this connection, there also springs to mind the enormous influence of such thinkers as Aristotle, Bacon, Descartes, Leibniz, Kant and others upon particular scientific theories, even apart from their work as philosophers in monitoring and correlating scientific theory in general, studying its logic, and relating it to the rest of knowledge.

Comparisons between actual results of scientific enquiry in different ages must then be made with caution. There remains, however, the second question of how the *methods* of earlier thinkers can be compared with those of modern scientific thought.

Benjamin Farrington rightly argues that 'the true history of science. . . should be rather a history of method than of results, for the latter are often accidental and only seem impressive to later generations when they have been rediscovered by improved methods'.[23] Taken out of context, individual theories can be highly misleading, perhaps having been reached by scientifically questionable methods. And while the actual conclusions reached in Herder's day, especially in sciences such as chemistry and physiology, can rarely be compared directly with those of today (because improved techniques of investigation have since become available), the theoretical methods and general attitudes encountered in the two periods do allow of such comparisons.

But while these considerations, as well as the purely subjective quality of many of Herder's theories, render most of his actual results unacceptable in the light of later advances, his theoretical methods, where applied objectively by him or where applicable objectively in the present, are at least partially acceptable to modern science and its associated philosophies. For past methods often coincide with subsequent procedures when they are applied to empirically verified data. And a correct conclusion reached by a dubious method surely deserves less respect than a conclusion reached by a logically unimpeachable method, but superseded as more facts become available.

All this discussion is particularly necessary because so many writers dealing with Herder have tacitly or explicitly raised the question: 'How scientific, or how modern, are Herder's ideas on science?'

Almost all the writers who have dealt with Herder's scientific thought have occupied themselves with his results rather than with his methods. Since Kant's damning reviews[24] of Herder's greatest work, the *Ideen*, raised grave doubts about the legitimacy of Herder's methodological practices, and the two founders of modern Herder studies, Haym and Kühnemann, endorsed and amplified Kant's opinion, the methods Herder used in his scientific thinking have habitually been ignored, dismissed in a few words, justified retrospectively by his allegedly modern results, or subordinated to methods used in other areas of his thought (as in his writings on poetry and religion).

The detailed study of Herder's scientific ideas began, furthermore, from completely false premises, with Bärenbach's *Herder als Vorgänger Darwins*,[25] which was followed in turn by a spate of related works, either agreeing or disagreeing with Bärenbach's contention that Herder was an early Darwinist, but never fully investigating the premises on which the whole largely futile controversy rested. Max Rouché's *Herder précurseur de Darwin? Histoire d'un mythe*[26] exposed the majority of this literature as a farrago of short-sighted partisanship, and the same writer's second, larger work, *La philosophie de l'histoire de Herder*,[27] although primarily a study of Herder's philosophy of history, contains the most valuable commentary on his scientific thought hitherto available, being full of extensive and scholarly information. But Rouché too came from his study of Darwinism interested primarily in the results, not the methods of science, and he sees the history of science first and foremost as the history of the evanescent theories themselves, not of the methods by which they were formulated. He goes so far as to say that scientific controversies can invariably be reduced to contemporary religious and social influences,[28] and accordingly writes of Herder: 'toute son oeuvre scientifique a consisté à mettre la méthode des sciences modernes. . . au service de thèses religieuses'.[29] This approach scarcely does justice to science as an independent organ of enquiry and discovery, possessing techniques, methods and attitudes shared by men whose lives may be separated by centuries. While individual hypotheses may be and indeed must be successively discarded, a core of known observations and established laws is built up, and even if exceptions to such laws should later be discovered, the laws do not cease to apply to the relative situations to which they originally referred.

R. T. Clark[30] has also devoted some attention to Herder's scientific thought, but likewise concentrates on his particular theories, comparing, for example, his qualitative notion of 'Kraft' to the modern and purely quantitative concept of energy.[31] Like the other American critic Martin Schütze,[32] he hails Herder as an early positivist.[33] It is singular that, in seeking to bring about a rapprochement between Herder and modern science, they also adopt the converse expedient of isolating modern doctrines which are anything but empirical (the vitalism of Bergson and Driesch, for instance), and which true positivists would at once reject, and comparing these with Herder's ideas.[34]

A considerable number of other works, such as those of Bruntsch,[35] Grundmann,[36] Sauter,[37] Temkin,[38] as well as various works on Herder's idea of environmental and geographical determinism and his psychological theories, constitute valuable studies of limited areas of his scientific thought. None of these, however, provides a thorough analysis of the methods he employs, and most of them deal only with his greatest work, the *Ideen*, which, though important, represents only one stage in the development of his scientific ideas.

3. Herder's concept of 'Kraft'[39]

For Herder, the activity of the scientist consists essentially in following up the all-pervading 'Kraft' or dynamic power behind all natural phenomena, and in particular, the numerous individual 'Kräfte' into which the universal 'Kraft' differentiates itself. Since the same concept has a major function in several other important areas of Herder's thought, a study of his scientific methodology will benefit from a preliminary survey of the range and limits of this notion in his writings as a whole. Besides, the same concept admirably illustrates his characteristic endeavours to reconcile disparates. For it fulfils many functions which are at bottom discrete, although Herder's customary and even intentional vagueness often disguises their separate identity.

(a) The philosophical usage

Throughout his career, as already remarked, Herder uses the triad of time, space and 'Kraft' as his basic metaphysical categories.[40] It appears that his teacher Kant first introduced him to the idea of 'Kraft' as part of this tripartite scheme, for in two of Herder's recently published manuscripts of 1762 or 1763, based on Kant's early lectures on mathematics, he divides the applied mathematical sciences into those which study objects according to 'Raum', 'Zeit' and 'Kraft' respectively.[41]

Herder subsequently employed the concept, however, in ways which Kant would scarcely have encouraged. His primary definition of it in his *Metakritik* of 1799, in which he violently attacked Kant's critical philosophy, shows that it has by this time acquired a new sense: '*Kraft* . . . ist *Maas der Realität eines Daseyns von innen*, da Raum und Zeit nur von außen seine Gestalt und Dauer meßen und ordnen'.[42] But since scientific investigation can take place only 'von außen', Herder's conception of 'Kraft' as it appears here has no scientific status whatsoever, and is part of his own private metaphysic.

Leibniz, it is almost universally agreed,[43] is the principal source for most of Herder's more specific philosophical applications of the concept. Indeed, he explicitly acknowledges and praises Leibniz for his theory of 'Kräfte' (i.e. monads), and apparently regards it as Leibniz's greatest contribution to metaphysics.[44] In his psychological treatise of 1778, *Vom Erkennen und Empfinden*, he amplifies Leibniz's monad theory so as to bridge Leibniz's (albeit veiled) dualism (his 'preestablished harmony'), of soul and body by saying that, since both elements can be reduced to 'Kraft' and are therefore alike in quality, they must be able to act directly upon one another.[45] The more general dualism of mind and matter is overcome in Herder's philosophical dialogues *Gott* of 1787 by means of the same concept,[46] and the third dualism of subject and object, the root of the perennial problem of perception, is disposed of in the same way in the treatise of 1778 mentioned above.[47]

The main function of 'Kraft' in Herder's philosophical arguments is thus that of a synthesising concept, which, by its very generality and intangibility, is put to questionable use in eliminating traditionally irreconcilable antitheses.

Some further metaphysical applications of the concept in Herder's works have hitherto escaped notice. For example, there is his belief that 'Kraft', when postulated as a causal principle, is derived from man's experience of himself as a causal agent. He observes: 'der Mensch. . . findet sich am innigsten als *Kraft*, als *Ursache*'.[48] But, as Maupertuis had already realised,[49] we must not forget that it is merely a personification of inanimate agencies when we apply the idea of force to the natural world as a pretended explanation of motion or causal action, and that, strictly speaking, it explains nothing. A similar reservation is expressed in Hume's doctrine that causal action may be postulated, but that its reality is not susceptible to proof. Kant held a similar opinion on the explanatory function of the concept of force[50]; it became a commonplace of philosophy in Herder's day[51], and Herder himself reiterates it again and again, as when he declares: 'Kein kluger Philosoph aber hat sich je unterwunden, zu wissen, was *Kraft* ist, oder würkende Wesen nach innern Gesetzen und Zuständen zu ordnen'.[52]

None the less, he does not hesitate to do the very thing he himself warns against, and writes: '[wir] schließen mit Recht, *daß der Wirkung eine wirkende Kraft, mithin ein Subject zum Grunde liege*'.[53] The word 'Subject' betrays his logically fatal step towards personifying inanimate agencies. In fact, a recently published manuscript of 1769 shows how he had proceeded to do this at a relatively early date, describing how the human body and, by analogy, the planets, are formed by the action of an inner 'Monas', 'Kraft', or 'Seele'.[54] He thus warns us on the one hand against attempts to define the intrinsic nature of 'Kraft', yet, on more than one occasion, himself personifies it as an intelligent causal agent. Once more, the inherent ambivalence of the whole idea is unmistakable.

The position becomes still further complicated when he proceeds to confuse the above-mentioned logical conception of 'Kräfte' as causal agencies, which are by definition unknowable in themselves, with the purely empirical problem of whether we can determine the nature of various physical agencies, also styled 'Kräfte', such as electricity, magnetism, and gravity. He writes:[55]

> *Wo Wirkung in der Natur ist, muß wirkende Kraft seyn. . . Es mögen viele Medien in der Schöpfung seyn, von denen wir nicht das mindeste wissen, weil wir kein Organ zu ihnen haben.*

The reason here advanced for our inability to comprehend such natural forces is no longer the logical one used elsewhere to explain our lack of knowledge of causality (although Herder never makes this distinction explicit); our lack of a suitable 'Organ' is here held alone responsible. The inference is clear that, if we possessed more sensitive organs or instruments, we might detect many more 'Kräfte' in the physical world.[56] Just as he had attributed real existence to 'Kraft', against his own warnings, as a metaphysical, soul-like principle, he now alternatively gives it reality by identifying it with practically detectable physical agencies.

Thus we can already distinguish three distinct conceptions, logical, metaphysical, and physical, closely related and barely distinguishable in Herder's earliest formulations, yet all disguised under the same word – 'Kraft'. Once again, the synthesising function of the concept is obvious, as is its incorrigible vagueness. Maupertuis' denunciation of such thinking is perhaps the clearest and most forthright of such statements in Herder's times:[57]

> D'autres [philosophes] ont cru avancer beaucoup, en adoptant un mot qui ne sert qu'à cacher notre ignorance: ils ont attribué aux corps une certaine *force* pour communiquer leur mouvement aux autres. Il n'y a dans la Philosophie moderne aucun mot répété plus souvent que celui-ci, aucun qui soit si peu exactement défini. Son obscurité l'a rendu si commode, qu'on n'en a pas borné l'usage aux corps que nous connoissons; une école entière de Philosophes [Leibnizians, no doubt] attribue aujourd'hui à des êtres qu'elle n'a jamais vus une force qui ne se manifeste par aucun phénomène.

(b) Animistic and related usages

From the personification of non-human agencies, it is a short step to the notion that the inorganic and vegetable worlds are endowed with soul-like attributes. In the manuscript of 1769 cited above in which Herder's fancy conjures up planetary souls, he also speaks of 'das Leben der Metalle' and 'das Leben der Pflanzen'.[58] Some years later, he represents the 'Kräfte' of plants and stones as analogous to the soul.[59] Similar references, all based on the Leibnizian model of a ladder of natural forms, each endowed with a different degree of consciousness, appear in several other passages in his works.[60]

Words such as animism, pananimism, panvitalism, panpsychism, panspiritualism, panlogism, hylozoism and the like all convey something of Herder's use of this complex of ideas, but, allowing for his characteristic vagueness and the facility with which one meaning of the 'Kraft' concept shades off into others, it is unwise to be over-specific. Perhaps 'pananimism' is the least misleading term to describe the present usage.

As to the sources of such ideas, various Herder scholars have suggested Plato,[61] Shaftesbury and Leibniz,[62] and the later medieval mystics,[63] and Herder himself, in an early fragment, speaks of 'Cardan, Campanella, die Gräfin Conneway und van Helmont, die allen Sachen Leben und Empfindung gaben'.[64] Late in his life, Herder found Kepler's animistic conception of gravitation more congenial than Newton's neutral or mechanistic one,[65] and he seems to have been familiar with the doctrine, first profounded by Gilbert in his *De Magnete* of 1600, that the earth's magnetism is a palpable manifestation of the world-soul, for he says in 1778: 'der große Magnetismus in der Natur, der anziehet und forstößt, ist lange als *Seele der Welt* betrachtet worden'.[66] But he subsequently rejects the idea of a world-soul as soon as it is made to comprehend the souls of men, as in Averroes' philosophy, since he realised that this would imperil the doctrine of personal immortality.[67] Thus he never fully accepted pananimism with all its consequences.

It is perhaps wiser, however, not to over-emphasise any one aspect or source of these ideas found scattered through Herder's works, but to see them all as various alternatives within the complex of interrelated ideas involving the concept of 'Kraft', related, in this case, to his Leibnizian attempts to reconcile mind and matter.

(c) 'Kraft' and the occult

Closely related to these animistic fancies is Herder's belief in occult, invisible powers at work around him. This belief is not reflected in his published works, in which he was always eager to denounce superstition, but his wife Caroline relates in her memoirs:[68]

> Sein Glaube an noch unerklärte oder unerklärliche Kräfte der Natur war Glaube an die allbelebte, geisterfüllte Welt, an innere Kräfte der Natur und Seele, die mit anderen uns bekannten Gesetzen innig harmoniren, uns aber noch nicht aufgeschlossen sind. . . Er glaubte auch, daß eine reine wohlgebildete Seele. . .der Ahnungen über bevorstehende wichtige Ereignisse allerdings fähig sey.

It is interesting that Caroline juxtaposes 'unerklärte' and 'unerklärliche' in a way which recalls Herder's own failure to distinguish between the logically inexplicable and the scientifically unexplained. No doubt his belief in a personal daemon, as recorded in his letters,[69] his use of Biblical lotteries,[70] his keen interest in galvanism,[71] and his statement to Jean Paul 'daß er sich eine Geistererscheinung wünschte, und daß er gar nichts von dem gewöhnlichen Geister-Schauder dabei empfände und ahnete'[72] are all part of this same conviction.

Yet just as he was prepared to personify causal agencies himself while reiterating the warnings of Hume and others against doing so, he on another occasion condemns all beliefs in mysterious forces within nature, writing to his son August: 'die Raumerfüllungen, geheime Kraft- und Thätigkeitsprinzipe, die Ichs, Selbste und Seelen der Metalle und Mineralien etc. etc. etc. überlaß dem Teufel'.[73] What he saw as a flaw in the scientific arguments of his adversaries (in this case, the Romantic thinkers who had influenced his son), he chose to overlook in his own thinking. Once again, the ambivalence of his views, especially of his 'Kraft' concept, is strikingly obvious. It must in all fairness be added, however, that he had no sympathy with occultism as a serious study, as a letter to the young Georg Müller shows.[74] And in the course of his duties as General Superintendent of the Weimar churches, he abolished the formula of exorcism from the baptismal liturgy, for fear that it might foster superstition.

(d) Religious and mystical usages

Herder early became acquainted with yet another cognate application of the 'Kraft' concept. In 1766, he made the following extract, in translation, from Hume's *Natural History of Religion*:[75]

> Wir sind auf einem Schauplatz, wo *unbekannte* Ursachen wirken, unbekannte Folgen wirken; nun beschäftigt sich die Einbildung, um diese *unsichtbaren Kräfte* zu erdecken; zu unphilosophisch, um den großen Mechanismus einzusehen, sucht man Alles nach sich zu bilden.

He himself adopted this rational explanation of how religions arise, and writes around 1780: 'Wilde [sehen] überall Kräfte, Geist: Orientalen überall Gott'.[76] Yet he is prepared to personify natural phenomena and their causes himself, in the same way as the savages he describes, and in his religious phase in Bückeburg, he warmly praises primitive peoples for their mode of worship, which Hume had rationalised as a delusion, and says in words of tribute to the purer original religion of early societies: '*Kräfte* wurden angebetet und nicht *Formen*. . . Sie beteten nur die Gottheit im Lebendigen an!'[77] And at a considerably earlier date, he describes God in terms of 'Kraft', saying: 'Gott erfüllt den Raum durch seine Kraft'.[78] Here, he is probably echoing a similar statement in Kant's *Allgemeine Naturgeschichte* (1755),[79] which he had certainly read by 1766.[80]

Enough has been written by earlier critics on how Herder extended this religious version of the 'Kraft' concept in his *Gott* of 1787, and on his endeavours in this work to link his supposed divine 'Kraft', indeed almost to identify it, with the 'organische Kräfte' of nature. This pantheistic resolution of the old dualism of God and nature, creator and created, is again thoroughly typical of his whole way of thinking.

As to the various precedents for the religious versions of the concept, there can be no doubt that Herder associated the Johannine doctrine of the divine logos with his own notion of 'Kraft',[81] and that he related this in turn to the Old Testament conception of the divine breath as a life-giving principle.[82] The idea that the divinity itself acts as an all-pervading 'force' can be traced back to Plato, to the medieval 'anima mundi', the writings of Philo and the Alexandrian mystics, the Cabbala, and many other works, all age-long fountain-heads of heresy, which are fairly fully discussed in Max Jammer's excellent history of concepts of force.[83] Among other writers whom Herder had certainly read there is the Cambridge Platonist Ralph Cudworth,[84] with his 'Plastick Nature', a hypothetical force bridging the gap between God and the natural world,[85] and Giordano Bruno, whose opinions Herder had encountered through the pantheist John Toland's writings in the 1770's, as his unpublished manuscripts show[86]; Bruno too conceived of the deity as a universal force. And finally, Leibniz's monads once again spring to mind as a possible influence. Leaving aside the much-debated question of whether Herder's religious conception of 'Kraft', as found in his *Gott* of 1787, is pantheistic, anyone who considers the ancestry of this idea of a middle term between God and nature, spirit and matter, will agree that it is more closely associated with mysticism and heterodoxy than with orthodox Christian belief.[87]

One further aspect of the concept deserves attention here. Herder regards the human soul itself as a 'Kraft', and argues that, since 'Kräfte' are indestructible, the soul must be immortal. He accordingly writes in 1769: 'Mein Tod ist nur ein Vertreiben aus Zeit, und Raum: *Keine Schwäche meiner Kraft'*. Yet in the same manuscript, he says of the soul at death: 'ihre vitale Kraft also kann nicht mehr dem Allen entgegenwürken, was auf sie stürmt – ich sterbe'.[88] It thus appears that he considers the soul as a 'Kraft' possessed of two aspects, one 'vital' and the other immortal. Rudolf Unger has examined this aspect of the idea in detail, and shows that Herder's problematic arguments for, and sometimes even against, the immortality of the soul's 'Kraft', never reach any satisfactory conclusion even in the *Ideen* of the 1780's, but remain vague, shifting, and contradictory.[89]

(e) The aesthetic usage

The sentence quoted above, in which Herder explains how religion arises when primitive people personify natural phenomena, continues with the words: 'Daher die älteste Poesie, Poesie der Wilden'. This juxtaposition of ideas shows how closely he associated the origins of religion with those of poetry. Hence he readily went on from describing the divinity as a 'Kraft' to describe the nature of poetry in the same terms. In fact, in the *Kritische Wälder*, he already adapts his familiar 'Raum, Zeit und Kraft' scheme to aesthetics, relegating the visual arts to space, music to time, and poetry to 'Kraft'.[90] In another passage, poetry is associated in turn with 'Energie'.[91] R. T. Clark has shown in detail how the English aesthetician Harris, with his (originally Aristotelian) notion of poetic 'energy', influenced Herder here.[92] Herder at any rate continued to associate poetry, like so many other things, with 'Kraft', especially in his writings on literature in the 1770's.

The poetic application of this concept is the most overtly subjective of all the uses Herder makes of it. After all, the young enthusiast of the Storm and Stress years saw poetry as a means of infusing emotional content into an effete and over-rationalised society. Yet when he proceeded to use the same concept in scientific contexts, this subjective element effaced what little objective value the concept might otherwise have possessed. It may have proved an inspiration to the young 'Kraftgenies' who took their name from it, but it could only detract from the clarity of Herder's scientific thought.

(f) The historical usage

The creative force at work in the poetic genius likewise expresses itself, according to Herder, in the process of history. He writes of historical studies in an early version of his *Auch eine Philosophie*: 'Wir suchen und wägen Kräfte, nicht das Schattenbild ihrer Abstraktionen und Folgen, die sich vielleicht mit jedem Stral der Sonne ändern'.[93] And even as he moves away from his youthful view of history as struggle, as 'Gärung', as organic growth, he still believes that 'Kräfte' are the raw material, so to speak, of history.[94] Then in 1787, in Part III of the *Ideen,* side by side with the earlier notion of historical 'Kräfte' as forces of spontaneous organic development, there appears the later idea that they operate according to quasi-mathematical, indeed mechanical laws.[95] Thus in history too, the concept acquires a dual significance.

(g) The physical usage

The young Herder's notes from Kant's lectures on mathematics, as earlier mentioned, already classify the physical sciences according to 'Raum', 'Zeit' and 'Kraft', the last of which is purportedly the object of dynamics, mechanics, geography (surprisingly enough), astronomy, optics, hydraulics, and statics.[96] There is evidence that he soon went on to connect this physical sense with the religious one, however, as when in 1774 he describes Newton's researches as a pursuit of the 'Gotteskraft' within nature.[97] And he had earlier declared, of course: 'Gott erfüllt den Raum durch seine Kraft'. But in this respect at least, he was not deviating from the beliefs of many, if not the majority of contemporary scientists, for as Jammer remarks of Newton's theory of gravitational 'action at a distance', 'the only way to reconcile this new and immensely successful notion with traditional ideas was to supply it with a metaphysical-theological foundation and to assimilate it into the Neo-Platonic body of doctrines. Force and gravitation were thus conceived as manifestations, par excellence, of divine omnipresence and omnipotence'.[98] In his important essay of 1777, *Über die dem Menschen angeborne Lüge*, Herder accordingly proceeded to use the pattern of gravitational attraction in the solar system as an analogy for the spiritual situation of man,[99] and at all times, he refers not only to gravity but also to electricity, magnetism and other physical phenomena as 'Kräfte', thus rounding off a complex scheme of physico-metaphysical relations extending from the simplest natural phenomena to the supreme being.

(h) The biological usage

Herder was early familiar with the concept of 'Kraft' as used in current biological literature, as his notes of 1766 on the 'vegetativische Kraft' of the microscopist J. T. Needham indicate.[100] And in his religious phase of the 1770's, as mentioned above, he went on to associate the biological idea of a life-force with the theological conception of the divine breath, completing another link in the great synthesis which the concept of 'Kraft' came to represent. From then onwards, he uniformly supports vitalistic theories of a 'Lebenskraft' in biology.

(i) The psychological usage

Early in his career, Herder encountered the traditional theory that the mind is composed of a series of 'Kräfte' (faculties), and in 1767, in characteristic fashion, he proceeded to reduce these to a single 'Kraft', of which, he maintained, the various mental functions are merely different expressions.[101] And from the time of his psychological essay *Vom Erkennen und Empfinden* (1775 and 1778 versions) onwards, in an attempt to justify scientifically Leibniz's metaphysical doctrine that the mind and body are both composed of dynamic elements, he made the neurological 'Kräfte' or 'vires' of the physiologist Albrecht von Haller the foundation of his own psychological thought. Once again, the concept was employed as a mediator between disparates.

(j) Conclusion

Despite the loss of the notebook[102] in which the mature Herder recorded his general reflections on 'Kraft', his other writings contain sufficient references to the concept to show how vast and ramified its associations are. The principal function it performs is to unite different areas of his experience and thought. The gaps which it is used to bridge are at times so wide that the resulting synthesis can be called little more than verbal, a mere papering over of gulfs which threaten to gape open again at the slightest probing. The very comprehensiveness of the concept makes it unwise to emphasise any one of its innumerable nuances, as too many critics have done in the past.

It is a compromise then, but not a compromise in the sense of a neutral territory on which a choice between extremes can be avoided; on the contrary, its function is to facilitate movement between extremes, any one of which Herder is prepared to embrace when necessary. He was often prepared to reduce physical and even biological 'Kräfte' to purely material or corporeal units.[103] Yet on the other hand, he often used the term to designate spirits or entirely incorporeal agencies. In this context, the concept is not so much an alternative to the extremes of spiritualism and materialism, as a veil, a conveniently ambiguous term which allowed him to take up materialistic *or* spiritualistic (even purely mystical) positions at will, to juxtapose traditionally incompatible ideas while avoiding the more obvious appearances of contradiction. It is worth repeating that these inconsistencies need not imply conscious dissembling, but are a constant and essential feature of Herder's problematic thought, already manifest in his early works of the 1760's.

All this shows that it is impossible to treat Herder's scientific ideas in isolation from the rest of his thought. For even the single concept of 'Kraft', as used in his scientific arguments, carries with it a plenitude of important associations from most other departments in which he was interested. This certainly enhances both the breadth and the unity of his thought, but it also renders the concept virtually valueless in scientific contexts as a description of natural phenomena. It likewise helps to confirm that theories concerning intrinsic quality or content, as distinct from measurable quantity or form, in the natural world, and indeed all supposedly scientific results obtained in a methodologically unsound way, have no legitimate place in science, and deserve less attention than do the methods by which they were arrived at.

Nevertheless the 'Kraft' concept does have its value, in a methodological sense, purely as a means of synthesis. Max Jammer writes: 'The history of physics shows clearly that the introduction of the concept of force led to a methodological unification of the conceptual scheme of science'.[104] That is, the methodological role of the concept in the history of science, strangely enough, has been essentially the same as it seems to have been within Herder's thought, just as it has proved in both cases to have no explanatory power whatsoever.

NOTES

1 As presented, for example, in Kronenberg 159 p. 11. Rudolf Haym, however, sees the influences of Kant and Hamann as harmonious and complementary.
2 W. Dobbek, in an excellent recent essay (number 76 in the bibliography), first elevates this pattern to the rank of a psychological principle at work throughout Herder's thought. For examples in the works of other critics, cf. Kühnemann 14 p. LXVI; Dachauer 142 p. 158; Hoffart 153 p. 89; Stadelmann 181 p. 137; Haym 64 I, 41; Berlin 137 pp. 54 and 102-103; etc.
3 Lovejoy 233 p. 294.
4 Haym 64 I, 42-43.
5 SW I, 418. *Fragmente*, 1767.
6 SW XXI, 62-64; cf. SW I, 419.
7 As in Dachauer 142 p. 80 and Steinborn 124 p. 97.
8 SW VIII, 320. *Vom Erkennen und Empfinden*; cf. SW VIII, 232-233 and Goethe 274 VII, 171, who declares 'daß Sondern und Verknüpfen zwei unzertrennliche Lebensacte sind'.
9 SW XXI, 34. *Metakritik*; cf. also SW XXI, 36.
10 Much confusion has resulted in Herder studies (as elsewhere) from failures to specify the senses in which the terms analysis and synthesis are being used.
11 Cf. Gillies 146 p. 89.
12 Cf. Leibniz 312 p. 622: 'nous devons remarquer ici encor une autre Harmonie entre le Règne Physique de la Nature et le Règne Moral de la Grace'; also Posadzy 170 p. 28.
13 Cf. Kühnemann 14 p. CXLV.
14 Hamann 30 V, 151, to Hamann, 10 May 1784: 'Daß ich in die Grundsätze und manchmal in die Flitterbeschäftigungen unsrer Zeit habe eingehen müßen, als ob sie große Sachen wären, *muste* ich, um Platz zum folgenden zu gewinnen und von dem Punkt, worauf jetzt alle Naturgeschichtschreiber als die Lieblingsautoren unsres Viertheil Jahrhunderts . . . stehn, nur allmälich wegzulenken.'
15 Dobbek 22 p. 250, to Sömmering, 28 February 1785: 'das letzte Buch kann für den, der es nicht gelten lassen mag, meinethalben wegbleiben; in meinem Plan und meiner Absicht wird damit nichts geändert.'
16 As Rouché 172 p. 331 does, referring to a similar contradiction, and arguing that the religious sections represent Herder's true commitment. Cf. also Clark 62 p. 213 and K. Marchioni, *Der Oberhofprediger als Freidenker*, Leipzig, 1926 for the view that Herder indulged in conscious hypocrisy in such matters.
17 SW XIII, 84.
18 Cf. Blumenthal 139 p. 9: 'Leibnizens Ausführungen interessieren Herder nur insoweit, als sie zur Ausbildung einer durchorganisierten, dem natürlichen Rhythmus unseres Lebens angepaßten Weltansicht beitragen. . .'.
19 Cf. the equally suspect methods of Herder's admirer Dalberg, 268 p. 8: 'Ich vergleiche die unläugbaren Grundsätze der Physik und Moral, der Chemie und Politik, der Theologie und Psychologie u.s.w. Und da such ich die Punkte der Aehnlichkeit unter ihnen auf.'
20 Düntzer 23 I, 289. Jean Paul to Herder, 31 July 1797.
21 Bacon 252 IV, 55.
22 Bertalanffy 195 p. VI.
23 Farrington 225 p. 58.
24 Kant 300.
25 Bärenbach 71.
26 Rouché 111.
27 Rouché 172.
28 Rouché 111 p. 79.
29 Rouché 172 p. 533.
30 Clark 62 and 75.
31 Clark 75 p. 752.
32 Schütze 176.
33 Clark 75 p. 751. Herder is here portrayed as a precursor of Auguste Comte.
34 Cf. Schütze 176 vol. 21, 127.
35 Bruntsch 74.
36 Grundmann 80.
37 Sauter 114.
38 Temkin 126.
39 R. T. Clark has published an article on this concept of Herder's (no. 75 in the bibliography at the end of this volume). Since he has dealt only with its aesthetic and physical applications,

and since his attempts to equate it to the modern conception of energy are seriously open to question, a fuller analysis of it here does not seem superfluous.

40 Cf. SW I, 419; III, 137; XXI, 66; *et alia.*

41 Irmscher 12 pp. 18 and 30; cf. also Martin 15 p. 301 for another manuscript entry of a similar kind.

42 SW XXI, 67.

43 Cf. Haym 64 II, 290; Blumenthal 139 pp. 19, 27 and 48; Siegel 179 p. 139; also Schmidt 174 p. 17.

44 SW XVI, 450. *Gott*, 1787.

45 The philosopher J. H. Lambert, whose works Herder knew, had earlier reached the same conclusion, so that it was by no means an original idea of Herder's. Cf. Lambert 309 II, 20, 39, etc.

46 SW XVI, 548.

47 For a clear exposition of these uses of the concept, see Siegel 179 pp. 126-132. Siegel's analysis removes the need for a more detailed discussion of them here.

48 SW XXI, 152.

49 Maupertuis 316 p. 31: 'Nous nous souviendrons toujours que la force motrice . . . n'est qu'un mot inventé pour supplier à nos connoissances, et qui ne signifie qu'un résultat des phénomènes.' Herder knew this work, and refers to it in 1774: cf. SW VI, 273-274.

50 E.g. Kant 303 p. 180 (1788): 'Von einer Grundkraft aber . . . können wir keinen andern Begriff geben, und keine Benennung dafür ausfinden, als der von der Wirkung hergenommen ist und gerade nur diese Benennung ausdrückt.'

51 Blumenbach, Burke, Berkeley, Euler and Needham all make similar remarks.

52 SW VII, 381; cf. likewise SW VIII, 177; XIII, pp. 10, 47, 161 and 358; XIV, 605; XV, 265; XVI, 551; XVIII, 342; XX, 180; XXI, 173; XXIII, 512; XXX, 395; XXXII, 227; etc.

53 SW XV, 533.

54 Irmscher 11 p. 288.

55 SW XIII, 84-85.

56 Cf. another remark he makes in 1769: 'Der Magnet müste so sehr verstärkt werden, daß seine Kraft fühlbar würde. Ich halte es für möglich' (SW VIII, 99).

57 Maupertuis 316 p. 28; cf. Friedrich Engels' words in Engels 199 p. 49: 'In order to save having to give the real cause of a change brought about by a function of our organism, we fabricate a fictitious cause, a so-called force corresponding to this change. Then we carry this convenient method over into the external world also, and so invent as many forces as there are diverse phenomena.'

58 Irmscher 11 p. 288.

59 SW VIII, 264.

60 See, for instance, SW XIV, 585; XIV, 665; XXX, 395; XXXI, 86; XXXII, 199 and 229.

61 Probst 106 p. 34.

62 Rouché 172 p. 180.

63 Burkhardt 9 p. 47 and Schütze 176 vol. 21, 39-40.

64 SW XXXII, 218.

65 SW XXIII, 522.

66 SW VIII, 169-170.

67 SW XIII, 346; cf. SW XIII, 17.

68 Caroline 65 III, 190.

69 Schauer 46 I, 126.

70 Caroline 65 III, 192.

71 Caroline 65 III, 194.

72 Quoted from Jean Paul's *Vorschule der Ästhetik* in Caroline 65 III, 251.

73 Düntzer 23 II, 451, Herder to his son August, 1800.

74 Gelzer 28 p. 114, Herder to J. G. Müller, December 1785.

75 SW XXXII, 193-194.

76 SW XIV, 605. *Versuch über die Kräfte.* Undated by Suphan but dated circa 1780 in Irmscher 6.

77 SW VI, 363.

78 SW XXXII, 228.

79 Kant 290 p. 329: 'Die Gottheit ist in der Unendlichkeit des ganzen Weltraums allenthalben gleich gegenwärtig. . .die ganze Schöpfung ist von ihren Kräften durchdrungen.'

80 Cf. SW I, 116.

81 Cf. Mc Eachran 68 p. 43.

82 SW VII, 13: 'Othem Gottes ist in uns, eine *Sammlung unsichtbarer* . . . *Lebenskräfte* . . .

ich bin Kraft!' Cf. SW XXX, 229, and the idea of Galen and others (cited Singer 243 p. 268) that life is sustained through inhalation of the world-soul, diffused as 'pneuma' in the atmosphere.

83 Jammer 231.
84 Cf. SW XXXII, 147 and VI, 440.
85 Cf. Jammer 231 pp. 150-151.
86 Herder's MSS S.P.K. D.S.T. Kapsel XXX Nr. 22 contain extracts from Toland as well as from Bruno, whom it is usually believed he encountered only late in his life. Irmscher's catalogue of the manuscripts remarks, however, that the notebook in question was 'benutzt größtenteils in den Siebzigerjahren'.
87 Strothmann 184 p. 174 can produce no evidence whatsoever for his claim that Herder derived the idea from Aquinas' 'forma substantialis'.
88 Irmscher 11 p. 289.
89 Unger 52 p. 20.
90 SW III, 137.
91 SW III, 157.
92 Clark 75. Hamann, however, had also used the word 'Energie' in relation to language: cf. J. G. Hamann, *Sämtliche Werke*, ed. J. Nadler, Wien, 1949-57, II, 71.
93 SW V, 591.
94 Cf. SW XIV, 609.
95 Cf. Kühnemann 14 p. CXV: 'Die Kräfte, welche ringen, bis sie ihr Gleichgewicht, ihr Maximum finden, erscheinen in doppeltem Sinn: bald sind sie die rohen Kräfte, die von Verstand und Vernunft überwunden werden, bald wieder sind sie Kulturkräfte, die sich im Gleichgewicht erhalten.'
96 Irmscher 12 p. 30.
97 SW V, 569. Cf. also Irmscher 12 p. 63: 'Gott ist die immerwährende Ursache der Bestrebung wie Schwere durch seine Allgegenwart. . . '.
98 Jammer 231 p. 148.
99 SW IX, 536 ff.
100 SW I, 246, and editor's note.
101 SW I, 524.
102 See SW XIV, 677 for Suphan's declaration that it disappeared before he could study it thoroughly.
103 Cf. his words to Mendelssohn in 1769 on the 'Grundstoff der Kräfte' in Herder 31 V, 113 and his tendency throughout the *Ideen* to reduce the 'forces' of heat, light, magnetism etc. to material entities ('Wärmestoff', 'Lichtteile', magnetische Materie', etc.).
104 Jammer 231 p. 242.

CHAPTER II : METHODOLOGY

1. Subjectivity and objectivity

(a) Experiment and observation

One of the most confusing features of Herder's scientific thought is that he frequently recommends the use of one method, while himself employing another. For example, it should already be obvious that his belief in a metaphysical 'Kraft' as the qualitative essence of the natural world was bound to predispose him against exact, quantitative techniques in science, yet in his *Gott* of 1787, that great apotheosis of 'Kraft', he writes of exact, quantitative procedures:[1]

> Sie sehen, Philolaus, den Vorzug solcher wissenschaftlichen Formeln. Was der gemeine Verstand in täglichen Erfahrungen dunkel, aber anschauend bemerkt, bringen sie ins Licht, führen es auf allgemeine Gesetze, ja wo möglich auf Zahl und Größe zurück; dadurch bekommt ihre Behauptung einen Werth der bestimmten Gewißheit, ja einer allgemeinen Anwendung, die man nachher gern bei jedem einzelnen Gegenstande verfolget.

Thus, especially in his later years, he was prepared to recommend a quantitative procedure, although its lessons did not benefit his own scientific thought.

But the eighteenth century, as Cajori[2] observes, witnessed a widespread decline in exact experiment after the great era of mechanics in the previous century had closed. It was in many ways an age of speculation and hypothesis, out of which new sciences were finally to arise; Herder was very much a part of this movement, especially since he was himself a theorist and philosopher rather than a practical scientist.

He was always prepared, however, to utilise the data of experiments recorded by others, but not so much in the physical and mathematical sciences, which, like Goethe (though not so markedly as he), he never entirely understood and appreciated. He eagerly read experimental reports in medicine and biology, as a glance at his *Ideen* of the 1780's will show. Already in 1769, in his fourth *Kritisches Wäldchen,* and again in his *Plastik* of 1778, he built his theory of the tactile origins of visual perception on reports of eye operations and the process of learning to see.[3]

Unlike Goethe, he wholeheartedly approved of instrumental aids in scientific investigations. In a late poem, he praises such instruments as follows:[4]

> . . . ein neues Werkzeug ist
> Dem Menschenvolk ein vielfachstärk'res Aug'
> Und Ohr und Hand; ein neues Werkzeug schafft
> Ihm neue Welten.

He had himself worked with a microscope in Goethe's company.[5] Like Goethe, however, he seems to have felt that the observer should never mistake the values inherent in unaided perception. Too close a scrutiny, he believes, can turn our delight over a living whole into revulsion, and he points out 'wie das schöne Gesicht, das mit bloßen Augen angesehen uns reizend vorkam, näher und mit einem Fernglase [sic] betrachtet, mit allen seinen Schweishölen und Höckern und Erhöhungen ein Gegenstand des Abscheus würde'.[6] No doubt his feelings were similar when, on enrolling as a medical student in his youth in Königsberg, he was forced to abandon his studies after being overcome at the prospect of a dissection. But in this matter, he never went so far as Goethe, against whom one remark vindicating instrumental aids is clearly directed. The embittered, older Herder says of the 'Sensualist' and 'Realist':[7]

> Unrecht aber hätten sie, wenn sie sich der Vergleichung, der Berichtigung und Verstärkung der Sinne widersetzten, und z.B. ein Vergrößerungs- oder Fernglas verschmähten, weil es ihnen den Mond oder die Milbe nicht mehr, wie diese ihr unbewafnetes Auge sah, zeiget.

More than once, he eulogises the Newton-Herschel reflector telescope as a great example of a 'new sense'.[8] He therefore approves in theory of experiments and instruments, and uses their findings, but in practice, his emotional reactions could prove stronger than his scientific curiosity.

On a more general level, he frequently recommends and employs the observer's approach as distinct from speculation.[9] He writes to his son August in the letter in which he warns him against Romantic speculations: 'Also kommt . . . auf Deine *eigne Beobachtungen und Erfahrungen* alles an'.[10] He himself examined various skulls[11] in comparing the anatomy of the apes with that of man, and says that a new physical anthropology is possible only if the various ethnological types are carefully studied and depicted.[12] He believed that the observations of individual scientists ought to be shared, and that greater co-operation was necessary for scientific progress in the future.[13]

But finally, he himself admitted: 'ich bin so flüchtig und ungeduldig bei Allem, was viele lange mechanische Uebung fodert'.[14] In this particular, he lacked Goethe's patience. Besides, his powers of hearing were more highly developed than his powers of vision, in which Goethe excelled.[15] Goethe's remark to Falk in 1809 conveys something of this difference:[16]

> Dazu kam, daß ich mich zu sämtlichen Betrachtungen der Natur geneigter fühlte als Herder, der immer schnell am Ziele sein wollte und die Idee ergriff, wo ich kaum noch einigermaßen mit der Anschauung zustande war.

The many concrete observations which Herder mentions are usually culled from the works of other scientists, gathered together in notebooks in accordance with his usual method of compiling collections of excerpts, and not based on any personal scientific research.

(b) Landscape and external nature

It has been said that Herder's interest in landscape and external nature was slight.[17] This judgement needs considerable qualification. Solitary walks and reflections on visible nature were a necessary part of his life at all its stages. His childhood dreams of a water-world[18] in the lake at Mohrungen during his walks around it, his voyage to France in 1769, when he turned violently away from abstract erudition towards nature, and his melancholy wanderings in the forests round Nantes in the same year[19] are all obvious examples. No doubt only his indisposition while in Strassburg prevented him from renewing such habits there. His letters from Bückeburg to his future wife again testify to his profound interest in the natural world, and the landscape descriptions in them are among the most striking passages of lyrical prose he ever wrote.[20] On surveying the landscape of autumn[21] and spring,[22] he seems to have been moved by the deepest emotions, and in Bückeburg, he spent hours alone in his garden and on long rides through the country round the town. The young Georg Müller's diary tells of Herder's continued interest in visible nature in Weimar, when his daily walks in the 'Webicht' were an essential part of his routine and inspiration.[23] His letters from Italy, especially from Naples, are full of descriptions of the Italian scenery.[24]

In fact, from his childhood until his stay with his son August, in the last year of his life, among the mountains at Schneeberg, an intense emotional interest attached him to landscape and external nature. This forms the subjective counterpart to his declarations in favour of precise scientific observation, and is of equal importance in determining the tone of his writings upon the natural world.

(c) Objective methods in theory and practice

Herder often seems to support empiricism, and contends that logic must have an empirical foundation, as when he declares: 'Der Logiker und der Naturerklärer wird Eins: was er ursprünglich auch ist, und in den Tsirnhausens, Pascals, Wolfen, Kästners und Lamberts war'.[25] Many of these utterances, however, arise out of his early, emotional and Rousseauistic reaction against pedantry and in favour of the senses, and are not, as such, based upon a reasoned examination of the nature of scientific knowledge. He exclaims, for example: 'Man verliert seine Jugend, wenn man die *Sinne nicht gebraucht*'.[26] His new 'physiological' psychology, given its final form in 1778 but begun in the fourth *Kritisches Wäldchen* of 1769, is full of such statements,[27] and indeed much of its value derives from the sentiments they express. The more emotional outbursts of the *Journal meiner Reise* gradually give place, however, to a less demonstrative but equally sincere respect for empirical data; upon these, Herder built much of his mature work, and he maintains that they must be the raw material of all true science:[28]

> Wenn alles Geschwätz des Wahns und der Sophistik zerfressenes Holz seyn wird: so werden wahre Versuche und Beobachtungen der Natur dauren, und vielleicht in anderen Theorien sich bewähren.

Again and again, he supports 'Erfahrung' against 'Metaphysik'.[29] He believes that the scientist must be completely impartial in choosing material for study, and adds only the one reservation that the greatest possibility of gaining new information should influence the investigator's choice.[30] The thoroughness of the investigation is more important than the particular object chosen.[31]

Herder's 'empiricism' is, however, considerably qualified in his own practice by non-empirical intrusions. For in constructing his unitary scheme of the universe, he found it necessary to introduce metaphysical assumptions which could not be verified empirically. He could never be content to admit final ignorance of the ultimate nature of any observed phenomenon. Where Goethe stopped in face of an 'Urphänomen', Herder went on to name and even to define another 'Kraft' producing it. Those who claim[32] without qualification that he was an empiricist or positivist are therefore mistaken. Various writers have noticed such inconsistencies between Herder's theory and practice,[33] usually without recognising that this ambiguity is not merely a curious fact or a whim of Herder's but a fundamental and necessary feature of his whole personality.

Although a predilection for the concrete is part of Herder's own nature, as his early attacks on excessive abstraction in poetry, education and religion suggest, he leaves us in no doubt that he looked to a specific mentor in advocating formal inductive methods. Francis Bacon is named again and again. As I have tried to show in detail elsewhere,[34] Herder believed that he had the authority of Bacon behind his own brand of empiricism, and he appeals repeatedly to Bacon's works in his attacks on *a priori* rationalism, as in his feud against Kant's critical philosophy in his last years. In his own common-sense view of induction, he failed to realise with Hume and Kant that naturalistic explanation, the objective foundation of all empirical science, requires a logical epistemology to elucidate its own characteristic problems, to define its nature and limits. He shared Bacon's theory of induction as a straightforward process of generalisation from sense-data which leads eventually to universal explanation[35] : the problem of induction simply did not exist for him, and he did not even set up an equivalent to Bacon's scheme of *idola*, of modifications which the subject, by its distinct nature, introduces into the objective data of experience. Thus his constant attempts to refute Kant's statements on the logical functions of the mind by appealing to empirical psychology go back to a misunderstanding of the separate roles of logic and of psychology, a common misunderstanding of Kant's first Critique exacerbated by his own habit of using psychological terminology in purely logical senses.

But with or without logical legitimation and qualification, and in spite of all discrepancies between theory and practice, the naturalistic side of Herder's philosophy is none the less real. It served as a much needed example in an age and country in which a one-sided rationalism, in the Enlightenment and again with the followers of Kant, was rampant, and it influenced much of his own scientific thinking.

What his friend Knebel said of Lucretius applies equally well to this aspect of Herder's work:[36]

> Der ganze Zusammenhang seiner Philosophie, so wie er dasteht, zerfällt von selbst; aber der Geist davon, nämlich alle Erscheinungen auf natürliche Gründe zurückzuführen, muß ewig der Geist der wahren Philosophie bleiben.

(d) Subjective methods in theory and practice

On the one hand, Herder makes such declarations as the following: 'Die wahrhaftigen ersten Grundsätze des Denkens und Empfindens sind allgemein, weil die Ähnlichkeit der Organisation, Mittel und Sphäre allgemein ist.'[37] Just as often, however, he maintains that there are subjective variations in what he above acknowledges as the universal basis of reason, of '*Vernunft*, die aber, so einförmig das Wort klingt, doch bei verschiedenen Menschen so verschieden würkt, sich jedesmal so einzeln und sonderbar mit Empfindung mischet, auf das und jenes und auf Nichts anders bauet, . . . daß niemand mit dem Magnet und Ruder des andern sicher fahren kann'.[38] (We should observe that these two utterances are almost contemporaneous.) Herder agrees with Locke that such variations arise since the reason develops from the data of vision and imagination, which themselves vary in the individual subject.[39] Nevertheless, he often returns to the position adopted in the first quotation, affirming that certain principles are common to all reasons: 'Man nenne sie *notiones communes*, oder *ideas innatas*, oder *axiomata rationis*, oder *Zopyra*, oder wie man wolle; sie sind da nur eben, weil sie allgemein dasind, weil sie jedem, wenigstens dunkel, vorschweben'.[40] Here, he seems to emphasise the subjective basis of knowledge even to the point of agreeing that *a priori* ideas of the kind which he was later to attack in Kant's critical philosophy are real. Thus he does at times use subjectivistic arguments, which conflict in characteristic fashion with opposing ones, in his considerations on the nature of knowledge.

It is generally agreed that the 'subjective' element (this time in the everyday sense of the word, meaning 'influenced by personal emotion') is also strong in Herder's pronouncements upon the natural world, that is, in his own practice.[41] Herder himself admits this, writing: 'Die Lampe meines Geistes brennt von gar zu naßem Feuer: sie hat fast immer Oel der Leidenschaft nöthig und das ist so grob und wäßrig'.[42] On the other hand, his turbulent style is often deceptive, for the content of his exclamations may be objectively perfectly valid, as often happens in his *Ideen* of the 1780's.

Most important of all, however, is that Herder not only allowed subjective elements to infiltrate his own scientific thought, but actually believed that the scientist is *necessarily* influenced by subjective factors. He himself wishes, in his study of the natural 'elements' in 1769, 'die Physik alles dessen, aus sich herausfinden zu können'.[43] He later writes of two great scientists: 'der empfindende Mensch fühlt sich in Alles, fühlt Alles aus sich heraus, und druckt darauf sein Bild, sein Gepräge. So ward Newton in seinem Weltgebäude wider Willen ein Dichter, wie Buffon in seiner Kosmogonie'.[44] And of the theory of Copernicus, he writes: 'Zu den größten Entdeckungen also, die wir dafür halten, winkte *Einbildung, Malerei, Poesie* herauf und hielt die Leiter!'[45] All of these utterances, however, date from before his mature period begins; he later tempered such unrestrained subjective inclinations and his method of 'Einfühlung' by increased development of the other, more objective pole of his thought.

Until this century, few theorists of science would have conceded to Herder the point that subjectivity is a major factor in scientific activity. The image of the scientist as a rigorously objective, almost sphinx-like observer long reigned unchallenged. Sir Karl Popper, however, accounts for the objectivity of science in a novel way, of which Herder, with his belief in the subjectivity of each individual, and his call for scientists to co-operate, would assuredly have approved. Popper writes that 'neither the dryness or remoteness of a topic of natural science prevent partiality and self-interest from interfering with the individual scientist's beliefs. . . . it is the public character of science which imposes a mental discipline upon the individual scientist, and which preserves the objectivity of science'.[46] In ages before scientific team-work was the rule, Herder's judgement on subjectivity, of course, contained even more truth than it does today.

(e) Subject and object: the problem of perception

Herder, especially in his *Vom Erkennen und Empfinden* of 1774-1778, devoted considerable attention to the problem of how subject and object, perceiver and perceived, are interrelated, and what their relative importance is.

As already mentioned, he overcame the dualism of mind and body by the conception of 'Kraft'. The same dualism recurs, however, on a more abstract level as that of subject and object, or of perceiving mind and perceived reality. Here, for the first time, we find him using the word 'Analogie' to bridge a gap; this is only one of the numerous senses in which he uses the word. This rather surprising use of the term 'Analogie' in a psychological sense may have been suggested by Baumgarten's designation of the senses, the mediators of subject and object, as the 'analogon rationis'.[47]

The idea of an 'Analogie' has two main uses: it can denote a parallel between the *content* of two distinct entities, or between their respective *forms*. In the case under discussion, the subject and object are seen as analogous because their content is similar; this inner essence, in both the perceiving mind and the perceived world, is, needless to say, yet another 'Kraft'. It is thus to be expected in advance that such an idea of analogy will share all the weaknesses of the 'Kraft' conception.

To return to details: Herder begins his psychological essay *Vom Erkennen und Empfinden* by solving the problem of perception, the problem of how it can be possible for the perceiving subject to be aware of an object, of something external to itself, by postulating an 'Analogie' between the inner 'Kraft' of the subject and the other cognate 'Kräfte' of the external world, the object of perception. The problem is thus summarily solved virtually before it is even stated as a problem. He writes:[48]

> Je mehr wir indeß das große Schauspiel würkender Kräfte in der Natur sinnend ansehn, desto weniger können wir umhin, überall *Ähnlichkeit mit uns* zu fühlen, alles mit unserer Empfindung zu beleben.

This is, of course, basically the same thing as his old idea of personified external 'Kräfte', and is, as such, a subjectivistic belief. It is also an example of his belief in empathetic understanding or 'Einfühlung' (a word he apparently coined himself)[49] into the external world. Haym notices the similarity between this doctrine and Schelling's later 'Identitätslehre',[50] a philosophical conception which Herder, however, never stated explicitly nor employed in such a consistently subjectivistic way as the Romantics were to do.

A second, alternative solution designed to explain this parallelism appears in the same work of Herder's. God, as the emanator of both aspects of 'Kraft', in perceiver and perceived alike, appears as their higher common denominator.[51] And a third, this time objectivistic and psychological explanation of the supposed 'Analogie' is implied by Herder when he writes, in the same work: 'Alle unser Denken ist aus und durch Empfindung entstanden'.[52] For, since our 'Empfindung' is derived from our sense-experience, as the whole of Herder's 'physiological' psychology of the 1770's with its theory of nervous 'Reiz' asserts, our subjective attributes must in this case be conditioned, or even determined, by our objective experience. This solution recalls how Leibniz, in a posthumously published work, eventually allowed 'petites perceptions' to enter the supposedly 'windowless' monad from without.

Of the three positions discussed, only the second, religious one merits the title of an analogy, although Herder often uses the word to denote the first position as well. The first and third solutions, subjectivistic and sensationalistic respectively, are not true analogical relations at all, but direct cause-and-effect explanations. For in the first, the subject shapes the object it comprehends by projecting its own characteristics into it, and in the third, the subject is built up out of the objective reality which confronts it. The second position, however, involves a basic equality between the parallel subject and object. Herder comes back to this solution, given a new, secularised turn, in his *Metakritik* of 1799:[53]

> *Diese Analogie unserer selbst* können wir nicht anders als auf Alles außer uns anwenden, weil wir nur *durch und mit uns selbst* sehen, hören, verstehen, handeln. Wir tragen sie aber nicht in die Objekte über [Herder here avoids subjectivism]: denn wenn in diesen nichts *Verständliches,* Hör- und Sichtbares wäre, so existierte an ihnen keine Kategorie, d.i. kein Sinn und kein Verstand.

Thus subject and object are pre-adapted by some unspecified external agency, a *deus ex machina* as in Leibniz's theory of pre-established harmony; only Herder, in this later passage, no longer wishes to name any transcendental factor. Such indirect linking of subject and object sets them in a true relation of analogy.

But Herder suggests alternative links apart from transcendental ones; such naturalistic links are the idea of an 'Äther', as a hypothetical medium linking perceiver and perceived,[54] again named in the 1778 essay on psychology and perhaps borrowed from Shaftesbury.[55] Later, he suggests that light is the 'Organ der Gottheit' by means of which we perceive.[56] This is, of course, related to the Greek idea, appropriated by Goethe in turn, of an inner and outer light. Herder too writes: 'Wäre in diesem Körper kein Licht, kein Schall: so hätten wir auf aller weiten Welt von nichts, was Schall und Licht ist, Empfindung'.[57] This inner light is something 'dem Licht Analoges'. Thirdly, he suggests in the *Ideen* that an '*ätherischer* oder *elektrischer Strom*'[58] in our nervous system is the same as that in many processes of external nature; and at other times, he names an 'animalische'[59] or 'organische Wärme',[60] or a 'Lebenswärme',[61] or yet again 'dieser himmlische Feuerstrom'[62] as the common denominator between ourselves as perceivers and the external world we perceive. All these 'physiological' or quasi-physical explanations of the mechanism of perception in terms of common intrinsic content were premature, to say the least, in Herder's age, and scientifically valueless. In most of these cases, moreover, it is really an identity, not an analogy, which is implied.

Another supposed analogy between perceiver and perceived is set up when he revives the archaic notion of the microcosm and macrocosm, again in his *Vom Erkennen und Empfinden* of 1778. He writes:[63]

> Ich fürchte mich also gar nicht vor dem alten Ausdruck, daß der Mensch eine kleine Welt sei, daß unser Körper Auszug alles Körperreichs, wie unsre Seele ein Reich aller geistigen Kräfte, die zu uns gelangen, seyn *müsse.*

Once again, it is the common content of the two units which he stresses, while the two were often considered, especially in antiquity, as analogous in their form as well (as with Seneca's analogy between the anatomy of man and the mountains as the bone-structure of the earth, or the Pythagorean belief that number governs both the reason of man and that of the universe). However, formal analogies, more common in Herder's mature period in Weimar, later tend to replace the earlier animistic or vitalistic ones; such are the idea that subject (mind) and object (world) are governed by the same laws or rational patterns, and the idea that man's physical form approximates to a universal organic 'type'.

Another more subjectivistic solution to the subject-object problem emerges in the 1780's with Herder's theory of 'Bilder'. ('Wir sehen nicht, sondern wir erschaffen uns Bilder.')[64] In fact, this psychologistic solution to the problem has in one sense more claim to scientific validity than the others, since it anticipates in some measure the modern 'Gestalt' theory. Herder actually writes of the 'Bild'-

creating soul:[65]

> Sie ruft aus dem Chaos der Dinge, die sie umgeben, eine Gestalt [sic] hervor, an die sie sich mit Aufmerksamkeit heftet und so schaft sie durch innere Macht aus dem Vielen ein Eins, das ihr allein zugehöret.

This theory implies a disorderly nature upon which the mind imposes an *a priori* available order. Yet Herder later writes, attacking *a priori* ideas in Kant: 'Vernunft als Gegenstand betrachtet. Als solcher ist sie die *reinausgesprochene Regel, die ich in mir gleichstimmig der Natur wahrnehme*'.[66] Here he appears to suggest that the order is equally present in both subject and object. This, of course, reflects his mature belief in parallel formal laws in mind and in nature.[67] Such an interpretation is confirmed by Herder's statement: 'Die Vernunft, sehe ich, gehört zum Gegenstande, wie der Gegenstand zur Vernunft; nach Einem Gesetz, zu einander *geordnet*'.[68] But two years later, we find him returning to his old sensationalistic idea that the mind, and reason itself, are developed only through the subject's experience of the objective world: 'an ihr [i.e. der Natur] hat sich der menschliche Verstand, ja die Vernunft selbst *zur Regel gebildet.*'[69]

Of all these attempts to solve the problem of perception, none is logically or metaphysically acceptable, since Herder does not really experience the dualism of subject and object as a profound problem of logic and metaphysics. Only once does he appear to doubt whether the problem can be finally solved, and on this occasion, he simply quotes the more sceptical Hamann: 'Unser eigen Daseyn und die Existenz aller Dinge ausser uns muß *geglaubt* und kann auf keine Weise ausgemacht werden'.[70] Treated, however, purely as psychological explanations of perception without regard to the associated logical or metaphysical difficulties, two of Herder's theories, the 'Bild' conception and the sensationalistic explanation, satisfy some of the demands of modern scientific psychology, which, however, develops these theories much more fully. Herder himself, it will be noticed, makes no attempt to distinguish between the philosophical (logical) and scientific (psychological) aspects of the theory of perception. This failing, we have already seen, was at the root of his misunderstanding of Kant.

But to return to the main topic, is there any means of establishing whether 'der größte, vielleicht nie ganz zu schlichtender Kampf zwischen Object und Subject',[71] as Goethe calls it, was resolved by Herder in any sense which he himself regarded as final? That is, what is for Herder the fundamental relationship between subject and object?

His conclusions on the closely related but more general question of what relationship should subsist between individual and society, between self-assertion and self-negation, or between 'Liebe und Selbstheit', as he calls the two (cf. Goethe's 'Systole und Diastole'), may help to suggest an answer.

In this other problem, Herder once more alternately adopts both extreme positions; that of individualism appears especially in the earlier period, with the doctrine of the Great Man, the 'Genie' or 'Ausnahme'.[72] He later writes: 'Der tiefste Grund unsres Daseyns ist individuell'.[73] But the opposite extreme of almost mystical self-negation also appears from time to time, as when he writes: 'Namenlos sterben ist süßer als man denkt . . . desto mehr hat unser Geist seine Hülle verlaßen: er floß zurück ins Meer der Gottheit unter den Menschen, ins Reich fortwirkender lebendiger Kräfte'.[74] Again, he states: 'Das Ich erstirbt, damit das *Ganze* sei.'[75] But in the great majority of cases, especially in his mature works of the 1780's, Herder chooses the central position, presenting both tendencies as equally fundamental: 'Alle Triebe eines lebendigen Wesens lassen sich auf die *Erhaltung sein selbst* und auf eine *Teilnehmung* oder *Mitteilung* an andre zurückführen.'[76]

From his treatment of the problem of perception, and of the cognate problem of the self and society, it therefore appears that Herder's position lies ultimately between the two extremes. In the problem of subject and object, he takes up a position *between* subjectivism and sensationalism. The mind and the objective world are poles of equal status, and through their interaction, perception and mental development become possible. Once again, it is basically the 'Kraft' concept which enables him to adopt a central position, still allowing him to move to either of two extremes at will. Between these two extremes, as we have seen, he fluctuates all his life, even attempting, as in his *Vom Erkennen und Empfinden,* to uphold conflicting theories simultaneously. Too many critics assume that Herder's thought is for the most part logically integrated; its very essence is its discontinuity.

Thus, not only in his own practice, but also in his theory of perception, Herder assigns equally important functions to subjectivity and objectivity. Neither should be emphasised to the exclusion of the other, as has so often happened in the past.

2. Anthropomorphism, anthropocentrism, and the 'type' theory

The first of Herder's three main answers to the problem of perception, the theory that man comprehends external reality by projecting his own characteristics into it, by personifying natural agencies, calls to mind the charges of anthropomorphic thinking about nature which have frequently been levelled against him.[77] These charges are fully justified, of course, so far as his personified 'Kräfte' are concerned. They have also been directed, however, at his theory of a universal 'type'. This theory, set forth by Herder in various versions of his *Ideen* of the mid-1780's, states that all organic and even inorganic entities approximate to a single formal pattern, an ideal universal form of which all particular forms are variants:[78]

> Nun ist unläugbar, daß bei aller Verschiedenheit der lebendigen Erdwesen überall eine gewisse Einförmigkeit des Baues und gleichsam *Eine Hauptform* zu herrschen scheine. . . indessen machen diese Uebergänge es nicht unwahrscheinlich, daß in den Seegeschöpfen, Pflanzen, ja vielleicht gar in den todtgenannten Wesen Eine und dieselbe Anlage der Organisation, nur unendlich roher und verworrener, herrschen möge.

Man himself, as a living organism, also conforms to this hypothetical universal model. Herder's theory was not the first of its kind;[79] it has been alleged[80] that it was influenced by that of the French philosopher and naturalist J. B. Robinet, whose main works[81] appeared between 1761 and 1768, and whose own typological theory[82] stated that scattered shapes, comparable to parts of the human organism, can be found distributed throughout nature. Robinet's theory implied, in short, that nature is anthropomorphic in every detail, and it thus follows that, if Herder's own version is essentially the same as Robinet's, Herder's view of the natural world must be anthropomorphic through and through.

As I have argued at greater length elsewhere,[83] the whole comparison with Robinet derives from a single sentence in Herder's *Ideen*:

> Man könnte, wenn man die ihm [i.e. dem Menschen] nahen Thierarten mit ihm vergleicht, beinah kühn werden zu sagen: sie seyn gebrochene und durch katoptrische Spiegel auseinander geworfne Stralen seines Bildes.

Herder further refers, in an earlier version[84] of this passage, to the old idea of man as a microcosm in the same connection. But in the final version, this archaic notion, for centuries the source of anthropomorphic ideas concerning the universe, is absent, and he proceeds to add the following qualification, which puts an entirely different complexion on the preceding sentence as quoted above:[85]

> Ich hoffe nicht, daß die Aehnlichkeit, auf die ich zwischen Menschen und Thieren zeige, mit jenen Spielen der Einbildung werde verwechselt werden, da man bei Pflanzen und sogar bei Steinen äussere Glieder des menschlichen Körpers aufhaschte und darauf Systeme baute. Jeder Vernünftige belacht diese Spiele, da gerade mit der äusseren Gestalt die bildende Natur innere Aehnlichkeiten des Baues verdeckte und verlarvte. Wie manche Thiere, die uns von aussen so unähnlich scheinen, sind uns im Innern, im Knochenbau, in den vornehmsten Lebens- und Empfindungstheilen, ja in den Lebensverrichtungen selbst auf die auffallendste Weise ähnlich!

He goes on to refer in detail to comparative anatomy as the key to similarities between man and the animals, as he does on several other similar occasions.[86] All this shows how Herder, departing from the image of catoptric refraction, and originally invoking the ancient microcosm theory, goes on to reject outright the beliefs of such thinkers as Robinet, for such ideas are clearly referred to here. Another earlier version of this passage begins with the same image of refraction, which once more is qualified, this time by a statement rejecting the complacent pride which usually characterises thoroughly anthropomorphic thinkers: 'Man würde mich übel verstehen, wenn man mich glauben ließe, daß nicht jedes Thier so gut für sich und die Erde gemacht sei als der Mensch.'[87] Herder's 'type' is thus a formal or anatomical pattern, quite different both from Robinet's anthropomorphic equivalent and from Herder's own personification of hypothetical 'Kräfte' in nature.

Other statements of the mature Herder qualify even his unambiguously anthropomorphic conception of 'Kräfte', for example when he says that the 'Kräfte' in other organisms are by no means always analogous to those found in man:[88]

> Es wäre ein sehr unwahres Lob, das man dem Menschen machte, wenn man jede Kraft . . . der belebten Natur in ihm dem größten Grad nach finden wollte. . . . Tausend Geschicklichkeiten und Künste der Thierschöpfung sind um ihn, die er nie erreicht, ja die er gar nicht begreift.

Such utterances show, moreover, not that he searches for elements of man in other organisms, as more radical anthropomorphic thinkers had done, but quite the reverse – they show him searching for elements of other, lower phases of existence in the human organism. The following scientifically unexceptionable words confirm this: 'Je organisirter ein Geschöpf ist, *desto mehr ist sein Bau zusammengesetzt aus den niedrigen Reichen.*'[89] That is, the lower levels of material and organisation are represented in man as well as the higher ones peculiar to him.

All this leads us to conclude that Herder's views on the natural Scale of Being should be styled anthropocentric rather than anthropomorphic. Life on earth culminates in and centres upon man, as no biologist will deny. The materialist Einsiedel as well as the ecclesiastic Herder wrote: 'Der Mensch, dessen Masch[ine] am vollkommensten, vereinigt alles, was durch die drei vorigen Reiche möglich wird, in bildenden Kräften'.[90] In this respect, Herder's anthropocentrism is scientifically respectable. (Its teleological implications will be discussed later.) But the Leibnizian and neo-Platonic conviction, common in Herder's day, that the ladder of nature may be extended above and beyond man, who is a 'Mittelgeschöpf', is, of course, irreconcilable with empirical science. It is part of the mystical superstructure, ultimately derived from Plato, which crowned the humanism of the Renaissance, and, more especially, of the eighteenth century, and in which man, rather than God, represented the centre of the universe.

Another class of anthropomorphic ideas in Herder's works are those criticised by his friend Georg Forster, who writes of the *Ideen*: 'Er läßt mir z.B. die Natur zu sehr auf menschliche Art allegorisieren in ihren Werken'.[91] Disregarding the personifications mentioned earlier, we do indeed encounter others, as when Herder habitually apostrophises nature as a mother, or describes the growth of plants in terms borrowed from human activities. The majority of these, however, are rather figures of speech than indications of a serious belief that nature, plants etc. have a personal intelligence. Expressions of this kind were very common, especially in works on natural history, in Herder's age, as for example in the works of Linnaeus, one of whose biographers writes: 'His phraseology, and even his titles, are figurative; but his figures are in general highly expressive. With him, the various means by which nature ensures the reproduction of plants are their nuptials; the changes in position of their parts at night are their sleep; the periods of the year at which they flower form the calendar of Flora'.[92] To this class belongs also Herder's[93] (and Goethe's) common metaphor of male and female principles in nature as the source of creative development. Popular natural histories are full of such usages, even at the present day. They are, however, best avoided, since it is not always possible to draw a line between mere metaphor and an unjustifiable hypostatisation of natural agencies.

Thus, while anthropomorphic arguments certainly appear in Herder's works, the criticisms levelled against him on this account are at times unjust. For his anthropomorphism, derived from his animistic conception of 'Kraft', is balanced in his mature writings by more objective tendencies, as when he unreservedly affirms comparative anatomy. He never treats animals as quasi-human intelligences, but prefers the middle way between personification and materialistic mechanism, and adopts a broadly vitalistic theory of life. For 'weder der bloße Mechanismus, den *Buffon*; noch die entwickelte mathematisch-politische Vernunft, die andre ihnen angedichtet haben'[94] is acceptable to him in accounting for animal activities.

3. The analogical method

We have seen how Herder used the concept of analogy to dispose of the traditional dualism of subject and object, thereby violating the requirements of both logic and causal explanation. He used the same concept in several other ways, however, which can now be examined in detail.

In his review of Herder's *Ideen*, Pt. I, Kant, referring in particular to Herder's attempts to prove that there is an afterlife by comparisons with natural metamorphoses (e.g. caterpillar to butterfly), classed Herder's use of analogies as among the indefensible methods which he was out to expose.[95] Haym and others have followed this lead, dismissing Herder's use of analogies as altogether unscientific.[96]

Now Kant himself had used and misused analogies in his *Allgemeine Naturgeschichte und Theorie des Himmels* of 1755.[97] He had, in fact, entitled the final chapter of the work 'Dritter Theil, welcher einen Versuch einer auf die Analogien der Natur gegründeten Vergleichung zwischen den Einwohnern verschiedener Planeten in sich enthält.'[98] Kant even proceeded to conclude from these premises that we may enjoy an afterlife upon some of the more distant or more 'perfect' planets, thereby using the very argument he later condemned in his pupil Herder. But at the time when he reviewed Herder's *Ideen*, Kant had recently made a final break with his earlier views as he went on to formulate his critical philosophy. He aimed at extirpating from philosophy the methodological abuses which he and many others had formerly countenanced. He must have seized at once upon Herder's extreme use of analogies as an example of all that he had now set his face against. But this gave to neo-Kantian critics the unfortunate impression that all Herder's analogical arguments are equally reprehensible, so that Kühnemann and others reject them *en bloc*.

Herder used analogies in many ways, three of which we have already noticed: these are the supposed analogy of subject and object, leading to anthropomorphic interpretations of the natural world; the wider version of this usage (which was briefly mentioned above and which will be discussed more fully later), whereby the mind of man, seen collectively, and the processes of nature, are supposed to be governed by analogical laws; and the fallacious analogy between death and various natural metamorphoses. Since all of these senses are open to refutation, those who have condemned Herder's analogical arguments are so far justified. But they have never clearly distinguished such senses from one another, nor from other and more interesting senses which it now remains to discuss.

Analogies have had their place in thinking from the earliest times, although their theoretical implications have on the whole been rarely analysed, at least until recent times. As one modern theorist writes:[99]

> In classical and medieval logic . . . there is a certain amount of analysis of types of analogy, but practically no attempt at justification of the validity of analogical arguments, although such arguments are frequently used.

Both Kant and Herder not only made use of analogies, however; they each made certain attempts to analyse analogical methods theoretically. Kant, in his *Kritik der reinen Vernunft,* having first observed that mathematical progressions can be extended by analogy with preceding terms to include further precise quantities, writes:[100]

> In der Philosophie aber ist die Analogie nicht die Gleichheit zweier *quantitativen,* sondern *qualitativen* Verhältnisse, wo ich aus drei gegebenen Gliedern nur das *Verhältnis* zu einem vierten, nicht aber *dieses* vierte *Glied* selbst erkennen und *a priori* geben kann, wohl aber eine Regel habe, es in der Erfahrung zu suchen, und ein Merkmal, es in derselben aufzufinden.

Herder, in criticising this passage in his *Metakritik,* replies that even mathematical analogies are not always exact, and that *any* formal relationships can be discovered by analogical reasoning in the same way as in mathematics, only with less precision; in other words, the difference is one of degree rather than of kind:[101]

> der Begriff der Analogie aber, d.i. die Handlung des Verstandes, die Verhältniße setzt, ist dort und hier dieselbe. . . Daß übrigens auch in der Mathematik der obere Begriff, unter welchem die Analogie steht, oft versteckt sei, und durch die Analogie nur annähernd gefunden werde, ist bekannt.

It is especially noteworthy that Herder here refers to formal or mathematical analogies, that is to something quite different from the purely qualitative analogies in terms of instrinsic content or 'Kraft' which he had earlier misused. The later Herder prefers more formal, to wit more verifiable and measurable ones. Besides, in the same passage, he goes on to note that analogies are possible between objects, thus extending his theoretical justification of the method to forms and relationships between objects in the natural world, to the world studied by science.

Kant, however, in the sentence quoted above, clearly sees analogical arguments as a means of prediction, of determining the existence of unknowns which can subsequently be identified by planned observations. This means that he too recognises a certain scientific use of analogies. But he qualifies this by the statement that such discoveries can be complete and exact only in mathematics, and must be supplemented in other cases by *a posteriori* investigations whereby some unknown member of a quasi-mathematical series is found. Herder in addition had recognised a looser use of the method: 'Wie unsre ganze Psychologie aus Bildwörtern bestehet, so wars meistens *Ein* neues Bild, *Eine* Analogie, *Ein* auffallendes Gleichniß, das die größten und kühnsten Theorien gebohren.'[102] In this (earlier) statement, the analogy is seen as a means not of determining unknown members of a series, but of creating new theories. That is, analogies are not themselves seen as a means of exact prediction; they help to create theories which, to judge by the examples Herder gives to illustrate the above passage (those of Newton's gravitational theory and Buffon's cosmogony), may themselves predict whole series of facts later confirmed by experience. This interpretation is supported by another statement of Herder's in 1787:[103]

> In allen Wissenschaften sind die größten Erfindungen nur durch *Analogieen* gemacht worden: man dachte sich mehrere ähnliche Fälle und machte Versuche . . . und führte sie auf allgemeine Begriffe, zuletzt auf ein Haupt-principium zurück; und wenn dies auf jeden der gegebnen analogischen Fälle paßte: *so war die Wissenschaft erfunden.*

Max Rouché agrees that Newton used a method 'qui consistait à percevoir des analogies (Herder, grand admirateur de Newton, abuse du mot et du procédé) et à rapporter beaucoup d'effets à peu de causes', and cites Leibniz and Lambert as other earlier advocates of such a method.[104] But, used in this sense, 'analogical method' can surely be made to describe the first step in all and any cases of scientific generalisation, which compares several similar phenomena and pronounces them, after suitable tests, to be the effects of the same cause or causes (or functions of the same variable or variables). This procedure was recommended or followed by many eighteenth-century scientists, including Boscovich,[105] Buffon[106] and Pallas[107]; they did not treat it as a distinct method, but simply as part and parcel of all inductive generalisations.

J. S. Mill, however, makes a finer distinction:[108]

> In the most rigid induction, equally with the faintest analogy, we conclude because A resembles B in one or more properties, that it does so in a certain other property. The difference is, that in the case of a real induction . . . there is an invariable conjunction between the former property or properties and the latter property: but in what is called analogical reasoning, no such conjunction has been made out.

It is clear from the last two passages from Herder quoted above that he did not himself make Mill's distinction between 'real induction' and 'analogical reasoning'. It is indeed not always easy to apply this distinction in practice, since what may long have appeared to be an 'invariable conjunction' of two or more properties in a number of instances grouped together within a single generalisation may subsequently turn out to be anything but invariable. But there is no evidence that

Herder was aware of this difficulty. His theoretical pronouncements, like those of several of his contemporaries, indicate that he valued analogies in science in so far as they encouraged observers to take the first step in a process of inductive generalisation.

More recent writers have reaffirmed that analogical reasoning does have a place in science, but not just that of encouraging the first step in what turns out to be a 'real induction' in Mill's sense. The physicist N. R. Campbell writes, for example: 'analogies are not "aids" to the establishment of theories; they are an utterly essential part of theories, without which theories would be completely valueless and unworthy of the name'.[109] Mary B. Hesse, in her work upon scientific analogies, elaborates upon this usage, distinguishing three elements in the process of analogical reasoning.[110] Two objects or sets of observations are compared, and a *positive* analogy between similar features is drawn. Other features are dissimilar: they are the *negative* part of the analogy. The third element is *neutral,* since further unknown similarities or dissimilarities may exist, but are as yet unobserved. For instance,[111] the wave analogy, derived from observations of sound effects (ultimately of water movements), may be applied to light; after negative aspects are eliminated, echoes are compared to reflections, loudness to brightness, pitch to colour, and then air, the medium of sound (or water, the medium of water-waves), being a neutral aspect, is compared to a hypothetical medium of light, so that the wave and ether theories of light arise. Used in this sense, a 'theory' is obviously not the same thing as an inductive generalisation; it is rather a working model which may become obsolete as further information becomes available. Hesse rightly emphasises that science made significant progress by employing such analogical procedures. She chooses a further example from anatomy, citing Aristotle,[112] Goethe, Cuvier and Geoffroy with their comparative techniques, and observes how they culminated in the 'type' theory (with no mention of Herder, however). The 'type' is seen as a noteworthy contribution to science:[113]

> The use of analogical argument. . . does not presuppose that the actual causal relation is known. The ideal type might be regarded simply as a formal scheme derived from some of the observed species and then found to be applicable to others. This would already rescue it from the charge of being *ad hoc.*

As we have already seen, Herder had himself arrived at precisely this theory by analogical arguments, anticipating the later typological theories of Goethe, Cuvier, Geoffroy and others. The ideal animal type was a hypothesis which, although eventually superseded, had a stimulating effect on comparative anatomy in its day.[114] This is in keeping with the contention of another recent writer that analogical arguments have the advantage of 'offering suggestions for hypotheses, especially in the early days of any subject'.[115] For in the later eighteenth century, biology was still in its early stages.

In conclusion, the following senses in which Herder advocates or employs an analogical method in science can be distinguished:

(a) Firstly, he believes, along with various others such as Leibniz, Lambert, Newton and Buffon, that the analogical method can be applied to the natural world, which is seen as basically simple and law-governed, as the first step in comparing a plurality of effects which are eventually to be subsumed under general laws. He attempted to formulate various laws of his own in this way, particularly in history: the validity of these will be discussed later in a separate section.

(b) In his criticisms of Kant's theory of mathematical analogies, Herder recommends the analogical method as a means of discovering new facts in the natural world. He had himself made some attempt to do so in practice many years before (in 1769), writing in his *Journal meiner Reise*: 'Da singt der Luftvogel und dazu sein Kopf; der Fisch, was tut er? was hat er für neue Wassersinne, die wir Luft-Erdengeschöpfe nicht fühlen? Sind sie nicht analogisch zu entdecken?'[116] He accordingly greeted Monro's ***Structure and Physiology of Fishes, explained and compared with those of Man and other Animals*** (1785) with enthusiasm some fifteen years later.[117] Herder's conjectures on analogical 'Wassersinne' in fish have been borne out in more recent times, with the discovery of the lateral line system, sensitive to all disturbances in water, in fish. Monro knew nothing of this mechanism, merely listing 'nerves, running lengthwise on the sides of the body, to which no spheroidal bodies are attached'.[118] Herder would no doubt have been keenly interested in Monro's chapter on 'Experiments on Hearing in Water'[119]; but Monro merely discussed the transmission of sounds to the human ear within water, and only in recent years have those sounds produced by fish, whose existence Herder suspected, been detected by microphones. No claim should be entertained that Herder achieved inspired insights into the science of later ages; subsequent discoveries have merely vindicated his analogical method as he used it in such cases as this.

(c) The analogical method is used by Herder as a means of formulating a biological theory, that of the natural 'type' (considered as a general hypothesis, apart from individual comparisons in animal anatomy). Its predictive quality emerged when Goethe discovered the intermaxillary bone in man by analogy with other animals. Hence Goethe could write in 1784 to Knebel:[120]

> Hier schicke ich dir endlich die Abhandlung aus dem Knochenreiche . . . Ich habe mich enthalten das Resultat, worauf schon Herder in seinen Ideen deutet, schon ietzo mercken zu lassen, daß man nämlich den Unterschied des Menschen vom Thier in nichts einzelnem finden könne.

Goethe undoubtedly refers to Herder's typological theory here, for it was based on the assumption that human and animal anatomy conform to a single pattern, while Herder's only specific allusion to the intermaxillary bone in his *Ideen* indicates that he accepted the current belief that the bone is absent in man.[121] This would seem to suggest that the theory of an animal type came to Goethe from Herder. Goethe's later words show, furthermore, that he thought explicitly of the analogical method in connection with his discovery. He says of the event:[122]

> Denn hier ist es, wo uns der Genius der Analogie, als Schutzengel, zur Seite stehen möge, damit wir eine an vielen Beispielen erprobte Wahrheit nicht in einem einzigen, zweifelhaften Fall verkennen, sondern auch da dem Gesetz gebührende Ehre erweisen, wo es sich uns in der Erscheinung entziehen möchte.

Finally, it is well to remember that the lack of inductive rigour which characterises analogical arguments does not detract from their value in science as a means of suggesting new theories. In the same connection, we may recall the current tendency to deny that the scientist does and must work in accordance with strictly logical and objective methods in *arriving* at his theories and hypotheses. As Sir Karl Popper pertinently observes: 'The question "How did you first *find* your theory?" relates, as it were, to an entirely private matter, as opposed to the question "How did you *test* your theory?" which is alone scientifically relevant'.[123] The critics who have denounced Herder's misuse of analogies have, wittingly or otherwise, ignored or summarily rejected those uses of the method which were genuinely suggestive and compatible with modern theories of scientific methodology.[124] Their attitude dates from Kant's censures of some of Herder's analogies, and from the subsequent misuse of the method by Schelling and other Romantic thinkers to prove the ultimate Oneness of nature. Once again, however, we find that there are two sides to one of Herder's central ideas, and that an impartial study of his work must do justice to them both.

4. Comparison and classification

(a) The comparative method

Herder's theory of a universal 'type', a theory based upon observed analogies in the structure of animals in particular, is used in the *Ideen* to justify the comparative approach in natural history: 'Es erhellet also von selbst, daß da diese Hauptform nach Geschlechtern, Arten, Bestimmungen, Elementen immer variirt werden mußte, *Ein Exemplar das andre erkläre* . . . Wer sie studiren will, muß Eins im Andern studiren'.[125] On other occasions too, he applies this theory directly to comparative anatomy.[126] But comparisons between organisms must not only include all aspects of internal and external anatomical structure; these must also be related to function and environment:[127]

> . . . die männliche und philosophische Naturgeschichte suchet den Bau des Thiers von innen und aussen, um ihn mit seiner Lebensweise zu vergleichen und den Charakter und Standort des Geschöpfs zu finden. Bei den Pflanzen hat man diese Methode die *natürliche* genannt und auch bei den Thieren muß die *vergleichende Anatomie* Schritt vor Schritt zu ihr führen.

Herder's aims in these matters are shared especially by Goethe, who sends for Herder's writings on the natural kingdoms for consultation as late as 1789;[128] around 1793 or 1794, he sends Herder his sketch *Ueber vergleichende Anatomie.*[129] And Herder, of course, was the first person to be notified of his discovery of the intermaxillary bone in 1784.[130]

The breadth of Herder's comparative method becomes clearest when he asserts, in the *Ideen,* that Camper's comparisons of craniological angles are not sufficient in themselves; they must be supplemented by comparisons between animals and men, which consider physiology, dimensions and proportions of organs, inner structure, anatomy, muscles and also climatic influences.[131] Such aims are in the best tradition of physical anthropology. It is therefore unjust to maintain that Herder's approach to anatomy is simply an attempt to extend the pseudo-science of physiognomy to animal forms, and to treat them as outward evidence of a divine purpose within each organism.[132] This belief arises since Herder's comparisons between species are often coupled to the Leibnizian and ultimately Platonic conception of the Chain of Being,[133] which, for Herder, is both a chain of forms and of 'Kräfte' behind these. This does not mean, however, that Herder was principally concerned, like Charles Bonnet, with giving 'physiognomic' interpretations of the inward 'Kräfte' rather than of the natural forms themselves. For the 'Kräfte' argument is used mainly in Part I of the *Ideen* as an alleged proof of immortality, and is thus employed for the most part in connection with the purely ideal half of the Chain, the soul-like entelechies which ascend into other-worldly hierarchies; but Herder's 'type' theory, which leads him to affirm the comparative method, applies only to the natural and visible parts of the Chain. His interest in comparative anatomy is genuine, wide, and quite distinct from his belief in 'Kräfte'. In 1799, in fact, he goes so far as to reject Leibniz's and Bonnet's ideas on the Chain of Being as *a priori,* emphasising that only an empirical approach to natural forms can provide a sound basis for comparisons:[134]

> *Vor* aller Erfahrung weiß die Vernunft von Gattungen, Arten und Geschlechtern gleich wenig, und kann sich über Gleichartigkeit, Varietät und Affinität keine Gesetze geben. Wird vollends 'aus der scholastischen Regel des continui specierum oder formarum logicarum' [quoted from Kant's first *Critique*] des mathematischen *Leibnitz Gesetz der Continuität* hergeführet und des *Leibnitz* mit *Bonnets* Stufenleiter topisiret: was kann man bei diesen Traumreden thun, als sich gähnend und gähnend verwundern.

Thus both an ideal series of 'Kräfte' and a natural series of forms, the latter studied by naturalistic comparison, are present in Herder's deliberations. He treats the two series with basically different methods, metaphysical and teleological on the one hand, and empirical and comparative on the other. He may have convinced himself, and some of his readers, that the two are in no wise contradictory (for he wished to add conviction and tangible evidence to his theories of 'Kräfte', thence of the afterlife), but we should not confuse the two, or subordinate one to the other. For the comparative and scientific approach to natural entities is of equal importance to the metaphysical edifice of 'Kräfte' in the great synthesis of Herder's *Ideen*. He was by no means the founder of comparative anatomy, but he was a leading advocate of the method in an age when it was beginning to bear fruit. After tentative beginnings in the work of Aristotle, Belon and others, it was just awakening, in Herder's times, as an independent discipline, in the hands of such men as Buffon, Daubenton, Vicq d'Azyr, Blumenbach, Camper, Hunter, Monro, and others, works of most of whom Herder had encountered. In this respect, he partook of the most advanced aspirations of biology in his age, and was ahead of many others in insisting that function and environment are as important as structure in our comparisons between organisms. A modern theorist of biology, maintaining that structure and function are inseparable, confirms the value of Herder's dynamic approach:[134a]

> The antithesis between *structure* and *function, morphology* and *physiology,* is based upon a static conception of the organism. . . . Actually, this separation . . . does not apply to the living organism. . . . What are called structures are slow processes of long duration, functions are quick processes of short duration.

Finally, that a broad similarity in structure between species should be recognised was undeniably a prerequisite for modern evolutionary theory. Kant, in his famous review of the *Ideen,* in fact realised that the 'type' theory could be used as an argument for evolution, a possibility which, however, he at once rejected.[135] This is not for a moment to suggest that Herder intended any such inference to be drawn. But Kant's remark demonstrates that the theory, with its associated comparative method, constituted a suggestive and essential step towards the theory of evolution by descent.

(b) The pathological method

Herder extended comparative methods to include abnormal and pathological cases. As early as 1768, he recommended this procedure, seeing it as likely to cast light, in psychology, upon the normal as well as the abnormal.[136] And in 1778, he makes the striking pronouncement: 'der Vorsteher eines Toll- und Siechhauses gäbe die frappantesten Beiträge zur Geschichte der *Genies* aller Zeiten und Länder'.[137] In this statement, as in the parallel one in the 1775 version of the same work which recommends the study of 'Blendwerke, Visionen, Krankheiten, Träume',[138] Herder probably has in mind such men as Swedenborg, whose strange genius had interested him since the time when he reviewed Kant's *Träume eines Geistersehers* in Riga. Herder connected unusual creativity with extreme powers of imagination, which often expresses itself in intuitions, dreams and forebodings. Such gifts are shared by the prolific but undisciplined fantasy of children and primitive peoples, which Herder in turn connects with their undeveloped, larger-than-life perception: 'Welches sind die ersten Gestalten, die sich der Seele eines Kindes eindrucken, von dem die Rede ist? Riesenfiguren, übernatürliche Ungeheuer.'[139] By their extreme quality, reappearing in the creative genius, such insights are not far removed from the transports of insanity, which therefore deserves the psychologist's attention. In the *Ideen,* he again mentions 'Krankheiten und Unnaturen . . ., die allemal lehrender sind als die mittelmäßige Gemeinheit'.[140] Whether such natures are or are not capable of foreknowing future events, doctors should study the dreams and delusions of their patients: 'Sie werden darin wie in einem Traumbuch wenn nicht die Zukunft so die verhüllete Gegenwart und Vergangenheit des Leidenden lesen.'[141] Herder here connects psychological delusions with the patient's past, rather than the future, just as modern psychoanalysis, of course, would do.

But he did not merely recommend such methods in theory; he employed the data of pathological cases in his own analysis of perception. Thence arose his keen interest in the report of the surgeon Cheselden on the progress of a patient whose sight had been restored by operation,[142] and in the similar instance of the congenitally blind subject examined by Diderot. Although Herder was here closely following Berkeley's studies of similar cases (in fact, Berkeley had cited the Cheselden case himself),[143] he had always applauded such a procedure and generalised it to cover psychology as a whole.

Among the extracts he made in the course of his reading in the early 1780's are notes from works on pathology by Gaub,[144] Sydenham, and Meier.[145] He seems therefore to have appreciated the importance of pathology outside psychological studies, as another more general statement of 1770 suggests: 'Was wollen wir also aus dem unnatürlichsten Falle von der Natur schließen? Gestehen wir aber ein, daß er ein unnatürlicher Fall sei – wohl! so bestätigt er die Natur!'[146] In fact, his earliest recommendation of this method extends it to biology as well as psychology.[147] Herder definitely shared, and perhaps encouraged, Goethe's belief in the paramount importance of pathological and teratological studies, and would have endorsed his declaration: 'Die krankhaften Phänomene deuten gleichfalls auf organische und physische Gesetze'.[148]

(c) Classification

Several critics have contended that Herder's natural history and classification of natural forms are based upon Lavater's physiognomical approach, not on objective criteria.[149] This contention does have some truth in it, especially when applied to Herder's writings before 1783, around which year his mature period may be said to begin. For example, he writes in his review of Lavater's *Physiognomische Fragmente* in 1776:[150]

> . . . die Physiognomie der *Thiere* ist ein Grundpfeiler der Physiognomik. Wie jedes Thieregeschlecht *eigne* Art und Trieb hat, so hats auch *eigne Charakterzüge* . . . Eine Reihe von ihm [i.e. Lavater] sagt mehr von der eigentlichen *Thierart* dieses Thiers, als die lange, sonst herrliche Geschichte dieses Thiers von *Buffon* (dessen Zweck jenes eigentlich nicht war).

Similarly, he early concluded[151] that Linnaeus' conventional and quantitative taxonomy must be supplemented by Buffon's proposed 'natural' system, which would do more justice to the individuality and uniqueness of species, values which were especially important to the young Herder. A pronouncement of the same kind in his review of Lavater's work confirms this interpretation:[152]

> So bald eine lebendige Sache *Wissenschaft, Scienz,* geschlossenes Kompendium mit Klausuren und Paragraphen wird: so ist sie todt: sie wächst nicht weiter, was sie als lebendiges Studium immer thäte. Das sagt nicht *Lavater,* sondern *Bako*!

Thus he did apply a physiognomical criterion to animals, although less often than to man, before the time of the *Ideen*; at this earlier stage, he was in fact more emotionally interested in their expressiveness, their 'character', than objectively concerned with their untrammelled natural history. Even in the *Ideen,* the idea of animal expressiveness is not absent. Here, however, it is no longer a 'personal character', but first and foremost an environmental factor which is expressed in the various animal forms. For the mystical and Platonic doctrine, so dear to Lavater, that the body is an expression of the soul, becomes more and more secularised. As Herder's scientific studies progressed, a formal and objective element, exemplified by his new interest in comparative anatomy, increasingly complemented his earlier, more subjective approach. He realised that he could not classify organisms simply by characterising the 'Kräfte' they embodied in terms of physiognomy; his breach with Lavater around 1780 shows in which direction his ideas were moving. He subsequently states, in fact, that physiognomy must concern itself rather with anatomical proportion in the tradition of Dürer, with the 'Studium des natürlichen Consensus der Formen im menschlichen Körper', and no longer mentions animals and formless inner character in connection with it; he also says that the archaic 'Lehre der Complexionen und Temperamente' cannot help us to understand man's natural functions.[153] And eventually, he rejected physiognomical classifications completely, saying: 'Daß unsre Temperaments- und physiognomische Eintheilungen zu Nichts sicherm führen, muß jedermann klar einsehn'.[154]

Vitalistic 'Kräfte' or soul-like principles in animals cannot readily be divided into distinct groups. It is indeed only too obvious that Herder uses them rather to overcome than to create clear distinctions, which are essential for any graded classification. He in fact affirms, in connection with the universal life-force which he postulates in order to unify all organic entities, the Leibnizian principle of continuity:[155]

> Ueberhaupt ist in der Natur nichts geschieden, alles fließt durch unmerkliche Uebergänge auf- und ineinander; und gewiß, was Leben in der Schöpfung ist, ist in allen Gestalten, Formen und Kanälen nur Ein Geist, Eine Flamme.

But in his actual classifications, which must finally depend rather upon form than upon intangible intrinsic content, he emphasises the opposite aspect, that of distinction, and insists 'daß indem man eine Leiter der Dinge sucht, man die wirklichen Sproßen und Zwischenräume [nicht] verkenne, ohne die keine Leiter statt findet'.[156] For like all of his principal scientific conceptions, his notion of the Chain or ladder of beings is used, as we have seen, in two senses: as a series of 'Kräfte', with all their extra-scientific overtones, and as a series of distinct natural forms, which should be classified objectively.

None the less, he never overcame his antipathy to Linnaeus' system; in a restatement of his 'type' hypothesis in 1785, Herder, protesting against Linnaeus, once more emphasises those factors which make organisms similar, rather than different: 'Ey! wie verlieren sich die Classen aller Geschöpfe in einander!'[157] While he had earlier reproached the Swedish naturalist with his failure to take account of individuality and uniqueness, he now accuses him of making distinctions which lead him to overlook basic similarities. This antipathy towards Linnaeus effectively prevented Herder from acquiring any real interest in systematic botany. In like fashion, he preferred accurate travelogues to systems of human racial characteristics such as Kant and others advocated. All this aversion to exact systems did have its progressive side, since, as Lovejoy points out,[158] it was necessary for the over-rigid systems of classification at the end of the eighteenth century to break down before subsequent evolutionary theories became possible.

What then, one may ask, was Herder's own classification, the 'natural' system he was looking for? In the *Ideen*, he did on the one hand attempt to use his idea of 'Kraft' as a means of classification, building upon the work of the physiologist Haller, just as he had done in his essay on psychology in 1778. Haller had attempted to give vitalism an exact basis, which encouraged Herder in the same ultimately futile quest. In 1778, he adopted and modified Haller's three classes of organic reaction to external stimulus, distinguishing 'elasticity', 'irritability' and 'sensibility'[159] as the three modes in which organic 'Kräfte' manifest themselves. It could be argued that these are suspiciously like the triad of vegetative, animal and rational souls which Aristotle used to classify forms of life.[160] This is not to deny that Haller built up a sound body of knowledge about physiological reactions around them; but it is this knowledge, and the exact senses which the terms have since acquired in physiology, which constitute their value. For in themselves, especially when equated to 'Kraft', that universal solvent with all its non-scientific associations, they tell us nothing. And Herder annulled such value as they ever had by maintaining that the three 'Kräfte' are fundamentally one.

He did, however, greatly supplement this 'classification' in the *Ideen*. In fact, he attempts to classify animals in this work by comparing their respiration, nutrition, and modes of reproduction, describing how these functions are distributed in different organisms, as well as by comparing in detail the numbers of their heart-chambers (still an important factor in zoological classification), the nature and temperature of their blood, and the type and relative complexity of their lungs.[161] This more realistic classification shows how far he had progressed from the earlier, purely vitalistic and physiognomical criteria. He had by no means abandoned his vitalistic principles; but he now relates them to a more acceptable classification in terms of physiological functions. He observes that lower animals possess greater powers of regeneration and greater independence of separate organs than higher ones do; the more complex the organism, the less its regenerative ability and the independence of its separate organs, and vice versa.[162] This phenomenon is now known as 'progressive integration' from lower to higher forms, and is well attested in biology. Goethe repeatedly makes the same observation in his writings on comparative anatomy after 1790.

Herder also notes that organisms of more advanced structure become more specialised in their various separate functions; this truism acquires new interest when he attempts to explain why lower forms, such as insects, often perform apparently complex activities. He observes that the single caterpillar or bee, for example, is in itself, by its lack of versatility, incapable of performing all the functions which the economy of its species requires; he then cites the phenomenon now known as 'alternation of generations' to describe how the caterpillar overcomes its lack of versatility, while he notices that division of labour is found among bees, each group performing distinct functions. Thus the complexity of functions in such lower species really arises out of a combination of simpler functions, and the progression from simple to complex in the scale of natural forms remains unbroken: '***Was sie*** [i.e. nature] ***in Einem Modell nicht ausführen konnte, legte sie in drei Modellen, die alle zusammen gehören, gebrochen aus einander.***'[163] And he does not try to explain high degrees of specialisation in lower forms such as spiders and ants by innate instincts or new proliferations of 'Kraft', the usual *asylum ignorantiae,* although even Reimarus, the rationalist who scorned all miracles and occult qualities, had to resort to 'Grundkräfte' and undiluted teleology here.[164] For Herder, already in 1770, explains them solely in terms of environment, propounding in terms obviously borrowed from Newton the following principle: '***die Empfindsamkeit, Fähigkeiten und Kunsttriebe der Thiere nehmen an Stärke und Intensität zu im umgekehrten Verhältniße der Größe und Mannichfaltigkeit ihres Würkungskreises***'.[165] The more limited the environment, the more specialised the creature can become within this restricted area. He does not, however, go on to relate this observed link between organism and environment to evolutionary adaptation. And besides, as Reimarus' son pointed out in his preface to a later edition of his father's work on this topic,[166] Herder's formula does not always hold. For example, the sloth, though its sphere of action is more restricted than that of the beaver, possesses no highly specialised constructive abilities as the beaver does.

All this, as well as Herder's distinctions between man and the animals in terms of structure, and his distinction between natural orders in terms of different levels of organisation (which remain to be discussed later), shows that his attempts to classify animals were by no means purely physiognomical. He increasingly felt the need to supplement Haller's categories, which even in themselves are a little more than 'physiognomic', by distinctions based on observable differences in both structure and function of organisms, in accordance with his growing belief in comparative anatomy and his own recommendation[167] that it should not lose sight of physiology.

5. Causality and teleology

From this point onwards, the chapter will be increasingly occupied with Herder's views concerning collective groups and interactions within dynamic processes, no longer with static comparisons.

(a) Causality and determinism

Herder, as we have seen, assimilated the concept of cause to that of 'Kraft', deriving this in turn from our knowledge of ourselves as agents; he also knew that this could lead to personifications of inanimate agencies, and attempted to defend himself against this charge by paying service on occasion to Humean scepticism: 'Keinen Zusammenhang zwischen Ursache und Wirkung verstehen wir also, da wir weder das, was wirkt, noch was gewirkt wird, im Innern einsehn und vom Seyn eines Dinges durchaus keinen Begrif haben.'[168]

Thus, on the one hand, he contended that our ideas of causality are merely derived from our knowledge of ourselves as causal agents; secondly, he tried to show, by quoting Hume at various junctures, that we cannot demonstrate the separate existence of causes; and thirdly, by his theory of 'Kräfte', he went on to do what he himself warned others against, and set up a whole range of personified external causes. At times he tried to qualify this: 'Also ist auch bei allen Wirkungen ausser uns alles nur Traum, nur Vermuthung und Name; indessen ein wahrer Traum, sobald wir oft und beständig einerlei Wirkungen mit einerlei Ursachen verknüpft sehen.'[169] These words show how Herder wanted to have it both ways: he wanted to agree with Hume, yet to affirm the independent existence of causes which he often treated as quasi-personal agencies. For he never seriously doubted the substantial reality of many of the 'Kräfte' which, in science, he considered as so tangible that he at times even reduced them to material and chemical agents.

It has been maintained, by Ernst Mach and various later theorists, that the whole idea of causality is anthropocentric and unscientific. This was why, as Max Jammer[170] notes, so many positivists attacked the concept of force or 'Kraft', seeing it as closely related to the idea of cause. All this is perfectly justified when a search for particular causes is governed exclusively by some practical purpose, when the constitutive and demonstrable reality of causal action is asserted, or when causes are in any way personified. But, like the concept of force in physics, that of cause may be used 'relationally', that is mathematically, as Boscovich used the idea of force,[171] or 'operationally' (functionally), as Berkeley used the idea of cause, without involving any of the above elements. And as S. Toulmin remarks:

'It is not essential that the search for causes should be anthropocentric; but that it should be ***diagnostic***, i.e. focused on the antecedents in some specific situation of some particular event, is essential'.[172] For in the latter case, in a scientific rather than a logical context, the idea of cause becomes merely an abstract term for describing prior conditions in an observed event.

Even so, it is true that the word 'cause' now has no place in the advanced mathematical sciences, as Bertrand Russell has observed. From this, he concludes: 'The law of causality, I believe, like much that passes muster among philosophers, is a relic of a bygone age, surviving, like the monarchy, only because it is erroneously supposed to do no harm'.[173] But as one of his critics points out, Russell is implying, without justification, that all language should be assimilated to the language of the physicist. The same critic (Patrick Gardiner) concludes:[174]

> We do not find causal laws occurring in advanced sciences like physics, but this does not imply that causality has become in general otiose. It may be indispensable upon other levels. Nor does it imply that explanation in physics is of a wholly different order: the explanation of the physicist and the explanation of the 'plain man' both depend upon observed correlations in experience. And between the two are interposed those sciences whose terminologies have not attained the quantitative precision of physics, and which still have a use for causal forms of explanation.

Most of the sciences were still in this position in Herder's age, as many of them still are, and causal explanation was accepted as the normal procedure. Herder certainly often did use the notion of cause in ways which cannot be reconciled with any present-day philosophy of science; in his usual practice, however, he treated science as a search for natural causes, that is, for prior conditions which must be enumerated if a description of any natural event is to be complete, and thereby (apart from his 'Kraft' theories) applied causal arguments in an unexceptionable way.

Did Herder then believe in a strict causal determinism throughout nature? This question will be answered fully when we later examine the various expedients he adopted to avoid giving a deterministic account of the universe in a purely mechanistic sense. For the moment, it is worth noticing that he refuses to exempt man from the causal laws which govern the rest of nature, and does not ascribe to him any freedom of will in the broader sense. His definition of freedom anticipates those of the great deterministic systems of the nineteenth century: 'Da ists wahrlich der erste Keim zur Freiheit, fühlen, daß man *nicht* frei sei, und an *welchen* Banden man hafte? Die stärksten freisten Menschen fühlen dies am tiefsten'.[175] He similarly writes in 1799: 'Selbstbestimmung nach Gesetzen der Natur, nicht außerhalb solcher Gesetze, ist die höchste Freiheit'.[176] These latter words show that Herder does believe that man is capable of spontaneous action; he is not merely the passive recipient of external influences. Herder's conceptions of dynamism, vitalism and organism (to be discussed later) in turn oppose to the mechanistic view of causality similar spontaneous principles in nature, parallel to man's limited freedom; these spontaneous principles may indeed be causally acted upon, yet they retain an inner resilience, a degree of latitude within a framework of causal laws which arise out of their interaction. But, as in the case of man, the latitude is of much less significance than the determinants.[177] For Herder emphasised environmental determinism much more than most of his contemporaries; in this, he is, of course, truly progressive.[178]

For Herder, thus, causal determinism precludes any indeterminacy or uncaused events; even his 'spontaneity' is not completely spontaneous, since it consists rather in a mode of individual reaction to some external circumstance. This is what he means when he rejects fortuity or 'Zufall', as he often does, for he sees no event as wholly arbitrary. But he *does* accept fortuitous causation in another sense: the *order* in which a causal sequence devolves may be fortuitous, being a result of the interaction of several independent causes:[179]

> Wirkt jede Kraft in *ihrer* Natur, so wirkt sie frei, und wenn sie durch andre eben so freiwirkende Kräfte eingeschränkt, d.i. in Wirkungen begrenzt wird, so entspringen daraus höhere Gleichungen, die man *Gesetze der Natur* nennt.

Apart from the 'Kraft' principle, which allows Herder to appeal back to purpose (or to the divinity) whenever he wishes, this view of causal laws in nature has affinities with that of Lucretius, admitting as it does a marked element of fortuity. But it will be discussed more fully later.

(b) Mechanism and teleology

Herder reached a relatively modern conception of natural law as a regularity arising out of the interaction of various independent natural agencies. Yet he wavered between this view and another much more questionable one which implied that each separate 'Kraft' embodies a natural law, or even a purpose, in itself. He says in a funeral sermon in 1772: 'wo *göttliche Kraft* ist, ist ja *göttliche Absicht* – so sicher und gewiß, als der Zug jenes Vogels'.[180] This was certainly the easiest way of solving the problem of apparent fortuity in natural events, by postulating an individual teleological purpose in each event for which a 'Kraft' was supposedly responsible. This purely teleological usage should not be confused with Herder's religious application of the 'Kraft' concept as in his *Gott*; for the divine 'Kräfte' in the latter work, although emanating from the deity, are yet constrained to follow laws of necessity wherein purpose, *as well as* purely natural causality, is manifest. This does not mean that distinct purposes can be discerned in individual 'Kräfte'. On one occasion, however, the more overtly teleological version of the 'Kraft' concept is applied directly to scientific data, in the *Ideen*. Herder maintains, with reference to embryology:[181]

> . . . daß die unsichtbare Kraft nicht willkührlich bilde, sondern daß sie sich ihrer innern Natur nach gleichsam nur *offenbare*. Sie wird in einer ihr zugehörigen Masse sichtbar und muß, wie und woher es auch sei, *den Typus ihrer Erscheinung in ihr selbst* haben. Das neue Geschöpf ist nichts als eine wirklich gewordene Idee der schaffenden Natur, die immer nur thätig denket.

This interpretation of animal genesis conflicts with Herder's earlier and later references to the universal animal 'type', which, elsewhere, is seen as resulting not from *one* purposive 'Kraft', but from a configuration of mutually limiting 'Kräfte'.[182] This particular instance should be seen as one of several separate attempts to counteract mechanistic theories of the organism; in this case, Herder goes to the opposite extreme of undiluted teleology. Many critics have indeed seen Herder's concept of 'Kraft' as completely teleological, although this criticism applies without qualification only to such instances as that cited above. In this case, however, he is manifestly writing under the influence of Harvey's embryological theories[183]; for in most cases, he does not describe each 'Kraft' as purposive; purpose emerges in natural laws, which are produced by the conflict of separate 'Kräfte'. One can, of course, justifiably argue that all vitalism is teleological, as many modern theorists of science are prepared to do. But critics of Herder's teleology have made their accusations on a more specific level, which requires to be qualified. The accusations would, however, be justified if directed against Herder's attempts to prove the soul's immortality by arguments from purposive 'Kräfte'. But in so far as the latter are seen as self-sufficient in their purposiveness, Herder's teleological arguments can be said to favour hylozoism, the pantheistic variant of teleology, rather than the teleology of traditional orthodoxy.

Rouché[184] relates Herder's belief in universal order to Kant's theory of divine 'eingepflanzte Kräfte' in his ***Allgemeine Naturgeschichte*** of 1755. This comparison is justified only in such instances as those mentioned above, since, as already observed, purpose for Herder is not usually immanent in 'Kräfte' themselves, but in the laws which arise out of them. Kant, however, had treated the forces of attraction and repulsion themselves as the direct purposive agents of the divine will.

Thus, although Herder is never a mechanist in the sense of one who holds mechanical theories of the organism (where in fact he resorts to teleology as one of several ways of avoiding mechanism), he combines the concept of 'Kraft', whose connotations range from pure teleology to materialism, with the mechanical theory of natural law, which declares that laws are produced by a conflict of mutually limiting forces. His position, once again, is thoroughly ambivalent.

(c) Anthropocentric teleology

The anthropocentric variety of teleology is well characterised and parodied in Goethe's epigram 'Der Teleolog':[185]

> Welche Verehrung verdient der Weltenerschöpfer, der gnädig,
> Als er den Korkbaum erschuf, gleich auch die Stöpsel erfand.

On some occasions, notably in his theological works, we find Herder supporting similar, if less exaggerated views. He says, for example, in a sermon of 1768: 'für mich glänzt jene Sonne, und mir legt sich der große Elephant zu Füßen: für mich schmückt sich die Erde mit Blumen und Früchten'.[186] Many critics have listed isolated remarks of this kind in the *Ideen*, garnered by Herder from the natural histories and theodicies of the day.[187]

We have seen that the idea of a natural 'type', as enunciated by Robinet and others, implied that man is the centre and goal of creation, all other parts of which exist for his sake. Herder, as a rule, adopts the more relativistic view that each organism is as necessary a part of the whole as any other. For example, he apostrophises Nature with the words: 'Kein Geschöpf bist du vorbeigegangen: du theiltest dich allem in deiner Unermeßlichkeit mit und jeder Punkt der Erde ist Mittelpunkt deines Kreises'.[188]

Many of what appear to be anthropocentric teleological remarks made in Herder's age reduce themselves simply to didactic formulations of facts from economic geography, which enumerates natural products according to their utility. For example, Herder's early unpublished manuscript dialogue on the nature of water contains such questions as: 'Schadet oder nutzt d[as] Seesalz?' or 'Gibt d[ie] Fluth a[uch] Nutz[en]? Ja! d[ie] Schiffe können durchs[egeln] üb[er] Ort[e], worüb[er] s[ie] sonst nie gek[ommen] wären'.[189] These questions carry no teleological overtones, yet they could easily, by the addition of a theological premise, be rephrased in such a way. Thus it is not so much in the individual statement about the use of natural amenities that we should look for anthropocentric teleology, but only where such statements are explicitly backed up by the doctrine that natural products were created exclusively for man's benefit. No such general doctrine is found in Herder's works. Buffon, although an opponent of teleology, likewise lists among the details which the natural historian ought to consider in describing animals 'toutes les utilités ou les commodités que nous pouvons en tirer'.[190]

(d) Teleology in general[191]

(i) The development of Herder's views

The first significant development in Herder's attitude to teleology, if we disregard his conventional treatment of the question in sermons and the like, occurs in 1769, a year in which mechanistic and even materialistic views appear to an unparalleled degree in his writings, especially those not designed for publication.[192] He writes, in the important manuscript published some years ago by H. D. Irmscher:[193]

> Es ist also Krieg und Friede unter allen Wesen! Sonne mit Sonne: Planet mit Planet: Körper mit Körper: Mensch mit Mensch:– Den Saft den diese Pflanze nicht anzieht, eine andre: . . . im Universum ist Alles Anziehung und Zurückstoßung und Also Gewaltsamkeit.

No mitigating teleology or theodicy appears here, as it does in Kant's *Allgemeine Naturgeschichte*, from which Herder derives the theory of universal attraction and repulsion. It is his first enunciation of the doctrine, derived from Lucretius (whom Herder had carefully studied), and shared by Hobbes, Holbach and later mechanistic materialists, of a universal struggle for existence. It is also noteworthy that, in this same sketch, Herder reiterates Hume's theory that religion originates in man's fear of nature, and that he portrays his planetary deities as inaccessible to personal entreaties or complaints, as themselves enmeshed in the universal, mechanical laws of struggle, just like the remote and impotent gods of Lucretius.

In his *Auch eine Philosophie* of 1774, Herder's well known reply to the optimistic teleologists of history is that a purpose does indeed lie behind historical development, but that the providence which is its vehicle is inscrutable to our limited vision. By considering each age as 'Mittel und Zweck zugleich', he combines this qualified teleology with the historical relativism which brought this work its deserved fame. He does indeed specify particular purposes in historical events at times; for example, he accepts the Biblical figures on the lifespan of the patriarchs, and says that their longevity was necessary to enable early man to consolidate his slow acquisitions in knowledge.[194] On the other hand, he goes on to say: 'Man bildet nichts aus, als *wozu Zeit, Klima, Bedürfniß, Welt, Schicksal* Anlaß gibt'.[195]

In his *Älteste Urkunde* (1774-1776), he returns to more religious theories, and elaborates the idea that a manifold and decisive intervention of God took place at the beginning of history. This new interest in *first* causes, more in keeping with deism than with Lutheran orthodoxy, rather overshadows his interest in *final* causes; man, he asserts, acquires at the beginning of history all the abilities which he requires in order to fulfil the course of his later historical development by natural means, without further divine aid (apart from the coming of Christ).

The next major advance in Herder's attitude to teleology begins with the writing of the *Ideen* in the 1780's. This work combines elements from nearly all of his earlier positions. The main use of teleology in history, and to some degree in science, is that of demonstrating that man is developing increasingly towards the goal of 'Humanität'.[196] Some interpretations of individual natural phenomena in terms of purpose appear, and have been well documented by various critics.[197] But the mainstream of Herder's teleological thought in his early mature period is one of immanent teleology, a combination of final and efficient causes.[198] Herder well knew that it is possible to phrase one and the same proposition in teleological and in naturalistic terms. For example, he says that 'Humanität' is the goal of man's nature,[199] but elsewhere he writes: 'Wenn man also auch von den Endursachen der Schöpfung ganz abstrahiret: so lag es schon im Stoff der Natur selbst, daß sie aus Vielem ein Eins machen und durch das kreisende Rad der Schöpfung Zahlloses zerstören mußte, damit sie ein Minderes aber Edleres belebte'.[200] For the very reason that he preferred statements which allowed *both* types of interpretation, his teleological statements are rarely extreme. The workings of purposeful nature or providence are never miraculous; he says of early geological upheavals: 'so änderte die Vorsehung den Plan ihrer Haushaltung mit unserm Geschlecht durch natürliche Ursachen unsres Wohnhauses'.[201]

Hints of the earlier, more radical view of development by conflict repeatedly appear alongside more teleological passages. Many of these utterances, in their almost aphoristic formulation, are strongly reminiscent of Tobler's fragment 'Die Natur' (formerly attributed to Goethe and included in most editions of his works): 'Immer und überall sehen wir, daß die Natur zerstören muß, indem sie wieder aufbauet, daß sie trennen muß, indem sie neu vereinet.'[202] Such passages occur throughout Herder's works, and provide, as they did with Goethe, a strong antidote to teleology; by the Weimar years, they have become coloured by Shaftesbury's emotional pantheism, which, though in no sense compatible with empirical science, was certainly opposed to traditional teleology. This blend of the Lucretian theory of conflict and the nature worship of Shaftesbury appears in the most surprising contexts, as in Herder's words on nature at the confirmation of Caroline Luise of Weimar in 1802:[203]

(1) Jedes Einzelne dient dem Allgemeinen und muß ihm, auch unbewußt und wider Willen, dienen.
(2) Jedes Einzelne lebt in seines Gleichen fort; die Natur erhält die Geschlechter.
(3) Jedes einzelne Daseyn ist darauf berechnet; der Tod ist Mittel der Natur zu ihrer ewigen Jugend.

These are strange words indeed for a Lutheran confirmation.

Herder's usual procedure, however, in the *Ideen,* Parts I and II, is to try to interpret the same phenomena both teleologically and naturalistically. His attempts to apply Leibniz's principle of plenitude to the natural world, in statements to the effect that all must come into being which can come into being, and that creation must be enjoyed in all its parts, come under this category. These have been interpreted teleologically by several critics,[204] or (naturalistically) related to environmental determinism by others[205]; by modern readers, they can easily be related to the theory of evolution by adaptive radiation, and it was such interpretations which gave rise to the mistaken belief that Herder was a precursor of Darwin and to the ensuing protracted controversy. Herder, in fact, states the idea in both teleological and naturalistic forms, as the two following quotations respectively show:[206]

> Die ganze Schöpfung sollte durchgenoßen, durchgefühlt, durcharbeitet werden; auf jedem Punkt also mußten Geschöpfe seyn, sie zu geniessen, Organe, sie zu empfinden, Kräfte, sie dieser Stelle gemäß zu beleben.

and (this time applied to history):[207]

> Was ist das Hauptgesetz, das wir bei allen großen Erscheinungen der Geschichte bemerkten? . . . *daß allenthalben auf unserer Erde werde, was auf ihr werden kann, Theils nach Lage und Bedürfnis des Orts, Theils nach Umständen und Gelegenheiten der Zeit, Theils nach dem angebohrnen oder sich erzeugenden Charakter der Völker.*

Both passages, and other similar ones, are really only different phrasings of one and the same idea.

Herder occasionally uses his concept of 'Kraft' in an overtly teleological way, as we have seen. On most occasions in the *Ideen,* however, his 'Kräfte' allow of more or less naturalistic interpretation as well, and are more often symptoms of an aversion to mechanistic materialism, which, although logically more consistent, was scientifically premature in Herder's day, since it involved the wholesale application of mechanics to complicated biological organisms. Herder's other teleological pronouncements do not introduce unverifiable entities or falsify the data of observation (with the notable exception of the theory that the other planets are inhabited, well-nigh generally accepted in that age). Usually, his teleology is a methodological weakness, not a distortion of empirical facts.

Furthermore, the teleological rephrasing of authentic observations is sometimes more apparent than real, somewhat in the manner of Linnaeus' metaphorical brand of anthropomorphism earlier discussed.[208] The philosopher J. H. Lambert, with whose works Herder was long acquainted, even converted this possibility into a doctrine:[209]

> Dieses Verhältnis [i.e. teleology] aber verwandelt höchstens nur das *ist*, so die physische Sprache gebraucht, in ein *muß seyn*, weil die göttlichen Vollkommenheiten das *fordern*, was die Erfahrung lehrt, das es sey.

That is, teleology provides an additional *a priori* justification for a causally stated proposition. As we have seen, such double-edged usages and arguments were particularly dear to Herder.

In the *Ideen*, the theory of divine intervention found in the *Älteste Urkunde* is renewed; but once more, it figures only in history, not in the province of non-human natural phenomena; secondly, the intervention again takes place only at the beginning of human history,[210] after which natural development prevails; and thirdly, this theory is one of first, not of final causes. In his theory of the origins of the natural world, Herder, in making statements which preclude any belief in evolution by descent, may be presumed, by a process of elimination, to have supported a creationist view of the origin of species; curiously enough, he never states this belief explicitly (hence the Herder-Darwin fallacy and controversy). But, as with the origin of man, this theory is one of first, not of final causes.

It has been said that the God who supposedly lies behind Herder's teleology is a personal God, even the God of orthodox Christianity.[211] But teleology founded upon the supposed order and wisdom of natural laws was by no means committed to orthodoxy in Herder's age; the freethinkers Maupertuis[212] and Reimarus[213] expatiated freely upon the wisdom manifest in natural laws. Teleology of this kind was connected rather with deism in the tradition of Descartes than with orthodoxy, as is attested by the many attacks launched by the orthodox upon Newton, who even suggested that the orbits of the planets may be corrected periodically by direct divine intervention. An affinity with Cartesian or Leibnizian deism is clearly manifest in Herder's theory of origins (divine creation followed by unaided natural development) and of final causes (as exhibited in the wisdom of natural law); but his continual attacks upon Cartesian mechanism and the machine analogy obscure this parallel. In its other important function as a justification of progress towards 'Humanität', Herder's teleology bears witness to the humanistic belief that man, left entirely to his own natural resources, has a great destiny before him.

It is well known, however, that Herder, in Part III of his *Ideen,* explicitly and categorically rejects final causes in history.[214] It is here that his first theoretical pronouncements upon teleology are to be found, for his earlier practice had no well-defined theory behind it. Max Rouché says of the change: 'C'est à partir de 1787 seulement que sous l'influence de Spinoza Herder interdira au Dieu de la Bible d'intervenir dans l'histoire humaine'.[215] But, as we have seen (and Friedrich Meinecke[216] says the same), Herder never at any time suggested that God intervened in history, except at the time of man's origin and first acquisitions, and (in his Bückeburg theological writings) at Christ's birth. All the instances of intervention named by Rouché are really initiations, origins. And secondly, Herder's criticism in 1787 was directed against final causes, not first causes. Having disposed of the delicate problem of origins in Part II of his *Ideen,* Herder was now free to reject all further appeals to the supernatural, that is, to divine intervention in history envisaged as a process guided by a purposeful agent. Moreover, although he had postulated divine action at the start of human history, such action is never mentioned in his scientific discussions. After he had arrived, in discussing nature, at the compromise of superimposing final upon efficient causes, then, in dealing with history, of relegating divine action to origins and using natural causes to describe subsequent developments, he was free to naturalise his conception of providence even further, and he finally concluded that the essential doctrines concerning man's progress can be demonstrated from nature and history alone. In this respect, his development is parallel to that of Lessing and of Reimarus, and culminates in many of the beliefs now associated with modern liberal theology.

Although Herder had decidedly rejected teleology in 1787, he does maintain, in an early manuscript for Part IV of the *Ideen* in January 1788, that the idea of one God and father is essential to knowledge[217] (in connection with the coming of Christ). This shows that he was still seeking to combine two conflicting positions, and to introduce the divine into history at the time of the Incarnation, the only place, apart from the very beginnings of man's history, where he had introduced it before. Knebel's objections led him to suppress the passage in question. From then onwards, he habitually rejects interventionism and teleology in theory,[218] although he occasionally reverts to teleological arguments in points of detail or in official ecclesiastical works such as his Lutheran catechism.[219] On principle, he opposes Kant's assaults on the traditional proofs of the existence of God, as he opposes all of the later Kant's doctrines, by reaffirming the teleological proof from universal order.[220] This contradiction to Herder's own earlier pronouncements can be fully explained, since we know that he was gravely concerned over the harmful effects of

Kantian teachings (often imperfectly understood by the students) among the young theologians who came to him from Jena; this was, in fact, one of his cardinal motives for writing the *Metakritik.* For elsewhere, in his later years, he believes that natural laws in science and a self-regulating providence in history are sufficient objects of wonder in themselves: 'Alle die, die Religionsbekenntniße ins Spiel bringen, sind *Feinde der Wißenschaft* aus Vorurteilen des Pöbels. . . . Kein Religionsdogma muß dem Forschungsgeiste der Wißenschaft sein Ziel setzen wollen'.[221]

(ii) The influence of other thinkers

We have seen how Max Rouché makes Spinoza responsible for Herder's rejection of teleology in 1787. But Rouché himself admits:[222]

> Il recommandait déjà la lecture de Spinoza dans les *Lettres concernant l'étude de la théologie*. . . ; et sa lettre du 6 février 1784 à Jacobi atteste qu'il l'avait à nouveau étudié depuis l'été 1783. Mais l'effet ne s'en est fait sentir qu'à partir de 1787.

No explanation is offered for this puzzling delayed action, so that the question of further possible influences at once arises.

Herder writes in his preparatory notes for the *Ideen*: 'ob Absichten in der Natur sind: unnütze Theil[e] S. Buffons Schwein 40 p.'[223] In the passage referred to, Buffon attacks those who look for final causes behind animal organs, noting that the aim of science 'est de connaître le *comment* des choses, la manière dont la nature agit; et que nous substituons à cet objet réel une idée vaine, en cherchant à deviner le *pourquoi* des faits, la fin qu'elle se propose en agissant'.[224] Lucretius, in fact, had said almost the same thing long before.[225]

There are, however, three occasions on which Herder goes against these warnings: when he says that apes were denied speech so that language might not be debased by them,[226] when he says 'Wo ein Organ weniger befriedigt werden konnte, reizte sie [i.e. nature] es auch minder',[227] and when he observes that the reproductive organs are situated lower down on the higher mammals 'als ob sie [i.e. nature] sich ihrer zu schämen anfinge'.[228] Now Buffon found that the best corrective to final causes lay in comparative methods and description, as opposed to explanation.[229] Similarly, Geoffroy rejected Cuvier's teleological approach, recommending, as Whewell puts it, 'that our attention is to be turned, not to the fitness of the organisation for any end of life or action, but to its resemblance to other organisations by which it is gradually derived [not by evolution, however] from the original type'.[230] It thus seems likely that biological criticisms of teleology at the end of the eighteenth century were inspired by the comparative method. In Herder's thought too, it provides an antidote to teleology, as when he stresses structural comparison in opposition to Reimarus' teleological 'Kräfte'.[231] Once again, we find him adopting one half of a recommendation, but also endeavouring to cling to earlier beliefs, and either to reconcile the two, or to ignore their mutual contradiction.[232]

The influence of Buffon, coupled with Herder's own interest in comparative methods, along with the relativism of his early theories of nature in 1769 and of history in 1774, were probably the first steps which led him finally to reject teleology. But there were other influences at work. Herder's friend August von Einsiedel, in opposing teleology from his usual materialistic point of view, must have helped to keep alive the Lucretian aspects of Herder's earlier beliefs.[233] And Bernhard Suphan, the editor of Herder's works, stresses Knebel's influence upon Herder's attitude towards teleology. He quotes Knebel's letter of 22 January 1788 criticising Herder for invoking the divine in history.[234] But, as we have seen, Herder had already abjured teleology in 1787, in Part III of his *Ideen,* and his invocation of the deity here was exceptional. Thus Knebel's influence, at this stage, can only have served to prevent Herder from returning to arguments for a supernatural providence, which he wished to use at this point to mitigate his violent denunciation of medieval Christianity.

But Suphan names another critic of Herder's manuscripts. The evidence[235] suggests that red lines which appear against certain manuscript passages of the *Ideen* are the work of Goethe. A glance at the passages marked tells us what the main fault in the critic's eyes was. For example, one of them runs: 'die Welttheile hangen auch so enge zusammen, als sie der Convenienz nach zusammenhangen konnten'.[236] Another passage on origins is also marked. It runs: 'Hier sollte sich also (so war der Riß des Schöpfers!) das Gebürge senken, damit auch das Meer seinen Ruheplatz finde'.[237] Yet another runs: 'es sei genug von der allgemeinen Struktur unsrer Erde zum Wohnplatz des Menschengeschlechtes geredet'.[238] The critic's objections to these passages are obviously directed against their teleological content, and Herder accordingly expunged them from his work. It is not difficult to conclude that the critic was in fact Goethe, who wrote a few years later: 'die Vorstellungsart, daß ein lebendiges Wesen zu gewissen Zwecken nach außen hervorgebracht und seine Gestalt durch eine absichtliche Urkraft dazu determiniert werde, hat uns in der philosophischen Betrachtung der natürlichen Dinge schon mehrere Jahrhunderte aufgehalten'.[239]

From all this it would seem that, although the influence of Herder's 1769 phase and of his subsequent historical relativism, along with his association with Einsiedel from the late 1770's and his study of Buffon in the early 1780's, was strong enough to make his teleological pronouncements fairly moderate from the start of his *Ideen,* the detailed objections of Goethe, perhaps seconded by Knebel, led him finally to reject teleology explicitly in 1787, or rather in 1786, when he set to work on Part III, *before* he came under Spinoza's renewed influence in 1787, while writing his *Gott.* Purely philosophical objections, as raised by thinkers such as Bacon and Spinoza, probably had less effect, since they would otherwise have made themselves felt at an earlier date.

(iii) Teleology and the philosophy of science

Herder thus did not participate in some of the abuses of teleology which were common in his day, since he did not employ crude anthropocentric teleology or make use of interventionist theories of natural processes. Other abuses which vitiated scientific observation included the predictive or deductive use of teleology. J. H. Lambert, although he elsewhere exercises moderation in teleology, is guilty of this when he argues that all celestial bodies, even comets, must be inhabited, since they must have been created for some purpose.[240] The astronomer J. E. Bode repeats this argument, saying of the planets: 'Wenn sie unterdessen bei dem allen keine Bewohner hätten, was sollte wol ihr Endzweck und ihre Bestimmung seyn . . .?'[241] (This is at the same time a misuse of analogical reasoning, since evidence for the analogy is totally insufficient.) Kant similarly argues in his *Allgemeine Naturgeschichte* that space must be infinite, since God's creative works, being eternal, require infinite space within which to manifest themselves.[242] Even in his critical period, Kant argues that teleology is necessary to enable us to explain how the races of man originated (this shows how the problem of origins led even a philosopher who applied thorough logical analysis to the least questioned orthodox beliefs to appeal to first and often to final causes); purposive preadaptation by God or providential nature must be presupposed, he believes.[243] Herder knew all these works, including Kant's racial theories as put forward, in similar words, in his earlier essays on human races. But while he shared the general belief that all of the planets are inhabited (a belief which lingered on well into the nineteenth century in the work of Herschel and others), he did not otherwise attempt to predict or deduce unknown facts from teleological premises, as in Kant's theories of infinite space and of the origin of human races.

The most significant philosophical account of teleology in Herder's age was, of course, that contained in Kant's *Kritik der Urteilskraft,* which accepted teleology, with qualifications, as a regulative principle by which biological investigation must be governed. Kant's qualifications of teleology were *logical* in character; Herder's qualifications (such as avoidance of interventionism and crude anthropocentric teleology, use of an immanent teleology and its application to vitalism, avoidance of teleological prediction, use of comparative methods, historical relativism and the notion of development by conflict) are all concessions to *empirical* principles, but they are logically weaker than Kant's since they lack a comprehensive and consistent logical exposition. Herder is also less consistent than Kant in the way he uses teleological arguments in practice, although even in 1788, Kant postulates a purposive creative intelligence when he explains how the races originated.[244] Even in his third Critique, he sticks to this theory of preadapted, inherited 'germs', reminiscent of Charles Bonnet's hypothesis of genetic preformation, although he now qualifies it by saying that one cannot demonstrate the existence of a creative intelligence by a purely functional teleology.[245]

Qualified varieties of teleology as a regulative, functional or heuristic principle still appear frequently in biological literature. Nagel[246] and Braithwaite[247] accept this as an unavoidable feature of biology, with the reservation, however, that linguistic statements in terms of purpose are not proofs that any purposive agency exists. All this means is that many who wish to reject it in theory find it difficult to do so in practice. The anthropological argument that man, as a tool-maker, irrevocably becomes a thinker in terms of purpose, helps to explain the origin of teleology and its deep-rootedness, if not its logical difficulties. Herder himself seems to have recognised this human characteristic, and writes: 'Was sind alle Werkzeuge, die je die Kunst oder Wißenschaft erfunden, als substituirte Zeichen zu Bezeichnung eines gefaßten Merkmals oder zu Erreichung einer vernünftigen Absicht?'[248] As always, he had a clearer vision of empirical determinants than of logical demands; therein lay the root of his feud with Kant. But, as Kant first stated, science, whose aim is naturalistic explanation, cannot accept that teleology is knowledge in itself. With the downfall of vitalism, biological science is immeasurably nearer its methodological goal than it was in Herder's age.

One may therefore conclude that Herder's use of teleology was cautious, and counterbalanced by non-teleological methods. His attempts to synthesise these divergent elements are wavering and always changing, and are logically less satisfactory than Kant's. The only biologists of his age to abandon teleology completely in practice were some of the mechanistic materialists, most of whom were French. Herder felt that the machine analogy in biology was inadequate, and it was indeed premature and over-simplified. His inclination towards teleology was in part a reaction against such tendencies, as were his vitalistic theories of life. He invokes divine first causes in tackling the problem of origins, but neither this nor any of his teleological utterances warrants the criticism that he was merely imposing orthodox theology upon science. His final abjuration of teleology was not a sudden *volte-face,* inspired by Spinoza, in favour of rationalistic liberal theology. The ateleological tendency had been present since 1769 at least, and Herder's step merely represents the more exclusive emphasis of one half of a dualism which he was never able to overcome fully.

6. Holism and organicism

There is, however, another system of ideas, not unconnected with teleology, which was familiar to Herder and used by him, and which still survives in many present-day theories of scientific method. This is the doctrine that the significant units of the world investigated by science are *wholes,* which are not simply reducible to the sum of their separate parts, nor even, in extremer versions of the doctrine, to the parts along with the relations which obtain between them.

Such notions first appeared in more explicit form in modern scientific thought with the 'Gestalt' theories in psychology, and with Smuts' 'holism' and the works of such men as J. S. Haldane and Lloyd Morgan in biology. In connection with this early biological holism, Joseph Needham rightly speaks of 'the neo-vitalistic idea of the organism as a whole'.[249] The teleological implications of such extreme holism become clearest when nature, or the universe at large, is declared to be one unified, harmonic whole, which therefore has a general, cosmic purpose (Lloyd Morgan, etc.). A. J. Ayer's criticism of monism applies to this doctrine too: 'the assertion that Reality is One, which it is characteristic of a monist to make and a pluralist to controvert, is nonsensical, since no empirical situation could have any bearing on its truth.'[250] In fact, the idea of a whole, used in this way, shows traces of the archaic concept of substance, which reappears in new guises from time to time, as something which possesses attributes, yet is itself somehow prior to and distinct from all of these. These holistic beliefs, at least when propounded in biological contexts, are in many ways a legacy from the vitalism upon which holism sought to improve, and are no longer accepted as valid by most theorists of science.

Holism of this kind was soon superseded by 'organicism' in biology; this retains the belief that the most significant natural units are wholes, but it contends that these wholes can be reduced to their parts together with the relations existing between these; organicism repudiates all vitalistic theories, and accepts teleology only as 'a short expression for all phenomena upon which the maintenance of an observed state or process depends'.[251] It applies the analogy of the organism to all natural wholes, which are conceived as dynamic systems.

It is remarkable how many of these nuances within the holistic and organicistic theories are already present in Herder's works. Perhaps they have hitherto escaped notice since interest in such matters is of fairly recent origin, the word 'holism' itself having been coined by Smuts in 1926.

Herder tends to employ the relation of whole and part in preference to that of general and particular.[252] The following words show what he considered this relation, when applied to the natural world, to be: 'Alle Werke Gottes haben dieses eigen, daß ob sie gleich alle zu Einem unübersehlichen Ganzen gehören, jedes dennoch auch für sich ein Ganzes ist'.[253] Every part is a whole in itself, reflecting the qualities of the universal whole. This notion, of course, goes back to Leibniz's monads and to the microcosm conception, and as such is an instance of extreme holism, implying not only that the natural world is made up of wholes, but that there is a universal whole and that each and all and the ultimate whole are closely parallel; parts are wholes within wholes in endless series, as in a Chinese puzzle. The same belief was expressed in Anaxagoras' theory of 'homoiomeria', later adopted by Lucretius and discussed by Goethe in his scientific writings. The homoiomeria were universal particles, each of which contained something of every element in the universe. Such conceptions were to recur in the writings of a long line of thinkers from Plotinus and the neo-Platonists of the Renaissance down to Leibniz and the German Romantic philosophers, all of whom were in varying degrees preoccupied with what has since been called the 'Totalitätsgedanke'.[254]

This type of holism is too far-reaching and general to tell us much about the natural world. A thinker with such views must soon realise that he cannot, even intuitively, grasp the whole of existence, unless perhaps through mystical contemplation, and will thus tend to look for the universal whole symbolised in more concise form in smaller, observable entities. This, indeed, was Goethe's solution to the problem:[255]

> Faced with the manifoldness of phenomena, he tried to reconcile it with his basic idea of the unity of all things, by striving to discern the Whole in the tiniest individual thing. Any subject, however small and limited, with which he concerned himself, became the microcosm of something universal.

The same applies to Herder, especially to his individual 'Kräfte' and their relationship with the universal 'Urkraft'. For he thinks that nature is present, at least potentially, as a complete whole in every individual part:[256]

> Sie bestimmte Punkte des Raums und des Daseyns, wo Welten sich bilden sollten und in jedem dieser Punkte ist sie mit ihrer unzertrennlichen Fülle von Macht, Weisheit und Güte so ganz, als ob keine andre Punkte der Bildung, keine andre Weltatomen wären.

This recalls the words: 'Sie verbirgt sich in tausend Namen und Termen, und ist immer dieselbe' in Tobler's poetic fragment on nature[257]; Herder too sees nature as an integral whole, declaring: 'Alles ist in der Natur gebunden'.[258]

This theory of universal wholes is, of course, a primary ingredient in Herder's monism, and should show his readers that the latter is of unmistakably mystical origin. Kant confined himself to saying that the unity of nature is a subjective postulate, whereas Herder disagreed, and said it could be corroborated by objective experience.[259] As we have seen above, A. J. Ayer submits that dogmatic monism, whether mystical or materialistic in origin, has no place in any empirical philosophy of science, since its teachings cannot in principle be verified.

The belief in wholes, however, has associations with biology which are more than fortuitous. As Alfred North Whitehead remarks:[260]

> The relation of part to whole has the special reciprocity associated with the notion of organism, in which the part is for the whole; but this relation reigns throughout nature, and does not start with the special case of higher organisms.

Critics need not therefore puzzle why Herder was so attached to the idea of the organic even before he had studied organisms in any detail, or search for particular sources of his belief.[261] For if one substitutes the intuitively apprehended relation of whole and part for the logical relation of universal and particular, one is quickly and necessarily brought up against the notion of the organism, an entity within which all parts are related to each other as well as to an integral whole.[262]

Herder's thought, in fact, displays much that is characteristic of that 'organicism' which Whitehead describes, as well as of the more abstract and obsolete holism. Many critics have noticed how frequently Herder thinks in terms of the organism as opposed to the mechanistic models of which the Enlightenment was so fond; one of them writes:[263]

> Herder erblickte überall Ganzheiten und das einzelne als Glied eines Organismus, während der Rationalismus die Welt aus begrifflich trennbaren Teilstücken zusammensetzte und das einzelne als Rad im Uhrwerk auffaßte.

But the monistic, totalistic part of this belief, in that the universe is conceived of as one great organism, is just as mystical in colouring and remote from empirical science as its earlier equivalents had been. And it was this element which the Romantics were to inherit.

But apart from this rather vague picture of an organic nature, Herder applied his notion of organic wholes to particular areas of the natural world in a way akin to that followed by modern advocates of organicism. These areas will now be examined in turn, in order of increasing generality, beginning with that of the individual organism.

(a) The principle of 'Kompensation'

Herder regards each actual organism as a whole which is reducible to its parts together with the relations obtaining between them. In its more general formulations, however, this belief still shows traces of the Leibnizian doctrine that the part in some way reflects the complete whole, especially where the human organism is concerned; for example, in his *Ideen,* he writes of the classical Greek statues: 'Der Genius eines einzeln-lebendigen Wesens lebt in jeder dieser Gestalten, die er wie eine Hülle nur durchhaucht und sich im kleinsten Maas der Stellung und Bewegung, ähnlich dem Ganzen, charakterisiret'.[264] This passage represents a half-way stage between the original mystical conception of universal wholes and more recent ideas concerning organic unity. Closer to the latter by far is the idea of 'Kompensation', later developed by Goethe,[265] whereby the organism appears as an organic whole, whose growth proceeds by a kind of budgeting of the available resources. Geoffroy St.-Hilaire later restated this idea in his 'loi de balancement'.[266] Before any of these writers lived, Aristotle had put forward something approaching the same idea, but only with reference to isolated concrete examples. He writes: 'some birds have the feet weak; in which case the defect is compensated by the superior action of the wings, as in swallows'.[267] This notion, grafted on to typological theories of the animal kingdom, led various naturalists to compare the ways in which available resources are deployed within the same structural plan in different species, as in Goethe's and Geoffroy's writings on comparative anatomy, and in certain instances in Herder's works.[268] Already in 1766, Herder observes: 'Je weichlicher das Tier, um so härter das Behältnis'.[269] And in his essay on the origin of language in 1770, he writes: '*Je schärfer die Sinne der Thiere, und je wunderbarer ihre Kunstwerke sind, desto kleiner ist ihr Kreis*'.[270] He actually combines the idea with his theory of an animal 'type' at one point, thereby arriving at a formulation almost identical with Goethe's later version:[271]

> Wer sie [i.e. animal forms] studiren will, muß Eins im Andern studiren; wo dieser Theil verhüllt und vernachlässigt erscheinet, weiset er auf ein andres Geschöpf, wo ihn die Natur ausgebildet und offen darlegte.

Other statements of the same kind, sometimes with explicit reference to comparative anatomy, occur in various works of Herder's,[272] and he applies the same principle in discussing negroid characteristics as a phenomenon of racial variation: 'Trat der Mund hervor: so ward eben dadurch die Nase stumpf und klein: die Stirn wich zurück und das Gesicht bekam von fern die Aehnlichkeit der Conformation zum Affenschädel'.[273] He generalises this principle in a later statement, again in his *Ideen*:[274]

> . . . so zeigt die vergleichende Anatomie gnugsam, daß die Verartung die ganze Gestalt angegriffen und sich keiner dieser vesten Theile ändern konnte, ohne daß das Ganze verändert wurde.

Critics have rightly compared the latter statement to Darwin's 'law of correlated variation', which states that alterations to parts of organisms affect other parts as well.[275] (Herder, of course, does not have the general evolutionary background of Darwin, although he certainly knew that the human races had evolved in some way.) This was the phylogenetic equivalent of the older idea of compensation, which held that a constant supply of nutrition is available to each organism, so that if one part receives more of it, the others will receive less.

So far, it has emerged that, in Herder's opinion, a fixed relationship exists between the sizes and proportions of the various organs in every organism. This relationship supplies the comparative anatomist with a formal criterion, still recognised by at least one modern organicist,[276] to guide his investigations. The relative sizes and proportions of organs in each organism can vary only within limits imposed by the fixed resources available to it. When we ask, however, what Herder understands by the resources available to each organism, we find a less satisfactory answer. He sees each organism as endowed with a certain measure of 'Kraft'. This constant quantity determines the fixed 'budget' on which the organism can draw in its development.

Herder's principle of 'Kompensation' has been likened, without any justification, to the modern principle of the conservation of energy.[277] He could in fact have had only two sources for the principle: one is the *a priori* conclusion that wholes, being complete in themselves, must be made up of a constant *quantity* of parts (even if, as in the organism, they require progressive replenishment), so that any change can only mean that the constant available resources are redistributed, as in the presumed change from European to negroid physiognomy (what is added to one part must be taken from another, and vice versa); the second source might be the empirical observation, utilised by man from the earliest times, that if, as in plants, we deprive one part of nutrition, the size of other parts increases correspondingly. Nothing comparable with the conservation theory of modern physics plays any part in either. Earlier conservation theories of a universal kind sprang as a rule from analytical *a priori* arguments concerning wholes.

Similarly, Herder's belief that changes brought about in organisms by environmental influences can be either superficial and uninherited, or radical and inherited, derives from his vitalistic holism. The inherited change must affect the genetic 'Kraft' or 'Kräfte' by which the organism's character is determined; this means that a purposive or teleological agency fixes the genetic characteristics of the organism, as in all vitalistic theories. Holism of this sort clearly does not originate in empirical science, for a purposive 'Kraft' is more than a mere quantity; it is a quality as well, and cannot be reduced to the observed parts of an organism together with their reciprocal relations.

We noticed in the preceding discussion on teleology that Herder only partially agreed with Buffon's objections to final causes. In the passage which Herder had referred to in his notes, Buffon further argues against what would now be called 'holistic teleology'. He says of the pig: 'il a évidemment des parties inutiles, ou plutôt des parties dont il ne peut faire usage . . . La nature est donc bien éloignée de s'assujétir à des causes finales dans la composition des êtres; pourquoi n'y mettrait-elle pas quelquefois des parties surabondantes, puisqu'elle manque si souvent d'y mettre des parties essentielles?'[278] If Herder and Goethe had fully accepted the message of this remarkably modern passage, namely that organic wholes do not necessarily exist in the way that intuition says they should, their theory of 'Kompensation' would never have appeared. But then its positive aspects as well as its non-scientific ones would have been lost to posterity together.

Thus, Herder's theory of whole organisms advances, on the one hand, into modern organicistic theory, and, on the other, it perpetuates the older holistic theory which departs from vitalistic premises and includes teleological elements. This vitalism and its associated teleology are mild, however, in comparison with interventionist or anthropocentric teleology, and frequently reappear in the holistic theories of the 1920's which preceded the development of organicism in the works of Woodger, Needham, Bertalanffy and others. Furthermore, as one writer observes,[279] Herder's theory of gradual organic change through environmental influences was a genuine improvement on the piecemeal theories of change which were current in his age, especially among mechanistic thinkers.

New and fruitful theories can thus arise out of a peculiar blend of empirical principles and *a priori* or intuitive ones. Experience often has a disconcerting way of confirming *a priori* ideas; this is perhaps because many apparently *a priori* conclusions really have a small but significant empirical ingredient in their origin. But then if we elevate this frequent correspondence to axiomatic status, the divergence between the two modes of knowledge sooner or later exposes us to error. True parallels between *a priori* and empirico-scientific findings are possible where the former are reducible to the latter in a way which allows them to be verified quantitatively. This explains why Herder's holistic conception of the organism appears relatively modern. Here, for once, the 'Kraft' behind the organism, in the sense of the resources available to it, admits of quantitative analysis in principle at least and, in this century, in practice. For available resources or energy consumed in growth is the very factor around which much recent quantitative and mathematical biology has grown. The empirical ingredient, whether consciously or unwittingly introduced, was in this case strong enough to lead Herder at least some way beyond his usual limitations.

(b) Ecology

The community of all organisms which share a common environment was also treated by Herder as a holistic unit. He conceived of it in a truly organicistic way which makes it possible to compare his conclusions directly with those of modern biology. For he considers the ecological community as existing in a state of dynamic equilibrium 'wo . . . Eins das andre überwältigt und nur durch das Gleichgewicht der Kräfte Friede wird in der Schöpfung'.[280] The budget theory of nature as a whole, of nature as a 'lebendige Haushaltung',[281] is again at the back of this conception; in this case, it can be reduced to quantitative terms, in the shape of available resources and food supply, and of population statistics of various species, and (with the reservation that such statistics were not available to Herder) it can be compared with the modern notion of the biocoenosis, defined by one authority as 'a population system, maintaining itself in dynamic equilibrium'.[282]

Herder further concedes that the equilibrium may alter with the passage of time:[283]

> Es kümmert mich also nicht: ob große Thiergattungen untergegangen sind? Ging der Mammuth unter: so gingen auch Riesen unter; es war ein anderes Verhältniß zwischen den Geschlechtern. Wie es jetzt ist, sehen wir das offenbare Gleichgewicht. . .

He here combines a progressive approach to palæontology with the quaint, but then widely accredited belief in earlier races of giants, whose bones (actually those of extinct saurians) Scheuchzer and others claimed to have found in fossil form.

But the present equilibrium may be disturbed and altered by man, and untold repercussions upon the ecological whole may result: 'die ganze lebendige Schöpfung ist im Zusammenhange und dieser will nur mit Vorsicht geändert werden.'[284] For, as Herder notes on another occasion: 'Selten hat man eine Gewächs- oder Thierart dieses oder jenes Erdstrichs ausgerottet, ohne nicht bald die offenbarsten Nachtheile für die Bewohnbarkeit des Ganzen zu erfahren'.[285] He deplores such unthinking disturbances of the natural community in America, observing how disastrous repercussions may be felt even upon the climate, as actually happened when trees were indiscriminately felled.[286] As a modern organicist says of the ecological whole: 'If one group of organisms were eliminated, it would have to attain a new state of equilibrium or collapse'.[287] Friedrich Meinecke rightly notes how insights of this kind led to modern studies of symbiosis among different organisms.[288]

For Herder here integrates the bald accounts of travellers into a far-reaching organicistic theory which is only too relevant in the present age, when we daily hear urgent demands that natural resources should be conserved and exploitation of the environment controlled.

At this level, Herder's holistic theory again had some positive value. Taken any further, to cover universal nature as a whole, it reverts to its archaic and mystical origins, whereas, tempered by observation as in the present case, it could become scientifically respectable.

(c) 'Gestalt' theories in psychology

The functions of the mind, for Herder, are all reducible to 'Kräfte', as we noted earlier. Such a complex of 'Kräfte' is also seen as a whole, so that the basis of Herder's psychology is likewise holistic.

In psychology, modern thinkers have applied holistic arguments, achieving perhaps their greatest success in the 'Gestalt' theories of perception, whereby no percept is considered to be reducible simply to the sum of the external stimuli producing it, but a formative activity on the part of the perceiver completes, shapes, or confers structure and wholeness upon them. It is curious that, of all the many works written on Herder's psychology, only one of them attempts to compare Herder's ideas and modern 'Gestalt' theory.[289] Yet, in his *Ideen,* he writes:[290]

> das Bild der Seele ist ein geistiges, von ihr selbst bei Veranlassung der Sinne geschaffenes Wesen. Sie ruft aus dem Chaos der Dinge, die sie umgeben, eine Gestalt hervor, an die sie sich mit Aufmerksamkeit heftet und so schaft sie durch innere Macht aus dem Vielen ein Eins, das ihr allein zugehöret.

The same idea is taken up and expanded in the slightly later essay *Über Bild, Dichtung und Fabel.*[291] The perceiving organ and mind spontaneously create integrated images out of the disorderly data of perception.

Once more, however, the reservations which applied to the 'Kompensation' principle must be made here. Herder's interest in wholes, increasingly directed towards their formal and organic properties in his mature years, does appear strikingly modern, but it relies ultimately on vitalistic and speculative presuppositions. Modern organicistic theories, however, place much greater emphasis upon experimental data: the 'Gestalt' theory, for example, has been backed up by a vast volume of experiment. But the common element in the two theories is organicistic holism, which was beginning to re-enter scientific thought at the time when the 'Gestalt' theory first arose near the end of the nineteenth century. This theory of Herder's is of more use to exact science than most of his other ideas since it can be tested by experiment, for the 'Bild' or image is a measurable and formal, not a qualitative criterion.

(d) The human society and mankind as wholes

The next kind of unit which Herder treats in similar fashion (disregarding his scattered utterances upon the family group) is the individual human society, considered as a dynamic historical entity. Like Herbert Spencer, he believes that societies are closely analogous to organisms.[292] This conviction cannot be separated from his theories of social change and the laws by which he believes the latter is governed, and it can be more profitably discussed in that connection later. But of the human race as a whole, he early notices '*wie nach aller Wahrscheinlichkeit das Menschliche Geschlecht ein Progreßives Ganze* [sic] *von Einem Ursprunge in Einer großen Haushaltung ausmacht*'.[293] The word 'Haushaltung' at once betrays the holistic implications of this dictum. It naturally leads to the idea that mankind has an overall lifespan with phases analogous to youth, maturity, and age, and to the kind of thinking expressed in Lessing's *Erziehung des Menschengeschlechts.* Notions of this kind are to be found in the works of numerous writers with whom Herder was conversant, but one should be wary of specifying any particular source,[294] since they are in any case the natural outcome of his own holistic beliefs.

It is interesting that Herder, who declares in his *Auch eine Philosophie* of 1774 that, as society becomes more mechanised, its parts or members become increasingly interdependent,[295] thereby enunciates a principle exactly parallel to his later biological theory, earlier discussed, that nervous functions are more interdependent in higher organisms and more autonomous in lower ones. This latter, biological theory is in turn parallel to the modern organicistic theory of 'progressive mechanisation' in higher organisms.[296] All this shows that it is possible to detect a uniformity in holistic thought processes at all times and in all contexts.

Herder is uncomfortably conscious, however, that his theory of a corporate human personality is akin to the doctrine of Averroes and others that all beings partake of a single universal soul.[297] As in all holistic thought, a vitalistic or even animistic substratum is never far to seek. And since, in this case, exact data relating to historical developments are so sparse, it is manifestly impossible to reduce holistic generalisations of this sort to quantitative and scientifically workable terms. Holistic theories always risk casting their nets too wide, as happens on this plane of excessive abstraction.

(e) Theoretical implications

We have seen that holistic ideas tend to be associated with vitalism, and thence with teleology, from which, however, the later modern theory of organicism in the main dissociates itself. Herder's thought, on a general level, displays almost every nuance of these twentieth-century developments, for he fluctuates, as usual, between extremes. The metaphysical conception of a Chain of Being, almost universally accepted in Herder's age, also had holistic associations, which in this case ran counter to teleology and suggested that species exist in an ecological equilibrium, since every link in the Chain was by definition equally important within the whole: 'Denn Thiere sind der Erde so unentbehrlich als Menschen, und kein Glied ihrer Kette kann zerrißen werden, ohne daß nicht zugleich das Ganze leidet'.[298]

But a reaction against holistic ways of thinking set in in the 1930's, many of the earlier ideas having been recognised as misleading or valueless. More fruitful 'organicistic' theories began to appear in biology. The reaction perhaps arose in part because many physicists, and philosophers who took note of their findings, were becoming sceptical as to whether the universe itself has the same kind of orderliness as the formulas of the physicist possess.[299] But it was also precipitated, no doubt, by the revulsion of certain thinkers against the sinister consequences of the great holistic systems of political planning which became conspicuous in those years. Sir Karl Popper roundly denounces various aspects of holism, and admits its value only in highly specific contexts which can be investigated by science:[300]

> . . . a sentence such as 'Organisms are wholes' reduces itself to the triviality that, in an organism, we can discern some order. Besides, a so-called 'heap', as a rule, has a 'Gestalt' aspect too, just as much as the often cited example of the electrical field. (Consider the regular manner in which pressure increases within a heap of stones.)

Herder is in advance of his age as a thoroughly holistic thinker; but another remark of Popper's reminds us of the ancient origins of such ideas, long before they appeared in modern scientific thought: 'The doctrine that we may obtain a kind of concrete knowledge of 'reality itself' is well known as part of what can be technically described as *mysticism*; and so is the clamour for 'wholes'.'[301]

7. The study of origins and the 'genetic method'

Herder was keenly interested in origins and first things, both in history and in the natural world, from an early date: 'Eines von den angenehmsten Feldern, auf welche sich die menschliche Neugierde sehr gerne verirrt, ist dies: den Ursprung dessen, was da ist, zu erkennen.'[302] Another well-known utterance, which need not be quoted here, reveals, as he considers his own nature and childhood in the *Journal*, how deep-rooted and subjective this interest in origins was.[303]

The original reason why Herder believed that the study of origins is valuable is that he considered that, in an investigation of any developmental process, all subsequent developments can be traced back to, and explained by, the original state:[304]

> In dem Saamenkorn liegt die Pflanze mit ihren Theilen; im Saamenthier das Geschöpf mit allen Gliedern: und in dem Ursprung eines Phänomenon aller Schatz von Erläuterung, durch welche die Erklärung desselben *Genetisch* wird.

That is, the eventual state of maturity, completion, or perfection can be discerned from the very beginnings of a given development, which need not therefore be followed step by step before it can be explained.[305] This is, in fact, another instance of a more extreme kind of holistic thinking in Herder's works, dating here from a time before he had learnt to look upon an entire dynamic process as an organic whole. Instead, he sees all developments as already present in an initial state, a static whole, complete in its parts; the developments are compressed into a single origin, which he probably felt at this time to be a more concise and manageable unit than the complex devolution of a causal process in time. This sort of original whole recalls the Leibnizian conception of the monad, all of whose eventual developments are considered to be potentially present from the start (the statue within the marble). It may be likened, not without qualification, to Herder's later, highly telescoped account of the divine first causes behind man's early acquisitions. On the other hand, it must be remembered that he later rejected Kant's teleological theory that racial evolution is caused by preformed 'Keime', present in all men from the beginning, and called forth in racial evolution under climatic and other external influences. Similarly, he was soon to oppose uncompromisingly the theory of 'Präformation' in embryology. All this shows that his early belief that origins alone are enough to explain a complete process was soon considerably modified by his later studies of causal developments in nature and history. He then learnt to treat each complete process as a dynamic whole in itself.

As for possible sources of Herder's so-called genetic method, the influence of Leibniz's monadology at once suggests itself, while Max Rouché observes that Herder probably derived the actual word 'genetisch' from the writings of H. S. Reimarus.[306]

Herder's preoccupation with origins has a pronouncedly aesthetic quality about it. He would have agreed with Goethe's remark: 'Wenn man von Uranfängen spricht, so sollte man uranfänglich reden d.h. dichterisch'.[307] He well knew that the earliest historical documents are themselves generally poetical, and refers to 'die Dichterischen Fiktionen, in welche sich alle Weisheit und Kunst bei ihrer Geburt, wie in Windeln einkleideten'.[308] He regarded such documents, including all ancient myths and the early chapters of the Old Testament, as evidence not only on early history, but even, at times, on early natural (e.g. geological) changes. He is equally interested in all such 'dichterischen oder philosophischen Hypothesen von dem Ursprunge der uns bekannten Gegenstände'.[309]

So far as the Bible is concerned, one is reminded of his belief in divine first causes, which reaches its climax in the *Älteste Urkunde* of his Bückeburg phase. In fact, he describes the opening of St. John's gospel, itself dealing with ultimate origins, as 'die Stelle der Bibel, die mir mit jenem Anfange, der Schöpfungsgeschichte, am höchsten und tiefsten dünkt'.[310] But by the time the *Ideen* were composed, a growing desire to explain origins in naturalistic terms was competing with his preoccupation with divine first causes. For although, as we have seen, he resorted to unmediated divine first causes in grappling with the problem of how human history began, he attempts to combine natural and divine agencies in explaining the origin of the natural universe. In this way, he declares, 'gefiel es dem Schöpfer dieser Welten, die Materie sich bilden zu lassen nach den ihnen anerschaffenen inneren Kräften'.[311] This attempt to reconcile two varieties of causation by means of hypothetical 'Kräfte' once more recalls Kant's *Allgemeine Naturgeschichte,* of course.[312] In Herder's case, it is simply another instance of his familiar desire to have things both ways rather than of any distinct 'genetic method'.

This semi-naturalistic treatment of origins leads us to consider the second major sense in which critics speak of Herder's genetic method. One of them writes in this connection:[313]

> La méthode "génétique" de Herder est donc ce qu'on appellera une centaine d'années plus tard la "théorie du milieu", laquelle combine la "méthode historique" avec l'explication par le sol et l'hérédité.

But they have neglected to distinguish this notion that origins are determined by environmental factors operating within a dynamic process (for example, in Herder's theory of racial origins) from what Herder himself had called 'genetic' explanation, i.e. from his earlier conception of origins as static wholes, within which all later developments are already in some way present, as in Leibniz's monads (no environmental factors being mentioned). This latter sense has little in common with scientific explanation, of course, whereas the later usage obviously does.

As a circumlocution for the theory of environmental determinism, however, the term 'genetic method' has nothing to mark it out as a particular scientific method, distinct from the usual statements of cause and effect, origin and development, found in many areas of science. It is not the method itself but the emphasis on climatic and other types of external cause in biology and anthropology which gives Herder some limited claim to being an innovator. And, when the genetic method reverts to a hankering after knowledge of ultimate origins, it usually becomes, as in Herder's case, either poetical, mystical or speculative, or all of these together, a search for first causes which lie outside the province of science. And as Popper points out: *'Questions of origin are "how and why" questions. They are comparatively unimportant theoretically* and usually have only a specific historical interest'.[314] Should they, however, be non-specific, they inevitably lead to a search after first causes. Empirical science can investigate the origin only of specific objects or happenings, and it necessarily supposes that a causal sequence of indeterminate length, which can be followed up as available data, and interest, decide, stretches backwards behind each event. Even questions of remote historical origins, concerning which we can, of necessity, obtain but the scantiest of information, can rarely be answered completely by empirical investigation. For example, the problem of the origin of language, so dear to Herder, is specifically excluded by the Société de Linguistique de Paris from the topics to be studied by its members: 'La Société n'admet aucune communication concernant . . . l'origine du langage'.[315] Such questions are left to speculation, which alone can provide (tentative) answers.

Herder's merit in studying the origin of language was not that he approached the problem by means of any particular 'genetic method', but simply that he ruled out non-naturalistic explanation, in his essay of 1770, as a matter of principle.

Too much has been said in the past about Herder's genetic method, which has been only partially understood, and much overrated. The evidence suggests that when the 'viel berufene genetische Erklärungsart'[316] sets itself up as a distinct method, it has no place in science, and when it can be reduced to the theory of environmental determinism, or to the conventional search for specific natural causes, it should be recognised quite simply as such, and given some less ambiguous title.

8. The idea of development, and cyclic theories of change

(a) The idea of development

Let us briefly examine the logic, origins and scientific implications of Herder's so-called 'Entwicklungsgedanke', about which so very much has been written, especially by the earlier critics.

Natural wholes, as a rule, are considered by Herder as developing. For example, in his theory of 'Kompensation', he treats the individual organism as a developing unit; on other occasions, he says that the individual human being never ceases to develop (hence the need for unceasing 'Bildung'), that the ecological community of species is a dynamic unit, that the society or nation is a developing quasi-organism, and that mankind, seen as a corporate personality, is involved in a process of becoming. These are the most obvious instances in which he speaks of development, in a naturalistic sense (although metaphysical examples, such as the development of the soul after death by a process of 'palingenesis', etc., also appear).

But by the words 'Entwicklungsgedanke' or 'Idee der Entwicklung', critics[317] usually mean Herder's historical relativism, his belief in a natural, causal development of individual units in the historical process (as opposed to his alternative theories of absolute historical purpose or the historical progress of the theorists of perfectibility). As such, it is now usually called 'Historismus', as Meinecke calls it, or at times 'historicism', or the 'historical method'. The word 'Entwicklung' in such cases is, in fact, misleading, and they are only of secondary interest for the student of Herder's theories of development in the natural (as distinct from historical) world. It was this historical use of the so-called 'Entwicklungsgedanke' which Friedrich Schlegel criticised, maintaining 'daß die Herdersche historische Anschauung kein anderes Resultat aufweise, als daß alles sein mußte, wie es ist und war'.[318] Modern critiques of 'historism', 'historicism' or the 'historical method' strike very similar notes, for Schlegel penetrates to the essence of the method in this dictum. Herder, in fact, is one of the first of 'the school of thinkers who believed that in describing a development historically one has causally explained it',[319] in so far as his 'Entwicklungsgedanke' in history is concerned. This method, various modern theorists of history contend, has been much overrated, and it has likewise received far too much attention from critics of Herder's historical writings. Correspondingly less attention has been paid to the idea of development as Herder employs it in physical and biological contexts (other than in the mistaken idea that Herder was an early Darwinist).

But, like the genetic method, it boils down simply to an interest in causal sequences. If we must make any distinction between the two, we may say that the idea of development applies to all stages of a process, while the 'genetic method' examines either the earliest stages, or those few environmental factors, acting upon one or more living entities, which are supposed to determine their future development. Both relate to causal sequences, and any causal sequence presupposes the idea of development, simply because causes, by definition, precede their effects.

Yet although the idea thus scarcely merits the title of a distinct method, it undoubtedly led to great advances in many sciences from the time of Herder onwards. In the hands of Kant, the way for whose achievements had been prepared for by Descartes and the astronomer Thomas Wright, it engendered the theory of stellar evolution. (Herder inclined towards this idea increasingly in later years.) In Herder's hands, it meant that function as opposed to structure should be emphasised in the study of living organisms, that organisms are progressively determined by their environment, that ecological communities are dynamic processes rather than unchanging states, and that psychology should concern itself with natural developments. It eventually led, though not in Herder's works, to the theory of evolution by descent.

In fact, the idea of development is fundamental to that whole movement which transcended the older descriptive sciences and went on to establish the functional, developmental sciences of modern biology and psychology. Yet it is easily forgotten that the idea of development had long before been firmly established by the science of mechanics: the whole subject of dynamics necessarily presupposes it. Herder's age saw it extended to astronomy and biology, and, in part, to psychology. The term 'Entwicklungsgedanke', however, like the term 'genetic method', is often used confusingly, and implies simply that temporal sequences are enumerated, and antecedent events are presumed to be causes of later ones. Today, we see it declining from the status it held in the later nineteenth century and after in theories of history; in the sciences, if we disregard such descriptive disciplines as morphology and taxonomy, it is usually taken for granted.

(b) Cyclic theories of change

The conception of organic wholes, as we have seen, necessarily involves the idea of development. In turn, the development of an organism, or any process to which the organism analogy is applied, must follow a *cycle* of growth. This can be represented by a graph whose curve rises to a vertex, then falls away again until a new curve begins when a new organism is produced. Now Herder applied the organism analogy to the ecological community, to society, and to mankind as a corporate personality. Thus we should expect him also to apply the analogy of the growth cycle to these, as well as to the individual organism (where it is, of course, no longer an analogy). In fact, he does discuss the growth cycle of the organism from birth to reproduction and death, the cycles within each human being's psychological development (in his essay *Tithon und Aurora*[320] and elsewhere), the cycles of disturbed and recovered equilibrium in ecology, the similar cycles of recurrent 'Maxima', and their various earlier equivalents,[321] in the evolution of societies, and the 'Lebensalter' of mankind as a corporate whole which develops through one, or perhaps two great cycles (in his *Auch eine Philosophie*[322]). He also applies the cyclic theory to the supposed ages of taste,[323] the phases of Greek literature,[324] the development of language,[325] and (after Hemsterhuis) the development of knowledge in general,[326] ultimately arriving at a general cyclic theory of history.[327]

But he had generalised the cyclic theory of change at an early date (1767), as the following passage makes clear:[328]

> . . . vom Schlechten zum Guten, vom Guten zum Vortreflichen, vom Vortreflichen zum Schlechtern und zum Schlechten: dieses ist der Kreislauf aller Dinge. So ists mit jeder Kunst und Wissenschaft: sie keimt, trägt Knospen, blüht auf, und verblühet.

Already in his notes of around 1766, he writes:[329]

> 1) das Ungebildete bildet sich aus
> 2) die Ausbildung geht durch alle Stuffen
> 3) bleibt auf der höchsten nicht lange
> 4) sinkt
> 5) stirbt, um wieder zu auferstehen.

Critics have been at needless pains to discover the sources of the cyclic theory of change as Herder uses it.[330] It was, of course, a necessary outcome of his whole way of thinking; for the quest for wholes in everything, coupled with the 'Kraft' concept, leads to the idea that the organism is the prototype of all dynamic wholes; the idea of development by growth automatically arises therefrom, as does also the analogy of growth cycles. Besides, so many writers, from antiquity onwards, have spoken of growth cycles that it is idle to single out particular precedents. Herder may have been influenced by virtually any of them, although we ought surely to attach greater importance to those which he names himself.[331] Besides, the precedents are too varied to be evaluated as a coherent tradition.

Herder's ideas concerning cyclic change go back to his conviction that reality consists of dynamic wholes, which may be treated as if they were organisms. An 'organism', in this sense, is something purely abstract, not a concrete biological unit. (This explains why Herder could readily use alternative models, even 'mechanical' ones from mathematics and physics, such as planetary orbits, pendular oscillation, Lambert's 'Maxima', etc., in discussing cyclic changes.) The speculative premises on which theories of this kind are based do not necessarily render them valueless to science, unless they are incapable of being applied to measurable data. The cyclic theory of social and historical change is of this kind, however, for exact data (for example, population statistics, etc.) are almost invariably too scarce to allow us to define the cycles in terms of quantitative changes. Such reduction is, however, possible in ecology, as we earlier noticed, although it was not so in Herder's day. But the cyclic theory appears even in prescientific philosophies. Popper notes that 'the doctrines of the life cycles of cities and races actually precede the primitive teleological view that there are hidden purposes behind the apparently blind decrees of fate'.[332] At best, the cyclic formula provides a rough and convenient description of the rise and fall of states as political systems.

We conclude that, in history, the idea of cyclic change, though still flourishing in this century,[333] has nothing particularly original or illuminating about it. It is merely another aspect of Herder's relativistic approach to history, tempered elsewhere by a belief in progress.[334] Applied to biological organisms, the theory of growth cycles is, of course, no longer a theory, but a statement of observed fact, and Herder's use of it is, in this case, beyond challenge; his theory of changing ecological equilibria, moreover, is well attested today. His attempts to describe cycles mathematically (especially in social change), and similar attempts in modern sociology, will be discussed later in connection with his attitude towards mathematics.

9. The dialectical method

The notion of polarity, or of development through a conflict or interaction of opposites, frequently appears in Herder's works, and has received considerable attention from critics. Three articles have been devoted exclusively to it.[335] This 'dialectical method' of Herder's has interested critics of Marxistic persuasion in particular, since it was to become the organ of Hegelian, and then of Marxist logic. It now remains to be seen whether the applications, sources, and philosophical and scientific implications of this method as Herder uses it justify the claims that they have made for it.

(a) Herder's applications of the method

Students of Herder's works have long realised how important the essay ***Über die dem Menschen angeborene Lüge,*** written in 1777,[336] is. This essay extends the religious and ethical notion that man's self-negating (or divine) and egocentric tendencies are in polar opposition, and postulates a *lex contrariorum* which obtains throughout the universe:[337]

> Ueberall zwo Kräfte, die sich einander entgegengesetzt doch zusammenwürken müssen, und wo nur aus der Kombination und gemäßigten Würkung beider das höhere Resultat einer weisen Güte, Ordnung, Bildung, Organisation, Leben wird.

But as early as 1766, in his casual notes, Herder had remarked that the principles of attraction and repulsion, contraction and expansion, are the universal mechanisms of change, not only in the physical world, but also in history.[338] That is, all such changes come about dialectically. He reiterates this belief that the universe, in all its aspects (including the human mind), is sustained, and even created, by the conflict of opposing principles, as late as 1802.[339]

However, he rejects the idea that fundamental 'Antinomieen'[340] or 'Dichotomieen'[341] exist within reason itself, as Kant suggested and Hegel later stated as a universal principle. Apparent contradictions arise only out of polarities in the empirical world, and Herder goes on to say of nature: 'ihre Antiphonieen heben einander, ihre Gegensätze verschmelzen'.[342] Thus, all conflicts are ultimately reconcilable, and never absolute, for Herder.

The important manuscript of 1769 which was published some years ago clearly shows that Herder, under the influence of Kant's *Allgemeine Naturgeschichte,* believed that the physical world is created and sustained by the interaction of polarised 'Kräfte'.[343] Several other instances of the belief appear in Herder's works, and one of them dates from before 1769.[344] Kant himself had made it clear that the Newtonian theory of gravity (whose 'dialectical' aspects he himself particularly emphasised) was the main inspiration of his own cosmogony; Herder too appealed to this ultimate source, and believed that all gravitational phenomena are produced by two forces which sustain this and other worlds.[345] But in his later years he rejected the theory that the universe had also been created mechanically by two opposing forces, probably because of his antipathy towards Kant; instead, he now invoked yet another teleological 'organische Kraft'.[346]

Herder had early enlarged on Kant's theory that the physical universe is created by two opposing forces, and proceeded to account for the formation of biological entities in a similar way. Just as Kant's forces create planets, etc., 'so auch unsre Seele den Körper'.[347] He goes beyond everything that Kant ever advocated when he extends the idea to the organic world.[348] Again in the *Ideen,* he maintains that the transition, by way of crystallisation, from inorganic manifestations of the universal 'type' to forms resembling plants, takes place through 'Zusammendrang und Ausdehnung'.[349]

Herder's psychology likewise teems with dialectical conceptions. Even in its physiological groundwork, which states that nervous reactions are produced by the expansion and contraction of nervous parts under varying stimuli, it rests upon a patently dialectical foundation.[350] Such pairs of complementary opposites recur on all levels of psychological activity for Herder, and culminate in his theory that two types of genius, the one marked by 'Innigkeit', the other by 'Ausbreitung', may be distinguished. The most general level of all is the polarity of 'Liebe' and 'Selbstheit', as earlier mentioned, in Herder's conception of the individual and society. Herder anticipates Goethe's conception of 'Systole und Diastole' in such psychological theories, and even uses the image of breathing, and the same Greek terms, on several occasions.[351]

He at times applies the dialectical formula to history too, as when he writes:[352]

> In jedem Zeitpunkt des Strebens und Fortstrebens giebts immer *Gegenpartheien,* die *für und wider einander gebohren zu seyn scheinen* und die sich einander oft nahe genug leben. . . . ihre Kräfte *mässigen* einander, daß ein drittes *mittleres Gute* aus den zusammengesetzten Bemühungen beider herauskommt.

This idea recurs in his later 'pendulum' theory of progress, which he conceives of as occurring by movements between two extremes gradually approaching equilibrium.[353]

Herder early uses the gravitational analogy to describe man's ethical position. In the 1760's, long before he wrote the essay *Über die dem Menschen angeborene Lüge* and corresponded with his friend Karl von Dalberg on this topic, he wrote: 'Unsre Seele dachte, das ist ihre Centralkraft . . . Weniger Centralkraft, näher an Gott'.[354] This, along with other factors, caused him to postulate an analogy between physical and moral worlds, enabling him to formulate ethical laws (which will be examined in detail later) on the pattern of physical laws. Such highly questionable formulations abound in Herder's works.[355] The belief that man possesses two opposing ethical tendencies, one self-negating (or social, or divine), the other egocentric, is, of course, simply another instance of Herder's familiar dualism of 'Liebe' and 'Selbstheit', reinforced in this case by physical analogies.

Wilhelm Dobbek has written a separate article in which Herder's aesthetic ideas of opposition and resolution or harmony, and the Golden Mean, are thoroughly examined.[356] In the present context, we need therefore only note that he applied the dialectical formula to aesthetics as well as to other disciplines.

The essay *Über die dem Menschen angeborene Lüge,* of course, not only applies the dialectical principle to the universe as a whole and to ethics, but to the religious life in general. It is of interest to notice the Gnostic and Manichaean ancestry of this idea that forces which draw man closer to God are equally balanced by others which draw him away.

This survey, though not exhaustive, shows that Herder applied the dialectical formula, as a means by which mechanisms of change, development, or mutual interaction can be demonstrated, to the universe as a whole, to the physical, biological, and psychological worlds, to history, ethics, aesthetics and religion, i.e. to almost every area of his experience and thought.

(b) Sources and precedents

The dialectical formula was used, in a sweeping, universal manner, by thinkers as early as the pre-Socratic philosophers.[357] Of the early universal dialectical theories, Herder knew and mentioned that of Empedocles, who imagined that all things were created and sustained by a conflict between love and hate.[358] Campanella, who, following Parmenides and Telesio, was later to explain the creation of all things by a hypothetical conflict between hot and cold principles, is mentioned by Herder by 1768,[359] and on many later occasions. By 1766, he knew the work, at least in extract, of the biologist Needham, who wrote that all effects observed in the universe can be reduced to a dualism of action and reaction.[360] (He seems here to be rephrasing Newton's third law of motion, which states that, to every action, there is always opposed an equal reaction.)[361]

Several critics[362] have rightly named Kant's *Allgemeine Naturgeschichte* as the major source for Herder's belief that physical phenomena are produced by dialectical conflict between forces. It has also been suggested[363] that Kant's early essay *Versuch, den Begriff der negativen Größe in die Weltweisheit einzuführen* (1763)[364] may have been Herder's principal source. But although a copy of this work was in Herder's library,[365] it simply used theoretical arguments to justify the application of dialectical formulations to the objective world, whereas Herder was interested only in these applications themselves, and had little or no theory to back them up. Boscovich, whose ideas were known to Herder in some form by 1772,[366] stated that the atoms of all bodies obey the magnetic laws of attraction and repulsion, and the chemist Candido Pistoi, in a work which Herder read in the early 1780's, declared that the entire physical world functions through the polarised forces of attraction and 'Ausdehnung'.[367] But Kant's physical theory, ultimately derived from Newton, is undoubtedly Herder's principal source here.

It is doubtful whether Herder independently extended Kant's dialectical theory of creation by physical forces to the organic world.[368] For he had encountered a dialectical theory in biology by 1766 in the writings of the biologist Needham, and had noted[369] that Needham's 'vegetativische Kraft' operates by 'Trennung und Zusammensezzung' in the growth of organisms as embryos. The organism develops further by a process of 'Ausdehnung; diese haben Thiere und Pflanzen; indeß ist im Aether auch eine wiederstehende [sic] Kraft, sonst würden sie ins Unendliche zerstieben'.[370]

Critics have noticed that a parallel exists between Herder's theory of 'Innigkeit' and 'Ausbreitung' as the qualities of the two types of genius he distinguishes, and Burke's theory of expansion and contraction of the nerves, which were believed to produce the twin aesthetic emotions which we feel towards the Sublime and the Beautiful.[371] This comparison is indeed justified, since Herder had known Burke's work on aesthetics long before he wrote the work in question (his psychological treatise), and had even, in 1769, contemplated translating it into German.[372] Others stress the influence of Hemsterhuis' 'amour et égoïsme' upon Herder's theory of 'Liebe und Selbstheit' as the polar reactions which occur in the relationship between individual and society.[373] Herder, in fact, had reviewed the relevant work by Hemsterhuis in 1772.[374] To these possible sources might be added the theories of contraction and expansion of the nerves put forward by Montesquieu[375] and by Gaubius,[376] the works of both of whom were familiar to Herder, although he did not meet that of Gaubius before 1780, by which time he had already formulated his dialectical theories of psychology. A similar theory put forward by the English philosopher Francis Hutcheson has been noted by some writers as another possible influence.[377] Hutcheson's name and theory do appear in Herder's notes to Kant's lectures,[378] and he is named again in a work of 1769.[379] The theories of Burke and Hutcheson were probably the earliest and most important influences of their kind on Herder's thinking.

Kant's theory that historical progress comes about through a conflict between man's social and egocentric tendencies has been likened to Herder's idea of progress.[380] But Kant's version, which appeared in an essay in 1784, is unlikely to have influenced Herder, who completely rejected it, even though he had put forward analogous views in his own psychological writings. In so far as Herder's theory of progress towards 'Humanität' by conflict has an ethical import, the suggested influences of Isaac Iselin[381] or of 'le dogmatisme rationaliste-chrétien'[382] are, in a sense, of the sort which we should expect to find. For, in Herder's age, all theodicies which described history as a conflict between good and evil forces, the good eventually triumphing, proclaimed the same message. But Herder's idea of progress cannot be described as merely imposing theology upon history, thereby making Herder a German Bossuet.[383] For Marxism and other non-theological theories explain historical progress towards an ideal state in a comparable way.

This brings us again to those theories which present man's ethical situation as a dialectical process in which laws, analogous to the law of gravity, are believed to operate. Mechanists such as Hobbes and Holbach had used the analogy of attraction and repulsion to explain the nature of desire and fear, but there are also more explicitly ethical precedents: the theologian Spalding, for example, had compared man's conscience with the force of gravity,[384] and Karl von Dalberg was to use the same analogy in the manuscript work which inspired Herder's *Über die dem Menschen angeborene Lüge.*[385] Hemsterhuis, moreover, had likened his 'amour et égoïsme' to a 'vis attractionis' and a 'vis centrifuga', as Herder himself points out in his review of the work concerned in 1772.[386] But Herder uses this analogy in the 1760's, before he had met the writings of Dalberg and Hemsterhuis. Hartley also uses the analogy,[387] but Herder read his work for the first time only in 1772.[388] Hutcheson was perhaps the first writer to compare gravity and ethics,[389] and Herder, as we have seen, refers to his ideas in his lecture notes of 1762-1764 and again in a work of 1769.[390] Kant uses the same analogy in his *Träume eines Geistersehers,* and since Herder reviewed this work in 1766,[391] it is quite possible that it first led him to employ the dialectical formula in this most characteristic way, attempting as he does to unify the scientific and the ethical worlds. (Kant may have derived the analogy in turn from Swedenborg,[392] who applied it, however, on a transcendental rather than a realistic ethical level.) From all this, it is clear that many writers before Herder had likened man's moral situation to gravitational phenomena, and it is impossible to say finally which of them did most to shape Herder's cognate theory.

The position is somewhat less complicated, however, as regards dialectical formulations in aesthetics. In describing works of art in such terms, Herder is simply renewing the classical conception of the Golden Mean, known to all writers on aesthetics in his age. There is therefore no need to search for more specific sources.

The religious application of the dialectical formula has a long and turbulent history through Gnosticism and other heresies within Christianity. These details need not concern us. It has, however, been suggested that the ideas of Bruno and Böhme influenced Herder in this respect.[393] As already mentioned, Herder knew something of Bruno's ideas in the Bückeburg years, as his unpublished manuscripts show. This was before he wrote his *Über die dem Menschen angeborene Lüge,* in which the dialectical theory of religion is most fully expounded. And he mentions Böhme as early as 1767.[394] A.O. Lovejoy shows that the related idea that opposites are resolved when the believer immerses himself in the deity (the *coincidentia oppositorum*) was associated especially with neo-Platonic mysticism.[395] But Herder, in his *Älteste Urkunde,* frequently refers to even earlier instances of the religious idea of a dialectical dualism. Such are the Zoroastrian dualism of light and darkness, good and evil, and the many dualistic creation myths of the Ancient Near East. Such myths usually teach that the universe was created, and is sustained, by two opposing agencies or divinities; these can no doubt be reduced ultimately to the functions of the two sexes as described in even earlier mythologies. Furthermore, on several occasions (from the early excerpt *Wahrheiten aus Leibniz*[396] onwards), Herder mentions the English theologian Robert Fludd. Fludd believed in a universal conflict between light and darkness, heat and cold, and between God and creation. These beliefs, according to Lovejoy,[397] were derived from the philosophy of Telesio, and the Cabbala. Fludd, however, contends, as does Manichaeism, that both dualistic poles are of a divine nature.

Of all these possible sources for Herder's religious application of the dialectic principle, none may have given rise to it directly, since it was already well prepared for in so far as he had already applied the same formula to ethics, just as Kant and others had done before him. But the fact that Herder refers to them all shows that his interest in the idea was constant, and they afford further proof that his dialectical formula, one of whose main functions is to show that similar principles apply in both religion and science, led him into regions well beyond religious orthodoxy.

It thus appears that the Newtonian theory of gravity, amplified and modified by Kant, was the principal source, later reinforced by others, for Herder's so-called 'dialectical method'. Encouraged by the precedents of Needham in biology, Burke in psychology, and Kant and others in ethics, he extended it to ever wider areas of his thought, using it as a universal formula to cover all areas of his experience.

(c) Philosophical and scientific implications

Engels declares that Hegel's dialectical laws are mistaken: 'The mistake is that these laws are foisted on nature and history as laws of thought, and not deduced from them.'[398] For 'the dialectics of the brain is only the reflection of the forms of motion of the real world, both of nature and of history'.[399] With these words, Engels indicates the two conflicting ways in which the dialectical formula has been used as a philosophical method – subjectively or idealistically on the one hand, and objectively or empirically on the other.

Now we have seen that Herder refused to agree with Kant's suggestion that fundamental contradictions are inherent in reason itself, in the subject. The only subjective dichotomy, he declares, is that between the limitless imagination and the determinate understanding; but this is rather an existential dichotomy than a logical one. Herder never hints that reason itself might be in some way self-contradictory.

As an objective principle, the dialectical method was first legitimated in theory by Kant's early essay *Versuch, den Begriff der negativen Größe in die Weltweisheit einzuführen*; Kant showed that 'contradiction', in the sense of conflict or opposition, is possible between real or natural entities, whereas *logical* contradiction is of an entirely different order, involving not so much a conflict as an error in our reasoning, an error which can be overcome. Herder used the dialectical principle objectively, although there is no reason to suppose that Kant's essay, which merely justified in theory what Newtonian science and the study of magnetism, for example, had long recognised in practice, had any influence upon him. The later Kant, followed by Hegel and his school, concentrated his attention on contradictions which might be inherent in reason itself. Marx and his followers reestablished the dialectic as an objective, empirical principle.

It may be well to ask at this juncture why the conflicting agencies supposed to be active throughout nature are so often said to be two in number. Cusanus, on the other hand, said that there were really as many antinomies as things existing. Hobbes' theory of the state of nature spoke of a conflict of all against all. And Lucretius, and the whole school of Epicurus, envisaged a conflict not between two, but between all units of the natural world. This generalised version of dialectics, through the medium of Malthus, culminated in Darwin's theory of a universal struggle for existence.

We have already seen that Herder used this generalised theory of conflict from an early stage, and that it led to some of his more fruitful ideas on nature and science. It therefore seems that he employed the more formalised dialectic of *two* conflicting or complementary poles as a special case. In fact, its mystical and aesthetic connotations, and its value as a means of bringing together disparates in a facile and sweeping manner, explain why it appealed to Herder and so many others. It is perhaps more than a coincidence that Hegel was so fond of Böhme's works, and that manuscript copies of Böhme's writings were found among Newton's papers. The real roots of the dialectical formula are mystical; therein lay its appeal for men like Blake. It can only claim to represent natural phenomena with any accuracy in so far as it remains a special case of the more complex notion, as propounded by such men as Lucretius, that *many* distinct agencies interact with one another in the natural world.

Often, in fact, 'dialectical' accounts of natural phenomena are excessively laboured. They attempt to bend observations to fit the predetermined idea that two (and only two) units must interact in order to produce the phenomenon under discussion. Thus, one pole is often a mere fiction, a foil to the other. For example, we have seen how Needham introduced a certain 'résistance' or, in Herder's paraphrase, a 'wiederstehende [sic] Kraft im Aether', as the opposite to the expansion which is inevitably observed in the growth of all organisms. Similarly, Candido Pistoi[400] postulated an ill-defined 'Ausdehnung' as an opposite to the known laws of chemical affinity in order to account for the fact that chemical bonds can be dissolved. And many students of Newton, including Kant, were at pains to emphasise the centrifugal component of gravitational phenomena as observed in astronomy, although Newton's law of gravity applied to all cases of gravitational attraction, not just to those in which one body is seen to move round another. Such examples could be multiplied indefinitely.

As the critic of Marxism Sidney Hook writes:[401]

> When we consider the set of conceptions identified with dialectic as a method of analysis and discovery, we notice that they represent a characteristic exaggeration of some features found exhibited in non-dialectical scientific enquiry.

Herder advances a theory of manifold conflict in history, but this is not derived from the formalised polarity described in Kant's work on cosmogony, as one Marxist writer[402] supposes; it originates, as we noticed earlier, from the Lucretian views he had imbibed in the 1760's (later fostered by the similar views of his friend Einsiedel, no doubt).[403] Herder's later theory of a polarised dialectic (usually ethical) of progress is far too schematic, and is not even related to concrete historical agencies such as the antagonistic social classes of Marxist dialectics, but merely to (ethical) 'Kräfte'. Those[404] who seek dialectical materialism in Herder's writings are doomed to disappointment.

In assessing the function of the dialectical method in science, we must try to decide whether it is in any sense a means of prediction or discovery. Suppose we discuss the interaction of two forces (although the number two need not necessarily arise). We can predict what the magnitude and direction of the resulting force will be, where two forces are involved, by means of the parallelogram of forces, but only if the magnitudes and directions of the two initial forces, acting upon some body, are already known. Formulating the problem dialectically does not help us to solve it; it merely enables us to *define* it on a more abstract level, without conveying any new information. As Hook says of a similar case: 'what we have here is not an hypothesis to be developed but a delimitation of a subject matter in terms of a convenient organising category'[405]. The dialectical method, applied to the empirical world, can describe, but not predict.

As Herder applies it to the natural world, the dialactical formula ('formula', it should by now be obvious, is really a more suitable word than 'method') usually describes processes, whether physical, biological, psychological or historical. It is therefore a dynamic conception.

But a conception can be dynamic in various ways; it can describe actual motions, which can be measured, or it can postulate unknown agencies as motor forces. The latter is Herder's usual procedure: his dialectic is a conflict between 'Kräfte': '. . . Anziehung und Zurückstoßung? was will das sagen, wenn ich nicht eine Monas setze, die *Kraft*, die eingeschränkte *Kraft* hat, und das ist die Seele!'[406] Engels, on the other hand, writes of his own materialistic dialectic: 'It is expressly to be noted that attraction and repulsion are not regarded here as so-called '*forces*', but as *simple forms of motion*'.[407] He might almost have been replying to Herder.

Kant, however, in the preface to his *Allgemeine Naturgeschichte,* denied that his avowedly mechanical theory of creation in any way resembled the Lucretian theory. His (two) hypothetical 'Kräfte', which were supposedly divinely implanted, were expressly designed to prevent any such inferences. Yet in Engels' and in later theories, only the Lucretian materialism survives, and the intangible 'Kräfte' are gone. Similarly, Herder combined the Lucretian idea of conflict (often involving *many* units) with the saving clause that the conflicting units are 'Kräfte'. But, since he often maintained that no 'Kraft' could operate without its (material) 'Organ', his 'Kräfte' tend at times to fade into insignificance. This is the case in his theory that the child first develops through its sense of touch – touch does not take place between 'Kraft' and 'Kraft', but between our body and external bodies.[408]

As appearing in Herder's dialectical formulations, 'Kräfte' serve therefore not only to indicate movement and change, but also to avoid the Lucretian, mechanistic implications which may emerge when the formula is applied in scientific contexts. These 'Kräfte' are not quantities, and can rarely be reduced to the latter. Thus the only naturalistic element in Herder's dialectical method consists in the legacy of Lucretius with his idea that many units interact and conflict with one another throughout nature, not in the dual poles of the mystical tradition, or the 'Kräfte' used by those who sought to dissociate themselves from materialistic mechanism.

Biological polarities are subordinate, in man, to psychological polarities, which in turn exist within social and historical ones, and so on. Even on the physical level, attraction is itself a relationship between two units, whereas attraction and repulsion, occurring together (as on the two poles of a magnet) constitute a polarity of polarities.

All this shows that the formula has holistic implications. Furthermore, each polarity within higher polarities is usually composed not only of two parts, but also of the new quality or product which arises out of their mutual relations, the synthesis of Hegel, or the 'Steigerung' of Goethe. And, if the dialectic is applied to a process, for example to history, it is tacitly assumed that changes to one part produce or call forth changes in other parts, and in the organic whole which the process is believed to constitute.

But in what sense can one pole be said to enter initially into any relationship whatsoever with its opposite in an empirical situation?

Firstly, in the Lucretian sense, whereby many units compete or conflict among themselves, as in Herder's theory that a struggle for existence brings about a changing ecological equilibrium, the single contacts which occur between the various units must be fortuitous in themselves, but the result of the many fortuitous single contacts is that a law-governed state arises. Secondly, where only two poles are involved, one may actually suppress the other. In this way, evil always ministers to good in the classical age,[409] and it is merely a foil to its opposite; Herder had passed somewhat beyond this position (which his friend Dalberg had adopted), and, until his later years, stressed the equal importance of both ethical poles.[410] But Herder, although he placed equal emphasis on both ethical poles in his almost Gnostic *Über die dem Menschen angeborene Lüge* essay, writes already in 1787: 'Alles Böse ist ein Nichts; wir nennen aber Übel, was *Schranke,* oder *Gegensatz,* oder *Übergang* ist und keins von dreien verdient diesen Namen.'[411] Here, one pole suppresses or supersedes the other, just as one class suppresses and supersedes the other in the Marxist theory of history. Thirdly, the two poles may coexist in an equilibrium, which may be either static or dynamic, as Wilhelm Dobbek observes.[412] Or, fourthly, if one pole becomes part of the other, or becomes like the other, what Herder calls a process of 'Vereinigung' or 'Verähnlichung' takes place.

This process is described in the three laws enunciated in his *Gott*:[413]

(1) *Beharrung,* d.i. innerer Bestand jeglichen Wesens.
(2) *Vereinigung* mit Gleichartigem und vom Entgegengesetzten Scheidung.
(3) *Verähnlichung* mit sich und Abdruck seines Wesens in einem andern.

A slightly different formulation of these laws appears in an essay of the same year (1787),[414] and the last law appears later on as follows: 'Alles was sich liebt, verähnlichet sich einander'.[415]

But first of all, let us consider the possible sources of the second law. (The first scarcely concerns us here, since it merely reaffirms Herder's principle of 'Selbstheit', i.e. of individuation or self-preservation, and uses a new word borrowed from the philosopher Lambert.) At least two critics have remarked that this idea of like uniting with, or attracting, like, and repelling its opposite, is clearly unscientific in origin, since, in magnetism, like poles repel, and unlike poles attract each other.[416] Now Herder refers, in the same context as these laws, to the magnet, strangely enough, as 'ein flüßiger Tropfen'.[417] He also declares: '[daß] wo ein System von gleichartigen Kräften eine Axe gewinne, sie sich um dieselbe und um ihren Mittelpunkt so lagern, daß jedes Gleichartige zum gleichartigen Pol fließt . . . '.[418] These sentences give the clue to Herder's meaning. He had read too many works on magnetism to have misunderstood it so basically as his critics imply.

The main authority he had consulted was the Dutch scientist Anton Brugmans.[419] His *Philosophische Versuche über die magnetische Materie,* translated into German in 1784, treat magnetism as essentially a fluid phenomenon; there are two 'magnetische Flüssigkeiten' distributed in everything, and magnetic phenomena arise when all like elements, constituting one of the fluids, flow to one pole, dissociating themselves from, or repelling, the opposite fluid.[420] This explains why Herder's account of magnetism is so paradoxical. 'Jedes Gleichartige' is the like fluid, not the like pole of another, external magnet.

It could, on the other hand, be argued that a misprint appearing in the table of contents of this work by Brugmans, which lists an 'Erklärung der Ursache, warum sich die gleichnamigen Pole anziehen', did lead Herder to misunderstand magnetism basically. But the error is not repeated in the body of the work itself,[421] from which Herder, also using many similar works, had made copious extracts. It was undoubtedly Brugmans' theory that each magnetic fluid converges upon its like pole which encouraged Herder to cite magnetism as an illustration of his law that like unites with, or attracts, like. Besides, this law presumably applies to the attraction and union of the two sexes, although these are no more alike than are the opposite poles of a magnet.

The second and third laws are never exactly distinguished from one another in their sources and their applications. Their origins could be several in number. Firstly, there is the religious, or rather mystical precedent, the medieval 'Omnia intendunt assimilari Deo'.[422] Plotinus' similar conception has also been suggested as Herder's source.[423] Secondly, Plato's theory of gravity involved an 'innate tendency of bodies of like nature to come together'.[424] This led in turn to 'the neo-Platonic theory of cosmic sympathy',[425] which Herder may well have encountered. Thirdly, we have already encountered Herder's theory of perception by 'Analogie': the subject recognises and takes into its consciousness that which, by empathy or by some unspecified process of preestablished harmony, can be conceived of by analogy with the self. This same theory led Herder to contend that love, and mutual assimilation by love, are the highest form of 'Erkennen'.[426] Similarly, Karl von Dalberg, as Rudolf Haym[427] notes, formulated a supposed law of 'Aehnlichwerdung' by love (cf. Herder's 'Verähnlichung'). The loved object is presumably analogous to the loving self; as the Platonist Hemsterhuis puts it: 'le degré de la force attractive se mesurera constamment par le degré d'homogénéité de la chose désirée'.[428] But fourthly, there is also a biological precedent within Herder's own writings. He wrote in the *Ideen,* Pt. II, of the human 'Lebenskraft': '. . . in Gesundheit und Krankheit stehet sie uns bei, aßimilirt gleichartige Theile, sondert die Fremden ab, stößt die feindlichen weg'.[429] Thus, our diet ('gleichartige Theile', substance akin to our own) is assimilated, and 'Verähnlichung' takes place as it is transformed into the substance of our bodies. If interpreted in this sense, Herder's second law simply describes the process of nutrition. Needham may have been his particular source here, for he writes that there are various combinations of two principles in each organism:[430]

> . . . elles [i.e. ces combinaisons] sont attractives ou répulsives, et produisent les sympathies ou les antipathies physiques, selon que l'action ou constitution particulière de chaque substance spécifique est plus ou moins semblable, plus ou moins analogue à celle d'un autre.

Besides, the third law in particular clearly has a further biological basis in the notion of mating and reproduction by two sexes.

The first of the two biological usages, the idea of nutrition, implies that one pole completely overcomes the other. But what of the second? Herder had stated this point more clearly on an earlier occasion, saying that each organism possesses the ability: 'den Abdruck sein selbst mit allen in ihm wirkenden Kräften an seiner statt der Welt zu geben'.[431] Similarly, Hemsterhuis speaks of 'la faculté de produire, par le moyen des deux sexes, un composé qui lui ressemble'.[432] The polarity of the sexes, therefore, does not mean that one pole is cancelled out by the other.

It thus appears that the second two laws, as applied to Herder's theory of love, and to the biological processes of nutrition and reproduction, cannot be distinguished clearly from one another. It is further evident that it is not enough to say that his theory of 'Vereinigung' and 'Verähnlichung' by polarity simply derives from religious (actually, mystical) premises, as some writers have done. Its scientific associations are just as pronounced, although it would be absurd to claim that the so-called laws themselves are of the same order as genuine scientific laws.

Herder never explains what actually *causes* mutual attraction. Goethe speaks of the 'Fordern' of one colour by its opposite, Hegel talks at times of one dialectical pole 'evoking' its opposite, and Herder likewise believes that some sort of necessity operates within such polarities, but does not explain precisely why this should be so. Presumably, 'Kräfte' are once more responsible, as in magnetism. The idea of a mysterious necessity led Herder, like Goethe, to employ the analogy of chemical 'Wahlverwandtschaften'. Herder compares this type of affinity with the intersexual relation in an early version of the *Ideen,* Pt. I.[433] He later refers to 'Wahlanziehung'.[434] Such forms of attraction are necessary, but they must simply be accepted without being explained, as he declares: '. . . in der Chemie sind Wahlanziehungen und Repulse die gemeinste Beobachtung, ohne daß wir die innere Ursache wißen, oder uns darum kümmern'.[435] It is this substratum of unexplained 'Kräfte', not any religious source, which renders Herder's notion of polar 'Verähnlichung' more like Romantic *Naturphilosophie* than present-day science.

But when all is said and done, theories concerning the relationship between opposites in the history of dialectical thought are incorrigibly vague.[436] This applies particularly to Herder's ambiguous theories of attraction and of magnetism, and to his ill-differentiated ideas of 'Vereinigung' and 'Verähnlichung'. For the 'law' of 'Vereinigung' should imply that union takes place between identical entities; the 'law' of 'Verähnlichung mit sich' that units different from or opposite to one another should become similar or identical before uniting. But the failure of

Herder, and of many of the writers he consulted, to distinguish clearly between unity and identity, makes it impossible for us to separate the second and third 'laws' clearly. As Sidney Hook observes:[437]

> Just as Nicholas of Cusa calmly uses the phrase "coincidentia oppositorum" – identity of opposites – interchangeably with "connexio oppositorum" – the unity of opposites – so Hegel speaks of the "Einheit" and "Identität" of "Widersprüche" and "Gegensätze" as if they meant the same.

This confusion in the thinking of two notable dialecticians is exactly parallel to Herder's confusion of 'Vereinigung' and 'Verähnlichung'. The confusion perhaps originates in the mystics' belief that mystical union involves a loss of separate individuality, and ends in pure identity of the mind and the divinity. Union would therefore appear only as a half-way stage to identity, the two states differing only in degree.

Let us recall for a moment those cases in which one pole suppresses the other, as in Herder's later theory of good and evil. This is an instance of what in Hegelian language would be called 'negation of the negation',[438] whereby one pole overthrows the other, and a new state (which should scarcely be called a 'synthesis') arises. But whereas new syntheses are forthcoming after every conflict, according to both Hegelians and Marxists, Herder's ethical conflict entails simply the monotonous alternation of good and evil, the same two poles, over an indefinite period of time. Does nothing then correspond, in Herder's work, to Hegel's 'synthesis' or to Goethe's 'Steigerung'?

Synthesis, as the term is usually employed by dialecticians, denotes a new state which arises out of an earlier conflict. It is not simply the sum of the earlier parts, but differs from them in kind, in quality. This is what Hegel calls 'the law of the transformation of quantity into quality and vice versa'.[439] Herder's 'drittes mittleres Gute',[440] already mentioned, arises out of the conflict of two extreme factions in history; it is one of a few almost Hegelian syntheses propounded in Herder's works. A new quality, something historically superior to the separate forces which constitute its parts, emerges. 'Quality', as usual, introduces a value judgement, and, as such, has no place in scientific thought. A similar value judgement appears in a later synthesis suggested by Herder in his *Kalligone.* He writes: 'nicht Gegensätze sind das Erhabne und Schöne, sondern Stamm und Aeste Eines Baums: sein Gipfel ist das erhabenste Schöne'.[441]

Can the idea of synthesis then be acceptable in *any* sense to scientific thought? Instead of a new quality, or something more valuable, we can sometimes speak, in considering natural changes, of something more *complex* which arises out of simpler interacting units. We find that Herder does refer to something of this kind too, in his *Ideen*:[442]

> Elasticität und Reizbarkeit grenzen aneinander, wie Fiber und Muskel zusammen grenzen. So wie dieser nur ein verflochtenes Kunstgebilde jener ist; so ist auch die Reizbarkeit wahrscheinlich nichts als eine auf innige Art unendlich

> vermehrte Schnellkraft, die in dieser organischen Verschlingung vieler Theile sich aus dem todten Fiberngefühl zur ersten Stuffe des thierischen Selbstreizes erhoben. Die Empfindsamkeit des Nervensystems wird sodenn die dritte höhere Art derselben Kraft seyn, ein Resultat aller jener organischen Kräfte...

(Herder reverts to the generalised version, not the dualistic version of dialectics here, as the phrase 'vieler Theile' shows.) Such syntheses, whereby dialectical processes produce new levels of complexity, rather than of quality or value, abound in the works of dialectically minded theorists of biology, such as J. B. S. Haldane,[443] in the present century. Haldane's dialectical triad of heredity, mutation and variation[444] is analogous to Herder's triad of 'genetische Kraft', climate, and (racial and animal) variation.[445] In Herder's case, however, a vitalistic basis, foreign to most modern thinkers, is always present. Herder's theories that the child's mind develops (in complexity) through the experience of touch, and that the embryo develops (again in complexity) by contact with its surroundings,[446] are similar instances of the belief that dialectical development produces greater complexity rather than superior quality.

Let us conclude with a word on the way in which all these dialectical statements are formulated. The dialectical theorist of the natural world usually begins by picking out some complex object or state, and then discovers its simpler basic ingredients or earlier phases. But he goes on to state his dialectical proposition in the reverse order, as a progression from simple to complex. Besides, it is a paradoxical fact that the transition from two (or more) initial poles to one, the synthesis, appears, formally, to be a transition from complex (a plurality of two or more) to simple (unity). Herder no doubt preferred to think of the formula in this latter sense, for it is more in keeping with his desire to reconcile all dualisms in some simpler, monistic synthesis. This is also the way of the mystic: out of two arises one, out of chaos order, out of variety unity. The paradox which this difference between the formal progression from complex to simple and the empirical progression (as in growth processes, social development, etc.) from simple to complex presents, adds not a little to the piquancy of the dialectical formula, as Goethe assuredly knew when he propounded his theory of 'Polarität und Steigerung'.

Thus Herder does define syntheses, new states which arise out of a dialectical process.[447] The many other instances in his writings of dialectical pairs which are simply complementary, and involve no real synthesis, such as 'Liebe und Selbstheit', 'Innigkeit und Ausbreitung', etc., require no further elucidation.

What then is the scientific value of Herder's so-called dialectical method? Of all the senses in which he uses it, only the original, Lucretian sense, involving a plurality of units, does justice to the complexity of most natural changes, and mitigates the obscuring influence of the 'Kraft' concept. The choice of the number two has no scientific justification whatsoever. The notion of dialectical change towards great complexity in the natural world appears in the works of various contemporary theorists, as will be discussed below, and is clearly foreshadowed in Herder's works. Other usages are either quite outside the province of science, or are truisms (such as the observation that the magnet has two poles); otherwise, they are ambiguous, like the supposed 'laws' of 'Vereinigung' and 'Verähnlichung', or too devoid of nuance to be informative, as is the theory that historical change conforms to a pattern of pendular oscillation.

Furthermore, the dialectical method is in no sense a new logic, as Hegel claimed, but merely a descriptive formula. As Popper remarks, in an enlightening article upon dialectics:[448]

> It is not scientific reasoning itself, not scientific arguing, which is *based* on dialectic, but it is only the *development* of scientific theories which can, with a certain amount of success, be *described* in terms of dialectic method.

The formula cannot make predictions either, as we have seen. As Hook says:[449]

> There is always a number of syntheses or supra-ordinate systems that can be construed to resolve "oppositions" . . . In abstracto all oppositions may be solved, but in concreto what prevents us from admitting that some oppositions may be irreconcilable?

Dialectical examples in science merely show, as Popper remarks, 'that the world in which we live shows, sometimes, a certain structure which could perhaps be described with the help of the word "polarity" '.[450] He adds: 'Any development whatsoever will fit into the dialectic scheme; the dialectician need never be afraid of any refutation by forthcoming experiences'.[451] And, so far as history goes, the dialectic claims to reveal not the patterns of causality, but those of destiny.[452] A cosmic end is postulated, a veiled teleology is introduced. The whole world is governed, in such schemes, by panlogistic forces, as soon as we attribute any independent rationale to the polar forces supposed to govern human progress. This is especially clear, of course, in the case of Hegel's World-Spirit.

But Herder never used the dialectical principle as a key to all knowledge. He used it as a descriptive model on most occasions, as one methodological tool among many others, and frequently fell back upon the less simplified Lucretian variant.

All this criticism has seemed necessary in view of the exaggerated claims made for Herder's use of dialectics by Marxist critics.[453] Herder uses it as a formal, methodological device, and, as such, it is not committed to any particular ideology, as these critics believe. It is used by thinkers as different as Zoroaster and Marx, and can be harnessed to a legion of different ideologies. One writer speaks of 'die materialistische Philosophie Herders',[454] as if this were the necessary consequence of Herder's dialectical formulations, and another emphasises only the concrete, physical applications of the idea, with a similar intention.[455] Herder, however, applies it to *all* levels of existence, in his usual monistic fashion. He does not build any comprehensive theory around it, on the other hand, and we should be wary of interpreting it as part of a consciously planned system. Far too much has been made of it in the past.

It is true that some scientific thinkers still use the dialectical formula in describing aspects of the natural world, and that Herder did so in more varied ways than most of his contemporaries, anticipating Goethe's (more conscious) application of it. For Goethe admitted that he had not yet arrived at his notion of 'Polarität und Steigerung' when writing on the natural world in the early 1780's,[456] by which time Herder had already used it in the most diverse ways. Some of Herder's dialectical propositions remind us of ancient mysticism, but others again foreshadow those of more modern theorists of nature and science.

10. Mathematics and pseudo-laws

(a) Herder's knowledge of mathematics

Herder became acquainted with mathematics at an early stage in his career. He attended Buck's lectures on the subject at Königsberg.[457] A considerable quantity of material relative to the subject survives among Herder's early manuscripts. From his early period as student and teacher date the three sketches *Theoremata der Longimetrie, Lehrsätze der Planimetrie,* and *Lehrsätze der Stereometrie,*[458] all unpublished, and all in the same notebook, the last two grouped together. H. D. Irmscher, in his catalogue of the Tübingen manuscripts, considers the first of these to be based on Kant's lectures in Königsberg, the second (perhaps because of the title 'Lehrsätze') to be preparatory notes for teaching in Riga; the third is not separately classified. It is obvious from the titles, however, that all three are connected: the first treats of the elements of linear geometry, the second deals with the geometry of plane figures, and the third with the geometry of solids, culminating in a proposition concerning the area of the surface of spheres. The very first of Herder's surviving notebooks, compiled during the earliest Königsberg period, contains jottings on extremely elementary geometry, consisting of diagrams of parallelograms and the construction for the theorem of Pythagoras.[459] The later notes are thus of a considerably more advanced standard, indicating that Herder knew little or nothing of geometry before he arrived in Königsberg.

Two further groups of manuscript notes, *Vorerinnerungen in der Mathematik* and *Vorläufige Erinnerungen,* are catalogued, like the notes on linear geometry, as associated with Kant's lectures, and have now been published.[460] The first contains a careful and detailed scheme (which scarcely looks as if it had been noted directly from lectures) of all the branches of mathematics, from pure mathematics to the applied physico-mathematical sciences. These notes, as well as the second group, deal rather with the general logic of mathematical statements than with any particular mathematical problems. The second series gives exact definitions of fractions, powers, proportion and series in arithmetic, and, once again, a brief résumé of the functions of linear, plane and solid geometry, becoming sketchier, and tailing off rather abruptly, at the end. Irmscher's catalogue records that the first group of notes is partially based upon the German version of Chr. Wolff's *Elementa Matheseos Universae,* although I have searched in vain for any correspondence with the Latin version of that work. (Unfortunately, the German version has proved unobtainable.) The notes show at least that Herder had received a serious grounding in the elements and logic of mathematics, particularly in geometry and arithmetic.

Herder taught mathematics to the third class in the Collegium Fredericianum in Königsberg in 1763, as his wife's memoirs inform us.[461] A letter he wrote to Lindner in 1764 shows that he taught the subject to the 'Sekunda' of the same institution in the following year.[462]

The *Journal meiner Reise* testifies to his continued interest in the subject, and reveals especially a new desire to study applied branches such as navigation and acoustics. He refers to d'Alembert, Bouguer, Euler and La Caille in this connection.[463] The fourth *Kritisches Wäldchen*[464] shows that he did possess some knowledge of mathematical acoustics in the same year, but Caroline writes in her memoirs that his plans for studying the mathematical sciences, drawn up in the *Journal,* were among the few projects he failed to carry out.[465] Navigation and naval architecture – 'ein Theil der Mathematik, den ich noch nothwendig lebendig studiren muß'[466] – were no doubt subjects which attracted him at this time because of his enthusiasm over the sea voyage, and his revulsion at abstract learning as opposed to practical activity. None the less, it was Herder (if the editors of his works are correct in attributing the review to him) who was called upon to review the (predominantly mathematical) *Novi commentarii Societatis Regiae scientiarum* of Göttingen for the *Frankfurter gelehrte Anzeigen* in 1772,[467] and throughout his works references to the mathematical writings of men such as Barrow, the Bernouillis, Newton, Kästner, Leibniz, Lambert, Maclaurin, Maupertuis and Wolff show that he continued to consult works on the subject. His library contained at least ten other works on mathematical science.[468]

Herder was interested, above all, in applying mathematics to concrete situations: 'Mathematik ist die wahreste Wißenschaft, nur durch Physik wird sie *lebendig,* so wie die Zahl nur in Dingen, die gezählt werden, da ist.'[469] Several similar utterances appear elsewhere in his works, ranging from the earliest to the latest period.[470] But the actual applications which he suggests are, from the start, quite remarkable. For instance, he suggests, in the fourth *Kritisches Wäldchen* of 1769, not published in his lifetime, that aesthetics may one day become a physico-mathematical science.[471] He is not referring merely to such popular, pseudo-mathematical theories as Hogarth's 'line of beauty', for he proposes that the exact science of optics should supply a foundation for the psychology and aesthetics of vision.[472] Similarly, he consulted several mathematical treatises on musical acoustics, but, in this case, he decided that they were not enough, with their analyses of intervals etc., to explain our pleasure at musical sounds.[473] At first sight, this objection reminds us of how Goethe later revolted against Newton's physical and mathematical theory of light. But, on the other hand, Herder says of unpleasant sounds: 'alle diese widrige Gefühle ließen sich durch unregelmäßige Linien . . . ausdrücken, an denen sich die *Mathematik intensiver Größen* weithin versuchen könnte'.[474] Eighteenth-century scientists, such as Euler and d'Alembert (both of whom Herder mentions in a group which also includes Diderot, Mersenne, Gravesande and Sauveur),[475] had attempted to extend the uses of mathematics in acoustics, endeavouring, for example, to represent the vibrations of a string mathematically.[476] But Herder believes that the mathematical and physical analysis of objective sound is of little value for aesthetic purposes; the only application he envisages for mathematics is that mentioned above, as a means of describing subjective 'Gefühle'. He considers that these are produced by movements of the 'Gehörfibern', and by differences within the 'Nervenäste des Gehörs':[477]

> In der Verschiedenheit der Nervenäste des Gehörs muß auch die wesentliche specifische Verschiedenheit der Töne und Tonmaßen, das ist, der Schälle liegen, so fern sie der Qualität nach, der Grund des Musikalischen Wohl- oder Übellauts ist.

He attempts to distinguish the subjective, qualitative 'Ton' from the purely quantitative 'Schall', the object investigated by mathematics and physics. His meaning becomes clearer when he identifies 'Ton' with timbre, and cites as examples the distinctive sounds produced by various instruments.[478] Such qualities, he believes, cannot be reduced to pitch, volume, or intervals.

Herder thus thinks that mathematics can be applied to the physiology of hearing, especially in representing our reactions to quality of sound. This was a truly progressive idea in that the physiology of sound was not studied mathematically until the time of Helmholtz (1862), who also explained the nature and physiology of sensations of timbre, or 'Klangfarbe', as he called it, taking into account the sympathetic vibrations of the fibres of the basillary membrane, part of the end organ of the auditory nerve; the physiology of sound had been relatively neglected up till then, as Herder already realised.

But Herder was wrong in believing that quality or timbre could not be explained directly and quantitatively by mathematics and physics. It can, in fact, be explained quite objectively in this way; the distinctive quality of a 'pure' note produced by a certain instrument comes from the harmonics (rejected in Rameau's theory by Herder as irrelevant) which arise in the instrument, alongside the basic note, through auxiliary vibrations of segments within the instrument, as, for example, of fractional parts of a complete string which also vibrates as a whole.[479] Nevertheless, he correctly believed that subjective or physiological explanation must complement objective research. At this time (1769), he was becoming more and more convinced of the importance of physiology.

As for the representation of unpleasant 'Gefühle' by mathematics, their objective basis *can* be represented by irregular lines. For 'noise [as distinct from all musical notes] affects us as an irregular succession of shocks . . . The only condition necessary to the production of a musical sound is that the pulses should succeed each other in the same interval of time'.[480] Musical dissonances, likewise unpleasant, can be described graphically by an irregular curve which shows their increase and decrease with varying musical intervals; Helmholtz represented them in this way.[481] Thirdly, the actual frequencies producing dissonance can be represented directly by undulating lines portraying the vibrations associated with two or more discordant notes, but the lines themselves, in this case, are regular, since the individual notes are musical.

But all three involve representing objective sounds quantitatively, and Herder, as we have seen, believed that this procedure is virtually useless in aesthetics, which studies quality rather than quantity. It would appear that he was uncertain in his own mind whether mathematics should be used symbolically here, to represent subjective feelings, or literally, but applied to the vibration of parts of the inner ear, rather than to their external counterparts which produce the initial sounds (e.g. the strings of an instrument). Such uncertainty would be in keeping with the way in which Herder's ideas on mathematics developed; for he began, as we have seen, by studying the subject as the method of the applied sciences, yet later, as we shall see, he attempted to use it analogically or symbolically. The literal, physiological sense is, however, more in keeping with the relatively mechanistic views he entertained in 1769 – he suggests, in the fourth *Kritisches Wäldchen,* that it may be possible 'jeder Gefühlsart gleichsam ihre Gegend in der Seele einzumeßen', and even remarks 'wie es also . . . überhaupt eine Materielle Seele gebe'[482] ; he vehemently rejected such ideas later, after his Bückeburg experiences. Thus, his later attempts to apply mathematics to the subjective world were no longer physical, or rather physiological, as in 1769, but purely analogical.

Let us now briefly consider what Herder deemed to be the nature of mathematical knowledge. He writes in his *Metakritik*:[483]

> Wäre dem Mathematiker kein Raum und im Raum kein Körper als möglich oder wirklich, d.i. durch innere oder äußere Erfahrung *gegeben*: so könnte er von Körpern keine Flächen, von Flächen keine Linien absondern, noch solche als Begriffe im Raum construiren.

He therefore rejects Kant's thesis that all mathematical knowledge is *a priori*. Bertrand Russell writes of this problem:[484]

> To the Greeks – and to the moderns until a hundred years ago – geometry was an *a priori* study like formal logic, not an empirical science based upon observation. Lobachevsky, in the year 1829, demonstrated the falsehood of this opinion, and showed that the truth of Euclidean geometry could only be established by observation, not by reasoning.

This is not to suggest that Herder's solution displays any unaccountable insight into later developments. It is part of the whole naturalistic side of his thought, and is not arrived at by mathematical demonstration. He had, in fact, learnt from the pre-critical Kant himself to study the empirical basis of mathematics; for the early lecture notes *Vorerinnerungen in der Mathematik* contain a fairly detailed historical introduction, showing how mathematics arose to meet practical needs: 'Sie ist von der Bedurftheit der Menschen erfunden. Die *handelnden* Völker, die mit der alten Zählart bis 10 nicht zufrieden seyn konnten, . . . trieben sie mehr.'[485] A similar, but shorter historical introduction appears in the related *Vorläufige Erinnerungen*.[486] Herder further appealed to A. G. Kästner's writings in support of this proposition,[487] and it is well known that Aristotle believed that things mathematical never exist apart from things sensory.[488] Nonetheless, Herder's theory was destined in some respects to supersede that of the later Kant.

Finally, Herder believed mathematical propositions to be either analytical or identical (tautological), not synthetic, as Kant believed. The modern view is again that of Herder, who, in this case, did justify his opinion by logical argument in his final onslaught on Kant's *a priori* philosophy.[489]

Herder also applied mathematical formulae to historical and ethical contexts, however, and propounded various pseudo-laws of history and ethics. Before we can understand how he came to do this, we must first digress in order to investigate the premises which, in his eyes, justified such unusual practices.

(b) The 'Analogie' of physical and moral worlds

It is here that we encounter the last of Herder's principal arguments from analogy, having already discussed how he employed them in tackling the problem of perception, and in other scientifically more acceptable ways, as well as in suggesting that certain gravitational phenomena are analogous to the ethical situation of man. Herder had often applied a single idea, such as the theory of a natural 'type', the idea of growth cycles, the idea of development, and the dialectical formula, to many levels of existence, often from the inorganic world to the world of human behaviour. Indeed, his holistic and monistic attitudes naturally suggested to him that all these levels are parallel, or analogous to one another, and that the same patterns, in varying degrees of complexity, occur on them all. Thus, just as he postulated an 'Analogie' between the individual psyche and the objective world, he also maintained that a similar one exists between the collective psyche of each society, or even of mankind as a whole, and the physical world. In this case, the collective mind is usually considered from the point of view of ethics. This new analogy is merely a more extreme version of the one earlier discussed, but a logically inevitable consequence of it. This, then, is what Herder means when he uses the phrase 'Analogie der Natur' throughout his works, and suggests that physical and moral laws are analogous.[490]

The notion that an 'Analogie' obtains between the individual mind and the external world, as Herder assumed when he attempted to solve the problem of perception, proved to contain at least three distinct senses:

(i) The suggestion that subject and object are parallel because the subject is shaped by the object, i.e. by the external environment.

(ii) The subjectivistic notion that we comprehend the external world by applying our knowledge of ourselves to it, thus treating it anthropomorphically.

(iii) The notion that such a parallel is pre-established by some hypothetical, or even divine, mediation, or by some quasi-physical medium such as 'Aether'.

Exactly the same three senses recur in Herder's more general doctrine of an 'Analogie der Natur' with the collective mind of man:

(i) The minds, as well as the bodies, of men (especially in primitive societies), and the mind of man as a whole, reflect the physical, or even the cosmic, environment.[491] This influence extends even to ethical codes.[492]

(ii) Herder often imagines that natural laws exhibit ethical qualities, such as goodness and wisdom.[493]

(iii) The physical and ethical worlds are, at other times, simply stated to be parallel, because the same divinity is manifest in both, in the physical universe and in human history.[494]

These three senses all imply some kind of monism, and may be compared (not without reservation, of course) to the philosophical systems of positivism, idealism, and occasionalism respectively. Only the third sense is truly an analogy, for in the first, the object conditions the subject, and in the second, the subject projects its own characteristics into the object. But all three senses contribute something to Herder's belief that physical and social or ethical laws are similar, a belief which appears, in various forms, throughout his works, but which is most fully elaborated in the *Ideen,* where his main aim is to relate the natural world to the world of man.

Critics, however, have failed to distinguish the separate senses listed above. Those eulogists who see in Herder a precursor of Darwin emphasise the first of the three senses; another writer emphasises the second, subjectivistic sense[495]; and yet another emphasises the third, more religious one.[496]

It is not sufficient to explain away Herder's belief in historical and social pseudo-laws, with their ethical overtones, by referring to the influence of any one particular thinker, as most writers have done. Walter Pater, in his essay on Winckelmann, rightly contends that these ideas are part of a much wider movement: 'The chief factor in the thoughts of the modern mind concerning itself is the intricacy, the universality of natural law, even in the moral order.'[497] Herder had indeed done much to stimulate this movement, by insisting that all true art must reflect nature. He illustrated this by relating the artistic products of most earlier cultures to a natural way of life, directly conditioned by a geographical and physical environment, as in his studies of the Ossianic poems. The study of art led in turn to history, to which he applied the same principles. No wonder, then, that he came to relate *all* cultural and historical phenomena, including ethics, to the natural world.

He must have suspected, however, that such sweeping generalisations are not entirely satisfactory. On one occasion, in the *Ideen*, Pt. II, he makes it clear that natural laws, in his opinion, govern human behaviour, but only up to the level of family existence: 'Die Natur leitete das Band der Gesellschaft nur bis auf Familien.'[498] Political behaviour, therefore, is no longer 'natural'. Yet it was in the very field of social and political behaviour that Herder, later in the same work, asserted that quasi-physical, natural laws are valid. Similar doubts concerning the universality of natural law arose in his mind before he attempted to reconcile his historical 'laws' and human freedom: 'wie konnte je ein denkender Mensch darauf kommen, alle Welttheile und Nationen in Bienenkörbe und Ameisenhaufen zu verwandeln und unveränderliche Regeln der Natur hiebei anzugeben?'[499] Despite these doubts, Herder soon went beyond even his original belief that history shows a rational pattern, and took up the less defensible opinion that it shows an ethical pattern.[500] And although scientific sociology must assume that all human behaviour follows natural laws, no scientist would now agree with Herder that such laws have any ethical significance, or, if they have, that scientific reasoning can tell us what this (necessarily subjective) significance is.

(c) Mathematics and pseudo-laws

Herder wrote in 1774 to the astronomer von Hahn: 'Mir fehlt . . . der Gebrauch der höhern Mathematik, in der, wie ich wittre, wenigstens vortreffliche *Gleichnisse* liegen müssen, in der Philosophie höher zu steigen'.[501] Haym quotes a similar passage from another letter to the same person.[502] These utterances show that Herder, after his more radical views of 1769 had toned down, wished to apply mathematics analogically within philosophy, rather than directly to physical science, or even physiology, as before. Having satisfied himself, as we have seen, that physics and ethics are analogical, he found that the way was henceforth open for those mathematical pseudo-laws which eventually appeared in the *Ideen*, particularly in the theoretical chapters upon historical development.[503] The first of these pseudo-laws are as follows:[504]

(i) Mathematics tells us, Herder maintains, 'daß zum Beharrungszustande eines Dinges jederzeit eine Art Vollkommenheit, ein Maximum oder Minimum erfordert werde, das aus der Wirkungsweise der Kräfte dieses Dinges folget'. (This recalls the first dialectical 'law' of 'Beharrung' in the contemporary *Gott*.)

(ii) He says: 'daß alle Vollkommenheit und Schönheit zusammengesetzter, eingeschränkter Dinge oder ihrer Systeme auf einem solchen Maximum ruhe'.

(iii) If an entity or system is disturbed 'aus diesem Beharrungszustande seiner Wahrheit, Güte und Schönheit', it eventually returns to its previous state 'durch innere Kraft, entweder in Schwingungen oder in einer Asymptote'.

He goes on to apply these 'laws' firstly to the individual man, and, secondly, to the individual society; thirdly, he generalises their common features as 'eine Menschenvernunft', and, fourthly, traces 'eine Kette der Cultur', in which single nations, each governed by the 'laws', form the separate links; fifthly, he observes that 'Maxima' are never permanent.

All critics are agreed that the physical terms 'Maximum' and 'Minimum', as Herder himself, making statements similar to those listed above, admits in his *Gott*,[505] are borrowed from the philosopher and mathematician J. H. Lambert. Exact references to Lambert's writings need not be given here, since other critics have supplied them in detail.[506] It has been maintained,[507] however, that Herder merely used Lambert's formulae to reexpress earlier ideas of his own. Let us now ask what these earlier ideas are.

For the first 'law', Max Rouché asserts that Herder's idea of cultural autarchy is an important precedent.[508] To this it might be replied that any doctrine of organic holism will necessarily arrive at the idea of individual dynamic wholes which exist in equilibrium. Such wholes appear, as we have seen, on all levels of existence for Herder, from that of the growing organism to that of the entire human species, and not merely on the level of individual cultures. Lambert's 'Maximum' etc. is simply a concise formula for expressing the idea of dynamic equilibrium, conveying a superficial impression of mathematical exactitude and quasi-physical regularity, in the unusual context in which, along with the ambiguous words 'Vollkommenheit' and 'Schönheit', it here appears.

Rouché rightly likens the second 'law', an extension of the first, to Herder's theories of 'Kompensation', the natural 'type', and of the solar system as a process in equilibrium. Once more, however, these are only two of many levels. Herder makes it clear in his second 'law' that he really has concepts of value, such as moral perfection, in mind.

The third 'law', for which Rouché suggests the precedents of Spinoza's 'persévérance dans l'être', as he calls it, and Aristotle's belief 'que chaque être . . . représente l'état d'équilibre d'un système de forces' (Aristotle, it may confidently be added, nowhere uses terms so reminiscent of post-Renaissance mechanics), is once again a logical and necessary product of Herder's organic holism; this implies, by definition, that a dynamic whole whose equilibrium is disturbed can only return, on the one hand, to a new equilibrium, or be destroyed, for its very existence can be defined only as an equilibrium, as a departure from equilibrium (towards non-existence), or as progress towards a new equilibrium. Herder's earlier theories of the changing ecological equilibrium and of racial changes in man exemplify this 'law', which simply generalises and reaffirms earlier, organismic principles of this kind.

As for the five points by which Herder supplements his three 'laws', they simply apply the latter to the ethical situations of the individual's life, social existence, national (political) growth and decline, and mankind as a whole, finally, and fifthly, making the link between the 'Maximum' idea and Herder's old cyclic conception of rise and fall explicit. In the latter connection, it is worth remembering that Kant too used the value-expression 'Vollkommenheit' in describing the climax of a cycle.[509]

Finally, Rouché states that Herder's mechanico-historical 'laws' of progress, associated with those just discussed, differ from those of modern science, since they merely affirm 'un progrès voulu par Dieu'.[510] To this it must be replied that all humanist theories of history, and even the Marxist theory of history, believe in historical progress by quasi-mechanical necessity. Besides, Herder had openly abjured teleology by this time. Such theories certainly cannot be called scientific; they are subjective in origin. But, as such, they do not afford sufficient evidence for Rouché's 'voulu par Dieu', a conception which Herder, in his attempts to formulate naturalistic laws, is at special pains to circumvent.

Let us briefly review the few further mathematical expressions which Herder employs in a similar way. He attempts from time to time to describe the pattern of historical development by various geometric curves. For example, he names the asymptotic curve in the third of his above 'laws'. The same image, that of an asymptotic hyperbola of progress, or growth which approximates indefinitely to a point but never reaches it, figures in several other passages in his mature works.[511] On another occasion, Herder suggests a spiral as an alternative way of describing progress.[512] (This, of course, combines the line and the circle, the progressive and the cyclic, the absolute and the relativistic, in a way typical of Herder.) At other times, the elliptical orbit, with its perihelion and aphelion, is used as an image to describe the cycles of man's development.[513] Here, the idea of progress is absent. This image is, of course, related to the gravitational analogy, and is probably borrowed, like that of the asymptote, from Hemsterhuis, as a letter from Hamann to Herder of 1781 suggests.[514] On another occasion, in the *Humanitäts-Briefe* of 1793, the cycloidal curve is suggested and rejected as a means of describing development cycles.[515]

One critic speaks of Herder's 'laws' as 'dieser Sieg der Mechanik über die Geschichte', seeing in them a regrettable departure from his earlier insight into 'das sittlich-organische Lebèn der Kulturen'.[516] But as we have seen, Herder is thereby only describing cyclic, organic development on the level of human life in a more formalised way than before, and emphasising his ethical feelings towards it. The mechanico-mathematical formulae are purely superficial. This is no doubt what Jean Paul, who understood Herder's mind better than most other contemporaries did, meant when he said of him: 'um das trockne Kernhaus eines Lamberts zog Er eine süße Frucht-Hülle'.[517] That is, he combined Lambert's bald formulae with his original ideas. And mathematical or mechanical descriptions of regularities need not imply that these are *caused* mechanically; such regularities can just as well be purely statistical. Herder never intended to prove that historical change was a mechanical process. If, on the other hand, the above critic (Kühnemann) means that the rationalistic belief in progress, which he deplores, increasingly supplants the earlier relativistic theories of Herder, one need only retort that the mathematical 'laws' just discussed do not in themselves imply absolute progress, but only a cyclic rhythm. Apart from the image of 'Schwingungen' or pendular oscillation, which, as Herder uses it, combines the ideas of progress and of cycles, it is only in other, non-mathematical passages, and in the isolated references to the spiral curve, that Herder puts forward an unqualified theory of progress, which will now be examined. (These 'laws' of progress are no longer couched in mathematical or physical terms; but since they are closely related to the mathematical 'laws', and, like them, claim to be natural laws in the scientific sense, they may well be mentioned here.)

Among the pseudo-laws of progress, one especially stands out: it is that of the self-destruction of evil in history, appearing in the *Ideen*, Pt. III.[518] In this first formulation, 'Uebermacht', not evil, is seen as the self-destroying force. It reappears shortly after when Herder declares that destructive forces must gradually give ground to forces of preservation, and that increasingly destructive warfare must eventually make itself impossible.[519] He then says that more 'Erhalter' are born among men than 'Zerstörer', and that a 'friedliches Gleichgewicht' has arisen among peoples.[520] (This was written, ironically enough, in 1787.) The time-honoured idea of a balance of power is itself thoroughly holistic, and fits in well with Herder's similar ideas on many other levels. In the *Humanitäts-Briefe*, however, Herder, now fully convinced that ethical progress is manifest in history, restates these 'laws' more fully, and again affirms that preserving forces are stronger than destructive ones.[521]

The source of Herder's 'law' that constructive forces must prevail over destructive forces is almost certainly to be found in the *Ideen* of the materialist Einsiedel, which Herder had excerpted at great length, or even copied in full. Einsiedel wrote: 'Die Natur schuf im Menschengeschlecht zwei Hauptgenera, verderbende und erhaltende; jenes das kleinere, dies das größere Genus: diese erhielten die große Balance'.[522] Furthermore, the apostle of Lucretius, Knebel, wrote that progress is a 'Verminderung des ausgezeichneten groben Egoismus'[523] in history; Herder incorporated this remark, with other passages by Knebel, in the 1792 version of his *Humanitäts-Briefe*. Perhaps these ideas came from Herder's own influence; nonetheless, Knebel, the opponent of teleology, found them acceptable. Like Herder,[524] he believed that progress in history, as in the natural world, lay in '*das wachsende Maas der Dinge unter einander*'.[525] All this shows that Herder's pseudo-laws of progress, as enunciated in the *Ideen*, Pt. III, are not merely extrapolations from theology, but an attempt to combine ethical and scientific standards in history, while avoiding any reference to the supernatural. They are, of course, unscientific in themselves. Finally, it should be understood that these 'laws' of progress are distinct from those of the 'Maximum', etc., although some of them are appended to the chapter in which the latter occur.[526] The link between the two groups is the conception of 'Schwingungen', the image of varying pendular oscillation, which, like that of the spiral, Herder uses to combine the idea of progress with that of cycles.[527]

Herder's belief in the Golden Mean is an earlier, static version of the later, dynamic idea of the 'Maximum'.[528] He himself links the aesthetic conception of the Golden Mean to the mathematical formula of the 'Maximum' in his *Kalligone*.[529]

The 'law' of 'Wiedervergeltung', appearing as early as 1781,[530] is also an earlier version of the 'Maximum' theory, expressed in non-mathematical terms; it is the 'do as you would be done by' mandate, the mainstay of all naturalistic systems of ethics which contend that the moral world regulates itself without requiring punishments or rewards in an afterlife. The same formula is applied to politics, peoples, and to mankind as a whole in the *Ideen*, Pt. III,[531] and thenceforth reappears on numerous occasions.[532] It is a moral law of 'Kompensation' (Herder actually uses this word in a similar ethical context[533]), applied to various wholes within the moral world. Leibniz was probably the source of this doctrine of automatic retribution, which he claims is purely natural, and even 'méchanique'.[534] It has rightly been observed that this contradicts another 'law' of Herder's, that of the triumph of the strongest[535]; but the latter appears only in a rejected manuscript for the *Ideen*.[536] Herder tempered this more Lucretian conception to fit the requirements of ethics in his final version – but not, we should observe, the requirements of theology.

Finally, Herder's 'law' of a 'Nemesis' or 'Adrastea' is a later version of the 'Maximum' theory.[537] Once again, as with the Golden Mean, Herder chooses an antique rather than a Christian image, although he applies it to the Christian theory of ethics in particular.[538] And once again, he uses the word 'Kompensation' to describe the workings of this 'law'. He had, moreover, himself related it to the 'Maximum' idea on one occasion, in his *Gott*.[539] It is interesting to find that Linnaeus spoke of a 'Nemesis divina' which, he believed, operates in the ethical world, and which he associated with his previous observations upon the ecological balance in nature.[540]

The only other 'laws' Herder formulates are a group of ten which appears in his *Gott*.[541] These are either variants upon those already discussed, including the dialectical ones, or restatements of the 'Kraft' conception in its metaphysical and religious aspects, and, as such, have no scientific validity.

Why, one may ask, did Herder use the mathematical concepts of a 'Maximum' and 'Minimum' of forces to describe ethical equilibria in his major work, while non-mathematical versions are more common in his earlier and later works? The answer is that his other images are instances of a straightforward conflict between the two poles of good and evil, preservation and destruction, whereas the 'Maximum', applied to societies, nations, and to mankind as a whole, attempts to do justice to *many* 'Kräfte', constructive and destructive, and is therefore a more complex idea. Besides, it is more naturalistic, for, while there are only one each of the abstract poles of good and evil, there are many separate human agents in society and in history. Herder actually speaks, in his second 'law', of 'Systeme' as the units governed by the 'Maximum', not of polarities. The dialectical interaction of two 'Kräfte' may therefore be seen as a special case within a wider theory of natural laws which apply to many 'Kräfte'. Thus, the mathematical theory of the 'Maximum' applies ethical judgements to the overall states of societies or groups of human beings, and not to the individual agencies who contribute to this state of balance or imbalance, as does the cruder dialectic of good and evil. Besides, it was only this dialectical formula, as in the notion of 'Schwingungen', which introduced the idea of progress. The more complex 'Maximum' does not in itself necessarily involve this belief.

To conclude these remarks upon Herder's mathematical and physical descriptions of ethics and society, let us ask whether, resting as they do upon the belief that physical and moral worlds are analogous, they imply that Herder viewed history and nature as two forms of revelation, a view which, according to Max Rouché, he had inherited from Hamann. Hamann roundly denounces such quasi-mathematical theories on encountering them in the works of Hemsterhuis, and writes to Herder: 'das Uebergewicht der Trägheit-Kräfte gegen die Anziehungs-Kräfte, zur Grundlage aller Moral und zum Erzeugungsprincip des Universi kommen mir als portenta dictionis und fictionis vor',[542] or again: 'verstehe nichts von seinen Perihelien und Kometenrevolutionen'.[543] He regretted that Herder admired Hemsterhuis, that mathematician of morality, as the letter of 1781, from which the last words are taken, reveals.

It is not Herder's insight into 'das sittlich-organische Leben der Kulturen', praised by Kühnemann[544] at the expense of Herder's mathematical, 'mechanical' approach, which survives in modern science. His theory of equilibria has proved fruitful in ecology, and has now been re-formulated mathematically.[545] But what of the sociological application? Economics, for example, represents cycles by mathematical formulae: as one writer on the subject observes: 'The general business cycle is usually likened to the motion of a frictionless pendulum which satisfies a simple Newtonian second order differential equation'.[546] Or again: 'Lewis F. Richardson has attempted the mathematical determination of a point of equilibrium in world politics'.[547] Furthermore, as S. Nilson, the writer just cited, points out, observed regularities need not imply that men act like mechanical automata in their social and political behaviour. This is what those who object to Herder's 'mechanical' theory of change appear to have feared.

A modern biologist similarly writes: 'relaxation oscillations appear in certain physical systems, and in many biological and demographical phenomena as well. A general theory of periodicity is a desideratum in various fields'.[548] The same writer affirms the concepts of equilibria and rhythmic change in these fields, and considers that they are essential steps towards a general system theory of the sciences.[549]

Thus, Herder made use of analogies and hypotheses which have been acclaimed in modern scientific thought. His ethical judgements and his failure to specify exact quantities meant that his own versions have no serious scientific value, however. Had he related his 'Kräfte' to available statistics on populations or natural resources, it might have been otherwise.

But such analogies in sociology can lead to dangerous over-simplifications.

Popper decries 'the scientistic misuse of the examples of physics and astronomy',[550] still prevalent in sociology, and calls such examples 'little better than a collection of misapplied metaphors'.[551] Those who seek to unify all knowledge under a few sweeping catchwords borrowed from the exact sciences cannot expect much recognition from the latter.

11. The formulation of natural laws

In embryology, Herder speaks on occasion as if one single 'Kraft' might be responsible for producing an orderly configuration of forms – the embryonic organism. More often, as we have seen, he seems to believe that regularities arise through the dialectical interaction of two 'Kräfte'. Then, in his notion of a 'Maximum' or dynamic equilibrium, as also in his theory of a natural 'type' and many other related ideas, he implies that a group or system of *several* 'Kräfte', by their interaction, produces a law-governed state or formal regularity.

It is upon the last of these three cases, that of many 'Kräfte', that his clearest definition of natural law rests:[552]

> Wirkt jede Kraft in *ihrer* Natur, so wirkt sie frei, und wenn sie durch andere eben so freiwirkende Kräfte eingeschränkt, d.i. in Wirkungen begrenzt wird, so entspringen daraus höhere Gleichungen, die man *Gesetze der Natur* nennt.

This definition appears in the *Metakritik* of 1799. But in 1777,[553] he had stated the same proposition in terms of *two* polarised 'Kräfte', which are therefore a simpler case of the later, more complex one.

Herder, as we have repeatedly noticed, found that he could overcome many discrepancies between science and other areas of thought by his vague concept of 'Kraft'. But within science itself he came to realise increasingly how inadequate it was. It described the hypothetical content, not the form of the natural world, and efforts to reduce it to more specific, verifiable proportions invariably led to materialism. He therefore came more and more to emphasise formal categories, such as natural laws, in endeavouring to describe the orderly workings of the natural universe. In his final conception of natural law, quoted above, he combines the 'Kraft' concept which was always associated with development, and often with disorder, with that of an orderly form which arises out of the conflict of interacting 'Kräfte'. In so doing, he amalgamates Leibniz's dynamism with the Lucretian theory that order is created out of a conflict of numerous fundamental units.

But how can 'Kräfte' come into conflict? As Herder often says, they are themselves incorporeal. Yet they are always associated with a material 'Organ'.[554] Is then the conflict of 'Kräfte', for Herder, simply the random motion and collision of the material bodies with which they are associated, as in Lucretius' atomic theory? Herder would never have accepted this consequence, since it would have rendered his 'Kräfte' more or less redundant, and committed him to unambiguous materialism. In fact, the 'Kräfte' concerned were, for him, not forces of random motion, but forces of *expansion*. A force expands the body or 'Organ' in which it resides by a process of assimilation. This assimilatory, expansive force appears as gravitational or magnetic attraction, for example, on the physical level, as nutritive assimilation on the biological level, and as apperception of objects analogous to the subject, to take another single instance, upon the psychological level. Such associations, as we have already seen, are all present in the theory of 'Verähnlichung' in Herder's *Gott*.

Such conceptions, however, can hardly be said to add up to a Lucretian theory of conflict. Nonetheless, the Lucretian fundament, the idea of relentless conflict, is revealed in earlier statements. In the 1769 manuscript published some years ago by H. D. Irmscher, Herder maintains that each planetary 'Genius' is totally indifferent towards lesser beings such as man, who may suffer unnoticed just as the worm which man himself unwittingly crushes.[555] The same manuscript notes refer to competition among plants for nourishment, and state that 'Gewaltsamkeit' governs everything.[556] In the *Ideen* Pt. I, Herder enunciated his theory of a struggle for existence among plants and animals[557] (without, however, introducing any evolutionary conclusions). Again, he states in the same work that the 'Kräfte' of humbler organisms can become sublimated only by assimilation into higher ones; thus 'jede Zerstörung ist Übergang zum höhern Leben'.[558] The implications of such a theory are somewhat sinister. Only Herder's mitigating belief in the supremacy of love, and in the equal dignity of man and woman, can have prevented him from extending this theory by a logical process to the social level; even in this case, hints of such an extension appear in the early 'Genie' theory, and in the theory, as stated in his *Auch eine Philosophie*, that certain great historical figures may be exempt from the canons of conventional morality.[559] In this respect, Goethe, with his theory of the daemonic personality whose rise to greatness may involve the sacrifice, one might even say the assimilation, of lesser personalities, went further than Herder. Only Herder's theory of the planetary 'Genius', indifferent to lesser beings, fully anticipates such ideas; and it arose in 1769, that year of exceptionally radical thought for Herder: 'der Genius hört auf mich so wenig, als ich auf das Schreien eines Wurms! Er ist zu Groß dazu . . . Ich bin ihm zu klein!'[560]

Thus, a body is expanded through the action of its indwelling 'Kraft', which absorbs humbler 'Kräfte', or arrives at a state of balance with equal ones. For, as it expands, it eventually encounters similar expanding 'Kräfte'. At this stage, a Lucretian conflict begins, continuing until a state of equilibrium is attained. We can even speak of collisions between *material* entities in many such cases, especially on the physical and biological levels; such, as we have seen, is Herder's (dialectical) theory of embryonic growth, whereby the foetus develops by contact with its surroundings,[561] and his belief that man's power of perception develops by touch.[562] He says of the body: 'Er [i.e. der Leib] ist also von ihr [i.e. der Seele] durch eine Art von fühlbarer Anziehung gebildet'.[563] All the elements hitherto mentioned are present in this short sentence: the 'Kraft' (the 'Seele'), manifesting itself in assimilation ('Anziehung') by contact ('fühlbar') with something external to it. Such dialectical formulations are merely simpler versions of the theory which postulates *many* 'Kräfte'. Herder writes of the complete organism in his *Ideen*:[564]

> Denn was ist eine Organisation, als eine Masse unendlich-vieler zusammengedrängter Kräfte, deren größter Theil eben des Zusammenhanges wegen von andern Kräften eingeschränkt, unterdrückt, oder wenigstens unsern Augen so versteckt wird, daß wir . . . nicht die einzelnen Wesen selbst, sondern nur das Gebilde sehen, das sich zur Nothdurft des Ganzen so und nicht anders organisiren mußte.

The same process creates the ecological equilibrium, the social 'Maximum', and the political balance of power. Herder also explains the rise of technological inventions in history 'nach der Kosmogonie des Epikurs, durch ein Zusammentreffen der Atomen . . . ! Reihen von Ursachen wirkten zusammen, gegen und nach einander . . . ohne Plan und Regel drängte eins das andere'.[565] Such earlier formulations as the latter are subsequently modified in favour of form and order, of course, but the basis remains unaltered. Thus, Herder's dialectical and mathematical theories of orderly change should simply be seen as special cases of a fundamental, and more general theory of natural law.

What are his specific sources, if any, for this singular hybrid of Lucretian and Leibnizian theory as applied to the objects of science? Firstly, Kant's theory of cosmic evolution by gravitational forces, and Needham's theory of growth by 'expansion' and 'resistance' were examples, early known to Herder, of the special case of growth through two dialectical forces. So also is C. F. Wolff's theory of growth,[566] which Herder, however, only encountered much later. But Kant, in one passage of his *Allgemeine Naturgeschichte*, lapsed back into the older Lucretian theory that order arises out of collisions between *many* elementary particles, not of a *duality* of (Newtonian) forces as he suggests on all other occasions in this work. A balance arises 'indem die Theilchen eines des andern Bewegung so lange einschränken, bis alle nach einer Richtung fortgehen'.[567] Herder had also encountered the doctrine in the *De rerum natura* of Lucretius himself at an early date, as his Riga notebooks show.[568] (It was Herder who later introduced Knebel, the greatest German translator of the poem, to this work of Lucretius, with the highest recommendation.)[569] Yet it is clear that Herder combined the Lucretian theory of conflict with the modern, ultimately Leibnizian theory of growth by expansion (or accretion). This may even have been suggested by some passages in the works of Leibniz himself, but Leibniz did not apply his theory to specific situations within the natural world as Lucretius had done.

This whole theory received what is perhaps its clearest expression in a late essay of Goethe's entitled *Die Lepaden*.[570] It is one of the finest and most characteristic of his shorter scientific writings. He illustrates 'die nach dem Regellosen strebende, sich selbst immer regelnde Natur' in a way in which Herder had described it in general long before; but his words have a vividness and clarity which

Herder, preoccupied with his amorphous 'Kräfte', never commanded. Goethe describes the growth of the stalk of the crustacean *lepas polliceps*, a variety of barnacle, as governed by the expansion of many shell-like points upon the stalk's surface:

> . . . und hier, bei genauer Betrachtung, scheint es als wenn jeder Schalpunkt sich eile, die nächsten aufzuzehren, sich auf ihre Kosten zu vergrößern, und zwar in dem Augenblicke, ehe sie zum Werden gelangen. Eine schon gewordene noch so kleine Schale kann von einem herankommenden Nachbar nicht aufgespeist werden, alles Gewordene setzt sich mit einander ins Gleichwicht.

Herder's theory of natural law admirably reconciles freedom with a measure of determinism when applied to society; the freely developing individual is limited in his actions by those of others. E. Zilsel, a modern writer on sociology, expresses a similar view.[571] It can similarly be used, as in Popper's theory, earlier mentioned, to account for the fact that the individual scientist may be no less subjective than his fellows, yet that science becomes objective through its public character (by the balancing influence of the conflicting opinions of other scientists).

In its best known form, the theory of a struggle for existence, this line of thinking had, of course, an enormous influence. A. O. Lovejoy asserts that Herder discovered this 'sinister' aspect of biology, without becoming an evolutionist himself.[572] He even argues that Herder's discovery was 'the main source, alike of the most important scientific hypotheses of the nineteenth century, and of certain of the most significant and characteristic developments of nineteenth century philosophy – especially of philosophical pessimism'.[573] But a great deal of the credit for these developments must go to those earlier thinkers upon whose ideas Herder built. Besides, the idea of a struggle of this kind had earlier appeared in Hobbes' theory of the state of nature, and, in Herder's lifetime, in the economic theories of Adam Smith, as well as in the population theory of Malthus, which greatly influenced Darwin.

Finally, it is worth noticing how the modern doctrine that certain natural laws (or even all natural laws, according to some theorists) are statistical averages, irrespective of the particular causality, or even freedom, non-causality or randomness, behind the actions of individual units within a process, retains something of Herder's theory of natural law. Of all Herder's critics, only one, it would appear, has noticed this parallel, but he mistakenly adds that such a theory implies an anarchic universe.[574] On the contrary, individual units obeying statistical macro-laws may be governed also by various causal micro-laws, as, for example, individual molecules do in their motion, although their collective motion can be expressed by the purely statistical second law of thermodynamics.

Statistical laws can become a vehicle of prediction only in association with the theory of probability. Herder knew various writings on the theory of probability, mentioning those of (Jacques) Bernouilli, Lambert, Hume and Mendelssohn in his *Journal*.[575] But lacking the data of, and interest in, exact statistics, he failed to apply the theory to the natural world, although August von Einsiedel, in notes copied by Herder, suggested that the analogies (i.e. regularities) observed in nature are perhaps merely a result of the laws of probability,[576] and J. H. Lambert put forward the remarkably progressive hypothesis that compound laws (the result of a plurality of simpler laws) may be formulated only numerically, and employed only in accordance with the theory of probability.[577]

Herder's theory of natural law tallies well with this one of Lambert, which may indeed have influenced him, since he had studied the work concerned by 1769 at the latest.[578] Like Lambert, Herder would declare that every individual event has a cause – although the causes may either be obscure (i.e. unknown 'Kräfte') or complex (as in history). His historical 'laws', such as that of the 'Maximum' (borrowed, we should recall, from Lambert himself), were of this kind, but they lacked all statistical support. Lambert himself mentions the related 'law' of 'Beharrung', also adopted by Herder, as an example of his theory.[579]

In conclusion, Herder's views on natural laws may be summarised as follows.

He accepts the Baconian definition of the natural law as an inductive generalisation.[580] This, as a modern philosopher of science observes,[581] is a definition in keeping with the phase of natural history which preceded the rise of many of the newer sciences. It describes observed regularities in general terms, instead of defining physical causes or functions. Of this kind is Herder's 'type' principle, when applied to animal structure, postulating as it does a formal regularity which can be detected in all species.

The social 'laws' adapted from Lambert are an attempt to apply physical laws of motion, in a questionable way, to human society. Such physical laws, in themselves, are no longer regarded as irrefutable inductive generalisations, as Herder would have contended, but, as a recent theorist points out, as 'axioms . . . which are accepted so long as applications of them are found to fit the facts'.[582] The non-mathematical pseudo-laws of progress are, of course, in no sense comparable with modern conceptions of natural law.

Herder's most general definition of natural laws seeks to delineate the mechanism by which all observed regularities, within dynamic processes at all levels, are brought about. This is no longer a simple description of observed or imagined regularities in natural history. The laws are averages produced by the interaction of many (or sometimes of two) natural units. Their encounter may be fortuitous, but their individual actions and mutual interactions (such as attraction) are causal processes, even if imperfectly understood, as when caused by the nebulous 'Kräfte'. This, from a modern point of view, is the most satisfactory portion of Herder's theory of natural law.

But it must be remembered that Herder applied none of these conceptions of natural law in an exact or quantitative manner, although some of them were capable of being used in this way, as has happened in more recent times.

12. Levels of organisation in the natural world

Again and again we have found that Herder employs concepts which either embrace, or treat as parallel yet distinct, several ascending levels of existence, from the physical to the social, and even on into transcendental levels. Such comprehensive conceptions were that of the Chain of Being, the 'type' theory, various analogies, the notion of organic wholes, the doctrine of cyclic development, the dialectical formula, etc. They all give evidence that he wished to synthesise all areas of his experience, and to comprehend them as a single, integrated whole.

The usual levels of existence which Herder distinguishes, while always attempting to relate them to others, are the physical, the biological, the psychological, the family group, the individual society, the nation as a political unit, and the process of human history. Within the physical world, he at various times distinguishes between the astronomical sphere and that of the terrestrial objects of physics and chemistry; within biology, we find him dealing separately with embryology and physiology. All of these successive stages exhibit some degree of organisation, as Herder always insists, and we may use the modern terms 'levels of organisation' or 'integrative levels' to describe them.

Many critics have noticed that Herder uses broadly similar principles in dealing with the individual human being, the single society or nation, and mankind *in toto*.[583] Indeed, he admits as much himself when he enumerates them separately, applying to each his 'Maximum' theory, in the *Ideen*, Pt. III.[584] But no complete survey of Herder's divisions within the natural world, or study of how he relates them, has so far been undertaken. Yet the whole problem of what constitutes a separate level of organisation is as important today as it was in Herder's time, since it involves such fundamental questions as what makes living matter different from inanimate matter, and how man as an animal differs psychologically and biologically from other animals, as well as from man as a collective sociological unit.

The least successful of Herder's efforts to interrelate various levels of organisation is that based upon 'Kräfte'. We have already seen how he adapted Haller's categories of 'Elasticität', 'Reiz' and 'Empfindung', setting them up as separate 'Kräfte' in order to differentiate degrees of physiological and psychological organisation.[585] But the unqualified concept of 'Kraft' in itself suggests that a common, not a varying content, exists behind divergent forms; thus Herder himself, in the *Ideen*, states that Haller's three 'Kräfte' are only different aspects of one and the same 'Kraft'.[586] It is therefore clear that the 'Kraft' concept in itself rather unites different levels than distinguishes them. Herder uses it, in fact, to explain how transitions from one level to another take place. For example, the 'Kräfte' of animals are sublimated by assimilation into the human organism, and the 'Kraft' of each human being migrates to a new 'Organ' on a higher, spiritual level. Clearly, this whole scheme in itself, including such temporal transitions, is ideal and metaphysical, and neither distinguishes nor interrelates different levels of organisation satisfactorily from the point of view of science.

A second attempt by Herder to relate different levels of organisation likewise tends to identify rather than to distinguish between them. We have seen how he applied physical laws to social, historical, and even ethical spheres. He believes this to be justified 'da Geist und Moralität auch Physik sind und denselben Gesetzen, die doch zuletzt alle vom Sonnensystem abhangen, nur in einer höhern Ordnung dienen'.[587] This time, formal laws rather than amorphous 'Kräfte' are employed, but the result is essentially the same as before. No scientist would deny that physical laws, such as that of gravity, continue to apply to living units as well as to inanimate ones. (Matter does not become weightless when animate.) But Herder suggests that they apply 'in einer höhern Ordnung' of mind and morality, which is quite a different proposition. He says, on the one hand, that they are derived from the constitution of the solar system, implying that they *directly* determine the workings of these higher levels. On the other hand, they are to be used only analogically, not literally. This second attempt to relate distinct levels is therefore self-contradictory, and unsatisfactory as a scientific theory. In its organicistic variant, whereby it is assumed that the processes associated with the growth of organisms recur on all (holistic) levels of organisation, it led, as we earlier noticed, to some more interesting conclusions.

Herder, however, does employ other means of relating different levels, without obscuring the individuality of each. The simplest of these means is the so-called dialectical method, which relates the various levels dynamically. For he used it to demonstrate how a developing unit can progress from a lower to a higher level through conflict or opposition; thus the polarised 'Kräfte' of expansion and contraction produce crystals, and even plant-like forms, in the inorganic world,[588] the human infant acquires its perceptive abilities through its tactile activity, the interaction of nations leads to an international balance of power, and so on. Hegel developed this idea, backing it up with more systematic reasoning; the result was his 'law of the transformation of quantity into quality',[589] which asserts that quantitative changes among units existing on one level can produce qualitatively different effects on a higher level. Herder had often argued in this way, without defining the principle or method involved. Joseph Needham, in an essay on Whitehead's philosophy, indeed considers that the dialectical method necessarily leads to a theory of distinct levels of organisation, and rightly links this theory in turn to holism:[590]

> The syntheses at all successive levels of being, resolving the successive contradictions, form a series of envelopes, for they each include the elements of the contradictions on the levels below them as a series of parts. Like so many things in nature, the successive syntheses form a dendritic continuum or hierarchy of wholes.

Thus, this particular procedure of Herder's is still associated, among certain dialectically minded theorists, with scientific thought concerning the levels of organisation.

Herder's next solution to the problem of levels is the most complex, and the most satisfactory, of them all. Before he adopted Haller's vitalistic 'Kräfte', he defined the differences between biological and psychological levels, in his essay on language in 1770, as produced by the different arrangement of constant elements. He says of man and the animals: 'Der Unterschied ist nicht in Stuffen, oder Zugabe von Kräften, sondern in einer ganz verschiedenartigen Richtung und Auswickelung aller Kräfte'.[591] For example, the human reason is not a new 'Kraft' or faculty:[592]

> Nach richtigern Begriffen ist die *Vernunftmäßigkeit* des Menschen, der Charakter seiner Gattung, etwas anders, nehmlich, *die gänzliche Bestimmung seiner denkenden Kraft im Verhältniß seiner Sinnlichkeit und Triebe.*

He later combines this formal distinction with Haller's 'Kräfte' in the *Ideen*, thereby making not distinct 'Kräfte', but different arrangements of the same 'Kraft' or basic constituent the means of distinguishing between physical and physiological levels. The passage in question has already been quoted in connection with dialectical thinking, but it is worth quoting again here:[593]

> Elasticität und Reizbarkeit grenzen aneinander, wie Fiber und Muskel zusammen grenzen. So wie dieser nur ein verflochtenes Kunstgebilde jener ist: so ist auch die Reizbarkeit wahrscheinlich nichts als eine auf innige Art unendlich vermehrte Schnellkraft, die in dieser organischen Verschlingung vieler Theile sich aus dem todten Fiberngefühl zur ersten Stuffe des thierischen Selbstreizes erhoben. Die Empfindsamkeit des Nervensystems wird sodenn die dritte höhere Art derselben Kraft seyn, ein Resultat aller jener organischen Kräfte. . .

The distinction through different 'Kräfte' and the earlier distinction through the presumed rearrangement of constant components coexist uneasily in Herder's phraseology. A manuscript version of the same passage conveys the earlier sense more clearly: 'In der Proportion und in der Temperatur des Ganzen muß alles liegen'.[594] Herder here again recommends that distinctions between animal and man should be based on this criterion of rearrangement, of increased complexity. His other formal distinctions between animals and man (already mentioned in connection with methods of classification), such as the variation of certain craniological angles, the relation of structure to biped or quadruped gait, and (much more satisfactory) the theory that the nervous system becomes progressively more integrated and complex in higher organisms, are all preferable to introducing new unknowns or 'Kräfte'; *principia praeter necessitatem non sunt multiplicanda.* But Herder says even more clearly of the human soul, the psychological dimension, further on in the *Ideen*: 'daß sie mit allen Kräften der Materie, des Reizes, der Bewegung, des Lebens ursprünglich Eins sei und nur auf einer höhern Stufe und in einer ausgebildetern feinern Organisation wirke'.[595] Despite this admission, he proceeds to draw purely metaphysical conclusions; but this criterion of increasing complexity within the same elements as a means of distinguishing between levels is closer to modern versions than any of those hitherto discussed. For example, Joseph Needham uses the same distinction in 1928 to demarcate, in this case, physical and biological levels:[596]

> . . . the processes of living matter are subject to the same laws that govern the processes in dead matter, but . . . the laws operate in a more complicated medium; thus living things differ from dead things in degree and not in kind.

L. von Bertalanffy writes around the same time: 'The characteristic feature of life is thus to be sought not in some one peculiarity of the particular vital processes, but in the special organisation of all these processes among one another'.[597] Herder uses a similar argument to distinguish between the physical and the biological, between 'Elasticität' and 'Reiz'.

A few implications of this comparison between Herder's ideas and those of modern theorists must, however, be considered. The elements out of whose configuration a new quality arises are, in Herder's case, the ubiquitous 'Kräfte', whereas in the recent theory, they are chemical processes. But this difference does not nullify the comparison, which is one between *methods.* The important point is that both Herder and the modern theorists believe that the constituent elements on differing levels are the same, and that only in form and complexity of arrangement of the components are the different levels distinct. Both approaches are therefore monistic, and the method of looking for variation in form rather than for qualitative differences is the same. Herder's 'Kraft' allows him to escape materialism, while he elaborates methods later employed neutrally or in association with materialism in science.

The clarity of Herder's conceptual distinctions suffered greatly from the vague 'Kraft' conception. He insists that laws obtaining upon lower levels continue to operate on higher ones, yet he was aware that a new configuration of elements could produce new and more complex situations. He never seems to have been certain what exactly constitutes this new complexity (apart from his excellent remarks upon progressive nervous integration), and employs such phrases as 'auf innige Art unendlich vermehrt', and speaks of a new 'Temperatur des Ganzen' to express the difference between levels. The more logical mind of Claude Bernard, for example, drew an exact 'distinction between processes, laws and theories' which, as a recent monograph on the history of physiology indicates, enabled him to show that inanimate and animate levels may well have the same components and follow the same *laws*, whereas new *processes* appear on the biological level.[598] These processes may indeed prove, as the same writer remarks, to obey new *laws* upon a higher level, like Mendel's Laws of Inheritance in biology. Only on one occasion does Herder appear to suspect that processes on a higher level may actually obey new and higher laws; no new material faculty of the mind should be sought, he again says:[599]

> Also ists eine schwache unphysiologische Vorstellung, sich das Gehirn als einen Selbstdenker, den Nervensaft als einen Selbstempfinder zu denken; vielmehr sind es, allen Erfahrungen zufolge, *eigne psychologische Gesetze,*

> nach denen die Seele ihre Verrichtungen vornimmt und ihre Begriffe verbindet.

Here once more, Herder seeks new patterns rather than new 'Kräfte'; this was one of the best achievements of his mature period. The reason why he failed to achieve even better results was that he never emancipated himself finally from his 'Kräfte'; ultimately, too much depended upon them.

But Herder, in his more satisfactory solutions to the problem of how levels should be differentiated, most closely approached definitions of life and of mind which could offer an alternative to vitalism, while avoiding the crasser aspects of mechanism, with its tendency to disregard those distinctive characteristics which do supervene on biological and psychological planes. The criterion of new and more complex forms, combinations and processes appearing in the workings of basic elements of a constant quality is a theory which has almost completely usurped the position of the earlier vitalistic and mechanistic theories in modern theoretical biology. Some of the details of this revolution have been discussed above in connection with 'organicism', which necessarily entails the modern theory of levels of organisation.

Further examination of sociological and political levels in Herder's thought is unnecessary, since this has already been done in the earlier discussion of his pseudo-laws. The ideal or transcendental levels of supposed higher beings, often imagined to inhabit planets and other celestial bodies, have no real place in this discussion of scientific methods. Nevertheless, it would be false to pretend that such ideal levels are not present, as part of the speculative side which always counterbalances the naturalistic side in Herder's mind.

In conclusion, a word may be added on Herder's sources. The Chain of Being, and the chain of 'Kräfte' behind it, form the scale of gradual transitions on to which the theory of distinct levels was imposed. Herder partially succeeded in separating those levels which the Leibnizian theory was at special pains to merge into one another, according to the doctrine of *natura non facit saltum*. As for the theory of rearrangement of constant elements, Lucretius considers that life differs from the inanimate not because it possesses new sentient 'parts', but because insensate elements appear in certain new combinations.[600] If we substitute Herder's 'Kräfte' for Lucretius' atoms, we have, as in the theory of natural law, Herder's own version. Such ideas were a step, in theory, towards objective distinctions between the levels of matter, life, and mind. Kant's criterion of biological 'Zweckmäßigkeit' was in many ways satisfactory as a logical rule, but, sooner or later, it had to be complemented by empirical distinctions between the living and the inanimate.

CONCLUSION

The above survey has followed the principle that the history of scientific methods is more important than the history of detailed theories and results, since the latter acquire significance only through the former.

Nearly all of Herder's methods combine an interest in naturalistic and in ideal or absolute standards. This has emerged from his solutions to the problem of subject and object, his attitude towards the position of man in the natural world, his 'type' theory, his views on classification, his use of analogies, his attitude to teleology, his holistic theories, his 'genetic' method, his theory of development, his dialectical method, his attitude towards mathematics, and his theory of natural laws. In each case, he does not merely impose one aspect upon the other; both coexist, usually in an unstable synthesis, as independent functions within his mind.

Where many critics have over-emphasised one side of Herder's thought, it has been argued here that the other is equally important. Where the non-scientific facets of his methods have been stressed too heavily, as has so often happened, a more positive approach to them has been adopted in this survey; conversely, claims that particular theories of Herder's were preeminently modern and scientific have been examined in the light of the methods which Herder employed, and contrasted with the negative, less scientific aspects. Since some critics of his scientific thought, especially Max Rouché, the most thorough of these, have contended that orthodox theological doctrines were at the back of most of Herder's scientific interests, and that the latter merely ministered, in a subordinate position, to theology, it has seemed advisable to emphasise the naturalistic or relativistic aspects of his thought, in order to counteract such one-sidedness, while pointing out that a perfectly balanced picture of his methods must lose sight of neither side: both aspects are nearly always equally present, and equally important, and while each is often distorted in some way to facilitate its reconciliation with the other, each retains its basic independence. In this way, Herder's natural religion tends towards liberal theology, while his scientific efforts are tempered, and often vitiated, by metaphysical doctrines and mystical, ethical or aesthetic suppositions.

It has been assumed throughout that the scientific thought of Herder and of more modern theorists can be compared only with reference to the methodological equipment of each. Comparisons between his particular theories and those of today are invariably misleading, and usually erroneous. As for Herder's methods, as distinct from the conclusions based in part upon them, they are often capable of being applied quite objectively, and are not in themselves committed to any particular dogma; these, as well as the other methods which he applied in order to compare and synthesise different areas of his experience (for example, the comparative, analogical and dialectical methods, and his arguments concerning the organic, the natural law, and distinct levels of organisation), have frequently reappeared in later and in modern scientific theory as valuable means of description and of enquiry. Some of the ways in which he applied these methods constituted original contributions to scientific thought.

In virtually every case, the methods compared refer to forms and formal relationships in nature; they are not concerned with defining the ultimate content of the natural world. We have seen that Herder supplemented his qualitative definitions of content more and more by formal criteria, especially in his mature period. Eighteenth-century theories of the basic constituents of nature can rarely be compared with modern ones, since, at that time, knowledge of the ultimate physical, chemical and biochemical properties of matter was almost entirely speculative, whereas we now possess a mass of exact experimental evidence. Herder considered the ultimate content of the natural universe to be 'Kraft'. It was on this assumption that he built his monistic interpretation of nature. Modern theories of nature are usually either monistic, or indifferent to the number and intrinsic character of the qualitative elements of the universe, while applying broadly uniform principles to all areas of it; this indifference to qualitative distinctions, coupled with the uniform treatment, might be described as a methodological monism, but not as a qualitative or dogmatic monism like Herder's. Both Herder's theoretical methods and those of today rest on the understanding, however, that the same principles can be applied to all aspects of nature. A unitary theory of the natural world demands versatile methods of description and explanation. We therefore find that Herder's monism and modern unitary theories (notably those associated with biology) employ similar formal principles, while differing fundamentally in their views concerning the elements of which the universe is compounded.

So far as Herder's personal development is concerned, it appears that he acquired the greater part of his theoretical equipment in his philosophy of science at a remarkably early stage in his life, and, from the beginning, his strivings to reconcile the many conflicting sides of his wide experience and interests are manifest. In fact, it was such desires, the mark of the polymath and even of the mystic, which caused him to elaborate most of his characteristic methods. It is clear that the year 1769 saw a high water mark in his more radical scientific ideas. These ideas stayed with him for the rest of his life, and he continually renewed his efforts to assimilate them into the rest of his thought, although they never entirely lose their original identity.

NOTES

1 SW XVI, 470-471.
2 Cajori 220 p. 99.
3 Cf. SW IV, 50 and VIII, 4; also XXII, 40.
4 SW XXVIII, 367. *Der entfesselte Prometheus,* 1802.
5 Goethe 29 VII, 203, Goethe to Frau von Stein, 10 April 1787; cf. Varnhagen 53 II, 301, Herder to Knebel, April-May 1785.
6 SW XXXII, 471 (1769).

7 SW XXI, 161.
8 E.g. SW XV, 167 and XXIII, 523 *et seq.*
9 Cf. SW II, 257-258: 'Immer ist unsre Psychologie noch nicht weit über die Kindheit hinaus, wenn sie . . . ihren Weg durch Schlüsse und Errathungen fortsetzt; ohne auf die Besonderheiten einzelner Subjekte mit der Genauigkeit zu merken, mit welcher der Naturforscher die Körper der Thiere zergliedert . . . '.
10 Düntzer 23 II, 454, Herder to August von Herder, 1800.
11 Cf. SW XIII, 120, note: 'Meine Meinung ist aus vorliegenden Thier- und Menschenschädeln geschöpfet.'
12 SW XIII, 251.
13 Caroline 65 III, 194-195: 'er bedauerte es oft, daß Deutschlands Fürsten sich nicht vereinigten, um durch ihre geschicktesten Männer die Kenntnis dieser Dinge gründlich aufzuklären'.
14 Schauer 46 I, 46, Herder to Caroline, 20 September 1770.
15 Cf. Siegel 179 p. 199.
16 Goethe in conversation with Falk, 1809.
17 Schwarz 119 p. 149; also Schwarz 118 p. 170 and Roy Pascal, *The German Sturm und Drang*, Manchester, 1953, p. 193.
18 Cf. Gillies 10 p. 161 for details of these reveries.
19 Cf. SW IV, p. XVII and SW IV, 439.
20 Cf. Schauer 46 I, 320-328, 342, etc.
21 Schauer 46 I, 342.
22 Suphan 185 p. 73.
23 Baechtold 17 p. 58 *et passim*; cf. Suphan's words on Herder's thoughts on nature in the *Ideen*: 'Nicht über Büchern und Papier sind sie dem Denker einst aufgegangen, sondern vornehmlich im Leben und innigen Verkehr mit der Natur und ihren Erscheinungen' (SW XIV, 672).
24 See Düntzer 24, *passim.*
25 SW IV, 391.
26 SW IV, 451.
27 See SW VIII, 265 for a typical example.
28 SW IX, 352; cf. IX, 444.
29 E.g. SW XIII, 9, 110 and 177.
30 SW XIV, 85: 'Dem Naturforscher, der zur Känntnis und Ordnung aller Classen seiner Reiche gelangen will, ist Rose und Distel, das Stink- und Faulthier mit dem Elephanten gleich lieb; er untersucht das am meisten, wobei er am meisten lernet.'
31 SW XV, 384.
32 E.g. Clark 75 p. 751 and Götz 78 p. 166.
Schütze 176 vol. 21, 129-130 says of Herder: 'He comprehended . . . what the scientists of his age were prone to ignore, that the principles of knowledge, being inductive, excluded speculations passing beyond the limits of the hypothetical into the region of the absolute, or dogma'.
33 E.g. Haym 64 II, 717 and Posadzy 170, *passim*. Noll 104 pp. 319-320 simply declares: 'Es scheint uns aber der Nachweis zu genügen, daß Herder mehrdeutig vorgegangen ist und in seiner Stellung geschwankt hat'.
34 Nisbet 102.
35 Cf. SW IV, 465 and Bacon 252 IV, 97 and 192.
36 Varnhagen 53 III, 457.
37 SW VIII, 301. *Vom Erkennen und Empfinden*, 1775 version.
38 SW XXXI, 305. Sermon of 1774.
39 For statements on subjective variations in perception see SW VIII, 156; XV, 532; XXIV, 438. For similar variations in the imagination see SW XIII, 299.
40 SW V, 411-412; cf. SW VIII, 248, *Vom Erkennen und Empfinden*, 1774 version.
41 Cf. Gillies 63 p. 86 and Kühnemann 67 p. 66. Kühnemann consistently emphasises the subjective elements in Herder's thought, often to the exclusion of others. See also Hoffart 153 p. 43 and Litt 164 p. 169.
42 Behrens 18 p. 406, Herder to von Hahn, 5 August 1774.
43 SW IV, 350.
44 SW VIII, 170; cf. also IV, 10.
45 SW IX, 507.
46 Popper 209 pp. 155-156.
47 Cf. Armand Nivelle, *Les théories ésthetiques en Allemagne de Baumgarten à Kant*, Paris, 1955, p. 25. Cf. also Herder's words in Irmscher 12 p. 134: 'das analogon rationis ist ein sicherer [sic] Führer in der Moralität als die Vernunft. . . '.

48 SW VIII, 169.
49 Cf. Meinecke 167 p. 385.
50 Haym 64 I, 675-676.
51 SW VIII, 253-254.
52 SW VIII, 233-234.
53 SW XXI, 100-101.
54 SW VIII, 190-191.
55 Cf. Rouché 172 p. 214.
56 SW XII, 7.
57 SW VIII, 193 (1778).
58 SW XIII, 77.
59 SW XIII, 78.
60 SW XIII, 78.
61 SW XIII, 175.
62 SW XIII, 175.
63 SW VIII, 193. Cf. Rouché 172 p. 214.
64 SW XV, 526.
65 SW XIII, 182.
66 SW XXI, 297.
67 Cf. SW XXI, 298.
68 SW XXI, 298.
69 SW XXIII, 252.
70 SW V, 462.
71 Goethe 274 XI, 18-19.
72 E.g. V, 576.
73 SW VIII, 207.
74 SW XIV, 499.
75 SW XXIX, 135.
76 SW XIII, 155.
77 Cf. for example Kühnemann 67 p. 151, who speaks of Herder's 'Erkenntnis der Natur in ihrem inneren Leben als eines Abbildes der Menschheit'; also Haym 64 I, 666, and Hoffart 153 p. 50, who refers to his 'universellen Anthropomorphismus'.
78 SW XIII, 66-67; cf. also XIII, 274; XIV, 590; and XIV, 693. The theory is at times confined more strictly to animate nature or simply to the animals: see, for example, SW XIV, 590 and XIII, 70: 'Es ist also anatomisch und physiologisch wahr, daß durch die ganze belebte Schöpfung unsrer Erde das Analogon *Einer Organisation* herrsche. . . '.
79 See Nisbet 103 pp. 83-97 on the history of this theory up to the time of Herder.
80 Notably by May 97 p. 37 and Rouché 172 pp. 215-216.
81 *De la nature,* Amsterdam, 1761-1766 and *Considérations philosophiques de la gradation naturelle ou les essais de la nature qui apprend á faire l'homme*, Paris, 1768. Herder knew the former work at least, and mentions it in 1776: cf. SW VII, 75.
82 Cf. *De la nature* IV, 17 and 78 and *Considérations* pp. 6 and 11. See also Thienemann 244 p. 257 and Lovejoy 233 pp. 269-83 for discussions of Robinet's theory.
83 Nisbet 103 pp. 90-91. In the article referred to, I have discussed the sources, implications and status of typological theories down to the present day.
84 SW XIII, 68, note.
85 SW XIII, 69.
86 E.g. SW XIII, 66, 70 and 123; XIV, 590; XXII, 117.
87 SW XIV, 590-591.
88 SW XIII, 445.
89 SW XIII, 168.
90 Einsiedel 270 p. 81.
91 Hettner 32 p. 222, Forster to Sömmering, 19 May 1785.
92 Macgillivray 234 pp. 370-371.
93 Cf. SW XV, 535.
94 SW XIII, 101.
95 Kant 300 p. 45.
96 Haym 64 II, 267 disparages 'die Zwittermethode der Analogieschlüsse'; cf. Kühnemann 66 pp. 228 and 385 and Noll 104 p. 316.
97 Cf. Rouché 172 p. 226.
98 Kant 290 p. 349. See also Irmscher 12 p. 74 (Herder's notes to Kant's lectures) for clear evidence that it was from Kant himself that Herder first learnt to deduce immortality from natural metamorphoses.

99 Hesse 200 p. 63.
100 *Kants Werke,* ed. Preußische Akademie der Wissenschaften, Berlin, 1910 ff., III, 160-161.
101 SW XXI, 136.
102 SW VIII, 170.
103 SW XV, 553.
104 Rouché 172 pp. 176 and 226.
105 Cf. Z. Markovic, 'Boscovich's *Theoria*', in Boscovich 259 p. 132: 'Two very general principles should be recognised in his philosophical thought on nature, which were the constant supports on which he leaned in his journey into the "new world". They are *simplicity and analogy in nature*. This is indeed a reasonable desideratum for any profound study of nature, and is in conformity with the basic tendency of science at any stage of its journey into new fields.'
106 Buffon 262 a p. 62 declares that the investigator should collect his data, then 'il faut les lier ensemble par les analogies . . . et les présenter dans l'ordre le plus naturel. Cet ordre peut se prendre de deux façons, la première est de remonter des effets particuliers à des effets plus généraux, et l'autre de descendre du général au particulier'. See also Herder's MSS S.P.K. D.S.T. Kapsel XXV Nr. 102 for Herder's extracts, made around 1780, from this section in Buffon.
107 Cf. Thienemann 244 p. 266 on Pallas.
108 J. S. Mill, *A System of Logic*, London, 1843, II, 96-98, also quoted in Arber 194 p. 228.
109 Quoted in Hesse 200 p. 5 from his *Physics. The Elements*.
110 Hesse 200 pp. 9-10.
111 Hesse 200 p. 66.
112 Hesse 200 pp. 68 and 77.
113 Hesse 200 p. 93.
114 Cf. Nisbet 103 pp. 118-119.
115 Arber 194.
116 SW IV, 354.
117 In a letter to Sömmering, 28 February 1785, in Dobbek 22 p. 251.
118 Monro 317 p. 106.
119 Monro 317 p. 52 *et seq.*
120 Goethe 29 VI, 389, to Knebel, 17 November 1784. Since writing these lines, I have read G. A. Wells' article 'Goethe and the Intermaxillary Bone', *British Journal for the History of Science*, 3, 1966-7, 348-361, which makes it clear that one can only speak with considerable reservations of Goethe's having 'discovered' the bone.
121 SW XIII, 118.
122 Goethe 274 VII, 199. Nordenskiöld, in his history of biology, claims that Goethe's discovery was neither original nor accurate (Nordenskiöld 237 p. 280). Goethe did notice the bone independently of earlier anatomists, however, and Nordenskiöld does not dispute this. But he contends that Camper was more accurate than Goethe, since Camper had said that man and the apes do differ in as much as the bone is usually invisible as such in man. But Camper, in fact, denied its existence in man entirely, saying: 'Je ne le trouve pas, et je continue à prétendre que nous ne l'avons pas!' (Wagner 54 p. 469, Camper to Merck, 19 September 1785). On Goethe's predilection for analogies cf. also his words in the essay *Entoptische Farben* (1820): 'Hier dürfen wir also die Analogie als Handhabe, als Hebel, die Natur anzufassen und zu bewegen, gar wohl empfehlen und anrühmen. Man lasse sich nicht irre machen, wenn Analogie manchmal irre führt, wenn sie als zu weit gesuchter willkürlicher Witz, völlig in Rauch aufgeht. . . . Halten wir uns aber zu unserm Zweck an eine reine methodische Analogie, wodurch Erfahrung erst belebt wird, indem das Abgesonderte und entfernt Scheinende verknüpft, dessen Identität entdeckt und das eigentliche Gesamtleben der Natur auch in der Wissenschaft nach und nach empfunden wird.' (Goethe 274, V, I, 292-293). Goethe here, like some of the Romantic *Naturphilosophen*, presses the analogical method into the service of his metaphysical doctrine of the unity of nature, which, of course, is no part of science proper.
123 Popper 209 p. 135.
124 Cf. also item 204 in the bibliography, *Models and Analogues in Biology*, for the continued function of analogical arguments in modern science.
125 SW XIII, 67-68.
126 E.g. SW XIII, 66; XIV, 590.
127 SW XIII, 69.
128 See Düntzer 23 I, 100, Goethe to Herder, July 1789.
129 Düntzer 23 I, 145, Goethe to Herder, 1793 or 1794.
130 Düntzer 23 I, 75, Goethe to Herder, 27 November 1784.
131 SW XIV, 598.

132 See Rouché 172 p. 201: 'L'anatomie chez lui n'est qu'une physiognomie étendue à l'ensemble du corps, une psychologie des formes' and 'la dimension et l'emplacement des organes révèlent l'intention de Dieu.'
133 Cf. Lovejoy's classic study *The Great Chain of Being* (Lovejoy 233) on this immensely influential conception. Lovejoy shows that it was not an inductive generalisation created by the spirit of Christian 'piété rationaliste' in the eighteenth century, as Max Rouché (Rouché 172 p. 527) believes, but an *a priori* and thoroughly heterodox scheme, eventually burst asunder by later, genuinely inductive methods of classification.
134 SW XXI, 248.
134a Bertalanffy 196 p. 134.
135 Kant 300 p. 47; cf. also Kant 296 p. 418 and Nisbet 103 p. 109.
136 SW II, 258. Psychological studies should take 'Ungeheuer, Mißgeburten, Seltenheiten' into account.
137 SW VIII, 182.
138 SW VIII, 319: 'Blendwerke, Visionen, Krankheiten, Träume charakterisieren den Charakter des Menschen und den Lebenssaft, der ihn durchwallt, stärker als allgemeine Worte.'
139 SW IV, 86.
140 SW XIV, 603.
141 SW XVI, 383.
142 SW IV, 50; V, 48; etc.
143 Cf. Wolf 248 p. 672.
144 See SW XIV, 681. The work in question was entitled *Institutiones pathologiae medicinalis.*
145 His extracts from Sydenham's *De morbis epidemis* and Meier's *Abhandlung von der Kopfwassersucht* are still unpublished (Herder's MSS S.P.K. D.S.T. Kapsel XXVIII Nr. 6).
146 SW V, 44.
147 SW II, 257-258.
148 Goethe 274 I, 46 (*Zur Farbenlehre*).
149 Rouché 172 p. 201: 'L'histoire naturelle pour Herder, c'est tout simplement la physiognomie étendue à l'ensemble du corps et à la totalité des êtres vivants.' Also Haym 64 II, 210 and Koch 158 p. 11, who derives Herder's view of the organic world 'aus der Philosophie des Symbolischen, die jedes Ding als Ausdruck eines hinter seiner Erscheinung steckenden und treibenden Gehaltes, den Körper als "fühlbar gewordene Seele" anzusehen gewöhnt hatte'.
150 SW IX, 456-457.
151 SW II, 258; cf. Buffon 262 a p. 38.
152 SW IX, 413; cf. the passage of similar purport in SW XI, 293 (1782).
153 SW XIII, 280-281. It is also significant that an approving reference to Lavater in an earlier version of this passage is omitted in the final published version.
154 SW XVII, 358.
155 SW VIII, 178.
156 SW XIII, 256.
157 SW XV, 287.
158 Lovejoy 233 p. 231.
159 SW VIII, 171 *et seq.*
160 Cf. Singer 243 p. 49.
161 SW XIII, 72-77 and 79-81.
162 SW XIII, 90: 'je roher ein Geschöpf ist, d.i. je minder die organische Macht seiner Reize und Muskeln zu feinen Nervenkräften hinaufgeläutert und einem größern Gehirn untergeordnet worden; desto mehr zeigen sie sich in einer verbreiteten, das Leben haltenden oder erstattenden *organischen Allmacht'.*
163 SW XIII, 104.
164 Reimarus 322 p. 414.
165 SW V, 24.
166 Reimarus 322 p. 23.
167 SW XIV, 598.
168 SW XIII, 358-359.
169 SW XIII, 162 (1784). He was prepared to fall back on faith to preserve the integrity of the causal principle: 'Möge *Hume* mit hundert noch scharfsinnigern Zweifeln das Band zwischen Ursache und Wirkung bestreiten; der Menschenverstand wirds immer *sehen* und *glauben.*' (SW VIII, 301: 1775).
170 Jammer 231 p. 15.
171 Cf. Boscovich 259 pp. 108-109.
172 Toulmin 212 p. 121.
173 Bertrand Russell, *Mysticism and Logic,* London, 1918, p. 180.

174 Patrick Gardiner, *The Nature of Historical Explanation*, Oxford, 1952, reprinted 1968, pp. 10 and 24.
175 SW VIII, 202.
176 SW XXI, 229.
177 Cf. Gillies 63 p. 92: 'Herder takes free will for granted but hardly convinces us of its ability to function amid all the external and inherited factors to which he proceeds to ascribe a decisive formative effect.'
178 G. A. Wells (Wells 130 pp. 262-264) gives a good statement of this position, but, in ignoring the role of 'Kräfte' in Herder's theory of spontaneity, he gives the impression that Herder's views are even more modern than they in fact are.
179 SW XXI, 228-229.
180 SW XXXI, 215.
181 SW XIII, 274.
182 Cf. Nisbet 103 pp. 89, 93, 96 and 100 for detailed references.
183 He had written in his preparatory notes on embryology (SW XIV, 680): 'Harvei [sic] nimmt impressio idealis an, wie im Kopf des Künstlers'. This clearly resembles Herder's statement quoted in the text.
184 Rouché 172 p. 368.
185 *Goethes Werke*, Weimar edition, I. Abtheilung, V, I, 207.
186 SW XXXI, 67; cf. SW V, 127.
187 See, for instance, Siegel 179 pp. 150-152; Steinborn 124 p. 79; Lehmann 92 p. 13; and Grundmann 80 p. 12.
188 SW XIII, 446.
189 Herder's MSS S.P.K. D.S.T. Kapsel XXX Nr. 1. This unpublished dialogue appears to be based in part on Kant's essay of 1763, *Der einzig mögliche Beweisgrund zu einer Demonstration des Daseins Gottes*, or on lectures of around that time in which Kant may have used the same arguments. Kant writes, for example: 'Der Mond schafft unter andern Vortheilen auch diesen, daß Ebbe und Fluth Schiffe auch wider oder ohne Winde vermittelst der Ströme in den Straßen und nahe beim festen Lande in Bewegung setzen.' Kant expressly refuses to explain such natural utilities teleologically (Kant 292 p. 131).
190 Buffon 262 a p. 30. Most critics, even Kohlbrugge, who finds nothing of scientific value in Herder's works, admit that a doctrine of anthropocentric teleology has no real place in them (cf. Kohlbrugge 89 p. 1113).
191 The problem of teleology in Herder's works has been discussed by many writers, but nearly always with reference only to his *Ideen*; Götz 79 p. 417 and Steinborn 124 p. 79 give useful lists of Herder's teleological statements in this work.
192 One thinks, in this connection, of the rebellious frame of mind in which he left Riga in that year, and of his encounters with the views of the *philosophes* during his stay in France.
193 Irmscher 11 p. 289.
194 SW V, 478-479.
195 SW V, 505.
196 E.g. SW XIII, 191.
197 Cf. SW XIII, 141: the ape was denied vocal organs like those of man so that language might not be debased in its mouth, etc. Steinborn, Götz, Kühnemann and others list such passages fairly fully.
198 Cf. Rouché 172 pp. 196 and 236.
199 SW XIII, 191.
200 SW XIII, 401.
201 SW XIII, 483.
202 SW XIII, 48.
203 SW XXXI, 614.
204 E.g. Kühnemann 14 p. CIII; Kühnemann 67 p. 194; Steinborn 124 p. 81; Siegel 179 p. 137.
205 E.g. Grundmann 80 p. 12.
206 SW XIII, 85; cf. SW XIV, 86.
207 SW XIV, 83; cf. SW XVI, 118.
208 K. Lamprecht realises this: 'Bisweilen liegt es nur in der Sprache, daß man den Eindruck der Teleologie erhält, wie z.B. in dem Satze: "Die Natur wollte versuchen, welcher gewaltsamen Zustände unser Geschlecht fähig wäre", usw.; in solchen Fällen ist dem Gedanken nur das Kleid herkömmlicher Begriffsfassung angelegt, ohne daß er selbst inhaltlich teleologisch charakterisiert zu sein braucht' (Lamprecht 161 p. 195).
209 Lambert 311 II, 393.
210 Cf. Meinecke 167 pp. 421-422, who says of Herder even during his religious phase that 'von der schwebenden Behandlung der Uroffenbarung und der Entstehung des Christentums abgesehen, [er] ein übernatürliches Eingreifen Gottes in die Geschichte nicht anerkennen

wollte'.
211 Rouché 172 p. 201: 'le Dieu de Herder est ici un Dieu personnel . . . C'est même le Dieu de l'orthodoxe.'
212 Maupertuis 316 p. 18.
213 Reimarus 322 pp. 407, 414, 420, etc.
214 SW XIV, 145 and 202.
215 Rouché 172 p. 259.
216 Meinecke 167 pp. 421-422.
217 SW XIV, 557.
218 E.g. SW XVI, 487 and 490.
219 E.g. SW XVIII, 290 (the earth will become uninhabited only after man's destiny is fulfilled) and SW XXX, 335 (Herder's Lutheran catechism: 'in der Schöpfung ist alles aufs genauste zu Zwecken und Absichten geordnet').
220 SW XXI, 238; cf. SW XXIII, 525. Kant himself had used the teleological proof in his *Allgemeine Naturgeschichte* (Kant 290 p. 227).
221 SW XXIII, 551; cf. SW XXI, 243.
222 Rouché 172 p. 259, note. Herder had long been familiar with Bacon's philosophical works, in which teleology is likewise rejected on philosophical grounds (Bacon 252 IV, 57), but they seem to have had no more effect on his attitude towards teleology before 1787 than had Spinoza.
223 SW XIV, 628.
224 Buffon 262 b p. 104.
225 Lucretius 315 I, 380.
226 SW XIII, 141.
227 SW XIII, 298.
228 SW XIII, 75.
229 Cf. Nordenskiöld 237 pp. 221-222.
230 Whewell 213 p. 457.
231 SW XIII, 98.
232 As Hoffart 153 p. 22 and Rouché 172 p. 196 suggest, Herder's knowledge that Leibniz had claimed to have 'harmonised', final and efficient causes may well have encouraged him to act in this way.
233 See SW XIV, 640. Einsiedel writes: 'Nur aus dem was sie gemacht hat, kann man abnehmen, daß sie [i.e. nature] dies hat machen wollen' and 'Sie läßt die einmal gemachten Naturgesetze ihren Gang gehen, es komme Leben oder Tod heraus'.
234 SW XIV, 705-706.
235 Suphan (SW XIV, 699) notes that Goethe mentions such marking as his usual procedure when criticising his friends' MSS, and thus concludes that Goethe was responsible in this case. But this argument loses its weight when we read, in a letter of Knebel's to Herder, 'Verzeihen Sie, daß ich hier und da einige kleine rothe Striche angezeichnet habe' (Düntzer 25 III, 90, Knebel to Herder, 30 December 1792). Besides, although Suphan believes that Knebel's criticism of Herder's MSS begins only after Goethe left for Italy, Rudolf Haym cites a letter of Herder's showing that he sent Knebel the MS of Book VI of the *Ideen* in 1784 (Haym 64 II, 239). There can be no final certainty as to whether the critic was Knebel or Goethe, but Suphan's belief that it was Goethe is probably correct, not because of Suphan's own questionable arguments, but because we might have expected Knebel, in objecting in his letter of January, 1788, to Herder's words on the divine in history, to have referred to any criticisms of the same kind he had made on earlier occasions.
236 SW XIV, 701.
237 SW XIV, 575, note.
238 SW XIV, 582, note.
239 Goethe 274, VII, 217-218 (around 1790).
240 Lambert 310 p. 62.
241 Bode 257 p. 575.
242 Kant 290 p. 309.
243 Kant 303 pp. 167-169 (1788).
244 Kant 303 p. 182.
245 Kant 296 p. 420.
246 Nagel 205 p. 537 *et seq.* and 558.
247 Braithwaite 197 p. XX.
248 SW XIII, 368.
249 Needham 236 p. 191.
250 A. J. Ayer, *Language, Truth and Logic,* second edition, London, 1946, p. 146.

251 Bertalanffy 195 p. 14, quoted from H. Winterstein's writings.
252 Cf. Litt 164 p. 93, who contrasts Herder's procedure with that of Kant: 'Der Relation zwischen Allgemeinem und Besonderem schiebt sich wie selbstverständlich eine andre unter: die Relation zwischen dem *Ganzen* und dem *Teil.*'
253 SW XIII, 350. He had already written in his notes to Kant's lectures (Irmscher 12 p. 290): 'Jede Begebenheit, jedes Factum in der Welt ist auf seine Art ein *Ganzes,* ein Ganzes, das zum Unterricht dargestellt werden kann. . . '.
254 Cf. H. Wilhelmsmeyer's commendable study of this idea and its development from Herder to the Romantics (Wilhelmsmeyer 189, esp. p. 217 *et seq.*).
255 Agnes Arber, 'Goethe's Botany', *Chronica Botanica,* 10, 1946, p. 84.
256 SW XIII, 14.
257 Goethe 274 XI, 9.
258 SW XI, 296.
259 SW XXI, 247.
260 Whitehead 214 p. 208.
261 As Rouché 172 p. 372, for example, does.
262 Dachauer 142 p. 157 correctly observes that Herder's 'organic' way of thinking is intuitive, and an inseparable part of his nature.
263 Rasch 69 p. 20. See Dachauer 142 pp. 36-45 and 150-160 for a useful survey of the development of Herder's 'organic' approach in his earlier works, especially the historical writings. Dachauer deals in some detail with the effects of this attitude upon Herder's language and style. On this topic cf. also Janssens 330 and Janssens 331.
264 SW XIII, 279. Cuvier's theory of animal types likewise entailed the assumption that each individual organ in a given class of animals somehow reflects the character of the whole organism. As a recent taxonomist writes: 'The falsity of the Cuverian principle was early demonstrated by the famous case of the chalicotheres, whose feet imply a carnivore and whose skulls imply an ungulate. The principle survives in folklore as the belief that paleontologists can reconstruct a whole skeleton from a single bone, which all paleontologists know, to their sorrow, to be untrue' (G. G. Simpson, *Principles of Animal Taxonomy,* New York and London, 1961, p. 44).
265 See, for example, Goethe 274 VII, 205 (1832). Herder uses the word 'Kompensation' in this sense in his *Ideen* (SW XIII, 96-97) and again in 1797 (SW XVIII, 248).
266 Cf. Bertalanffy 196 p. 139.
267 Quoted in Macgillivray 234 pp. 58-59.
268 Siegel 179 pp. 152-153 notes several examples of the idea in Herder's writings from 1770 onwards.
269 SW XIV, 661. This early statement disproves Rouché's contention that the theory in question, which Rouché calls by its Darwinian name of 'correlation des parties', came to Herder from Bonnet's *Palingénésie philosophique,* since the latter work was published only in 1769.
270 SW V, 22.
271 SW XIII, 68.
272 E.g. SW V, 28; XIII, 56 (on plants); XIII, 105; XIII, 153; XIV, 590; XVIII, 248; etc.
273 SW XIII, 235-236.
274 SW XIII, 278-279.
275 E.g. Götz 79 p. 407 and Rouché 172 p. 224. Cf. *The Origin of Species,* reprint of the sixth edition, O.U.P., London, 1951, p. 149. Darwin (*op. cit.* pp. 152-153) refers to and qualifies the cognate theories of Geoffroy St.-Hilaire and Goethe which he treats under the heading 'Compensation and Economy of Growth'.
276 Bertalanffy 196 pp. 139 and 185.
277 Siegel 179 p. 154: 'Das Kompensationsprinzip, das man etwa mit unserem modernen Energieprinzip vergleichen könnte, weist, kurz und unbildlich gesprochen, auf einen konstanten endlichen Kraftvorrat der Welt hin.' R. T. Clark says the same of Herder's 'Kraft' theory as a whole (Clark 75 p. 752).
278 Buffon 262 b p. 105.
279 Bruntsch 74 p. 38.
280 SW XIII, 61.
281 SW XVIII, 249.
282 Bertalanffy 196 p. 51.
283 SW XIII, 61.
284 SW XIII, 287; cf. SW XIII, 288.
285 SW XIII, 59.
286 SW XIII, 287; cf. Schmitt 175 pp. 34-35.

287 Bertalanffy 196 p. 52.
288 Meinecke 167 p. 462.
289 Lehwalder 94 p. 160: 'Die moderne Psychologie als Gestalt-, Strukturpsychologie usw., kurz, alle Spielarten von Ganzheitspsychologie wenden sich gegen das atomistische Modell der Seele, weil diesem keine unmittelbare Selbsterfahrung entspricht.' Herder's psychological theories are of this kind.
290 SW XIII, 182.
291 SW XV, 523 *et seq.*: 'Liegt nämlich das, was wir Bild nennen, nicht im Gegenstande, sondern in unsrer Seele, in der Natur unsres Organs und geistigen Sinnes', etc. (SW XV, 532). Martin Schütze, whose article on this essay rightly acclaims it as one of Herder's most characteristic and significant utterances, fails to draw the obvious comparison with the modern 'Gestalt' theories of Ehrenfels, Wertheimer and their successors (Schütze 116).
292 Cf., for example, SW XXXI, 542: 'Die Gesellschaft der Menschen ist, wie Paulus sagt, ein *Körper mehrerer Glieder*' (1783). On Spencer's views see Needham 206 p. 249.
293 SW V, 134.
294 As P. Regli (Regli 171 p. 74) does with Iselin's *Geschichte der Menschheit.*
295 SW V, 104.
296 Bertalanffy 196 p. 46.
297 Cf. SW XVII, 77.
298 SW XIV, 592; cf. SW XIV, 586.
299 Cf. Russell 211 p. 98 (1931): 'I think the universe is all spots and jumps, without unity, without continuity, without coherence or orderliness. . . such orderliness as we appear to find in the external world is held by many to be due to our own passion for pigeon-holes'.
300 Popper 209 p. 83.
301 Popper 209 p. 78.
302 SW XXXII, 85.
303 SW IV, 438-439.
304 SW II, 62; cf. SW XXXII, 86-87.
305 Cf. Dachauer 142 p. 41.
306 Rouché 172 p. 21, note.
307 Quoted by Bernhard Suphan in SW XIV, 704.
308 SW II, 61.
309 SW XXXII, 85.
310 SW VII, 323.
311 SW XIV, 213.
312 Kant's 'eingepflanzte Kräfte' are not entirely the same as Herder's 'organische Kräfte' in that Herder thinks that whole configurations of 'Kräfte' rather than individual forces are responsible for observed regularities in nature. Nevertheless, he does use Kant's term on two occasions in the *Ideen* ('eingepflanzte organische Kräfte', SW XIII, 422, and 'eingepflanzte göttliche Kräfte', SW XIV, 214).
313 Rouché 172 p. 21. This is perhaps also what Siegel means, although he does not say so explicitly, when he says that Herder likes to build up an idea genetically rather than analyse it philosophically (Siegel 179 p. 9).
314 Popper 209 p. 144.
315 Statutes, in *Mémoires de la Société*, 1, Paris, 1868, p. III. Goethe, unlike Herder, was as a rule averse to speculating on first (and last) things: 'Der Begriff vom Entstehen ist uns ganz und gar versagt: daher wir, wenn wir etwas werden sehen, denken, daß es schon dagewesen sei. Deshalb das System der Einschachtelung [i.e. the embryological theory of preformation] uns begreiflich vorkommt' (*Goethes Werke,* Hamburger Ausgabe, XII, 447, *Maximen und Reflexionen,* 599).
316 Dachauer 142 p. 41.
317 E.g. Schaede 173 p. 42; Posadzy 170 p. 92; Stadelmann 181 p. 59; etc. There is no need to search for further specific sources of Herder's belief that everything is developing. It was a natural consequence of his choice of the organism model to describe nature and human society, and of his conviction that everything is made up of dynamic 'Kräfte'.
318 As quoted by Stadelmann 181 p. 59.
319 Popper 210 p. 423.
320 SW XVI, 109 *et seq.*
321 E.g. SW V, 504 and 588; SW IX, 375; etc.
322 SW V, 477 *et seq.*
323 SW V, 645.
324 SW VI, 404.
325 SW I, 152-153.

326 SW XI, 125.
327 XVIII, 329, etc.
328 SW I, 151-152.
329 SW XIV, 655.
330 Rouché cites Lambert's theory of recurrent 'Maxima' (discussed later in this chapter) as one of Herder's principal sources. But Lambert's *Architektonik*, from which Rouché quotes a relevant passage (Rouché 172 p. 370), did not appear until 1771, whereas Herder had generalised the cyclic theory, as we have seen, some five years earlier. Rouché also names Adelung (Rouché 172 p. 373), Polybius, Machiavelli, Bodin, Ibn-Khaldun, Le Roy, Du Bos, Caylus, Winckelmann and Montesquieu as exponents of similar theories (Rouché 172 p. 86; he might have added Vico), and finally opts for the French classicists' theory of a 'point de perfection' in literary history as Herder's most important source (Rouché 172 p. 371). But Herder, to the best of my knowledge, nowhere refers to this theory, and he might just as well have encountered it in one of Kant's early essays, in which the following passage occurs: 'Eben dieselben Ursachen, durch welche ein Ding zur Vollkommenheit gelangt und darin erhalten wird, bringen es durch unmerkliche Stufen der Veränderungen seinem Untergange wiederum nahe' (Kant 293 p. 198). This use of the term 'Vollkommenheit', if any external source is needed, might explain why Herder applied similar value expressions to cyclic phases. H. M. Wolff, however, believes that Herder borrowed his notion of historical cycles from Rousseau (Wolff 193 p. 758). L. Spitz names Wieland in the same connection (Spitz 122 p. 463), Grundmann (Grundmann 80 p. 16), followed by Regli (Regli 171 p. 58), maintains that Isaac Iselin's writings inspired Herder's theory of the 'Lebensalter' of mankind, Pamp registers Charles Bonnet's belief in cyclic change (Pamp 168 p. 8), and Koller names Du Bos (and ultimately Tacitus) as a probable source (Koller – Du Bos 269, p. 124).
331 He writes, for example, in the notes he made in Riga from Creech's edition of Lucretius: 'Zeiten bringen einerlei wieder' (SW XIV, 660). The last passage quoted in the text, from Herder's 1766 notes, adds (SW XIV, 656) references to Euler (mathematician and scientist), Voltaire (as a historian), Mallet (either the famous historian of Denmark, or the engineer and mathematician named by Gillies in his edition of Herder's *Journal* (Gillies 10 p. 138)), and Pontoppidan (another Danish historian). For the different ages of the single organism or human being, Herder refers to Aristotle, Horace and Hagedorn (SW IV, 450), for the cycles of knowledge in human history he names Hemsterhuis (SW XI, 125), and for the idea of world or cosmic cycles he names the Egyptian and Persian religions of antiquity (SW XXIV, 541 *et seq.*). Finally, we know that he was familiar from an early date with Kant's cyclic theory of stellar evolution as propounded in the *Allgemeine Naturgeschichte* (Kant 290 p. 317).
332 Popper 209 pp. 159-160.
333 Cf. the theories of Spengler and Arnold Toynbee.
334 Cf. Rouché 172 pp. 85 and 375.
335 Reimann 108; Harich 84; and Dobbek 76.
336 SW IX, 536 *et seq.* Rudolf Haym (Haym 64 II, 54) was the first to appreciate the essay's significance as an expression of Herder's theodicy; cf. also Boucke 73 p. 139 and Jacoby 154 p. 310.
337 SW IX, 537.
338 SW XIV, 655.
339 SW XXIII, 522.
340 SW XXI, 223 and 225.
341 SW XXI, 316.
342 SW XXI, 316.
343 Irmscher 11 p. 288; Harich 84 p. 54 also discerns Kant's influence.
344 SW XXXII, 229.
345 SW XIII, 47, note, and XXIII, 514-515; cf. Newton's words in the preface to his *Principia*: 'I am induced by many reasons to suspect that they [i.e. the phenomena of nature] may all depend upon certain forces by which the particles of bodies, by some causes hitherto unknown, are either mutually impelled toward one another and cohere in regular figures, or are repelled and recede from one another.'
346 SW XXIII, 518-519.
347 SW XXXII, 229; cf. SW IV, 469.
348 Cf. Irmscher 11 p. 291.
349 SW XIV, 583. Dobbek wrongly suggests that only Goethe, not Herder, applied the dialectical notion to biology (Dobbek 76 p. 43).
350 SW VIII, 173-174; cf. SW VIII, 272.

351 SW VIII, 174; also SW XII, 20 and XV, 535; cf. Jacobi's letter to Herder, 30 June 1784 (Jacobi 36 pp. 492-493).
352 SW XI, 208.
353 SW XIV, 234. Rouché 172 p. 377 cites several other instances of the same kind.
354 SW XXXII, 228.
355 E.g. SW VIII, 99; VIII, 169-170; XI, 397; XIV, 651; XV, 305; XVI, 554; XXI, 257; XXII, 230; etc. On the ethical aspects of Herder's dialectic, see also Dobbek 76 pp. 33, 43 and 45.
356 Dobbek 143.
357 Cf. Boucke 73 pp. 18-93 for a detailed review of the earliest exponents of such ideas.
358 SW XV, 305.
359 Cf. H. Hallam, *Introduction to the Literature of Europe in the 15th, 16th and 17th Centuries*, London, 1837-1839, III, 144, and SW XXXII, 157.
360 Cf. SW I, 246 and the editor's note thereto on Herder's reading of Needham, who is also mentioned in Herder's notes to Kant's lectures of 1762-1764 (Irmscher 12 p. 57). For Needham's own doctrine, see Needham 319 p. 322.
361 Cf. Jeans 232 p. 194.
362 E.g. Harich 84 p. 63 and Irmscher 11 p. 290.
363 By W. Witte (Witte 191 p. 252).
364 Kant 304.
365 *Bibl. Herd.* 3 Nr. 3519[4].
366 Cf. Düntzer 23 II, 20, Herder to Lavater, 30 October 1772.
367 Pistoi 321 p. 231; cf. SW XIV, 681.
368 As Irmscher 11 p. 291 implies.
369 SW I, 246 and XIV, 663.
370 Needham 319 p. XI refers to 'expansion' and 'résistance'.
371 Haym 64 I, 673 and Boucke 73 pp. 130 and 177.
372 Cf. SW IV, 103 and Haym's biography of Herder, new edition, 1954, I, 384.
373 Hoffart 153 p. 43 and Rouché 172 p. 370.
374 SW V, 466 *et seq.*
375 Cf. Günther 229 p. 60.
376 Cf. SW XIII, 267.
377 Cf. Rouché 172 p. 377, note; Irmscher 11 p. 291; and Boucke 73 p. 176.
378 Irmscher 12 pp. 89-90: 'Praktische Philosophie nach Hutcheson und Baumgarten . . . Das uneigennützige Gefühl ist [der] Anziehungskraft ähnlich und der Zurückstoßung eigennützige. Beide in conflictu machen die Welt aus.'
379 SW IV, 5.
380 By Haym 64 II, 246 and Boucke 73 p. 147.
381 Cf. Regli 171 pp. 38 and 80.
382 Rouché 172 p. 378.
383 As Rouché 172 p. 378 implies.
384 Cf. Haym 64 I, 584. The work concerned appeared in its second edition in 1764.
385 Cf. Haym 64 II, 54.
386 SW V, 468.
387 Cf. Willey 247 p. 137.
388 See SW V, 269, editor's note.
389 As Boucke 73 p. 94 maintains.
390 See notes 378 and 379 above.
391 SW I, 125-130. Kant (and Herder) also knew the similar theory of the astronomer Thomas Wright, whom Kant refers to in his *Allgemeine Naturgeschichte* (Kant 290 p. 231).
392 Cf. Zöckler 250 II, 206.
393 Dobbek 76 p. 28; cf. also Rasch 69 p. 124, who believes that Böhme influenced Herder here.
394 SW I, 520.
395 Lovejoy 233 p. 83.
396 SW XXXII, 218.
397 Lovejoy 233 p. 94.
398 Engels 199 p. 26.
399 Engels 199 p. 153.
400 Pistoi 321 p. 231.
401 Hook 201 p. 712.
402 Harich 84 p. 63.
403 As Dobbek suggests in his editorial comments to Einsiedel 270 p. 14.
404 Notably Reimann 108 and Harich 84.

405 Hook 201 p. 712.
406 Irmscher 11 p. 288.
407 Engels 199 p. 38.
408 As Irmscher 11 p. 293 puts it, Herder presupposes a 'Communikabilität von Geist und Wirklichkeit'.
409 Cf. Dobbek 76 p. 18.
410 Cf. Dobbek 76 pp. 20-21 and Boucke 73 p. 138.
411 SW XVI, 570.
412 Dobbek 76 p. 17.
413 SW XVI, 551-552.
414 SW XV, 535.
415 SW XVI, 560.
416 Rouché 172 p. 532 and Boucke 73 p. 160.
417 SW XVI, 555.
418 SW XVI, 556.
419 Cf. SW XIII, 266 and XIV, 681.
420 Brugmans 261 pp. 200 and 213.
421 Cf. Brugmans 261 p. 141 etc.
422 Cf. Strothmann 184 p. 185.
423 By Rouché 172 p. 532 and Boucke 73 p. 160.
424 As formulated in Jammer 231 p. 31.
425 Jammer 231 p. 31.
426 SW VIII, 202; cf. SW XVI, 560.
427 Haym 64 II, 54.
428 Hemsterhuis 284 p. 68.
429 SW XIII, 276.
430 Needham 319 p. 342.
431 SW XIII, 179.
432 Hemsterhuis 284 p. 74.
433 SW XIV, 586.
434 SW XVI, 558 (1787).
435 SW XXIII, 512.
436 The reason for this is not least that one can speak of 'opposition' in empirical situations in so many different senses. A relationship between opposites need not involve any conflict, for example, as it does in the Marxist theory of class struggle. Such relationships may be relationships of complementarity, interaction, alternation, or mutual exclusion: cf. Dobbek 76 p. 17, who distinguishes between opposition within a higher concept (e.g. black and white), the superseding of one pole by its opposite (e.g. youth and age) and the interdependence of opposite poles (e.g. North and South). Obviously, not all of such pairs can be said to produce a 'synthesis' either.
437 Hook 201 p. 708.
438 Cf. Engels 199 p. 26.
439 Engels 199 p. 26.
440 SW XI, 208.
441 SW XXII, 240.
442 SW XIII, 82.
443 Needham 206 pp. 16-19 and 190.
444 Needham 206 p. 190.
445 Cf. SW XIII, 284.
446 SW VIII, 104, studies for the *Plastik*, around 1769. In this instance, Herder combines the two theories, of embryological and of mental development.
447 Rouché, who writes: 'En tout cas, Herder se distingue de Hegel en ce que chez lui l'alternance de la thèse et de l'antithèse n'aboutit pas à une synthèse' (Rouché 172 p. 376), is clearly mistaken.
448 Popper 210 p. 418.
449 Hook 201 p. 709.
450 Popper 210 p. 419.
451 Popper 210 p. 424.
452 Cf. Hook 201 p. 710.
453 Especially Reimann 108 and Harich 84; even Dobbek, whose article on the same theme is less extravagant (Dobbek 76), does not refute his more incautious predecessors.
454 Reimann 108 p. 62.
455 Harich 84, *passim*.

456 Goethe 274 XI, II, to Kanzler von Müller, 1828, concerning Tobler's aphoristic fragment on nature.
457 Haym 64 I, 30.
458 Herder's MSS S.P.K. D.S.T. Kapsel XXVI Nr. 5 pp. 9-11 and p. 21.
459 Herder's MSS S.P.K. D.S.T. Kapsel XXX Nr. 1, Studienbuch A I, pp. 126 verso-127 recto.
460 Irmscher 12 pp. 17-39.
461 Caroline 65 I, 58.
462 Herder 31 I, 312, Herder to Lindner, 5 October 1764.
463 SW IV, 346 and 362.
464 SW IV, 90 *et seq.*
465 Caroline 65 I, 135.
466 SW IV, 362.
467 SW XXXIII, 222-223.
468 *Bibl. Herd.* 3 Nr. 3102, 3103, 3111, 3256, 3257, 3571-3, 3578, 3579, 3584, 3619.
469 SW VIII, 64, *Plastik,* 1778.
470 E.g. SW XXXII, 32; IV, 373; XXII, 238.
471 SW IV, 89.
472 SW IV, 88-89.
473 SW IV, 90-103, fourth *Kritisches Wäldchen.*
474 SW IV, 103.
475 SW IV, 90; see SW IV, 101 for more details concerning Euler's theories.
476 Cf. Pledge 238 p. 82.
477 SW IV, 102.
478 SW IV, 95 and 98.
479 Cf. J. Tyndall, *Sound. A Course of Eight Lectures,* London, 1867, p. 117.
480 Tyndall, *op. cit.,* pp. 49-50.
481 Tyndall, *op. cit.,* pp. 305-306. On all this, see also articles 'Hearing' and 'Helmholtz' in the *Encyclopaedia Britannica.*
482 SW IV, 105.
483 SW XXI, 32-33.
484 Russell 211 p. 61.
485 Irmscher 12 p. 21.
486 Irmscher 12 p. 31.
487 SW XXI, 32. *Metakritik.*
488 Cf. Caspar-Kepler 308 p. 280.
489 SW XXI, 36, *Metakritik.* On this point cf. also Clark 62 p. 401.
490 See, for example, SW V, 521; X, 338; XIII, 9; XIII, 177; XVIII, 406; XXXI, 567; etc. For the idea that physical and moral laws are parallel see SW VIII, 99 and 169-170; XI, 397; XV, 305; XVI, 558; XXI, 257; XXII, 230; etc.
491 For the influence of the environment upon the society and its collective mental attributes, see SW XIII, 305 (*Ideen* Pt. II). For the same influence on the mind of mankind as a whole, see SW XIII, 20 (*Ideen,* Pt. I). Similar deterministic doctrines appear in the work of Du Bos (cf. Koller 269 p. 73) and of Montesquieu (cf. Regli 171 p. 11), with both of whom Herder was early familiar.
492 SW XIII, 209: the ethical outlook of the Eskimos is conditioned by climate.
493 Cf. Kühnemann 67 pp. 102 and 193 and Witte 191 p. 265. This doctrine, very widespread in the eighteenth century, is expressed particularly forcefully by the philosopher Shaftesbury.
494 SW XIV, 207 and 244, *Ideen.* The belief that physical and ethical worlds are parallel, by divine ordinance, occurs in Hamann's doctrine that nature and history are parallel revelations of God, as Rouché 172 p. 178 and Sommerhalder 180 p. 30 observe. It also appears in the works of Thomas Burnet (cf. Willey 247 p. 33), in Butler's *Analogy of Religion,* in the works of Dalberg (Dalberg 268 p. 101), Lavater (cf. Haym 64 I, 507), Leibniz (cf. Blumenthal 139 p. 46 and Leibniz 312 p. 622) and others, all of whom Herder mentions at some time or another. Butler and Lavater, however, rely on scriptural revelation in making this comparison, whereas Herder, and to a lesser extent the others named above, think that the parallel can be upheld on the strength of naturalistic evidence alone. In applying the analogy of gravitation to ethics, for example, Herder uses predominantly naturalistic arguments.
495 Kühnemann, a neo-Kantian, consistently stresses the subjectivistic elements in Herder's thought, as in this case (cf. Kühnemann 67 pp. 102 and 193).
496 Rouché 172 p. 178. As always, Rouché is out to show that Herder is a thoroughly religious thinker.
497 Walter Pater, *The Renaissance,* Library Edition of *Works,* London, 1910, p. 231.

498 SW XIII, 382.
499 SW XIII, 448.
500 Cf. Kühnemann 66 p. 364.
501 Behrens 18 pp. 405-406.
502 Haym 64 I, 665.
503 SW XIV, 225 *et seq.*
504 SW XIV, 225-226.
505 SW XVI, 469.
506 See Kühnemann 14 p. CXI and Rouché 172 p. 370.
507 By Boucke 73 p. 148, Rouché 172 pp. 369-370, and Clark 62 p. 344.
508 Rouché 172 p. 369.
509 'Eben dieselben Ursachen, durch welche ein Ding zur Vollkommenheit gelangt und darin erhalten wird, bringen es durch unmerkliche Stufen der Veränderungen seinem Untergange wiederum nahe' (Kant 293 p. 198).
510 Rouché 172 p. 380.
511 E.g. SW XVII, 118; XVIII, 329; XVIII, 339. Rouché 172 p. 370 points out that the image appears in the works of Lambert and Hemsterhuis. Dalberg 268 p. 106 also uses it, although Hemsterhuis, as Rouché says, is probably Herder's chief source.
512 SW XVIII, 339. *Humanitäts-Briefe.*
513 SW XVIII, 329; cf. SW VIII, 209.
514 Hamann 30 IV, 304, Hamann to Herder, 3 June 1781.
515 SW XVII, 118.
516 Kühnemann 67 p. 145. Haym 64 II, 237-238 and 296 argues in like fashion.
517 *Jean Pauls Werke,* ed. Preußische Akademie der Wissenschaften, Weimar, 1927 ff., I, 11, 431.
518 SW XIV, 53.
519 SW XIV, 213 and 222.
520 SW XIV, 215 and 218.
521 SW XVII, 119-120.
522 Einsiedel 270 p. 80.
523 SW XVIII, 345.
524 E.g. SW XVI, 49. *Zerstreute Blätter,* 1792.
525 SW XVIII, 345 (Knebel, quoted by Herder).
526 SW XIV, 230-234.
527 SW XIV, 234.
528 Cf. Rouché 172 p. 370.
529 SW XXII, 72.
530 SW X, 400. *Theologische Briefe.*
531 SW XIV, 177-178.
532 E.g. SW XV, 559; XVI, 150 and 376; XVII, 108; XIX, 171; XXIII, 230; XXX, 350.
533 SW XVI, 547.
534 Leibniz 312 p. 622.
535 By Stadelmann 181 p. 39.
536 SW XIV, 250.
537 Cf. Kühnemann 67 p. 220.
538 SW XXIV, 58-59, *Adrastea,* 1802.
539 SW XVI, 469-470.
540 Cf. Nordenskiöld 237 p. 215.
541 SW XVI, 541-544 and 569-571.
542 Hamann 30 IV, 374, Hamann to Herder, 20 April 1782.
543 Hamann 30 IV, 304, Hamann to Herder, 3 June 1781.
544 Kühnemann 67 p. 145.
545 See Bertalanffy 196 p. 52.
546 Nilson 207 p. 205, quoting from Paul A. Samuelson's *Foundations of Economic Analysis.*
547 Nilson 207 p. 209.
548 Bertalanffy 196 p. 201.
549 Bertalanffy 196 p. 201.
550 Popper 209 p. 112.
551 Popper 209 p. 119.
552 SW XXI, 228-229.
553 SW IX, 537. *Uber die dem Menschen angeborene Lüge.*
554 E.g. SW XIII, 174, *Ideen,* Pt. I; also SW XXI, 219, *Metakritik.*
555 Irmscher 11 p. 288.
556 Irmscher 11 p. 289.

557 SW XIII, 60-61.
558 SW XIII, 178.
559 SW V, 583-584.
560 Irmscher 11 p. 288. Cf. Eudo C. Mason, *Goethes 'Faust'. Its Genesis and Purport*, Berkeley and Los Angeles, 1967, p. 134, who argues (rightly, in my opinion) that Goethe was probably influenced by these very utterances of the young and radical Herder.
561 SW VIII, 104, notes for the *Plastik*, circa 1769.
562 E.g. SW VIII, 8-9, *Plastik*, 1778.
563 SW VIII, 104, notes for the *Plastik*, circa 1769.
564 SW XIII, 169.
565 SW II, 65. *Fragmente*, 1768.
566 Wolff 328 I, 53.
567 Kant 290 p. 266.
568 Cf. SW XIV, 660 (Herder's notes to Thomas Creech's edition of Lucretius).
569 Cf. Varnhagen 53 II 223, Herder to Knebel, 11 September 1784 and *ibid.* p. 237, Herder to Knebel, 6 November 1784.
570 Goethe 274 VIII, 258-259. 1823.
571 Zilsel 215 p. 716.
572 Lovejoy 96 p. 173; cf. also Götz 79 p. 399 and Schmidt-Cürtow 115 p. 144.
573 Lovejoy 96 p. 173.
574 McEachran 68 p. 84, note.
575 SW IV, 361.
576 See SW XIV, 641.
577 Lambert 311 II, 323.
578 Cf. SW IV, 89 (fourth *Kritisches Wäldchen*, 1769) and editor's note.
579 Lambert 311 II, 394.
580 Cf. SW IV, 465. Notes for the *Journal*, 1769. For a more detailed discussion see Nisbet 102 p. 271.
581 Toulmin 212 p. 42.
582 Toulmin 212 p. 86.
583 O. Temkin, for instance, in his excellent article on principles of ontogeny around 1800, notices that, in Herder's thought, the development of the single organism (or human being), that of man as a whole through the various 'ages', the successive creation of species, and the history of man (considered as a succession of civilisations), are all parallel but distinct levels (Temkin 126 p. 244). Cf. also Kuhfus 160 p. 22.
584 SW XIV, 227-229.
585 See the first half of his *Vom Erkennen und Empfinden* of 1778.
586 SW XIII, 82.
587 SW XIII, 20. *Ideen*, Pt. I.
588 SW XIV, 583, early MSS for the *Ideen*.
589 Cf. Engels 199 p. 26.
590 Needham 206 p. 192.
591 SW V, 29. *Über den Ursprung der Sprache*.
592 SW V, 30.
593 SW XIII, 82.
594 SW XIII, 83.
595 SW XIII, 176.
596 Needham 206 p. 182.
597 Bertalanffy 195 p. 34.
598 Goodfield 228 pp. 131 and 160.
599 SW XIII, 182. *Ideen*, Pt. I.
600 Lucretius 315 I, 165-166.

PART II

HISTORY OF SCIENCE

CHAPTER III : THE PHYSICAL SCIENCES

The evolutionary process involves a development from purely physical forms to new forms possessing life, and ultimately to others equipped with mind. The modern sciences emerged, from the Renaissance to the present, in broadly the same order: the basic principles of the physical sciences were laid down first, then the biological sciences emerged as such, and finally, scientific methods were applied to the study of man. Similarly, any scientific problem which involves more than one of these levels must usually be approached first of all in its fundamental, i.e. physical aspects, and only later can the more involved biological or psychological phenomena be clearly understood.

Herder rightly follows this sequence of investigation in his *Ideen*. Unfortunately, however, if we disregard his early grounding in mathematics and physical science during his university and teaching years (as well as his sporadic encounters with information from all the sciences in the course of his multifarious reading), we find that his scientific studies, so far as they are directed by a specialised interest which finds detailed expression in his works, follow exactly the reverse order. First arose his interest in the psychology of art and the phases of human society; then he set out to establish psychology upon a physiological, i.e. biological basis. While preparing his *Ideen,* which again treat of human society, he embarked upon a wider study of general biology and natural history, although the physical sciences are also represented in this work, in a subordinate position. Finally, in the *Adrastea,* we find his scientific interest confined entirely to the physical disciplines, such as astronomy and the theory of light and colour.

This reversed order of study helped to produce the anthropomorphic and anthropocentric ideas we have already noticed in his biological thought, as well as certain animistic elements in his later theories of the physical world.

While it would be wrong to lose sight altogether of this unusual feature of Herder's development, the present study will review his knowledge of the sciences in the conventional sequence; this should help to prevent earlier conceptions from distorting our attitude to later ones, as happened with Herder himself, and it should make it easier to assess his ideas impartially as contributions to the scientific tradition.

Herder obtained some knowledge of the physical sciences from Kant's lectures, which dealt, among other things, with the classification of the physico-mathematical sciences, and with physical geography. He also read Kant's ***Allgemeine Naturgeschichte*** at an early date. Caroline Herder tells us that he further attended Teske's lectures, devoted entirely to physics, at Königsberg.[1] His library included physical treatises by J. Clauberg, J. A. Comenius, members of the French Académie des Sciences, J. Keill, S. Majolus, H. Regius, J. C. Stock, and Chr. Wolff[2]; in the *Journal,* he mentions various writers upon physics, such as Mariotte, Nollet, Torricelli, and Tsirnhausen,[3] although he did not subsequently study them all in detail as he had intended. All this, apart from the numerous writers on all branches of physical science whose influence upon Herder will shortly be discussed, indicates that, from an early date, he showed interest in a wide selection of authorities on the physical sciences, and physics in particular, although this interest reached its height only in his later years.

But before dealing in full with Herder's knowledge of the various physical sciences, one must first decide what his opinions were concerning the basic elements of the physical world.

1. The nature of the physical world

(a) The nature of matter, and atomic theories

The earliest physical theories, such as those of the pre-Socratic philosophers and those of ancient China, usually postulate not one, but several basic kinds of matter – such was the long-lived theory of the four elements. Yet even in some pre-Socratic thinkers we can detect a tendency to select one element as the most powerful, or even as the progenitor of the others: this happened in Thales' theory of water, Heraclitus' theory of fire, and so on.

With the later Greek philosophers, and, more particularly, with the influx of Judæo-Christian ideas into European thought, there arose dualistic theories which distinguished physical matter (collectively) from the spiritual realm of mind.

Much later philosophy and psychology is dominated by the problems resulting from this dualism. Monistic thinkers rejected the dualism either by denying that one or other of the two poles had any separate identity, or by seeking some higher common factor supposed to lie behind both. Herder, as we know, tended to favour monism. Thus, in discussing his theory of matter, one cannot disregard his beliefs concerning mind, as one could with any thoroughly dualistic thinker; conversely, it is impossible to deal with his theory of mind as a purely psychological question without referring to his conception of matter. For, in all monistic systems, mind and matter are each defined in relation to the other, which is either negated, or accommodated in some way to its opposite.

R. T. Clark Jnr., however, maintains:[4]

> In Herder's epistemology there is no science of matter. ... At no time does he devote any attention to the conception of matter. He does not, like Bishop Berkeley, deny its existence; he simply ignores it.

This is not strictly true; for although Herder's works yield no *science* of matter in the physicist's sense, they do present several divergent solutions to the philosophical problem of matter, all of them bound up in some way with his concept of 'Kraft'.

Some critics maintain that Herder's 'Kräfte' are purely spiritual.[5] This implies that he denies the existence of any non-spiritual or inanimate matter, independent of the 'Kräfte' themselves. His wife Caroline, in her memoirs, indeed says that Herder believed that physics would come to recognise more and more 'geistige Kräfte'.[6] He says himself, on one occasion, that all 'Kräfte' are 'von geistiger Art'; but in the latter case, he is referring in particular to the soul and its immortality.[7] One critic declares of his attitude: 'Auch die Materie besteht aus Kräften', which are purely immaterial; this writer thereby denies that matter has any distinct reality for Herder.[8] He does, in fact, state (in his *Gott*): 'auch das Organ selbst ist ein System von Kräften', and he speaks of 'diese die Materie ausmachenden Kräfte',[9] thus lending support to such contentions. Most critics agree that Leibniz's influence encouraged him in these more spiritualistic statements.[10]

Statements of a completely different kind appear, however, elsewhere in Herder's writings. The following passage appears in the compilation *Herders Lebensbild,*[11] and is there said to date from the Riga period; it was republished by Suphan, who on one occasion dates it in 1769, on another in 1771.[12] In the light of our earlier conclusions, this utterance in fact seems typical of Herder's views in 1769: 'Wie alle klare Ideen aus dunkeln werden: so auch Gedanken aus Bewegung der Materie.' It must also be added, in justice, that Herder continues with the qualification that his statement would still be true 'wenn endliche Materien doch nur nichts als Vorstellungen einfacher Wesen sind, die nicht Materie sind'; these 'einfache Wesen', as Haym observes,[13] are Leibniz's monads, and Herder introduces them in order to leave the way open to his alternative theory of 'Kräfte', which so often replace matter in his philosophy. Again in 1769, however, he writes to Mendelssohn of the 'Grundstoff der Kräfte', thus apparently implying that 'Stoff' is more basic than 'Kraft'.[14] We earlier noticed, moreover, that in the fourth *Kritisches Wäldchen,* also of 1769, he speaks of man's 'materielle Seele',[15] and in examining his various approaches to the problem of perception, we saw that some of his theories carried strong materialistic overtones. Again, in the *Ideen* and after, he often reduces the various 'Kräfte' of the physical world to material agencies (e.g. 'Wärmestoff', 'Lichtteile', 'magnetische Materie', 'Aether', etc.), and since he frequently employs these 'Kräfte' to describe the properties of organic life, he cannot avoid implying that life, and therefore also the soul which manifests itself in life, is of a subtle but material nature. Such an inference recalls the pneuma of the Stoics, and Swedenborg's belief in a subtle, material soul.[16]

It was earlier observed that Herder, in his theory of a universal 'type', and in various descriptions of the growth of organisms, at times maintains that the complete organic form is nothing more than a configuration of interacting 'Kräfte'. On the other hand, he often says, as in his *Gott,* that these 'Kräfte' must operate within a *material* 'Organ'.[17] In these latter utterances, he clearly accepts that *both* 'Kräfte' and inanimate matter exist; this immediately recalls the traditional dualism of matter and mind or spirit. Thus he likewise declares in the *Ideen*: 'Es ist *organische Materie,* zu der lebendige Kräfte kommen müssen, sie erst zur Gestalt des künftigen Geschöpfs zu bilden'.[18] On this occasion, he is arguing in favour of the soul's immortality. It is on such occasions that the latent dualism within his 'Kraft' theory becomes most apparent. In such cases, it is no longer a question of a dualism of 'Kräfte' and forms which arise out of their interaction, but of 'Kräfte' and traditional inert matter, i.e. two separate entities.

But even in a completely naturalistic context Herder says, in the same work, of his organic 'Kraft', 'daß sie organische Teile sich aus dem Chaos einer homogenen Materie zueigne'.[19] Here, he unmistakably concedes that an inert matter, divisible into 'Teile', has a separate existence. On the other hand, he again affirms, in his *Adrastea,* that no matter exists apart from indwelling 'Kräfte'.[20] This recalls Leibniz's statement: 'il y a un Monde de Créatures, de Vivans, d'Animaux, d'Entelechies, d'Âmes dans la moindre partie de la matière'.[21] Thus, those who contend[22] that Herder believes in a 'dead' matter imbued with vitalising forces would indeed be right in the case of the more dualistic passages just cited, but not of the others which define even matter itself as consisting of 'Kräfte'.

In the light of such conflicting ideas as all these, it is no wonder that Herder declared in 1774 of the soul and its 'Kräfte':[23]

> Wir werden sie nie ganz übersehen, wenn wir uns immer nur bei einer Seite aufhalten, bei dem Idealismus ihrer Kräfte, oder bei den *qualitatibus secundis* körperlicher Ideen . . . Auf der Höhe des Meers ist freie, grosse Fahrt.

He repeats this point in the more famous words which occur in the 1778 version of his *Vom Erkennen und Empfinden*: 'ich weiß noch nicht, was Material oder Immaterial sei?'[24]

Thus, it should be clear that it is not enough to say that Herder was a materialist or a spiritualist, or a dynamist, a believer that only 'Kraft', as a common denominator of matter and mind, exists. He is all of these, often with hints of traditional dualism, and it would probably be true to say that he used his 'Kraft' conception not only to paper over a concealed dualism, but also as an ambiguous device by which he could employ purely materialistic ideas on some occasions, and purely spiritualistic ones on others.

What is the scientific significance of all this? Boscovich resolved matter entirely into purely relational, but mathematically delineable forces in a way which anticipated a good deal of modern physical theory. Classical physics (i.e. Newtonian mechanics) operated with quantitative matter (mass) and force, leaving mind as a category quite distinct from physical force, and outside the purview of physics. Materialistic theorists of science declared that physical matter and force, with their physical or mechanical laws, applied to mind as well as to inert matter, but pursued their strictly physical investigations in the traditional way. All of these theories are unambiguous, and each could provide a working basis for the growth of physical science. Herder's theories of matter, however, are incorrigibly ambiguous, and belong almost wholly to the realm of speculative metaphysics; taken together, they have no place in any coherent theory of the physical world.

Similar ambiguity arises when Herder discusses the ultimate structure of matter. His first reference to atomic theories appears in an early extract from Leibniz's *Nouveaux essais*:[25]

> Wäre die Materie aus völlig harten Theilen zusammengesetzt, so wäre die Bewegung im Vollen unmöglich. Vielmehr ist der Raum voll von einer ursprünglich flüssigen Materie, die aller Theilung fähig, und auch aller Theilung ins Unendliche ausgesetzt ist...

The density of this matter varies locally according to degrees of motion; no part is impenetrable or indivisible.

In an early version of the *Ideen*, Pt. IV, Herder says in passing that the world is composed of both 'Kräfte' and atoms.[26] In his *Gott*, he again affirms that atoms are the ultimate components of the universe, referring, however, to Leibniz's (ideal) monads and to Boscovich's atomic theory.[27] He calls atoms, as defined by Boscovich, 'untheilbare wirkende Elemente . . . , ohne welche sich die Natur der Körper selbst physisch nicht erklären läßt'.[28] These indivisible elements, however, are clearly at variance with the infinitely divisible matter Herder had described in his early extracts from Leibniz, and which Leibniz had already described in his *Monadologie.*[29] In another version of his *Gott*, Herder speaks of 'manches unphilosophischen Wahnes, daß es z.B. Atomen, absolut-harte Körper und dergleichen in der Natur gebe. . . . ein unendlich kleiner Atom hemmte die Räder der ganzen Schöpfung',[30] repeating this objection in the *Adrastea* of his last years.[31] But if there are no infinitely hard (and therefore indivisible) units, matter must be infinitely divisible; yet we have just seen that Herder described Boscovich's atoms as 'untheilbar', and considered such units as necessary for any account of the physical world.

It seems, therefore, that he had no certain views upon the atomic theory of matter. Although chemists since the time of Boyle had used the theory without worrying unduly about the intrinsic nature of the atoms, philosophers such as Leibniz rejected them and considered that matter was infinitely divisible, so that no ultimate, extended particles, such as Lucretius, Gassendi, Huygens and Boyle had postulated, could exist. Boscovich revised Leibniz's theory by identifying the ultimate units of matter with mathematical points.[32] These are, in a sense, 'untheilbar', since a point is not extended. If this is what Herder meant in his approving description of Boscovich's theory, he is freed from the charge of inconsistency, and can thus be classed as a Leibnizian who accepted the physically superior version of the Leibnizian theory of matter put forward by Boscovich. But, since Boscovich's inter-atomic forces were purely relational and mathematical,[33] whereas Herder considered his own 'Kräfte' as real and dynamistic, the parallel is far from complete. As in his theory of matter and 'Kraft', he seems to have been uncertain about the ultimate nature of atoms, and put forward no constructive or coherent physical theory concerning them.

Lange, referring in his history of materialism to all who attempt to describe the ultimate nature of matter and its constituents, shrewdly declares 'daß das ganze Problem von Kraft und Stoff in ein Problem der *Erkenntnistheorie* ausläuft und daß für die Naturwissenschaften ein sicherer Boden nur in den *Relationen* zu finden ist, wobei immerhin gewisse Träger dieser Relationen, wie z.B. die Atome hypothetisch eingeführt und wie wirkliche Dinge behandelt werden dürfen; vorausgesetzt freilich, daß man aus diesen 'Realitäten' kein Dogma mache'.[34] Gottfried Martin, in like vein, writes in his work on Kant's theory of science: 'This renunciation of the knowledge of essence and the limitation to relations constitutes the peculiar pathos of modern natural science and was also expressed convincingly by Kant' [i.e. with the 'Ding an sich'].[35] Bertrand Russell similarly rejects materialism so long as it claims that all reality consists of 'little hard lumps'. True scientific materialism, he says, simply states that all reality, including mind, is subject to physical laws: 'The important question is not whether matter consists of little hard lumps or of something else, but whether the course of nature is determined by the laws of physics.'[36] And Popper supports the 'methodological nominalists', who ask how matter behaves, and regard words only as useful means of description, against the 'methodological essentialists', who ask such questions as 'What is matter?' and 'What is force?'[37]

All this goes to show that Herder's qualitative concepts such as 'Kraft' made it impossible for him to elaborate a theory of matter compatible either with the classical physics of his age, or with the more progressive hypotheses of contemporaries such as Boscovich, or with more recent scientific usage.

(b) Force and energy

Various critics have denied that Herder's 'Kraft' has any similarity to the 'Kraft' (i.e. force) of modern mechanics.[38] Lacking any definition in terms of such quantities as mass, velocity and distance, and retaining, in the doctrine of 'Palingenesie', a quasi-personal individuality throughout their transformations, Herder's 'Kräfte' are certainly very different from the forces of both classical and modern physics. One writer further correctly points out[39] that Herder's 'Kraft' cannot be compared with modern *energy*, since it is not mathematically (quantitatively) measurable, but constitutes, in Herder's words, the *'Maas der Realität eines Daseyns von innen'*.[40]

Undeterred by such considerations, R. T. Clark shows how Herder borrowed the word 'Energy' from Harris, who distinguished it from Power, and quotes Kluge's *Etymologisches Wörterbuch* in claiming that Herder introduced the word 'Energie' *in its modern, scientific sense* into German.[41] But firstly, there is no evidence to show that Herder had read the work (*Philosophical Arrangements*) in which Harris made the distinction between Power (as potential force) and Energy (as active force), although the word 'Energy', without this definition, appears in Harris' *Three Treatises*, read and quoted by Herder in the 1760's; besides, Harris made no attempt to relate his conceptions to physics. Secondly, the reference to Herder's 'Energie', supported by Kluge, as the first example of the modern scientific usage of the term, can scarcely be reconciled with Clark's subsequent statement that Herder's 'Kraft', *not* his 'Energie', corresponds to our modern 'energy'. And thirdly, Herder never uses the word 'Energie' in the way in which it is used in modern science, as Kluge infers, for it is never quantitative, but is employed, for example, to describe man's soul as an 'Abdruck göttlicher Energie'[42] (in 1778), and to describe the natural divisions of the world as arising 'zufolge der ihm [i.e. jedem Theil der Welt] einwohnenden Natur- oder göttlichen Energieen'[43] (in 1787). For Herder, like Harris, always uses the word in an aesthetic (cf. Schiller's 'energische Schönheit'), religious, or metaphysical sense.

Clark soon drops the comparison between Herder's 'Energie' and modern energy, and goes on to say:[44]

> Above all, if we can equate Herder's 'Kraft' with modern energy – and to do so would be doing no violence to either – it is startling to notice how he places energy at the center of all physics, i.e. of all science.

He further says of Herder's 'Kraft': 'If it is purely metaphysical, then most of modern physics is also metaphysical',[45] and excuses Herder's vagueness and his inability to define 'Kraft' coherently by showing how physicists in Herder's age could not decide whether the product of mass and velocity (mv – our measure of simple mechanical motion) or of mass and the square of velocity (mv^2 – our measure of mechanical motion in its capacity to do work, i.e. of kinetic energy) should be the measure of motion (or of force, still not clearly distinguished from energy at this time).[46]

In the passage quoted by Clark as an example of Herder's pardonable vagueness, Herder says of the word 'Kraft': 'wer weiß, was es, inwendig der Sache selbst, bedeute?'.[47] But in this, as in all similar utterances, Herder is not voicing doubts concerning the quantitative measure (whether mv or mv^2) by which physical force (not energy, for he nowhere mentions any quantitative formulae comparable with those by which potential and kinetic energy were defined in nineteenth-century physics) could be defined; he is simply echoing the current truism, which, as we noticed initially, he nevertheless violates on other occasions by reducing his 'Kraft' to various animistic or even material agencies, that the intrinsic *quality* of 'Kraft' may be unknowable. Thus, the cause of Herder's uncertainty is not to be found among the disputes of contemporary physicists over mathematical formulae; his doubts are purely metaphysical.

But Clark says that most of modern physics is just as metaphysical as Herder's 'Kraft'. It is indeed true to say that physics makes no claim to know the intrinsic nature of energy, or, for that matter, of force. But this does not mean that they are metaphysical concepts as used in science, because the aspects of them with which physics is exclusively concerned are the measurable changes observed in the physical world; the metaphysical reality, non-reality, or nature of energy as a thing-in-itself is a matter of total indifference to the physicist. In mechanics, terms such as energy can be used not only quantitatively to describe observed changes, but can even be used (more questionably, from the point of view of philosophy), to describe the *causes* of these changes, without prejudicing the accuracy of scientific results. But there is the risk that they may pass into other sciences such as biology, where they tend to acquire a quasi-substantial reality, distinct from the observed effects with which they were originally associated. As Friedrich Engels says of force: 'in every natural science, even in mechanics, it is always an advance if the word *force* can somehow be got rid of'.[48]

In conclusion, let us briefly review the stages through which the conception of force has passed in physical science, in order to judge whether Herder's versions were behind or in advance of those of his age.

Leonardo wrote in his notebooks: 'Weight is corporeal and force is incorporeal. Weight is material and force is spiritual'.[49] Max Jammer records of Newton's theory: 'Force, for Newton, was a concept given *a priori,* intuitively, and ultimately in analogy to human muscular force'.[50] Nonetheless, though Newton engaged in private theological and metaphysical speculations upon the intrinsic character of force, he allowed only its quantitative aspects to enter into his scientific arguments. Not long before Herder wrote, there were published various works by Boscovich, whom Herder had studied to some degree. Boscovich, as we earlier saw, regarded the intrinsic nature of force as irrelevant to physics, using the word to signify a mathematically determinable relation[51]; his views have been inherited by modern science. On a more philosophical level, Berkeley had earlier supported a similar view,[52] and it was later proclaimed anew by such scientific theorists as Mach, Kirchhoff, and Hertz.[53]

Theories like that of Leonardo concerning the spiritual nature of force are instances of what Whitehead calls 'the fallacy of misplaced concreteness'[54]; it is easy to allow what is merely a word, a model representing a set of relations, to acquire a substantial content of its own. Herder's theory is closer to that which Leonardo had inherited from the Middle Ages than to those of modern physics. It is not comparable with that of Newton, who used force only as a measurable quantity, unlike Herder, who, when applying the term to the physical world, did not even begin to free it from a mass of extraneous associations. In fact, it was this very wealth of association which made the concept so useful, from his point of view. Boscovich's advanced conceptions had been put forward before Herder began to write, but he does not appear to have benefited from them either.

(c) The conservation of energy, force and mass

In the *Ideen,* Herder argues that, since the 'Kraft' of which the soul consists, like all 'Kräfte', is indestructible, the soul must be immortal.[55] This idea has inspired several critics to declare that Herder recognised the law of the conservation of force ('Kraft') or of matter ('Stoff').[56]

Now we have seen that Herder's force is nowhere equivalent to the force whose conservation was proved in nineteenth-century mechanical physics by mathematical theory and experiment, in the work of Robert Mayer, Helmholtz and others. His theory that the individual 'Kräfte' within all organisms are conserved is never extended to include all forces in the universe, physical as well as biological ones. His supposed proof of the theory is that we can never see a 'Kraft' perish[57]; one might add that we can never see a 'Kraft' at all. All this is in no way comparable with modern scientific theories, as several critics have mistakenly claimed. The same objections render void any comparison of Herder's ideas with the law of the conservation of energy. And, so far as the notion of the conservation of mass (or matter) is concerned, we may recall that Herder's theory of matter is completely vague and imperfectly resolved; furthermore, he rejected Kant's theory 'von einem allgemeinen, nie vermehrten, nie verminderten *Quanto* aller Substanzen' in his *Metakritik,* on the grounds that such a statement can never be verified.[58]

What then do early non-mathematical, non-experimental conservation theories such as Herder's signify? Above all, they do not adumbrate modern scientific theories in a marvellous or inspired fashion. They are ultimately derived from the *a priori* conclusion that since the universe, the organism, etc. are all complete wholes, the quantity of their constituents must be constant overall, and changes to them can only take place by rearrangement of their parts. Such are Herder's principle of 'Kompensation', Spinoza's 'suum esse conservare',[59] and Leibniz's principle of plenitude.

On a more materialistic level this *a priori* deduction is expressed in the dictum of Lucretius, noted by Herder in the 1760's, that nothing can be completely destroyed, since something new must always arise out of it.[60] The same assumption lies behind man's use of (presumably constant) weights from the earliest times. All this implies that matter, or rather mass, is conserved throughout all changes. Bacon enunciated this principle,[61] and it soon became an axiom of the new, quantitative chemistry of Boyle, Black and others.[62] As one historian remarks, a belief in the conservation of matter, and even of energy, had already been at least implicit in Galileo's quantitative mechanics.[63] Newton's laws of motion entail the law of the conservation of momentum, as a writer on Newton's science observes.[64] Descartes enunciated the principle of the conservation of motion,[65] which leads directly to that of the conservation of force. Leibniz's physical theory of *vis viva* (our kinetic energy) even implied the law of the conservation of energy, as another authority points out.[66] Kant, in his early essay on physical 'Kraft', also notes that Leibniz himself accepted the Cartesian principle 'daß sich in der Welt immer einerlei Größe der Kraft erhalte'.[67]

Thus, although the more philosophical conservation theories were based only upon *a priori* reasoning, or religious guarantees of permanence (which could be construed as heretical, since they imply that the universe is eternal), and although, in science, they were proved to be valid as universal laws only in the nineteenth century,[68] by Mayer, Joule and others, they had already been applied in a much more practical and quantitative way than they are in Herder's works, from a time long before Herder began to write. Once more, attempts to prove that Herder's scientific *results* were strikingly modern are seen to be completely misguided; they indicate a wholesale disregard for the way in which scientific *methods* have developed.

(d) Mechanism and dynamism

In his *Erläuterungen zum Neuen Testament* (1774-75), Herder declares: 'Die unsichtbare Welt ist uns endlich ganz verschlossen, weil wir Mechanisch denken'.[69] This is but one of numerous similar utterances. In his fourth *Kritisches Wäldchen* of 1769, he had already begun to doubt whether mechanical physics can inform us, for example, about our sensations of sound, although he put forward other more or less mechanistic theories himself in the same year. From this time onwards, however, the psychology of feeling tends to replace mechanical analysis for Herder, and 'Kräfte' increasingly supplant 'dead' matter, as the subjective and objective poles of the world studied by science; thenceforth, he consistently attacks mechanistic theories of nature.

One modern theorist enumerates seven meanings of the term 'mechanism'.[70] We have already encountered one of these in assessing the place of 'mechanistic' as opposed to teleological ideas in Herder's works. A second sense, whereby 'mechanism' is opposed to dynamism, the doctrine that omnipresent forces exist throughout the physical world in their own right, not merely as functions of the mechanics of motion, will now be examined. 'Mechanism', in this case, denotes the belief that the laws of motion, operating within an inert matter, can fully explain how all observed nature is created and sustained. How then does Herder's dynamism alter such a picture of the universe? The answer to this question should bring out the remaining few implications of the 'Kraft' concept for Herder's views on the physical world.

Firstly, 'Kräfte' often simply add a dimension of inwardness to an otherwise 'dead' universe.[71] The forces of simple mechanical motion are assumed to produce all movements from *outside*, by external impact, in elementary mechanics. But the search for an internal cause of motion in the physical world, by analogy with the spontaneous movements of animate beings, helped to produce emotionally conceived, dynamistic theories such as that of Herder, who could not by nature accept the inert and passive universe of mechanistic materialism.

A second obvious feature of Herder's physical dynamism is that it introduces a hypothetical principle of development working from within an ever-changing universe. His views, in this respect, belong to an ancient tradition of philosophical dynamism which reaches from Heraclitus down to the eighteenth century.[72] Such ideas had appeared, usually in idealistic forms, with increasing frequency from the Renaissance onwards, but were becoming more naturalistic around the time of Herder. (See the earlier section on Herder's so-called 'Entwicklungsgedanke'.) With Herder himself, the metaphysical basis of the doctrine is still very pronounced.

Thirdly, this doctrine of development could be implemented upon a more concrete, physical level, producing the theory that everything in the physical world is in a state of perpetual motion. Herder quotes the following sentence from Leibniz's writings, which in turn refer to Boyle: 'Eine Substanz kann nie ohne Handlung, ein Körper nie ohne Bewegung seyn.'[73] Leibniz believed that rest was only a particular, infinitesimally small degree of motion.[74] Kant, more empirically, had said in 1758 that everything is in motion, in gravitational orbits, in the universe of astronomy.[75] We know from his *Allgemeine Naturgeschichte* that he believed, around that time, that such motion was caused by dynamistic 'Kräfte', just as Leibniz had done. But Kant soon overcame Leibniz's rather contrived theory that rest is a form of motion, even before his critical period. Already in 1758, three years after writing the *Allgemeine Naturgeschichte,* he called 'Kraft' 'das Gesetz einer durch die Erfahrung erkannten allgemeinen Erscheinung, wovon man die Ursache nicht weiß',[76] making its existence verifiable only in cases of observed motions. Like Boscovich, he eventually succeeded in using the concept of 'Kraft' descriptively, without substantivising it as Herder so often did. The idea of perpetual motion was forced upon Leibniz's scientific thought by his metaphysical doctrines. Herder, who declared in his *Gott* that even matter is a manifestation of 'Kraft', seems, unlike Kant, Boscovich and others, never to have gone beyond the Leibnizian theory.

A fourth function of dynamism in the physical theory of Herder's age was to provide, within science, an alternative to mechanistic theories of impact or impetus. For the laws of motion, as phrased by Descartes and other pre-Newtonian thinkers, meant that inert masses of matter could only be moved by direct external impact. Newton realised, however, that gravitation is proportional not to the surface, as required by a theory of direct impact, but to the mass of a body.[77] Newton therefore propounded the theory that a gravitational force, of unknown nature, is at work; completely breaking with mechanistic theories of impact, he dismissed Descartes' hypothesis that space is filled with an ether, the swirling motion of which produces gravitational phenomena by direct contact with the affected bodies. Newton's hotly disputed theory of action at a distance admirably described the observed phenomena, but created methodological difficulties, and opened the way for a more extreme dynamism such as that of Herder, who supposed that unseen but *substantial* forces, different from the forces of impact mechanics, governed the physical world. It was Newton's theory of gravity which was to give to much of eighteenth-century physics a more mystical aura than that of the apparently more down-to-earth mechanical physics of Galileo and Descartes.

In his theory of simple mechanical motion, however, Newton retained the concept of impact. An initial impact could set a body into motion, which persisted uniformly in a straight line until the body was acted upon by some other force.[78] (Newton did, however, reject the Aristotelian and medieval notion that a mover (*movens*) must be in constant contact with the moving body (*mobile*) throughout the duration of its motion.) Boscovich, on the other hand, reduced all forces, including those of simple mechanical motion, to action at a distance (between atoms consisting of mathematical points with surrounding miniature 'gravitational' fields), and thus used Newton's theory of gravity to eliminate the concept of impact altogether from his mechanics. The development of electromagnetism in the nineteenth century caused more and more phenomena to be explained in this way, without the concept of impact, thus extending Newton's method to new areas.

But after all, as Herder's friend Dalberg said: 'Wissen die Herren wohl mehr, was Impulsion ist, als sie das wissen, was Attraction ist?'[79] This view is echoed by a present-day historian of the concept of force: 'It is pure prejudice to assume that action at contiguity is more intelligible than action at a distance.'[80] No doubt this prejudice arises because we associate the sensation of contact with applying our muscular force to any external body. But this does not justify us in carrying this experience beyond ourselves as an analogy. Thus, it is a fallacy, but a common one, to believe that the French materialists of Descartes' school were scientifically and methodologically more correct than physicists who, like Newton and Boscovich, put forward (albeit carefully qualified) dynamistic views.

The only scientific argument which can justify dynamism is Newton's. For Newton's gravitational force, or any electromagnetic force, can be used as a hypothetical construct, so long as it does not lead to speculations on the inner nature of the forces. The three other senses in which we have encountered the term as applied to Herder – as 'inwardness', as the so-called 'Entwicklungsgedanke' and as the doctrine of perpetual motion, have no place in recognised theories of the physical world.

Herder, however, found even Newton's theory of gravity and Kant's early (teleological) creative forces too mechanistic in his last years, apparently preferring the archaic, animistic forces of Kepler.[81] In this, and in the three previous cases discussed, he went beyond the qualified dynamism which employs the concept of force only as a hypothesis. His dynamism is predominantly intuitive and metaphysical, not scientific or even pragmatic.

Nevertheless, traditional mechanism, as expounded by Descartes, had proved inadequate in physics, especially in the theory of gravitation; Herder's objections to Cartesian mechanism are largely justified for this reason alone. Even the Lucretian Knebel did not accept Lucretius' crude mechanism of endless impacts between solid, inert atoms.[82] In Newton's wake a whole wave of dynamism arose. Among the dynamists of Herder's age were Diderot, Reimarus, and his friend Einsiedel, as well as more mystical exponents such as Swedenborg. From the first three names alone, it is clear that dynamism was something more than a theological or even mystical revolt against materialistic physics. It was also an attempt to build a naturalistic model of nature upon a theory which had successfully overcome some of the weaknesses of earlier mechanics, and which, stressing as it did the all-pervading, immanent forces of movement and change, was no doubt emotionally satisfying to a generation whose temper was more progressive, revolutionary, and even romantic, than that of its predecessors.

(e) Theories of ether and universal media

The propagation of sound as a disturbance within the medium of air, and of light (according to Huygens and Euler) within the hypothetical medium of ether, were ideas generally known in Herder's day. Since Herder himself often treated sound and light as 'Kräfte' operating within a medium, it followed for him that his many other 'Kräfte' likewise required some medium within which to operate.

Accordingly, in his basic metaphysical triad of 'Raum', 'Zeit' and 'Kraft', he considered that space and time were media within which the 'Kräfte' acted.[83] He was led by the same considerations to suppose that organic 'Kräfte' must work within an 'Organ',[84] and thereby reinstated that inert matter, with its concomitant dualism, which, as we have seen, he rejected elsewhere. But the numerous physical 'Kräfte' act not only in matter; in the *Ideen*, Herder declares that *air* is 'das allverbindende Vehiculum der Schöpfung',[85] within which many known and unknown forces work. He borrowed this notion from J. F. Gmelin's work on air,[86] as well as from that of the chemist Candido Pistoi, from whose work he had excerpted the words: '*d*[*ie*] *Luft* dient d[en] andr[en] Elem[enten] z[um] Träger' (in his unpublished notes).[87] The physical phenomenon of light, however, requires the special medium of ether, as Herder repeats after Euler and Bode,[88] whose theories he knew, in a letter of 1772 to Lavater.[89] In the unpublished manuscript *Anfangsgründe der Sternkunde* of 1765, he already says that the stars move 'im Aether herum', and that this ether can even hinder the earth slightly in its motion. (This implies that the ether is definitely a *material* medium.)[90]

The physical agencies of light and sound, however, do not only act within other media (ether and air). They are themselves the media within which our senses of sight and hearing function, Herder writes in his 1778 essay on psychology.[91] And again in his *Gott*, he says that all 'Kräfte' must have a medium, and that the media for the basic physical forces are *themselves* 'Kräfte' (not subtle material ethers, etc.): 'und welches könnte bei diesen die Materie ausmachenden Kräften ein solches Medium seyn, als die Kräfte der Substanzen selbst, mit denen sie auf einander wirken?'[92] By dispensing with inert matter, Herder is here forced to make 'Kräfte' the media of other 'Kräfte'. He ought to have realised at this point either that he should discard the idea of a medium as redundant, reducing everything to 'Kraft' or that he should have kept the traditional idea of a subtle material medium, within which the 'Kräfte' could act. Candido Pistoi's theory of air as a universal medium ran into similar difficulties; his translator, in a spirit of compromise which is as understandable as it is unscientific, added the note that air is 'sowohl eines körperlichen als geistlichen [sic] Wesens theilhaftig',[93] and subsequently identified air with ether.[94] Where 'Kraft' and medium are of a like kind (in Herder's case, both are 'Kräfte'), an indefinite number of media or ethers is required, in infinite regression, each one transmitting another; Euler boldly accepted this logical consequence, and postulated 'a series of fluids, one always more subtile than another, and which are perfectly balanced together'.[95]

Herder also used the conception of a medium in biology and psychology, and confusion again resulted. Many writers, as Haller remarks in his shorter manual of physiology,[96] had used the idea of an imponderable ethereal substance to explain phenomena in neurology, and even to define life itself. Lamarck indeed later defined life as 'ethereal fire'.[97] Herder, in a well known passage from the *Ideen,* likewise writes:[98]

> In den tiefsten Abgründen des Werdens, wo wir keimendes Leben sehen, werden wir das unerforschte und so wirksame Element gewahr, das wir mit den unvollkommenen Namen *Licht, Aether, Lebenswärme* benennen und das vielleicht das Sensorium des Allerschaffenden ist, dadurch er alles belebet, alles erwärmet.

Here, light (usually treated as a 'Kraft' by Herder) and ether (traditionally, a subtle *material* substance) are confused, and the words 'Element' (implying a substance) and 'Sensorium' (a *medium* for sensation) merely add to the obscurity of the passage. Physical and biological terms are not in any way distinguished, nor are the 'Kräfte' clearly separated from the media within which they supposedly act. Herder had introduced the whole passage as a description of 'das Medium, . . . in dem alle Kräfte der Schöpfung wirken'.[99] Life and mind, he already says in 1778, operate within, or are even identical with, this Protean inner ether:[100]

> Dieser innere Aether muß nicht Licht, Schall, Duft seyn, aber er muß alles empfangen und in sich verwandeln können. Er kann dem Kopfe Licht, dem Herzen Reiz werden: er muß also ihrer Natur seyn, oder zunächst an sie gränzen. Ein Gedanke, und Flammenstrom gießt sich vom Kopf zum Herzen.

In the *Ideen,* he once calls it 'der *ätherische* oder *elektrische Strom*',[101] saying that it is the one common 'Principium des Lebens' in plants, animals, and, in more refined form, in the nerves and mind of man, where it becomes 'das Medium der Empfindung'.[102] Once again, it is unclear whether it constitutes life in itself, whether it is merely a medium for some other 'Kraft', or whether it is itself material, hyper-physical, or both. In fact, it can be likened, not unfairly, to the ever-elusive Philosophers' Stone.

The concept of a medium is put to yet another use in the *Ideen*: the medium in which the soul (whose nature is 'Kraft') passes on to a new 'Organ' in a higher existence, is once more ether.[103]

All this shows how multifarious and involved are Herder's applications of the medium and ether theories. Max Rouché claims that passages in the writings of Shaftesbury, and of such mystics as Böhme and Oetinger, were the source of Herder's views.[104] In fact, Shaftesbury, in the principal passage to which Rouché alludes, speaks of an 'invisible ethereal Substance', then likens it to the element of fire, mentioning light in the same context[105]; he does not distinguish it from the divine force he names elsewhere.[106] But Herder, as we have seen, mentions ether as a substance permeating space in the astronomy notes of 1765 for his classes in Riga (i.e. in a purely scientific context), and repeats this idea, referring to the scientists Euler and Boscovich, in his letter to Lavater in 1772. Later, he confuses the medium within which the 'Kräfte' operate with the 'Kräfte' themselves, as we observed; it is probable that Shaftesbury, who regarded ether in itself as a life-giving substance, may have influenced him here, so that he confused Shaftesbury's vital ethereal substance with the scientific hypothesis of a subtle material medium, and in turn, with his own conception of vital 'Kräfte'.

Other sources were known to him, however, and they doubtless helped to add to the confusion. Bonnet considered that ether provided a new spiritual medium or body for the soul in the life hereafter, just as Herder, who knew Bonnet's writings, later did.[107] Friedrich Hoffmann, the famous physician of Halle whom Herder mentions in his *Journal*,[108] defined life as a subtle substance, a 'Nervenäther' (but not a 'medium') which circulates in the nerves[109]; Mesmer was later to adopt this idea. Besides, science had used the idea to provide a medium for many forces, as in Huygens' and Euler's theories of light, and had also, as Newton sometimes did, defined various unknown forces as manifestations of subtle (presumably non-material) 'aethereal spirits' within a common (presumably material) universal ether.[110] Ethers could thus be either mechanical transmitters of motion, as also in Hartley's and Condillac's theory that thoughts are 'modifications of the ether',[111] or unknown, dynamistic and immaterial agents, as in Newton's notion of 'aethereal spirits', or even both, as in Pistoi's theory of elemental air, and in Herder's conception of ether. And finally, ether played an important part in many mystical, usually pantheistic philosophies, from the Stoic notion of a 'pneuma' and the Pythagorean belief in moist, cold, etc. ethers,[112] to Lavater's[113] and Bonnet's ethereal bodies of the afterlife, and, of course, those other mystical doctrines such as Shaftesbury's, as named by Rouché.

Thus, 'Kräfte', for Herder, can, by implication, be either material or immaterial, they can be their own medium, they can act without a medium, or they can have as a medium various forms of ether; this ether itself, by implication, can be material or immaterial, or both, or of an unspecified composition, and can perform functions usually reserved for physical, biological, or psychological 'Kräfte'. The whole concept, as used by Herder, is therefore hopelessly confused. It mirrors, with added complexity, his ambiguous conceptions of matter and force. The ether concept, although often used in physical science until the late nineteenth century, is not so frequently used in traditional scientific senses by Herder. Perhaps he conceived an antipathy for such usages since they were associated with Descartes' mechanistic theory of gravity. As in Hoffmann's writings, his 'ether' is often simply another guise for biological vitalism.

(f) Space and time

For Herder, space and time are empirical conditions of existence, and are therefore relative to our experience of the objective world. We acquire our knowledge of space by observing that objects, including ourselves, though existing separately, may be juxtaposed. We achieve our conception of time by observing that movements and changes take place around us.[114] Time, however, is relative not only to the external objects from which we abstract our idea of it,[115] but also to our (presumably emotional) subjective state at any particular moment.[116] Thus, in his *Metakritik*, Herder rejects Kant's theory, enunciated in the *Kritik der reinen Vernunft*, that space and time are absolute, *a priori* 'Anschauungsformen', imposed by the mind itself upon external reality. For the Kant of the first *Kritik*, they are subjectively conditioned in the sense that they are determined universally by the constant attributes of the human understanding, not by the subjective (i.e. emotional) state of the individual, which falls within the province of empirical psychology, not of critical philosophy.

Yet it is interesting to compare the following two utterances, the first from Herder's essay on Shakespeare, and the second from Kant's early *Allgemeine Naturgeschichte*:

> Hast du nie gefühlt . . . , wie es blos an dieser Seele liege, sich Raum, Welt und Zeitmaaß zu schaffen, wie und wo sie will?[117]
>
> Daher eben dieselbe Zeit, die für eine Art der Geschöpfe gleichsam nur ein Augenblick ist, für eine andere eine lange Periode sein kann. . .[118]

In both cases, time (and also space for Herder, on this occasion) is seen as relative to the subject. But already, Herder here believes that time is relative to subjective *emotions* ('gefühlt', 'Seele'), presumably of the individual, whereas Kant implies, more abstractly, that it is relative to the constant mental equipment of each entire species.

In his *Gott*, however, Herder declares: 'Ist nicht der Raum, ist nicht die Zeit Endlos?'[119] This implies that space and time have an absolute, independent existence in themselves (and, incidentally, suggests the heretical doctrine that time is infinite). And in his dialogue *Voraussicht und Zurücksicht* of 1795, he calls time 'die große Mutter der Dinge',[120] reminding us of Greek mythology. In a sermon of 1775, however, he upholds the orthodox religious doctrine, calling time 'ein kleines spannenlanges Bild der Ewigkeit'.[121] On another occasion in his *Gott*, he reaffirms his more usual idea: 'Raum und Zeit sind nur Phantome unsrer Einbildungskraft',[122] without, however, adding the complementary statement, as he does in the *Metakritik*, that they are also relative to our objective experience.

So far as science is concerned, Herder's theory of space and time is the empirical one; space and time are the media within which 'Kraft' manifests itself, and which we abstract from external objects as a means of measurement.[123] He enters into no further attempts to define time and space as used in science, but it seems, from the statement in his *Gott* that time and space are endless, that he did regard cosmic time and space as existing independently, and as infinite in duration and extent. Since the age of Newton, cosmic space had been regarded as infinite by most thinkers.[124] Theories of time were more varied, since they were complicated by theological considerations. But in Herder's thought, as one writer correctly observes,[125] both time and space are secondary in importance to the idea of 'Kraft'.

Conclusion

Herder's views on the general nature and structure of the physical world are vague and ambiguous. This ambiguity, as will soon be seen, detracted from the value of many of his theories within particular departments of physical science. Once again, his concept of 'Kraft' was responsible for the most serious deficiencies in his scientific thought.

2. Astronomy and the theory of gravity

(a) Astronomy

The forerunner of astronomy was astrology, of which there are traces in Herder's *Ideen.* He writes, for example: 'Unsre Erde ist . . . im Conflict mehrerer himmlischen Sterne'.[126] This could refer simply to conflicting gravitational attractions, but the mode of expression is reminiscent of that found in astrological literature. Herder also believes that meteorological changes, like the oceanic tides, are caused by extra-terrestrial influences, and he says that the progress of meteorology will reinstate 'die *Astrologie* aufs neue in der ruhmwürdigsten nützlichsten Gestalt unter unsern Wissenschaften'.[127] (He even declares that important changes in history may have been produced by the influence of similar unknown 'Kräfte' working within the atmosphere.[128]) Goethe's condemnation of all astrology, especially in meteorology, may possibly have been written (in 1825) with Herder's words in mind.[129]

Herder was interested in astronomy throughout his life. He mentions over thirty writers on the subject in his works,[130] and his library contained further works which he does not cite.[131] He often writes rhapsodically of the stars,[132] thus showing that the motives behind his interest in astronomy, as with many actual astronomers, included aesthetic and mystical admiration for the vastness and harmony of the stellar universe.[133]

But the unpublished manuscript *Anfangsgründe der Sternkunde,*[134] based on notes made by Liborius Bergmann, a pupil in Herder's classes at Riga in 1765, shows that he had considerable and accurate knowledge of scientific astronomy from an early date. The notes, 48 pages in length, contain a detailed description of the constellations with their main stars, systems of astronomical measurement, the numbers of stars according to contemporary catalogues and computations, the structure of the nebulae and the Milky Way, the planets and their satellites, the sun and sunspots, the moon and its surface, and eclipses; further statistics are added concerning the shape, size and structure of the earth. The remarks about the structure of our galaxy[135] clearly reflect Kant's *Allgemeine Naturgeschichte,* to which, although it was withdrawn before publication and remained virtually unknown for many years, Herder must have had access, perhaps with Kant's own assistance.

One interesting inaccuracy in the manuscript requires elucidating. The writer says: 'es sind ihrer bishero 10 Trabanten der Venus'. This is merely an error of dictation, because the sentence is incoherent throughout. But it is subsequently stated that Venus has *one* satellite.[136] This statement, now known to be false, at least shows that Herder had paid careful attention to contemporary sources. For, among others in the seventeenth and eighteenth centuries, James Short in England and Cassini in Paris, both of whom Herder names, believed they had discerned a satellite of Venus. It is now thought to have been a 'ghost' produced by refraction in the lenses of telescopes.[137]

Herder's interest in astronomy led to no published writings until 1776, when he wrote an essay on Copernicus, in the best Storm and Stress manner, for Wieland's *Teutsche Merkur.* It is of little scientific interest, however, eulogising Copernicus rather as an inspired artist, a 'Genie' of the kind so esteemed in the 1770's, than as an actual astronomer. Although there is much to be said for this view of the great theorist, Herder's whole treatment suggests that his purely scientific interest in astronomy has waned.

When he wrote his *Ideen,* he was more preoccupied with biology and the study of man than with the physical sciences. His words on astronomy are stereotyped, and bear witness rather to his pleasure at the harmony of the universe and the symmetry of the earth's mean position in the solar system than to his earlier scientific knowledge. Kant's influence is still apparent, and critics have noticed several parallels.[138] The influences of Bode, Kästner and Lambert are also visible in some details of the text.

In 1787, Herder writes to Göttingen for a work on astronomy from the library there.[139] His unpublished notes contain excerpts from two articles by Herschel which had appeared late in 1784, i.e. *after* the part of the *Ideen* dealing with astronomy had been written.[140] This indicates that his interest in the data of astronomy was increasing at this time; it reaches its height in the *Adrastea.* But his aesthetic and mystical inclinations also grow more intense as, older and disappointed, he turns away from the world around him to contemplate the eternal. In his remarkable account of a supposed dream or vision of the universe, entitled *Kalligenia,* Herder says: 'mir wars, als empfände ich hier *Gottes-Gedanken,* die *Regel der Schöpfung,* die *Kepler* mir in Harmonieen erklärte'.[141] By this time, he had conceived a great admiration for Kepler, as the prototype of the misunderstood German genius; no doubt he unconsciously identified himself with the great astronomer and mystic.

Herder's late studies of the astronomical universe will be discussed later in connection with the theory of gravity and the other branches of physics; for the present, we need only note that he devoted a long section, in his *Adrastea,* to the progress of physical science, and especially of astronomy, during the previous two centuries.

Finally, it is worth noting that Herder followed Kant in accepting the idea of stellar or cosmic evolution. He writes in 1792: 'der allweite Raum [hat] sich zu Sternen und Sonnen aufgeklärt, und was Chaos war nach Gesetzen in daurende Bahnen geregelt'.[142] In 1802, he again declares: 'Auch diese Sterne altern; . . . Dagegen siehe jenen hellaufglänzenden Brand, die Morgenröthe einer neuen Schöpfung, *Orion*'.[143] Besides, we have already seen how he accepted Kant's 'dialectical' theory of creation by gravitational forces. But in the *Adrastea,* it is no longer to Kant that Herder refers for this idea, but to the works of practical astronomers such as Schröter[144] and Herschel,[145] which he had read in the 1790's in Bode's *Astronomische Jahrbücher.*

Thus, while Herder had considerable knowledge of astronomy from an early date, he took the greatest interest in it, and thought most independently about it, in the last years of his life. His early knowledge was confined to scientific facts and to Kant's theory of cosmogony; his later interest is largely mystical and aesthetic.

(b) The theory of gravity

Newton wrote of his gravitational force in a letter to Bentley: ' . . . whether this agent be material or immaterial, I have left to the consideration of my readers'.[146] In his scientific writings, he wisely did not attempt to define its intrinsic nature. Similarly, present-day theories of gravity are purely mathematical, and do not refer to intrinsic qualities.[147] Herder, like many post-Newtonian thinkers, was not content with this; he frequently speculated on the intrinsic nature of gravitational attraction.

But first of all, it is worth mentioning that, although Herder at some time or other acquired a copy of Newton's *Principia,* and at least two works on the Newtonian theory of gravity,[148] he took his earliest formulation of the law from Kant's *Allgemeine Naturgeschichte,* not directly from Newton. Compare the following two passages, the first from Herder's unpublished dictated notes on astronomy of 1765, the second from Kant's *Allgemeine Naturgeschichte*:

> Die Bewegung der Erde um die Sonne setzt zwei Kräfte voraus: fortschiessende Kraft dadurch sie in jedem Punkt ihres Lauffs die gerade Richtung fortsetzen und sich ins Un[s]endliche entfernen würden [sic], 2 eine sinkende Kraft, die die vorige in jedem Punkt schwächet, . . . und . . . den Körper in einer [sic] krummen Gleise erhält.[149]

> Die Bewegung aller dieser Körper [i.e. the planets] . . . setzt zwei Kräfte voraus . . . nämlich *eine schießende Kraft,* dadurch sie in jedem Punkte ihres krummlinichten Laufes die gerade Richtung fortsetzen und sich ins Unendliche entfernen würden, wenn nicht eine *andere Kraft* . . . sie beständig nöthigte diese zu verlassen und in einem krummen Gleise zu laufen. . .[150]

We have earlier seen how Herder often used the gravitational orbit as an analogy in discussing social and ethical questions. This involves the 'dialectical' idea that gravitation consists of two equally important components, a centrifugal force and a force of attraction, as in Kant's formulation of the law. Newton was of course aware that a centrifugal force existed (Herder's 'fortschiessende Kraft'), but disregarded its origin, and treated it as governed by inertia, going on to state his law of gravity, which applies not only to bodies in orbit around others, purely in terms of the *one* attracting, radial force. Earlier theories, such as the first of Kepler's various explanations of gravity, had stated that the centrifugal component of gravitational phenomena is of great importance; it was seen as a tangential force, constantly impressed upon the orbiting planets as if by the invisible spokes of a wheel whose centre was the sun. This earlier theory was more 'dialectical' in presentation than Newton's, therefore. Herder, as we know, was always fond of dialectical formulations. His late admiration for Kepler's animistic theory (which Kepler adopted as an alternative to the spoke or vortice theory), perhaps coupled with his aversion to Kant, led him, however, to abandon not only Kant's dialectically formulated theory, but even the Newtonian one, which had at least recognised that a centrifugal component is present in extra-terrestrial phenomena of gravitation. Herder asks of the centrifugal force: 'Und woher wäre sie kenntlich?'[151]

But what of the inner nature of gravitational attraction? Einsiedel believed that it might be a composite force,[152] and Herder adopted this idea in an early version of the *Ideen,*[153] but omitted it in the final version. He had himself earlier declared, however, in an empirical and Baconian spirit, that the law of gravity might simply be a very abstract, inductive generalisation, and that the reality of the law might lie entirely in individual and distinct phenomena.[154] This may be what Einsiedel meant with his composite force.

Hints of an animistic interpretation of gravity appear even in Herder's early writings. We have seen that he spoke of planetary souls in the 1769 manuscript which H. D. Irmscher published some years ago. This metaphysical, Leibnizian idea takes on a quasi-psychological colouring in the 1775 version of Herder's essay on psychology: 'Selbst der Stein, wenn er durch innern Trieb fiele, müste seinen Trieb zum Mittelpunkt auf die dunkelste Weise erkennen d.i. empfinden.'[155] Similarly, in 1777, he says that the force of gravitational attraction may partake of the nature of 'geistiger Kraft'.[156] And in the *Ideen*, he observes that the motion of a pendulum varies as gravitational attraction decreases at higher altitudes, then compares this known fact with the beneficial effects of mountain life upon man[157]; this implies that man may be constitutionally affected by small variations in gravity, so that the whole statement reminds us of occultist doctrines of animal magnetism, galvanism, and the like. But the idea is perhaps only an echo of Kant's early theory that the inhabitants of the various planets are physically and mentally 'lighter', and more highly developed, if they live on a planet more distant from the sun, the centre of gravity.[158]

As stated at the beginning of this chapter, it is probable that Herder, like Aristotle[159] and Linnaeus,[160] allowed his earlier biological studies to affect his later theories of physical science. Thus, in 1797, in the *Humanitäts-Briefe*, he calls the earth 'ein organisches Wesen', likening it to an orange ('Pommeranze').[161] In preparing his *Adrastea*, he studied Kepler's ideas, and there found support for his own animistic theories of gravity. Kepler had put forward various hypotheses on the nature of gravitational force at different times, but it was his archaic, animistic theory which appealed to the older Herder. He describes Kepler's doctrine, and contrasts it with the more guarded, purely mathematical formulation of Newton.[162] He calls Newton a 'Glückessohn' who reaped the harvest sown by Kepler, and says that Kepler had discovered all the significant elements of the law of gravity himself.[163] And, elsewhere in the same work, he quotes a passage from Kästner's history of mathematics which alleges that Newton attempted, by a deception, to steal the laurels of Leibniz as discoverer of the differential calculus.[164]

The animistic theory of gravity has a long history. Plato believed that the stars were animated,[165] as did Plotinus.[166] Gilbert's magnetic theory 'de tellure sententia'[167] has much in common with Plato's, as have those of the other Renaissance thinkers Campanella,[168] Bruno,[169] and Montaigne.[170] Kepler hesitated between various theories of gravity, and favoured the archaic theory that animating principles are active within each cosmic body, regulating its motions, before he elaborated the scientifically superior, mathematical conceptions of his later years, and repudiated his earlier animistic theory.[171]

Herder, doubtless thinking of Kant's 'mechanical' cosmogony,[172] denied that gravity could be produced by 'blind' forces which create and sustain the heavenly orbs. He does not dare to reject Newton's theory directly, but points out that Newton, though a teleologist, never defines the inner nature of gravitational attraction (as if this were a fault!). Formulae such as Newton's 'in jedem Moment wesentlich *behinderte Anziehung*' are 'nur Hülfsbrücken, *Denkbilder des menschlichen Geistes*', he maintains.[173] He further portrays the misfortunes of Kepler in a sympathetic light, contrasting his position with that of the 'Glückessohn' Newton.

He cites Kepler's animistic ideas in some detail,[174] concluding with the observation: 'Er nahm also zu einer *animalischen Kraft* seine Zuflucht, mit der er Sonne, Erde und alle Planeten beseelte, wovon künftig die Rede seyn wird'.[175] It seems probable, from these words, that he intended to try to justify Kepler's theories on some later occasion, but his promise is not fulfilled: they are never mentioned again.

Herder's thinly veiled preference for Kepler's theory as against that of Newton can be seen as a milder version of the antipathy with which Goethe regarded Newton's theory of light. Goethe and Herder in fact corresponded on theories of light and colour even at a time when they were becoming increasingly estranged from one another, and Goethe's colour theory influences certain passages in the *Adrastea*.

The predilection for Kepler's archaic and mystical ideas is typical of the older, disillusioned Herder, and also of the new 'Naturphilosophie' which was arising in those same years. Even the title (*Weltseele*) of one of Schelling's works recalls Kepler's early doctrine. We can perhaps detect Herder's influence when Goethe, in 1825, speaks of the 'lebendigen Erdkörper'[176] whose supposed breathing causes meteorological changes. When Goethe, around 1829, suggests that mountain-masses may once have exerted a strong quasi-gravitational attraction, which caused stratified rocks to be uplifted, he seems to echo Herder's earlier belief that the Asian mountain massif attracted the most powerful, generative 'Kräfte' in the early phases of the earth's development.[177]

Herder's theories of gravity were therefore closer to those of the 'Naturphilosophen' than to the mathematical theories found in both Newtonian and present-day science. Like so many other ideas of his, this one was impaired by his metaphysical concept of 'Kraft'.

3. General physics and chemistry

(a) Electricity and magnetism

Although Herder once suggested that the forces of life, electricity, motion and gravity may be reducible to some common origin,[178] let us try to discover what distinct characteristics, if any, he attributed to electricity and magnetism in particular.

Hopeless confusion confronts us from the start. In the *Journal*, the 'elektrische Funke, der das Schiff umfließt'[179] (identified by A. Gillies, probably correctly, as St. Elmo's fire[180]) is likened both to the *aurora borealis* and the earth's magnetic field. Similarly, in a note added to a poem he sends to Caroline in 1772, Herder says that the phosphorescence of the glow-worm is electrical in nature.[181] In a letter of the same year to Lavater, he identifies electricity with 'Lichtäther', the hypothetical medium of light.[182] In 1778, 'der elektrische Strom' is treated as a species of heat ('Strom' is an unwittingly prophetic word, since current electricity was still unknown at this time), and calls it 'diese sonderbare Erscheinung des großen, all-gegenwärtigen Lebensgeistes'.[183] As we have already noticed, he was by this time freely invoking physical agencies such as electricity and light to describe biological phenomena. So it is with nervous reactions; 'der Elektrische Nervenstrom' is mentioned in a work of 1775.[184] (We now know, of course, that nervous impulses are indeed electrical; but the doctrine of Herder's age was fanciful, and probably originated with Linnaeus, many of whose works were known to Herder – Linnaeus asserted that our nerves obtain their energy from 'an electrical principle inhaled by the lungs',[185] and Charles Bonnet similarly likened his hypothetical nervous 'Lebensgeister' to electricity and light.[186])

In the *Ideen,* Herder no longer speaks of an electrical 'Strom', but of an 'elektrische Materie'.[187] In the same work, light is likened to electricity, as when 'die elektrische Sonne'[188] is mentioned. (The astronomer Bode, in a work which Herder read, had called the sun 'eine feuerlose electrische Kugel'.[189]) In the next part of the *Ideen,* Herder calls electricity 'der elektrische Feuerstrom',[190] again bringing heat or fire into his description. The elemental, creative 'Kräfte' which operated in the atmosphere of the early earth included electrical ones, he believes.[191] Volcanic activity, with its associated explosions and conflagrations, may be connected with electricity, he likewise suggests around this time.[192] In an essay of 1785, the generative function of sexual union is likened to the electric spark.[193]

It is interesting to note that Herder underwent electrical treatment, which was very fashionable in that age, on at least two occasions in his life.[194] The treatment would consist of mild electric shocks.

It is seldom clear whether Herder is employing such ill-defined physical 'Kräfte' as electricity merely as metaphors to describe unknown biological principles, or whether, in such contexts, he intends us to accept them literally. But we may blame the ignorance of science at that time concerning the nature and workings of electricity for much of the vagueness which surrounds the subject. For example, as late as 1798, Herschel speaks of the 'elektrischen Ausstrahlungen des Nordlichts', perhaps by analogy with lightning[195]; Herder, as we know, had made a similar observation. Franklin spoke of 'electrical fire', calling it an 'element'.[196] Hauksbee, in the seventeenth century, had maintained that light is electrical.[197] Nollet, whom Herder mentions in the *Journal,*[198] considered that heat and electricity were identical.[199] Sometimes electricity was called an imponderable substance, at other times a fluid (hence Herder's 'Strom'), and so on.[200] Since Herder possessed at least four works on electricity,[201] including Priestley's celebrated history of the subject, he probably met many such groping attempts to identify heat, light and electricity in the course of his reading. But his own desire to bring together many disparates under the common title of 'Kräfte' must also be held responsible for much of his vagueness.

In his *Gott,* however, he very rightly says that we are not justified in equating electricity and magnetism just because they often appear to obey similar laws.[202] Like all scientists of his age, he knew more about magnetism than electricity. Long extracts devoted to magnetism, especially from Euler, survive among his unpublished notes.[203] He had read works by Cassini,[204] Halley, and Tobias Mayer[205] on the subject, and even sent (unsuccessfully) for the latter physicist's unpublished manuscripts on magnetism from Göttingen.[206] But, as with electricity, he is not content simply to record observed regularities and to try to arrange them under formal laws; he again speculates upon the inner nature of the phenomenon (although it must be admitted that most scientists of that age did the same). Thus 'der magnetische Strom' is mentioned in the *Ideen.*[207] This suggests Euler's influence.[208] Magnetic forces, he believes (doubtless by analogy with Kant's gravitational forces), may be the agents which create basic physical bodies, and may even cause certain meteorological phenomena.[209] In a discarded sketch for the *Ideen* on the cataclysms of the early earth, he displays considerable knowledge of the earth's magnetic field and of magnetic variation, declination and deviation, but uses such facts unwarrantably to argue that the earth's axis has shifted.[210] He had studied Brugmans' works on magnetism and magnetic polarity, and based some of his dialectical pseudo-laws, as discussed in Part I of this work, upon them. Even in 1794, his interest in magnetism is still strong or even increasing, as a letter to Knebel, in which he asks for all available works on magnetism, proves,[211] and he took a keen interest in galvanism and animal magnetism when these topics reached the attention of the public. The occultism endemic in such subjects would naturally appeal to him, since he regarded magnetism rather as another mysterious force than simply as a series of observed regularities in the physical world.

(b) Light

Light, with its manifold associations, is of paramount importance throughout Herder's thought – and not only in scientific contexts. He names the triad of 'Leben, Licht, Liebe' as 'ursprüngliche Kräfte in der Welt',[212] and, like so many of his favourite 'Kräfte', these are considered as both physical and spiritual realities. The same three words were engraved upon his signet ring, and, after his death, upon his tombstone. (They may perhaps have had some connection with Freemasonry or the Illuminati, one might further conjecture.)

The beginning of St. John's Gospel probably appealed to Herder more than any other passage in the Bible. The apotheosis of light in those verses stirred him profoundly. In his Bückeburg years, he again and again refers to the light-religion of Zoroaster as a commentary upon the New Testament. In the 1769 manuscript on planetary souls, the following words occur: 'Und also Gott, der die Sonne ist. Hat also Perser so unrecht, daß er die Sonne verehrt hat?'[213] It is interesting that Kepler, whom Herder admired so much in his later years, at one time seriously considered sun-worship as a form of religion. Herder, like many Platonic mystics, frequently alludes to the idea that God is the centre of the universe, or in some way related to the sun. In a letter to Lavater in 1772, he calls light 'ein Organ der Gottheit',[214] making it clear, however, that he is using the words figuratively.

If Herder's more scientific applications of the term 'light' are to be seen in the context of his thought as a whole, one must also consider the mass of half-scientific, half-symbolical uses to which it is put in the *Ideen*.

Already in 1780, the young Georg Müller writes in his diary while staying at Herder's house (and presumably under Herder's influence): 'Luft-Licht-Wärme – diese *drei* sind *Eines*, wie der Geist, der Sohn, der Vater'.[215] A similar mystical (if less theological) tone is sounded throughout the *Ideen* whenever light is mentioned. As we have seen, it is equated to electricity on one occasion.[216] It also acted as a purifying and creative 'elemental fire', working *within* the other elements, in the early, chaotic phases of earth history, when all the elements retained their pristine potency.[217]

Interpreters of the Old Testament have often puzzled over the fact that the narrative of creation in the Book of Genesis includes the words 'Let there be light' *before* sun, moon and stars are created; this at one time fostered the belief that there existed a subtle, elemental form of light, distinct from that of the sun, and that this perhaps acted as a secondary agent in the process of creation. This notion probably influenced Herder; for the conception of light as a creative 'Elementarfeuer' recurs several times in the *Ideen*,[218] and one of these passages, in which 'das Licht oder das Elementarfeuer' is named, states that this agency purified the other, coarser elements, acting as an 'Auswirker der Schöpfung'.[219]

At other times light is confused with ether, as we earlier noticed.[220] In other passages again, light is related, or even equated, to the principle which produces heat.[221] Like the hypothetical ether, it is also used, in the same work, to designate the life-principle. Indeed, as early as 1773 or 1774, Herder declared, in a sermon on the opening verses of St. John's Gospel: 'das innigste Leben des Menschen ist *Licht*'.[222] This theory is further elaborated in the *Ideen*, where he says of this life-giving light that it is 'kein Licht, das aus der Sonne kommt; ein Licht, das aus dem Innern dieser organischen Masse hervorbricht', and that it plays an integral part in animal reproduction.[223]

Thus, light appears in the *Ideen* not so much as an observed physical phenomenon, but as a mystical, even symbolic conception which, like the elusive 'ether', often simply ministers to biological vitalism.

It is only in his later period that Herder shows real interest in the theory of light as a distinct branch of physics, for physics was the last branch of science to which he devoted his concentrated attention. He had nevertheless acquired much general knowledge of the subject in his youth, and his early writings contain several utterances on light and its nature.

The first informative statement appears in the unpublished manuscript on astronomy of 1765. The sun is described as follows:[224]

> Sie ist vermuthlich ein äusserst erhitzter Körper dessen Theile in schwingender Bewegung sind und der also entweder beständig auf das Licht wirket oder selbst einem glüenden Schmeltzofen voll dichter und flüssiger Theile daß

> [sic] Liecht ausschiesset.

(The pupil who wrote these notes from dictation, not Herder, is responsible for the bizarre orthography and syntax.) Here, both wave (undulatory) and emission (corpuscular) theories of light are suggested, and Herder does not discriminate in favour of either. His letter to Lavater of 30 October 1772 contains a long statement concerning light.[225] (Herder is criticising Lavater's use of light as a symbol for the 'Organ' of the immortal soul, and suggests that magnetism or some other physical agency might be a better symbol.) First, he says: 'Das Licht z.E. ist durchaus Körper, denn – es springt ja zurück'. Here, he seems to support the emission theory. However, he next names Euler (among others) as a reliable authority on the subject, and says: 'Das Licht nämlich . . . [ist] ein großer, überall ausgebreiteter Aether, den bloß die Sonne in Bewegung setzt . . . '. This is in accordance with Euler's wave hypothesis. Herder adds that such an inference does not follow 'nach der alten Newtonischen [i.e. emission] Theorie'. Thus, just as in 1765, he cites both theories, committing himself to neither.

In the course of his astronomical studies for his *Adrastea,* he encountered a new theory of light which especially attracted him, since it combined elements both of Newton's corpuscular theory and of the wave theory of Euler. He eagerly grasped at the idea, which, he says, was suggested by Herschel's and his own friend von Hahn's observations of the nebulae. These observations indicated that space might be filled with a kind of invisible light-ether which becomes visible as light whenever it comes into contact with a suitable surface, such as that of the sun or of the nebulae. It might even become visible to a lesser degree, through some sort of reflection, or, as yellow light, through contact with air, on the surface of dark bodies like the earth. Herder sums up the theory in 1802, in his *Adrastea*:[226]

> Ist die Sonne der große *Lichterreger* unsres Planetensystems, so kommt natürlich das Licht von ihr; an ihr wird es in größtem Glanz sichtbar. Sie darf aber es weder in Cartesischen Kugeln, noch in Cylindern herunterschiessen, die feine Materie, deren Zartheit nichts übertrift; diese *kann* sich nicht anders als Pfeilschnell in Linien *uns offenbaren.* Gegenseits: ist sie auflösend aus dem feinsten Aether gewonnen, so darf dieser nicht von der Sonne, als einer Glocke angeschlagen, vibriren und zittern. In sanften Strömen flößet das Licht sich fort, und findet allenthalben seinen *homogenen Träger,* die himmlische Aura, bis es in Nähe unsrer Erde sich mit Feuerkräften waffnet.

Thus, light is generated as a subtle material substance (as in the emission or corpuscular theory) derived from the universal ether, in which it is present in invisible form, and with which it is homogeneous. It is then transmitted by this ether (as in the wave theory).

We should observe that Herder believes that light and its medium are similar in nature. He ignores the difficulty which this presents, and which Euler had resolutely accepted, namely that if light requires a medium which is like itself, this medium, in turn, requires a further medium, and so on. Besides, while rejecting the theory that light is propagated as a vibratory wave disturbance ('vibriren und zittern'), he leaves it unclear exactly how light can pass 'Pfeilschnell in Linien' or 'in sanften Strömen' as a uniform disturbance through the ether. He thus seems to accept the wave theory, but without the waves.

In the eighteenth century, the emission or corpuscular theory of light enjoyed far greater prestige than the wave theory. This was largely because scientists believed that the great authority of Newton was on the side of the emission theory. In actual fact, Newton never finally decided between the rival theories of light, and 'usually wrote as though it began as corpuscles and ended as vibrations which the corpuscles had excited in an ether'.[227] Herder, unlike most of his contemporaries, was therefore unwittingly supporting a theory similar to that of Newton himself but not, of course, comparable with Newton's in mathematical exactitude and careful observation. Herder's theory is scientifically worthless, because it does not explain how light reaches us, in waves or in lines, as a material substance transmitted by another substance, or as a disturbance in a medium. His failure to resolve the relationship between 'Kräfte' and their media, earlier discussed, is responsible for this ambiguity.

The wave theory had been held by Leonardo,[228] but was first formulated more scientifically by Huygens and Euler; early in the nineteenth century, it was at last almost generally accepted, but, early in the present century, both wave and emission theories were used, the one being found convenient for explaining certain phenomena, the other serving in the remaining cases. A new epoch began when the quantum theory largely replaced both.

It would be erroneous to say that Herder anticipated the dual theory used early in this century. He did not use the two theories alternately as working hypotheses, as happened in modern practice, but amalgamated the two into one. His habitual desire for synthesis is again responsible. His final theory of light, suggested, as he says, by the observations of Herschel, von Hahn, Schröter and Bode[229] on luminous nebulae which could not be resolved into stars, should be seen as a scientific curiosity, an imaginative and ephemeral synthesis which, at first sight, seems to foreshadow the later pragmatic rapprochement which took place between the two theories.

It is remarkable that Schelling had also tried to reconcile the theories of Newton and Euler.[230] In 1798, Herder had read Schelling's *Ideen zu einer Philosophie der Natur* and *Von der Weltseele,* as a letter to Knebel testifies; 'Sie *müssen* sie lesen', he writes to Knebel.[231] In his *Ideen* of 1797, Schelling regards the emission and wave theories as alike unsatisfactory, but seems to prefer the former.[232] But in his *Weltseele* of the following year, he writes:[233]

> Ich meinte, ob man die Newtonsche und Eulersche Theorie vom Licht nicht vereinigen könnte . . . Wer kann beweisen, daß nicht zwischen Erd' und Sonne eine Materie ausgegossen ist, die durch Wirkung der Sonne decomponirt

> wird, und könnten nicht diese Decompositionen bis in unsre Atmosphäre sich fortpflanzen, da in ihr selbst eine Quelle des Lichts ist?

He combines the idea of 'eine eigenthümliche Lichtmaterie' with that of an 'Erschütterung eines zersetzbaren Mediums'.[234] Like Herder, he mentions Herschel in support of his views; the article in which Herschel suggested his theory of light-accretion around the nebulae appeared in the same year as Schelling's work.[235]

Herder's theory, propounded in 1802, is too similar to Schelling's not to have been influenced by it. Herder did not acknowledge his debt to the younger thinker, however, probably because he had come to detest him as a Romantic and follower of Kant (although Schelling, in fact, had been much influenced by Herder himself).

On the other hand, the idea that the sun has a dark 'planetary' body surrounded by an extraneous 'Lichtmaterie' appears in a work of Bode's[236] which Herder had long since read.[237] Bode, whose work first appeared in 1768, postulated a light-substance 'dessen feuerlose Stralen sich durch den Aether fortpflanzen', thus implicitly combining the corpuscular and emission theories in a way which distinctly foreshadows the theories of Schelling and Herder. Von Hahn, acknowledging Bode's precedent, also suggests, in a work written in 1792 and referred to by Herder in the *Adrastea*[238] in 1802, that light may collect round the sun, and speaks of 'die Entwicklung der Lichtmaterie aus dem Raum',[239] just as Herder does. And Herschel, in the article to which both Schelling and Herder refer, had spoken (in 1798) of light as a 'leuchtender Stoff' which accumulates around the sun and stars.

From all this, it would seem that Herder probably first met the idea in Bode's book. He was greatly stimulated, however, by Schelling's theory, which agrees with his own more closely than those of any other writers. The theories of Herschel and von Hahn, although much more empirical, probably further strengthened his conviction that the light emanated by the sun originates as a material substance. He cited the latter works rather than that of Schelling, perhaps assuring himself that his own views were sufficiently confirmed by the facts adduced by the astronomers. All of the writers named wrote in indefinite terms about the exact mode in which light, once produced, is transmitted, so that Herder's own vague theories of an ethereal medium were not improved by their influence. But Schelling's influence proved really decisive, because he alone, before Herder, had *explicitly* attempted to reconcile the theories of Newton and Euler, whereas the astronomers had merely used an *ad hoc* hypothesis to explain their particular observations, without referring to established and comprehensive theories of light. At any rate, all this shows that Herder, like many physicists of his age, was uneasily aware that light theory was in an unsatisfactory state, and wished to bring the two rival theories, each of which had proved valuable in explaining certain phenomena, into some positive relation with one another.

But, along with the relatively scientific theories in the *Adrastea,* there are echoes of the more mystical ideas on light which Herder had already recorded in his *Ideen.* He again refers to the mysterious 'inner' light, calling it 'das Edelste, was in uns denkt, *unser Licht*',[240] and again 'das Licht in dir, dein Gedanke'.[241] The belief that light can act as a purifying agent in creation, as an awakener of life, also recurs: 'Licht ist der stille Wirker der überall gegenwärtigen Gottheit, der immer erneuet . . . der flüssige Aether wird einst auch dem Monde Leben geben, und Gedeihen und Wachsthum.'[242] He introduces a quotation from the Orphic poems at this point, indicating the mystical source of his inspiration. His poem 'Orion', dedicated to his old friend, the astronomer von Hahn, is of the same quality:[243]

> Was regt und treibt und beseelet,
> Wodurch sich Alles bewegt,
> Und lebt und fühlt und genießet,
> Und denkt und strebet, ist – *Licht*!

Perhaps it is possible to explain why light, more than any of his various 'Kräfte', appealed to Herder so much. The 'Kräfte' could, on the one hand, be treated as natural, and even at times material, agencies, as when light, electricity, heat, ether, etc. are referred to as 'Materie', 'Stoff', 'Theilchen', and so on; on the other hand, they enabled Herder to introduce metaphysical, or even mystical ideas, at will. But they all had the great disadvantage of being invisible, intangible, elusive, and amorphous – with one exception. For light, which Herder regarded as a 'Kraft',[244] combined all the advantages of the 'Kräfte', yet was also in the unique position of being visible. Like all symbols, it can be immediately perceived. It includes undifferentiated white and all the colours; as rays, or as waves, it can also be described in terms of form. And finally, there clings around it an abundance of traditions and associations, reaching back to the earliest religions, in which it repeatedly figured as the perennial symbol of eternal life and perfect goodness.

The short sketch *Kalligenia,* written in Herder's last years, contains a singular description of a mystical dream or vision. (It has been quite undeservedly ignored by critics, even by those who discuss Herder's mysticism.) Faced with a cosmic view of change and transformation, the initiate calls out:[245]

> 'Laß mich ein Symbol sehen dieses sanften *Strebens,* dieses unendlichen *Werdens,* du unsichtbare Kraft!' rief ich in innigster Bewegung. –
>
> Und siehe da! *Licht* glänzte vor mir, ein Stral des reinsten Lichts. Da er sich theilte, wars, als sähe ich in ihm alle Gestalten der Dinge in der ganzen Eintracht ihrer Verhältniße und Formen. Punct, Linie, Kreis, Säule, Würfel, jede Schwebung und Schwingung der Natur, Blumenketten in allerlei Farben, jede auf dem kürzesten Wege zu ihrem Ziel eilend, dann sich hebend zur sanftesten *Flamme,* aufstrebend zu Einem *Punct harmonischen Lebens.*

The One and the Many, form and content, permanence and change – all the disparates which Herder unceasingly sought to combine – find reconciliation in this mystical apotheosis of light.

(c) Optics and the theory of colour

In his fourth *Kritisches Wäldchen* of 1769, Herder, impatient with deductive systems of aesthetics, proposed that the science of optics should be made the basis of a new aesthetics of vision. The corollaries to this statement were that the psychology and physiology of hearing should prepare the way for a new system of musical aesthetics, and that the psychology and physiology of the sense of touch should transform the aesthetics of plastic art.

Accordingly, the first problem which he encountered in optics was that of distinguishing between visual and tactile sensations; this can be reduced to the more particular problem of explaining which senses we use to judge distance (and magnitude and shape). The solution to this celebrated problem is reached, of course, when we recognise that what is now called 'blending', or 'complication', or 'fusion' takes place[246]; this means that we first learn to judge distances etc. by touch, and these tactile sensations, through habit, gradually become 'blended' with our sensations of seeing, so that we eventually appear to see distances, and we correlate visual shapes and apparent magnitudes with our earlier experiences of touch.

It is usually thought that Herder reached this solution in his fourth *Kritisches Wäldchen* of 1769. Actually, the unpublished manuscript *Anfangsgründe der Sternkunde* of 1765 shows that he knew that our judgements of distance are acquired by habit, not directly by vision, at least four years earlier. His words are as follows:[247]

> Alle Sterne scheinen gleich entfernt zu seyn und auf einer Fläche zu stehen: dieses kommt daher, weil aller ihrer Bilder [sic] sich im Auge auf einer Fläche mahlen und wir von der Entfernung der Dinge nicht unmittelbar aus den Sinnen sondern durch Gewohnheit urtheilen.

He does not yet specify the rôle of touch in this passage, however.

In the fourth *Kritisches Wäldchen*, he mentions Diderot, whose *Lettre sur les aveugles* recorded the observations of the surgeon Cheselden upon a boy whose sight had been restored by a historic operation of 'couching' for cataract in the early eighteenth century.[248] Herder mentions Cheselden by name in the same work.[249] In his 1770 essay on language, he also refers to Robert Smith's *Compleat System of Opticks*, which also mentioned Cheselden's conclusions.[250] This surgeon's report, in fact, showed an understanding of 'blending', and it is to be supposed that Herder acquired his knowledge of it from this source.

On the other hand, Suphan also names Diderot's *Lettre sur les sourds et les muets* as one of Herder's sources, as well as Berkeley's *New Theory of Vision* (1709).[251] But while there is proof that he used this work of Diderot, he does not name Berkeley's work until *after* he had put forward his own theory concerning 'blending'. Cheselden's report, however, does not dwell on the cardinal importance of touch in our judgements of distance so exclusively as Herder does. For Cheselden, as quoted by Robert Smith, also says that 'the apparent magnitude of the object in view'[252] is of great importance as a guide to distance, and adds that 'the ideas of distance are suggested to the mind by the ideas of magnitudes of objects'.[253] But Berkeley is much more concerned with tactile sensations, and he stresses the need for exact distinctions between sight and touch, just as Herder does[254]; like Herder, he treats the problem theoretically and deductively (but not mathematically) as well as inductively, whereas Cheselden had dealt only with its empirical aspects.

It is therefore possible that Herder had read Berkeley's work earlier than it appears from his later references to it. This becomes more probable when we read sentences such as the following in Berkeley's work: ' . . . those *lines* and *angles* have no real existence in nature, being only a *hypothesis* framed by *mathematicians*, and by them introduced into *optics*, that they might treat of that science in a *geometrical* way.'[255] He thus considers that mathematical optics can tell us nothing about the subjective aspects of vision, in the same way as Herder, in 1769, says of our sense of hearing: 'abstrahirend von Verhältnißen, weiß der Mathematiker also von dem, *was Ton ist*, so wenig, als der Naturlehrer'.[256] Herder, like Berkeley, tended to dwell upon the subjective aspects of perception more than upon its objective conditions, so that exact physical optics plays little part in his theories. Altogether, the influence of Berkeley upon Herder has been much underrated, perhaps because Berkeley's name is associated with the subjectivism which Herder later criticised so virulently in the Kantians. Nonetheless, there survives, unpublished, an entire notebook, devoted by Herder to excerpts from Berkeley.[257]

Herder's real claim to originality in his treatment of this whole topic is, of course, that he applied the study of tactile sensations to the aesthetics of plastic art. The influence upon him of the various writers named above in no way detracts from this independent achievement.

Herder's works also contain more general remarks concerning visual perception and optics. In 1770, in an early version of his *Plastik*, he again emphasises the subjective side of perception, and even says that visual perception is relative to the *individual* organism or human being with its own peculiarities: 'So wie jedes Thier nach einer andern Gestaltung seines Auges auch eine andre Welt sieht: so werden auch im Menschlichen Sinne diese mancherlei innere Vorstellungen fühlbar.'[258] Again and again he insists that the structure of the eye conditions our perception, and writes in 1799: ' . . . eine *Logik des Sehens* ist dem Verstande durch die *Form seines Werkzeuges* selbst *gegeben*.'[259]

But the objective counterpart of these ocular studies, the theory of light, must not be neglected either; he says in 1787: 'Für die Philosophie der Empfindung ist eine *Theorie des Lichts und des Bildes* von gleich mannichfaltigem Nutzen'.[260] The eye and the light, the image the eye perceives, are complementary in Herder's opinion, as the following words from the psychology essay of 1778 show: 'Wäre in diesem Körper kein Licht, kein Schall: so hätten wir auf aller weiten Welt von nichts, was Schall und Licht ist, Empfindung . . . '.[261] This sentence reiterates the old mystical doctrine of an inner and outer light, which was later adopted by Goethe, who wrote: ' . . . so bildet sich das Auge am Lichte fürs Licht, damit das innere Licht dem äußeren entgegentrete'.[262] (From our earlier review of Herder's theories of light, it is easy to guess at the nature of the mysterious inner light he speaks of.) But while Goethe's words suggest that some natural process of adaptation takes place as the organism develops, it is clear from a passage in the *Ideen* that Herder envisaged a teleological preadaptation of eye and light. The eye finds 'sogleich den goldnen Lichtstral vor sich, der für dasselbe, wie das Auge für den Lichtstral, erschaffen ist und die Weisheit seiner Anlage vollendet'.[263]

As we noticed in considering the problem of perception, Herder also put forward a more particular and highly subjectivistic theory of vision. It is the theory of the 'Bild'. The subjective image ('Bild') we create in the act of seeing, not its objective, external origin, is the most important factor in perception: 'Wir sehen nicht, sondern wir erschaffen uns Bilder.'[264] However, this 'Bild', as one critic observes, is 'the work of the creative artist, which is our "soul" or integral individual self'.[265] It must not be confused with the optical image produced within the eye itself. Nonetheless, it is probable that this concrete, optical image gave Herder his later idea of a spontaneously created inward 'Bild', for, in the *Journal,* he suggests that the act of vision produces an actual 'Gemälde' within the eye and within the brain; the inward, cerebral image might even be traced by dissection, he conjectures along with Maupertuis.[266] In the 1770 version of his *Plastik,* he again says: ' . . . da ist auf der Netzhaut ein kleines Gemälde. . . . Die grosse, allweite Gegend, die ich vor mir sehe, was ist sie . . . ? Bild!'[267] Such ideas were perhaps suggested to him by Euler, who declared in a work published in 1768-1772 and read by Herder (although Herder first quotes it in 1800[268] – yet he may have read it, or a similar work, at an earlier date): 'As often as we see an object, the image of it is painted on the bottom of our eyes; and this is produced by the rays which proceed from the object to us'.[269] Euler even suggests that this image can be found in visible form, at the bottom of a dissected eye.[270]

Thus, in his earlier works, before he wrote the essay *Über Bild, Dichtung und Fabel* in 1787, Herder still uses the word 'Bild' in a purely optical, not a psychological sense. It was the concrete, physical usage of the word which Goethe adopted. The latter says that, in the study of light, 'nicht von einem unbegränzten, bedingenden, sondern von einem begränzten bedingten Licht, von einem Lichtbilde, ja von Bildern überhaupt, hellen oder dunkeln, die Rede sei'.[271]

It is interesting that while Herder, especially in his early years, emphasised the senses of hearing and touch, and rebuked the young Goethe (calling him a 'Specht'[272]) because of his natural preference for vision, the 'superficial' sense, he became more interested in vision as time went on, even devoting an essay to colour and vision in his last years. He had read various works on optics, as, for example, his history of the telescope in the *Adrastea* shows, and consulted Priestley's classic history of the subject.[273] His increased interest in this topic must be explained partly by his general preoccupation with physical science in his last years, but also, in large measure, by Goethe's influence.

Herder's earlier works do contain a few scattered observations on colour and on the composition of light. In a letter to Hamann in 1773, for example, he says of the younger Hemsterhuis:[274]

> Er ist dünkt mich mehr als Diderot der Philosoph, soll eben so stark in der Mathem[atik] seyn und unter andren ganz Anti-Newtonische Offenbar[ungen] in der Optik unter der Hand haben, die diese ganze Wißenschaft verändern (was mir Futter für die Seele wäre)...

The final parenthesis seems to foreshadow, in a striking way, not only Herder's own later criticisms of Newton's theories of gravity and of light, but also the controversial attitude which Goethe adopted in his *Farbenlehre.* But no anti-Newtonian theories on optics or colour appear in Hemsterhuis' published works, and Herder himself did not put forward any detailed views on colour until Goethe commenced his optical studies in the 1790's.

It is probable that Herder, perhaps influenced by Berkeley, had, by the time he wrote to Hamann in 1773, extended his belief that objective mathematical analysis cannot fully account for musical euphony so as to doubt, in turn, whether it can account for our awareness of colour either. His only mention of colour during this period, in the 1769 version of his *Plastik,* confirms this suspicion; for it is what Goethe later called the 'sinnlich-sittliche Wirkung' of colour, not the objective constitution of light, which Herder discusses here:[275]

> Es ist zu beweisen, daß die *grüne* Farbe die *fühlbare* Farbe sei, gleichsam der Ton unseres Auges, wo es mit den Fühlnerven zusammenhängt . . . die *grüne* und *blaue* Mittelfarben [wirken] auf Gefühl, *blaue* des Erhabenen, *grüne* des Angenehmen, *weißrothe* des Schönen.

The word 'Ton' shows how closely Herder's ideas on colour and on sound were associated.

It was in January 1790 that Goethe, examining Büttner's prisms, suddenly saw the way open for his own anti-Newtonian colour theory.[276] And in the following year, he wrote to Karl August:[277]

> Noch kann ich mit lebhafter Freude melden, daß ich seit gestern die Phänomene der Farben wie sie das Prisma, der Regenbogen, die Vergrößerungsgläser pp. zeigen auf das einfachste Principium reducirt habe. Vorzüglich bin ich durch einen Widerspruch Herders dazu animirt worden der diesen Funcken herausschlug.

Clearly, some important development had taken place. Since his first intuitions had come to him, he had conducted many experiments, and we know that around this very time he succeeded in formulating his results and convictions in a unified pattern.[278] But, in the absence of more detailed information, we can only conclude that Herder, as his earlier words to Hamann also suggest, may have had more influence upon Goethe's colour theory than is generally supposed. Besides, Caroline mentions Goethe's early optical experiments in a letter to Gleim in 1791.[279] Herder, around the same time, attended a meeting of the 'Freitagsgesellschaft' at which Goethe delivered a lecture on the prism,[280] and he refers himself to Goethe's optical pursuits in a letter to Heyne in the following year.[281] In 1928, a fragmentary letter from Herder to Goethe on the subject of colour was discovered and published.[282] This document probably dates from late in 1793, or from 1794. In it, Herder criticises Goethe's *Versuch, die Elemente der Farbenlehre zu entdecken,* and observes that black and white, mixed together, produce grey, which is also produced by the mixing of all the colours. (We know that this applies only when pigments, which are never quite pure, or incompletely resolved spectral colours, are mixed, for the pure colours, when mixed, should produce white, as Newton realised.) Upon this observation, Herder bases the supposedly Newtonian objection to Goethe's theory that all the colours must therefore be actually present 'in Licht, durch Schwarz modificirt', adding: 'Du wirst dem Zweifel leicht begegnen'. Indeed, Herder's objection is closer to Goethe's, or even Aristotle's[283] point of view than to that of Newton, who, of course, derived the colours from white light alone, without referring to darkness at all. All this further suggests that more exchanges took place between Herder and Goethe on the subject of colour and optics than is commonly supposed.

Herder began to enunciate his own more or less anti-Newtonian views on colour in his *Kalligone* of 1800, when he wrote the following words, in dialogue form: 'Sie glauben also . . . nicht an *Newtons* sieben einfache Farben? . . . *Tobias Mayer* hat aus Mischungen der drei Hauptfarben 819 Farben deduciret.'[284] That belief which led Herder to assert that light is transmitted 'in sanften Strömen' rather than in (presumably abrupt and mechanical) waves, his belief in gradual transitions, originally inspired by the Leibnizian principle of continuity, is again at work here.

Like Goethe, Herder also declares that darkness, as well as light, is essential for producing colour. He says of black: 'Es [i.e. das Schwarze] scheinet mir, wenn das Licht der glänzende Vater des ganzen Farbensystems ist, die Mutter der Farben. Als Licht die Finsternis bestrahlte, ging jenes tiefe Blau aus ihm hervor . . .'.[285] Bernhard Suphan, in a note to the text, rightly notices Goethe's influence here.[286]

Herder wrote an essay on colour for his *Adrastea*; it remained unpublished, however, during his own lifetime. This essay is parallel to, and arises out of, his earlier disquisition upon light, since it likewise sets out to reconcile the rival theories of Newton and Euler, this time with reference to colour.

He begins, in a way which recalls his attitude towards sensations of musical euphony in 1769, by affirming that the objective study of light is not in itself enough to explain the origin of colour; the eye and its workings must also be investigated. For, like Euler,[287] Herder says that the ultimate cause of colour production is unknown; it may just as well be determined by the nature of the eye as by the nature of light.[288] In insisting that the ultimate physical cause of colour production remains unknown, Herder also involuntarily reminds us of Goethe's theory of an irreducible 'Urphänomen' of colour.

He again rejects Newton's seven colours, saying that the transitions between them must be gradual, and declares: ' . . . wie Schwingen des Lichts zeigen sich die Farben'.[289] This recalls Goethe's description of colours as 'Taten des Lichts', as well as Herder's own dislike for abrupt and mechanistic transitions as implied by Newton's 'Brechung' (refraction) of light.

His next words on the colours take us by surprise: 'Polartiges ist in ihnen nichts.'[290] This remark is obviously directed against Goethe, who was now thoroughly estranged from Herder. Herder probably considered, despite his usual liking for dialectical formulations, that the polarity of light and darkness, like Newton's seven distinct colours, meant too harsh a distinction, and that it failed to do justice to the nuances of shading which appear between all colours. He calls yellow a 'Maximum', again employing Lambert's term as he had done in the *Ideen*. We may remember that Herder considered that a 'Maximum' is produced by the interaction of *many* forces, not just by two. Thus, yellow arises amidst *many* colours, so that Goethe's theory of colour-polarity must be rejected.

Herder here treats yellow as the central colour. (In the *Plastik* of 1769, he had called green and blue the 'Mittelfarben'.[291]) It is also an 'irdischer Repräsentant' of invisible, pure white light.[292] But we know from the colour spectrum that yellow is the third colour from the lower extreme of the scale. He later adds the rather forced explanation that the lower 'half' of the spectrum *seems* longer than the other, although the true centre of the series, a supposedly invisible white, cannot be seen by the human eye.[293] He also speaks of yellow 'das oben in der dichtesten Spitze zum Roth aufsteigt'[294]: thus red, at the end of the spectrum, now becomes the apex of the colour series, just as in Goethe's colour pyramid.

Herder's criticisms of Newton's theory are much less virulent than Goethe's. It is Newton's mechanistic treatment of light ('die zarte Materie', as Herder once calls it[295]) which he resents, not his supposition that it is material (i.e. corpuscular), or even his description of it in terms of mathematics; for he is never hostile towards mathematics *per se,* but only when it is allied to mechanics: ' . . . so ist mit *Stoß* und *Hieb,* mit *Auf-* und *Abprallen* hier nicht Alles ausgerichtet.'[296] For his emotional attitude towards light led him to believe that it must flow gently, and that the colours must intermingle smoothly; Newton's mechanics offended his sensibilities.

In the *Kalligone,* he says of the eye: ' . . . so entstand in ihm die Scala der Farben natürlich'.[297] This is parallel to a statement in Goethe's *Farbenlehre*: 'Das Auge verlangt dabei ganz eigentlich Totalität und schließt in sich selbst den Farbenkreis ab.'[298] Herder says, however, in his essay on colour, two years later than the *Kalligone*: 'Der Chemie muß es überlassen bleiben, in die Bestandtheile der Farben und des Lichts einzudringen . . . '.[299] He now implies that colour has some objective reality, independently of the human eye. Thus, as usual, he employs subjectivistic and objectivistic theories at different times. But, after his words on chemistry (which, incidentally, remind us of Goethe's investigations into the chemistry of colour), he reaffirms the subjectivistic theory: ' . . . ist überhaupt nicht Alles, was wir sehen, ein unsichtbares Bild der Seele?' (The word 'Bild' is used psychologically here, not optically; this is true of all its applications after the 1787 essay *Über Bild, Dichtung und Fabel.*) Thus, in the last resort, he prefers subjectivistic, or ocular theories of vision and colour perception to those based purely upon the physics of light.

Finally, he attempts to reconcile the colour theories of Newton and Euler, as he had done with their theories of light. He declares: 'warum sollte man die zarte Flüßigkeit der Lichtmaterie sich nicht eben sowohl in Schwingungen bewegen lassen, als in schießenden Pfeilen?'[300] On this occasion, he retains the corpuscular theory associated with Newton, but rejects his mechanics, substituting for them the wave theory of Euler. The colours are not broken-off parts of the light, but modifications of it. As before, he seems to imply that light waves are of a smooth, not an abrupt kind, for he subsequently uses the word 'Strömung' instead of 'Schwingung'. As in his essay on light, he still seems uncertain about precisely how light is transmitted.

Once again, he adds a physiological definition to these external ones: 'Das Licht reizt; Theile des Nervs schwingen sich; die Empfindung erfolgt – wir können kaum weiter.'[301] This recalls his early attempts to apply the neurological theories of Haller, Burke and others to the psychology of perception.

Goethe links the colour red with heat or fire, but only symbolically. Herder, however, makes this comparison a literal one: 'Offenbar brennet der zusammengespitzte rothe Stral heftiger, als der blaue . . . ; wir kennen kein Licht, ohne mit Feuerstof verbunden.'[302] Herder was close to the truth, although he did not know of infra-red rays as such.

All this, however, is again vague and unscientific.[303] Nevertheless, there is a certain order behind Herder's so-called 'theory' of colour. This order is not that of mathematics, nor of empirical observation, but of certain fixed associations within Herder's peculiar intellect. The desire for synthesis, the counterbalancing remarks on subject and object, and rejection of mechanistic theories, the appeals to psychology and physiology, the belief in gradual transitions – all these are familiar and interconnected features of Herder's mind, and they cannot be treated either as piecemeal fancies, or ascribed entirely to Goethe's influence. The whole disquisition upon colour is inferior to Herder's early writings on hearing and touch, perhaps because, as Haym observes,[304] his senses were musically rather than visually orientated, and because he lacked Goethe's powers of painstaking observation. He did not study the theory and practical workings of colour nearly carefully enough, but simply fell back upon *a priori* criticism of existing theories. He thus committed the very error he so stridently condemned in Kantian philosophy.

(d) Sound, and the analogy between colour and pitch

Herder was not really interested in the theory of sound except in relation to musical acoustics, his views on which have already been discussed in the earlier section on mathematics. Characteristically, he made much of the analogy between the musical scale and the colour spectrum. Even Aristotle had noticed the correspondence between pitch and colour, and between musical harmony and pleasing colour combinations.[305] But it was Euler who, in Herder's age, gave new life to this old theory, by employing the analogy of sound waves in his undulatory theory of light, which explained the colours as produced by varying frequencies of lightwaves.[306] He declared: 'The parallel between sound and light is so perfect, that it fits even in the minutest circumstances'.[307]

Already in 1769, Herder calls the ocular nerves 'Saitenspiele für die Farben'.[308] And in the same year, he describes the colour green as 'gleichsam der Ton unseres Auges'.[309] Thus, he appears to have related colour and sound from an early date, possibly under Euler's influence. Chladni, whose work Herder mentions in his *Kalligone*[310] in 1800, and who himself visited Herder in 1803,[311] had devised a means of making sound patterns visible by spreading sand over vibrating plates – the famous 'Chladni's figures'. Chladni may thus also have encouraged the older Herder to follow up the analogy of eye and ear. An extreme case of inferrelations between colour and sound was that of the celebrated 'Farbenklavier', an early experiment in synaesthesia. Herder did not approve of it, however, and declared in 1778, in the *Plastik,* that colours, appealing solely to the eye, can provide only 'das flachste Gedankenloseste Vergnügen'.[312]

Already in his *Kalligone,* Herder draws several parallels between musical sound and colour, but it is in the later essay on colour that he presents his fullest exposition of the analogy. Some of the parallels are contrived, as, for example, when he says that both the musical scale and the colour spectrum have no perceptible central unit[313]; but most of them do not contradict the scientific knowledge of the times. Herder now acknowledges at last that Euler is his authority and source for the whole analogy,[314] although Newton too had compared the scale and the spectrum as both consisting of seven units (disregarding the eighth note of the octave).

Knebel hailed Herder's remarks on the analogy with the words: 'Welch schönes Concert zwischen Himmel und Erde! So entsteht die Musik der Sphäre!'[315] These words express Herder's feelings as well as Knebel's. For as Rudolf Haym realises, it was the aesthetic aspects of the analogy which appealed to Herder, along with the fact that it provided him with evidence for his belief in universal harmony.[316] Such motives are scarcely those of the strict physical scientist.

(e) Heat

Theories of heat in Herder's age were in an uncertain state. Heat was at times considered to be a material substance,[317] which was identified by Nollet and others with electricity,[318] and was widely believed to be imponderable.[319] In the seventeenth century, many had supported the true theory that heat is a kind of motion,[320] but this remained for long a disputed hypothesis. Lavoisier thought that it was a measurable fluid, calling it 'calorique', but Benjamin Thompson revived and proved the correct theory in 1798,[321] though his achievement was not universally accepted for a considerable time.

Newton, however, had associated heat closely with light, declaring that light (which was regarded as material or corpuscular), on striking material bodies, sets up vibrations within them; we perceive this effect as heat.[322] And although Herder had at times linked heat with electricity, he more often relates it to light, just as Newton had done. In the *Adrastea,* he appears at first to support the Newtonian theory, saying that light flows 'in sanften Strömen' through space 'bis es in Nähe unsrer Erde sich mit Feuerkräften waffnet'.[323] Bode, in a work known to Herder, had likewise spoken of light, 'dessen feuerlose Stralen sich durch den Aether fortpflanzen, aber erst . . . an der Erdoberfläche mehr oder weniger Wärme hervorbringen und bewirken'.[324]

In his essay on colour, Herder is more specific: 'Wir kennen den Sonnenstral nur, wie er zu uns kommt, mit Wärmestoff gerüstet; seine sanfteren Schwingungen und Directionen in der dephlogisierten Luft kennen wir kaum, im Aether noch minder.'[325] Like Newton, he associates heat with light, but also introduces the current eighteenth-century doctrine that heat is a substance. Thus, light becomes associated with the heat-substance upon the earth's surface. The whole conception is further complicated when Herder introduces Stahl's theory of phlogiston, a hypothetical substance thought to be liberated during combustion, and therefore also associated with heat.[326] In the passage quoted above, he seems to imply that the heat-substance ('Wärmestoff') and phlogiston are identical (since the action of light is 'sanfter' in air which contains no phlogiston).

But in 1800, Herschel discovered 'that rays of ordinary light transmit a certain amount of heat, that this effect is more marked for light at the red end of the spectrum . . . , and that beyond the red end there are rays which transmit heat but do not affect the human sense of vision'.[327] Herder wrote in 1802 of 'Herschels Entdeckung, daß die Sonne uns außer dem Licht auch unsichtbare Wärmestralen zusende', quoting an article by von Hahn in Bode's *Astronomisches Jahrbuch.*[328] This shows that his scientific knowledge could be extremely up to date in an age of slower communications. But since neither Herder himself, nor von Hahn in the article Herder cites, mentions either red or infra-red rays in particular, and both speak only of 'unsichtbare Wärmestrahlen', it would seem that Herder, when he associates the colour red with heat on another occasion around this time,[329] was simply placing a literal interpretation upon the traditional symbolism which used red, the colour of fire, to represent heat or warmth.

Herder's views on heat thus reflect the materialistic theories current in his age, as well as the general uncertainty which then prevailed throughout the subject. They are probably influenced by Newton's theory, as well as by the already obsolete phlogiston hypothesis. He acclaimed Herschel's discovery of radiant heat when he first met a short notice on it, but himself added nothing to existing observations or theories.

(f) Chemistry

Herder writes in the *Ideen*:[330]

> Die Chemie, die in den neuen Zeiten so eifrig geübt wird, öfnet dem Liebhaber hier im unterirdischen Reich der Natur eine mannichfaltige zweite Schöpfung; und vielleicht enthält diese nicht blos die Materie, sondern auch die Grundgesetze und den Schlüssel zu alle dem, was über der Erde gebildet worden.

But although he here avows that chemistry is a highly significant science, he broadly neglects the subject throughout his works. Again, in 1798, he says of his hopes to attend classes on chemistry: '. . . ich wünsche sehr, daß es zu Stande komme, indem ich nach dieser Wissenschaft eigentlich *durste*'.[331] It appears that he at least discussed the subject with the chemist Scherer, who visited him in the following year,[332] but whatever new knowledge he acquired had no repercussions upon his own writings.

Nevertheless, various concepts and theories derived from chemistry do appear in his works. For example, the reader soon encounters the archaic notion of the four elements – earth, water, air and fire. In an early, unpublished dialogue on water, written in Königsberg, the nature of water is discussed exclusively in terms of the elements. It is curious that Herder even uses the old symbols for them – 🜂 for fire, 🜁 for air, 🜄 for water, 🜃 for earth.[333] In a notebook of around 1766, quoted by Suphan, he enumerates the supposed agents of universal change as follows: 'Elemente, Feuer ['Erde' scored out], Meer, Luft, Aether'.[334] These terms reappear throughout the first two parts of the *Ideen*. They constitute, for Herder, the crudest forms of matter, within which the subtler 'Kräfte' work. But fire, particularly in the form of 'Elementarfeuer', has something of the status of a creative 'Kraft', as we noticed in connection with his theories of light. The other elements are simply media, as the presence of 'Aether' in the above list indicates.

On one occasion in the *Ideen*, these archaic concepts are used to lend support to the Mosaic narrative of creation: 'Im Tode wird unser künstliches Gebäu in Erde, Wasser und Luft aufgelöset, die in ihm jetzt organisch gebunden sind.'[335] This is one of the rarer occasions in this work where orthodox theology directly influences Herder's scientific views. The passage also recalls the old doctrine of the microcosm, which was thought to be compounded of the same elements which constitute the macrocosm.

Usually, Herder contends that the elements (apart from earth) were creative agents in the earlier phases of our planet's existence: 'Drei mächtige Wesen wirkten in diesen großen Zeiträumen, Wasser, Luft, Feuer.'[336] Water and fire raged within the primitive atmosphere, and, through precipitation, gradually purified the air and shaped the earth's surface.

The scientific standing of the four elements in Herder's day was already extremely low. Boyle had condemned these Aristotelian concepts in 1661. None the less, they kept reappearing in the works of several reputable scientists for a considerable time, but usually only in looser descriptions where the strictest chemical accuracy was not deemed imperative. Linnaeus, in a work referred to and read by Herder, even defined climate in these terms: 'Unter dem Worte Clima werden hier alle vier Elemente verstanden.'[337] The chemist Candido Pistoi, in a work from which Herder made excerpts, clung to the old conception, and, like Herder, regarded fire as the most active of the four: '. . . so ist es doch so zu sagen die Seele von den andern.'[338] Goethe named the elements as the effective agents of environmental determinism as late as in 1824, in an essay dealing with the anatomy of the rodents.[339] This recalls the similar belief of Linnaeus.

Quantitative chemistry had begun to appear by 1740, however, with the work of Joseph Black in particular, and Herder's use of these archaic, qualitative notions can only be described as outdated. Similarly, when he mentions 'Wahlverwandtschaften' (elective affinities), he declares: 'Der Chymiker veranstaltet nichts als Hochzeiten und Trennungen'.[340] Metaphorical though the words may be, they were favourites of the medieval alchemists.

In Herder's lifetime, modern chemistry finally emerged with the work of Priestley and Lavoisier. The last great battle with the older school was fought over the traditional phlogiston theory of combustion, which had originally been propounded in the 1670's by Becher, and subsequently by Stahl. The property of combustibility was substantivised as the hypothetical, imponderable substance phlogiston, and a complex chemical nomenclature was evolved in accordance with it. Thus, modern oxygen was called 'dephlogisticated air', nitrogen was 'phlogisticated air', and hydrogen, although usually called 'inflammable air', was sometimes identified with the elusive phlogiston itself.[341]

Herder never seems to have questioned the merits of the phlogiston theory, although Lavoisier had more or less disproved it by 1784.[342] In a rejected manuscript for part of the *Ideen*, Herder treats 'Phlogiston' and 'das Brennbare in der Luft' as synonyms, as the older school of chemists did.[343] He takes note of Ingenhouß's important and recent discovery that plants extract an unbreathable gas from the air, and uses the phlogistic terminology to describe the process, as Ingenhouß himself had originally done. The gas which the plants extract, he calls 'das Brennbare', the modern carbon dioxide.[344] Yet we have just seen that he elsewhere equates 'das Brennbare' to phlogiston, although others still identified the latter with hydrogen, which is genuinely inflammable; the theory was thus hopelessly confused. Herder also refers to the observation made by the climatologist Wilson, and widely accredited in his day, that the presence of phlogiston in the air promotes organic putrefaction and hinders respiration, and that the colder Arctic air, being deficient in phlogiston, is purer than air elsewhere.[345] (Kant used the same theory to explain why Europeans find Africa unhealthy: the negroes, he said, are adapted to resist the noxious effects of phlogiston.[346]) We have already seen that Herder described how heat is produced by saying that light associates itself, on striking the earth, with atmospheric phlogiston; on this occasion, like many writers of the time, he in turn identifies phlogiston with 'Wärmestoff', the hypothetical heat-substance.[347]

The phlogiston theory was already passing out of currency in the 1780's, however. Knebel, in a letter to Herder in 1789, rightly observes that the idea creates confusion (in a work on electricity he has just read).[348] But Herder cannot be blamed entirely for his confused ideas on the subject. Like many educated men of the time, he was compelled to use a theory which was quite inadequate, for no alternative theory was as yet known to him. He simply used the phlogiston theory as best he could.

Herder's knowledge of chemistry was, in the long run, somewhat greater than the reader of his works would at first suspect. Among the notes he copied from his friend August von Einsiedel's manuscripts were several passages on chemistry, unfortunately omitted in the recent edition of Einsiedel's previously unpublished *Ideen.*[349] (Einsiedel was a keen student of chemistry and mineralogy.) He possessed or read various works on the subject,[350] although Lavoisier is mentioned only once, in 1801, in passing[351] : it seems that Herder failed to recognise his signal importance. Herder's late interest in chemistry, which was no doubt part of that general re-awakening of his interest in all branches of physical science in his last years, yielded no productive result in his works.

4. The geological sciences and cosmogony; meteorology; geography

(a) Mineralogy

Although Goethe, Knebel, Einsiedel, Merck, and August Herder were all persons with whom Herder was in close contact at various times, and all possessed a considerable knowledge of practical mineralogy, Herder himself never evinced any real interest in empirical observations of the minerals and rocks of which the earth is composed. Largely through discussions with his son August, and probably with Einsiedel, he does seem to have acquired some knowledge of mineralogical and mining terms,[352] but this did not lead him to write anything on the subject himself. (His knowledge of palaeontology, which was more considerable, will be discussed later in connection with theories of evolution.)

(b) Chronology: the age of the earth

Herder says in an earlier version of his *Älteste Urkunde,* around 1771 or 1772: 'Aber so wißen wir ja nicht das Alter der Welt!'[353] The Book of Genesis, he says, can give us no information on this subject. But in 1774, in the final version of the same work, he says that 'die Welt fast sechstausend Jahr alt . . . ist'.[354] In a sermon of the same year, he says of the three Magi: ' . . . viertausend oder Eins oder Zwei wars, da die Weisen ankamen'.[355] Thus, it appears that during his most religious phase, he came to accept the Biblical chronology he had rejected two or three years previously.

In the *Ideen*, he rejects Buffon's longer chronology as arbitrary (which it is), and dismisses the 'aeons' of various ancient mythologies for the same reason.[356] But he does not accept the 'days' of creation literally either, and concludes:

> Der Fels unsrer Erde ist sehr alt und die Bekleidung desselben hat lange Revolutionen erfodert, über die kein Streit statt findet. Hier läßt Moses einem jeden Freiheit, Epochen zu dichten, wie er will...

Moses' 'days' are only an abbreviated and figurative description, Herder claims, thereby anticipating a favourite compromise of nineteenth-century chronologists. Again in an essay of 1792 he says that Moses' 'days' tell the geologist nothing.[357]

Kant's exceptional chronology, in his *Allgemeine Naturgeschichte*, involving 'vielleicht eine Reihe von Millionen Jahren und Jahrhunderten',[358] may have been responsible for Herder's caution. Another of Kant's remarks, in the lectures on physical geography attended by Herder, may have encouraged him to suppose that Moses' 'days' are symbolic: 'Bei Gott ist eine Zeit wie der Tag zum Schaffen zu viel und zur Ausbildung der Erde zu wenig.'[359]

It is certainly clear that his mature views on chronology were fairly liberal for his time. One writer lists several of his contemporaries, most of whom doubted Archbishop Ussher's scriptural chronology, but often named arbitrary figures which are still vastly too short by modern reckoning.[360] Herder was wise to leave the question open, since no detailed evidence became available until well on in the following century. On the other hand, his remark that the convulsions of the primeval earth must have lasted 'Jahrtausende' indicates that he too greatly underestimated the earth's age.[361] Besides, he believed that some of these vast geological changes took place within the time covered by human records; this again implies that his own computation was only a fraction as large as present-day estimates of the geological time-scale.

(c) The earth's core and the earliest mountains

Bernhard Suphan was the first to point out that Herder, like Goethe, believed in an 'Urgebirge', and thought that this, as well as the earth's core, was composed of granite.[362] He believes that Goethe gave Herder this idea, but that Herder was the first to put it on paper.

Allusions to an 'Urgebürge', an 'Erdrücken', or 'den Kern unsrer Erde, der Granit' are so frequent in the *Ideen* that only a list of page-references can be given here.[363] One characteristic passage contains views extremely close to those expressed by Goethe in his essay *Über den Granit*:[364]

> Der alte Granit, der innere Kern unsres Planeten, zeigt soweit wir ihn kennen, keine Spur von untergegangenen organischen Wesen ... Wahrscheinlich ragte er in seinen höchsten Spitzen über die Wasser der Schöpfung empor, da sich auf denselben keine Spur einer Meerwirkung findet...

Let us for the moment ignore the problem of how the granite core was first formed, and try to ascertain the sources from which Herder's and Goethe's theory is derived.

Moro (1740), Arduino (1759), Lehmann (1759 *et seq.*) and Delius (1770) all distinguished 'primitive' mountains from later 'secondary' ones.[365] Herder, however, nowhere mentions these writers. A. G. Werner, in a geognostic table published in 1777 for limited circulation, speaks of 'uranfängliche Gebirge', and mentions granite first in his list of the rocks which form these mountains.[366] De Saussure, in the first volume of his great work on the Alps (1779), says he has devoted most attention to the primitive mountains, particularly those composed of granite, since he believes they contain the secret of the origin of things.[367] But it was P. S. Pallas, in 1777, who first declared unequivocally that the primitive mountains and the earth's core were composed of granite.[368] Two writers on Herder note that Buffon also believed that the earth's core consists of granite,[369] and Linnaeus postulated an 'Urberg der Schöpfung', situated near the equator,[370] although he does not say what it was made of.

Suphan is wrong in saying that Herder recorded the granite theory before Goethe, who, in fact, writes to Merck in 1782: 'Wegen des Granits, ob ich gleich überzeugt bin, daß er die Basis unsrer bekannten Oberfläche ist, werden wir aber doch wohl nachgeben und einen *granit secondaire* statuiren müssen.'[371] The French words, and a reference to the Abbé Soulavie in the same letter indicate that it was this writer who gave Goethe his idea. Goethe already seems to distinguish between a primitive mountain system (his later 'Urgebirge') and a secondary one.

Herder may thus have acquired the idea from any of several sources. Goethe himself may have introduced it to him, or the ideas of Werner may have reached him in the early 1780's through students of the renowned Freiberg geologist. He was also familiar with the mineralogical writings of Buffon, of course. In the *Ideen,* he also refers to de Saussure and Soulavie,[372] and to Linnaeus' 'Urberg der Schöpfung'[373] (which may have suggested the word 'Urgebürge'). Finally, he refers at least four times in the *Ideen* to the very work of Pallas which said that the primitive mountains, and the earth's core, were made of granite.[374] He probably took the granite theory from Pallas,[375] but we cannot rule out the possibility that some of the other writers named above may also have helped to shape his views.

Pallas, however, says of granite: ' . . . rien n'est plus vraisemblable que de prendre cette roche pour le principal ingrédient de l'intérieur de notre globe'.[376] He distinguishes between 'montagnes primitives' and 'montagnes secondaires', saying that the latter are built up from sediments deposited in the oceans.[377] This is very similar to the view of Herder, who distinguishes the 'Urgebürge' from 'herangeschwemmte Berge'.[378]

One other branch of the 'Urgebirge' hypothesis has a more ancient pedigree. In 1775, Herder calls the great mountain systems 'der Rücken der Erde'.[379] In an early sketch for the *Ideen* he calls them the 'Knochen der Erde'.[380] Seneca had also likened the earth's rocks to its bones,[381] and Leonardo called the mountains the bones of the earth.[382] Thus Herder combined the granite theory with another idea of much greater antiquity and less scientific standing.

But the granite theory itself was rejected in the nineteenth century. Before his death in 1797, James Hutton discovered that granites are of igneous origin and differ greatly in age, some being of comparatively recent origin.[383] (His discovery, however, was published only in 1899.) Lyell too, in 1833, realised that granites vary in age.[384] At the present time, geologists are usually unwilling to commit themselves to any exact definition of the rocks which formed the earliest solid surface of the earth; both sedimentary and igneous varieties are found amongst the oldest rocks known. The nature of the earth's interior is still little known, but seismological tests show that it is certainly not uniform, and consists of several distinct layers. It is interesting, however, that the contemporary earth-historian, G. Gamow, does not say that the earth's *core* is made of granite, but he does declare: 'The outer crust of the Earth consists of a layer of granite . . . extending to a depth of from 50 to 100 kilometres'.[385] He notices that granite is absent only in the Pacific basin, from which it was removed, he believes, when the moon became detached from that side of the earth.[386] Gamow thus seems to have returned to the old theory that the *original* crust of the earth was of granitic composition.

(d) Cosmogony

Herder's views on cosmogony are ambiguous and at times contradictory; they have to be pieced together from many scattered utterances, most of which, however, appear in the various versions of the *Ideen,* Part I. Like all such theories of that age, they are almost entirely speculative.

Descartes,[387] Leibniz[388] and Buffon[389] had declared that the earth first arose as a molten body, having become detached in some way from the sun. Herder writes, in a poem of 1769, referring to the various cosmic bodies: 'Wann in unendlichen/ Ruh ewigkeiten [sic] riß ihr Rad sich/ feurigen Schwungs in den wüsten Äther?'[390] He thus seems to have accepted the theory that they all passed through an initial glowing or molten state, at this time. But in the *Ideen*, Part II, he shows that he has altered his opinion, saying of the granite 'Urfels':[391]

> Daß dieser Fels glühend aus der Sonne geschleudert sei, ist ein riesenhafter Gedanke, der aber weder in der Analogie der Natur noch in der fortgehenden Entwicklung unsrer Erde Grund findet . . . Viel wahrscheinlicher ist, daß dieser wunderbare Urfels durch innere Kräfte sich selbst gebildet d.i. aus dem schwangern Chaos, daraus unsre Erde werden sollte, verdichtend niedergesetzt habe.

(For he thinks that a molten state would have prevented any water from appearing on our planet.) In an earlier, rejected manuscript, on the other hand, he says: 'Hat unsre Erde sich unläugbar aus einem flüßigen Zustande gebildet'.[392] Despite their apparent contradiction, the last two passages can be reconciled. Kant, in his *Allgemeine Naturgeschichte,* had stated that matter, in the form of small particles, was more or less evenly distributed throughout space before our universe emerged in its present condition[393]; he does not specify the size, shape, or composition of these particles, but it is obvious from his subsequent descriptions of how the stellar and planetary bodies grew by accretion, under gravitational attraction, that they obeyed the laws of rotating *fluid* masses. For example, he says that the highest mountains on the earth ought to be at the equator.[394] (Herder later uses the same argument.[395]) Thus, collections of fine particles behaved like rotating fluid spheres, without having actually been molten, or, in the case of the planets, 'aus der Sonne geschleudert'. All this tallies precisely with Herder's opinions.

An interesting passage in Part III of the *Ideen* has escaped the attention of critics, perhaps because it appears in a chapter written much later than the geological sections of the work:[396]

> Als einst im Unermeßlichen der Werkstoff künftiger Welten ausgebreitet schwamm, gefiel es dem Schöpfer dieser Welten, die Materie sich bilden zu lassen nach den ihnen anerschaffenen inneren Kräften. Zum Mittelpunkt des Ganzen, der Sonne, floß nieder [N.B. 'floß' – the particles behave like a fluid] was nirgend eigne Bahn finden konnte . . . Was einen andern Mittelpunkt der Anziehung fand, ballte sich gleichartig zu ihm. . .

This, in essence, is a restatement of Kant's cosmogony.

Unlike Kant, Herder goes on to describe in detail how the diffuse, rotating mass of the earth developed towards its present state. The components of the earth, as we noticed above, became 'verdichtend niedergesetzt'.[397] Herder further explains: 'In periodischen Zeiträumen entwickelte sich aus geistigen und körperlichen staminibus die Luft, das Feuer, das Wasser, die Erde'. The order given here can scarcely be meant to be chronological, for, while air may have arisen first, it seems from other passages that Herder believed a solid core had formed at an early stage, and that the other elements subsequently acted upon it. He says, for instance, in an earlier manuscript for the *Ideen*, that the granite core 'wahrscheinlich durch Feuer in seine ['jetzige' scored out] Masse überging'.[398] This implies that fire appeared after earth, which it then consolidated into its present granitic form. Another passage confirms this order:[399]

> Die Luft, die diesen Klumpen umgab, war von Wasser und Feuer noch nicht gesondert: beschwängert mit den mancherlei Materien, die sich erst in vielfältigen Verbindungen und Perioden an die Grundlage der Erde setzten und ihr allgemach Form gaben . . . [etc.]

The primitive atmosphere was charged with water, fire, diverse kinds of matter, and various 'Kräfte'. (Compare the above phrase 'aus geistigen und körperlichen staminibus'.) Thus, from a small nucleus,[400] arose our earth, 'deren erste Bestandtheile vielleicht alle aus der Luft niedergeschlagen wurden'.[401] As we earlier noticed, fire (or rather 'elemental fire') played a primary part in purifying this dense atmosphere. (No doubt it was this same 'fire' which consolidated the granite.) The granite eventually became weathered, producing the sand which now covers much of the earth's surface.[402]

It is interesting that Burnet, whose work Herder had read, claimed that the primeval air was full of dust particles,[403] while Buffon, like Herder, believed that water first appeared on the earth by condensation or precipitation from the atmosphere.[404] The philosopher Rüdiger, early in the eighteenth century, had also put forward a theory of creation by precipitation; he went so far as to say that the other elements evolved out of the air itself.[405] Herder does not seem to have read his work, however. The illustrious Werner claimed that granite was a precipitate; but it was precipitated within the ocean, not within the atmosphere, and had originally existed in suspension within the waters which once covered the earth.[406] Herder, on the other hand, believed (more correctly, as it happens) that fire had assisted in the development of granite, as we have seen.

From all this, it is clear that Herder took over Kant's cosmogony, extending it by adding the theory that the elements were gradually precipitated. The idea of precipitation was really implicit in Kant's work already. The granite theory of Pallas and Goethe was then introduced in turn. The ultimate inspiration of this composite theory remains the *Allgemeine Naturgeschichte* of Kant.

(e) Earth history

Herder once says, in the *Ideen*, 'daß manche Umstände, die jetzt weniger wirken, in frühern Zeitaltern, da alle Elemente noch in ihrer ersten rohen Stärke waren, auch stärker gewirkt haben müssen'.[407] The plastic power of these elements was especially great around the mountain massif of Asia.[408] Climatic determinants, which first caused the human races to become differentiated, were likewise stronger.[409] Even in the modern age, Herder says, the tropical zone, where the elements are professedly stronger, abounds in the largest and most powerful animals, and vegetable growth is most prolific in the same area.[410]

The first exponent of this theory was possibly Lucretius, who declared that the early earth produced larger animals: 'And what in former Times with Ease she bore,/ Grown feeble now, and weak, she bears no more.'[411] Buffon, in his *Histoire des minéraux* (1783-88), is of the same opinion.[412] Kant put forward the same theory in an early essay,[413] and Goethe, in a late study of stratification, declares 'daß in den ersten Epochen unserer Erdbildung alles Chemische und überhaupt alles Dynamische kräftiger und stärker gewesen'.[414]

But the potent primeval elements, according to Herder, were not always constructive. Living organisms were often annihilated by 'neue Absätze der Luft und des Wassers'.[415] This idea is doubtless designed to explain why large layers of fossils are found.

Herder distinguishes two types of 'Revolutionen' in the earth's history: those which helped to shape the earth at its origin (already discussed in our section on cosmogony), and those which the planet has undergone in later ages, even since man inhabited it. Let us now examine this second variety of change.

In 1797, de la Métherie, in his *Théorie de la terre,* was able to enumerate over 50 different theories hitherto advanced to explain the earth's history.[416] Herder's age, which witnessed the birth of modern geology, was fertile in speculative hypotheses too. Since Herder, with his habitual love of synthesis, believed, like the eclectic geologist Pallas, that 'il faut réunir plusieurs hypothèses modernes, mais non pas s'attacher à une seule cause',[417] some means must be found of classifying his various ideas.

Firstly, the so-called 'diluvial' theories, which held that all major convulsions undergone by the earth could be explained as effects of the Noachian Deluge, had long been current. Secondly, there arose the 'Neptunist' school of Werner, which maintained that water, above all, had shaped the earth, but over long periods, and not in one universal inundation; this school was soon impugned by the followers of Hutton and Playfair, who, under the name of 'Vulcanists', or 'Plutonists', declared that fire (i.e. volcanic activity) was a greater formative agent in the earth's history. Thirdly, there later began the famous controversy between the schools of Lyell and Cuvier, known respectively as 'Uniformitarians' and 'Catastrophists'; for, while they might both agree that water and fire alike were powerful agents of geological change, the former maintained that changes were gradual, involving similar agencies to those now at work, the latter that they were cataclysmic. These two schools, flourishing from the early to mid-nineteenth century, are sometimes confused with the late eighteenth-century schools of Neptunism and Vulcanism; but while the ideas of the two groups are often parallel (especially those of the Vulcanists and the Catastrophists), their similarity is by no means without exception, since, for example, the diluvial theory, the ancestor of Neptunism, might sooner be called Catastrophist than Uniformitarian. All of these names, without capital letters, will be used below as generic terms for certain types of theory, although it must be remembered that Herder himself had no part in either of the famous controversies, which reached their height after he had expounded his personal theories of earth-history. First, we shall discuss catastrophist and uniformitarian ideas.

(i) Catastrophism and uniformitarianism

In one of the rejected manuscripts for the geological portion of the *Ideen*, Herder puts forward the theory that the earth, in its early stages, may have had a more eccentric orbit, more like that of a comet. It must later have moved into its present orbit, whose shape is that of a less elongated ellipse. The earlier orbit, Herder infers, took only 360 days for one revolution, as is proved by certain ancient calendars which fixed the year at this length.[418] This, of course, implies that some catastrophic change took place, and even that it happened within the times of recorded human traditions. For, although Herder explicitly rejects the hypotheses of writers such as Buffon and Whiston[419] that the planets were torn forth from the sun, in a molten state (or subjected to some tremendous cataclysm), by the close approach or impact of a comet, he adapts the comet theory to his own purpose, and applies it to the earth itself. His purpose is to suggest that some cataclysmic change befell the earth, and to explain by it, in one comprehensive theory, how many of the planet's present features originated. All changes, including that in the earth's orbit, are to be explained as the results of one great event: this was a change in the angle of the earth's axis to the plane of the ecliptic. Herder did not mean by this that the angle of the present axis altered in relation to the ecliptic (as if the earth, like a spinning top, had tilted as it spun); he thought that the axis of rotation itself had altered – i.e. he supposed that the axial poles themselves had changed (as if a top were suddenly to begin spinning on a new base).

The anomalies in the angles of the planets' axes to the solar ecliptic long troubled certain thinkers, whose aesthetic stirrings told them, as with Thomas Burnet, that the planets must originally have rotated in a 'right posture'.[420] The changes they presumed had taken place since then could also be conveniently adduced, in the case of the earth, to explain how there came about all the other cataclysms thought necessary to produce the seemingly disorderly and ruinous condition of the planet as it is at present. Surely, the eighteenth-century mind reasoned, the divine architect must originally have designed the earth in more classical style.

Herder too was puzzled by the varying angles of the planets' axes; he remarks, early in the *Ideen*, that no universal law explaining the anomalies has yet been discovered.[421] While his aesthetic sense revolted against the obvious irregularity of the earth's axis, he soon called in teleology to show how beneficial the present angle is for man, since it makes the seasonal changes possible.[422] Soon afterwards, he points out the other apparent discrepancy that the earth's highest mountains do not lie round the equator, as they would do if their formation had been governed by the laws of a rotating fluid sphere; in this case again, he justifies the anomaly teleologically.

But it is clear from the rejected *Ideen* manuscript mentioned above that teleology alone did not satisfy Herder's desire to explain convulsive geological changes. He says of their unknown causes: 'Warum bedörften wir auch eines unbekannten Maschienengottes, da im Bau und in den Lebensaltern der Erde selbst Revolutionen der Art mit allen ihren Folgen nothwendig liegen'.[423] In this manuscript, published by Suphan, Herder attempts to show that both the asymmetry of the earth's axis and the supposedly incongruous situation of the earth's highest mountains can be traced to *natural* causes. Other incongruities which offended his aesthetic sense, such as the great irregularities in the world's coastlines, and the situation of the magnetic poles at a considerable distance from the axial poles, are explained by the same comprehensive hypothesis.

He first confesses '[daß] freilich mit der Veränderung unsrer Erdachse bisher sehr gespielt worden'.[424] For example, Burnet, whom Herder several times mentions, had suggested that the earth was originally symmetrical in all respects, but that a change in the angle of the axis had caused a great upheaval.[425] Whiston and Cluver believed that a comet had caused a similar change, while Whitehurst said that it was brought about by outbursts of 'subterranean fire', and Sturm was of a similar opinion.[426] The renowned experimentalist Hooke had explained by the same theory how supposed climatic changes came about,[427] and Pluche, whose work is cited by Herder, had contended that the change was caused directly by God in order to bring on the Deluge as a universal retribution.[428] Scheuchzer, however, whom Herder also quotes (in 1774),[429] held the teleological opinion that the axis is best the way it is.[430] But even Kant had said that the angles of the planetary axes ought to be regular, at right angles to the plane of the ecliptic, and had attempted to explain the supposed changes by natural causes, saying:[431]

> Meine wahre Meinung geht dahin: daß die Umdrehung der Planeten um die Achse in dem ursprünglichen Zustand der ersten Bildung mit der Fläche ihrer jährlichen Bahn ziemlich genau übereingetroffen habe, und daß Ursachen vorhanden gewesen, diese Achse aus ihrer ersten Stellung zu verschieben.

Once again, it was Kant's early scientific thought which directly inspired Herder; it was Kant's approach which encouraged him to explain the change by *natural* causes. From another remark of Kant's he also realised that the earth's highest mountains *could* lie near the equator if the axial poles were different.[432]

Kant had even suggested one particular natural cause which could have produced the change. Variations in density caused parts of the earth's crust to collapse: ' . . . so hat sie [i.e. die Erde] nicht das Gleichgewicht des Umschwunges in ihrer Achsendrehung mehr auf allen Seiten leisten können.'[433]

But it is time to examine Herder's theory in more detail. In 1772, in a rough sketch drawn up for tutorial purposes, he had already suggested that the Biblical Flood may have caused the axial change.[434] In 1782, he observes more simply that the earth's axis may have altered.[435] But in the rejected manuscript for the *Ideen* now under discussion, it is no longer the Flood which causes the axial change, but the axial change which causes the Flood; Herder is now turning away from the Biblical to a more naturalistic mode of explanation. Besides, it is not the mandate of an irate God, but 'ungleichartige Eintrocknung' of the earth's crust,[436] with ensuing subsidences, which renders the axis unstable, *just as in Kant's theory.*

One critic correctly notices that Herder's approach is quite different from the Scriptural one, which was adopted by such theorists as Lulof, and he observes that Herder's hypothesis is scientifically better founded than similar, earlier ones of Whiston and others, with their comets and arbitrary deities.[437] But most of the credit, which should go only to the naturalistic method, not to the speculative, scientifically unverified hypothesis itself, belongs to Kant rather than to Herder; Herder simply tried to combine eclectically all the possible agents of geological change, and to explain away every aesthetically displeasing asymmetry, ending up with an involved and drastic theory.

The theory, however, is not only involved; it is also ambiguous and even at times self-contradictory. For example, Herder remarks that a magnetic field, like that of the earth, with its magnetic poles, is very susceptible to changes, especially from around its equator[438]; this, he believes, is added evidence that the *rotational* axis of the earth actually did alter. But he had just assumed that the earth's magnetic poles remained *constant*, while the poles of rotation altered[439]: this is exactly the reverse of his later statement. Furthermore, the argument that the earth's highest mountains ought to lie near its equator is groundless, because the earth's oblate spheroidal shape, bulging at the equator and flattened at the poles, neatly conforms to the present axis of rotation, and indicates that the earth solidified with its axis the same as it is now. Herder knew this, as his references to the earth as a spheroid[440] and to Bouguer, Condamine and Maupertuis,[441] the men whose expeditions proved that the earth is an oblate spheroid, indicate; he seems simply to have ignored the implications of this fact, and, undaunted, reapplied the theory of rotating fluid spheres to the Asian mountain system rather than to the equatorial bulge, just as Kant had done in 1755.

According to Herder, further catastrophes have occurred in the earth's past. He rejects all theories which maintain that earlier worlds, with their lost civilisations, have been totally destroyed (presumably because he could not accept historical catastrophes so readily as geological ones). He concludes:[442]

> Die Systeme also, die von zehnfacher Veränderung der Weltgegenden und Pole, von hundertfältiger Umstürzung eines bewohnten und cultivirten Bodens, von Vertreibungen der Menschen aus Gegend in Gegend oder von ihren Grabmälern unter Felsen und Meeren reden und in der ganzen ältesten Geschichte nur Graus und Entsetzen schildern, sie sind, trotz aller unleugbaren Revolutionen der Erde, dem Bau derselben entgegen oder von ihm wenigstens unbegründet.

Probably he has in mind the cataclysmic theory of Charles Bonnet, who believed that all life, except the 'germs' of new and superior forms, is periodically destroyed. But, as we have seen, the hypothesis in his own discarded manuscript on the earth's axis is almost as catastrophic as the theories he attacks, for it assumes that the axial change occurred *after* man had appeared on the earth. He had rolled all his cataclysms into one in this version, however, and had associated them with the (teleologically justifiable) Noachian Deluge. But, on other occasions in the *Ideen*, his own catastrophist views become quite fantastic, as when, carried away by his imagination, he depicts a geological holocaust, a primeval ocean which boiled ('siedet') 'von jenen Vitriolgüssen und andern Materien'.[443]

The notion that enormous caverns arose within the earth as it consolidated appears early in the *Ideen.*[444] As we have seen, he had originally used the same theory, with the corollary that the caverns cause huge subsidences, to explain how the earth's axis was shifted. The opening of these 'Klüfte and Hölen'[445] caused earthquakes, tidal waves and other convulsions.

This theory of subterranean caverns was a popular one in geology up to and during the eighteenth century.[446] In fact, it was used throughout antiquity as an explanation of earthquakes. Pallas had also used the theory to explain supposed cataclysms,[447] and Du Bos, whose work Herder also knew, had suggested, perhaps basing his hypothesis upon a fanciful etymology of the word 'Holland', that the country, now flat, once boasted numerous hills, which unhappily proved to be hollow.[448]

Nearly all of Herder's more catastrophic theories of geology appear in rejected manuscripts of the early 1780's for the *Ideen*. As Suphan notes, red lines appear against several such passages, and are probably Goethe's work.[449] Unlike Goethe, Herder at this time was spontaneously inclined to interpret geology catastrophically, and uniformitarian ideas have no place in the writings hitherto discussed.

(ii) Diluvial theories

In an early sketch entitled *Zur Geschichte der Wissenschaften aus Boulanger,*[450] dated by Suphan at around 1766,[451] Herder repudiates the ideas of Boulanger, who, in a work published in 1766, claimed that he could detect vestiges of the Noachian Deluge in topography and human customs throughout the world. Herder concludes that this theory is the product of a mania which had developed out of Boulanger's constant work with water as an overseer of dykes, and writes: 'Wer sagt es ihm, daß, wenn auch in allen Ländern Spuren von Sündfluth seyn sollten, diese Ueberschwemmungen alle auf einmal . . . gewesen?'[452] In 1769 he says that, as natural historians have proved, fossil beds were often deposited when tracts of land were submerged for 'Jahrhunderte', not just for a few days, and that Noah's Flood was merely national in character.[453] He next says of the Flood in 1782: ' . . . so gehörte sie gewiß zu den Naturgesetzen der sich bildenden Erde', adding that much of the earth was submerged for prolonged periods, and that isolated inundations occurred frequently (no doubt because the primeval 'elements' were more active).[454] In the *Ideen,* he calls the account of Noah 'eine Nationalerzählung', and says that, although natural history records traces of a great inundation, especially in Asia, a plurality of Noahs may have survived in various lands.[455] In the earliest manuscripts for the geological parts of the *Ideen,* he reinstates the one near-universal deluge, but also invokes vulcanistic agencies in explaining it.[456] And he next decides, in the slightly later manuscript on the earth's shifted axis, that a great deluge was produced when the planet's axis became unbalanced. In evidence for this, he mentions the irregularity of the southern coastlines of the great land masses; this physical feature, as well as the observation that southern capes and inlets often run parallel, had already puzzled such travellers as Reinhold Forster, as Herder points out.[457] He still regards the Noah story as a 'Nationalsage', however.[458]

Thus Herder never accepted the Biblical narrative on the Deluge literally, but, after first saying that the inundations indicated by marine fossils were protracted events in the earth's development (the uniformitarian view), he later proceeded to integrate the diluvial hypothesis into a composite, thoroughly catastrophist theory of geological development in the earlier manuscripts for the *Ideen.*[459]

In the eighteenth century, no thinkers seriously doubted that one or more widespread floods had occurred at some time or another, as fossil beds suggested.[460] They differed only in the degrees to which they accredited the Scriptural narrative. Already in the seventeenth century, a few bolder spirits conjectured that Noah's Flood may have been local or national,[461] just as Herder and others later did. Unlike those who invoked a direct miracle as the cause of the Deluge,[462] Herder relied upon natural causes. These, however, were also part of a higher, teleological system, and he does regard the Mosaic account as valid evidence that the Flood took place[463]; on the other hand, he regards the myths of other ancient peoples as evidence of equal value.[464]

Once again, Kant had entertained a very similar opinion to Herder's; both at some time believed that the earth's crust, undermined by vast caverns, had subsided, thereby causing the planet's axis to alter, and thus in turn causing a great inundation.[465] The eclectic geologist Pallas, like Herder, incorporated one or more near-universal floods into his theory[466]; but Pallas postulated volcanic outbreaks as the cause, just as Herder had done in his earliest manuscript for the *Ideen,* before he gave preference to Kant's subsidence theory.

It must be emphasised that, in amalgamating the diluvial hypothesis with his piecemeal theory of geological catastrophe, Herder was not subordinating science to theology, but was bending both kinds of argument in order to reconcile them. Diluvial theories, furthermore, had been typical of geological thought throughout the century, and were only beginning to pass out of currency when he wrote his *Ideen.*

(iii) Vulcanism

Herder believed that the 'elemental fire' which helped to form the earth in its earliest stages still lay dormant, in fairly large quantities, in the interior of the earth: 'Welche unendliche Menge groben Feuers z.B. riß die Steinmasse unsrer Erde an sich, die noch in ihr schläft . . .'[467]. He sometimes equated this primeval fire to electricity, as we have seen. It is therefore not surprising that, since volcanic activity is likewise caused by 'elemental fire', Herder says that it too is of an electrical nature.[468] But this view was fairly current at the time. Karl August of Weimar enquires in a letter to Merck in 1780 what effects electricity has upon men during volcanic eruptions,[469] and Du Bos believed that thunder and lightning are ultimately produced by the earth (no doubt by exhalations).[470] Probably volcanic lightning, which is often produced by the friction of erupted particles in the atmosphere above volcanoes, gave rise to such beliefs.

As was mentioned in the preceding section, Herder's earliest manuscript for the geological portion of the *Ideen,* written before 1784, explains the Deluge by vulcanistic agencies. It is interesting to compare this with one of Kant's theories, advanced in his *Kritik der Urteilskraft* in 1790; Kant here considers that the world's irregular coastlines are the product of 'wilder, allgewaltiger Kräfte'.[471] Herder had said of the inundation which helped to carve out the great inlets: '. . . die nähere Ursache, die sie vollständig erklärt, liegt uns vor Augen . . . wo tiefe Meerbusen sind, finden sich jedesmal ausgebrannte oder feuerspeiende Berge in der Nähe.'[472] Similarly, Pallas thought that convulsions around the Indian Ocean had been caused by earthquakes and volcanoes,[473] but his pseudo-vulcanistic idea that volcanic eruptions result from the combustion of subterranean organic deposits finds no echo in Herder's belief that 'elemental fire' is the source of volcanic activity.

In his later manuscript on the earth's axis, Herder uses Kant's subsidence theory to explain how the initial change in the earth's axis and the resultant inundation came about. Nevertheless, even in this later version, he still invokes volcanic activity, for good measure, saying that it assisted the work of the flood by fortifying certain coastlines with lava, and weakening others by explosive eruptions.[474]

Herder was too fascinated by volcanoes to omit them from his dramatic theory of earth-history. He had read the Fürstin Esterhazy's descriptions of Vesuvius, and made copious excerpts from the notable accounts of volcanoes by Hamilton and Soulavie, published in German in 1784.[475] At least three other works of this kind, on Etna, Vesuvius, and the earth's interior respectively, found a place in his library.[476]

(iv) Neptunism

Herder's interest in the sea is especially conspicuous in his *Journal* of 1769, but it lasted on throughout his life. Not surprisingly, therefore, he thought that the sea had performed an important task in the shaping of the earth. Apart from his diluvial theories, which have already been discussed, he considered that the sea had fulfilled other less spectacular and more constructive functions in the history of the earth.

Already in 1782, in his *Vom Geist der ebräischen Poesie,* he says of the earth: 'Aus Waßern hat sich diese langsam gebildet: Waßer haben lange und in verschiedenen Perioden über ihr gestanden'.[477] Even in 1780, he had considered writing a prize essay for the Académie des Inscriptions on the topic: 'Rechercher ce que les monuments historiques nous apprenent des changemens arrivés sur la surface du globe par le déplacement des eaux de la mer'.[478] In his classified notes for the *Ideen,* there appears the reference 'Bildung der Erde aus Wasser', as Suphan notices.[479] The first *Ideen* manuscript on geology, with Goethe's red lines against the more catastrophist passages, contains the phrase 'der Aufbau der Erde aus dem Wasser',[480] and in the *Ideen,* Part II, Herder says that America 'einem großen Theil nach wahrscheinlich später aus dem Schoos des Meers gestiegen war, als die andern

Welttheile'.[481] Earlier in the same work, he says that lands near the sea are always of later origin than are central highlands.[482] And finally, Goethe writes of his discussions with Herder while the latter was writing Part I of the *Ideen*: 'Unser tägliches Gespräch beschäftigte sich mit den Uranfängen der Wasser-Erde und der darauf von altersher sich entwickelnden organischen Geschöpfe'.[483]

Thus, by 1782, Herder had come to the conclusion that the continents (apart perhaps from their granite peaks) originally emerged from the sea. This was *before* his old friendship with Goethe was renewed in the following year. And the reference 'Bildung der Erde aus Wasser' in his classified notes, giving a volume and page number in the *Abhandlungen der königlichen schwedischen Akademie der Wissenschaften,* shows that he had independent sources for his belief. The article in question, written in 1743 by A. Celsius, begins as follows: 'Man hat schon viele Beweise, welche einhellig darthun, daß Schweden sowol als andere Länder auf dem Erdboden, vorzeiten Boden der See gewesen ist'.[484] Curiously enough, the writer goes on to suggest that Northern Europe was suddenly inundated from East to West, just as Herder does in his manuscript on the earth's axis, and later adds that the flood waters may have drained away into cavities within the earth.[485] This article exhibits the same blend of neptunian (and uniformitarian) ideas of continental growth and the more archaic diluvial (and catastrophist) hypothesis as we find in Herder's *Ideen.* It is therefore almost certain that this article of Celsius' had a greater influence upon Herder than had Goethe's more exclusively neptunian ideas.

Herder, like Pallas, believed that the continents arose from the seas through the gradual accumulation of detritus eroded from central granite massifs. Thus it was inevitable that he should believe that the earth had undergone a neptunian phase, as many writers, such as Buffon,[486] Linnaeus[487] and de Maillet,[488] all of whom Herder mentions at various times, had previously maintained. Such neptunian theories, often combined with diluvial, or even vulcanistic ideas, mark the transition, which took place around the time of Herder, from the earlier, purely diluvial phase of geological thought to the ideas of Werner and the resultant controversies which were the birth-pangs of modern scientific geology.

One further remark on early neptunian theories seems necessary. The Swedes, for example Celsius and Linnaeus, were particularly convinced that the continents had risen from the waters, since Sweden, then as now, was seen to be rising quite appreciably. It is now known, however, that this country has been rising only since it was released from the weight of the last quaternary ice-sheet, which began to melt some 20,000 years ago.[489]

(v) Conclusion

Herder supported all the important geological hypotheses elaborated or inherited by his age, combining them together in his early manuscripts for the *Ideen,* and placing varying emphasis upon the separate ingredients of his composite theory at different times; later he seems to have become more or less converted to

Werner's views, under the personal influence of that gifted lecturer.[490] But at that transitional period in geology during which he wrote his *Ideen,* diluvial theories were still in use, and vulcanism and neptunism, catastrophism and uniformitarianism had not yet crystallised into the mutually exclusive, self-sufficient systems they later became; it was still possible for him to believe to some extent in each way of thinking, just as every geologist of today is prepared to use any of the four last-named theories, on a limited scale, as the evidence before him demands.

Herder once said that the study of the earth's history should prepare us for 'die Hinfälligkeit und Abwechselung aller Menschengeschichte'.[491] But this does not explain why his theories, which can all be traced separately to the works of various scientific thinkers, are so complex in their composite form. We have already seen only too often how he would find where the opposite extreme of a subject lay, then try to reconcile its disparate implications, rarely adopting a one-sided view, especially in his mature period. This inherent tendency, in conjunction with his reading, determined the character of his purely speculative geological theories.

His reading on geology, as should now be obvious, was very extensive. Besides the numerous works of the writers mentioned above, his library contained at least ten more volumes dealing exclusively with earth-history.[492] As so often, his greatest debt was to his old teacher, Kant. (It is no wonder that, so soon after he had written these passages on geology, he felt deeply wounded when Kant's scathing review of the *Ideen* Part I appeared.) Individually, his theories can all be traced to various earlier authors. What originality they possess, they have by virtue only of their unusually complex combination.

The most interesting and characteristic of Herder's geological writings remained unpublished during his own lifetime. Goethe's influence, perhaps seconded by that of Einsiedel, a pupil of Werner's, was responsible for their suppression. It is noteworthy that Caroline mentions an essay entitled *Revolutionen der Erde* in a letter of 1807 to Johannes von Müller, who was helping to edit Herder's complete works.[493] The editor of the recent volume in which Caroline's letter is published says that this reference is to 'ein verlorener Aufsatz Herders, der von Alexander von Humboldt gelesen und beachtet wurde, von August Herder aber für die Aufnahme in die Sämtlichen Werke abgelehnt wurde'.[494] This information seems to be based upon unpublished letters in the Schaffhausen Ministerialbibliothek. If we did not know that Herder's manuscript on the earth's axis *was* published in the edition of his works supervised by Caroline and Georg Müller,[495] it would be tempting to suppose that this was the 'lost' essay. The lost work, however, was almost certainly yet another version of the geological parts of the *Ideen,* and probably advanced some other drastic theory of earth-history. For August Herder, himself a pupil and protégé of Werner, probably felt that his father's earlier catastrophist and vulcanistic ideas deserved to pass into oblivion, particularly since Herder himself had eventually come to admire Werner, and, already in 1792, had written in his *Tithon und*

Aurora:[496]

> Nicht Revolutionen, sondern *Evolutionen* sind der stille Gang dieser grossen Mutter [i.e. nature], dadurch sie schlummernde Kräfte erweckt, Keime entwickelt, das zu frühe Alter verjünget, und oft den scheinbaren Tod in neues Leben verwandelt.

Though not referring to geology, Herder here expresses the more classicistic views which are typical of his post-Italian years. This, no doubt, made it easier for him to agree with Werner; but, unfortunately, he left no statement of his final opinions on the history of the earth.

Herder lived at a time when geology was entering perhaps its most crucial phase. Already in the *Ideen,* he had said that a unified theory of cosmogony, with comprehensive laws, could soon be expected to follow after the beginnings had been made by such men as Buffon.[497] (Such a theory did appear with the work of Laplace in 1796.) With the extensive field studies of stratification pioneered by Werner and others, and the great work of William Smith, who determined the sequence of the rocks in England with unprecedented thoroughness, geology became a truly empirical science; a new understanding of the enormous time-scale, of the gradual changes and astonishingly varied developments in the earth's past, raised the geology of the middle and late nineteenth century far above the circumscribed speculative doctrines of the previous age.

Perhaps Herder realised that his own theories belonged to a more archaic phase, in which discovery had not kept pace with imagination. Caroline says:[498]

> In den letzten Jahren so mannichfaltiger Entdeckungen, unter welchen er Werners geognostisches System vorzüglich schätzte, wünschte er manchmal, erst jetzt geboren zu seyn, um die Resultate, die sie herbeiführen, zu erleben.

(f) The future of the earth and the solar system

In Herder's unpublished *Anfangsgründe der Sternkunde* of 1765, the following passage occurs:[499]

> Da die Erde in dem feinen Aether worin sie sich fortstöst immer eine kleine Hinderung hat: . . . die Laufbahn der Erde muß sich also immer etwas mehr der Sonne nähern und eine feine Spirallinie machen. Euler ist der [sic] diese Annäherung zur Sonne durch Beobachtungen zu bemerken gesucht hat.

And in the *Ideen,* he writes: 'Die schöne Schöpfung arbeitet sich zum Chaos, wie sie aus einem Chaos sich herausarbeitete'.[500] Similarly, Kant declared in his *Allgemeine Naturgeschichte* that the chaos out of which the universe progressively emerged will once again engulf it 'durch einen allmählichen Verfall der Bewegungen', and then spoke of the increasing 'Mattigkeit' of the planets,[501] just as Herder speaks of 'die alternde Kraft der Erde, die sich nicht mehr zu halten und fortzutreiben vermag'.[502] Herder thus seems to have followed Euler and Kant in his speculations on the end of the earth and of the solar system.[503]

He appears to have believed all his life that the earth will eventually be destroyed by approaching the sun too closely. This idea appears again in the 1769 manuscript recently published by H. D. Irmscher,[504] and also in a sermon on the afterlife, probably delivered late in the previous year.[505] And later, of course, it recurs in the *Ideen*.

This doctrine has a long history. The Stoics thought that 'all things began with fire and will end in it'.[506] Thomas Burnet, whom Herder mentions at various times, believed that the earth will eventually be destroyed by fire,[507] and the idea received some support from Christian eschatology. Euler (and to a lesser extent Kant) tried to base his theory of the future of the solar system upon more scientific premises, but it was not until 1824, when Carnot formulated the second law of thermodynamics, that the notion of a gradual running down of the universe achieved the status of a physical law. When Michelson and Morley, in the late nineteenth century, found that ether resistance to the earth's movement is impossible to detect, the older theories of a gradual approach to the sun became obsolete. But the 'heat-death' theory survives in the less spectacular conception of entropy, and some astronomers believe that the sun may eventually expand so as to engulf the earth.

Herder realised that scientific theories of doom conflicted with that belief in progress which he came to support increasingly in his mature and later years. In the *Ideen*, he apologises rather lamely for the earth's approaching descent into the sun: '. . . was geschähe anders, als was nach ewigen Gesetzen der Weisheit und Ordnung geschehen mußte?'[508] Some years later, he adds that the earth will end only after man's role is fulfilled,[509] thus returning to the teleology he had meanwhile repudiated.

Unlike Pallas, Bonnet and others, Herder does not suggest that great geological cataclysms may again overwhelm the earth. No doubt he felt that the earth, now lacking its pristine vigour, has become incapable of producing further convulsions on a large scale.

(g) Meteorology

Since Herder's definitions of climate, in the *Ideen*, correspond approximately to modern definitions of the whole natural environment in relation to man, one looks in vain in his works for any theory of climatology in the narrower sense. His thoughts on meteorology in particular are equally imprecise. Instead of attempting to describe and classify the known phenomena governing atmospheric changes, he prefers to speculate upon unknown 'Kräfte' which may be at work in the air. In the *Ideen*, for example, he suggests that magnetism, as well as the other 'elements' which act in the atmosphere, may influence climate.[510] Unseen 'Himmelskräfte' operating in the aerial medium may, when discovered, provide material for 'eine geographische Aerologie'. He even adds: 'Die Bildung der Menschen an Körper und Geist wird sich mit daraus erklären'.[511] Close upon this audacious claim, there comes the following remarkable passage:[512]

Das ganze Himmelssystem ist ein Streben gleich- oder ungleichartiger aber mit

> größer Stärke getriebner Kugeln gegen einander . . . Werden einst alle diese Bemerkungen und ihre Resultate auf die Veränderungen unsrer Luftkugel angewandt werden, wie sie bei der Ebbe und Fluth schon angewandt sind: . . . so wird, dünkt mich, die *Astrologie* aufs neue in der ruhmwürdigsten nützlichsten Gestalt unter unsern Wissenschaften erscheinen. . .

Thus, unlike Goethe, who insisted upon a purely 'tellurial' theory of meteorology,[513] Herder believes that unseen virtues inherent in other cosmic bodies may influence the earth's weather. Kepler had likewise thought that astrological 'aspects' can influence the earth's 'intelligent soul', so that 'strong aspects' cause thunderstorms, and so on.[514]

It is curious that Herder should mention the tides in this connection. In the *Journal* he writes: 'Wie sich Welle in Welle bricht: so fließen die Luftundulationen und Schälle in einander'.[515] In fact, he frequently compares water and air, water-waves and atmospheric waves. Similarly, Goethe believed that effects analogous to tides are manifest in the atmosphere, but are caused, as he puts it, by the breathing of the earth. (Leonardo had said that the *oceanic* tides follow the 'breathing of the world',[516] and Kepler too saw them as a symptom of the 'breathing of the earth body'.[517]) It would surely have interested both Goethe and Herder to learn that, for the past 40 years, actual tides have been observed by scientists in the earth's atmosphere. These are caused by the moon's attraction, and have recently been found to influence rainfall on the earth.[518]

Herder had read works by several writers who discussed meteorological phenomena. But nearly all of these treated climate only as an environmental determinant acting upon man, not as an object of scientific study in itself. Besides, it is typical of him that he is more interested in the 'Kräfte' which work in the atmosphere than in quantitative criteria such as temperature, air-pressure, rainfall, etc. Meteorology is one of the sciences about which he has least to say. Admittedly, it had scarcely emerged as an autonomous discipline in his day. But what he did say was already archaic.

(h) Geography

There is little point in presenting a separate account of geography as a whole in this study, for Herder did not treat the subject systematically and in isolation, and since, by its very nature, it encompasses so many diverse branches of science. It is worth observing, however, that he was keenly interested in it from the time when he attended Kant's lectures on physical geography in Königsberg onwards. He also appears to have taught it, in schools at Königsberg or Riga, or as a private tutor, since he later declares '[daß] ich sie [i.e. die Geographie] selbst in den besten Jahren meines Lebens mit dem äußersten Vergnügen gelernt und mit eben so viel Vergnügen andre gelehrt habe'.[519] His library contained at least 48 volumes on geography, and 46 atlases and maps,[520] as well as numerous travelogues. Furthermore, he delivered a perceptive 'Schulrede' on geography in Weimar, probably in

1784; it was entitled *Von der Annehmlichkeit, Nützlichkeit und Nothwendigkeit der Geographie.*[521] Although the main purpose of this address was to demonstrate the educational value of the subject, it also reveals several characteristic features of Herder's attitude to it. For example, it is clear that he believes it to be fundamentally a scientific subject, since he names physical geography as the necessary foundation upon which all else must rest.[522] Geography teaches us that the earth is governed by natural laws, he contends, and he describes the student's delight 'wenn er einsehen lernt, daß was ihm in der Gestalt der Erde sonst Chaos war, auch seine Gesetze und Ordnung hat'.[523] He rejects the time-honoured fallacy that it is simply a dry catalogue of countries, rivers, frontiers and towns,[524] and it is the Herder of the *Ideen* who exclaims that geography is inseparable from the history of the earth's peoples.[525] He concludes:[526]

> . . . ich darf sagen, daß die Geschichte ohne Geographie so wie ohne Zeitrechnung grossentheils ein *wahres Luftgebäude* werde. . . . Kurz die Geographie ist die Basis der Geschichte und die Geschichte ist nichts als eine in Bewegung gesetzte Geographie.

Indeed, we have already seen how large a part the whole subject occupies in Herder's greatest work. Most of his views on physical geography have been discussed in the section on the geological or earth sciences, and his attitude to landscape was examined at the beginning of the earlier chapter on scientific methodology. His theory of climate and environmental determinism will be analysed in the following chapter, which is devoted to biology, human geography will receive attention in the section on human races, and his influence on the subject will be touched on at the end of the work. As for his general knowledge of the countries and peoples of the earth (i.e. of general descriptive geography), a critical appraisal of most of the travelogues and general geographical descriptions he read and used will be found in J. Grundmann's commendable work on the *Ideen.*[527]

It need only be added that, apart from a few errors arising out of the limited knowledge of his age (e.g. he says: 'Die Cordilleras sind die höchsten Gebürge der Welt'[528]), Herder had an accurate and diversified knowledge of nearly all aspects of geography, and he used it as an explanatory commentary on universal history to a much greater extent than most theorists of history before or since his time.

NOTES

1 Caroline 65 I, 56.
2 *Bibl. Herd.* 3 items 2585, 3076, 3077, 3079, 3081, 3088-9, 3095, 3372-3, 3629-36.
3 SW IV, 346 and 391, etc.
4 Clark 75 p. 750.
5 E.g. Siegel 179 pp. 130 and 139. Richter 109 p. 13 also describes Herder's monism as a form of 'Spiritualismus', and Götz 78 p. 12 similarly concludes that materialism has no place in Herder's thought.

6 Caroline 65 III, 196.
7 SW XIII, 180.
8 Hoffart 153 p. 39.
9 SW XVI, 548.
10 E.g. Schütze 176 vol. 21, 48 and Blumenthal 139 p. 36.
11 Herder 31 III, 365.
12 SW XXXII, 197 and editor's note; cf. SW XII, 367.
13 Haym 64 I, 295.
14 Herder 31 V, 113.
15 SW IV, 105.
16 Cf. Nordenskiöld 237 p. 22. In this connection, Kühnemann 14 p. XXXIII rightly speaks of Herder's 'spiritualistische und doch auch materialistische Gedanken von der Lebenswärme', and Lange, in his monumental history of materialism, correctly observes that significant elements of materialism are present in Herder's philosophy (Lange 202 I, 401). As we have already seen, others, such as the Marxist Reimann (Reimann 108), go too far in claiming that Herder was a (dialectical) materialist.
17 E.g. SW XVI, 453, 480 and 546; cf. SW XIII, 274.
18 SW XIII, 173.
19 SW XIII, 274.
20 SW XXIII, 517.
21 Leibniz 312 p. 618.
22 McEachran 68 p. 67 and Posadzy 170 p. 46.
23 SW VIII, 250.
24 SW VIII, 193.
25 SW XXXII, 216-217.
26 SW XIV, 527.
27 SW XVI, 450-451.
28 SW XVI, 450.
29 Leibniz 312 p. 618.
30 SW XVI, 564.
31 SW XXIII, 518.
32 Cf. Jammer 231 p. 170.
33 Jammer 231 p. 170.
34 Lange 202 II, 220.
35 Martin 203 p. 92.
36 Russell 211 p. 125.
37 Popper 209 p. 29.
38 E.g. Berger 136 p. 119; H. Schwarz, 'Die Entwicklung des Pantheismus in der neueren Zeit', *Zeitschrift für Philosophie und philosophische Kritik,* 157, p. 59, note 1; Hoffart 153 p. 40; and Rouché 172 p. 386.
39 Berger 136 p. 119.
40 SW XXI, 67.
41 Clark 75 p. 743.
42 SW VIII, 194; cf. SW VIII, 196.
43 SW XVI, 454.
44 Clark 75 p. 750.
45 Clark 75 p. 752.
46 Clark 75 p. 741; cf. Engels 199 p. 71 on these distinctions and disputes in the eighteenth century.
47 SW VIII, 169.
48 Engels 199 p. 134.
49 I. A. Richter (ed.), *Selections from the Notebooks of Leonardo da Vinci,* London, O.U.P., 1952, p. 63.
50 Jammer 231 p. 124.
51 Jammer 231 p. 178.
52 Jammer 231 p. 203.
53 Jammer 231 p. 229.
54 Whitehead 214 pp. 72 and 82.
55 SW XIII, 170.
56 E.g. Posadzy 170 p. 53 ('das Gesetz von der Erhaltung der Kraft'); Hansen 81 p. 23 ('den Gedanken an eine Erhaltung der Kraft und des Stoffes'); Vielhaber 128 p. 101 ('das Gesetz von der Erhaltung der Kraft und des Stoffes'); cf. also Clark 62 p. 315 and Siegel 179 p. 154.
57 SW XIII, 176.

58 SW XXI, 137.
59 Cf. McEachran 68 p. 80.
60 Lucretius 315 I, 28; cf. Herder's note (SW XIV, 660): 'Nichts geht unter, es kommt ein Anderes'.
61 As Masson 235 p. 116 observes; cf. *Novum Organum* II, aphorism XL.
62 Cf. Masson 235 p. 116.
63 Singer 243 p. 258.
64 Bell 218 p. 113.
65 Jammer 231 p. 103.
66 Jammer 231 pp. 166 and 168.
67 Kant 295 p. 58.
68 This is not the place to discuss how all other conservation laws were subordinated to that of the conservation of energy in the present century.
69 SW VII, 382; cf. SW VIII, 255 and XXIII, 513.
70 Bertalanffy 196 p. 151.
71 Cf. Berger 136 p. 8 and Bruntsch 74 p. 7.
72 See Boucke 73 for a detailed survey of this tradition.
73 SW XXXII, 214, *Wahrheiten aus Leibnitz.*
74 Cf. Thienemann 244 p. 234.
75 Kant 298 p. 17.
76 Kant 298 p. 20.
77 Cf. Jammer 231 pp. 141-142.
78 Cf. Jammer 231 p. 65.
79 Dalberg 268 p. 6.
80 Jammer 231 p. 208.
81 Cf. SW XXIII, 513 *et seq.*
82 Cf. Varnhagen 53 III, 456.
83 SW XXI, 66. *Metakritik.*
84 SW XIII, 174-175.
85 SW XIII, 421.
86 Cf. SW XIII, 269, where he acknowledges Gmelin.
87 Herder's MSS S.P.K. D.S.T. Kapsel XXVIII Nr. 6.
88 Cf. Bode 257 p. 569.
89 Düntzer 23 II, 20, Herder to Lavater, 30 October 1772.
90 Herder's MSS N.F.G. (G.S.A.), *Anfangsgründe der Sternkunde,* pp. 23 and 45.
91 SW VIII, 197.
92 SW XVI, 548.
93 Pistoi 321 p. 51.
94 Pistoi 321 p. 89.
95 Euler 271 II, 265.
96 Haller 281 p. 201.
97 Cf. Nordenskiöld 237 p. 327.
98 SW XIII, 175.
99 SW XIII, 175.
100 SW VIII, 190-191.
101 SW XIII, 77.
102 SW XIII, 78.
103 SW XIII, 175-176.
104 Rouché 172 p. 180.
105 Shaftesbury 325 II, 378-379.
106 Shaftesbury 325 II, 366.
107 Cf. Unger 187 p. 267 and Pamp 168 pp. 24-27.
108 SW IV, 373.
109 Cf. Dessoir 223 I, 506.
110 Cf. Whittaker 246 I, 19.
111 See Zöckler 250 II, 208.
112 Cf. Engels 199 p. 247.
113 Cf. Haym 64 I, 506.
114 SW XXI, 55-56. *Metakritik.*
115 SW XXI, 55.
116 SW XXI, 59; cf. SW V, 228.
117 SW V, 228.
118 Kant 290 p. 361.

119 SW XVI, 454.
120 SW XVIII, 379.
121 SW XXXI, 653.
122 SW XVI, 542.
123 SW XXI, 53 and 61.
124 Cf. A. Koyré, *From the Closed World to the Infinite Universe,* Baltimore, 1957, pp. 274-276.
125 Barnard 134 p. 61; cf. also Barnard 133 pp. 46 and 123-124.
126 SW XIII, 29.
127 SW XIII, 32.
128 SW XIII, 32.
129 Goethe 274 XII, 77. *Versuch einer Witterungslehre.*
130 E.g. Bailly, Bode, Boyle, Bradley, Brahe, Cassini, Copernicus, Descartes, Euler, Fischer, Flamsteed, Galileo, von Hahn, Hamberger, Herschel, Hevelke, Huygens, Kästner, Kant, Keill, Lagrange, Lambert, Laplace, Lichtenberg, Maupertuis, Olbers, Piazzi, Schröter, Schubert, Weidler, Wilkins, Wright, von Zach, etc.
131 *Bibl. Herd.* 3 items 3086, 3098, 3624, 3627, 4689, etc.
132 E.g. SW XV, 278 and SW XXIV, 573.
133 Georg Müller wrote, after Herder's death, that his spirit was perhaps 'bei den Sternen, wo sein Auge und Gemüt so gerne weilte' (Stokar 50 p. 236, G. Müller to J. G. v. Müller, 31 December 1803).
134 Herder's MSS N.F.G. (G.S.A.), *Anfangsgründe der Sternkunde.*
135 *Anfangsgründe* p. 23.
136 *Anfangsgründe* p. 37.
137 Cf. *Encyclopaedia Britannica,* 13th Edition, article 'Venus'.
138 Cf. Rouché 172 p. 185 and Grundmann 80 p. 25.
139 Cf. Düntzer 25 II, 245, F. L. W. Meyer to Herder, 23 September 1787.
140 Herder's MSS S.P.K. D.S.T. Kapsel XXVIII Nr. 6.
141 SW XXIV, 573. This work first appeared in the *Taschenbuch für das Jahr 1803.*
142 SW XVI, 49.
143 SW XXIII, 518.
144 Cf. SW XXIII, 526.
145 Cf. SW XXIII, 524.
146 Quoted in Jammer 231 p. 139.
147 Cf. Jammer 231 p. 260.
148 *Bibl. Herd.* 3 items 2986, 3092 and 3580.
149 *Anfangsgründe der Sternkunde* p. 44. Herder's MSS N.F.G. (G.S.A.).
150 Kant 290 p. 243.
151 SW XXIII, 522.
152 Quoted in SW XIV, 642.
153 SW XIV, 583 (as Rouché 172 p. 187 observes).
154 Quoted in Haym 64 I, 587.
155 SW VIII, 264.
156 SW IX, 537.
157 SW XIII, 479.
158 See Kant 290 p. 358. Strange to say, it seems that Kant, although he revered Newton, may have been the first to encourage Herder to interpret gravity non-mechanically, for the following words occur in Herder's notes to Kant's lectures: '*Die Schwere* kan nicht mechanisch, d.i. aus den Gesetzen der Bewegung, gemäß des Raumes und der Zeit erklärt werden. . . Gott ist die immerwährende Ursache der Bestrebung wie Schwere durch seine Allgegenwart. . . ' (Irmscher 12 p. 63).
159 Cf. Jeans 232 pp. 50-51.
160 Cf. Macgillivray 234 pp. 300-302.
161 SW XVIII, 290.
162 SW XXIII, 515.
163 SW XXIII, 509.
164 SW XXIII, 542.
165 Cf. Zöckler 250 II, 241.
166 Cf. Jammer 231 p. 47.
167 Cf. H. Hallam, *Introduction to the Literature of Europe in the Fifteenth, Sixteenth and Seventeenth Centuries,* London, 1837-1839, II, 463-464.
168 Cf. Hallam, *op. cit.*, III, 148-149.
169 Cf. Lovejoy 233 p. 119.

170 Cf. Lovejoy 233 p. 102, note.
171 Cf. Jammer 231 pp. 81-90.
172 Cf. SW XXIII, 525.
173 SW XXIII, 515.
174 SW XXIII, 520-521.
175 SW XXIII, 522.
176 Goethe 274 XII, 81.
177 SW XIII, 402.
178 SW XXXII, 199. *Aphorismen, circa* 1769-1771.
179 SW IV, 354.
180 Gillies 10 p. 130.
181 Schauer 46 II, 162.
182 Düntzer 23 II, 21, Herder to Lavater, 30 October 1772.
183 SW VIII, 170.
184 SW VIII, 287.
185 Cf. Macgillivray 234 p. 312.
186 Cf. Pamp 168 p. 24.
187 SW XIII, 29.
188 SW XIII, 46.
189 Bode 257 p. 554.
190 SW XIII, 268.
191 SW XIII, 402.
192 SW XIV, 576.
193 SW XV, 316.
194 Cf. Schauer 46 I, 248 and 263, Herder to Caroline, 22 June and 2 July 1771. The treatment was for toothache. Also Düntzer 23 II, 300, Caroline to Jacobi, 11 November 1792, and Düntzer 25 I, 151, Herder to Gleim, 12 November 1792. On this occasion, he was treated for pains in the leg.
195 Herschel 287 p. 139.
196 Cf. Cajori 220 p. 121.
197 Cf. Cajori 220 p. 71.
198 SW IV, 346 and 374.
199 Cf. Whittaker 246 I, 50.
200 Cf. Engels 199 pp. 82 and 87. Schelling subsequently identified electricity and magnetism, and, for good measure, made them responsible for the production of heat (cf. Nordenskiöld 237 p. 276).
201 *Bibl. Herd.* 3 items 44, 3093, 3116, and 3615.
202 SW XVI, 559.
203 Cf. Suphan's remarks in SW XIV, 664.
204 SW XIV, 682.
205 SW XIII, 476.
206 Cf. Düntzer 25 II, 241, F. Meyer to Herder, 19 November 1786.
207 SW XIII, 29.
208 Cf. Euler 271 I, 243.
209 SW XIII, 266.
210 SW XIII, 470 *et seq.*, esp. 478.
211 Varnhagen 53 II, 304, Herder to Knebel, early October 1794.
212 SW XIV, 608; cf. SW XIV, 672.
213 Irmscher 11 p. 288.
214 Düntzer 23 II, 20, Herder to Lavater, 30 October 1772.
215 Baechtold 17 p. 74.
216 SW XIII, 46.
217 SW XIII, 48.
218 E.g. SW XIII, 175, 420 and 426.
219 SW XIII, 421. The Ptolemaic cosmology envisaged a zone of invisible 'elemental fire' which exists beyond the sphere of the air, so that Herder's belief is one of considerable antiquity.
220 See, for instance, SW XIII, 175.
221 E.g. SW XIII, 420 and SW XIV, 584; cf. SW XIII, 175.
222 SW XXXI, 243.
223 SW XIII, 420.
224 Herder's MSS N.F.G. (G.S.A.), *Anfangsgründe der Sternkunde*, p. 26.
225 Düntzer 23 II, 19-21.

226 SW XXIII, 538.
227 Jeans 232 pp. 209-210.
228 Jeans 232 p. 123.
229 SW XXIII, 528.
230 Cf. Haym 64 II, 784-785.
231 Varnhagen 53 II, 276, Herder to Knebel, 23 November 1798.
232 Schelling 323 p. 37.
233 Schelling 324 p. 12.
234 Schelling 324 p. 12.
235 Herschel 287.
236 Bode 257 p. 554; Herder puts forward the same idea in his *Adrastea* (SW XXIII, 528).
237 Cf. his reference to Bode's work in SW XIII, 14.
238 SW XXIII, 529.
239 Von Hahn 276. As early as 1610, the astronomer Thomas Harriot had stated that the sun's light is merely a luminous envelope surrounding the sun's exterior (cf. H. Hallam, *Introduction to the Literature of Europe in the Fifteenth, Sixteenth, and Seventeenth Centuries,* London, 1837-1839, IV, 27-28). Such theories had the attraction that they enabled their advocates to argue that the sun, like all other celestial bodies, is probably inhabited.
240 SW XXIII, 529.
241 SW XXIII, 533.
242 SW XXIII, 534.
243 SW XXIII, 532.
244 Cf. SW XIV, 608.
245 SW XXIV, 574.
246 Cf. Wolf 248 p. 669.
247 Herder's MSS N.F.G. (G.S.A.), *Anfangsgründe der Sternkunde,* p. 8.
248 Cf. Clark 62 p. 95. Clark wrongly calls this blind boy Saunderson, which was in fact the name of a blind English mathematician.
249 SW IV, 85.
250 SW V, 48.
251 SW IV, 61, editor's note.
252 Smith 326 p. 49.
253 Smith 326 p. 51.
254 Berkeley 254 pp. 32 and 80.
255 Berkeley 254 p. 16.
256 SW IV, 93.
257 Herder's MSS S.P.K. D.S.T. Kapsel XXVIII Nr. 7.
258 SW VIII, 156.
259 SW XXI, 97.
260 SW XV, 525.
261 SW VIII, 193.
262 Goethe 274 I, p. XXXI. *Zur Farbenlehre,* 1807.
263 SW XIII, 349.
264 SW XV, 526. *Über Bild, Dichtung und Fabel,* 1787.
265 Schütze 116 p. 24.
266 SW IV, 458.
267 SW VIII, 118.
268 SW XXII, 67.
269 Euler 271 I, 158. The edition quoted here is in English, the original edition in French having proved unobtainable.
270 Euler 271, I, 158.
271 Goethe 274 I, 152.
272 Cf. SW XXIX, 529. 'Eine Bilderfabel für Goethe. März 1773'.
273 Cf. SW XXII, 40 and SW XXIII, 523.
274 Hamann 30 III, 31, Herder to Hamann, 2 January 1773.
275 SW VIII, 101; cf. Kant 292 p. 136, who says that green 'unter allen Farben die mittlere Stärke hat'.
276 Cf. *Goethes Werke,* Hamburger Ausgabe, 1948 ff., XIII, 605.
277 Goethe 29 IX, 261, Goethe to Karl August, 18 May 1791.
278 Cf. *Goethes Werke,* Hamburger Ausgabe, 1948 ff., XIII, 605, editor's remarks.
279 Düntzer 25 I, 145, 6 November 1791.
280 Cf. Haym 64 II, 461.

281 Düntzer 25 II, 218, May, 1792.
282 Wahle 57.
283 Aristotle believed that colours are mixtures of light and darkness (cf. Singer 243 pp. 298-299).
284 SW XXII, 59.
285 SW XXII, 60-61.
286 SW XXII, 58, editor's note.
287 Cf. Euler 271 I, 103.
288 SW XXIV, 435.
289 SW XXIV, 436.
290 SW XXIV, 436.
291 SW VIII, 101.
292 SW XXIV, 436.
293 SW XXIV, 437.
294 SW XXIV, 436.
295 SW XXIV, 436.
296 SW XXIV, 438.
297 SW XXII, 59-60.
298 Goethe 274 I, 28.
299 SW XXIV, 438.
300 SW XXIV, 439.
301 SW XXIV, 439.
302 XXIV, 438.
303 As Haym 64 II, 784 puts it: 'Er nannte Theorie, was nur eine Summe poetischer Aperçus war'.
304 Haym 64 II, 785.
305 Cf. Hesse 200 p. 77.
306 Cf. Wolf 248 p. 164.
307 Euler 271 I, 127.
308 SW IV, 102.
309 SW VIII, 101.
310 SW XXII, 66.
311 Cf. Düntzer 26 II, 41, Caroline Herder to Knebel, 25 January 1803.
312 SW VIII, 39; cf. SW XXII, 68 and XXIV, 440.
313 SW XXIV, 437.
314 SW XXIV, 437 and 439.
315 Düntzer 25 III, 165, Knebel to Herder, 9 June 1800.
316 Haym 64 II, 704 and 785. For Goethe, the analogy is only an indirect one, through a higher common factor from which both elements may be derived (cf. Goethe 274 I, 301, *Zur Farbenlehre*).
317 Cf. Cajori 220 p. 101.
318 Cf. Whittaker 246 I, 50.
319 Cf. Masson 235 p. 93.
320 Cf. Cajori 220 p. 113., Francis Bacon was one of the first to propound this theory.
321 Cf. Singer 243 pp. 351-352.
322 Cf. Whittaker 246 I, 39.
323 SW XXIII, 538.
324 Bode 257 p. 554.
325 SW XXIV, 439.
326 Cf. Cajori 220 p. 114.
327 Whittaker 246 I, 99.
328 SW XXIII, 530. See Hahn 275 for the article in question.
329 SW XXIV, 438: 'Offenbar brennet der zusammengespitzte rothe Stral heftiger, als der blaue. . . '.
330 SW XIII, 48.
331 Varnhagen 53 II, 276, Herder to Knebel, 23 November 1798.
332 Düntzer 25 III, 130, Knebel to Herder, 26 January 1799.
333 Herder's MSS S.P.K. D.S.T. Kapsel XXX Nr. 1. *Aufzeichnungen zum Unterricht in der Physik*.
334 SW XIV, 655.
335 SW XIII, 430.
336 SW XIII, 422.
337 Linnaeus 314 p. 6, referred to by Herder in his notes for the *Ideen* (SW XIV, 623).
338 Pistoi 321 p. 2.
339 Goethe 274 VIII, 249.

340 SW XVI, 558, *Gott*, 1787.
341 Cf. Masson 235 p. 135.
342 Cf. Masson 235 p. 133. It is possible that Herder first studied the theory in Priestley's *Observations upon Several Different Kinds of Air*, a work which he requested from Heyne of Göttingen in 1774 for the Count of Schaumburg-Lippe.
343 SW XIV, 588.
344 SW XIII, 58.
345 SW XIII, 211.
346 Kant 291 p. 103.
347 SW XXIV, 439.
348 Düntzer 25 III, 52, Knebel to Herder, 7 September 1789.
349 Cf. Dobbek's remarks in Einsiedel 270 p. 58.
350 E.g. by Oetinger (*Bibl. Herd.* 3 No. 3595), Mann (Herder's MSS S.P.K. D.S.T. Kapsel XXVIII Nr. 6, extracts from Mann's work on 'Elementarfeuer'), Scherer and Fourcroix (cf. Düntzer 25 II, 282, Herder to Knebel, 30 November 1799), and Jordan (*Bibl. Herd.* 3 No. 379).
351 SW XXIII, 85.
352 Cf. SW XX, 253, editor's note; also SW XXII, 235, note and Düntzer 23 II, 454-455, Herder to August Herder, 1800.
353 SW VI, 186.
354 SW VI, 296.
355 SW XXXI, 294.
356 SW XIII, 428-429.
357 SW XVI, 52.
358 Kant 290 p. 313.
359 Kant 299 p. 267. Alternatively, he may have been influenced by Whiston, whom he mentions on several occasions (e.g. SW I, 116; VI, 197; XIII, 471), who declared that Moses' 'days' were really years (cf. Zöckler 250 II, 158).
360 Bruntsch 74 pp. 10-13.
361 SW XIII, 421, *Ideen.*
362 Cf. SW XIV, 695.
363 SW XIII, 33, 35, 40-41, 48, 208, 397, 419, 471 and SW XIV, 571, 575, 578, 584, etc.
364 SW XIII, 397; cf. Goethe 274 IX, 175.
365 Cf. Adams 216 pp. 368-377.
366 Adams 216 p. 218.
367 Adams 216 p. 388.
368 Adams 216 p. 379.
369 Sauter 114 p. 17 and Rouché 172 p. 187.
370 Linnaeus 313 p. 153.
371 Wagner 54 p. 369, Goethe to Merck, November 1782.
372 SW XIII, 46.
373 SW XIII, 402; cf. SW XVII, 219.
374 SW XIII, 46, 69, 213 and 403.
375 As Grundmann 80 p. 32 suggests.
376 Pallas 320 p. 25.
377 Pallas 320 p. 40.
378 SW XIII, 35.
379 Düntzer 23 II, 124, Herder to Lavater, 20 February 1775.
380 SW XIV, 575.
381 Adams 216 p. 75.
382 I. A. Richter (ed.), *Selections from the Notebooks of Leonardo da Vinci*, London, O.U.P., 1952, p. 32.
383 Woodward 249 p. 29.
384 Woodward 249 p. 80.
385 G. Gamow, *Biography of the Earth. Its Past, Present and Future*, New York, 1941, revised edition, London, 1959, p. 43.
386 Gamow *op. cit.* p. 56.
387 Cf. Zöckler 250 II, 138.
388 Cf. H. Hallam, *Introduction to the Literature of Europe in the Fifteenth, Sixteenth and Seventeenth Centuries*, London, 1837-1839, IV, 590.
389 Cf. Nordenskiöld 237 pp. 223-224.
390 SW VI, 120.
391 SW XIII, 419.

392 SW XIII, 480.
393 Cf. Nordenskiöld 237 p. 270.
394 Kant 290 p. 289.
395 SW XIII, 471.
396 SW XIV, 213-214.
397 SW XIII, 419.
398 SW XIV, 584.
399 SW XIII, 397.
400 Cf. SW XIII, 480.
401 SW XIII, 29.
402 SW XIV, 584.
403 Cf. Willey 247 p. 31.
404 Cf. Sauter 114 p. 71.
405 Cf. Zöckler 250 II, 142.
406 Adams 216 pp. 221-223.
407 SW XIII, 234.
408 SW XIII, 402.
409 SW XIII, 216.
410 SW XIII, 64.
411 Lucretius 315 II, 537.
412 Cf. Sauter 114 p. 65.
413 Kant 293 p. 303.
414 Goethe 274 II, 96, *Lage der Flötze, circa* 1829.
415 SW XIII, 422.
416 Cf. Zöckler 250 II, 122.
417 Pallas 320 p. 53.
418 SW XIII, 480.
419 SW XIII, 481.
420 Cf. Willey 247 p. 31.
421 SW XIII, 17.
422 SW XIII, 27-28: ' . . . so sehen wir abermals, mit welchem feinen Zuge der Finger der Allmacht alle Umwälzungen und Schattierungen auf der Erde umschrieben und bezirkt hat. Nur eine kleine andre Richtung der Erde zur Sonne und alles auf ihr wäre anders.' Max Rouché (Rouché 172 p. 193) translates this as follows: ' . . . il eût suffi que Dieu modifiât l'inclinaison de l'orbite terrestre sur l'écliptique, et toute l'histoire eût été changée.' Over-anxious to discover religious orthodoxy in Herder's thought, he has personified Herder's 'Allmacht', which is an impersonal term. In his *Gott,* for example, Herder says: 'Wir sind mit Allmacht umgeben, wir schwimmen in einem Ocean der Allmacht' (SW XVI, 456). The word should not be translated by the personal 'Dieu' on either occasion. Herder uses his 'Allmacht' in a way typical of his usual *immanent* teleology, which assumes that the higher purpose and natural causes work together in harmony. (Incidentally, the phrase 'der Finger der Allmacht' comes straight from Kant's *Allgemeine Naturgeschichte*: cf. Kant 290 p. 347.)
423 SW XIII, 480.
424 SW XIII, 477.
425 Cf. Willey 247 pp. 32-33.
426 Cf. Zöckler 250 II, 159, 188, and 141.
427 Cf. Woodward 249 p. 9.
428 Cf. Rouché 172 p. 193.
429 SW VI, 197.
430 Cf. Zöckler 250 II, 101.
431 Kant 290 p. 288. The same theory appears in his lectures on physical geography, which Herder attended (cf. Kant 299 p. 305).
432 Kant 290 p. 289.
433 Kant 290 pp. 288-289.
434 SW XXX, 397.
435 SW XI, 389, *Vom Geist der ebräischen Poesie.*
436 SW XIII, 483.
437 Bruntsch 74 pp. 18-19 and 23.
438 SW XIII, 478.
439 SW XIII, 476-477.
440 E.g. SW XIII, 477.
441 E.g. SW XIII, 479.

442 SW XIII, 399.
443 SW XIV, 214.
444 SW XIII, 21.
445 SW XIII, 482.
446 Bruntsch 74 p. 20 lists Aristotle, Leibniz, Whiston, Woodward, Scheuchzer, Pluche, de Luc and Kant as earlier exponents of it. To these one might add Anaxagoras (cf. Adams 216 p. 400), Ovid (Adams 216 p. 331), Lucretius (Lucretius 315 II, 681), Seneca (Adams 216 p. 402) and Albertus Magnus (Adams 216 p. 335).
447 Pallas 320 p. 58.
448 Cf. Koller-Du Bos 269 p. 102.
449 Cf. SW XIV, 575.
450 SW XXXII, 153 *et seq.*
451 SW XI, 249, editor's note.
452 SW XXXII, 154; cf. SW XI, 249.
453 SW VI, 113.
454 SW XI, 388.
455 SW XIII, 436-437.
456 SW XIV, 571-572.
457 SW XIII, 473.
458 SW XIII, 475.
459 On this evidence alone, G. A. Wells' comparison between Herder's and Hutton's views on geology needs qualification. Wells writes: ' . . . Herder's views seem more akin to the Scottish writer's uniformitarian hypothesis . . . than to the hypothesis which attributed all past change to sudden and violent convulsions such as the Mosaic flood' (Wells 131 p. 107).
460 Zöckler 250 II, 123 says of the period 1650-1780: 'Diluvialismus ist der Grundcharakter der schöpfungsgeschichtlichen Theorien unsres Zeitraums'.
461 Cf. Zöckler 250 II, 126-128 and 177. Leonardo, earlier still, was perhaps the first to suggest this (cf. I. A. Richter, *Selections from the Notebooks of Leonardo da Vinci,* London, O.U.P., 1952, p. 30).
462 E.g. Reyher in 1679 and Scheuchzer in 1731 (cf. Zöckler 250 II, 140 and 172).
463 SW XIII, 474.
464 SW XIII, 475.
465 Cf. Kant 299 p. 304.
466 Pallas 320 pp. 52-53.
467 SW XIII, 426, *Ideen.*
468 SW XIV, 576.
469 Wagner 54 p. 242, Karl August to Merck, 30 April 1780.
470 Cf. Koller-Du Bos 269 p. 110. W. Stukeley, whose works Herder does not seem to have known, claimed that earthquakes are caused by electricity (cf. Woodward 249 p. 17).
471 Kant 296 p. 427.
472 SW XIV, 571-573; cf. SW XIV, 578-580.
473 Pallas 320 pp. 51 and 56.
474 SW XIII, 482.
475 Cf. Herder's MSS S.P.K. D.S.T. Kapsel XXVIII, Nr. 6.
476 *Bibl. Herd.* 3 items 3603, 3604 and 7009.
477 SW XI, 388.
478 Cf. SW XIV, 673, editor's remarks.
479 SW XIV, 621; cf. SW XIV, 694.
480 SW XIV, 582.
481 SW XIII, 315.
482 SW XIII, 271.
483 Quoted by Suphan in SW XIV, 694.
484 *Schwedische Abhandlungen* 251 V, 25.
485 *Schwedische Abhandlungen* 251 V, 25 and 34.
486 Cf. Nordenskiöld 237 p. 224.
487 Linnaeus 313 p. 153.
488 Cf. Nordenskiöld 237 p. 328, note.
489 Cf. R. Carrington, *A Guide to Earth History,* London, 1956, p. 177.
490 Cf. Caroline 65 III, 109: 'In Aachen, 1802, wo auch Werner zu gleicher Zeit mit uns da war, hatte derselbe die Güte, Herders Wißbegierde zu befriedigen, und ihm mündlich in mehrern Stunden einen Abriß seines Systems mitzuteilen. Herder hatte eine ausnehmende Freude darüber.' Cf. also Caroline 65 III, 195.
491 SW XIII, 24.

492 *Bibl. Herd.* 3 items 3090, 3589-90, 3594, 3597, 3599, 3601, 3602, 3605 and 3611.
493 Hoffmann 33 p. 181, Caroline Herder to J. von Müller, 2 February 1807.
494 Hoffmann 33 p. 181, note.
495 Cf. SW XIII, 470, editor's note.
496 SW XVI, 117.
497 SW XIII, 22.
498 Caroline 65 III, 195.
499 Herder's MSS N.F.G. (G.S.A.), *Anfangsgründe der Sternkunde*, p. 45.
500 SW XIII, 427.
501 Kant 290 pp. 319-320.
502 SW XIII, 24.
503 Cf. Grundmann 80 p. 30, who rightly says: 'Diese Ausführungen erinnern an Kants und Eulers Mutmaßungen über das Altwerden unseres Planeten'.
504 Irmscher 11 p. 289.
505 SW XXXII, 337.
506 Cf. Adams 216 p. 352.
507 Cf. Zöckler 250 II, 143.
508 SW XIII, 24.
509 SW XVIII, 290.
510 SW XIII, 266.
511 SW XIII, 31.
512 SW XIII, 31-32.
513 Cf. Goethe 274 XII, 77.
514 Cf. Caspar-Kepler 308 p. 99.
515 SW IV, 354.
516 I. A. Richter (ed.), *Selections from the Notebooks of Leonardo da Vinci*, London, O.U.P., 1952, p. 45.
517 Caspar-Kepler 308 p. 291.
518 Cf. *Science Journal*, vol. 1 no. 1, March, 1965, p. 14, 'Rainfall and the Moon'.
519 SW XXX, 97.
520 *Bibl. Herd.* 3 nos. 3122-42, 3600, 3606-7, 3818, 3822, 3826, 3831, 3833, 4169-83, 4717, 4735 and appendix nos. 214-215. See also the appendix on atlases and maps.
521 SW XXX, 96 *et seq.*
522 SW XXX, 98.
523 SW XXX, 99.
524 SW XXX, 97.
525 SW XXX, 101.
526 SW XXX, 102.
527 Grundmann 80.
528 SW XIII, 44.

CHAPTER IV : THE BIOLOGICAL SCIENCES

Herder's knowledge of natural history was certainly considerable. It is not, however, the purpose of this study to discuss natural history, or to enumerate Herder's citations of purely descriptive facts, and readers are referred to the notes for further information.[1] Such data are mentioned in the text only where they throw light on his knowledge of works of scientific interest, or on his use of some scientific method or principle. This chapter will accordingly deal with his thoughts on scientific or functional biology, although it must be borne in mind that, in Herder's day, botany and zoology were still largely occupied with taxonomy and natural history. The word 'biology', in fact, was not coined until after 1800, but the all-embracing study of life and its functions had already begun before then, and occupies an important place in Herder's works.

1. The nature of the biological world: definitions of life

(a) Specific definitions of life

As we have already seen, Herder at various times uses terms such as 'Äther', electricity, light, and heat to describe the elusive life-force itself. It is never completely clear whether these 'Kräfte', as he calls them, *are* the actual life-force, or whether we should consider them only as imperfect and approximate analogies, which is what he himself at times implies. Let us now examine some of his further attempts to reduce the life-force to some specific agency.

Firstly, he often says that our breath, the air, or some vital ingredient of the air, is essential to life:[2]

> . . . die innere Oekonomie des animalischen Lebens aber hangt von dem verborgnen Reiz oder Balsam im Element der Luft ab . . . und so wird wirklich der Mensch durch den lebendigen Othem zur regsamen Seele. Durch ihn erhält und äußert er die Kraft, Lebenswärme zu verarbeiten. . .

On the one hand, this notion, as Herder uses it, looks back to such ancient ideas as the 'pneuma' of the Stoics or the divine afflatus. On the other hand, the same notion received a new scientific stimulus from the experiments which Priestley and others, in Herder's lifetime, carried out upon oxygen, a recently discovered gas already known to be essential to most living organisms. Similarly, Boyle had earlier entertained 'a great suspicion of some vital substance, if I may so call it, diffused thro' the air'.[3] It would accordingly be wrong to emphasise only the religious or mystical affinities of Herder's ideas on breathing.

Secondly, his reference to 'Lebenswärme' reminds us of those theories of 'animal heat', so often used in that age to explain the nature of animal vitality. 'Animal heat' was first interpreted in a genuinely scientific way when Joseph Black put forward the theory that body-heat is produced by *combustion* which takes place during respiration; this theory was improved upon by Crawford's experiments, published in the *Transactions* of the Royal Society in 1781.[4] Herder cites this (then recent) article, along with a similar work by the chemist Crell[5]; this shows once more how up to date his scientific knowledge often was, and that his notion of 'Lebenswärme' had some scientific support. But along with the cautious experimental conclusions of Crawford upon the maintenance of body-heat in animals, there appear, in the *Ideen,* those more archaic theories of animal heat, 'elemental fire', light and 'inner ether', already examined in the appropriate sections. Such attempts to describe life in terms of heat or fire go back to Aristotle, Democritus, and even Heraclitus.[6] Linnaeus, like Herder, preferred to use several of these ancient pseudo-chemical theories of life in an eclectic combination, saying that the living body is a machine kept going by an 'ethereal electric fire maintained by breathing'.[7]

But apart from these vacillating attempts, still common in the late eighteenth century, to compare or even to identify life with imperfectly understood chemical processes or physical forces, there existed other theories which defined life in purely biological terms. Popular tradition, probably inspired by the words 'the blood is the life' as recorded in Deuteronomy 12, 23,[8] held that the vital principle resides within the blood. Thus the young Georg Müller, staying with Herder in 1780, writes in his diary, probably after a conversation with Herder: 'Im Blut steckt ein besonderes thierisches Leben'.[9]

A more modern, bio-chemical conception of the basic composition of living forms is that of protoplasm. It has been much valued by materialistic thinkers, and is widely used, even today, in elementary biology. Now in the *Ideen,* Herder refers to a 'Prototyp' of all animal forms; on the following page, in Suphan's edition, he calls it a 'Hauptplasma der Organisation'.[10] Bärenbach, the first of that line of critics who mistakenly hailed Herder as a precursor of Darwin, seized upon the word 'Hauptplasma',[11] and identified it not only with Haeckel's evolutionary 'Urzelle', but also with what is now called protoplasm, forgetting that Herder's 'Hauptplasma' is a *form* or *pattern* of organisation, not a fundamental organic *substance* like the modern protoplasm. Bärenbach's absurd and hasty inference merits no further attention in itself, but it does raise an interesting question in the history of scientific terminology. For no critic appears to have noticed that Herder, in his *Zerstreute Blätter* of 1785, uses the actual word 'Protoplasma' to describe his universal 'type'.[12] Although his term and the modern equivalent, on this occasion again, have quite different meanings, there is no denying that he uses this significant word long before the conception with which later biologists associated it had been even tentatively formulated.

The process by which Herder arrived at this striking word is simple. He combined the words 'Prototyp' and 'Hauptplasma', which he had used in juxtaposition in the *Ideen,* perhaps following the model of the old term 'protoplast', often used by theologians to describe Adam, the first-made man. Elsewhere, he uses similar words himself, such as 'Protevangelium'[13] and 'Protoapostel'[14] in theological contexts in 1797; on one occasion, in 1799, he actually describes the first men as 'Protoplasten'.[15]

The *Deutsches Fremdwörterbuch* of Schulz and Basler states that the word 'Protoplasma' (as distinct from 'Protoplast') was first used in 1846 by the botanist Hugo von Mohl, and a similar reference work by Darmstaedter, referred to in Schulz and Basler, claims that Purkinje first coined the word in 1840.[16] The Oxford Dictionary first records the word in English in 1848. But while it is true that nineteenth-century scientists first gave the word its modern meaning, Herder had used it, in a biological context, over half a century before them, probably for the first time. It is possible that von Mohl or Purkinje originally encountered it in Herder's works.

The last of Herder's many attempts to describe life in terms of some specific agency is his neurological theory, borrowed chiefly from Haller. Since it is of great importance for his psychological ideas, it can more appropriately be discussed later in the chapter on psychology.

(b) Vitalistic theories

The one common factor behind all of Herder's many conceptions of life is 'Kraft', that same unknown 'force' which is encountered in all vitalistic theories of biology, even in the present century. His pseudo-chemical definitions of life are simply variants upon, or more materialistic deviations from, the fundamental vitalism in his entire biological thought.

A vigorous tradition of vitalism had existed in biology since antiquity; it attained new vigour in Herder's century, and culminated in the biological 'Naturphilosophie' of the Romantics.[17] Let us first ask whether Herder's vitalism was in advance of the biology of his own age, as one critic claims,[18] and then proceed to compare it with modern vitalism, as another writer does.[19] It will be of help if we bear in mind the distinction which a modern historian of physiology draws between two types of vitalism – descriptive and explanatory. The latter sort introduces unknown vital agencies of a non-physico-chemical kind, whereas the former, more modern vitalism maintains that 'the doctrine of the vital principle should be recognised as simply descriptive' (i.e. of *observed* events), and that 'the question of whether the mechanisms behind these activities involve unique substances, or forces, or agencies . . . is quite a different one'.[20] This problem, we may recall, is parallel to that of 'relational' and 'explanatory' theories of force in physics.

Herder, as we have seen, had multiplied his vitalistic unknowns, and attempted, on numerous occasions, to reduce them to specific agencies of a pseudo-physical or pseudo-chemical nature. But various earlier thinkers, such as C. F. Wolff, had been content with only *one* such unknown (the 'vis essentialis', in Wolff's case). The vitalistic theory of Blumenbach appeared in his *Über den Bildungstrieb* as early as 1781. Herder wrote to Knebel in 1784, requesting a copy of this work, and received it two days later.[21] This was before he wrote his chapter on embryology and growth for the *Ideen*, Part II, in which he shows signs of favouring only one vitalistic unknown, as in Blumenbach's and Wolff's theories, but it was too late to remedy that proliferation of unknowns we encounter in the *Ideen*, Part I. Blumenbach's 'nisus formativus' or 'Bildungstrieb' is recognisable, however, only by its effects.[22] Its cause and nature are unknown, and Blumenbach compares it with the gravitational force.[23] He thus uses it descriptively or relationally, and makes no attempt to define its inner nature, as Herder had repeatedly done with his 'Kräfte' in Part I of the *Ideen*. But even before he wrote Part I of the *Ideen*, Herder had met and used Haller's three physiological 'Kräfte', which Haller, like Blumenbach, had used only to *describe* observed natural functions.

Thus, Herder's confused vitalism was not scientifically advanced even by the standards of his own age. It is more often explanatory than descriptive, and the equivalent theories of Haller and Blumenbach have far more relation to empirical observation than his does, just as Boscovich's relational conception of physical force was scientifically superior to Herder's qualitative physical 'Kraft'.

The last great exponent of vitalism in modern times was Hans Driesch, whose *History and Theory of Vitalism* first appeared in English in 1914. He was an opponent of Darwinism, and had no misgivings about citing Plotinus and Leibniz in support of his views on modern biology[24]; he wrote works on telepathy in his later years. Such a thinker was scarcely typical of scientists even in his own age. But even Driesch's ideas are free from most of the confusion we find in Herder's, for he does not multiply unknowns, or attempt to reduce them in turn to imperfectly known physical or chemical forces or subtle and elusive substances, or to personify them, as Herder does. His vitalism is descriptive compared with Herder's explanatory system.

As Dessoir observes in his history of psychology, the conception of 'life' is merely an abstraction from observed processes such as nutrition, growth, reproduction, etc.[25] But used in an explanatory sense, as in Herder's personifications of natural (including biological) agencies, or when reduced to vital 'Kräfte' (at other times said to be irreducible), to physical and pseudo-chemical forces and substances, life takes on a reality of its own, quite apart from observed phenomena. Such vitalism simply explains *ignotum per ignotius*,[26] and it cannot be compared with modern biochemical reductions, since the agents Herder names are more often qualitative than quantitative, and since the science of biochemistry was virtually non-existent in his day. Bertalanffy points out that this kind of vitalism is emotional rather than intellectual in origin, that it bars the way to scientific progress, and that it 'means nothing less than a renunciation of a scientific explanation of biological data'.[27] In fact: 'The history of biology is the refutation of vitalism, for it shows that always it was just those phenomena which appeared inexplicable at the time that seemed the domain of vitalistic factors.'[28]

(c) Mechanism, vitalism and organicism

In the previous chapter (on physical science), we noted that Herder sets up a 'dynamistic' picture of the physical world in opposition to the 'mechanistic' one. In biology, the equivalent antithesis is that between 'vitalistic' and 'mechanistic' theories of life; Herder, of course, supports the former.

In biological contexts, the word 'mechanism' has two principal meanings. Firstly, it can mean that the phenomena of life can be explained, at least in principle, by the universal causal laws of physical science alone, without any special factors such as hyper-physical forces or teleology. Secondly, it can involve the more specific theory that the living organism should be treated as closely analogous to the machine.[29]

Driesch, the greatest modern exponent of vitalism, uses vitalism *in conjunction with* mechanism; for as Bertalanffy points out, the fundamental defect of mechanism is that it cannot do without elements of vitalism, and vice versa.[30] This applies to Herder too. For he introduces his vitalistic forces by which the soul manifests itself (and, for that matter, his teleological arguments) *alongside* causal explanations of life. In fact, it is exceedingly difficult to say where the one begins and the other ends, for his theories of animal heat, electricity, etc. can usually be construed *either* as groping attempts to define life, in principle, by physical or naturalistic criteria, or as a means of introducing traditional vitalism under more novel guises. But it would be fair to say that, in his biological theories as a whole, vitalism usually takes precedence over mechanism.

The second major sense in which the term 'mechanism' can be used in biology is when it refers to the analogy between the organism and the machine, first consistently formulated in the modern era by Descartes. This analogy well expresses the feelings 'of an epoch which, proud of its technological mastery of inanimate nature, also regarded living beings as machines',[31] for Descartes lived in the Golden Age of mechanics. Now we have seen that Herder denied that mechanics can explain all phenomena even in the physical world (as in his reflections on gravitation, etc.). It is not therefore surprising that he execrated the machine model of the organism, which was still current in his day, especially with the French school of materialists. Thus, in 1769, he exclaims: 'O Mensch, die grausam vornehme Naturlehre ist nicht immer gewesen, daß die Thiere nichts als Empfindungslose Maschienen [sind].'[32] In fact, it was primarily as a reaction against the machine analogy, not against causal explanation in itself, that he adopted a vitalistic theory of life. He rightly believed – and his belief was emotional in origin – that the machine analogy is an over-simplification, and he frequently rejected it as inadequate, especially in the *Ideen*.[33]

The machine analogy as an interpretation of life is indeed inadequate. Newtonian mechanics alone were not enough to explain the phenomena of life, for, although the attempt was correct in principle, it was premature and grossly over-simplified in Herder's day, since it ignored many of the complex and distinctive processes by which we recognise life. This is what even the materialist Engels means when he says: 'Motion is not merely change of place; in fields higher than mechanics it is also change of quality.'[34] The word 'quality' here should not be understood in the sense of 'intrinsic nature'. It simply means that life, for example, is different from inanimate substance in some significant way, ultimately in the enormously greater complexity of the physical and chemical processes which take place within the organism. The laws of motion are indeed basic for all branches of science, as Whitehead remarks,[35] but the machine analogy in biology assumes that they *alone* are enough to explain without mediation everything with which science is concerned, that is, the entire observable universe, including the phenomena of life and mind.

But the machine analogy is more than this. For it fails to eliminate teleology, since every machine requires a designer. (This was why the school of Descartes long adhered to a deistic theology.) If, using this analogy, we do not accept traditional teleology, we are thrown back upon an immanent one, which, in biology, always assumes the form of vitalism. Thus, as Bertalanffy observes:[36]

> If we begin with the machine analogy, we shall wander eternally between the two poles of vitalism and mechanism. We must therefore avoid this fiction and begin with a plain statement of the actual biological data for whose explanation a theory is to be sought.

Herder's vitalism thus had some merit as an antidote to the crude and inadequate machine analogy, then still rampant in biology, especially in France. With scientific knowledge as it then was, Lamettrie and others had grossly to over-simplify their biological theories in order to maintain the consistent materialism in which they believed. Herder's vitalism was too near the opposite extreme, however, and even prejudiced the principle of natural causation itself, leading directly to a speculative metaphysics of 'Kräfte'.

Finally, it should be recalled that those of Herder's ideas which resemble what are now called the theories of 'organicism' and of 'levels of organisation' present a much more acceptable alternative to both mechanism (in the sense of biological mechanics) and vitalism. It is unfortunate that he failed, in biology as elsewhere, to emancipate himself finally from his 'Kräfte', despite these more auspicious steps towards a formal rather than a qualitative demarcation of animate and inanimate.

2. Ontogeny

(a) Embryology

Three earlier versions of Chapter IV, Book VII, of the *Ideen*. Part II, the chapter in which Herder deals most fully with embryology, survive among his manuscripts.[37] This shows how great his interest in the subject was, as well as how unsettled his ideas on it were, at the time when he wrote his masterpiece. He also expresses opinions on embryology on many other occasions in his works.

As we noticed in relation to dialectics and theories of natural law, Herder often maintains that processes of development are produced by a conflict between two, or sometimes several 'Kräfte'. Accordingly, he adopted Kant's theory that the stars and planets are formed by the conflict of two (gravitational) forces. Similarly, it is through the resistance offered by the many 'Kräfte' of the external world to the 'Kraft' within our body, a resistance which the child first experiences through its sense of touch, that our mind, by means of the senses, first begins to develop, as H. D. Irmscher points out. Irmscher writes:[38]

> Unter diesem Aspekt ist der menschliche Leib sozusagen die Grenze, bis zu der die Kraft der Seele sich gegen die zudringenden Kräfte des Universums gerade noch zu behaupten vermag, innerhalb deren sie noch ganz bei sich selbst ist. Jenseits dieser Grenze beginnt für sie mit der Erfahrung des *Widerstandes* die Welt der *Objekte.*

In both the cases just cited, those of astronomical and psychological processes of development, one 'Kraft' attracts to itself, or assimilates, elements from its environment; hence the stars and planets grow by the gradual accretion of matter, and the mind develops by accumulating tactile sensations of the objective world. But Herder also applies the latter (psychological) principle on a biological level. The body itself is formed by the 'Kraft' of the soul, which assimilates and organises the raw materials constituting the body by means of contact or conflict with the 'Kräfte' it encounters in its environment. He says of the body, in his early sketches (around 1769) for the *Plastik*: 'Er [i.e. der Leib] ist also von ihr [i.e. der Seele] durch eine Art von fühlbarer Anziehung gebildet; diese Attraktion ist aber noch völlig zu berechnen, so wie das Fühlbare in ihr aus der Bildung des Fötus noch zu experimentiren.'[39] The latter words of this passage indicate that Herder's psychological theory of development by touch is matched, on a more basic, biological level, by an *embryological* conception of growth through dialectical conflict or opposition. Now we observed, while studying the problem of dialectics, that Herder had encountered a dialectical theory of embryology early in his Riga period: this was the theory of John Turberville Needham, from whose works Herder had excerpted the following words in 1765:[40]

> eine vegetativische Kraft sey der Grund aller Erzeugung; diese befindet sich in jedem Mikroscopischen Punkt und ist aus der sich ausdehnenden und wiederstehenden [sic] zusammengesezt. . . Sie besteht aus *Ausdehnung*; diese haben Thiere und Pflanzen, indeß ist im Aether auch eine wiederstehende Kraft, sonst würden sie ins unendliche zerstieben.

But Needham applies this theory to generation and growth of *all* kinds: as Herder later notes: 'Needham beweist nur, daß es hervorbringende Kräfte gebe.'[41] It could easily be applied, however, to animal embryology in particular. In fact, we can explain how Herder came to apply the dialectical principle to embryology simply by postulating the direct influence of Needham, without having to suggest that he did it by extrapolating either from Kant's dialectical cosmogony or from his own theory of psychological development by touch. No doubt when he read the work of C. F. Wolff in 1784 he regarded it as confirmation of Needham's theory. For Wolff, although he contemptuously dismissed Needham's work as 'ein unerträglich confuses Buch',[42] was certainly influenced by it himself. He merely applied Needham's dialectical theory in a more specific manner, saying that growth takes place by assimilation, expansion and resistance: 'Es ist daher die wesentliche Kraft mit der Erstarrungsfähigkeit des Nährsaftes [not the vague 'wiederstehende Kraft im Aether' which Herder had noted from Needham's work] ein hinreichendes Prinzip jeder Entwicklung sowohl bei Pflanzen, als auch bei Thieren.'[43] Similarly Treviranus, early in the nineteenth century, said that an expanding inner force is resisted by the rigidity of the (material) organic body it builds up around itself: 'The organ is a restriction, not the cause, of the activity of the formative impulse.'[44]

In Part I of the *Ideen,* Herder still adheres to the theory that embryological growth takes place by dialectical conflict. But he is now no longer sure whether only one 'Kraft' (as in his earlier idea that the one 'Seele' constructs its body), or perhaps several, may be responsible for the growing embryo's inner expansion. Accordingly, he says of development in the bird's egg:[45]

> Die organische Kraft muß zerrütten, indem sie ordnet: sie zieht Theile zusammen und treibt sie auseinander; ja es scheint, als ob mehrere Kräfte im Wettstreit wären und zuerst eine Mißgeburt bilden wollten, bis sie in ihr Gleichgewicht treten und das Geschöpf das wird, was es seiner Gattung nach seyn soll.

On the whole, he abides in the *Ideen* by the conception that only *one* 'Kraft' within the embryo, opposed from without by various environmental 'Kräfte', provides the inward pole in the conflict of growth. None the less, this one ruling 'Kraft' may assimilate and govern other lesser 'Kräfte' which it draws into the embryo from outside ('sie, die über tausend Kräfte, die sie anzog, in dieser Organisation herrschte'[46]). As we earlier noticed, however, he does fall back, on one occasion in the *Ideen,* upon the notion of a single, purely teleological 'Kraft': 'Sie . . . muß . . . den *Typus ihrer Erscheinung in ihr selbst* haben.'[47] In this statement, he has abandoned the less teleological idea of growth by dialectical conflict, and even declares, in a truly Platonic vein: 'Das neue Geschöpf ist nichts als eine wirklich gewordene Idee der schaffenden Natur, die immer nur thätig denket.'[48] It is the influence of Harvey, whose classic work on embryology Herder read in the 1780's, which has here supplanted the dialectical theory of Needham in his mind. Herder himself had noted while preparing his *Ideen*: 'Harvei [sic] nimmt impressio idealis an, wie im Kopf des Künstlers.'[49] This is clearly the source for his surprisingly teleological statement quoted above. But it would be wrong to dwell on this teleological or Platonic element in Herder's remarks on embryology, for it is only one among several different interpretations which he puts forward at various times.

Embryology was still a very imperfectly developed subject, largely given over to speculation, in Herder's age. He himself is aware of the prevailing lack of knowledge, and says in 1783 of the human embryo: 'Die Art der Bildung des Menschen im Mutterleibe war den Morgenländern das unerforschbarste Wunder, das tiefste Räthsel; und ist sie es nicht allen Naturweisen noch bis auf diese Stunde?'[50] Nevertheless, amidst the many theories then in currency, two main schools of thought can be distinguished: the 'epigeneticists' and the 'preformationists'.

Many modern writers, including Driesch, the historian of vitalism, have assumed that the theory of epigenesis, which argued that the embryo develops by acquiring its parts and its characteristic conformation *successively,* is always coupled with vitalism, whereas vitalism and preformationism are seen as incompatible. Joseph Needham, in his history of embryology, has shown, however, that the connection between epigenesis and vitalism is by no means necessary.[51] Now Herder, as we know, held vitalistic opinions in biology from his earliest period as a thinker. Yet his first utterances upon the epigenesis-preformation question seem to indicate that he favoured the hypothesis of preformation, also known as the theory of 'incapsulation', 'emboîtement' or 'evolution' (i.e. the theory that the embryo develops only by expanding, and that the parts and conformation of the adult organism are present in miniature, preformed or predelineated, from the time of generation, and that the earliest members of every species contain all future members, in the form of microscopic 'seeds', within them). He writes in 1768, in his *Fragmente*: 'In dem Saamenkorn liegt die Pflanze mit ihren Theilen; im Saamenthier das Geschöpf mit allen Gliedern'.[52] In the language essay of 1770, he again writes: ' . . . ist also nicht im Keime der ganze Baum enthalten?'[53] And in a sermon of 1773, he speaks of the initial state 'wo der Baum im Keime und tausend Keime in Einem und die ganze Schöpfung in Einem Keime liegt, und nur auf stille Entwicklung wartet'.[54] This last statement, however, obviously refers not just to embryology, but to development in general; it is probably only a renewed affirmation of that so-called 'genetic method' (cf. Chapter II) which Herder cultivated in his earlier years. But just as he abandoned his early notion that, by the genetic method, we can discover or predict all subsequent developments simply by studying the origin of a phenomenon, and decided instead that the sequence of development itself must be studied in all its stages (in accordance with the so-called 'Entwicklungsgedanke'), he soon gave up his early allegiance to a loosely preformationist conception of embryology, and, as we shall see, eventually came to accept the main teachings of the rival epigenetic school. Perhaps he also realised that preformationism was incompatible with that dialectical theory of successive growth which he had borrowed from Needham and Kant.

It appears then that Herder, in his earlier years, used both vitalism and preformationism, just as Bonnet did. At this time, however, he had not yet studied biology, or embryology, in any detail. But as soon as he had begun, in the 1770's, to study physiology and biology in some detail in the works of Haller and others, he found Bonnet's theory of preformation inadequate. For example, in the *Älteste Urkunde* in 1776, he scathingly rejects the idea of a 'Limbus präformirter Seelen'[55] – presumably it is Bonnet whom he here has in mind. Already in the 1774 version of his essay on psychology, he had rejected the theory of preformed 'Keime' as 'mechanisch': 'Die Mechanische Philosophie betrachtet die Natur als abgestorben, todt, die blos aus alten, abgelebten Keimen würke. . . '.[56] And in the *Ideen*, he says:[57]

> Die Theorie der Keime . . . erklärt eigentlich nichts: denn der Keim ist schon ein Gebilde und wo dieses ist, muß eine organische Kraft seyn, die es bildet. Im ersten Saamenkorn der Schöpfung hat kein Zergliederer alle künftige Keime entdeckt. . .

Later in the same work, he again repudiates the preformation hypothesis, having explicitly named Bonnet a few pages earlier as the source of this untenable theory.[58]

In another sentence in the *Ideen*, however, he even goes on to reject epigenesis as well:[59]

> . . . so, dünkt mich, spricht man uneigentlich, wenn man von Keimen, die nur entwickelt würden, oder von einer *Epigenesis* redet, nach der die Glieder von außen zuwüchsen. *Bildung* (genesis) ists, eine Wirkung innerer Kräfte, denen die Natur eine Masse vorbereitet hatte, die sie sich zubilden, in der sie sich sichtbar machen sollten.

And in an earlier version of the work, he speaks of 'die sinnlose Epigenese'.[60] It is clear from the passage just quoted that he is, as usual, more interested in his qualitative, vitalistic 'Kraft' in embryology, than in the formal patterns of development which were described in both the preformation and epigenesis theories. This becomes specially evident in Part II of the *Ideen*, where a whole chapter is devoted to the vitalistic theory of growth (which is treated in turn in relation to the environmental determinants which act from outside upon the organism).

At the beginning of the chapter in question, the development of the animal embryo is described in more concrete detail: 'Aus Kügelchen, zwischen welchen Säfte schießen, wird ein lebender Punkt . . . das Herz erzeuge sich nicht anders, als durch eine Zusammenströmung der Kanäle, die schon vor ihm da waren. . . '.[61] One critic maintains that these notions seem to be derived from C. F. Wolff.[62] This is quite correct, for Wolff writes in his *Theoria generationis*:[63]

> Die Nährsäfte bewegen sich, durch diese Kraft [i.e. Wolff's 'vis essentialis'] getrieben, durch jene aus Kügelchen gebildete Substanz hindurch, lagern sich zwischen diesen Kügelchen ab, und vermehren auf diese Art das Volumen des Embryos. . .

Besides, in declaring that the heart is formed successively from 'Kanäle' which gradually converge, Herder is employing in practice the very epigenesis which, along with preformation, he had rejected in Part I of the same work.

The reason for this change is that, since writing Part I of the *Ideen,* he had read three works on embryology, each of which put forward a theory of embryological growth which could be classified as both vitalistic and epigenetic: these were Harvey's *Exercitationes de generatione animalium* (1651), Blumenbach's *Über den Bildungstrieb* (1781)[64] and C. F. Wolff's *Theoria generationis* (1759, 1764 and 1774).[65]

It might be helpful to pause at this point in order to examine how Herder came to know the work of C. F. Wolff, since critics have hitherto failed to agree on this important question.

In the first place, R. T. Clark's statement 'I find no evidence that Herder ever read Caspar Friedrich Wolff'[66] is completely unfounded. On the contrary, Herder refers to Wolff on four occasions in the *Ideen,* even mentioning him twice in Part I.[67] Three of these references are to Wolff's principal work, the *Theoria generationis.* Furthermore, Suphan, in his edition of Herder's *Ideen,* observes that a long extract from this work appears in Herder's notebooks.[68] Other critics, however, have realised that Herder did read Wolff's work; but they disagree over several chronological details. The controversy dates from Rudolf Haym's assertion: 'Durch Herder ist Goethe K. F. Wolffs theoria generationis bekannt gemacht worden'.[69] Now Adolph Hansen, in his well known work on Goethe's *Metamorphose der Pflanzen,* notes that Goethe himself said that F. A. Wolf drew his attention to C. F. Wolff's work *after 1790* for the first time.[70] The question of date is an important one, because Wolff's ideas have significant similarities with Goethe's theory of plant metamorphosis, yet Goethe claims that he did not meet Wolff's writings until after he had composed his own work. Hansen accepts Goethe's word, and is therefore compelled to disagree with Haym. But Haym quotes two letters from Herder to Knebel, and dates them 15 and 19 December 1784, although they were published in *Knebels Literarischer Nachlaß without dates.* In these letters, Herder asks Knebel to procure the work of Wolff, which Herder intends to give to Goethe as a present. Hansen, who is aware that the letters were published without dates, concludes that Haym's dates can only be arbitrary.[71]

But Hansen, who is bent upon minimising Goethe's debt to others, is not justified in doubting Haym's scholarly integrity. For the letters written by Knebel in reply to Herder's are printed by Heinrich Düntzer, with dates from Knebel's original manuscripts (because Düntzer always brackets conjectural dates, and these are not in parentheses), in the collection of letters *Von und an Herder.* In a footnote, Düntzer refers to the two letters from Herder, whose dates, as given by Haym, Hansen has questioned, and dates them just as Haym does; for although Herder had not dated them himself, the known discrepancies between the dates of Knebel's letters and the time of postal deliveries in Weimar from Jena provide the dates of Herder's letters with tolerable accuracy, and Düntzer no doubt used this method of dating them. Thus, Haym had quite correctly cited the dates given by Düntzer, whose work Hansen apparently omitted to consult.

Suphan, in his edition of the *Ideen,* unfortunately accepts the word of Hansen, not that of Haym, and also adds that Goethe first obtained a copy of Wolff's work from Loder at a later date.[72] But others again,[73] no doubt following Haym, declare that Goethe came to know the work of Wolff through Herder.

The true sequence of events was, in fact, as follows. (Sources are given in the notes to each statement.) Herder writes to Knebel on or around 15 December 1784, asking for Wolff's *Theorie der Generation* [sic] among other works on biology.[74] Knebel replies on 17 December 1784, apparently sending the Latin edition of Wolff with the other works.[75] (Since, in this letter, Knebel says that he looks forward to Part II 'Ihres trefflichen Buchs', i.e. of the *Ideen*, we have further proof that these letters date from late in 1784, not from after 1790, as Hansen claims.) Herder replies on or around 19 December 1784, saying that he has in the meantime read the Latin version of Wolff, but now wishes to obtain the German edition of 1764.[76] Knebel writes back on 28 December 1784, saying that he is trying to obtain this edition.[77] Shortly afterwards, in a letter given the conjectural but erroneous dating '1795?' by the editors of *Knebels Literarischer Nachlaß*, Herder renews his request, and says that he intends to make a present of the German edition of Wolff's work to Goethe, to whom he is also about to show his newly finished chapter on embryology for the *Ideen*, Part II.[78] But Knebel replies on 7 January 1785, announcing that he has finally failed to obtain a copy of the required edition.[79]

All this, along with the references to Wolff's work in the *Ideen,* shows that Herder read the work, in the Latin edition, in the winter of 1784-85. But have we any proof that he showed this edition to Goethe at this time? The chances are that, having failed to obtain the German one, he did.[80] Besides, he tells Knebel that he is about to show Goethe his chapter on embryology for the *Ideen,* in which he twice refers to Wolff. And Wolff is mentioned even in Part I of the *Ideen*, as we have already seen. Goethe undoubtedly read the complete *Ideen*, the greatest work of Herder, his closest friend in those years, so that he must have encountered at least some of Wolff's ideas at that time, if only through the mediation of Herder's own theories.

But how could Herder refer in Part I of the *Ideen* to the work of Wolff which, as we know from his letters, he read only while preparing Part II?

The great opponent of the epigeneticist Wolff was the preformationist Haller. Herder read Haller's writings in the early 1770's, and often refers, at that time, to his great work on physiology, especially to Volume VIII, which deals with embryology and reproduction. Now Haller, in this volume, describes, discusses and criticises the ideas of Wolff, his subsequently successful opponent, in considerable detail.[81] Besides, we know that Herder came to reject preformation at the very time when he was reading and quoting from the preformationist Haller, and early gave preference to a vitalistic theory of embryology. It is therefore probable that he acquired some knowledge and appreciation of Wolff's ideas from Haller's work. This would explain why he could mention Wolff in Part I of the *Ideen*, before reading his *Theoria* himself. It also seems probable that Goethe encountered some of Wolff's ideas before he wrote his *Metamorphose der Pflanzen*, even if he did not read the work, and the more particularly botanical theories expounded in it, until later. But since it is not the task of this study to discuss in detail the influence of Wolff on Goethe, we may now return to Herder's ideas on embryology.

In Part II of the *Ideen*, then, Herder ended up by employing in practice the very epigenesis, with its doctrine of successive growth by convergence upon a centre, which he had rejected in theory in Part I before reading Harvey, Blumenbach and Wolff. In Part I of the *Ideen*, he had in fact been unwilling to commit himself either to preformation or to epigenesis, and had rejected both in favour of a general and unspecific vitalistic theory. He had also, especially in earlier years, used the dialectical theory of Needham (which was itself really epigenetic), and had even toyed with the preformation hypothesis, in a general way, in his first pronouncements on embryology, before dismissing it in the 1770's.[82] His approach was therefore typically vague and eclectic throughout.

Before we leave this question, a word must be said about sources. Both preformation and epigenesis had religious affiliations (corresponding respectively to the doctrines of simultaneous and successive creation).[83] The 'Limbus präformirter Seelen' which Herder rejected in the 1770's does indeed suggest a theological source; in fact, it recalls the doctrine of traducianism, found in certain of the Patristic writings, which declared that all souls were created at the earth's creation.[84] The latter doctrine, however, involves a subsequent transmigration of the original souls rather than the emergence of new ones from preformed 'germs', as in the preformation theory. Alternatively, as one historian of theology and science shows,[85] the doctrine may well have been suggested by Hebrews, 7, 10: 'For he was yet in the loins of his father, when Melchidesec met him.' But although preformation and epigenesis both had theological equivalents or sources, we need not assume that Herder, in using either of them, was applying theology to science. These two theories were the principal ones current in his day in embryology, and it was in the writings of earlier scientists, not theologians, that he encountered them. Preformation had been taught by Swammerdam, Malpighi, Bonnet, Haller, Spallanzani, Hartsoeker and others.[86] Herder himself had encountered it in the writings of Bonnet and Haller, and, in a less specifically embryological form, in Kant's theory, already mentioned, that racial changes are brought about when climatic influences evoke certain preformed 'germs' of potential racial differentiation which are present in all men since the creation. As for epigenesis, it had been upheld by Harvey,[87] Descartes, Maupertuis,[88] Needham, Wolff and Blumenbach,[89] among others. Herder had met the theory, as we have seen, chiefly in the works of Harvey, Blumenbach and Wolff, although he had early encountered the less circumstantial theory of Needham.

Finally, it must be emphasised that Herder, in supporting epigenesis, was following the most progressive current of embryological thought in his age, but that his own vitalistic theory, unlike the qualified vitalism of Blumenbach and even of Wolff, was too unspecific to be of much value as a working hypothesis. Truly scientific embryology arose only in the following century, with the exact studies of W. Roux,[90] and *a priori* speculations were finally banished. Joseph Needham, in his history of embryology, sums up the modern position in relation to eighteenth-century ideas:[91]

> Whitman distinguished between Predetermination, a physiological or potential preformation not capable of microscopic resolution, and Predelineation, which is the old morphological or visible preformation. Modern embryology might therefore be called Predetermined Epigenesis.

(b) Growth and regeneration

In the *Ideen*, Herder compares the growth of the individual human organism with that of the flowering plant, and, in keeping with his usual belief that growth is successive or epigenetic, he says that the brain develops out of, and after, the spinal cord.[92] He writes of the developing brain: 'So ward, wenn ich in einem Bilde reden darf, die Blume gebildet, die auf dem verlängerten Rückenmark nur empor sproßte. . . '.[93] He also speaks of 'das kleinere Gehirn, die sprossende Blüte des Rückens',[94] and extends the same image to describe less advanced creatures:[95]

> In Geschöpfen, bei denen das Gehirn kaum anfängt, erscheinet es noch sehr einfach: es ist wie eine Knospe oder ein paar Knospen des fortsprießenden Rückenmarkes, die nur den nöthigsten Sinnen Nerven ertheilen.

In this last sentence especially, the archaic notion that the brain, situated at the highest point of the body, is the most refined product of the upward-striving creative force (which is in turn related to the idea that the juices of a plant become more refined with sublimation, finally producing the flower), is combined with the correct embryological observation that the brain sends out nerve-connections, as it grows, so as to establish links with the organs of the various senses.

The notion that the brain is simply an extension of the spinal medulla reminds us of a comparable and better known theory put forward some years later by Goethe and first mentioned by him in a letter to Herder from Venice[96]: it is the so-called 'Wirbeltheorie des Schädels', the theory that the skull or cranium is an extension and modification of the upper few vertebrae. Goethe's theory is simply the osteological equivalent of Herder's physiological conception of cerebral development, and it is quite conceivable that one may have influenced the other.

Herder's remarks upon the growth of the brain and the nerves bring us to another problem, that of how the nerves are distributed and how this distribution is related to the regeneration of severed organs in the animal. On several occasions in his *Ideen*, he distinguishes between lower and higher organisms by supposing that a progressively more complex arrangement of constant basic elements can be observed from lower to higher forms. This now well-attested phenomenon, as we earlier noticed, is known today as 'progressive integration'. Thus, in lower organisms, nerve-centres are more independent of each other, i.e. they are less integrated. 'Jeder Nervenknote' of a lower organism, Herder declares, is 'ein kleineres Gehirn'.[97] In such creatures, an 'organische Allmacht' prevails throughout the separate organs, and 'bei einigen Thieren kommen nicht einmal die Nerven beider Augen . . . zusammen'.[98] He also says of the insect: 'Die Seele des kleinen Kunstgeschöpfs war also in sein ganzes Wesen gebreitet'.[99]

It is this idea that the less specialised organs of lower organisms are more independent than those of more advanced creatures which Herder correctly uses to explain how they have greater powers of regenerating lost parts. But the term 'Seele', instead of the more usual 'Kraft', reveals on this occasion the archaic roots of the idea, which experimenters such as Spallanzani, even before Herder's time, were already correlating more closely with the observed processes of regeneration.[100] Aristotle had said that all parts of the organism possess some kind of 'soul', although usually only a 'vegetative' soul in the case of elementary creatures. ('Sentient' and 'rational' souls are found only in more advanced species, and are situated only in certain more specialised areas of their bodies.)[101] Robert Whytt (1714-1766), a follower of the vitalist Stahl, had also said that the souls of all organisms pervade their entire bodies.[102] Thus, Herder's conception of regeneration lies between older, animistic beliefs and the modern idea of progressive integration.

Goethe makes a related observation in his essay ***Fossiler Stier*** of 1822:[103]

> Alle einzelnen Glieder der wildesten, rohsten völlig ungebildeten Thiere haben eine kräftige vita propria; besonders kann man dieses von den Sinneswerkzeugen sagen: sie sind weniger abhängig vom Gehirn, sie bringen gleichsam ihr Gehirn mit sich und sind sich selbst genug.

But whereas Herder had used the concept of varying degrees of integration within the nervous system as a means of classification, and of explaining the regeneration of lost parts in extant species, Goethe (and other writers read or mentioned by Goethe) began, in the earlier part of the nineteenth century, to relate it to palaeontology and phylogeny. It was soon applied to the evolutionary series as a means of distinguishing between more primitive and more advanced organisms, and became related to the modern theory of evolution by descent.

(c) The life-process and the effects of age

In the chapter of the ***Ideen***, Part II, which contains Herder's fullest account of embryology, the vitalistic force supposedly responsible for the growth of the foetus is called the 'genetische Kraft'. Herder says further 'daß diese lebendige Kraft das ausgebildete Geschöpf nicht verlasse sondern sich in ihm *thätig zu offenbaren fortfahre*; zwar nicht mehr schaffend, denn es ist erschaffen, aber erhaltend, belebend, nährend'.[104] As O. Temkin observes, the 'genetische Kraft' sustains the adult organism until it weakens with age.[105] Thus, the development of the embryo and the further life-processes of the independent organism are continuous for Herder, and, as on so many occasions, it is a constant 'Kraft' which provides the continuity. (It is this same 'Kraft' which causes the regeneration of lost parts, as described above.) C. F. Wolff likewise says of his own 'vis essentialis' 'daß diese Kraft . . . ebenso auch im erwachsenen Menschen vorhanden ist, davon kann man sich leicht überzeugen',[106] and Blumenbach says of his 'nisus formativus' that it 'continues to act through the whole life of the animal, and by it the first form of the animal, or plant is not only determined, but afterwards preserved, and when deranged, is again restored'.[107]

In the 1769 manuscript published by H. D. Irmscher, Herder explains the process of ageing as caused by a decline in the strength of the sustaining 'Kraft': ' . . . meine Seele kann sich nicht mehr vervollkommnen: sie kann nicht mehr im Raum und Zeit würken: ihre vitale Kraft also kann nicht mehr dem Allen entgegenwürken, was auf sie stürmt – ich sterbe.'[108] Similarly, Haller had written of the process of ageing: 'Es nimmt die angebohrne und nervige Kraft ab'.[109] And Blumenbach likewise declared later: 'The activity of the nisus is in an inverse ratio to the age of the organised body'.[110]

It is more likely, however, that Herder first found his theory of ageing as a decline in the inner 'Kraft' of the organism in the face of opposing 'Kräfte' in the writings of Needham, since he did not know the works of the other writers named, at least not in detail, in 1769. Needham maintains that 'la force expansive, qui d'abord prédominait, perd son empire peu à peu, et cède à la résistance, qui à son tour prend le dessus . . . ainsi on peut dire que nous portons au-dedans de nous les principes de la vie et de la mort'.[111] But if Needham's ill-defined 'résistance' were an *internal* force, that of the increasing rigidity of the body itself acting against the expansive life-forces which work within it (as in Wolff's version of the same theory), and not a set of external forces (as in Herder's theory of 1769), Herder might be said merely to be applying Kant's theory of conflict between gravitational forces to the organism.

On the other hand, he goes on in the 1769 manuscript already cited to say that the soul itself is nevertheless immortal in man: 'Mein Tod ist nur ein Vertreiben, aus Zeit, und Raum: *Keine Schwäche meiner Kraft*.'[112] This, of course, conflicts with his previous description of ageing as a *decline* in resistance to outside forces. But perhaps he considered the 'vitale Kraft' which weakens with age as different from the transcendental 'Kraft' of the soul itself, which remains unaffected by age or even by death. Yet he says in the *Ideen* of the soul: 'Lasset es seyn, . . . daß sie nur als eine organische Kraft wirke; sie soll auch nicht anders würken dörfen'.[113] And in the chapter which deals with embryology, he says of the 'Lebenskraft': 'sie ermattet endlich im Alter'.[114] He distinguishes it at least from the higher faculties of the soul on this occasion: 'Das Vernunftvermögen unsrer Seele ist sie nicht. . . '.[115] Yet in Part I of the *Ideen* he ascribes a permanence or quasi-immortality to the purely organic 'Kraft' of plants and trees, and denies 'daß die Kraft, die diese Theile belebte, die vegetiren und sich so mächtig fortpflanzen konnte, mit dieser Decomposition gestorben sei'.[116]

Thus, the organic 'Kraft' which creates and sustains the individual organism, like the immortal soul, can never be destroyed, according to the mature Herder, although his later words 'sie ermattet endlich im Alter' seem to imply that some change takes place. But he fails to make any clear distinction between the two kinds of 'Kraft', for to do so would have meant reopening that dualistic gap between soul and body which the very concept of 'Kraft' was designed to bridge. The same weaknesses we have observed in all his applications of this concept thus also render his ideas on the life-process of the individual organism obscure and unscientific.

3. Ontogeny and phylogeny

The following words from Herder's *Ideen* have given rise to a good deal of comment:[117]

> Das Kind in Mutterleibe scheint alle Zustände durchgehen zu müssen, die einem Erdegeschöpf zukommen können. Es schwimmt im Wasser: es liegt mit offnem Munde: sein Kiefer ist groß, eh eine Lippe ihn bedecken kann, die sich nur spät bildet; so bald es auf die Welt kommt, schnappt es nach Luft und Saugen ist seine ungelernte erste Verrichtung.

Max Rouché asks of the passage: 'Et ne semble-t-il pas entrevoir la célèbre loi de Haeckel sur les rapports entre l'embryogénie et la phylogénie . . . ?'[118] He soon adds, however, that Herder, unlike Haeckel, does *not* say that the developing embryo repeats all the main stages found in the evolution of species by descent.[119] The Marxist Reimann, on the other hand, acclaims Herder's statement as an exact anticipation of the materialist Haeckel's 'biogenetisches Grundgesetz' that ontogeny repeats phylogeny.[120] But since Herder did not believe in the evolution of species by descent, he obviously cannot have anticipated Haeckel's purely evolutionary formula. This notwithstanding, there is no reason why he should not have believed, as another writer suggests,[121] that the successive emergence of species in time, through other means than evolution by descent, followed the same order of phases as the growing embryo, except that he himself only says that the growing embryo undergoes 'alle Zustände . . . , die einem Erdegeschöpf zukommen können', and does *not* specifically refer to the consecutive phases in the emergence of species in time. He could easily have made this comparison, which readily suggests itself from his own premises (for he did believe in the successive emergence of progressively higher species in the earth's past, without suggesting that they are descended from one another), but he did not do so; it was left to later writers, perhaps under his influence, to draw this conclusion.

Thus, Herder draws a parallel between temporal developments on the ontogenetic level and the apparently unchanging differences between extant organisms on earth. But in his *Auch eine Philosophie*, he also compares the development of all individual organisms with the cultural 'Lebensalter' of human history. He believed, moreover, that the vision of primitive peoples is parallel to that of the young child, for both see 'Riesenfiguren', while the civilised or adult sense of vision, mediated by the sense of touch, reduces objects to their correct relative sizes.[122] In the latter case, it is almost a *biological* evolution which is here implied – i.e. the idea that man's senses have progressively developed in history. To this extent, it is true to say that history and biology are parallel for Herder.[123] Such parallels between different levels of development, however, are usually derived rather from *a priori* holistic premises than directly from the data of embryology, biology, and so on (although Herder, especially in the *Ideen*, reinforces them with a certain amount of empirical evidence). He believed that parallel dynamic wholes exist on different levels, from that of embryology to that of history; the later consequences of such (originally *a priori*) conclusions have indeed been momentous in biology, but one must beware of exaggerating the function of empirical biology in Herder's own formulations of these ideas.

The theory which Haeckel is often said to have originated, the theory that ontogeny repeats phylogeny, is technically known as the 'recapitulation theory'. Aristotle had already put forward a related theory, in a concrete but non-evolutionary context.[124] Only in the eighteenth century were such ideas revived on a more empirical basis. Joseph Needham, in his history of embryology, says that it was von Baer (not Haeckel) who first formulated it,[125] and A. D. White, in his history of science and theology, shows that Darwin and Agassiz had also stated it perfectly clearly before Haeckel publicised it in Germany.[126]

Herder himself presumably did not arrive at his much debated statement on ontogeny out of nowhere. Charles Bonnet had contended that, with each periodic cataclysm of the earth, the 'germs' of new living forms begin to develop, all earlier forms having been destroyed; the new 'germs' produce more advanced species than those destroyed, but, as they develop, they recapitulate those phases found in the earlier, extinct organisms.[127] It is impossible to say with certainty, however, whether this or some other remark in the many works on natural history which he read influenced Herder's statement.[128]

Herder, one may conclude, is a notable member of a sequence of thinkers who gradually came to realise that there are significant similarities between ontogeny and phylogeny. The train of ideas to which he contributed eventually led, with new palaeontological evidence and the evolutionary theory of Darwin and others, to the principle that ontogeny repeats phylogeny.

4. Phylogeny: the problem of evolution

Considerably more has been written about Herder's views on evolution than about any other division of his scientific thought. There can no longer be any major disagreement on his general attitude, largely because Max Rouché has treated the question so thoroughly in his authoritative work on Herder and Darwinism.[129] But since no account of Herder's scientific ideas would be complete without some mention of this topic, and since many of Rouché's detailed arguments are open to disagreement, a reconsideration of the whole subject should not be out of place here.

As in most areas of Herder's scientific thought, there are two sides to his beliefs concerning the history of life on earth – a naturalistic, and a metaphysical or even religious one; these two sides, as usual, are difficult to distinguish. Too many critics have emphasised either the one or the other, as when certain propagandists of militant materialism, whose dogmatic and uncritical pretensions Rouché exposes so well, attempted in the later nineteenth and early twentieth centuries to portray Herder as a thorough-going Darwinist, and, conversely, when other critics (with Rouché himself not least among them) tried to show that his theories of life and its emergence are firmly based upon religious premises, even upon those of Christian orthodoxy.

But first of all, it is important to realise that pre-Darwinian theories of evolution by descent are not necessarily either scientific (or Darwinistic) or anti-religious. For example, Sir James Frazer finds that the idea that man evolved from animal ancestors or from elementary forms of life is just as common in the religions of primitive peoples as the belief that man was created by a higher being.[130] Besides, as we shall see, naturalistic theories of creation by spontaneous generation find a certain amount of support even in the Book of Genesis, and various Christians, from the Middle Ages onwards, put forward theories of creation which included more or less evolutionary elements. For instance, Franciscus Rueüs, in 1566, declared that 'the earth and all that therein is was [not] brought into existence in its completed form in an instant of time, but rather . . . this edict [the divine fiat] constituted "Creation". Some things at once appeared in their final and perfect form; others in their principles and beginnings, these to reach their completed growth as time went on through the action of secondary causes, which were also put into operation by the creative act'.[131] Thus, pre-Darwinian beliefs in some form of natural evolution were not necessarily anti-religious; and conversely, those who did not support the theory of evolution by descent before Darwin's evidence gave it overwhelming support cannot be infallibly branded as men who sought to impose religious orthodoxy upon science, or as opponents of science out of theological prejudice. Their prejudices, where they existed, were just as often metaphysical as theological, and, since no clear palaeontological and genetic evidence had as yet been adduced in support of the evolutionary hypothesis, earlier theories of evolution by descent, for example those of the eighteenth century, were scientific only in a qualified sense. They were scientific only in that they extended the principle of natural causation to cover every known phenomenon, including the origin of man and of the animals on earth. But to do so they had to theorise far in advance of available evidence. This meant that the average scientific thinker, in the almost complete absence of empirical evidence, was not prepared to adopt such theories, even although they were methodologically sound. Declared opponents of evolutionism and non-evolutionists in general in the eighteenth century accordingly numbered not only the champions of religious orthodoxy, but also the great majority of educated men. The embittered conflict which raged in the later nineteenth century between anti-Darwinian theologians and certain militant and atheistic adherents of Darwin's ideas made the whole issue appear much clearer-cut than it had previously been, and than it has again become within the last few decades.

Secondly, in examining the problems of the history of life on earth and the classification of existing organisms, Herder and most of his contemporaries were much less influenced by the orthodox Christian tradition than by the metaphysical doctrine of a 'Chain', 'Ladder' or 'Scale' of Being. As A. O. Lovejoy points out in his classic history of this doctrine, it is derived, like so many other conceptions common to both scientific and mystical thought, from the Platonic tradition, and ultimately from the *Timaeus* of Plato himself.[132] Comprehending both real and ideal entities in one symmetrical, unifying series, gratifying the aesthetic sensibility, and influencing both science and mysticism throughout many centuries, this metaphysical scheme dominated European thought concerning the sequence of forms in biology and the relation of the earthly hierarchy to that of the transcendental plane until the late eighteenth century. In this latter century, as Lovejoy shows, it began to assume a dynamic significance, and became 'temporalised', in an ideal and metaphysical sense at first, and was finally superseded in science by the empirically based theory of evolution by descent. It was Leibniz, above all others, who inaugurated this 'temporalisation' of the Chain of Being.

All this tends to show that, in the eighteenth century, theories of the compass and succession of life were usually set in the framework of an ancient metaphysical scheme, which had a much greater influence upon biological thought (and especially upon Herder's, as we shall later see) than had either the Scriptures or the actual data of palaeontology, genetics, etc. concerning the history of life on earth. The doctrine of a Chain of Being could be and was applied in so many ways by Herder and his contemporaries that we should consider the theory of transformism or evolution by descent only as one possible consequence of a much wider body of ideas. To discuss the ideas of thinkers of that age only in relation to the Darwinian theory, for example, is to do them an injustice; it serves only as a test of their modernity by the standards of a later age, and it is valueless unless it is supplemented by a comparative study of scientific methods in their age and Darwin's, for it must fail to reveal the full extent of their ideas in relation to the knowledge and beliefs of their age.

(a) The origin of life

(i) Organisms other than man

Unlike the problem of evolution by descent, that of the origin of life as Herder deals with it has been generally ignored by critics. Since it involves a choice between creation by a higher being and natural emergence, it raises theological issues more than most of his other biological ideas.

The clearest statement in the *Ideen* on the origin of life is as follows:[133]

> Und siehe da, alles dies faßt unser Naturweise [i.e. Moses] in eine Stimme des Weltschöpfers zusammen, die, wie sie das Licht hervorrief und damit der Luft sich zu läutern, dem Meer zu sinken, der Erde allmälich hervorzugehen befahl, d.i. lauter wirksame Kräfte des Naturkreises in Bewegung setzte, so auch der Erde, den Wassern, dem Staube befiehlt, *daß jedes derselben organische Wesen nach seiner Art hervorbringe und sich die Schöpfung also durch eigne diesen Elementen eingepflanzte organische Kräfte selbst belebe.*

As usual, Herder avoids making a direct choice between extremes and combines them. Creation does take place, but only through the mediation of natural causes. This kind of compromise was not new: for example, Matthew Hale, in a work which Herder possessed,[134] said in 1660 that the earth itself, when life first appeared upon it, 'als ein Werkzeug mit der obersten würckenden Ursache concurriret und das Ihrige zu solcher Würckung beigetragen habe'.[135]

As Herder makes clear in his *Gott,* the creation and sustenance of the universe is effected by 'Kräfte', which are ultimately of a divine nature, yet which can perform physical functions (and, as we have seen, are often actually identified with known physical agencies). In a remarkable passage recently published by Wilhelm Dobbek as an appendix to August von Einsiedel's *Ideen*, Herder (for he is the author of the passage in question, according to Dobbek[136]) writes:[137]

> Die Urkraft war so lange dem Ohngefähr unterworfen, bis sie die schwer zu erobernden und mit vielen leidenden Erfahrungen verknüpften Kenntniße der Ur. . . [lacuna in text] bewußtseinsloser Substanzen erwerben und sich selber unterwerfen konnte. . . . Jetzt hat Gott die Natur kennen gelernt.

The date of this passage is uncertain,[138] but its unorthodoxy is beyond question. It shows at least that Herder's theory of creation was by no means orthodox, and that he believed that the process of creation was a protracted one, not a short-lived creative activity on the part of the divinity. This is also confirmed by our earlier study of his cosmogony.

In the section on cosmogony, we noticed that the 'elements' acted, according to Herder, as subordinate agents or secondary causes in the creation of the earth. He also imagined that they performed a similar function in the creation of life itself, in conjunction with the organic 'Kräfte' at work within them. Thus, he says that the largest and most powerful animals are still found in areas 'wo die Kräfte der Natur am wirksamsten sind'.[139] And he says of the prolific species found in certain parts of Asia: ' . . . sie treffen am meisten auf die Gegenden, wo die elektrische Kraft der Sonne, der Luft, der Erde im größesten Strom ist'.[140] This recalls Lucretius' theory that the stronger 'elements' of the early earth produced the first living organisms, although, in Herder's case, the theory is tempered by those 'Kräfte' which, as we know, permit either a physical or a hyper-physical interpretation. But conversely, he writes of the colder, inclement regions of the earth: ' . . . da scheinen sich auch nimmer jene Geschöpfe zu entwickeln, zu deren Bildung das ganze Spiel der Elektricität gehöret'.[141] (It must be remembered that electricity, in such contexts, is equivalent for Herder to heat or 'elemental fire'.) On another occasion in the *Ideen*, he says of the earth: ' . . . hätten sich die Erdharze, die Schwefel in der Menge auf ihr gefunden, in der sich jetzt der Sand, der Thon, und endlich die gute fruchtbare Erde findet: welch andre Geschöpfe hätten auf ihr leben müssen!'[142] Thus, life was produced by 'Kräfte', themselves at once divine and physically efficient, through the medium of the 'elements' and natural substances found on the earth.

Although the creation of new forms has ceased on this planet, the same 'elements' and 'Kräfte' which originally gave it life may still operate on other heavenly bodies. Herder declares in the *Adrastea*: 'Der flüssige Aether wird einst auch dem Monde Leben geben, und Gedeihen und Wachsthum'.[143]

All this brings us to consider the theory of spontaneous generation. In the form in which it was current in Herder's lifetime, the theory taught that living organisms, particularly lower and even microscopic ones, may be generated spontaneously from inanimate substances, under certain conditions, without being reproduced from previously existing parent organisms. In Herder's day, the embryological theory of epigenesis was nearly always associated with spontaneous generation.[144] In fact, it was largely to avoid accepting the theory of spontaneous generation that some scientists, such as Swammerdam, rejected epigenesis in favour of the preformation hypothesis.[145] But throughout antiquity and the Middle Ages, it was almost universally believed that lower organisms at least could be generated spontaneously, and this belief was not deemed heretical by the Christian Church, since even St. Augustine had accepted it.[146] Indeed, as one historian observes, certain passages of the Book of Genesis can be construed in terms of spontaneous generation.[147] Such a verse as the following may serve as an example: 'And God said, Let the earth bring forth the living creature after his kind. . . '. And Genesis 1, 20 suggested to some exegetes that birds were first created in, or by, the waters of the oceans.

Such ideas, however, were much in dispute in the eighteenth century. On the one hand, notable epigeneticists such as J. T. Needham believed in the ancient theory,[148] whereas all preformationists rejected it, as did various experimenters such as Spallanzani in 1766.[149] Already in 1668, Redi had disproved by experiment many supposed instances of spontaneous generation.[150] But even in the early nineteenth century, before Pasteur finally disproved all the cases hitherto suggested, Lamarck and others, many of whom were influenced by the current predilection for epigenesis, still believed that the phenomenon can, and does, take place all around us.[151]

Herder may well have accepted this theory in his Riga years, as when he says that the ideal art-critic arises spontaneously amidst inferior artistic productions 'als sich nach der ältesten und neuesten Philosophie das Lebendige gebiert, aus einer gährenden Fettigkeit: es sei diese der Nilschlamm, oder Chaldäens rothe Erde, das Chaos des Epikurs, oder Needhams faulender Tropfen'.[152] But although he never applies the hypothesis directly to embryology (i.e. ontogeny), hints of it appear in the *Ideen*, applied in this case to the phylogenetic emergence of animals on the early earth. He says of the smaller fauna of the Americas: 'Mit Mühe haben sich diese gleichsam aus dem warmen Schlamm losgewunden'.[153] He likewise calls the sloth 'ein Klumpe des Schlammes, der sich zur thierischen Organisation erhoben'.[154] The 'gleichsam' of the first quotation shows, however, that he did not mean such statements to be accepted without reservation. He uses the theory of spontaneous generation only to explain how life was originally created, but never applies it to the origin of man, as we shall see. He describes the original creation of life in vague terms, and 'Kräfte', with all their associations, are introduced alongside the more overtly materialistic conception of the 'elements' and generation through matter and heat. His final words on spontaneous generation through the animating power of heat are as follows:[155]

> Noch jetzt scheint die Sonne, wie sie im Anfange der Schöpfung schien; sie erweckt und organisirt aber keine neuen Geschlechter: denn auch aus der Fäulniß würde die Wärme nicht das kleinste Lebendige entwickeln, wenn die Kraft seiner Schöpfung nicht schon zum nächsten Uebergange daselbst bereit läge.

Besides, as he often reiterates, the 'elements' themselves have now lost much of their early vigour.

Yet he leaves us in no doubt that he believed that organisms were created successively: the lowest forms arose first, and the higher forms later.[156] In fact, even the Book of Genesis names such a sequence, but without the longer time-scale and the palaeontological evidence adduced by Herder and various of his contemporaries. He first says in the *Ideen* that many plants must have flourished and perished before the first 'Thierorganisation' appeared.[157] Later, he is more explicit: 'Das Brennbare der Luft beförderte vielleicht den Kiesel zur Kalkerde, und in dieser organisirten sich die ersten Lebendigen des Meers, die Schalengeschöpfe.'[158] He goes on to speak of 'die Muschelform, in die der Kiesel springt', thus again suggesting that the first living forms were generated spontaneously. After the sea-creatures, the plants arose.[159] And in the *Ideen*, Part II, he again declares that shellfish arose first, followed by plants, and then the larger animals, such as the elephants and rhinoceroses now found as fossils.[160] But in another passage from the same work, he allows the Mosaic narrative, which he here mentions (not

Buffon, as one writer[161] supposes), to modify his earlier conclusions, and suggests another order of succession, thus contradicting his earlier statements: 'Die Vegetation geht voraus . . . Der fruchtbare Schoos des Meers folgte mit seinen Geburten. . . '.[162] These two views need not be mutually contradictory, however, if we assume that Herder meant that land-plants arose before the more *advanced* sea-creatures, while the shellfish etc. emerged even before the plants. But partly because of his own unwillingness to commit himself to any exclusive explanation, and perhaps partly because palaeontological evidence was as yet scant and ambiguous, he does not enter into such details.

At all events, he usually says that life first arose in the oceans,[163] and justifies his belief by the precipitation theory of the earth's origin, already discussed, which states that the primeval air, laden with various extraneous materials, could not at first support life on land.[164] The theory of the marine origin of life had previously been held by several writers with whose works Herder was familiar, such as de Maillet and Pallas.[165] Goethe, of course, shared this belief, and Knebel, in a letter to Herder in 1789, later (perhaps under the influence of Herder and Goethe) put forward a more detailed chemical theory according to which early life was spontaneously generated in the oceans by the aid of marine salt.[166]

It therefore appears that Herder supported a broadly naturalistic theory of the origin of non-human life, and, like most epigeneticists, believed in some form of spontaneous generation, in which his 'Kräfte' played an essential part. But, since his 'Kräfte' can be interpreted in so many ways, one cannot finally say that he held a materialistic theory of the origin of life in the same way as Lucretius, for example, did. Living organisms arose in a natural succession, in which ill-defined 'Kräfte' acted in an unspecified manner: ' . . . die Gattungen der Geschöpfe folgten einander, wie sie ihrer Natur und ihrem Medium nach wirklich werden konnten.'[167]

(ii) The origin of man

Christian theology, in Herder's day, could in no way be reconciled with naturalistic theories of the creation of man. In this question, there was no room for those compromise hypotheses of which Herder was so fond. Just as he explained the origins of human history in terms of divine first causes, so also did he explain the actual creation of man. This subject, therefore, provides a religious counterpart to Herder's relatively naturalistic ideas on the origin of other forms of life.

In the *Älteste Urkunde*, written during his most religious phase, he rejects the naturalistic theory of man's origin which Maupertuis had put forward: 'War der Mensch *das Geschöpf Gottes*, und nicht . . . *Ein Zufall des Zufalls*? ein *Kothwerk* des *bildenden Nils* . . . '.[168] And in the same work, he says: ' . . . alles wirst du in Adam finden, und in dem kleinen Umlauf, der ihm ward'.[169] Although he is less explicit in the *Ideen*, he does not seem to have altered his opinion, for he calls human beings the 'Lieblinge der Natur', implying that their lot is associated with a special providence.[170]

In the earlier section on diluvial theories and the Noachian Flood, we noticed that Herder believed that not one, but many Noahs may have survived cataclysms such as the Scriptural Deluge.[171] By the same logic, he ought to have accepted the co-adamite or autochthon hypothesis, suggested by several writers of his age. These thinkers maintained that a plurality of Adams may have appeared in various parts of the earth, and they usually used this argument to explain the origin of the human races, postulating black, red and yellow Adams for the respective racial groups.[172] But Herder never wavers from the monophyletic Biblical account. He dismisses the autochthon hypothesis as early as 1770, in his famous essay on language,[173] and in 1774, he twice affirms that man arose from a single pair.[174] With wit as well as acumen, he cites the celebrated case of the 'porcupine man' in England, who was born covered with bristles: ' . . . hätte der Stachelschweinmann, der schon einen Sohn nach seinem Bilde zeugte, sein Geschlecht fortgesetzt, so hätte gewiß ein Stachelschweinadam . . . erdacht werden müssen . . . '.[175] His view is unaltered in the *Ideen.*[176]

Among writers whose works were known to Herder, opinions on this question were divided. There were those who believed that the human species originated from a single stock,[177] and those who upheld the autochthon theory.[178]

Herder likewise repudiated the pre-adamite hypothesis, according to which men existed before Adam.[179] Buffon had entertained this belief,[180] and so had all those geological catastrophists, such as Bonnet, who believed that periodic cataclysms overwhelm the earth, destroying all life, which again emerges, in superior forms, from preformed 'germs' which remain unscathed during the upheaval. Here again, Herder adheres to the Biblical narrative.

In the *Ideen*, he says that the idyllic valley of Kashmir was probably the earliest home of man, the Garden of Eden of the Old Testament.[181] In the *Journal* of 1769, he had already asked himself where man originated, as he reflected upon the great migrations of peoples within historical times. He weighed the various current hypotheses, without finally deciding between them.[182] In a sketch of 1772, he first names Asia as the homeland of man.[183] He further specifies the 'Höhe Asiens' as the oldest seat of human culture in his *Vom Geist der ebräischen Poesie* of 1782,[184] and many times in the *Ideen*, he suggests that Asia, particularly its mountain massif, was the site of man's creation,[185] finally naming Kashmir as the exact locality.

It is probable that he first encountered the latter idea in Kant's lectures on physical geography in Königsberg. In Herder's unpublished notes on these lectures (but not in Rink's later published version of Kant's lectures as it appears in complete editions of Kant's works), Kashmir is called a 'Parad[ies] zw[ischen] Gebirg[en]'[186]; this, of course, immediately suggests a connection with the Garden of Eden. Buffon, however, had also said that the area around Kashmir and Tibet witnessed man's first appearance,[187] and Pallas, in a work read by Herder, named the valleys to the south of the Asian highlands in the same connection,[188] while Zimmermann, less specifically, said that man first arose in the Asian mountains.[189] (It was from such beginnings, of course, that the 'Aryan' myth arose.)

But before Herder finally concluded that man first arose in Asia, he deliberated on two alternative theories. In a 'Schulrede' on geography, probably delivered in 1784, he names the Caucasus mountains in conjunction with the 'Höhe Asiens' as the place from which human history began.[190] His friend Einsiedel had written in notes copied by Herder that the country around the (mythical) Mountains of the Moon in the unknown interior of Africa is inhabited by 'unmixed' races.[191] Herder did not himself suggest that man ever arose independently in this locality, but he does say that these mountains may be an 'Erd-Rücken',[192] a term he usually reserves for the Himalayas, and that 'manche glückliche und ruhige Nation', as yet undiscovered, may dwell around them.[193] Perhaps Einsiedel's belief can ultimately be traced back to Genesis 2, 13, where it is said that the second river flowing from Paradise encompasses Ethiopia, known before the eighteenth century to be a mountainous country; but it was Ptolemy's map which first marked the legendary Mountains of the Moon,[194] a name which captured the imagination of the would-be African explorer Einsiedel, and through him, his friend Herder.

One further feature of Herder's ideas on human origins deserves attention. He accepted the Biblical statements concerning the unusual longevity of the early patriarchs.[195] Like Burnet, whose work he knew, he suggested that this longevity was possible because more clement climatic conditions prevailed before the earth's axis shifted.

Herder thus accepted the Biblical narrative on the creation of man, as did most thinkers of his age, and he did not extend the naturalistic explanations he had used in discussing the origins of other forms of life to the origin of the human species. In determining the place in which man first appeared, he followed the theories of certain contemporary writers listed above.

Before we proceed to examine theories of evolution, a word must be said about the arrangement of topics within the remainder of this chapter. The conception of a 'Chain of Being' provides a convenient and appropriate frame of reference in relation to which all ideas on evolution (and classification) in the eighteenth century, and Herder's ideas in particular, can be assessed. Now this 'Chain' can be considered basically in four different ways. Firstly, it can be seen as a *static* series of *natural* entities, arranged in the gradually ascending order of their relative complexity; we have already examined this application in the earlier section on classification, but a few further remarks will be added in the present chapter. Secondly, it can be seen as a *dynamic* series of *natural* entities; this corresponds either to the theory of successive creation, in time, of living species, from simple to complex (already discussed in the previous section), or, in its later equivalent, to the modern theory of the evolution of species by descent (which will be dealt with in the present chapter). Thirdly, it can be seen as a ***static*** series of ***ideal*** entities, a hierarchy comprising not only the known earthly forms of life, but also transcendental beings such as angels and even the putative denizens of other planets or stars: this version of the 'Chain' is also relevant to Herder's thought, and will be discussed below. Fourthly, it can be envisaged as a *dynamic* series of *ideal* entities; this corresponds to Leibniz's and Herder's theories of developing 'Kräfte', to the doctrines of metempsychosis and palingenesis, and to other related conceptions, all of which will be mentioned in so far as they appear in Herder's works.

(b) The static series of natural entities

In those sections devoted to the theory of a natural 'type', to the comparative and analogical methods, to classification, and to levels of organisation in the natural world, we noticed that Herder treats the known and visible portion of the 'Chain of Being', which extends from formless, inanimate matter up to the human organism, in a broadly naturalistic way, and that he advocates some relatively progressive methods of biological classification.

One of his major achievements in this connection was to realise that a fundamental similarity obtains among all animal forms. This realisation was a necessary forerunner of the nineteenth-century theory of evolution by descent,[196] and itself arose out of the older belief in a natural 'Chain of Being'.[197] Herder, indeed, already speaks of a natural 'Kette' or 'Leiter der Wesen'[198] in the *Journal* of 1769. He describes the same natural sequence in the *Ideen*, and as one writer acutely observes, some passages in which Herder appears to be describing a *dynamic* (i.e. Darwinistic) succession of organisms are simply new enumerations of the ***static*** series of forms in the natural 'Chain'.[199] One such ambiguous passage from the *Ideen* should illustrate this: 'So gehets aus dem Staube der Würmer, aus den Kalkhäusern der Muschelthiere, aus den Gespinnsten der Insekten allmälich in mehr gegliederte, höhere Organisationen. Durch die Amphibien gehets zu den Landthieren hinauf . . . [etc.]'.[200] In another similar passage, Herder really only says that organisms emerged or were created successively, not that they are descended from one another.[201]

The very circumstance, however, that descriptions of the static series of natural forms, in accordance with the 'Chain of Being' conception, can seem so deceptively close to the dynamic Darwinian theory, confirms that this ancient conception of a gradually ascending natural hierarchy was a necessary step towards the modern theory of the evolution of species by descent.

(c) The dynamic series of natural entities: the problem of evolution

(i) The theory of evolution by descent

Although Herder did accept that the universe of astronomy and geology has evolved by a gradual process, he never applied the same reasoning to the community of living species.[202] Three sentences selected from the *Ideen* may show conclusively that he did not believe that species have evolved by descent. The first is as follows: 'Kein Geschöpf, das wir kennen, ist aus seiner ursprünglichen Organisation gegangen. . . '.[203] In the second, he says that man and the apes were never 'Ein' und dieselbe Gattung'.[204] And thirdly, he describes an ancient Tibetan evolutionary myth as 'diese entehrende Tradition . . . , die den Menschen vom Affen herleitet'.[205] Besides, we noticed in the earlier section on the origin of life and of man that he believed the creation of new species to have ceased long ago, whereas the modern theory of evolution teaches that the process continues indefinitely. Notwithstanding these unambiguous utterances of Herder's, numerous critics, as Max Rouché shows, have vainly attempted to prove that Herder was a precursor of Darwin.[206]

To convey a more accurate impression of Herder's true position, a word must also be said about the ideas which prevailed in his age concerning the history of living species. A. O. Lovejoy notices that Leibniz had briefly expounded a theory of evolution by descent in 1710[207]; naming Maupertuis, Diderot, Monboddo and others, he says elsewhere that the decade 1745-1755 saw the first appearance of the modern evolutionary theory in its basic elements,[208] and later adds that it was 'almost a commonplace' in Herder's day.[209] Max Rouché more guardedly writes that vaguely evolutionary ideas are to be found in the works of Buffon and de Maillet, both of which Herder knew,[210] but another critic lists 34 writers who, he claims, believed in some kind of evolution in or before Herder's time.[211]

All of these earlier evolutionary theories, of course, lacked that foundation of exact palaeontological and genetic evidence which the nineteenth century eventually accumulated, and some of them, like those of the pre-Socratic philosophers and of primitive mythology, were totally fantastic. Moreover, the theory was scarcely a 'commonplace' in Herder's day, as Lovejoy claims. For example, Kant, when he realised in his review of Herder's *Ideen*, Part I, that the animal 'type' and the numerous analogies between species which Herder had so vehemently emphasised could be explained by a relationship through descent, at once hastened to add:[212]

> Nur eine *Verwandtschaft* unter ihnen [i.e. animal species] . . . würde auf Ideen führen, die aber so ungeheuer sind, daß die Vernunft von ihnen zurückbebt, dergleichen man unserm Verfasser [i.e. Herder] ohne ungerecht zu sein, nicht beimessen darf.

This is not the reaction we should expect in face of a 'commonplace'. Furthermore, even although Kant later used the evolutionary theory as a working (or 'regulative') hypothesis in 1790, as Lovejoy also notices,[213] it is clear from his review of Herder's work that he considered it too extravagant an idea to be taken *literally* for a single moment. Of other early theories of evolution, some, like that of the older Linnaeus, were applied only to a few species or varieties,[214] and others, like those of Maupertuis and Diderot, not only lacked detailed support, but, especially in France, arose within a philosophical movement whose aim was as much to question nearly all traditional values as to advance scientific knowledge. Besides, the shorter geological time-scale in which nearly all thinkers then believed made it hard to imagine that all known species could have evolved by descent in so short a time.

Thus Herder, in denying the theory of evolution by descent, which he had undoubtedly encountered in works of some of the above-named writers, most of whom he mentions at some time or other, was quite typical of his age. Like Kant, he doubtless found it impossible to accept such theories literally, because of the difficulties mentioned above. His theological beliefs would certainly never have allowed him to admit that man had evolved from other less advanced species. But just as he was quite prepared to admit that other forms of life could be generated spontaneously, finding theology no obstacle here, so also had he no theological reason for denying that species other than man have evolved by natural descent; here as before, he could easily have used his 'Kraft' concept to leave the way open for more than one interpretation. In fact, he raises no objection whatsoever to the contention of Pallas, whom he quotes in this connection, that the dog is descended from the jackal.[215]

Although Herder's religious beliefs would always have made it impossible for him to accept the idea that man evolved from lower creatures, his reason for believing that other species did not evolve by descent was not a theological one; it was rather because current evolutionary theories seemed extreme, ill-founded, and generally incredible to most men of his age. Yet as Lovejoy declares: 'Herder's book [i.e. the *Ideen*] is certainly full of aperçus that come near to the evolution theory; and it unquestionably helped to produce a state of mind favourable to the acceptance of the theory'.[216] This was not because he entertained any serious belief in evolution, but because, along with certain other writers of his age, he drew important naturalistic conclusions from the ancient conception of a static Chain of Being, and because he helped to lend it a new temporal or dynamic significance.

(ii) Palaeontology and natural selection

The science of palaeontology was only in its infancy in Herder's age. Such men as Camper and Merck had begun to suspect the great antiquity of fossil remains, but they usually erred in relating them too closely to existing species.[217] Buffon had postulated a longer time-scale and extensive climatic changes in order to account for the presence of fossil tropical animals in the North,[218] while Forster,[219] Blumenbach[220] and a few others were beginning to realise that such remains as the recently discovered saurian petrefacts of Ohio were those of species long extinct. Zimmermann tried to circumvent this problem by saying that such apparently extinct fossiliferous species probably still survived on earth, but had not yet been discovered; he further stressed the difficulty of correctly reconstructing fossil skeletons.[221] Woodward first put forward the sedimentation theory of fossils, but, like most others at that time, he linked his theory too closely to the Noachian Deluge,[222] and Goethe, in a much-quoted letter to Merck in 1782, declared (probably under Buffon's inspiration): 'Es wird nun bald die Zeit kommen, wo man Versteinerungen nicht mehr durch einander werfen, sondern verhältnißmäßig zu den Epochen der Welt rangiren wird'.[223]

But alongside such relatively enlightened views, more naive and fanciful ideas survived. The noted scientist Sömmering suggested to Merck in 1786 that the fossil mammoth might have been a cross-breed ('Bastard') between the elephant and the rhinoceros,[224] and another of Merck's correspondents suggested in 1783 that the larger tropical animals found as fossils in Northern Europe were the remains of circus animals imported for Roman entertainments.[225] Voltaire declared that fossil shells found at high altitudes on land were pious relics dropped by pilgrims returning from the Holy Land.[226]

Herder had encountered nearly all of these ideas. He realised in 1769 that marine fossils on land had been deposited during prolonged periods of sedimentation in the early oceans.[227] Like Woodward, he came to associate the larger fossils in the North with a sudden inundation, but, unlike some of the more fanciful writers, he did not contend that they had been swept bodily from the tropics, and said, like Buffon, that they were overwhelmed in their usual habitat while the Northern climate was warmer.[228] He cites both Buffon and Pallas on the tropical remains in the North,[229] and, like Goethe (and probably under his influence), he recognises the stratigraphic method, contending that different fossils occur in different strata, which date from successive periods, and he correctly says that the higher strata contain the remains of more advanced creatures than the lower ones, adding that the supposed fossil men in lower strata are not authentic.[230] On another occasion, he readily concedes that the North American fossils may include those of extinct animals,[231] and says elsewhere that the mammoth is now extinct.[232]

Thus, Herder's views on palaeontology are representative of the more advanced trends in that subject in his day, and (with the exception of the diluvial hypothesis, common in contemporary geology) are in no way influenced by theological considerations.

Since Herder believed that certain species have become extinct, we might readily imagine that he had some inkling of the evolutionary principle now known as natural selection. But he applies it to the history of life only in a non-evolutionary sense. Some older species may disappear, he believes, but no new ones are created. A new equilibrium is reached, and, while individuals may perish, most species succeed in surviving. Several utterances to this effect occur in the *Ideen*,[233] and, as we earlier noticed, the theory of universal conflict enunciated in the 1769 manuscript published by H. D. Irmscher is of a similar, but more general kind.[234]

Lucretius, Hobbes, and (in Herder's lifetime) Malthus and Adam Smith put forward similar ideas in different contexts, but, of these thinkers, only Lucretius applied his version of the hypothesis to the whole community of animal species, and said that some earlier species were less equipped for survival than others.[235] August von Einsiedel too had similar ideas; this becomes specially clear from certain passages in his own *Ideen* (whose title Herder borrowed), recently published by W. Dobbek from Herder's transcripts. Einsiedel says of animal species: 'Was vertilgt werden kann, ists längst worden'.[236] In another passage, he says of them: 'Sie vertilgen und werden vertilgt, doch nie ausgerottet'.[237] But, like Herder and Lucretius, he does not suggest that new species emerge in the process. Bonnet had also believed that natural selection takes place, but only in the form of progress towards a superior natural equilibrium.[238] John Ray, whom Herder also mentions, had likewise considered such theories, but only to reject them as a 'grand subterfuge of Atheists'.[239] Maupertuis revived Lucretius' theory that the more poorly equipped species produced by fortuitous creation soon became extinct,[240] and Buffon declared: 'Tout ce qui ne se nuit point assez pour se détruire, tout ce qui peut subsister ensemble, subsiste . . . '.[241] Such theories of struggle are closely related to the Chain of Being conception, for the Chain, between whose links transitions were thought to be gradual, presupposed a full universe, a plenum; Leibniz expressed this in his 'principle of plenitude'. But since a full universe must contain beings of all possible kinds, struggle is inevitable, yet the equilibrium of the Chain is preserved. By Herder's time, palaeontological discoveries were beginning to modify this doctrine, for some investigators realised that whole species could, and actually had, become extinct. Thus the revised theory of struggle meant that whole links in the Chain could drop out. This represented a half-way stage between the principle of plenitude and the Darwinian theory of natural selection.

Herder's theory of the survival of the fittest was therefore quite different from Darwin's theory of evolution by natural selection. It was not peculiar to him either, but had been applied to biology, in a similar way, by several earlier thinkers. The roots of his theory of struggle, as they are revealed in his 1769 manuscript on universal conflict, were thoroughly Lucretian and non-teleological, although this theory became blended with the teleological conception of increasing progress towards eventual social equilibrium when he applied it to human history in the *Ideen*.

(iii) Evolution by adaptation; environment and heredity; the races of man

Herder, it will be remembered, offered several (basically three) different answers to the problem of perception – i.e. a deterministic or objectivistic one, a theory of 'Analogie', which implied that subject and object are preadapted to one another, and a subjectivistic one which emphasised the power of the subject itself to shape its perceptions of the external world. He answered the problem of natural law and the social world in the same complex way – i.e. he sometimes adopted a deterministic approach, suggesting that objective physical laws ***actually*** influence the mental or moral world, at other times he maintained that the two worlds are analogical or preadapted to one another, and yet again, he attributed to natural laws such spiritual values as beauty and wisdom. He follows exactly the same procedure in dealing with the relationship between the organism and its environment. Firstly, he frequently suggests, after the manner of Lamarck, that the organism can be physically changed by environmental influences, and that such changes are inherited. At other times he seems to suggest that the organism and its environment are teleologically preadapted to one another. And thirdly, he often declares that the inward influence of heredity is much more powerful than any external determinants.

Herder often says that the organism is adapted to its environment, as in the following passage[242]:

> Der Vogel fliegt in der Luft: jede Abweichung seiner Form vom Bau der Landthiere läßt sich aus seinem Element erklären; sobald er . . . die Erde berührt, wird er (wie in Fledermäusen und Vampyrs) dem Gerippe des Menschen ähnlich. Der Fisch schwimmt im Wasser; . . . Sobald er die Erde berührt, wickelt er wie der Manati, wenigstens die Vorderfüße los und das Weib bekommt Brüste.

This passage does not imply, of course, that any evolutionary change takes place in time. It simply describes, without explaining, the adaptation of the organism to its environment, and shows how Herder, like many of his contemporaries, was led by the doctrine of the Chain of Being, between whose links transitions were supposed to be gradual, to contemplate transitional creatures like bats, the manati, and (on other occasions) the zoophytes, hydra, etc.

In other parts of the *Ideen*, he is more explicit, and explains adaptation by the direct influence of climate. A few examples may illustrate this: 'Mannichfaltigkeit des Erdreichs und der Luft macht Spielarten an Pflanzen, wie an Thieren und Menschen'[243]; 'Auch die Gattungen, die fast überall auf der Erde leben, gestalten sich beinahe in jedem Clima anders'[244]; and 'Die Bewohner künftiger Klimate werden uns nicht gleichen'[245]. And again, he sometimes explains racial characteristics in man as resulting from a process of adaptation such as Lamarck later described. For example, he considers that the Mongolian physique has been produced by acquired characteristics which have become hereditary, just as Erasmus Darwin[246] and Lamarck subsequently did. On the other hand, the Epicureans and other earlier thinkers had believed that organs develop with use and weaken with disuse,[247] so that we cannot call Herder's 'Lamarckian' views entirely original.

While Herder did not believe in general evolutionary transformism, he certainly did believe that new *varieties*, if not new species, may be produced by the influence of environment.[248] Several writers whose works he had read also believed that new varieties may be produced in this way, and, as we earlier noticed, Pallas even thought that the dog, a distinct species, is descended from the jackal.[249] Forster and Kant also believed that limited variations may occur among species.[250] Critics have rightly observed that Herder regarded such limited variations in species as *degenerative*, since each species is best suited to the area in which it was originally created, so that variations take place only when it leaves this area, or when the climate changes.[251]

We may now ask exactly what Herder understood by 'environment'. Unfortunately, he never clearly distinguishes between the environment which can bring about biological changes in the organism and that which influences the human mind and all cultural phenomena in particular, and uses the word 'Klima' to describe both kinds of influence. His first list, in 1765, of determinants which act upon man in particular, is borrowed from the anonymous author of the *Geschichte des menschlichen Verstandes*, and includes subjective ones such as 'Genie', as well as physical and climatic, social, religious, and fortuitous ones.[252] In the *Ideen*, determinants acting upon man again include both inward or social ones and external ones which we should today call climatic. In fact, he enumerates as the main influences heat and cold, electricity, air (or vapours in the air), altitude, the nature of the soil and its products, food and drink, 'Lebensweise', type of work, dress, 'gewohnte Stellungen', and pleasures and arts.[253]

As Rouché points out, W. Falconer's work on climate, which Herder had read, lists temperature, air, situation, topography, population, food, and way of life (cf. Herder's 'Lebensweise') as components of 'climate'.[254] Einsiedel too considered that population exerts an important influence upon social development,[255] although Herder apparently did not. Hippocrates, who, in Herder's words, was 'für mich der Hauptschriftsteller über das Klima',[256] listed seasons, winds, waters, direction of outlook, topography, and way of living as determinants which work upon man,[257] and Kant, as it appears from Herder's unpublished notes on his lectures on physical geography, included topography, population, and way of life in his list of climatic influences on man: 'Je mehr Ackerb[au] desto + [i.e. mehr] Leute z.E. China kaum Raum: also aus dem Clima und Lebensnot folgt' [sic].[258]

It should now be obvious that Herder's theory of biological determinism in the *Ideen* is simply a more specialised version of his earlier and wider theory of cultural and social determinism. In the case of plants and animals, all the determinants he enumerates, such as heat and cold, electricity (and other supposed aerial 'Kräfte'), air, altitude, soil, and food and drink, but not the specifically human ones, such as 'Lebensweise', dress, 'gewohnte Stellungen', pleasures and arts, may be expected to aid in producing biological variations. Physical peculiarities in certain human races are presumably produced by the same agencies which cause animal variation, together with 'Lebensweise', dress, etc., while purely abstract cultural phenomena, such as the arts, would not bring about physical changes in man, but only mental ones.

A word may now be said about some distinctive features of Herder's theory of environment. As he sees it, the deterministic influence of environment is never total, but is always modified by other factors.[259] With the exception of a few rare cases, as when he declares, for example, that the Eskimos have become smaller, just as a piece of metal contracts, through the effects of cold,[260] his theory of determinism is usually tempered by a vitalistic 'genetische Kraft', which resists and modifies climatic and environmental influences. Even the instance just mentioned is simply taken from the work of the Greenland explorer Cranz,[261] and is quite untypical; Zimmermann too had said that the cold 'preßte . . . zusammen' the Eskimos' physique.[262] Earlier writers such as Du Bos had put forward much cruder and more mechanical views,[263] leaving little room for an adequate theory of heredity, and Montesquieu, as Herder himself remarks, had built his whole theory of climate on some very unrefined observations upon the expansion and contraction produced in the 'Faserngewebe' of the human body by changes in temperature,[264] and upon 'das trügliche Experiment einer Schöps-Zunge' which altered physically as it froze and thawed.[265]

But Herder's theory of environment was tempered not only by his vitalism. W. Falconer had declared that the combined influence of many external causes produces a composite effect upon the human organism which differs from the sum of effects produced by each cause taken separately.[266] Similarly, Herder speaks of climatic 'Umstände, die in ihrer lebendigen Verbindung viel wirken; alle sie gehören zum Gemählde des vielverändernden Klima'.[267] The words 'lebendige Verbindung' and 'Gemählde' at once suggest a holistic, or rather organicistic approach, similar to that of Falconer. It implies that the action of external influences manifests itself in far-reaching changes which are produced in the *whole* organism, not just in the parts immediately affected.

In the light of all this, it appears that Herder's theory of environmental determinism was relatively modern,[268] and superior to most equivalent theories of his own and of previous ages, although he never coupled it with a theory of evolution by descent, as Lamarck did.

We now come to the second aspect of Herder's solution to the problem of the organism and its environment. This is the supposition that the two are mutually preadapted. For instance, the following words occur in the *Ideen*: 'Sie [i.e. die Natur] dachte ihm [i.e. dem Geschöpfe] vor, da sie diese Kräfte in solche und keine andre Organisation setzte. . . '.[269] And in his essay of 1770 on the origin of language, he writes: 'Nun ist offenbar der ganze Erdboden für das Menschengeschlecht und dies für den ganzen Erdboden gemacht'.[270] And on yet another occasion, he says that nature mercifully leaves an organ dormant where it cannot be satisfied.[271]

This idea of teleological preadaptation does not really contradict Herder's other theory of adaptation and environmental determinism, however, since the teleological explanation applies to animal species only as they were *initially* created, whereas the theory of natural adaptation applies to them only when they have left their original climate and habitat, or when the climate itself has changed. Besides, even the teleological theory contains a more naturalistic element than critics have supposed. For the organism and its environment were not preadapted simply by a miraculous act; the organism is adapted to its environment simply because it was originally *produced* by it, by some process of spontaneous generation in which undefined 'Kräfte' played their part. Herder declares '[daß die] Stimme des Welt-schöpfers . . . lauter wirksame Kräfte des Naturkreises in Bewegung setzte, so auch der Erde, den Wassern, dem Staube befiehlt, *daß jedes derselben organische Wesen nach seiner seiner Art hervorbringe. . .* '.[272]

Along with theories of environmental and physical determinism, or the influence of external factors upon the organism, and that of teleological preadaptation, which implies that environment and organism are initially matched, the theory that heredity, an internal characteristic of the organism, exerts just as important an influence upon it as does the outside environment, is also found in Herder's writings. This theory of heredity, it may be added, only modifies, but does not contradict the theory of environmental determinism.

Herder believed that the same 'genetische Kraft' first forms the animal embryo and then sustains it as an independent organism until age overcomes it. This 'genetische Kraft', as he calls it, represents the permanent, inherited characteristics of the organism, and before the latter can be altered by outside influences, the 'Kraft' itself must be changed. He thus makes the same 'Kraft' responsible for embryological, physiological and genetic functions in biology. Let us now examine his ideas on genetics in further detail.

Already in 1767, he says that 'Generation' is of greater importance than 'Clima' in producing human beauty.[273] And in 1781 he disagrees with those who, like Locke, declare that the child's mind is like a blank sheet yet to be written upon, and rightly says instead that certain psychological dispositions may be hereditary.[274] In that same year, Georg Müller, on a visit to Herder, writes in his diary (no doubt recording Herder's words, as Suphan believes): 'Klima giebt nie der Nation Schwung und Geist, der liegt in dem Samen der Väter. Klima befördert, wie guter Boden eine edle Rebe'.[275] And again in 1787, Herder speaks of 'die Gestalt der Menschen, die mehr vom Stamm als vom Himmelsstrich abhängt'.[276]

As we noticed in connection with animal adaptation, Herder believed that certain acquired (racial) characteristics, such as the Mongolian physique, which was supposedly shaped by the people's way of life, are inherited, just as Lamarck later said. Yet he denies elsewhere in the *Ideen* that deformities produced by artificial means can be inherited:[277]

> Jahrhunderte lang haben Nationen ihre Köpfe geformt, ihre Nasen durchbohrt, ihre Füße gezwungen, ihre Ohren verlängert; die Natur blieb auf ihrem Wege . . . Ganz anders, sobald die Misbildung genetisch war und auf Wegen der Natur wirkte. . .

But we should add that, in the same work, he had already said of those Orientals who deform their ears and feet:[278]

> Man schämte sich seiner [i.e. original Mongolian] Bildung und wollte verändern; traf aber auf Theile die, da sie der Veränderung nachgaben, sich als die häßlichste Schönheit zuletzt vererbten.

Here, rather in contradiction with the previous passage, he implies that artificial changes to certain parts of the body, over a sufficiently long period, may indeed become hereditary. This would be similar to his idea that the Mongolian physique originally resulted from changes produced by environmental influences, which were finally inherited, but the contradiction shows that his views on the subject were not settled.

He says of climate and genetic factors in general in the *Ideen*:[279]

> Beide Streitführende Mächte sind also von großer Wirkung . . . Das Klima ist ein Chaos von Ursachen, die einander sehr ungleich, also auch langsam und verschiedenartig wirken, bis sie etwa zuletzt in das Innere eindringen und dieses durch Gewohnheit und Genesis selbst ändern; die lebendige Kraft widerstehet lange. . .

As an exact basis for the science of heredity, Herder's ill-defined 'genetische Kraft' is, of course, quite unsatisfactory. Nevertheless, it was this which helped him to overcome the crude mechanistic determinism postulated by Montesquieu, Du Bos and others, and to leave the way open for a true understanding of how important heredity actually is. 'Kräfte' are of scientific value only when they are potentially reducible to exact quantities. His 'genetische Kraft' is potentially reducible to an exact quantity, for it denotes some internal characteristic of the organism which, if altered, can produce inherited changes, while other, more superficial changes are not passed on. Just such a factor exists, according to modern science.[280] Herder's 'Kraft' introduced an inward dimension to balance the outer factor of environment; to use Claude Bernard's phrase, we can say that it constituted a kind of 'internal environment' which links together all those parts which can be modified by outside influences. In itself, as a vitalistic quality, it was scientifically valueless, but it was sufficiently related to observed phenomena to be interpreted quantitatively when genetics arose as an exact science.

Finally, a word may be said on Herder's sources, and the ideas of his contemporaries on heredity. Hippocrates, writing on the *macrocephali* who were supposed to elongate their infants' heads, maintained that such artificial changes are inherited.[281] Herder denies this on one occasion, but, as we noticed, believes that it can occur under certain circumstances. He thus adopts a position midway between that of Hippocrates and that of Kant, who denied that any artificially acquired characteristics can be inherited.[282] Blumenbach, like Herder, said that artificial changes may produce a permanent effect over a period of time,[283] and Camper said that only climate, and not artificial deformation, has caused racial differentiation in man.[284] As R. T. Clark observes, Thomas Abbt, with his belief that genius is compounded of *both* genetic and environmental elements, perhaps influenced Herder's ideas on heredity.[285] These various writers seem to have been the major sources for his theory of heredity, although the vitalism which goes with it is very much his own.

One thing at once strikes us about Herder's ideas on heredity. They concern only the human species. This is because, like most of his contemporaries, he did not believe in evolution but still had to explain how the different races of man have sprung from a common stock. It was this conflict between the (originally Biblical) doctrine of a single human origin and the known reality of present racial differences which produced his somewhat Lamarckian theory of human adaptation.[286]

Man first appeared in Asia, he believed. He tried to justify this providential choice by teleology:[287]

> Wenn die Gottheit nicht unsre ganze Erde zum Sitz der Schönheit machen konnte: so ließ sie wenigstens durch die Pforte der Schönheit das Menschengeschlecht hinauftreten und mit lang' eingeprägten Zügen derselben die Völker nur erst allmälich andre Gegenden suchen.

Unlike Winckelmann, he believed that the temperate zone of Asia, not Greece, first produced the ideal human form. It was probably through the influence of Hippocrates, however, not of teleology, that he acquired his predilection for the temperate Asian climate: Hippocrates said that the men of temperate Asia were 'fairer and larger' than others.[288]

We have already seen how Herder thought that no new species were created after the 'elements' of the early earth had lost their original strength. He uses this belief in more potent early elements to explain the origin of races. This removes the apparent contradiction between his remarks on the Mongols, who did inherit acquired characteristics (while the climatic elements were still strong), and his later remark that artificially acquired characteristics cannot be inherited (because the elements are *now* weaker). He says explicitly that negroes became black because the elements were more potent when they settled in their present habitat.[289] He likewise says of the Mongols:[290]

> . . . sollte es nicht wahrscheinlich seyn, daß vor Jahrtausenden schon, da vielleicht einige dieser [climatic] Ursachen noch viel stärker wirkten, eben hieraus ihre Bildung entstanden und zur erblichen Natur übergegangen wäre?

Not only climatic agencies but human activity too was probably more vigorous in that early era, he seems to imply, for he is speaking here, among other things, of the Mongols' physical adaptation to horsemanship and other habits of steppe-dwellers. He thus appears to believe that acquired characteristics were more easily inherited in the halcyon era of the earth's youth, when the present races first arose out of one stock as they migrated to different regions.

He denied, however, that the present racial differences are well-defined: 'Kurz, weder vier oder fünf Racen, noch ausschließende Varietäten giebt es auf der Erde. Die Farben verlieren sich in einander. . . '.[291] And in 1797, in the *Humanitäts-Briefe,* he writes: 'Das Urbild, der *Prototyp der Menschheit* liegt also nicht in Einer Nation Eines Erdstriches; er ist der abgezogne Begriff von allen Exemplaren der Menschennatur in beiden Hemisphären'.[292] He even adds: 'Der Neger hat soviel Recht, den Weißen für eine Abart, einen gebohrnen Kackerlacken zu halten, als wenn der Weiße ihn für eine Bestie, für ein schwarzes Thier hält'. Yet in 1766, in an essay on human beauty, he had himself called the negroes 'Brüder der Affen',[293] and, in the *Ideen*, he said that the Asians of the temperate zone are the ideal human type. But these latter considerations are purely *aesthetic*, in the tradition of Winckelmann. F. Günther rightly observes in his history of eighteenth-century anthropology that all writers on race at that time believed that some final *anthropological* classification of races is possible, and adds:[294]

> Die Menge der Einteilungen muß um so mehr überraschen, als man gar nicht leugnete, daß ein wirklich zureichender Einteilungsgrund nicht vorhanden sei. Von denen, die sich eingehend mit diesem Stoffe beschäftigt haben, hat nur einer die Konsequenz gezogen, unter solchen Umständen auf eine Klassifikation ganz zu verzichten: Herder.

Thus, although Herder was prepared to classify races *aesthetically*, he believed that they cannot be classified *anthropologically*, since he realised (quite correctly, according to most present-day theorists) that racial differences in man are only superficial. Thus, those who, during the Nazi era, used Herder's aesthetic classification to suggest that he considered certain races as anthropologically superior to others, were quite mistaken.[295]

Herder probably refused to classify races exactly largely because he distrusted all strict systems of classification. We earlier noticed how he disliked the exact Linnaean taxonomy, a feeling common among those who believed in the Chain of Being, whose divisions were thought to be gradual, and never abrupt. His theory of race was thus much more flexible than Kant's theory of racial origins or 'germs' and of four clearly separate racial groups.[296] In fact, he explicitly rejects the latter theory of race in his *Humanitäts-Briefe.*[297] But it was almost certainly through Kant's lectures on physical geography that he first became interested in the problem of race,[298] and it was probably from Blumenbach,[299] Buffon and Camper,[300] and Pallas[301] that he borrowed his notion that the human races have evolved over a period of time under climatic influences. Perhaps he derived his idea that colour is not a basic ethnological characteristic from Blumenbach,[302] or from Georg Forster,[303] who supported Herder's theory of race against Kant's 'germ' theory[304]; Zimmermann and Meiners, like Herder, believed that white people can become black over a period of time, and vice versa.[305] From Buffon[306] and Camper,[307] he learnt that the negroes' pigmentation is subcutaneous, and he was probably following Haller when he said, in the *Ideen*, of the action of heat upon the lower layers of the negroes' skin: 'Es ist ein Oel, womit sie diese Netzhaut färbte'.[308] Such theories at least bear some relation to physiological observations, unlike that of Blumenbach, who said that the bodies of negroes contain excessive carbon,[309] or of those who used the chimerical 'phlogiston' to explain dark pigmentation.

Herder's ideas on race, apart from certain distortions caused by his aesthetic predilections, were thus superior to most contemporary theories, and were founded upon a wide reading. His distrust of rigid classifications, in this case, served him well.

Having completed this analysis of Herder's thoughts on the temporal series of living organisms in the earth's past, we may conclude that, like most thinkers of his age, he was not an evolutionist. Theology hardly influenced his ideas, except in the question of human origins, and he at times applied a qualified teleology which did not rule out natural causes. His ideas are broadly naturalistic, so much so that, in this section, the metaphysical scheme of the Chain of Being has been little in evidence. He temporalised this scheme in a concrete sense only in postulating that organisms were created successively, but not by putting forward a theory of evolution. His ideas are firmly rooted in the empirical observations which were at his disposal, and his reading was wide and up to date. His beliefs clearly reflect his age and his own personality, and they neither strikingly anticipate those of nineteenth-century evolutionists nor do they seem the work of a theologian striving to impose his doctrines upon natural science.

(d) The static series of ideal entities: the cosmic hierarchy

While he did study the history of life in concrete and dynamic terms, Herder continued to believe in the ancient doctrine of an ideal Chain of Being which extends through the observable hierarchy of earthly forms and culminates in transcendental beings. Already in a sermon at Riga he asserts 'daß es also wahrscheinlicher Weise in der *Reihe der Wesen* noch weit *mehrere Claßen* die uns übertreffen, geben müsse, daß in der *Leiter der Vollkommenheit* weit mehrere *Stuffen* über uns stehen, und daß . . . wir eine *Mittelgattung zwischen Geist und Thier* . . . sind'.[310] Revelation confirms this with descriptions of angels, he adds. In the 1769 manuscript on planetary souls, as we have seen, he says that 'viele Götter' exist, although he adds: 'Der Gott, der endlich alles durch Raum und Zeit verbindet, der ist *Gott*'.[311] In a funeral sermon in 1772, he again calls man 'das *gewagte Mittelgeschöpf* zwischen *Engel* und *Thier*', saying that many higher beings doubtless exist,[312] and he restates the same doctrine in a poem of the following year.[313] But the most famous utterance of this kind occurs in the *Ideen,* where he refers to man as a 'Mittelglied', 'Mittelring', 'Mittelgeschöpf' or 'Mittelgattung',[314] and further says:[315]

> Wenn also der Mensch die Kette der Erdorganisation als ihr höchstes und letztes Glied schloß: so fängt er auch eben dadurch die Kette einer höhern Gattung von Geschöpfen als ihr niedrigtes Glied an. . .

He even writes: 'Unsre Brüder der höhern Stufe lieben uns daher gewiß mehr und reiner, als wir sie suchen und lieben können'.[316] Just as he had said in 1769 that one supreme God exists, *apart* from the 'viele Götter' of planets and stars, he later writes in his *Gott* of 1787: 'Gott ist nicht ein Höchstes auf einer Stuffenleiter von Seinesgleichen'.[317] Only on these occasions, and in his two explicit references to angels in sermons in Riga and in 1772, does he allow Christian theology to modify what is basically a mystical and Platonic scheme, which had been widely publicised by Leibniz and others. Herder's name became particularly associated with this doctrine, which he had merely borrowed from an earlier tradition; Tolstoy refers to it as an idea of Herder's in his *War and Peace.*[318]

We are here concerned with the *ideal* Chain of Being, however. And we know that Herder always used 'Kräfte' to link real and ideal worlds. But 'Kräfte' are dynamic, not static, so that we are now led to consider his more customary interpretation of the ideal hierarchy, whereby he treats it not as a static sequence of beings, but as a dynamic progression of 'Kräfte'.

(e) The dynamic series of ideal entities: immortality, metempsychosis, palingenesis and planetary habitation

The first chapter of Book V of Herder's *Ideen* carries the following title: 'In der Schöpfung unsrer Erde herrscht eine Reihe aufsteigender Formen und Kräfte'.[319] Like Leibniz, he thus introduced a dynamic element into the Chain of Being by saying that a 'Kraft' exists behind every form. This scale of 'Kräfte' is exactly parallel to the visible Chain of Being, although it stretches on into the transcendental world as well. As Lovejoy remarks, Bonnet, and even Addison, had put forward similar interpretations of the Chain of Being, which are both ideal and dynamic or 'temporalised'.[320]

Herder introduces this ideal, dynamic series chiefly in order to demonstrate that the soul is immortal. To analyse this conception is therefore to find out his answer (or rather answers, for he presents several different solutions, as usual) to the problem of immortality. But since *all* 'Kräfte', not only those of human souls, are indestructible, it is immortality in the widest sense, including that of animal 'souls', which is at stake. For all visible natural forms are merely '*eine Leiterin derselben* [i.e. of 'Kräfte'] *zu einer höhern Bildung*'.[321]

Herder was no longer satisfied with the orthodox Christian teachings on the afterlife in his mature and more liberal period.[322] He set out to provide philosophical proofs of the afterlife, although he had himself questioned Moses Mendelssohn's 'proofs' of immortality before he entered upon his religious phase in Bückeburg.[323] But even in his mature period some of his old scepticism remained. He speaks with confidence about the various modes of immortality which all 'Kräfte' enjoy, but he does sound a note of doubt at times. For example, he says in the *Ideen*:[324]

> Und wohin kehren nun diese geistigen Kräfte, die allem Sinn der Menschen entgehen? Weise hat die Natur hier einen Vorhang vorgezogen und läßt uns, die wir hiezu keine Sinne haben, in das geistige Reich ihrer Verwandlungen und Uebergänge nicht hineinschauen...

He later admits in the same work: 'Der Mensch also soll in seinen künftigen Zustand nicht hineinschauen, sondern sich hineinglauben'.[325] Kant, in his review of the *Ideen*, Part I, was prepared, in accordance with the old Platonic doctrine, to concede that a series of ideal beings may exist.[326] But, just as the young Herder had maintained when criticising Mendelssohn's *Phädon*, he says that we cannot prove that beings on one level can ascend to a higher one. Even in his early and in this respect more sanguine *Allgemeine Naturgeschichte*, he had adhered to the old static conception of the ideal Chain of Being, only adding that man may *perhaps* visit higher worlds some day.[327] At that time, he had indeed believed that progressively more perfect ideal beings on other stars and planets are *created* successively, but he never temporalised the ideal series in the way that Herder did in his attempted proofs of immortality.

In dealing with this problem, Herder offered basically three solutions. These were the theories that 'Kräfte' may ascend by metempsychosis, by palingenesis, or by being assimilated by other higher 'Kräfte'. Let us review these three hypotheses in turn, as aspects of Herder's ideal evolutionism, before concluding this chapter with some remarks on the idea of planetary and stellar habitation.

(i) Metempsychosis

Metempsychosis usually denotes a belief that the souls of men, or of lower creatures, enter after death into new bodies, of either higher, lower or the same living species, but always on this earth. It is well known, however, that Herder, in his *Gespräche über die Seelenwanderung* of 1785, rejects the idea that men may return to this earth after death.[328] And in 1797, he impugned the cyclic or regressive metempsychosis of the Pythagoreans and Hindus, which taught that souls may return to lower bodies on this earth for punishment; he calls this 'ein häßlicher und verächtlicher Gedanke'.[329] Nevertheless, his belief that animal 'Kräfte' may ascend to the human level when their former bodies are dissolved at times appears very akin to metempsychosis, especially when he says, in an early notebook: 'Ich bin ein Thier gewesen'.[330] The singular number '*ein*' implies that the identity of the animal soul is conserved in its later existence, as in the doctrine of metempsychosis; yet Herder's more usual theory that lower 'Kräfte' are assimilated by higher ones, as we shall see, does *not* involve conservation of identity. Frau von Stein, in a letter of 1784 to Knebel, says that Herder believes '[daß] wir erst Pflanzen und Thiere waren'.[331] This is another instance of metempsychosis, it seems, although Frau von Stein may merely have misunderstood Herder's doctrine that plant and animal 'Kräfte' are assimilated by higher ones such as those of man, as he propounds it in the *Ideen*, or perhaps as she had heard it in conversation with him. But he writes in a similar style of the bee in 1783 or 1784: 'Vielleicht war sie einmal eine Blume . . . in einer andern Organisation wird sie auch eine andre Sphäre zu wirken haben'.[332] Such utterances are exceptional, however, and we cannot say that Herder was a complete believer in metempsychosis, since he rejected it when applied to man, and in its cyclic and regressive forms.

(ii) Palingenesis

Herder and his critics usually apply the word 'Palingenesie' to the development of the human soul in particular. Sometimes it involves the regeneration of the soul in a new, higher body elsewhere in the universe (and is therefore linked with theories of planetary habitation), and sometimes an inward regeneration of the soul in *this* life, as in Goethe's idea of 'Stirb und werde'. In both cases, the soul remains associated with a body, for every 'Kraft' must have its 'Organ', as Herder so often maintains.[333]

One of Herder's earliest utterances on palingenesis appears in his 1769 manuscript on planetary souls, where he asks with reference to death: 'Was thut meine Seele? sie bleibt im Universum: . . . sie fängt gleich an, sich wieder einen Körper zu bauen. Wo? wie? in welcher Zeit? von welcher Gestalt? Das ist die Frage?'[334] He adds a little later: 'Menschliche Seele ist wesentlich von andern verschieden. Mensch bleibt Mensch'.[335] In a letter of that same year to Mendelssohn, he says that the human soul must be reborn as a human soul, with a body, if it is to be reborn at all.[336] But it is not clear once again *where* this regeneration takes place; if he means that it occurs on earth, he is clearly advocating that very metempsychosis which he later rejected. Since there is no evidence for the latter inference, we must assume that he believed that the soul is regenerated on some other world within the universe. Thus he suggests in the *Ideen*, as we shall shortly see, that the human soul ascends after death to a higher existence on some other cosmic world, but in a new 'Medium' (i.e. body). In his *Gespräche über die Seelenwanderung* of 1785, he says more cautiously that true palingenesis is the regeneration of the individual man in *this* life, and that a higher but unknown palingenesis doubtless occurs after death too.[337] And in 1797, when his religious beliefs no longer included any seriously transcendental or supernatural elements, but virtually coincided with his ethical ideal of 'Humanität', he writes: 'In *diesem* Leben ist also den Menschen Palingenesie, Metempsychose unentbehrlich; oder sie ist überhaupt mißlich'.[338] He does not even trouble to distinguish between the two words here, since he is no longer concerned with their metaphysical significance.

From what sources did Herder derive such ideas? As two critics have shown, Bonnet, with his 'palingénésie' and ethereal body of the afterlife, was certainly a major source.[339] Leibniz too believed that the soul requires a new body in the future existence.[340] Needham's belief that polarised forces create and develop the embryo perhaps also influenced Herder's idea that the soul cannot exist without a body, which it creates for itself by attraction and repulsion.

(iii) The assimilation of lower by higher 'Kräfte'

While the few passages in Herder's works which suggest metempsychosis, and all of those which deal with palingenesis, imply that the ascending soul conserves its personal identity, the theory of assimilation does not. The 'Kräfte' of organisms lower than man, he often declares in the *Ideen*, can ascend only through being assimilated by higher ones. He thus concludes: 'jede Zerstörung ist Uebergang zum höhern Leben'.[341] He also observes more explicitly:

> Der einzige Elephant ist ein Grab von Millionen Kräutern; aber er ist ein lebendiges, auswirkendes Grab, er animalisirt sie zu Theilen seiner selbst: die niedern Kräfte gehn in feinere Formen des Lebens über.

And in the *Gespräche über die Seelenwanderung* of 1785, he writes:[342]

> Das Reich der Thiere, unsrer stummen Mitbewohner, zerstört tausend Formen niedrigerer Art, um seine höhere Formen zu beseelen: der Mensch endlich, der größte Ausarbeiter und Zerstörer der Schöpfung, . . . er ist ohne daß ers weiß, das Ziel seiner niedrigen Mitbrüder, nach dem sie vielleicht alle unvermerkt geführt werden.

Similar utterances already appear in works of 1777 and 1778.[343]

Two things in particular strike us about this doctrine of Herder's. Firstly, it necessarily involves the loss of individual identity with death, and secondly, it is applied only to beings lower than man, who does retain his identity in 'Palingenesie'. Now there is no way of logically justifying this abrupt distinction between man and lower beings within the metaphysical scheme of a gradual series of forms or 'Kräfte'. The logical conclusion to be drawn from the doctrine of assimilation would be that man too, and other higher beings, ascend and lose their identity through being assimilated by beings whose nature is higher still than theirs. Dr Johnson satirised Soame Jenyns' interpretation of the Chain of Being since it implied (more consistently than Herder's) that the torments of lower beings minister to the well-being of higher ones throughout the whole series.[344]

It is not at all remarkable that Herder *did* clearly hint at this sinister implication in another of his writings – in his 1769 manuscript on planetary souls. He says of the earth's 'Genius': '. . . der Genius hört auf mich so wenig, als ich auf das Schreien eines Wurms! Er ist zu Groß dazu: . . . Er hat mit sich so zu thun, wie ich mit mir, ohne daß ich den Wurm höre wenn ich gehn will und ihn zertrete'.[345] *Nemo contra deum nisi deus ipse*, Herder seems to imply here. The same idea recurs in an early manuscript for the *Ideen*, already quoted earlier, in which he says that the human soul merges with the 'Meer der Gottheit' after death.[346]

Another way of solving this problem is to suppose that individuals of sufficient greatness may retain their identity after death. Herder hints at this idea, strangely enough, in a sermon of 1775:[347]

> – der Ruhm, der *in mir* ist, das Gefühl *thätiger Kräfte*, die ich mir auch aus mißlungenen Versuchen *gesammelt*, muß mir, wenn gleich mein Leib in Trümmer versinckt, *doch bleiben* . . . meine Werke werden mir nachfolgen. . .

Goethe boldly accepted the consequences of this rather ruthless conception:[348]

> Wer keinen Namen sich erwarb, noch Edles will,
> Gehört den Elementen an; . . .

A further implication of Herder's theory of progress by assimilation is that the 'Kräfte' or souls of those animals which are not eaten by higher creatures or by man must surely also return to the elements or become assimilated by *lower* creatures than themselves, such as worms. And those of which only portions are eaten must surely ascend only in part. But he was either unaware of these difficulties, or did not choose to grapple with them.

It is curious that Christian Wolff distinguished between the 'indestructibility' of animal souls and the 'immortality' of the human soul.[349] This is precisely equivalent to Herder's distinction between animal assimilation and human palingenesis, although Herder avoids making the distinction explicit. For although he declared on several occasions that no link in the Chain of Being is less important than any other, a hidden difference between the lot of man and of the animals is implied. That is, the 'Kräfte' which supposedly exist in all beings are of two distinct kinds. Those of the animals, in the theory of assimilation, are not generically different from the traditional concept of matter, although Herder would never have admitted this, and those of human souls are really coextensive with the traditional concept of mind or spirit. A latent dualism again becomes apparent when Herder admits that man is a 'Mittelgeschöpf', compounded of two natures. This is, in fact, a concession to the traditional dualism which the concept of 'Kraft' was designed to circumvent.

Thus, all 'Kräfte' are immortal, but some are more immortal than others. It is clear that the animals, with their humbler immortality reached only through the digestive tracts of higher creatures, are treated quite differently from man, and really only minister to his needs. Herder did not admit this teleological and anthropocentric consequence of his ambivalent theory, which he had, in all fairness, avoided in his writings on pure biology, but which comes out clearly in his attempts to prove the immortality of the soul. Steering his way between the logical alternatives of avoiding teleology, as he did in 1769, by suggesting that man may be destroyed or assimilated by higher beings (or that he may lose his identity in the 'elements'), and of avoiding such grimmer conclusions by presenting the Chain of Being in terms of anthropocentrism, teleology and theodicy, he pledged himself fully to neither, and used aspects of both, thus relapsing at times into traditional dualism. Once again, the 'Kräfte' which are supposedly shared by the animals, man, and the immortal souls of higher beings enabled him to bridge over a hidden dichotomy, but only superficially.

All of these ambiguities arise not out of Herder's attempts to apply orthodox theology to science, but out of his wish to prove his completely unorthodox idea of personal immortality through palingenesis by means of the old metaphysical and mystical doctrine of the Chain of Being, particularly in the dynamic form which Leibniz (and Bonnet) had given it. This, as Lovejoy says, was the beginning of that 'temporalisation' of the Chain of Being, which, when related to the empirical data of palaeontology, etc., culminated in the modern theory of evolution by descent. It is not surprising that many later critics, not sufficiently familiar with this time-honoured and all-embracing scheme within which *several* kinds of evolution, empirical *and* ideal, could be conceived, should have mistaken many of Herder's statements on dynamic but ideal processes for early expressions of the Darwinian theory, although they cannot be excused for ignoring Herder's clear repudiation of the theory of evolution by descent in other parts of his work.

(iv) Theories of planetary or stellar habitation

Already in the unpublished *Anfangsgründe der Sternkunde* of 1765, Herder says that the moon is probably a body like the earth, and adds: '. . . aber seine Geschöpfe können von gantz anderer Art seyn als wir'.[350] In the *Ideen*, he returns to this theme, but first of all admits that the speculations of Kircher, Swedenborg, Fontenelle, Huygens, Lambert and Kant on the inhabitants of other worlds simply prove 'daß wir davon nichts wissen können, nichts wissen sollen . . . wir . . . haben kein Maas der Vergleichung'.[351] Such misgivings do not deter him from echoing Kant shortly afterwards, and saying 'daß es endlich vielleicht gar unsre Bestimmung wäre, mit allen zur Reife gelangten Geschöpfen so vieler und verschiedener Schwesterwelten Umgang zu pflegen'.[352] In the *Metakritik* of 1799, he writes of 'die allerdings wahrscheinlichen Einwohner' of some of the other planets around the sun.[353] In 1802, in the *Adrastea*, he still believes that other worlds may be inhabited, but now qualifies this, mindful of the observations recorded by Herschel, Schröter and others concerning the moon's barren surface, by saying that they may not all be equally habitable.[354] He says that the moon may formerly have been habitable, but soon afterwards, he takes exactly the opposite view that it may gradually be developing towards a state where life will emerge upon it, under the influence of the vivifying 'Äther'.[355] This evolutionary approach to astronomy at once recalls Kant's *Allgemeine Naturgeschichte,* of course, but Herder no longer acknowledges his debt to his old teacher.

Alongside this general conviction, shared by many thinkers (and indeed astronomers) of that age, that other worlds are inhabited, there appears the more particular and dynamic theory that beings from this world ascend, after death, to higher worlds. More specifically still, Herder seems to have been influenced by the ancient Platonic belief that increasingly perfect beings are found towards some cosmic centre, whether the centre of the actual universe or merely of the invisible universe of the spirit, and that all creation aspires towards the central focus, the divinity. (In this old mystical doctrine, we can already discern the germ of that 'temporalisation' of the Chain of Being which developed more fully in that progress-loving age, the eighteenth century, after Leibniz had set it going again.) We have seen how Herder employs this idea of a universal centre by applying the analogy of gravitational fields to man's moral situation. Besides, he disagreed with Kant's early theory that perfection increases *away from* the centre, and he seems to have preferred the older, opposite idea that perfection or progress *converges upon* a universal centre.

In the manuscript *Anfangsgründe der Sternkunde* of 1765, he is already speculating about the probable centre of our galaxy, the Milky Way.[356] In the *Ideen*, he mentions Bode's hypothesis that the surface of the sun, beneath a surrounding envelope of light, may be habitable.[357] But in his *Gespräche über die Seelenwanderung* of 1785, he enunciates his theory of progress towards a cosmic centre more clearly than on any other occasion, and refers unambiguously to the *actual* universe, and not to any invisible, symbolic world of the spirit:[358]

> Vielleicht sind uns auch Ruheörter, Gegenden der Zubereitung, andre Welten bestimmt, auf denen wir, wie auf einer goldenen Himmelsleiter, immer leichter, thätiger, glückseliger, zum Quell alles Lichts emporklimmen, und den Mittelpunkt der Wallfahrt, den Schoos der Gottheit, immer suchen und nie erreichen. . .

He further conjectures 'daß vom letzten Planeten bis zur Sonne hinauf es Gradationen der Geschöpfe, wie des Lichts, der Entfernung, der Massen, der Kräfte gebe . . . , setzen Sie die Sonne nun als den grossen *Versammlungsort* aller Wesen des Systems'.[359] Already in a sermon in 1781, he had referred to the earth as 'nur ein Ruheplatz, eine Wanderstäte [sic]'.[360] And, in an undated poem written sometime in the 1780's, he writes:[361]

> Sieh umher, die sieben Sterne
> sind Ruhestäten für den Wandrer nur,
> der in sein Vaterland, die Sonn', hinaufeilt! –

From all this, it seems that he associated the sun with the highest cosmic throne of the divinity (although we have seen elsewhere that he believed the supreme God is superior to all the deities of planets, etc.; cf. the above passage where he says that we always seek but never reach the divinity). Not surprisingly, in the 1769 manuscript on planetary souls, he says that sun-worship is understandable.

As for the sources of these ideas, the belief that there is a divine centre of the universe towards which creation strives is almost certainly borrowed from Thomas Wright (ultimately from Platonism), whom Kant mentions and refutes in his *Allgemeine Naturgeschichte*. As Kant points out, Wright believed that God acts from the centre of the universe, attracting virtue and repelling vice.[362] No doubt this also influenced Herder when he used the gravitational analogy to describe man's ethical position. He actually writes to Lavater in 1772, recommending Kant's *Allgemeine Naturgeschichte*, 'wo Sie sogar Ihre Mittelsonne [Lavater had indulged in similar mystical speculations] finden, die auch ein Engländer [i.e. Wright] ordentlich astronomisch behauptet hat'.[363] It was thus from Kant and Wright that Herder derived the notion that the actual universe is the scene of an ideal evolution towards higher worlds. To the more abstract and ethical, but astronomical pattern of Wright, he added his own theory, in turn influenced by Leibniz and Bonnet, that a dynamic progress by psycho-physical 'palingenesis' occurs in the upper half of the Chain of Being.

Apart from Herder's personal belief in a *dynamic* inter-planetary sequence of beings (which Kant had qualified even in his early *Allgemeine Naturgeschichte*), with ethereal bodies, progressing up a ladder of existence towards a central sun, we can say that his ideas on the subject of planetary habitation were thoroughly typical of his age.[364] Teleology required that all celestial bodies must have a purpose, which is either to give light to other (inhabited) bodies, or to sustain living inhabitants on their own surface. The Chain of Being conception also posited a plenary universe. Moreover, the eighteenth century was an age which delighted in Utopias, whether they took the form of a past Golden Age, a future millenium, or of some unspoiled, undiscovered land peopled by noble savages. Thus the belief that other worlds are inhabited, although fairly common even around the Renaissance, became very widespread in Herder's age, since it appealed enormously to the century's peculiar kind of imagination. It had nevertheless been anathematised by orthodox theologians as incompatible with the dignity of man, who was created in God's image, with the Incarnation of Christ as the Son of God, and with the absolute and final validity of His mission of Redemption.[365]

Conclusion

It has seemed necessary to give a comprehensive account of Herder's views on the Chain of Being, because it is within this typically eighteenth-century context that his 'evolutionary' ideas are set. It should now be evident that he was neither a Darwinist *nor* a theologian who was bent upon interpreting the phenomena of life in terms of religious orthodoxy. He was a religious man, but his religion, at the time of the *Ideen*, was a liberal one, and it is only one element within his wide and varied learning and thought. In his attitude to the hierarchy of living forms and their development in time, we again encounter that blend of naturalistic and metaphysical or idealistic modes of explanation which is so characteristic of his thought.

NOTES

1 Even before he became a student at Königsberg, Herder, with the help of his patron, the army surgeon Schwarz-Erla, embarked upon studies of botany (cf. Herder 31 I, 109-110 and Caroline 65 I, 35). He possessed many of Linnaeus' works (cf. *Bibl. Herd.* 3 Nos. 3640-3647), and frequently mentions this authority, along with other botanists, throughout his works; in the *Ideen*, he hopes for 'eine allgemeine botanische Geographie für die Menschengeschichte' (SW XIII, 60). His interest in general zoology has already been discussed in the earlier section on methods of classification, and it is well known that the *Ideen*, and Herder's notes for that work, abound in references to the natural history of animals. The author of the article 'Herder und die Tierseele' (number 91 in the bibliography) has assembled nearly all the references to animals in his works, and it should be consulted for further proof that his knowledge of natural history was extensive.

2 SW XIII, 430. *Ideen.*

3 Masson 235 p. 88.

4 Cf. Goodfield 228 p. 35.

5 SW XIII, 267 (*Ideen* Pt. II, 1785).

6 Cf. Nordenskiöld 237 pp. 22 and 139 and Farrington 225 p. 50.

7 Nordenskiöld 237 p. 207.

8 Cf. Singer 243 p. 29.
9 Baechtold 17 p. 68.
10 SW XIII, 66-67.
11 Bärenbach 71 pp. 30 and 38.
12 SW XV, 287.
13 SW XIX, 411. *Christliche Schriften.*
14 SW XIX, 415 and 422.
15 SW XXI, 303. *Metakritik.*
16 *Deutsches Fremdwörterbuch*, Berlin, 1942, article 'Protoplasma'.
17 In the *Ideen*, Herder himself lists Hippocrates, Aristotle, Galen, Harvey, Boyle, Stahl, Glisson, Gaubius and Albin as earlier advocates of an unknown vital principle (SW XIII, 276); Galen had actually named over 60 kinds of vital force or 'dynamis' residing in the human body (cf. Jammer 231 p. 35). Other like theories put forward by thinkers known to Herder were Hoffmann's 'vis vitalis solidi' (cf. Dessoir 223 I, 506; Herder mentions Hoffmann in the *Journal*, SW IV, 373), Huarte's 'vitall spirits' (Huarte 289 p. 30; cf. SW IV, 458), Hufeland's 'Lebenskraft' (cf. Düntzer 25 III, 96, Knebel to Herder, 12 July 1795), Kielmeyer's 'organische Kräfte' (cf. Düntzer 23 I, 145, Goethe to Herder, 1793 or 1794), Needham's 'force végétative' (cf. Needham 318 p. XI and Needham 319 p. 241), Blumenbach's 'nisus formativus' (to be discussed later), C. F. Wolff's 'vis essentialis' (cf. SW XIII, 84, etc.), and, of course, the vitalism of Albrecht von Haller. Goethe, too, inclines towards vitalism at times, and introduces 'geistige Kräfte' in his *Metamorphose der Pflanzen* (cf. Nordenskiöld 237 p. 282).
18 Hansen 81 p. 11, who writes: 'Wie viel schärfer sind die Vorstellungen Herders von Kräftewirkungen, wie der damals verbreitete dumpfe Glaube an eine Lebenskraft, wie fein seine Kritik der Begriffe!'
19 Rüdiger 112 p. 2, who asserts in 1948: 'Die moderne Biologie, insbesondere der Vitalismus, hat sich nach dem Scheitern der materialistischen Naturbetrachtung – man möchte meinen: wohl oder übel zu der bei Herder vorgebildeten Anschauung bekehren müssen. . . Die Annahme von wirkenden Naturkräften ist unumgänglich, auch wenn wir sie nicht sehen.'
20 Goodfield 228 pp. 75, 108 and 158.
21 Varnhagen 53 II, 293, Herder to Knebel, 15 December 1784. The latter date is supplied by Düntzer 25 III, 16, with Knebel's reply of 17 December 1784.
22 Cf. Blumenbach 256 p. 20; also Driesch 224 p. 59.
23 Blumenbach 256 pp. 20-21.
24 See Driesch 224 pp. 137 and 224.
25 Dessoir 223 I, 514.
26 Cf. Bertalanffy 195 p. 43.
27 Bertalanffy 195 p. 45.
28 Bertalanffy 196 p. 8.
29 Cf. Goodfield 228 pp. 22-23.
30 Bertalanffy 195 p. 44.
31 Bertalanffy 196 p. 180.
32 SW VI, 26.
33 E.g. SW XIII, 101, 108 and 445; cf. SW VIII, 174.
34 Engels 199 p. 320.
35 Whitehead 214 p. 48.
36 Bertalanffy 195 p. 47.
37 Herder's MSS S.P.K. D.S.T. Kapsel VIII Nr. 23-25.
38 Irmscher 11 p. 292.
39 SW VIII, 104.
40 SW I, 246, editor's note; cf. SW XIV, 663 for a longer extract.
41 SW XIV, 680.
42 Wolff 328 II, 50.
43 Wolff 328 II, 60.
44 Cf. Driesch 224 p. 101.
45 SW XIII, 173.
46 SW XIII, 171.
47 SW XIII, 274.
48 SW XIII, 274.
49 SW XIV, 680.
50 SW XII, 190.
51 Needham 236 p. 184.
52 SW II, 62.

53 SW V, 32.
54 SW XXXI, 235.
55 SW VII, 17.
56 SW VIII, 255.
57 SW XIII, 86-87.
58 SW XIII, 165-166 and 172.
59 SW XIII, 173.
60 SW XIV, 596.
61 SW XIII, 273-274.
62 Temkin 126 p. 238.
63 Wolff 328 II, 5.
64 The Catalogue of the British Museum Library lists an edition of 1781, presumably the one consulted by Herder in 1784. Later editions appeared in 1789 (cf. Driesch 224 p. 58) and 1791 (cf. Nordenskiöld 237 p. 307 and bibliography).
65 Cf. SW XIV, 680, Suphan's remarks on editions of Wolff, and SW XIII, 273, on Harvey.
66 Clark 62 p. 225.
67 SW XIII, 84, 94, 273 and 274.
68 SW XIV, 680.
69 Haym 64 II, 205.
70 A. Hansen, *Goethes 'Metamorphose der Pflanzen'*, Gießen, 1907, p. 228.
71 Hansen, *op. cit.*, p. 229.
72 SW XIV, 680.
73 E.g. Gillies 146 p. 88 and Harich 84 p. 57.
74 Varnhagen 53 II, 293; date supplied by Düntzer 25 III, 16.
75 Düntzer 25 III, 16. (Herder's subsequent reply shows that he has received the Latin edition.)
76 Varnhagen 53 II, 297; date supplied by Düntzer 25 III, 16.
77 Düntzer 25 III, 16-17.
78 Varnhagen 53 II, 267-268.
79 Düntzer 25 III, 17.
80 Even R. T. Clark, who falsely maintains that Herder had not read Wolff, says: 'We can be sure that, had Herder known Wolff's work in the 1770's or 1780's, he would have directed Goethe's attention to it at the time of their biological discussions in 1783 and 1784' (Clark 62 p. 225). H. Bräuning-Oktavio, 'Vom Zwischenkieferknochen zur Idee des Typus', *Nova Acta Leopoldina,* N.F. 18, 1956, Nr. 126, pp. 55-56 is probably right in maintaining that Goethe encountered the work of Wolff through Herder in 1785; he gives no proof of this, however.
81 Haller 279 pp. 191-202; cf. pp. 156-158. Herder used the Latin edition of this volume, published in 1766.
82 Perhaps he abandoned preformationism because it fails to explain the phenomenon of regeneration, to which he often refers. The fact that certain organisms (usually lower ones) are able to regenerate lost organs furnished one of the most telling arguments ever advanced against the hypothesis of preformation (cf. Needham 236 p. 188). Besides, the theory of epigenesis was more in keeping with Herder's old belief in successive dialectical development whereas that of preformation is essentially static (cf. Lovejoy 233 p. 243).
83 Cf. Clark 62 p. 306.
84 Cf. Baldwin 217 I, 79.
85 Zöckler 250 II, 235.
86 Cf. Driesch 224 p. 39.
87 Driesch 224 p. 29.
88 Needham 236 p. 187.
89 Driesch 224 p. 39.
90 Cf. Needham 236 p. 212.
91 Needham 236 p. 190.
92 SW XIII, 123.
93 SW XIII, 130.
94 SW XIII, 130.
95 SW XIII, 123.
96 Düntzer 23 I, 121, Goethe to Herder, 4 May 1790.
97 SW XIII, 89.
98 SW XIII, 182.
99 SW XIII, 105.
100 Cf. Nordenskiöld 237 p. 244.
101 Cf. Driesch 224 p. 15.

102 Dessoir 223 I, 503.
103 Goethe 274 VIII, 239.
104 SW XIII, 275.
105 Temkin 126 p. 239.
106 Wolff 328 II, 5.
107 Blumenbach 256 p. 20.
108 Irmscher 11 p. 289.
109 Haller 279 p. 903.
110 Blumenbach 256 p. 75.
111 Needham 319 p. 317.
112 Irmscher 11 p. 289.
113 SW XIII, 176.
114 SW XIII, 276.
115 SW XIII, 276.
116 SW XIII, 171.
117 SW XIII, 142. K. F. Kielmeyer, directly influenced by Herder, drew a similar inference, saying that the main physiological functions in the growing embryo appear in a sequence commensurate with their relative distribution in the existing scale of natural organisms, and Schelling subsequently held a similar opinion (cf. Temkin 126 p. 241).
118 Rouché 172 p. 218.
119 Rouché 172 p. 220.
120 Reimann 108 p. 69.
121 Temkin 126 p. 240.
122 SW IV, 87.
123 As Temkin 126 pp. 242-243 does.
124 Needham 236 p. 202.
125 Needham 236 p. 201.
126 White 245 I, 308.
127 Cf. Lovejoy 233 p. 285.
128 W. Dobbek declares that August von Einsiedel, in manuscript notes which Herder copied for his own use, hinted at a similar 'biogenetisches Grundgesetz', (Einsiedel 270 p. 34). But the notes in question date from 1791-1796, ***after*** Herder had written his ***Ideen***, so it is more likely that Herder influenced Einsiedel than vice versa.
129 Rouché 111.
130 Frazer 227 pp. 3-34.
131 Adams 216 p. 306.
132 Lovejoy 233 p. 54 ***et seq.***; cf. also pp. 80 and 183-184 of the same work on the main exponents of the doctrine. A. Thienemann (Thienemann 244) and Basil Willey (Willey 247 esp. pp. 43-56) have also contributed valuable information on this theme.
133 SW XIII, 422.
134 *Bibl. Herd.* 3 No. 3591, *The Origination of Mankind.* Herder acquired the German translation of 1785, but only after he had written the words quoted in the text.
135 Cf. Zöckler 250 I, 741.
136 Einsiedel 270 pp. 19-21, editor's introduction.
137 Einsiedel 270 p. 232.
138 Cf. Einsiedel 270 p. 19. Dobbek says it may date from either 1777 or 1799-1800.
139 SW XIII, 64.
140 SW XIII, 64.
141 SW XIII, 64.
142 SW XIII, 49.
143 SW XXIII, 534.
144 Cf. Needham 236 p. 184; also Driesch 224 p. 39.
145 Cf. Nordenskiöld 237 p. 170.
146 Cf. Zöckler 250 II, 237.
147 Zöckler 250 I, 490.
148 Needham 319 p. 304; cf. SW I, 246.
149 Cf. Needham 236 p. 189.
150 Cf. Singer 243 p. 286.
151 Cf. Nordenskiöld 237 p. 323.
152 SW I, 246. *Fragmente,* 1767.
153 SW XIII, 65.
154 SW XIII, 96.
155 SW XIII, 423.

156 Cf. Rouché 111 p. 30.
157 SW XIII, 23.
158 SW XIII, 48.
159 SW XIII, 48.
160 SW XIII, 398.
161 Sauter 114 p. 19.
162 SW XIII, 423; cf. May 97 p. 34.
163 E.g. SW XIII, 208.
164 SW XIII, 397.
165 On de Maillet cf. Nordenskiöld 237 p. 328, and on Pallas cf. Pallas 320 pp. 53-54. Such theories go back to antiquity, as in the thought of Anaximander (cf. Farrington 225 pp. 44-45).
166 Düntzer 25 III, 49, Knebel to Herder, 13 February 1789.
167 SW XIII, 422.
168 SW VI, 309.
169 SW VII, 115.
170 SW XIII, 405.
171 SW XIII, 436-437.
172 Cf. Zöckler 250 II, 128.
173 SW V, 127-129.
174 SW V, 477 and SW VIII, 255.
175 SW VIII, 255.
176 SW XIII, 405.
177 E.g. Blumenbach (cf. Nordenskiöld 237 p. 309 and Blumenbach 255 p. 99), Kant (cf. Rouché 172 p. 313 and Bruntsch 74 pp. 35-36), Linnaeus (cf. Nordenskiöld 237 p. 210), and Zimmermann (cf. Günther 229 p. 43).
178 E.g. Boulanger, Voltaire and Home (according to Rouché 172 p. 266), and Georg Forster and Goethe (cf. Bruntsch 74 pp. 36 and 81).
179 SW XIII, 397-398, *Ideen.*
180 Cf. Sauter 114 p. 38.
181 SW XIII, 433.
182 SW IV, 352.
183 SW XXX, 397.
184 SW XI, 443-444.
185 E.g. SW XIII, 35, 63, 215, 402, 406, 410 and 432.
186 Herder's MSS S.P.K. D.S.T. Kapsel XXV Nr. 44, sheet 6, verso.
187 Cf. Zöckler 250 II, 186.
188 Pallas 320 p. 32.
189 Zimmermann 329 I, 114.
190 SW XXX, 109.
191 SW XIV, 685.
192 SW XIII, 33.
193 SW XIII, 233.
194 Cf. Scott Keltie 241 p. 31.
195 SW XIII, 479; cf. also the opening of *Auch eine Philosophie.*
196 Cf. Siegel 179 p. 158.
197 Cf. Thienemann 244 p. 188: 'Der Gedanke der "natürlichen Stufenfolge" oder der "Kontinuität in der Natur" gab so eine Grundlage ab, auf und aus der der Deszendenzgedanke mit hervorging.'
198 SW IV, 381 and 354.
199 Cf. Siegel 179 p. 239, note to p. 163.
200 SW XIII, 70.
201 SW XIII, 135-136.
202 Cf. Rouché 111 p. 27. Readers should consult this work by Rouché for details of the long controversy over Herder's supposed Darwinism. In the present chapter, I shall confine myself to a brief summary of the evidence from Herder's works, with some reference to earlier criticism and to the ideas of Herder's contemporaries.
203 SW XIII, 114.
204 SW XIII, 257.
205 SW XIII, 415.
206 Similar claims have occasionally been made even since Rouché's work appeared: cf. Neumann 101 p. 357 and Harich 84 p. 58.
207 Lovejoy 233 p. 256.

208 Lovejoy 96 p. 171.
209 Lovejoy 96 p. 176.
210 Rouché 172 p. 525.
211 Kohlbrugge 89 p. 1113.
212 Kant 300 p. 54.
213 Lovejoy 96 p. 172.
214 Cf. Nordenskiöld 237 p. 214.
215 SW XIII, 403.
216 Lovejoy 96 p. 172.
217 Cf. Wagner 56 p. 237, editor's note; also Wagner 54 p. XXIX.
218 Cf. Günther 229 p. 42.
219 Wagner 54 p. 406.
220 Rouché 172 p. 222 note.
221 Zimmermann 329 I, 27.
222 Cf. Zöckler 250 II, 167.
223 Wagner 55 p. 211, Goethe to Merck, 27 October 1782.
224 Wagner 54 p. 492, Sömmering to Merck, 21 October 1786.
225 Wagner 56 pp. 238-239.
226 White 245 I, 229.
227 SW VI, 113.
228 SW XIII, 472.
229 SW XIII, 472.
230 SW XIII, 398.
231 SW XIII, 479.
232 SW XIII, 61.
233 E.g. SW XIII, 54 and 60-61; also SW XIV, 250.
234 Various critics have realised that Herder recognises the principle of natural selection in this qualified sense: e.g. Kühnemann 66 p. 326; Lovejoy 96 p. 173; Götz 79 pp. 396 and 399; Schmidt-Cürtow 115 p. 144; and Rouché 172 p. 220.
235 Lucretius 315 II, 538: 'Thus, doomed by Chance, they liv'd an easy Prey/ To all, and thus their Kinds did soon decay.'
236 Einsiedel 270 p. 82.
237 Einsiedel 270 pp. 76-77.
238 Cf. Rouché 172 p. 231.
239 Cf. Willey 247 p. 38.
240 Cf. Lovejoy 96 p. 164.
241 Buffon 262 b p. 102.
242 SW XIII, 70.
243 SW XIII, 56.
244 SW XIII, 63.
245 SW XIII, 254.
246 Cf. Nordenskiöld 237 pp. 295-296.
247 Cf. Nordenskiöld 237 p. 61. In like vein, Goethe, probably influenced by Herder, wrote in 1795: '. . . das Thier wird durch Umstände zu Umständen gebildet' (Goethe 274 VIII, 18).
248 Cf. Götz 79 p. 401 and Siegel 179 p. 160. Since critics are now more or less agreed on this point, page-references to relevant passages in the *Ideen* should suffice here: SW XIII, 56, 63 and 282.
249 Cf. Zöckler 250 I, 742, for example, on the views of Hale, and SW XIII, 403 on Pallas.
250 Cf. Bruntsch 74 p. 37.
251 Cf. Bruntsch 74 p. 37 and Rouché 172 pp. 219, 224 and 271. Rouché also observes that Herder's theory of adaptive degeneration owes something to Buffon and Blumenbach, and that it cannot be called Lamarckian in the evolutionary sense. Zimmermann's theory of adaptation was also akin to Herder's (cf. Zimmermann 329 I, 23 and Rouché 172 p. 271).
252 SW I, 88. Review of *Geschichte des menschlichen Verstandes.*
253 SW XIII, 267-269. On Herder's composite 'climate' cf. also Rouché 172 p. 268, Schwarz 119 p. 152, and Steinborn 124 p. 46. Schwind 120 p. 6 rightly equates it to the modern conception of 'environment' in its most general sense, as I have also done.
254 Cf. Rouché 172 p. 268 and the title of Falconer 272.
255 Einsiedel 270 p. 70.
256 SW XIII, 269, note.
257 Hippocrates 288 pp. 1-2.

258 Herder's MSS S.P.K. D.S.T. Kapsel XXV Nr. 44 sheet 2. In 1767, Herder himself names Hippocrates, Plato, Aristotle, Galen, Huarte, Zimmermann and Winckelmann as theorists of climate with whom he is familiar (SW IV, 204), and in the *Ideen*, as well as the writers already mentioned, he refers to another by the name of Wilson in the same connection (SW XIII, 211 and 296). Gillies observes that Blair and Blackwell influenced Herder's theory of milieu (Gillies 148 pp. 15 and 37), Koller cites Ibn Khaldun and Bodin as precedents, and Du Bos, Buffon, Montesquieu and Hamann, apart from others already named, as further influences (Koller 90 XXII, 217-223), Schütze likens Herder's theory to those of Augustine, Vico, Buckle and Taine (Schütze 176 XIX, 361), and Rouché names Barclay, Fontenelle, Temple and Chardin, besides some of those listed above, as other exponents of 'milieu' theories. Clearly, there is a long tradition of such thinking in Europe, and it is impossible to lay down lines of influence with any certainty.
259 Cf. Gillies 63 p. 5 and Clark 62 p. 307.
260 SW XIII, 209; cf. Steinborn 124 pp. 54-55.
261 Cf. Grundmann 80 p. 35.
262 Zimmermann 329 I, 69.
263 Cf. Koller-Du Bos 269 pp. 67 and 89.
264 SW I, 272.
265 SW XIII, 268.
266 Cf. Günther 229 p. 64.
267 SW XIII, 269.
268 As Rouché 172 p. 268 also suggests.
269 SW XIII, 107; cf. Siegel 179 p. 165, and Rouché 172 p. 223, who declares: 'Pour Herder la fonction ne crée pas l'organe, comme l'admettent les évolutionistes: tous deux sont donnés ensemble dès la Création'.
270 SW V, 126.
271 SW XIII, 298.
272 SW XIII, 422.
273 SW IV, 206: '. . . wenn das Clima nichts als ein entferntes Medium ist, so ist die nähere Ursache der Schönheit *Generation*'; cf. also SW IV, 210.
274 SW X, 351.
275 SW XIV, 671.
276 SW XIV, 112.
277 SW XIII, 278; cf. Rouché 111 p. 64.
278 SW XIII, 218.
279 SW XIII, 284; cf. Siegel 179 p. 162.
280 Cf. Russell 239 p. 72: '. . . the evidence is now overwhelming that, with possible rare exceptions, the only acquired characters that are inherited are those which affect the germ cells, which are very few.'
281 Hippocrates 288 p. 23.
282 Kant 291 p. 97.
283 Blumenbach 255 p. 121.
284 Camper 264 p. 17.
285 Clark 62 p. 34.
286 Cf. Rouché 172 p. 270.
287 SW XIII, 227. *Ideen.*
288 Hippocrates 288 p. 20.
289 SW XIII, 234.
290 SW XIII, 216.
291 SW XIII, 258.
292 SW XVIII, 248.
293 SW I, 48.
294 Günther 229 p. 36.
295 Rasch 69 is guilty of such distortions.
296 Cf. Bruntsch 74 pp. 44-45.
297 SW XVIII, 248.
298 Cf. Kant 299 pp. 311-320 for Kant's ideas on race as expressed in his lectures.
299 Blumenbach 255 p. 121.
300 Camper 266 p. 38. Camper also acknowledges Buffon here.
301 Pallas 320 p. 54.
302 Blumenbach 255 p. 113.
303 Cf. Bruntsch 74 p. 46.
304 Cf. Düntzer 23 II, 384, editor's note.

305 Cf. Günther 229 p. 50.
306 Cf. SW XXXII, 21-22.
307 Cf. SW XIII, 233.
308 SW XIII, 234; cf. Günther 229 p. 51 on Haller's ideas.
309 Günther 229 p. 52.
310 SW XXXII, 355.
311 Irmscher 11 p. 288.
312 SW XXXI, 216.
313 SW XXIX, 441.
314 SW XIII, 194, 197 and 198.
315 SW XIII, 194.
316 SW XIII, 197.
317 SW XVI, 541.
318 Leo Tolstoy, *War and Peace,* transl. L. and A. Maude, London, O.U.P., 1941, I, 515.
319 SW XIII, 167.
320 Lovejoy 233 pp. 247-248 and 285.
321 SW XIII, 177.
322 Cf. Haym 64 II, 211-212.
323 Cf. Haym 64 I, 295-296. R. Unger (Unger 52 and Unger 187) has done much to elucidate the development of Herder's views on immortality, and F. Pamp (Pamp 168) has recently added to the literature on this subject. Unger is one of the few to appreciate just how complex Herder's ideas on this question are.
324 SW XIII, 180.
325 SW XIII, 199.
326 Kant 300 p. 53; cf. Haym 64 II, 247.
327 Kant 290 p. 367.
328 SW XV, 297-298.
329 SW XVI, 351.
330 SW XIV, 665.
331 Quoted in Haym 64 II, 205, to Knebel, 1 May 1784.
332 SW XIII, 447.
333 It is interesting to note that, as Rouché 172 pp. 210-211 shows, this doctrine differs from orthodox Christian teachings on immortality in at least five important respects.
334 Irmscher 11 p. 289.
335 Irmscher 11 p. 290.
336 Unger 52 p. 152 *et seq.*
337 SW XV, 303.
338 SW XVI, 352.
339 Unger 187 and Pamp 168.
340 Unger 187 p. 259.
341 SW XIII, 178.
342 SW XV, 291.
343 SW IX, 537 and SW VIII, 175.
344 Cf. Willey 247 pp. 52-53.
345 Irmscher 11 pp. 288-289.
346 SW XIV, 499.
347 SW XXXI, 396.
348 *Faust* Part II, lines 9981-9982. Herder, in 1797, quotes a passage from Dow's *History of Hindostan* which, in a more ethical setting, is parallel to Goethe's words: 'Aber die Seelen derer, die Böses thun, werden im Tode von den Elementen nicht befreiet' (SW XVI, 366).
349 As Unger 187 p. 261 points out. Others who may have influenced Herder's views on these matters include J. T. Needham, who said of the 'forces' which create and sustain animal organisms: '. . . elles assimilent ou sont assimilées' (Needham 319 p. 352). We have already seen in Chapter II of this work how important the idea of assimilation was in mysticism, in magnetic theory, and in several areas of biology.
350 Herder's MSS N.F.G. (G.S.A.), *Anfangsgründe der Sternkunde* p. 32.
351 SW XIII, 17.
352 SW XIII, 19-20.
353 SW XXI, 287.
354 SW XXIII, 526.
355 SW XXIII, 534.
356 Herder's MSS N.F.G. (G.S.A.), *Anfangsgründe der Sternkunde* p. 23.
357 SW XIII, 20. For further details see the section on light-theory earlier in this work.

358 SW XV, 272.
359 SW XV, 276.
360 SW XXXI, 502.
361 SW XXIX, 559.
362 Kant 290 p. 329.
363 Düntzer 23 II, 24-25, to Lavater, 30 October 1772.
364 Among the numerous writers Herder names throughout his works, there are many who likewise believed that other worlds are inhabited (if not that we actually ascend to some of them after death). Siegel 179 p. 143 names Kant, Lambert and Fontenelle as examples, and Rouché 172 p. 204 adds the names of Bode, Bonnet and Martinet. To these one might add Herschel (cf. Clerke 221 p. 68), Ray (cf. Macgillivray 234 p. 176), Campanella (cf. Lovejoy 233 p. 109), Bruno (cf. Lovejoy 233 p. 118), Kepler (cf. SW XXIII, 573), Edward Young (cf. Lovejoy 233 p. 138), Leibniz (cf. Lovejoy 233 p. 255), Bentley, Whiston, Derham and Burnet (cf. Zöckler 250 II, 59), and even then the list is far from complete.
365 Cf. Zöckler 250 II, 62.

CHAPTER V: THE SCIENCES OF MAN

1. Physical anthropology: man and the other animals; medicine

Since Herder's ideas on the physical differences between the human races were discussed in the last chapter, the only branch of physical anthropology which remains to be studied is that which treats of the physical differences between man and the other animals.[1]

Eighteenth-century thinkers were particularly interested in the differences between man and other animal species, especially the apes. This interest was part of the current vogue of 'primitivism', which was itself encouraged by the discovery of various backward, but apparently idyllic communities on Pacific islands and elsewhere. Rousseau's works helped to foster this interest, and Nature Utopias figured prominently in the literature of the age. Besides, the Leibnizian principle of continuity implied that transitions between natural forms, including that between man and the apes, are invariably *gradual*.[2] From this premise, it seemed likely that 'missing links' might exist somewhere between the apes and man.[3] Indeed, legends of ape-men, satyrs, boys suckled by wolves, and the like, not uncommon in antiquity, show that such beliefs were by no means new. But, for the reasons just named, they were particularly popular in Herder's age. All varieties of apes, 'noble savages' from distant and uncivilised lands, 'porcupine men' (and similar cases of genetic atavism), 'wild boys' long separated from human society, and other human freaks of all kinds, were studied by educated men with zealous attention. Anyone patronising such prodigies was assured of immediate celebrity, until, with the advance of science and the decline of primitivism, they eventually found their place in scientific textbooks for the learned, and in fair-grounds for the curiosity of the vulgar.

Already in his essay on language in 1770, Herder discusses cases of 'wild men' who, abandoned by society, had reverted to an animal state. But here, as later in the *Ideen*, he emphatically maintains that they are only degenerate men, and that man can never completely lose the peculiar identity of his species.[4] Similarly, he is sceptical from the start about legends of tailed men or ape-men, still widely accredited in his day. As early as in 1766 he doubts the existence of the fabled tailed men of Borneo, and remains incredulous regarding the theories of the eminent scientist Maupertuis, who firmly believed that such creatures exist; he rightly comments: '. . . alle diese Nationen gehören zu den ***Kaklogalliniern, Liliputtern und Huynhuyms,*** in die Welt, die Swift erschaffen'.[5]

Among those writers known to Herder who did believe that tailed men or ape-men existed, that apes could be taught speech and become like men, or that men could revert to ape-like states, were Rousseau, Lamettrie and Voltaire,[6] Linnaeus,[7] Moscati,[8] Bolingbroke,[9] Maupertuis,[10] and Monboddo[11]; even Kant, in his lectures on physical geography as they were published in 1802, declared: 'Die mit einem kleinen Ansatz von Affenschwanz versehenen Menschen auf Formosa, im Innern von Borneo u.s.w. . . . scheinen nicht ganz erdichtet'.[12] Robinet, in the 1760's, went so far as to claim the existence of mermen.[13]

On the other hand, such fanciful theories and legends were rejected by others whose works Herder had read; such were Blumenbach, who rightly believed, on scientific grounds, that the tailed men were only apes,[14] and Camper, who said on the strength of his dissections that negroes are basically the same as Europeans, and that apes are physically incapable of speech.[15] Tyson, the noted British anatomist, whom Herder also cites,[16] had already maintained in 1699 that the fabled ape-men, satyrs, etc. of the ancients were all merely apes, and added the following telling observation:[17]

> This Difference I cannot but remark, that the Ancients were fond of making Brutes to be Men: on the contrary now, most unphilosophically, the Humour is, to make Men but meer [sic] Brutes. . .

In other words, Tyson had witnessed the beginnings of the modern fashion of primitivism, possibly in the works of writers such as Hobbes, who portrayed 'natural man' as little better than a brute. It is clear from his words that he realised that such theories are fashions, the offspring of the temper of the age, rather than scientific hypotheses based upon genuine observations. Thus men like Rousseau and Monboddo, who believed in the eighteenth century that orang-outans are capable of acquiring speech and becoming civilised, and that our ancestors were orang-outans, should hardly in return be regarded as scientific thinkers or as precursors of Darwin. They were usually apostles of primitivism, led by their distaste for the rationalistic worship of progress to mount far-reaching attacks upon modern civilisation and to glorify the supposed natural or animal state of man.

Herder, however, denied that man and the apes are fundamentally identical, and that the one can become the same as the other. His grounds for saying this were scientific, to judge by the writers, such as Blumenbach, Camper, and Tyson, whom he cites in the *Ideen*. His earlier doubts, in 1766, concerning tailed men etc., before he read these authors, were probably inspired by that general scepticism regarding legends and miracles which he exhibits throughout his first period as a writer.

Let us now examine in detail how Herder differentiates between man and the other animals, particularly the apes. In the *Ideen*, he proposes several criteria upon which such a distinction may be founded. For example, he rightly says that a larger brain is a necessary condition, but not the only one, for a superior intelligence such as that enjoyed by man.[18] Nevertheless, as his views on the animal 'type' and on comparative and analogical methods suggest, he believed all animals, including man and the apes, to be basically similar, especially in their anatomy. This notion, as he elaborated it in the *Ideen*, made it necessary for him to show that whatever differences do exist between animal species, including man and the apes, are rather differences of degree or form than of kind or intrinsic quality. The principal difference between man and all the other animals, he accordingly argues, is that between man's distinctive upright posture and the horizontal posture natural to the quadrupeds. He believes that all man's superiorities over the animals, including his freedom of will, his ability to produce artifacts, his reason, his perfectibility, etc., can be derived from this physical peculiarity.[19]

This idea is not original to Herder, however. Buffon had said that the ape is four-handed, and man two-handed.[20] Helvétius, whom Herder mentions in connection with such theories, had emphasised the importance of man's two hands for his rational abilities, since the upright human posture leaves the hands free to perform purposeful tasks.[21] (This is still a favourite anthropological axiom.) Zimmermann also believed that man's gait is naturally and characteristically upright,[22] and Daubenton, with whose contributions to Buffon's *Histoire naturelle* Herder was acquainted, showed that various of man's anatomical peculiarities are related to his upright posture.[23]

The Italian Moscati, however, had declared (1770 and 1771) that man was formerly and naturally a quadruped, but that he assumed the erect posture at the time of Adam's Fall from Grace; Moscati regarded this as a curse, as the root of all man's miseries and afflictions. Herder explicitly mentions Moscati and his theory, with which he naturally disagrees, in the *Älteste Urkunde,*[24] but Kant had earlier composed a favourable review of this unusual work.[25] J. C. Mayer, in a work of 1783 which Herder read, refuted Moscati's hypothesis,[26] and Blumenbach, again like Herder, declared that any observer 'will not but see that a bipedal brute and a quadrupedal man would equally pass for prodigies',[27] and that the present gaits of man and the animals are perfectly natural. It is strange that, although Kant had favourably received Moscati's suggestion that man's present ethical situation is linked to his upright posture, he rejected Herder's much less fanciful theory that man's reason is linked to his characteristic bearing, when he reviewed Part I of the *Ideen.*[28] One can only conclude that Kant probably still sympathised with Rousseau's belief that man has degenerated from some earlier 'natural' state, and that his present characteristics, such as his upright posture, should not be regarded as unqualified advantages.

Georg Forster offered a more concrete objection to Herder's explanation of man's superiority. He writes of it to Sömmering as follows: 'Das nenne ich aus menschlichen Begriffen allegorisirt. . . Tragen denn nicht alle Vögel den Kopf in die Höhe; am meisten die allerdümmsten'.[29] But Herder's theory of man's superior mental ability *can* be reconciled with later scientific observations, as evidence cited by two modern critics suggests.[30] One can also reply to Forster's objection by pointing out that the erect position of the bird's head does not leave free two limbs which can be adapted to handling objects and tools as does the upright posture in the case of man.

None the less, Herder did tend to exaggerate this particular feature of human anatomy, linking it to 'Humanität' and at times displaying a thoroughly anthropocentric pride in man's superiority. But his main fault was that he failed to include further evolutionary and physiological preconditions of man's abilities in his theory. This occurred firstly, because he rejected the idea of evolution and lacked an adequate knowledge of man's evolutionary development, and secondly, because he did not make sufficient use of data concerning the physiology of the brain.

It is wrong to say that Herder's theory is definitely of Christian inspiration.[31] His view was shared by such freethinkers as Helvétius, and he supported it with evidence culled from the works of such eminent scientists as Buffon, Daubenton and Blumenbach. Besides, Moscati's theory, which Herder denounced, associated man's upright posture with the doctrine of original sin, and was accordingly far more influenced by theology than was Herder's. For Herder's pride in man's excellence is more typical of the humanism of antiquity, the Renaissance and of eighteenth-century rationalism than of orthodox Christianity, which tended to dwell upon man's shortcomings rather than upon his grandeur.

He employs a further technique in distinguishing between man and the animals, and borrows Camper's idea that the craniological angle between two lines, one drawn from the ear to the base of the nose, the other from the prominence of the forehead to the front of the jaw, is greatest in man, especially in the European races.[32] Herder further suggests that angles between four lines, drawn from the uppermost cervical vertebra to the rear of the head, the crown of the head, the front of the forehead and the chin respectively, should also be compared in different animal species and man.[33] Such methods can certainly be useful as rough guides to craniological types, but they are too subject to variables to be accurate,[34] and they can become dangerous if used as a basis for value judgements, especially in the question of racial superiority, as indeed occurred in more recent times. But, as one historian of anthropology points out, Camper regarded it primarily as an aesthetic criterion, not an anthropological one.[35] Herder himself does not use it to pass judgement on the intrinsic merits of racial types either.

One may conclude that Herder's theories of physical anthropology were not characterised by theological overtones, and that their limitations arose rather from Herder's having no theory of evolution than from his not having availed himself of such empirical evidence as was available at the time. His theories were, on the whole, typical of the more advanced anthropological ideas of his day, and they are particularly remarkable for their healthy scepticism regarding both time-honoured legends and the myths of contemporary primitivism.

A few words must be said on Herder's knowledge of medicine, since it was in this subject that, with the encouragement of his early patron, the army-surgeon Schwarz-Erla, he at first intended to make his career, until, overcome at the prospect of a dissection, he altered his plans.[36] He continued to show interest in the subject throughout his life, however, and several of his associates were members of the medical profession, from the student Pegelow in Straßburg, to J. G. Zimmermann, court physician at Hanover,[37] and, at a later date, his own son Gottfried.[38] In his writings, he mentions such medical authorities as Hoffmann of Halle,[39] Boerhaave,[40] Sydenham,[41] Gaubius[42] and Unzer.[43] Caroline says that he read and admired the works of the physician Leidenfrost,[44] and excerpts from the medical writings of Metzger, J. C. A. Mayer,[45] Prochaska, Meier, Gruner, Sydenham and Caldani are found in his unpublished notebooks.[46] His library also contained medical works by Baader, Heister and Culmus,[47] as well as various works on human physiology, etc., mentioned elsewhere in the present work.

All this, however, is evidence of Herder's wide reading in all subjects, including all of the sciences of his day, rather than of any particular preoccupation with medicine in itself. He used the data of medicine chiefly as an adjunct to his studies of biology, and of human psychology in particular, which, as we shall shortly see, he set out to base firmly upon physiology rather than upon the abstractions of metaphysics and epistemology.

2. Psychology[48]

The greatest difficulty which besets all critics of Herder's psychological ideas, even as they appear in the essay on psychology in 1778, is that they are usually interwoven with notions from other areas of learning, particularly aesthetics, the theory of language, pedagogics, ethics, metaphysics, epistemology, sociology (and so-called 'Völkerpsychologie') and history. In any case, psychology was usually regarded in Herder's day as a branch of philosophy, and scarcely yet existed as an autonomous discipline, far less as a fully-fledged science. It is therefore difficult to treat the subject in itself without referring to several allied branches of learning.

Herder himself first became interested in psychology through his early studies of aesthetics, which led him to reject the prevailing abstractions of Klotz, Riedel and others in favour of a new aesthetics of sense-experience. Thus, at an early date, he began to favour a more empirical, physiological and scientific kind of psychology, with special attention to the functions of the senses, instead of the abstract, Wolffian theories of the Enlightenment.[49] He actually writes in the *Journal* of 1769: 'Die Psychologie, was ist sie anders, als eine reiche Physik der Seele?'[50]

It is thus by no means impossible to assess Herder's psychological theories in relation to science, especially if one pays particular attention to the physiological foundation upon which he sought to establish them. For after he had dealt, in the fourth *Kritisches Wäldchen* of 1769, with the scientific background to the individual senses of sight, hearing and touch (already discussed above in the sections on optics and sound), he set out to elaborate a general physiological theory of psychology as a whole. This aspiration culminated in the 1778 essay on psychology, and in the chapters of the *Ideen* which he devoted to the human mind and its relation to the body.

(a) Introduction: mind and body

A historian of psychology aptly sums up the development of the subject, in relation to the wider issues of philosophy, as follows: 'The philosophy of the Greeks worked out the separation of mind and body; that of modern times seeks to bring them together again'.[51] Judged in this light, Herder's psychology is typical of the modern movement. Again and again, he attempts to reconcile traditional dualisms, and that of mind and body is no exception to this rule. We have already seen, in the second chapter of this work, how he resolved this particular dualism in so far as it appears in the problem of subject and object, the problem of perception. Striving to avoid the truly monistic extremes of pure materialism and pure mysticism or spiritualism, yet using elements of both, he usually failed to satisfy the requirements both of logic and of empirical science.

Thus, before we come to discuss Herder's more scientific, physiological theories of psychology, it must be remembered that the relatively scientific elements represent only one aspect of his wider philosophy of mind and body. In themselves, especially around 1769, these ideas seem to imply that the mind is conditioned and determined by sense-experience, by physical, or rather by physiological functions of the body. In this way, he speaks of man's 'materielle Seele' in 1769.[52] Yet in the wider, metaphysical problem of the *soul* and the body, his ideas are matched at the opposite extreme by the theory that the body is merely the product, the mirror, the expression of the soul. Thus he refers, in 1767, to 'ein Platonisches Mährchen, . . . wie der schöne Körper ein Geschöpf, ein Bote, ein Spiegel, ein Werkzeug einer schönen Seele sey',[53] and in an early version of his essay on psychology in 1774, himself uses this idea, describing the body as an 'Analogon, Spiegel, ausgedrucktes Bild der Seele'.[54]

Most theorists in Herder's day believed, however, that mind (or soul) and body are in some way parallel, and many, such as Hartley,[55] freely admitted that the true nature of their connection may remain unknown. Then Kant, by demonstrating in his *Träume eines Geistersehers* that the nature of the soul or spirit and its relation to the body are not only unknown, but also unknowable,[56] removed the main metaphysical obstacle which stood in the way of a genuinely empirical investigation of the *mind* or *consciousness* (not the intangible soul or spirit), whose functions can be observed through the workings of the body. Herder was one of those who undertook this task, but, as will soon be evident, he never finally broke with metaphysical theories of soul and body, attempting instead to combine them with his 'physiological' psychology by means of vitalistic and supposedly neurological 'Kräfte'.[57] His scheme of 'Kräfte' does not, however, make any clear distinctions between the physiological, the psychological, and the metaphysical aspects of consciousness; in fact, its main purpose is to make such distinctions unnecessary, although brain, mind and soul continue to reappear in their traditional but unacknowledged roles, uneasily coexisting in his thought.

All this confirms that psychology, in Herder's day, was still bound up with other extraneous subjects, particularly with metaphysics. Only when it ceased to occupy itself with concepts like those of soul or spirit could it become an empirical science of mind. A few thinkers were moving in this direction even in the eighteenth century, but the distinction between psychology and metaphysics is not always observed even today. In this, as in so many other questions, Herder stood between two opposing positions. His psychology stands between older metaphysical theories and modern empirical theories of mind.

(b) The brain and the physical basis of mind

As we have seen, in 1769, Herder refers to the 'materielle Seele' of man. This, like all materialistic premises in psychology, implies that the functions of the mind are associated with some area or areas of the body, and with physical processes within them. Accordingly, he declares on the same occasion: 'Nach diesen ersten Schritten . . . wäre man nahe dran, um jeder Gefühlsart gleichsam ihre Gegend in der Seele einzumeßen. . . '.[58] (The 'gleichsam' is a characteristic reservation, for Herder is rarely willing to commit himself to any exclusive interpretation.) In the *Journal*, he again refers to the physical basis of thought, grasping at Maupertuis' suggestion that dissections, or rather vivisections, of the brains of criminals might supply new information: '. . . die Bemerkungen, die Maupertuis vorschlägt mit dem Gehirn der Malefikanten würden dazu helfen, und denn würde gleichsam [note the 'gleichsam' again] die Welt Materieller Ideen lebendig'.[59] And in 1785, he suggests that music may influence our emotions directly by a physical process within the brain:[60]

> Ja, als man den grausamen Versuch machte, lebendigen Geschöpfen das Gehirn zu öfnen, und durch gewiße Druckungen bei ihnen bald Schmerz, bald Freude erregte; mochten diese Empfindungen, auf eine grobe Weise bewirkt, etwas anders seyn, als was du [i.e. music] auf eine unendlich feinere Weise bewirktest?

This last utterance is scarcely typical, however, because, already in 1775, he rejects Descartes' theory that the soul is localised in the pineal gland,[61] and, in the *Plastik* of 1778, although he is prepared to conjecture roughly that the sensory 'Kräfte' of the brain are situated nearer the external organs, particularly the eyes, while the 'ewigere Kräfte' are situated nearer the centre of the brain, he now heavily qualifies the whole supposition that mental functions can be localised within the cerebrum:[62]

> . . . so ist doch offenbar dies innere Gewebe von zu verflochtner feiner Art, als daß man mit Huarte ein Conklave von Cardinalkräften zimmern, oder den innern Bau und Saft des Granatapfels nach seiner äußern Schale entwerfen könnte.

(Huarte's ideas will be discussed below.) Here, it seems that he rejects not only the theory that each function or faculty can be localised within the brain, but also the whole pseudo-science of phrenology, which claimed to define mental resources and proclivities by the external conformation of the cranium, and which was yet to have its greatest vogue in the early nineteenth century. Again in an early version of the *Ideen*, he rejects the method of localising faculties physically, this time with more vehemence:[63]

> Man wird aufhören, die Seele in der Zirbeldrüse, den Verstand im spezifischen Gewicht des Gehirns zu suchen, oder gar die feinsten Gedanken und Triebe in pergamentnen Rollen und Seilen auf- und abwinden zu wollen: leere Versuche, die nichts erreichen können, so wie sie bisher nichts erreicht haben.

The reason for this change of front, which occurred during the 1770's, is that he had come to prefer the vitalistic theories of Haller, as he interpreted them himself, to his own earlier, more materialistic and almost mechanistic ideas of 1769. He makes this clear himself in the *Ideen*:[64]

> Nun zeigen alle bisherigen Erfahrungen, die der gelehrteste Physiolog aller Nationen, Haller, gesammlet, wie wenig sich das *untheilbare Werk der Ideenbildung* in einzelnen materiellen Theilen des Gehirns materiell und zerstreut aufsuchen lasse. . .

For intangible forces cannot be localised or compartmented so readily as material 'faculties', he believes. But he again refers to 'das innere Gehirn' (presumably the cerebral medulla) in which 'sich die Frucht der Gedanken unsichtbar und unzertheilt bildet'.[65] (Hartley likewise believed that the medulla, not the cortical parts of the brain, is the seat of mental activity.[66]) Thus the brain is indeed the seat of thought, but it is not compartmented, and thought-processes consist of invisible forces, not of visible material functions within it. The superiority of man's brain over that of other animals does not lie in additional faculties or compartments peculiar to man, but in 'die vollkommenere *Ausarbeitung*'[67] or 'in der Proportion und in der Temperatur des Ganzen'[68] – i.e. in the more complex arrangement of constant basic elements.

Let us pause for a moment to consider Herder's sources. It was from the Spaniard Juan Huarte (c. 1520-1592), whose work Lessing translated in 1752 under the title *Prüfung der Köpfe zu den Wissenschaften*, that Herder derived his early belief that mental functions have a distinct physical basis, presumably in various areas of the brain. He read this work in 1767, as appears from his letters of that year,[69] and extracts from it occur in his early notebooks.[70] The following quotation from Huarte's work, in English translation, may serve to illustrate the man's ideas:[71]

> . . . the fourth ventricle [i.e. of the brain] [has] both the office of digesting and altering the vitall spirits, and [serves] to convert them into animall. . . The three ventricles placed in the forefront, I doubt not, but that Nature made them to none other end than to discourse and philosophise.

No doubt Herder found some of Huarte's localisations more acceptable than Descartes', since the 'vitall spirits' were nearer his own habitual vitalism than were the mechanistic theories of the brain current among the French materialists. But he did not adopt Huarte's archaic doctrine of mental 'temperaments' – moist, cold, dry, etc.[72] – and he soon came to reject all such ideas in favour of his own version of Haller's neurological vitalism. It is interesting that Kant, in his *Träume eines Geistersehers*, a work which Herder reviewed, adopts (in 1766) a neurological theory, but with materialistic rather than vitalistic undertones, saying 'daß alle Vorstellungen der Einbildungskraft zugleich mit gewissen Bewegungen in dem Nervengewebe oder Nervengeiste des Gehirns begleitet sind, welche man *ideas materiales* nennt'.[73] Finally, Herder was not the first to reject completely the attempt to localise mental functions exactly within the brain, as he did in the *Ideen*. Argentier had already done so early in the sixteenth century, repudiating the theories of Galen, the first great theorist to suggest that all mental faculties have exact physical situations within the cerebrum.[74]

Herder had misunderstood Haller, however, when he assumed that the theories of the great physiologist ruled out all localisations of the thought-processes. As R. T. Clark points out, Haller had in fact correctly realised that the cerebral cortex plays a significant part in emotion (more correctly, perception) and cognition.[75] Clark says that Herder failed to study or appreciate this part of Haller's work 'for some inexplicable reason'. The reason is not inexplicable, and there is no need to suppose that he omitted to read the section in question. He saw in Haller's three 'Kräfte', which he adopted under the titles of 'Elasticität', 'Reizbarkeit' and 'Empfindung',[76] not the specific physiological functions of muscles, nerves, etc. (i.e. perfectly local phenomena) with which Haller associated them, but simply another addition to his already considerable repertoire of ill-defined 'Kräfte'. He saw them as invisible, intangible and ubiquitous, and wrongly believed that Haller's explanation of nervous sensations and reactions in terms of 'vires' or 'Kräfte' excluded all possibility of localising functions of the mind; he accordingly rejected all attempts to do so as 'mechanistic'.[77] It is true that he speaks of the 'inner' part of the brain (presumably the medulla) as the seat of thoughts on one occasion in the *Ideen*.[78] But it is clear that he regarded this only as the central focus of the invisible and undivided nervous 'Kräfte'. He brings out this point later in the same work: '. . . bei einigen Thieren kommen nicht einmal die Nerven beider Augen und bei keinem Geschöpf die Nerven aller Sinne so zusammen, daß Ein sichtbarer Punkt sie vereine'.[79] On this second occasion, he is arguing that mental processes are 'geistig', not physical.

From all this, it seems probable that Herder did not omit considerations of the cortex, now known to be the main organ of thought and perception in the human brain, because he was entirely ignorant of it or because its function was completely unknown in his day. For although it was only in the later nineteenth and early twentieth centuries that Pavlov and his predecessors and followers began to map out accurately the 'mosaic of functions'[80] in the cerebral cortex, several writers of Herder's age, some of whom were known to him, had drawn attention to it, and suspected that it performed an important function in the processes of sensation and thought.[81] He made no reference to this organ because he came to distrust all more specific localisations of mental processes, and he misinterpreted Haller's vitalism, linking it to his own metaphysics of 'Kräfte' rather than to precise physiological functions, as Haller had intended.

Herder does put forward some suggestions concerning the physical basis of memory, however. In the fourth *Kritisches Wäldchen* of 1769, he writes: '. . . die ersten Eindrücke in das zarte Wachs unsrer Kindheitsseele gibt [sic] uns Farbe und Gestalt des Urtheils'.[82] But in the *Journal*, he says that we do not know how ideas are impressed upon and retained by the brain, and maintains that the (physical) theories of Huarte and Julius Caesar Scaliger are not satisfactory.[83] And in the *Ideen*, he says more explicitly that memory is 'nicht körperlich sondern geistig'.[84] Yet later in the same work, he contradicts this statement, using the traditional physical theory of memory:[85]

> Das Hirn der Kinder ist weich und hangt noch an der Hirnschale: langsam bildet es seine Streifen aus und wird mit den Jahren erst vester; bis es allmälich sich härtet und keine neuen Eindrücke mehr annimmt.

In fact, this is precisely the theory of Huarte, which Herder had pronounced inadequate in his *Journal*, for Huarte writes:[86]

> . . . old men partake of much understanding, because they have great drinesse, and faile of memory, for that they have little moysture, and by this meanes the substance of the braine hardneth, and so cannot receive the impression of the figures. . .

Thus to the question of the physical basis of memory, Herder suggests two conflicting solutions, that of the wax model of the brain, which is also reminiscent of Locke's ideas, and the alternative spiritualistic theory, which denied that memory has any tangible physical basis at all. As usual, he is attracted by two opposing theories, and, in this case, he does not even attempt to reconcile them.

He considered yet another physical factor in describing mental functions, however – that of the weight or size of the brain. In an early version of the *Ideen*, he denies that the specific weight of the brain can be a measure of 'Verstand',[87] and later rightly adds that the relative weights of the brain and the rest of the nervous system are not a sufficient test of mental capacity either, since this criterion fails to take into account the nature or distribution of the nerves.[88] (Sömmering and Blumenbach had suggested that the ratio of the size of the brain to that of the nervous system is a better criterion of mental ability than size of brain alone.[89]) He admits, however, that larger brain capacity is a necessary condition for higher intelligence, such as that of man as opposed to the lower intelligence of the animals,[90] and now seems to regard Wrisberg's criterion of specific weight with more approval than before.[91] But all of these criteria, in Herder's mind, are of secondary importance to the degree of nervous complexity in the organism. This is indeed an excellent standard by which to judge how advanced an organism is, although he was wrong in believing that it is therefore unnecessary or even impossible to localise mental functions.

(c) The nerves and the neurological basis of mind

Vitalism, in psychology, has very often been associated with neurology. The nerves, above all, can be envisaged as the seat of an intangible yet extremely active principle, which produces the astonishingly swift and complex reactions we associate with the processes of thought and the movements of the body. It is no wonder, then, that the vitalist Herder soon came to prefer the neurological theories of Haller to the materialistic ones of Huarte and others. Indeed, as early as in 1766, he had already declared '[daß] die ganze Empfindung auf die Beschaffenheit der Nerven des Gefühls ankommt'.[92]

But just as he had introduced *many* different unknowns, in biology, to account for the elusive life-principle, so also did he employ various distinct theories in psychology to describe the workings of the nerves upon which the mental functions depend. Before discussing Haller's theory of three physiological 'vires', the theory of which Herder made most use, let us therefore first examine some of the other, more specific neurological hypotheses which he borrowed from the science of his age.

(i) The theory of a nervous fluid

In the *Ideen*, Herder refers on several occasions to the old theory that the nerves contain a subtle nervous fluid ('Nervensaft') which is the agent both of sensation and of motor-impulses. He first refers to 'die mehrere Mischung, Läuterung und Ausarbeitung der Lebenssäfte' in animals as opposed to plants, and mentions in particular 'den feinern Strom, der die edlern Theile befeuchtet'.[93] This fluid, which may possibly be only the blood in this case, is apparently regarded as a lubricant for the more delicate animal organs. Soon after, he says that more advanced creatures have more refined juices,[94] and later, referring to man's superior upright posture, he declares that this allows only 'die feinsten und reichsten Säfte' to ascend to the brain.[95] (This recalls the archaic botanical theory, which Goethe, for example, introduces in his *Metamorphose der Pflanzen*, that progressively more rarified juices are found from the root to the flower of the plant.) He later says, however, in his arguments for immortality, that this nervous fluid is not itself a vehicle of sensation, but that it only contributes (presumably as a lubricant) towards the physical health of the brain and the nerves, whereas the soul itself is 'geistig'.[96] He concludes: 'Also ists eine schwache unphysiologische Vorstellung, sich das Gehirn als einen Selbstdenker, den Nervensaft als einen Selbstempfinder zu denken'.[97] From this, it is clear that the fluid theory of the nerves, in itself, was too mechanistic for Herder; he condemns it for this reason in his mature period, along with other attempts to localise nervous and mental functions in specific physical components of the body, and retains it only in modified form, saying that it acts as a lubricant.

The theory that juices or fluids are responsible for nervous functions goes back to Galen at least.[98] Descartes believed that the nerves are tubular, and filled with a fluid which produces muscular movements.[99] Hoffmann of Halle and Malpighi had similar ideas, and believed that the nervous fluid comes to the nerves from the cerebral cortex.[100] The great physician Boerhaave was of the same opinion,[101] and it was probably from him that Haller took his own theory that a 'liquor nervosus'[102] is secreted from vessels in the cortex into small tubes within the nervous medulla, producing both sensation and movement in the body by its volatile motion:[103]

> Quare in universum certum esse videtur, ex vasis corticis separari in cavas medullae fistulas liquidum aliquod, quod in nervosos tubulos continuatum, ad extremos nervorum fines propulsum, sensus motusque causa est.

But although Swammerdam, in an unpublished work, had long since proved that the nerves are not hollow, liquid-filled tubes, this belief persisted till the early nineteenth century, and Sömmering referred to the fluid as 'animirt',[104] while Lamarck considered it to be the seat of the life-principle.[105] No doubt the belief first arose because certain parts of the brain, notably the ventricles, do contain some fluid. Herder knew this, but maintained that such fluids only serve to keep the brain healthy.

Herder's repudiation of this theory, like his disregard for the cortex, both of which figured in the works of Haller, his acknowledged mentor in physiology, shows once again that he misinterpreted Haller's vitalism, and wrongly believed that it made it impossible to localise mental functions, or to reduce them to material agencies. He probably realised that the hypothesis of a nervous fluid lent itself too readily to undiluted materialism; in fact, his friend Knebel used it in an argument for materialism,[106] and Lamettrie declared that this fluid mechanically transmits sensations from the sensory organs to the brain.[107]

(ii) Electricity, animal magnetism and galvanism

Since theories of electricity, animal magnetism and galvanism afforded essentially vitalistic interpretations of nervous processes in Herder's day, postulating as they did mysterious physiological or even psychic forces, one might naturally expect that they would have found more favour with him than did the essentially mechanistic theory of a nervous fluid.

Accordingly, we noticed in an earlier section on vitalism how Herder suggested that electricity might be akin to the elusive life-principle itself. Such ideas cannot be compared with the modern discovery that nervous reactions involve electricity, however. They arose rather out of the belief in 'animal magnetism', which, originating in the medical occultism of Paracelsus, van Helmont, Croll, Stahl and Hoffmann,[108] gained new ground in Herder's day with the spread of biological vitalism and the advent of Romantic *Naturphilosophie.*[109] A. Bertrand, in his history of animal magnetism, clearly demonstrates that the fashionable doctrines put forward by Mesmer and others around the end of the eighteenth century were really only a revival of the older mystical medicine of the early seventeenth century.[110] But even before Mesmer publicised his own version of these older doctrines in the 1780's, Herder wrote (around 1769): 'Der Magnet müste so sehr verstärkt werden, daß seine Kraft fühlbar würde. Ich halte es für möglich'.[111] And in the early or mid-1780's, he imagines 'einen neuen Sinn für die elektrische und magnetische Materie, für die Kraft der Schwere, der Anziehung oder gar für die Wirkung der Gedanken'.[112] But in 1785, he is more sceptical, perhaps thinking of the already notorious Mesmer, who was practising in Paris around this time.[113] He writes to G. Müller: 'Bald werden wir's auch hören, daß Christus . . . vermöge des höchsten ihm einwohnenden Magnetismus seine Wunder gethan, sogar in die Ferne gewirkt usw.'.[114] (In fact, no less a theologian than Bishop Butler had earlier drawn just such an analogy between magnetic effects and the miracles of Christ.[115]) Thus, Herder had shown a certain interest in the subject of animal magnetism before Mesmer inaugurated the vogue for it in the 1780's, although he did not enlarge upon it or relate it in detail to the study of nervous processes.[116] Galvani's experiments with the effects of electricity on animal organs[117] revived Herder's interest in such phenomena in the 1790's, but as before, he wrote nothing constructive of his own on the subject.[118]

Herder was certainly interested in electricity, animal magnetism and galvanism as possible agents in physiological processes, and mentions them at various times in his writings. But they are really very much subordinate to his more general theories of nervous functions and 'Kräfte'. The more comprehensive vitalism he borrowed from Haller was by far the greatest single influence upon his neurological theories.

(iii) The theory of expansion and contraction of the nerves

Herder often describes our reactions to the external world in terms of expansion and contraction. This notion, as he uses it, originally comes from neurology, and he probably first encountered it in Burke's work on the Sublime and the Beautiful. He himself observes of Burke in 1769 '[daß] er überall das Erhabene auf ein Gefühl der *Anstrengung,* das Schöne auf eine sanfte *Erschlaffung* der Nerven zurückleitet'.[119] But on this occasion, he also adds: 'ich laße ihm [i.e. Burke] alles, was System ist', and says that he values Burke mainly for his concrete observations; besides, we have already seen that the theory of Montesquieu, who also believed that nervous reactions consist in expansion and contraction of the nerves and fibres, was in Herder's eyes too crude to explain how the environment acts upon the organism.[120] In its literal form, this theory must have seemed too mechanistic to him. Yet on the other hand, he applies Burke's theory to psychology in his 1778 essay, distinguishing the expansive 'Mitgefühl und Mittheilung' we experience in the face of beauty and the 'Zurücktritt auf sich, mit Selbstgefühl' which is our reaction to sublimity, calling all this 'eine Theorie, über die ich ihn [i.e. Burke] ... fast beneide'.[121] He even declares outright that the nerves, like the 'Fasern' or 'Fibern' of the body, expand and contract in their reactions to external stimuli, likening these responses to 'eine Ebbe und Fluth',[122] and he again says of the nerve: '... er ziehet sich zusammen oder tritt hervor nach Art des Gegenstandes, der zu ihm gelanget'.[123] And in the *Ideen*, he refers to Gaubius' theory of the expansion and contraction of the nerves, without raising objections to it.[124]

It is therefore probable that Herder at times found the theory useful, but that at other times, as with the theory of a nervous fluid, he found it impossible to accept it literally, knowing that it could be construed in mechanistic terms, as in Montesquieu's work.

Haller had actually disproved the theory that the nerves themselves expand and contract.[125] He had retained the conception only in the case of certain kinds of tissue and muscle, which he observed to contract under stimulus, but denied that the nerve itself reacts in this way.[126] Yet this no more prevented Herder from applying the theory to the nerves in his own way, or as a universal psychic principle, than did Haller's observations on the cerebral cortex and the nervous fluid deter him from ignoring or repudiating these data in favour of his own vaguer vitalism. Once again, it seems that he was less influenced by exact physiological observations than by his own metaphysical preferences.

(iv) The vibratory theory

Already in 1767, Herder writes '[daß] man das Nervengebäude der Empfindung sehr treffend mit einem Saitenspiel vergleichen kann',[127] and, in 1769, he speaks of 'Nervenschwingung'.[128] Again in his psychology essay of 1778, he speaks of the human nervous system as a 'Saitenspiel der Gottheit',[129] and in the *Ideen*, he describes man's nervous system, referring to 'alle Theile seines vibrierenden Wesens',[130] while he writes as follows of the eye in his *Adrastea*: 'Das Licht reizt, Theile des Nervs schwingen sich; die Empfindung erfolgt'.[131] It therefore appears that, alongside the theories of electrical or magnetic principles behind physiological reactions and of nervous expansion and contraction, Herder also employed the vibratory theory of the nerves. On this occasion too, he was undeterred by the observations of Haller, who proved that the nerves are *not* subject to vibration or oscillation. Haller wrote: 'Neque oscillationes in nervo produci possunt ... [etc.]'.[132]

Among the first to believe that the nerves, or particles within the nerves, react to external stimuli by vibrating were Hobbes[133] and Newton.[134] Hartley[135] and Priestley,[136] both of whom Herder read, first systematised the idea and gave it wider currency, and it was adopted by such physiologists as Metzger and Schmid,[137] and the psychologist Lossius, in the second half of the eighteenth century.[138] It is clear from his review of a work on poetry and music by Daniel Webb that Herder also encountered it in the work concerned in 1772; he lists the types of vibrations caused by music, according to Webb, as follows: 'Nun bringt er alles in vier Klassen: die Nerven werden plötzlich *angegriffen,* oder sanft und ruhig *fortgezogen,* oder *erhöht* und ausgebreitet oder *niedergeschlagen*'.[139] But since he had used the vibratory theory in the 1760's, before reading the works of Hartley, Priestley and Webb, one can only conclude that he had heard of this old Newtonian conception in some other work, probably in one of the works on musical acoustics which he read in those years. For writers on acoustics often (with some justice) compared the ear's response to musical sounds with the behaviour of the vibrating stringed instrument. But in the case of the ear, as with other organs, it is not the nerves, but other parts such as the auditory hairs, which vibrate.

Herder thus favoured the vibratory theory of the nerves throughout his life, even although it was originally a mechanistic conception (as used by Hobbes, Hartley and others); it probably appealed to his intensely musical nature. He used it in conjunction with the theories of electricity, nervous expansion and contraction, etc., in a characteristically eclectic fashion, with little or no regard for the exact observations of Haller.

(v) Haller's theories

As Reimarus observes, it was very fashionable in the second half of the eighteenth century to provide a physiological basis for psychological theories in general (especially in the British empirical school and the French materialist school, and those who were influenced by them). Reimarus writes:[140]

> Denn seit Priestley in seiner Vibrationstheorie der Welt eine Erklärung der kompliziertesten psychologischen Prozesse gegeben hatte, galt es . . . für modern, psychologischen Abhandlungen ein physiologisches Mäntelchen umzuhängen.

In this respect, Herder was following an established tendency of his age, which saw the appearance of numerous 'physiological' psychologies, whence he himself drew many ideas for his own varied system.

In 1772, he was again studying physiology, thus resuming his earlier studies of 1769, for he writes to Hamann in August of that year, referring in some detail to Unzer's then recently published study of physiology, and to the heart-muscle in particular.[141] It also appears from his later writings that, at various times, he studied Mead,[142] Glisson,[143] Metzger,[144] Platner,[145] Prochaska[146] and Michelitz[147] on the nerves especially, as well as the other writers already named.

But the greatest influence upon his ideas on this subject were the two great physiological works of Albrecht von Haller, which he mentions again and again. R. T. Clark declares that he read Haller's works around 1774,[148] and claims that this influence, along with that of Hartley and Spinoza, was in great measure responsible for leading him out of his Bückeburg religious phase into his mature period.[149] Clark also says that the main difference between the 1770 and 1778 versions of the *Plastik* arises because Herder read Haller's works in the interval between the two versions, and he also explains the difference between the 1774/1775 and 1778 versions of the essay on psychology by the same circumstance.[150] He adds that Herder first mentions Haller as a physiologist in the *Älteste Urkunde* of 1774.[151]

Herder, however, already lists Haller under the heading 'Physiologie' in his notes to Kant's lectures in the early 1760's,[152] and he refers explicitly to a section in Haller's work on physiology in the 1769 notes for his *Plastik*, as published by Suphan: 's. Hallers Physiol. von der *tela cellulosa*'.[153] He calls Haller 'ein großer Physiolog' in a letter to Lavater in 1772,[154] and, already in 1771, he writes to Merck as follows: 'Ich habe . . . seine [i.e. Haller's] neuen Theile von Physiologie (Sinne, Seelenkräfte, und Oekonomie des Lebens) durchstudirt. . . '.[155] All this shows that Clark is quite wrong in the dates he gives for Herder's study of Haller, and that, since he studied his works between 1769 and 1772 (if not even earlier), before and at the very beginning of his Bückeburg period, they cannot be so readily seen as a powerful new incentive leading him out of his religious phase and into his mature period, as Clark claims.[156] It is obvious, therefore, that Herder did not come upon Haller's work as a sudden revelation; Haller was only one of many physiologists whom he studied from his Riga years onwards, and he happened to find the vitalistic triad of 'Elasticität', 'Reizbarkeit' and 'Empfindung', as he calls Haller's three 'vires', a more convenient basis for his own general, metaphysical vitalism of gradually ascending degrees of conscious 'Kräfte' than the other theories he had hitherto encountered.

After studying Haller in 1771, he writes to Merck: 'Ich habe . . . meine Hochachtung gegen diesen großen Mann, trotz aller Mühe, nie zum Enthusiasmus aufschwingen können'.[157] This would be in keeping with the fact that he paid little attention to Haller's own observations and conclusions, but simply used them eclectically, along with other conflicting theories, as part of his own general vitalistic philosophy of mind and body. For Haller not only showed that the functions of the nerves cannot be described in terms of vibrations, as Herder believed; he also declared that they are not subject to expansion and contraction, or of an elastic nature,[158] whereas Herder on several occasions continued to say that they are. Besides, Haller denied that nervous activity is electrical, since he believed that electricity would not remain in the nerves, but disperse itself throughout the body,[159] whereas Herder declared that the vital principle is of an electrical nature. And Haller had explained the action of the nerves by the nervous fluid hypothesis, which Herder rejected as such in the *Ideen*, likewise ignoring Haller's remarks upon the cerebral cortex. He also failed to understand what we should call irritability (Herder's 'Reiz' or 'Reizbarkeit', the ability to react to stimulus); for unlike Haller, he fails, especially in his psychology essay of 1778, to distinguish clearly between irritability, which is common to all living matter, and what we should call contractibility, encountered in fibres, muscles, etc., and he seems to apply his 'Reiz' or 'Reizbarkeit' indiscriminately to the lowest manifestations of life and to the 'Fibern' or 'Fasern' of muscles, etc.[160] Furthermore, he believes that 'Elasticität', 'Reizbarkeit' (or 'Reiz') and 'Empfindung', as he treats them in the *Ideen* and in the essay of 1778[161] are three grades of physiological (or even psychic) activity, which differ only in *degree*, and which contribute to one another in an ascending progression from the lowest reactions of (living) matter to the most advanced mental activity: 'Das Resultat der Reize wird Trieb; das Resultat der Empfindungen, Gedanke'.[162] But as one critic correctly observes, Haller believes that irritability and sensibility are quite separate and discontinuous phenomena, each associated with different physiological reactions.[163] For Herder, they are ascending functions of a single psychological rather than physiological process.[164] 'Reiz' is for Herder neither a physical nor a physiological phenomenon in the strictest sense; it is simply an ingredient of his basically metaphysical, Leibnizian psychology, lending it outwardly a physiological and scientific colouring.[165] Thus Herder did no more than add a misinterpreted version of Haller's physiology, in the 1778 version of his essay on psychology, to his own vitalistic, anti-faculty theory of psychology. For it may be recalled that, even in his 1769 sketch on planetary souls, he had already used the terms 'Kraft' and 'Monas', following Leibniz's metaphysical vitalism, to describe the souls of both man and the planets. Haller's 'vires' were merely added to this a few years later.

Haller had quite simply distinguished, according to his observations, between the following physiological processes – between the irritability of all living tissues (including the 'Fibern' or 'Fasern' to which Herder so often refers), the contractibility of muscles, which draw themselves together under external stimuli, and the sensibility of the nerves, which, as we have seen, he explained by the old theory of a nervous fluid.[166] Herder called these 'Elasticität', 'Reizbarkeit' and 'Empfindung' in the *Ideen*, as we have seen, and treated them, as he had done with 'Reiz' and 'Empfindung' in 1778, as gradually ascending degrees of psychic activity, as a means of bridging the dualistic gap between mind and body, and between emotion and reason, whereas Haller had related them to definite physiological functions of the body, in keeping with the earlier studies of Harvey,[167] Glisson[168] and others on irritability. But because Haller called them 'vires' ('vis contractilis', 'vis insita musculi', 'vis nervosa'[169]), Herder could at once label them as mysterious 'Kräfte', and use them as additions to his growing repertoire of obscure psycho-physical, vitalistic agencies, which already included vibratory 'Kräfte', forces of expansion and contraction, an inner 'ether', magnetism, etc. In his psychology essay of 1778, he also adds to his collection the purely physical phenomenon of 'Elasticität' – the ability of physical bodies to recover their size and shape – citing it in a list of *physical* 'Kräfte',[170] while in the *Ideen*, he applies the word to *physiology*, to the 'Fasern' of living bodies, apparently regarding it as equivalent to Haller's 'vis contractilis' manifest in all tissues.[171] (In the 1778 essay, he refers only to 'Reiz' and 'Empfindung', so that 'Reiz' here seems to do duty for two of Haller's three 'vires', for the 'vis contractilis' and the 'vis insita musculi'.) He thus completely misunderstood Haller, and ignored almost everything of scientific value in his work. There is no point in citing all his references to Haller, which are most frequent in the 1770's, for on almost every occasion, he is only talking emotionally about undefined 'Kräfte'. He used them to overcome traditional dualism, in appearance at least, so that he could introduce both empirical and metaphysical arguments at will. But in the main, his vitalistic psychology, with its 'Abgrund innerer dunkeln Kräfte',[172] inclines much more to speculative metaphysics, in the tradition of Leibniz, than to empiricism, and it has been greatly overrated by critics. As Herder uses them, Haller's three 'vires' are far closer to such metaphysical schemes as Aristotle's 'vegetative, sentient and rational souls'[173] (which he must have encountered in Huarte's work,[174] if not in Aristotle's own writings), than to truly physiological and scientific psychology.

(vi) Conclusion

Having adopted Haller's 'vires' in modified form, Herder took the further step of reducing them to one common factor, calling them 'sinnliche Darstellungen Einer und derselben *Energie der Seele*'.[175] Curiously enough, certain modern psychologists have used the idea of 'behavioural energy' as a model for the mind. But unlike Herder's theory, the modern theory does not presume to say that such energy actually exists as a psychic agency behind thoughts and actions, as a qualitative conception akin to that of the soul, but only uses 'energy' or 'force' as a convenient descriptive *model* for the mind. (It is not even the same as the quantitative physical idea of energy, although the workings of the body certainly can be described in terms of work, energy, etc. – but the latter procedure is only applied physics, not psychology.) We may here recall the parallel difference in biology between Herder's explanatory vitalism and Blumenbach's scientifically sounder descriptive vitalism, and in physics, between Herder's qualitative 'Kraft' and Boscovich's quantitative or relational conception. But even the modern psychological theory shares many of the defects of Herder's 'Kraft' or 'Energie'. One modern scientist criticises it as follows:[176]

> Energy models, by lumping together diverse processes which affect the strength of behaviour, can lead to an over-simplification of the mechanisms underlying it, and distract attention from the complexities of the behaviour itself.

The same writer adds of these models: 'They have been strangely sterile in leading to bridgeheads with physiology'. He then concludes of the whole theory: '. . . it seems possible and preferable to formulate behaviour theories in which concepts of energy, and drives which energise behaviour, have no rôle'.[177] All this applies *a fortiori* to Herder's 'Kraft'. While giving the appearance of physiological explanation, it really over-simplifies behaviour and distracts our attention from its complexities, and is, in fact, quite remote from scientific physiology.

Herder's psychological vitalism thus shares the defects of his biological vitalism. But it also shares with it the limited advantage that it helped to counteract the crude mechanistic theories of the age, by emphasising that the mind, like the organism as a whole, is not simply the inert recipient of outside stimuli. We now know, in fact, that 'the central nervous system is not normally inert, having to be prodded into activity by specific stimuli external to it. Rather it is in a state of constant activity – a state supported primarily by the non-specific effects of stimuli acting through the brainstem reticular system'.[178] In this sense alone can scientific psychology admit something akin to spontaneity.

Herder writes in his *Älteste Urkunde* in 1776, referring to Haller's physiology in support of his statement:[179]

> Da blitzt Licht! da strömt Glut! das Herz schlägt, Gedanke und Wille wandelt; tausend Düfte, Regsamkeiten und Kräfte, die uns durchwehen, treiben und – sonderbares Wunder! – sich in sich zur Einheit finden, fühlen: *ich bin Kraft*!

These words reveal another major factor in his psychological vitalism. He wished to infuse life and subjective content into the abstract world of Enlightenment psychology, and to appeal to the senses and emotions as well as to the reason. His 'Kraft' provided an excellent expression for this urge, and, as such, it also symbolises the feelings of the Storm and Stress generation. But Herder himself treated it as a reality, not as a symbol, and he superimposed upon it the purely physiological 'vires' of Haller, so that only confusion resulted. His psychological vitalism is much more permeated by emotional enthusiasm than are either his biological or his physical theories, and it accordingly bears even less relation to empirical science than they do.

(d) The functions of mind

(i) Herder's attack on faculty psychology

It has been said that Herder set out to attack 'faculty psychology' as propounded by earlier thinkers.[180] But under this heading there fall a number of distinct ideas, which ought to be clearly distinguished from one another. For the word 'faculties' can be used to designate firstly, the ill-defined agencies with which physicians of later antiquity and of the Middle Ages peopled the body, secondly, physical compartments of the brain (as discussed in the preceding section), and thirdly, in a more modern sense, logically separate divisions of the mind. As it is important that these senses should not be confused, something should be said about the biological sense of the word before Herder's theories on the functions of the mind itself are discussed.

R. T. Clark points out that Haller, with his 'vires', rendered the great service of reducing to only three the hosts of 'vires' by which medieval physicians believed the body to be tenanted. He considers this achievement as a severe blow to 'faculty psychology'.[181] But although, as Clark points out, Aquinas had postulated 53 'vires', which he divided into 'vires superiores' such as the will, and 'vires inferiores', such as life and the senses, Haller was concerned only with the 'vires inferiores', with purely physiological or biological categories, and he had nothing to say about faculty *psychology* as such. On the other hand, the eighteenth-century Wolffian faculty psychologists were not interested in biology or physiology at all, so that Haller's achievement bears no direct relation to Herder's supposed refutation of Wolffian ideas. Besides, Herder's criticisms of Wolffian faculty psychology date from a time before he had studied the works of Haller in detail.

It was Galen who introduced the doctrine of faculties into physiology, postulating no less than 60 different varieties of 'faculty', 'dynamis', 'virtus' or 'vis' (as they were variously called) as residing in the human body.[182] As Joseph Needham points out in his history of embryology, this was 'nothing more than a concise statement of the phenomena [e.g. digestion, heartbeat, sleep, etc.] themselves'.[183] Haller had described three hitherto little understood physiological functions, but by calling them 'vires', he added no more to our understanding of them than Galen had done with his 60 functions; his observations alone were of value. Moreover, Haller's achievement was not such an innovation as Clark seems to suggest, for men such as Giovanni Argenterio of Castel-Nuovo had already impugned Galen's system in the sixteenth century, and reduced Galen's faculties not just to three, but to one. Argenterio 'stated that these spirits [i.e. faculties] were purely imaginary things, and that a single one was sufficient to explain the manifestations of life'.[184] Besides, numerous other vitalists before Haller had been content with one 'vis', for example Stahl, C. F. Wolff, and others. Herder, in declaring that Haller's 'vires' are basically one, was simply following such earlier biological precedents. But he thereby fell into the error of lumping together in name physiological functions which Haller had shown to be separate in reality.

Although in the Middle Ages, the doctrine of faculties encompassed all known functions of mind and body alike, it divided after the Renaissance into a medical or biological branch, in the tradition of Galen, and a psychological or rather philosophical branch. Herder also at an early date reduced to a common denominator the faculties of the Wolffian school of philosophical psychology, again following earlier precedents. No doubt this latter step encouraged him when he later reduced Haller's 'vires' to one, for, as we have seen, he regarded them as psychic (i.e. psychological) rather than biological agencies in any case. Thus, the two *reductiones ad unum* are indeed parallel, but only the former can be described as an attack on faculty *psychology* as such, which, by Herder's day, had completely lost its original contact with medicine and biology, with the comprehensive medieval scheme of faculties which had covered all the functions of the mind and the body.

Herder disliked the psychology of the Enlightenment philosophers in so far as it tended to ignore the senses and the data of experience, and in so far as it portrayed the mind as essentially static. Mental faculties, particularly sensation, cognition and volition, are for him not finally distinct abilities of the mind; they are only *functionally* different, i.e. they are various expressions of a basically unitary mind, whose character is revealed only in action, development, or 'Würkung', and they can combine or shade off gradually into one another.[185] He writes in his language essay of 1770:[186]

> Alle Kräfte unsrer und der Thierseelen sind nichts als Metaphysische Abstraktionen, Würkungen! sie werden abgetheilt, weil sie von unserm schwachen Geiste nicht auf einmal betrachtet werden konnten. . .

This excellent observation, which still reflects Herder's more empirical views of the fourth *Kritisches Wäldchen* of the previous year, could have been the starting-point for a complete rejection of *all* 'Kräfte' in psychology. Instead, Herder himself introduced and hypostatised further 'Kräfte' in the following years.

At this point, it should be recalled that he uses the word 'Kraft' in psychology, as in the *Fragmente,*[187] for example, before studying Haller's works in any depth. He uses it in a dynamic, Leibnizian sense, as part of a general metaphysical vitalism which he borrowed chiefly from Leibniz himself, and he added Haller's 'Kräfte' to it only at a considerably later date. This general metaphysical vitalism is more apparent in the 1774 and 1775 versions of his essay on psychology – Clark rightly notices that they represent 'little more than the purely metaphysical phase of eighteenth-century psychology'[188] – but, already in the 1775 version, Haller's 'Reiz' figures fairly prominently, until, in the final version of 1778, Haller's ideas become the basis of the whole essay. The metaphysical premise of a broad, Leibnizian vitalism, however, is the same throughout.

For the remainder of his career, Herder continued to insist, as he did in 1770, that the traditional faculties are only abstractions from human behaviour. He had first said this as early as in 1767: 'Die Natur der menschlichen Seele verkennet überhaupt in ihren Würkungen die Abtheilung der Kräfte, wie die Philosophen sie in ihr abgetrennet.'[189] And in the fourth *Kritisches Wäldchen* of 1769, he rejects F. J. Riedel's 'Grundkräfte', the supposedly permanent and independent faculties for perceiving beauty, truth, and goodness. In this case, he is thoroughly justified, not because he substitutes *one* 'Kraft' for Riedel's three, but because he replaces Riedel's threadbare abstractions with an empirical analysis of how our judgements of beauty, etc., are developed by habit from our sense-experience.[190] (Baumgarten, who emphasised the rôle of the senses rather more than most other Enlightenment psychologists, probably influenced him here.) On numerous other occasions he repeats his assertion that the traditional faculties are only actively expressed modifications of the one basic 'Kraft' of the mind (or soul, as he usually calls it), and that we are not justified in regarding the mind as fragmented or compounded of static, discrete divisions. A list of references to such passages, from 1770 to the time of the *Ideen*, should suffice here, since nothing new is added to what has already been described.[191] The value of all these observations, let it be repeated, lies not in Herder's rejection of several 'Kräfte' in favour of one, but in the corollary that all mental faculties are simply different responses of the individual to the data of experience. This can lead to truly progressive and empirical observations, as when he says in the *Ideen*:[192]

> Die Vernunft ist ein Aggregat von Bemerkungen und Uebungen unsrer Seele; eine Summe der Erziehung unsres Geschlechts, die, nach gegebnen fremden Vorbildern, der Erzogne zuletzt als ein fremder Künstler an sich vollendet.

A further advantage of Herder's opposition to faculties was that it made it possible for him to envisage certain kinds of behaviour which cannot adequately be described within traditional faculty psychology. He is fond of describing such 'mixed' reactions, and of showing how emotion can contribute to apparently rational processes of thought. Such ideas are especially valuable when he discusses the psychology of the artist. Already in 1764 or 1765, he speaks of 'die Logik des Affekts'.[193] In 1767, he talks of 'anschauendes Erkennen', and says that artistic geniuses can think so well in terms of 'Anschauung', 'daß es fast scheine, daß sie mit der Vernunft empfänden'.[194] And in 1769, he notes that the genius can perform several rational steps in one, although strict logic must not omit any of them[195] (compare Mephisto's remarks to the 'Schüler' in *Faust*), while in his essay on Ossian, he speaks of a 'sinnlicher Verstand und Einbildung' which manifests itself in folk-literature.[196] Observations of this kind were then relatively new, although there are certain precedents for them in the works of Rousseau and Hamann; they greatly influenced the 'Stürmer und Dränger', including the young Goethe. They are a necessary feature of the period of 'Empfindsamkeit', but they only became possible through a weakening of the traditional philosophical faculty psychology, which had tended to ignore such 'mixed' processes of thought.

Related to all these observations are Herder's remarks, in his essay on language, concerning 'Besonnenheit', which he names as the distinctive feature of the human mind, and which makes the use of language possible. This 'Besonnenheit', which becomes active and conscious 'Besinnung' as man learns to use language, consists in an ability to collect and learn from the data provided by the various senses, which are themselves mediated by hearing, the 'middle' sense.[197] This, as Herder himself betrays, is simply a modern version of the old Aristotelian doctrine of a *sensorium commune*.[198] The data of experience are retained in the human consciousness, which has the ability to reflect upon them, to isolate any given impression, to generalise its experiences, and to translate them into a common language. But it is his remarks on the senses in particular which concern us here. He writes:[199]

> Wie hängt Gesicht und Gehör, Farbe und Wort, Duft und Ton zusammen? Nicht unter sich in den Gegenständen; aber was sind denn diese Eigenschaften in den Gegenständen? Sie sind bloß sinnliche Empfindungen *in uns*, und als

> solche fließen sie nicht Alle in Eins? Wir sind ein denkendes *sensorium commune,* nur von verschiedenen Seiten berührt – da liegt die Erklärung.

He again refers to this doctrine in his *Metakritik*: '. . . unser Inneres wird ein fortwährendes *sensorium commune* aller Sinne.'[200] Thus, he reduces the senses to a common factor, just as he had done with mental faculties in general, and with Haller's 'vires' some years later. He believes that this basic unity of the senses distinguishes us from the animals, with their unintegrated instincts or 'Triebe'. One may conjecture that the same idea must have helped to produce his early and important theory of the 'blending' of sight and touch as the child develops; for such a theory is possible only on the assumption that the senses are closely interrelated. An ancient doctrine thus provided Herder with a new weapon for attacking fragmented models of the mind, and helped him to reach conclusions which, as in the theory of 'blending', are still of value today.[201]

But despite all Herder's censures of faculty psychology, he couched his remarks on human 'Glückseligkeit' in the *Ideen* in such traditional phraseology that they elicited the following criticism, which is perhaps a trifle exaggerated, from one of his biographers:[202]

> Aber innerhalb dieses Gefühls [i.e. 'Glückseligkeit'] unterscheidet er Sinnlichkeit, Einbildungskraft, Verstand, Empfindungen und Triebe als Beginn oder . . . richtiger als Darstellungen des Willenlebens, ganz wie die gelernte Schulpsychologie sie unterschied. Ganz wie ihr ist auch ihm ein jedes dieser Seelenstücke eine reale Kraft; . . . so wenig vertieft er die Einsicht in den Vorgang der Seelenprozesse.

In the *Journal* in particular, he uses the conventional language of mental faculties:[203]

> Es giebt also eine eigne Gestalt des Gefühls von Wahrscheinlichkeiten, nach dem Maas der Seelenkräfte, nach Proportion der Einbildungskraft zum Urtheil, des Scharfsinns zum Witze, des Verstandes zur ersten Lebhaftigkeit der Eindrücke, u.s.w. . . .

In his scheme of education in the same work, as well as in parts of the *Ideen*, the *Metakritik* and other works, he again uses the conventional language.[204] But we should add, in all fairness, that he usually uses such terms only to designate functions of the mind in relation to its development from sense-experience to the higher levels of reason and will.

Let us pause at this point for a few words on sources. It is tempting to conclude that Herder took his arguments against faculty psychology from the school of Locke. A historian of psychology writes of Locke as follows:[205]

> The mind is conceived of as having certain 'powers' native to it. But there is only the one agent or person, who has ideas through the use of all the powers or faculties. These latter are simply its ways of acting. It may be aroused in the way of sensation or perception, in the way of memory, of imagination, of will, etc. This is Locke's refutation of the 'faculty psychology' of Scholasticism, afterwards continued by [Christian] Wolff.

It might therefore be argued that Herder simply reapplied Locke's arguments, which he doubtless heard in Kant's lectures, to the neo-Scholastic faculty psychology of Wolff's school. On the other hand, he disagreed with Locke's contention that the child's mind is like a blank sheet before it has been written upon[206]; Locke's picture of the mind was too inert and passive for Herder, who believed that the spontaneous principle within the mind is just as important as the impressions it receives from without. Herder's views are here closer to those of Leibniz, and indeed of Christian Wolff himself, than to Locke. Besides, as Ernst Cassirer observes:[207]

> The division of the mind into various faculties, and their definition and nomenclature, are for Wolff chiefly a matter of presentation; actually, however, as he repeatedly emphasises, all these faculties are not independent forces, but only the various tendencies and expressions of a single basic force, that of representation.

This being the case, it might even be said that, in denying that the mind is composed of rigidly separate faculties, Herder is not attacking Wolff but merely reaffirming the latter's initial assumption (derived in turn from Leibniz) for the benefit of those who were tempted to take the nomenclature of distinct faculties over-literally.[208]

Herder's attacks on faculty psychology certainly cannot be applauded in every respect. Firstly, his idea that a single 'Kraft' lies behind all mental activities encourages vagueness.[209] And there is a second major objection to this line of argument, especially when he directs it against Kant's later philosophy. One critic supports him against Kant with the following observation:[210]

> Kant . . . based his analysis of 'reason' in his *Critique of Judgement*, 1790, upon three 'fundamental faculties' which are essentially identical with those accepted by Riedel. He contradicted in effect the idea on which rested Herder's philosophy of genetic individuality.

But such a statement rests on the false assumption that, if we say certain functions of the mind must always be *logically* distinct, as Kant did in his critical philosophy, we thereby deny that the individual can develop *psychologically,* from the empirical basis of experience. Kant's faculties are logically distinct functions in epistemology, not innate psychological compartments of the mind, such as less meticulous analysts like Riedel, who failed to distinguish clearly between the logical and the empirical, between epistemology and psychology, had postulated. Herder himself likewise failed to distinguish between psychology and epistemology.[211] In fact, he writes as follows in the *Metakritik*: 'Das unziemende Wort *Kritik der Vernunft* verliert sich also in das anständigere, wahre: *Physiologie der menschlichen Erkenntnißkräfte*'.[212] He therefore believed that the methods of logical epistemology and of empirical science are mutually exclusive. But logic and empirical investigation can and should be complementary. Epistemology analyses the logical condition, limitations and forms of knowledge, whereas empirical psychology examines the actual mental processes and behaviour of the individual in relation to the causal world of experience.

Kant used the language of faculties in epistemology, where it properly belongs; and although, from the point of view of psychology, Herder was right to insist that the 'faculties' are only abstractions from behaviour, and to realise that they are thoroughly misleading if treated as rigidly separate 'Kräfte', actually existing in independence of one another within the mind, he would have been justified in using the same argument to attack Kant's epistemology only if the latter had set itself up as a substitute for that very necessary empirical and scientific psychology which Herder himself had helped in some measure to promote. All this confirms that, in Herder's day, empirical psychology and abstract philosophy were still imperfectly distinguished. They continually encroached upon one another's provinces, and, as in Herder's own philosophy, confusion was often the result.

(ii) Remaining features of Herder's psychology

Herder's psychology was systematic only in so far as it rested upon Haller's vitalistic triad of 'Kräfte', which, as Herder interprets them, lend a certain unity to his essay on psychology of 1778, and upon his critique of faculty psychology, which runs as a characteristic theme throughout all his writings on the subject. Various of his isolated utterances, however, touch upon other themes of interest in the history of psychology, and it is these which will now be examined.

Clark speaks of Herder's supposed 'associationism', which he borrowed, with his own variations, from the works of Priestley and Hartley.[213] In an interesting chapter of the *Ideen*, Herder writes of the thought-processes, and of those of the mentally deranged in particular:[214]

> Nicht wie die Fächer des Gehirns liegen, combinirt er [i.e. der Wahnsinnige], selbst nicht einmal wie ihm die Sensationen erscheinen: sondern wie andre Ideen mit seiner Idee [i.e. obsession] verwandt sind und wie er jene zu dieser nur hinüber zu zwingen vermochte. Auf demselben Wege gehn alle Associationen unsrer Gedanken: sie gehören einem Wesen zu, das aus eigner Energie und oft mit einer sonderbaren Idiosynkrasie Erinnerungen aufruft und nach innerer Liebe oder Abneigung, nicht nach einer äußern Mechanik, Ideen bindet.

He does not specify the principle according to which we associate ideas, whether according to repetition, synchronism, succession, similarity, contrast, contiguity, interest, etc. But he makes it clear that he does not believe that associations are physiologically determined ('nicht wie die Fächer des Gehirns liegen'), or that they originate from external, empirical associations of experience ('selbst nicht einmal wie ihm die Sensationen erscheinen . . . nicht nach einer äußern Mechanik'). In fact, this is *not* that 'empirical associationism' which Clark says he acquired from Hartley and Locke,[215] nor does it reflect the physiological (and materialistic) criteria of Hartley and Priestley. Hartley had written:[216]

> . . . the Powers of generating Ideas, and raising them by Association, must also arise from corporeal Causes, and consequently admit of an Explication from the subtle Influences of the small Parts of Matter upon each other.

On the contrary, the whole purpose of the above passage in the *Ideen* is to show that the mind has its own peculiar nature, that an 'innerer geistiger Mensch'[217] is formed, quite distinct from the visible body, and the chapter culminates, in truly dualistic style, in an argument for immortality founded upon the analogy of sleep.[218] If one had to find a designation for it, one might describe this as idealistic associationism, similar only in name to the empirical equivalent of the British associationist school.

Some of Herder's earlier utterances, however, more closely resemble those of the associationists. He stresses the role of habit, just as Hartley and his school had done, in the fourth *Kritisches Wäldchen,* although he had not read Hartley's work at that time. He says that our feeling for beauty results from 'ein Habituelles Anwenden unsres Urtheils auf Gegenstände der Schönheit',[219] and, in a sermon of 1772, he goes so far as to say: 'Unsre Denkart ist ja nichts, . . . als die Summe der Eindrücke, der Vorstellungen, der Gewohnheiten unsers Lebens'.[220] And in Part II of the *Ideen*, he declares: 'Die Vernunft ist ein Aggregat von Bemerkungen und Uebungen unsrer Seele'.[221] Besides, we earlier noticed some other features of associationist psychology in his remarks on how data from the various senses are combined (the equivalent of what was called 'simultaneous association') and on the interaction of different modes of thought or faculties. But all these remarks are thrown out without system, and they contradict that idealistic theory of association which appears in Part I of the *Ideen*. No complete and consistent theory of association can be found in Herder's works.[222]

Clark refers to Hartley as 'one of the three men whose work may be said to have forced Herder out of his traditional uncertainty into the clarity of his Weimar period'.[223] Yet Herder knew Hartley's theory of association already in 1772, near the beginning of his Bückeburg period, and he mentions it explicitly in a letter to Merck.[224] And we have seen that his theory of association, as expounded in the *Ideen*, in 'the clarity of his Weimar period', is much less empirical than his earlier remarks in 1769 and 1772 on the same topic. It seems, in fact, that Clark has much overrated the influence of Hartley, as well as that of Haller, upon Herder's thought.

Another interesting feature of Herder's psychological ideas is that he recognises the role of subconscious mental factors. In an earlier version of the *Ideen*, Book VIII, he says of the philosopher: '. . . er muß immer noch eine Menge dunkler Vorstellungen zugeben, die gleichsam im Grunde der Seele liegen, um immerwährend in unsre Neigungen und Urtheile unvermerkt aber desto kräftiger zu wirken'.[225] Such ideas came to him from Leibniz, particularly from the posthumous *Nouveaux essais,* which he read in 1765.[226] Hamann, in a letter to Herder in which he informs him of the publication of this important work,[227] already refers to Leibniz's 'perceptions insensibles' (or 'petites perceptions'), which undoubtedly influenced Herder's conception of the subconscious, as well as his idea that the transitions from sensation to emotion, reason, and will, etc. are gradual and almost imperceptible.

Other striking aperçus of Herder's include such remarks as the following: 'Im Traum und im Spiel zeiget sich der Mensch ganz, wie er ist; in jenem aber am meisten'.[228] He later speaks of our 'doppeltes Ich' in relation to dreaming, distinguishing 'den träumenden und den Traumanschauenden Geist, den Erzähler und Hörer'.[229] We have already discussed a further remarkable aspect of the mature Herder's ideas on the psychology of perception. This was his theory of the 'Bild', which was compared with modern 'Gestalt' theories in the earlier sections of this work on perception and on optics. It appears in the *Ideen*[230] as well as in the essay *Über Bild, Dichtung und Fabel*.[231] And it should also be remembered that, for Herder, the individual personality is constantly developing. Around 1773, for example, he says: 'Das Ich ist nie ganz'.[232] All psychology, as he sees it, must be developmental. (Such ideas, of course, can be traced back largely to Leibniz's influence.) Finally, some mention must be made of Herder's division of character-types according to 'Innigkeit' and 'Ausbreitung' in the 1774 version of his essay on psychology. This is not an original anticipation of the modern concepts of introversion and extraversion, although the two sets of concepts are certainly in many ways parallel. Herder's antithesis goes back to earlier ideas, such as Burke's distinction between aesthetic emotions according to expansion and contraction (originally of the nerves), and perhaps also to an observation of Pascal, which Herder himself relates to his own theory in 1778:[233]

> deux sortes d'esprits, l'un de pénétrer vivement et profondément les conséquences des principes – l'esprit de justesse: l'autre de comprendre un grand nombre des principes sans les confondre, l'esprit de géométrie – was meistens auf meine erste Eintheilung von Innigkeit und Ausbreitung der Geistesgabe hinausläuft.

(e) Conclusion

From the above study of Herder's psychology, it emerges that, as in nearly all other areas of his thought, the concept of 'Kraft' greatly detracted from the scientific value of his ideas. His physiological and psychological 'Kräfte' are predominantly qualitative and metaphysical, and since the mature Herder disliked most attempts to localise mental functions within the body, they can rarely be reduced to exact physiological processes. In his largest single contribution to psychology, the essay of 1778, he used Haller's physiological 'vires' in an attempt to overcome the dualism of mind and body, and to get beyond the faculty psychology of the Enlightenment, with the more specific aim of showing that an unbroken continuity exists between all forms of consciousness, from the most rudimentary physiological reaction to those involving sensibility, cognition and the will. But even in these aims, he was only partially successful, while his failure to understand Haller's exact observations, and the chronic vagueness of his metaphysical vitalism, jeopardised those empirical methods which he had set out to apply to psychology in his Riga years, but which he had already largely abandoned for a speculative, Leibnizian approach in the 1774 and 1775 versions of his psychology essay. It is to his earlier works, such as the fourth *Kritisches Wäldchen* and parts of the language essay of 1770, and to various aperçus scattered throughout his works, such as the *Ideen* and the essay *Über Bild, Dichtung und Fabel,* that we must look for his best contributions to psychology. For in his most systematic work on the subject, the essay of 1778, his characteristic endeavours to combine conflicting ideas and methods by means of the 'Kraft' concept ended, as usual, in contradiction and obscurity. Those who have emphasised only one side of his aspirations, such as his advocacy of empirical methods, have created too one-sided a picture of his complex and problematic nature.

3. Sociology and social anthropology

Sociology does not figure as a distinct discipline in Herder's writings; indeed, it can scarcely be said to have existed as such in his day, far less as an established branch of empirical science. But several topics now associated with this subject, such as theories of cultural determinism, development, holism, dialectics and laws of social change, are indeed covered in his works, especially those on the philosophy of history, and they have already been discussed in the appropriate sections of the present work. Many of these ideas were indeed novel in Herder's age, and for this reason, one can agree with W. H. Bruford that 'it is undeniable that Herder is the first German sociologist of note'.[234] The essay on language also raises some interesting sociological questions; the psychological premise of his theory of language, the idea of 'Besonnenheit', was touched on in the previous section, and since the whole theme is bound up with the question of origins, it was also discussed in the second chapter of this work in connection with the so-called 'genetic method', where it was pointed out that the problem of the origin of language is now recognised to be beyond the compass of empirical investigation, since no evidence is available on it, and that Herder's merit throughout the essay resides rather in the naturalistic principles he employs than in the theoretical conclusions he reaches. His political theories, as enunciated in the *Ideen* and the *Humanitäts-Briefe* in particular, fall outside the scope of this study, since they are in no way related to science, but simply reflect his dislike for the politics of his age and his preference for more liberal forms of government than prevailed at the time.[235]

Few other topics of interest to the philosopher and historian of science arise in Herder's works so far as scientific sociology is concerned. He does, however, have a good deal to say on what is now called social (or cultural) anthropology. The following words from his notes for the *Journal,* apart from their didactic and Rousseauistic overtones, show that his approach to the study of peoples has much in common with that of modern anthropologists:[236]

> *Ein Buch zur Bildung der Völker* fängt bei lebendigen Beispielen, Gewohnheiten, Erziehung an, und hört bei dem Schattenbilde trockner Gesetze auf. Es studiert alle Völker, und die lebendigsten insonderheit, das sind die wilden, die halbwilden, die gesittet zu werden anfangen.

As Clark observes, Herder followed Kant's essay of 1764, *Versuch über die Krankheiten des Kopfes,* in saying on another occasion that mental illnesses are less common in primitive societies than in those where the division of labour is far advanced, as in modern Europe.[237] Indeed, especially in his earlier years, he regarded the primitive mind as the prototype of the healthy personality, all of whose basic mental functions, particularly the emotions, are fully developed. He writes of primitive peoples in his study of Ossian and the folksong: '– über alle diese Schwächungen des Geistes seligunwissend, erfassen sie den ganzen Gedanken mit dem ganzen Worte, und dies mit jenem'.[238] Like their emotions, their powers of expression are simple, forceful, and healthy. But in utterances like these, it is Herder's emotional interest in primitive poetry rather than his scientific curiosity that is at work.

On the details and sources of Herder's views on descriptive human geography and social and cultural anthropology, with his many excellent sketches of various human societies and cultural phases in the *Ideen,* J. Grundmann's work should be consulted.[239] Since most of his writings on these subjects are purely descriptive, and, in the *Ideen*, related to the ethical standard of 'Humanität', they require no further mention in this study of the history of science. In dealing with Herder's theories of race and physical anthropology we have already discussed all those human phenomena which are relevant to the present theme.

4. Economics and commerce

Herder was always interested in commerce, especially in relation to history. Kant dealt with 'mercantilische Geographie', among other topics, in his lectures on physical geography,[240] and no doubt stimulated Herder's interest in it from an early date. Moreover, Herder spent several of his happiest years in the flourishing Hanseatic city of Riga, where he counted among his friends numerous men who were actively engaged in commerce[241]; it was through the help of some of these that he was able to arrange his voyage to France and his stay in Nantes. And in his library, there were at least 30 volumes on commerce, finance and economics, many of them devoted to the history of commerce.[242]

The first important reference to these subjects in Herder's works appears in the *Journal,* in which he points out that 'Handelsgeist' alone is not enough to establish a nation's well-being, and refers to Holland in particular: 'Da wird man sehen, wie der bloße Handelsgeist den Geist der Tapferkeit, der Unternehmungen, der wahren Staatsklugheit, Weisheit, Gelehrsamkeit u.s.w. aufhebt oder einschränkt . . . Alles ist in Holland zu Kauf. . . '.[243] For in the *Journal,* and the *Auch eine Philosophie* of the Bückeburg period, he attacks modern culture with its mechanisation of life and its deadening effects upon the natural virtues which are most common in primitive societies; he seems to see commerce as part of this harmful influence in the *Journal.* Besides, he later deplores the evil results of discovery and commerce among primitive native peoples, thus adopting the standpoint of Voltaire, Helvétius and Rousseau.[244]

In the *Ideen,* he emphasises the importance of commerce in history, devoting to it a chapter which contains an excellent and concise history of European trade.[245] On this occasion, it is rather the civilising influence of trade, in Europe at least, which he stresses.[246]

But he neither himself suggests any formula for economics, nor does he take any clear-cut stand towards the economic systems of his century, such as mercantilism, physiocracy, and the emergent theory of economic liberalism. He believes that economic law is nothing more than the order of nature,[247] and applies to economic growth his supposed law that less destruction occurs with time in history. He appears to think that competition, with honest attempts at co-operation, will enable commerce to fulfil its true mission of furthering the peaceful interdependence of nations:[248]

> Selbst der Gegenstand des scheinbar-größesten Eigennutzes, der Handel, hat keinen andern als diesen Weg [i.e. co-operation] nehmen mögen, weil er Ordnung der Natur ist, gegen welche alle Leidenschaften und Vorurtheile am Ende nichts vermögen. Jede handelnde Nation Europas beklaget es jetzt und wird es künftig noch mehr beklagen, was sie einst des Aberglaubens oder des Neides wegen sinnlos zerstörte. Jemehr die Vernunft zunimmt, desto mehr muß die erobernde eine handelnde Schiffahrt werden, die auf gegenseitiger Gerechtigkeit und Schonung, auf einem fortgehenden Wetteifer in übertreffendem Kunstfleiße, kurz auf Humanität und ihren ewigen Gesetzen ruhet.

Here, he seems to advocate a broad economic liberalism, without going into details or bringing out the harsher implications of the ethic of competition. In fact, his rather naive views on economics are completely bound up with his ideas of 'Humanität' and gradual progress, and appear to share their ambiguity – i.e. the progress of commerce is governed by natural laws, but it can also be affected by man's varying motives, and is subject to ethical criticism. Presumably, the 'law' of economic progress will operate ever more effectively as the canon of enlightened self-interest becomes more widely accepted.

It is therefore clear that, although Herder believed that commerce is a potent force in human development, he subordinated his views on it to his wider philosophy of history, and contributed nothing to economics as a science. Thus no further attention need be devoted to these subjects here, although some related topics will be dealt with when we come to examine his views on the history of technology and inventions.

NOTES

1 Herder uses psychological criteria, of course, as well as physical ones, to distinguish between man and the other animals. These include the human power to communicate by language (SW V, 95; cf. SW XIII, 369), man's perfectibility (SW V, 99; Rousseau had likewise argued

that perfectibility, or man's ability to develop, distinguishes him from the apes – cf. E. Castle, '*Pater Brey* und *Satyros*', *Jahrbuch der Goethe - Gesellschaft*, 5, 1918, 89), human 'Besonnenheit' (SW V, 100) and sociability or social altruism (SW V, 113-114): all of these criteria are invoked in the 1770 essay *Uber den Ursprung der Sprache*. Man is again unique by virtue of his immortal soul and of the special providence which guides his historical development. The present section, however, is concerned solely with physical distinctions.

2 Cf. Lovejoy 233 pp. 233-234.

3 Cf. Günther 229 p. 30; also Lovejoy 233 pp. 233-236.

4 SW V, 42; also SW XIII, 111-112; cf. SW VII, 80.

5 SW XXXII, 21, *Von der Verschiedenheit des Geschmacks* (etc.).

6 Cf. E. Castle, '*Pater Brey* und *Satyros*', *Jahrbuch der Goethe-Gesellschaft*, 5, 1918, 87-89.

7 Cf. SW XIV, 661 and Macgillivray 234 p. 274.

8 Cf. Rouché 172 p. 222.

9 Cf. Lovejoy 233 pp. 195-196; also Behrens 18 pp. 406-407 for evidence that Herder received Bolingbroke's works in 1774 as a present from the astronomer von Hahn.

10 Cf. SW XXXII, 21.

11 Cf. Lovejoy 96 pp. 177-178.

12 Kant 299 pp. 315-316.

13 Cf. Lovejoy 233 p. 271.

14 Blumenbach 255 p. 141; cf. Günther 229 p. 34.

15 Camper 266 p. 33; cf. SW XV, 186.

16 SW XIII, 115 and 118; cf. also SW XV, 185.

17 Tyson 327 p. 55.

18 SW XIII, 122.

19 Cf. SW XIII, 110, 117, 129, 131, 146 and 151.

20 Cf. Sauter 114 p. 34.

21 SW VII, 74 and SW XIII, 137; cf. also Siegel 179 p. 68.

22 Zimmermann 329 I, 124-129.

23 Cf. Lovejoy 96 p. 175.

24 SW VII, 73-74.

25 Kant 301.

26 Cf. Rouché 172 p. 206.

27 Blumenbach 255 pp. 84-85.

28 Kant 300 pp. 54-55.

29 Hettner 32 pp. 222-223, 19 May 1785.

30 Cf. Hansen 83 (no pagination), who quotes an article on human evolution as follows: 'Es kann schon aus rein statischen Gründen kein Zweifel darüber bestehen, daß für die mit zunehmender Hirnentwicklung parallel laufende Vergrößerung des auf der Wirbelsäule balancierenden Schädels die Aneignung der dauernd aufrechten Körperhaltung die natürliche Voraussetzung gebildet hat'; also Wells 130 pp. 138-139 who observes: 'Professor W. E. Le Gros Clark wrote recently: "In the process of human evolution, the expansion and elaboration of the brain followed, and were perhaps conditioned by, the perfection of the limbs for an erect mode of progression" (*History of the Primates*, London, 1950, p. 72 f.)'.

31 As Rouché 172 p. 206 does, although he admits that the ancients had likewise generally considered man's upright posture to be a distinguishing advantage.

32 SW XIII, 134-135; cf. Camper 264 pp. 15-16.

33 As Rouché 172 p. 206 declares, these additional measurements were probably suggested by some remarks of Blumenbach.

34 Cf. Haddon 230 pp. 31-32.

35 Haddon 230 p. 32.

36 Cf. Caroline 65 I, 53.

37 Cf. Düntzer 23 II, 325 *et seq.*

38 His interest in the subject was probably stimulated by his own frequent illnesses, and his letters, as well as those of his wife, contain innumerable references to illnesses and states of health; he was, in fact, something of a valetudinarian.

39 SW IV, 373.

40 SW IV, 443.

41 SW IV, 443.

42 SW XIII, 267.

43 Cf. Hamann 30 III, 12, Herder to Hamann, 1 August 1772.

44 Caroline 65 III, 223.

45 Cf. SW XIV, 680-681, editor's comments.

46 Herder's MSS S.P.K. D.S.T. Kapsel XXVIII Nr. 6.

47 *Bibl. Herd.* 3 No. 3406 and appendix No. 104.

48 A considerable amount has been written on Herder's psychological theories. On the whole, the relatively recent work of Lehwalder (Lehwalder 94) is the best individual contribution, as it is thorough and well informed, although it deals only with the psychology essay of 1778 and with Herder's theory of 'Empfinden' in particular. The same writer prefixes his work with a useful review of most earlier studies of the subject. From the point of view of the historian of science, the main defect of Lehwalder's work is that it is more concerned with certain metaphysical doctrines than with the growth of scientific psychology (some of Herder's theories are likened to those of Heidegger). Richter 109 gives at the beginning of his work an excellent summary of Herder's psychological ideas, but the rest of the work is mainly concerned with his theories of education. Probst 106 tends to relate Herder's psychology too closely to the wider issue of 'Humanität', a conception which is of little importance for Herder before the time of the *Ideen.* The work of Götz (Götz 78) is good on the whole, but too often relates Herder's theories to those of W. Wundt, whose ideas could appropriately serve as a test of Herder's modernity towards the end of the nineteenth century, but scarcely today. The American critics M. Schütze (cf. Schütze 117) and R. T. Clark (cf. Clark 62 esp. pp. 217-233) are particularly interested in the scientific value of Herder's psychology, but they tend to portray Herder as much more of an empiricist than he actually was. On the shortcomings of Fugate's work (Fugate 144) see my review of it in *Modern Language Review,* January 1969.

49 Cf. SW IV, 56. Fourth *Kritisches Wäldchen,* 1769.

50 SW IV, 383.

51 Baldwin 217 I, 30.

52 SW IV 105; cf. SW XIII, 176.

53 SW I, 397, *Fragmente.*

54 SW VIII, 239. Similar ideas were held by others, apart from Plato, such as Winckelmann, Schiller, Tetens and Shaftesbury (Cf. Probst 106 pp. 54-55), as well as certain medieval thinkers (cf. Strothmann 184 p. 183); Rouché lists Aristotle, Thomism, the Leibnizians, Lavater, Sulzer, Hamann, Oetinger and various others in the same connection. And we have seen in the last chapter that similar ideas, probably influenced by the biologists Harvey and J. T. Needham, appear in Herder's utterances on embryology. The whole pseudo-science of physiognomy grew out of notions of this kind.

55 Cf. Willey 247 p. 142.

56 Cf. Nordenskiöld 237 p. 270.

57 Cf. Probst 106 pp. 60-61: 'In jedem organischen Wesen sieht er eine untrennbare Einheit von Physischem, Psychischem und Geistigem. Daher muß die Psychologie nach seiner Ansicht immer alle drei Komponenten zugleich ins Auge fassen. . . '.

58 SW IV, 105.

59 SW IV, 458.

60 SW XV, 231-232, *Zerstreute Blätter.*

61 SW VIII, 266.

62 SW VIII, 42.

63 SW XIII, 83.

64 SW XIII, 124.

65 SW XIII, 125.

66 Cf. Hartley 283 I, 7.

67 SW XIII, 123.

68 SW XIII, 83.

69 Cf. Herder 31 II, 271, to Scheffner, 15-26 September 1767.

70 SW XIV, 661-662.

71 Huarte 289 p. 54.

72 Cf. Dessoir 223 I, 480.

73 Kant 302 p. 345. Yet according to Herder's notes to Kant's lectures of a year or two earlier, Kant had said of the soul, paradoxically: 'Sie ist an allen Orten des Körpers, ohne ausgedehnt zu sein' (Irmscher 12 p. 72).

74 Cf. H. Hallam, *Introduction to the Literature of Europe in the 15th, 16th and 17th Centuries,* London, 1837-1839, I, 639 and note.

75 Clark 62 p. 224.

76 SW XIII, 81-82, *Ideen.*

77 Cf. his refutation of Descartes' theory of the pineal gland in 1775 as 'mechanisch' (SW VIII, 266).

78 SW XIII, 125.

79 SW XIII, 182.

80 Cf. I. P. Pavlov, *Conditioned Reflexes. An Investigation of the Physiological Activity of the Cerebral Cortex,* Dover Books, New York, 1960 (first publ. 1927), pp. 2 and 219 *et seq.*
81 Thus Haller had in some measure realised the significance of this organ, although he attributed great importance to the medulla as a vital part of the brain (cf. Nordenskiöld 237 p. 237). Besides, Thomas Willis (1621-1675), to whose views on the brain Herder refers in some detail in the *Ideen* (SW XIII, 123), had localised ideas and memory in the cortex of the great brain (Nordenskiöld 237 p. 149) and Gall, whom Herder mentions in 1802 (SW XXIII, 583, *Adrastea*), also saw the cortex as the organ of intelligence (Nordenskiöld 237 p. 311). Malpighi had similar views, influencing the remarkably advanced but long unpublished theory of Swedenborg concerning the cardinal importance of the cortex (Nordenskiöld 237 pp. 161 and 187).
82 SW IV, 38.
83 SW IV, 458.
84 SW XIII, 186.
85 SW XIII, 344.
86 Huarte 289 p. 62; cf. *ibid.* p. 78.
87 SW XIII, 83.
88 SW XIII, 120-121.
89 Cf. Günther 229 p. 38.
90 SW XIII, 122.
91 SW XIII, 121 note.
92 SW XXXII, 23, *Von der Verschiedenheit des Geschmacks* (etc.).
93 SW XIII, 73.
94 SW XIII, 77.
95 SW XIII, 130.
96 SW XIII, 180.
97 SW XIII, 182.
98 Cf. Günther 229 p. 78.
99 Cf. Singer 243 p. 278.
100 Cf. Nordenskiöld 237 pp. 161 and 178.
101 Nordenskiöld 237 p. 186.
102 Haller 280 p. 195.
103 Haller 281 p. 202.
104 Nordenskiöld 237 p. 310.
105 Nordenskiöld 237 p. 323.
106 Varnhagen 53 III, 293, undated essay.
107 Cf. Günther 229 p. 75.
108 Cf. H. Hallam, *Introduction to the Literature of Europe in the 15th, 16th and 17th Centuries,* London, 1837-1839, IV, 70 and Dessoir 223 I, 506.
109 Cf. Cumston 222 pp. 339-340.
110 Bertrand 219 pp. 8-20.
111 SW VIII, 99, early notes for the *Plastik.*
112 SW XV, 167.
113 Cf. Bertrand 219 p. 34.
114 Gelzer 28 p. 114, Herder to J. G. Müller, December 1785.
115 Cf. Zöckler 250 II, 81; Herder mentions Butler in 1781 (SW XI, 205), but does not seem to have been aware of his views on this point.
116 Herder seems to have been more interested in whether man can respond to physical magnetism than in extending the concept of magnetism to cover reactions between living organisms. Kant had considered the former possibility in his *Träume eines Geistersehers,* only to deny 'daß magnetische Stäbe auf Fleisch und Knochen wirken' (Kant 302 p. 371).
117 Jeans 232 pp. 279-280.
118 He first mentions Galvani's experiments in a letter to Knebel in 1793 (Varnhagen 53 II, 295, to Knebel, 18 May 1793), and twice refers to him in his published works (SW XXII, 331, *Kalligone* and SW XXIII, 481, *Adrastea*). He was recommended to try galvanic treatment for his eyes in 1803, the year of his death (Schauer 47 p. 37, Herder to Caroline, 4 September 1803), and his wife declares that he had great hopes that studies of galvanism would provide new information on electricity, particularly in relation to the human constitution (Caroline 65 III, 108 and 194). He was keenly interested in the galvanistic experiments performed in his presence by his friend J. Ritter, a Romantic and student of physics (cf. Stapf 49 p. 86, Caroline to Jean Paul, 20 April 1801). But his caution did not desert him in such matters, for he wrote in 1800 to his son August, denouncing all

traces of 'Galvanismus, Humboldtianismus, Ritterianismus, Baderianismus' in his son's thesis, so long as they were unsupported by empirical evidence (cf. Düntzer 23 II, 452).
119 SW IV, 103; cf. Burke 263 pp. 134 and 149-150.
120 Cf. SW XIII, 268.
121 SW VIII, 186.
122 SW VIII, 173.
123 SW VIII, 185.
124 SW XIII, 267.
125 Cf. Dessoir 223 I, 516.
126 Cf. Haller 280 p. 194.
127 SW I, 489, *Fragmente.*
128 SW IV, 104.
129 SW VIII, 191.
130 SW XIII, 156.
131 SW XXIV, 439.
132 Haller 280 p. 195.
133 Cf. Willey 247 p. 141.
134 Cf. Günther 229 p. 78.
135 Cf. Willey 247 p. 138.
136 Cf. Dessoir 223 I, 516.
137 Cf. Dessoir 223 I, 516.
138 Cf. Dessoir 223 I, 217 and 219.
139 SW V, 310.
140 Quoted in Günther 229 p. 60.
141 See Hamann 30 III, 12, Herder to Hamann, 1 August 1772.
142 SW VIII, 250.
143 SW XIII, 276.
144 SW XIII, 281.
145 SW XIII, 281.
146 Herder's MSS S.P.K. D.S.T. Kapsel XXVIII Nr. 6 contains extracts from Prochaska's *De structura nervorum.*
147 Cf. SW XIV, 680, editor's notes.
148 Clark 62 p. 58.
149 Clark 62 pp. 204, 206, etc.
150 Clark 62 p. 218.
151 Clark 62 p. 223.
152 See Irmscher 12 p. 57.
153 SW VIII, 106.
154 Düntzer 23 II, 19-20, to Lavater, 30 October 1772.
155 Wagner 55 p. 35, to Merck, September 1771.
156 Martin Schütze, who says that Herder studied Haller's work between 1772 and 1774, also places this study too late in his career (cf. Schütze 117 p. 531).
157 Wagner 55 p. 35, to Merck, September 1771.
158 Haller 280 pp. 194-195.
159 Haller 281 p. 201.
160 Cf. Götz 78 p. 42: 'Das Phänomen des Reizes erscheint ihm als etwas Dunkles, Geheimnisvolles, das er stellenweise mit dem Triebe zusammenfließen läßt. Er hat augenscheinlich das Wesen des Reizes nicht erfaßt'.
161 SW VIII, 169 *et seq.* and SW XIII, 81-82.
162 SW XIII, 78, *Ideen.*
163 Lehwalder 94 pp. 48-49.
164 Cf. Lehwalder 94 p. 62, who says of Herder's theory: 'Hallers Lehre vom Reiz muß gleichsam neu gedacht d.h. das Schema vom Muskelreiz mit einem neuen, eben psychologischen Inhalt erfüllt, Hallers Physiologie muß erst "mit Geist erfüllt" werden. . . '.
165 Cf. Lehwalder 94 p. 101.
166 Cf. Clark 62 p. 223.
167 Cf. Needham 236 p. 23.
168 Cf. Berger 136 p. 314 and Rouché 172 p. 203 on Glisson as a precursor of Haller.
169 Cf. Clark 62 p. 223.
170 SW VIII, 169.
171 SW XIII, 81-82.
172 SW VIII, 172, *Vom Erkennen und Empfinden,* 1778.
173 Cf. Macgillivray 234 p. 56.

174 Cf. Huarte 289 p. 32 *et seq.*
175 SW VIII, 196; cf. SW XIII, 82.
176 R. A. Hinde, '*Energy Models of Motivation*', in *Models and Analogues* (no. 204 in the bibliography) p. 210. Apart from the neutral use of such concepts as models, they do still appear at times, even today, in a vitalistic sense. As one recent writer observes: 'Today it is the brain which is the last stronghold of vitalism: the workings of this organ are referred to an ill-defined entity known as "mind". Most neurophysiologists, however, are reasonably confident that human behaviour can and will prove wholly explicable in terms of the physicochemical interaction of brain cells' (G. Rattray Taylor, *The Science of Life,* London, 1963, p. 347). But this is not the place to go into the vast volume of literature now available on the subject.
177 Hinde, *op. cit.*, in *Models and Analogues* 204 p. 211.
178 Hinde, *op. cit.*, in *Models and Analogues* 204 pp. 211-212.
179 SW VII, 13.
180 Clark 75 p. 742; cf. Clark 62 p. 223.
181 Clark 75 p. 742.
182 Cf. Jammer 231 p. 35.
183 Needham 236 p. 216.
184 Cumston 222 p. 242.
185 Cf. SW II, 174, *Fragmente*; also SW VIII, 171.
186 SW V, 29.
187 SW I, 525 (1767).
188 Clark 62 p. 220.
189 SW I, 525.
190 Cf. SW IV, 11, 33 etc.
191 E.g. SW V, 31 (1770); SW VII, 262 (1774); SW VIII, 196 (1778); SW IX, 295 (1781); etc.
192 SW XIII, 345.
193 SW XXXII, 73. Suphan, in an editorial note to this passage, points out that Burke, in Hartknoch's translation, spoke of 'die Logik des Geschmacks'.
194 SW I, 524-525, *Fragmente.*
195 SW IV, 10.
196 SW V, 185.
197 SW V, 95 and 100, etc.
198 Cf. Farrington 225 p. 153.
199 SW V, 60-61; cf. also Lehwalder 94 pp. 112-118.
200 SW XXI, 83.
201 Cf. Münz 99 *passim*. Ideas not unlike those of Herder appear in the writings of some of his contemporaries. Thus his friend Knebel, in 1788, writes: 'Wir haben nur Ein Gefühl, das nach Verhältnis mechanischer Bestimmungen, zu welchen es die Nothwendigkeit der Eindrücke zwang, bald hört, bald sieht, riecht, schmeckt u.s.w.' (Varnhagen 53 III, 214, *Beiträge zur Intelligenz,* 1788). Sömmering actually believed that the *sensorium commune* has a physical location in the 'animated' cerebral fluid (cf. Nordenskiöld 237 p. 310), thus returning to the psycho-physical approach of Aristotle, who located it in the heart (cf. Baldwin 217 I, 64-65).
202 Kühnemann 67 p. 181.
203 SW IV, 361.
204 E.g. SW IV, 381 and 448-450; XIII, 307-308; XXI, 245 *et seq*; XXX, 510; etc.
205 Baldwin 217 II, 2.
206 Cf. SW VIII, 226, *Vom Erkennen und Empfinden.*
207 Ernst Cassirer, *The Philosophy of the Enlightenment,* transl. F. C. A. Koelln and J. P. Pettegrove, Boston, 1955 (reprint of 1951 edition), p. 121. Gottsched held the same opinion: 'Wenn Gottsched nun von verschiedenen Kräften der Seele spricht, so tut er das nur der Deutlichkeit halber. Sie sind als Äußerungen "der einzigen Kraft zu denken" zu verstehen, die er auch als "vorstellende Kraft" der Seele bezeichnet' (Joachim Birke, *Christian Wolffs Metaphysik und die zeitnössische Literatur - und Musiktheorie*: *Gottsched, Scheibe, Mizler,* Berlin, 1966, pp. 36-37).
208 There were, of course, other influences which could have encouraged Herder to reject the doctrine of distinct faculties. Clark rightly mentions 'Hamann's insistence upon the totality of the personality' (Clark 62 pp. 161 and 399) as well as 'Hemsterhuis' theory of the unitary personality' and 'Spinoza's monism' (Clark 62 p. 222) in this connection. In 1778, the materialist Hissman demanded 'daß man aufhöre mit der Verzettelung der Seelenkraft in unzählige Vermögen. Daraus, daß wir psychische Erscheinungen als "Kräfte" bezeichnen, folge nicht das thatsächliche Vorhandensein der letzteren' (Dessoir 223 I, 212); there is no

evidence, however, that Herder ever read Hissmann's work. Finally, it is worth emphasising that, although Herder's views on the mental faculties are not so far from those of Wolff as is often supposed, he did couple them with empirical arguments (especially in the fourth *Kritisches Wäldchen* of 1769) to an extent which Wolff and his followers would never have accepted.

209 Cf. Hegel, as quoted by Engels: 'Hence... in empirical psychology [we speak of] the forces of memory, imagination, will, and all the other faculties. All this multiplicity again excites a craving to know these forces as a single whole, nor would this craving be appeased even if the several forces were traced back to one common primary force. Such a primary force would be really no more than an empty abstraction, with as little content as the abstract thing-in-itself (Engels 199 p. 331). A modern writer makes a similar objection to all such sweeping theories: '. . . there is no *a priori* reason why these diverse characters of behaviour should depend on a single feature of the underlying mechanism: an over-simple model may hinder analysis' (R. A. Hinde, 'Energy Models of Motivation' in *Models and Analogues*, item 204 in the bibliography, p. 211).

210 Schütze 117 p. 522.

211 Cf. Götz 78 pp. 31-32; also Eduard Spranger, 'J. G. Herder; Ahnung und Erfüllung', in *Vom Geist der Dichtung*, ed. F. Martini, Hamburg, 1949, p. 39, who speaks of Herder's 'ausdrücklich psychologisierende Logik'.

212 SW XXI, 41.

213 Clark 62 pp. 204 and 315.

214 SW XIII, 183.

215 Clark 62 p. 204.

216 Hartley 283 I, 72.

217 SW XIII, 184.

218 SW XIII, 188.

219 SW IV, 36; cf. SW IV, 38.

220 SW XXXI, 183.

221 SW XIII, 345.

222 Cf. Götz 78 p. 82: 'Eine vollständige Associationstheorie finden wir bei ihm nicht'.

223 Clark 62 p. 204.

224 Herder to Merck, 1772, in Wagner 54: 'Hartley will ich recensiren. Ich bin dabei, und das Buch hat mich sehr erfreut... '.

225 SW XIV, 603; cf. SW II, 258.

226 Cf. Siegel 179 p. 52.

227 Herder 31 II, 6-19, Hamann to Herder, 21 January 1765.

228 SW XIII, 330.

229 SW XXIII, 289, *Adrastea*; cf. SW XXII, 119 and XXXI, 272.

230 SW XIII, 182.

231 SW XV, 523 *et seq.*

232 SW VII, 320.

233 SW VIII, 233. Herder here classifies character-types by the criteria of 'Innigkeit' and 'Ausbreitung', genius and non-genius, and pathological and non-pathological, with all their possible combinations. R. T. Clark (Clark 62 pp. 230-232; cf. also Clark 141) argues that this scheme influenced Goethe's *Werther*, since all the characters in the novel fit into it. One might, however, reply that *all* characters, not just those in *Werther*, could be fitted into the scheme, which is much too general to be related to any particular work of literature. Besides, it does not require a scheme of this sort to explain why Goethe was interested in the genius theme in the early 1770's. Finally, Clark himself admits that there is no evidence that Goethe ever saw this scheme, and that the years 1773-75 were a period of cool relations and geographical separation for Herder and Goethe. The whole argument boils down simply to *post hoc ergo propter hoc*.

234 Bruford 140 p. 222.

235 Readers who seek further information on Herder's political ideas are referred to F. M. Barnard's useful work on the subject (Barnard 133).

236 SW IV, 466.

237 Cf. Clark 62 pp. 228-229.

238 SW V, 181.

239 Grundmann 80. Grundmann sums up on these matters as follows (p. 111): 'Was Herders Völkerschilderungen so sehr vor allen anderen in den Menschheitsgeschichten auszeichnet, ist die feinfühlende und scharfe Urteilskraft hinsichtlich der doppeldeutigen und sich vielfach widersprechenden Nachrichten einiger Quellenschriftsteller, das bewundernswerte Kombinationsvermögen und die Fähigkeit, das Bedeutsame und Markante in dem Leben der Völker

zu erfassen und meisterhaft darzustellen'. For evidence that Herder nevertheless at times selected only those facts which supported his belief in the high moral standards of primitive peoples, ignoring the rest, see Schmitt 175 pp. 48-51.

240 Kant 299 p. 164.

241 Cf. Haym 64 I, 71-75.

242 *Bibl. Herd.* 3 Nos. 3705, 3706, 3708-9, 3732-48, 3852, 5777, 5780-2, 7011-13 and appendix No. 138.

243 SW IV, 410.

244 Cf. Rouché 172 p. 67.

245 SW XIV, 448-456.

246 SW XIV, 456.

247 SW XIV, 219; cf. Clark 62 p. 329.

248 SW XIV, 219.

PART III

SCIENCE IN HERDER'S THOUGHT AND HERDER'S PLACE IN SCIENCE

CHAPTER VI: THE PLACE OF SCIENCE IN HERDER'S THOUGHT

1. Herder's view of knowledge as a whole

Since Herder believed that the traditional mental 'faculties' are simply different functions of the *unitary* mind, it is not surprising that he applies the same holistic doctrine to the object of the mind, to knowledge in general; in his opinion, the various branches of knowledge are merely different aspects of a single whole. Accordingly, he writes in 1781, in his prize essay *Über den Einfluß der schönen in die höhern Wissenschaften*:[1]

> Das Reich der Wissenschaften scheint in allen seinen Gebieten eins zu seyn, wie die Kräfte der menschlichen Seele: sie liegen einander näher oder entfernter; abgerissen und inselhaft ist aber keine und zu allen ist Zugang.

Since, for Herder, everything which can be treated as a unitary entity is dynamic, and comparable with the living organism, it is understandable that, on another occasion in 1781, he uses an organic metaphor to describe the unity of knowledge:[2]

> Insonderheit zeigt das Beispiel der meisten und ich möchte sagen, aller großen Männer, daß keine den Geist bildende Wissenschaft eigentlich von der andern *abgetrennt* sey, sondern alle einander helfen, alle auf einander weisen und wie mehrere Blumen aus einer Wurzel wachsen.

And in 1768, he names Bacon as a particular example of the 'Polyhistor', for whom all knowledge is integrally linked.[3]

In keeping with these beliefs, he consciously set out, at an early date, to acquaint himself with all branches of knowledge. His youthful friend Kurella wrote many years later of the Herder he knew in Königsberg: '. . . sein Umgang trug sehr viel zu meiner Ausbildung bei: denn er war schon damals eine lebendige Bibliothek'.[4] Herder himself writes in 1764: 'Ich sammle den Geist jedes Volkes in meine Seele!'[5] And from this time onwards, his writings abound with ideas for works of a truly universal scope, such as a poem on all aspects of the human soul, which is already outlined in his notes of 1762 or 1763,[6] a 'Geschichte des menschlichen Verstandes' in 1767,[7] and an 'Universalgeschichte der Bildung der Welt' in 1769.[8]

It is obvious from these utterances that he adopted a historical approach to learning at an early stage of his life. The logical conclusion to his various aspirations was to undertake a universal, historical study of all human experience; in one of the more rhapsodic passages of the *Journal*, he actually sets forth a plan of this kind, announcing that he intends to cover 'die Grundsätze der Psychologie, und nach der

Entwicklung der Seele auch der Ontologie, der Kosmologie, der Theologie, der Physik . . . und aus allen eine Geschichte der Gelehrsamkeit und Wißenschaft überhaupt! und eine Geschichte der Menschlichen Seele überhaupt, in Zeiten und Völkern!'.[9]

Such enormous aims, which only a few individuals have entertained, could, even in Herder's day, be fulfilled only incompletely by any single individual. But in relation to the amount of information then available, Herder went further than most men before or since his time towards attaining universal knowledge, and no important discipline of learning is unrepresented in his extensive writings. In accordance with his belief that all subjects are related, he treated no single one in complete isolation, and was prepared to sacrifice factual details and scrupulous accuracy rather than let anything stand in the way of those great syntheses of different areas of experience around which he hoped to construct his *mathesis universalis.*

It should already be obvious that Herder, as one might expect, did not treat science in isolation from the rest of knowledge. On the contrary, he is usually at such pains to reconcile it with philosophy, religion, etc., that it suffers considerably in itself. But since we have hitherto studied in detail only his ideas concerning science and philosophy, let us now examine the ways in which he relates his scientific ideas to the other subjects and modes of experience which occupied him most, notably to history, education, religion, mysticism, and art. Such an investigation might prove especially interesting today, since few individuals now find it possible to explore the connections between all the major branches of learning in the same way as did Herder, whose interest in the broader issues of knowledge was unusually highly developed even for his own day. Such broader issues are as relevant today as they ever were, and their relevance has been increasingly impressed on our society by the ill consequences of over-specialised education and the fragmentation of learning and human activity in general.

2. Science and history

We have already seen how Herder attempted, with his supposed 'natural laws' of social change and historical progress, to apply science to history. It now only remains for us to ask how he applied history to science, i.e. what part he considered science to have played in human history.

(a) The history of science

Herder adopted a historical approach to knowledge as a whole. He used the same method in studying most individual subjects, including science itself. For example, even his early unpublished manuscripts on mathematics and the Riga manuscript *Anfangsgründe der Sternkunde* are preceded by fairly full introductions tracing the history of the sciences concerned.[10] And, although few works devoted exclusively to the history of science were available in his day, he managed to acquire an impressive collection of material related to the subject.[11]

Many references to the history of science appear in his published writings, showing that he did study in detail the works to which he had access. He realised that the beginnings of scientific thought are to be found in the mythologies of ancient and primitive peoples,[12] but, in the *Ideen*, he rightly says that the beginnings of science as we know it are to be sought in ancient Greece, and adds:[13]

> Wer indessen den Griechen den Geist reiner Wissenschaft abspricht, möge ihren Aristoteles und Euklides lesen . . . denn auch das war Platons und Aristoteles Verdienst, daß sie den Geist der Naturwissenschaft und Mathematik erweckten, der über alles Moralisiren hinaus ins Große geht und für alle Zeiten wirket.

His essay of 1776 on Copernicus shows detailed knowledge of ancient astronomy and of the theories of the Alexandrian school; he cites the opinions of Apollonius of Perga, Pythagoras, Philolaus and others, and correctly maintains that all the elements of Copernicus' heliocentric theory were already present in antiquity.[14] He shares the opinion of his century that science almost disappeared from Europe in the Middle Ages,[15] and observes that Scholastic philosophy was an obstacle to empirical investigation.[16] His genuine understanding of the significant Islamic contribution to medieval science was somewhat less typical of his times, and, in the *Ideen*, he lists the most important scientific achievements of the Arabs in some detail.[17] He concludes: 'Ohne Araber wäre kein Gerbert, kein Albertus Magnus, Arnold von Villa Nova, kein Roger Baco, Raimund Lull u.a. entstanden. . . '.[18] It is also significant that, in 1772, he observes that post-Reformation science and philosophy encouraged freethinking.[19] And he appears (in the *Ideen*) to share Bacon's belief that knowledge must continually increase, but, unlike the English savant, he does not seem to believe, at this date, that it will ever be complete; such sentiments as the following are indeed familiar to modern readers:[20]

> Wir also können in diesem einmal begonnenen Lauf nicht mehr stehen bleiben: wir haschen dem Zauberbilde einer höchsten Wissenschaft und Allerkenntniß nach, das wir zwar nie erreichen werden, das uns aber immer im Gange erhält, solange die Staatsverfassung Europas dauret.

He obviously realises that this self-perpetuating growth in learning is primarily a European phenomenon.

Herder was interested in the history of science, in its widest sense, including its theoretical aspects, to a greater extent than most thinkers of his times. He understood how important science is in human history, and in European history in particular, and traced the scientific tradition from Greece down to his own times. It was his characteristically historical approach to learning which led him to such conclusions, and his influence is clearly at work when Goethe writes in his *Farbenlehre* of 1807: '. . . so läßt sich hier auch wohl behaupten, daß die Geschichte der Wissenschaft die Wissenschaft selbst sei'.[21]

(b) The history of technology

Throughout Herder's writings, there are references to the history of technology, particularly to those great mechanical inventions which, as he and a few others before him realised, have profoundly affected human history. Thus, in the *Journal,* he refers to the invention of the vacuum-pump, etching, the telescope, the compass and other devices,[22] and in later works, he mentions the application of mathematics to mechanics,[23] the inventions of printing, the Arabic numerals, modern musical notation, clocks, oil-painting, and other technical advances, all of which he regards as major historical events.[24] Many other inventions, such as Greek Fire, are listed in his classified notes for the *Ideen.*[25]

But apart from factual observations of this kind, he makes more general pronouncements on the history of technology in various of his works. He maintains in his *Auch eine Philosophie* that fortuity helped just as much as human ingenuity to produce great inventions,[26] and in his essay on Winckelmann in 1777, he writes: '. . . die gerühmtesten Erfindungen sind nur Blitze, die aus dem Reiben der vorbereitetsten Umstände und gleichsam Vorerfindungen trafen, und auch bei ihnen *findet* der Mensch viel öfter als er *erfindet*'.[27] In the *Ideen,* Part II, he says that great inventions come about 'meistens durch eine kleine Zusammenrückung zweier lange bekannter Gedanken',[28] while already in the manuscript *Anfangsgründe der Sternkunde* of 1765, he rightly observes that the telescope was discovered by chance.[29]

But Herder is not always content to appeal to chance on such occasions. Realising how unpredictable technological inventions in history appear to be, he at times places a more teleological, providential interpretation upon them than on most other historical phenomena. Even in the *Ideen*, Part II, he writes:[30]

> Vielleicht ist keine Geschichte, die so augenscheinlich die Regierung eines höhern Schicksals in menschlichen Dingen zeigt, als die Geschichte dessen, worauf unser Geist am stolzesten zu seyn pflegt, der Erfindung und Verbesserung der Künste. Immer war das Merkmal und die Materie seiner Bezeichnung längst dagewesen: aber jetzt ward es bemerkt, jetzt ward es bezeichnet.

He adds shortly afterwards: '. . . das alles gehört zur obern Haushaltung Gottes mit unserm Geschlecht. . . '.[31] Statements of this kind are unusually teleological for the mature Herder, although he did not finally abjure teleology until he wrote Part III of the *Ideen*. But it must be remembered that teleological arguments, for Herder, do not require miraculous intervention to reinforce them, and he postulates such divine intervention only in explaining historical beginnings or first causes. Historical developments, in his opinion, can be interpreted both naturalistically and teleologically, for purpose and providence emerge only in *causal* changes governed by what he calls 'natural laws'. The unexpectedly great part played by chance in many great technological discoveries and inventions led him to invoke relatively undiluted teleology in this case, since, if he had conceded that fortuity alone produced them, he would have removed an important buttress from his doctrine of ultimate progress in history.

In his *Auch eine Philosophie,* Herder dwells on the negative aspects of technological inventions.[32] In fact, he traces much of the mechanisation he then deplored in modern culture to the spread of mechanical aids among the ignorant masses, who thus lose contact with the fuller and more natural existence they formerly enjoyed: '*Gewiße Tugenden der Wißenschaft, des Krieges, des Bürgerlichen Lebens, der Schiffahrt, der Regierung* – man brauchte sie nicht mehr: es ward *Maschiene,* und die Maschiene regiert nur *Einer*'.[33] Thus in this work, he does not share Bacon's belief that only unmitigated advantages can accrue from technological progress. But in his later works, he insists less on this Rousseauistic pessimism. He singles out the mechanical sciences for especial praise in an essay of 1781, saying with reference to their obvious utility and their freedom from the controversies which beset so many other subjects: 'Sie sind der Wald, der immer grünet. . . '.[34] Yet in the *Ideen,* he dilates upon the evil as well as the beneficial effects of mechanical inventions, and notes that, while inventors are few, the fruits of the advanced civilisation they help to create are unthinkingly enjoyed by masses who have no intrinsic claim to be called civilised themselves.[35] Later in the same work, however, he says that even the abuse of mechanical inventions, such as gunpowder,[36] must eventually produce good results,[37] and thus reconciles his earlier, more pessimistic views on the history of technology with his later historical optimism: 'So arbeitet sich auch in den Kräften des Menschen der übertreibende Misbrauch mit der Zeit zum guten Gebrauch um. . . '.

Thus, for Herder, mechanical inventions can produce both good and bad results. Technology is only a means, and can be used to serve many different ends, as he sees it, but it is with man that the choice between good and evil applications lies.[38]

Apart from the more unqualified historical optimism of his later period, Herder's remarks on technology are very relevant to the situation today, and although some of them may now sound like truisms, they were not so in the pre-industrial Germany of the eighteenth century. He combined Bacon's insight into the benefits conferred by technology with Rousseau's concern over its undesirable repercussions upon social life, and is accordingly closer to the opinions of most present-day thinkers than were either of his great, but more one-sided, predecessors.

All in all, whether the results of technology be good or bad, he regarded it as an extremely potent force in history. In 1774, he notices how inventions such as the telescope, gunpowder, the compass, and printing altered the whole course of human development.[39] In the *Ideen,* he stresses the need for a 'Geschichte der Erfindungen', thus renewing Bacon's appeal for a 'History of the [mechanical] Arts'.[40] Like the economic theorists of history in the nineteenth and twentieth centuries, he declares that the domestication of the horse[41] and the transition from pastoral to agricultural society[42] were vital stages in man's development. And in 1797, he lists inventions and 'Revolutionen der Erde' (presumably great geological events) as mainsprings of human change.[43]

Herder's belief that technology is a powerful influence in history should not, however, be thought of as completely anticipating the economic or materialistic theory of history, for he also uses teleological arguments, for example, whenever it suits him. He was really reviving the ideas of Bacon, who profoundly influenced his thought (it was Bacon who first pointed out the momentous historical repercussions of printing, gunpowder and the compass[44]), although, as we have seen, this Baconian optimism about the social effects of technology is tempered by an almost Rousseauistic pessimism in his first work on history in 1774. By the time of the *Ideen*, his remarks on the history of technology are entirely in Bacon's spirit:[45]

> . . . wenn wir erwägen, daß fast alle Erfindungen unsres Geschlechts in sehr junge Zeiten fallen und beinahe keine Spur, keine Trümmer eines alten Gebäudes oder einer alten Einrichtung vorhanden ist, die nicht an unsre junge Geschichte geknüpft sei; welche Aussicht giebt uns diese historisch-erwiesene Regsamkeit des menschlichen Geistes in das Unendliche künftiger Zeiten!

(c) The future of technology

Herder indulged in some interesting speculations concerning the future progress of technology. He declares in 1774 that the technical means of warfare have already reached an advanced stage of development. (Such ideas were perhaps brought home to him by the often tedious conversations to which he had to submit with his current patron, the militaristic Count of Schaumburg-Lippe.) In his *Auch eine Philosophie,* he writes: 'Wenn [sic] hat man mehr *Macht* und *Maschienen* gehabt, mit einem *Druck,* mit einem *Fingerregen* ganze Nationen zu erschüttern?'[46] In the *Ideen,* he claims that technical improvements in warfare will make war more dispassionate and impersonal, hence increasingly unlikely to occur.[47] But in 1793, with the menace of the French Revolution spreading over Europe, he writes less optimistically: 'Ein *Conflict aller Völker* unsrer Erde ist gar wohl zu gedenken; der Grund dazu ist sogar schon gelegt'.[48]

All these utterances are particularly striking for the modern reader. The opinion set forth in the *Ideen* that ever more powerful weapons will make war less and less likely to break out reminds us, in a somewhat ironical way, of the modern doctrine of peace through a balance of deterrents. But Herder was not such an isolated visionary as this would suggest; his friend Einsiedel, radical as ever in his views, actually suggested (in the 1790's) that delayed-action combustibles such as phosphorus, poisons, poisoned shrapnel, and even 'Pestmiasma' should be used as means of making warfare less likely to benefit the aggressor, and consequently less likely to be resorted to at all.[49] Discussions with this remarkable anarchist and eccentric doubtlessly led Herder to believe that war becomes decreasingly likely, but, as we have seen, he modified his ideas after the French Revolution, even suggesting that a world war may at some time break out.

Some further suggestions on future technological developments appear in Herder's works. For example, he regrets in 1803 that recently discovered scrolls, written in antiquity, cannot now be unrolled, and adds: '. . . zu wünschen wäre es gleichfalls, daß eine chemische oder andre Erfindung die Mühe des Aufrollens verkürze und ihr abhelfe'.[50] Chemical means are available for this very purpose today. Furthermore, a passage in the *Journal* seems to anticipate modern advances; Herder writes of the 'neue Erde' beneath the sea: 'Welcher Kolumb und Galilei kann sie entdecken? Welche *urinatorische neue Schiffahrt*; und welche *neue Ferngläser* in diese Weite sind noch zu erfinden?'[51] A. Gillies furnishes several interesting details concerning the history of submarine navigation in a note to the above passage in his edition of the *Journal*,[52] and from this, it emerges that Herder was by no means the first to put forward such suggestions. It may be added here that he had already encountered ideas of this kind in Kant's lectures on physical geography, because, in a plan drawn up for these lectures in 1757, Kant proposed to speak 'vom Senkblei und der Täucherglocke' and to discuss 'Methoden, versunkene Sachen in die Höhe zu bringen'.[53]

From all this, it appears that Herder was interested in the future as well as the past history of applied science, and that the striking speculations in which he indulged are a mixture of pure fancy, of ideas thrown out by earlier thinkers, and of bold conjectures about what might eventually develop from the resources of technology as they appeared in his day.

3. Science and education

More than most other thinkers of his age, an age in which classical and theological traditions of learning were still predominant, Herder believed that natural history and science are essential ingredients of every secondary school curriculum, and of the ideal general education. At the 'Domschule' in Riga, he himself taught natural history and geography,[54] as well as mathematics and astronomy.[55] His letters to the ducal family of Weimar show that he tutored the crown prince of that state, Karl Friedrich, in natural history, geography, mathematics, general science and the history of science,[56] and his 'Schulrede' on geography shows how indispensable to secondary education he considered this subject to be.[57] Moreover, he planned to write 'ein . . . natur-historisches Lesebuch für die niedern Schulen', as Caroline informs us, and in it, he intended to present younger children with 'richtige Begriffe von den ihnen zunächst liegenden natürlichen und ökonomischen Dingen, von nützlichen oder schädlichen Thieren und Pflanzen, vom Menschen, von Naturerscheinungen, und etwas allgemein Verständliches von der Naturlehre'.[58] And on various occasions in his writings, he considers the value for schools of specific works on natural history and science.[59] In fact, in order to appreciate how great his interest in scientific education was, one need only recall that all of his sons who survived until maturity chose practical or scientific careers, namely medicine, mineralogy, commerce, estate-management and forestry.[60]

But it was in the teaching of natural history that he was most interested. As early as 1765, he writes:[61]

> Die *Naturgeschichte* ist das Feld, das nach vielen neuern und sehr gründlichen Erziehungsplanen vielleicht am allermeisten unter den Schulwißenschaften, das *Genie* entwickelt, die Augen schärft, von einem zum andern überzusehen, ein Feld was die Aufmerksamkeit der Kinder *einzig und allein* vorzüglich beschäftiget. . .

The special merit of natural history is that, as a concrete and realistic study, it is admirably suited to capturing the attention of younger children. Buffon perhaps encouraged Herder in this idea, for the French naturalist had written:[62]

> . . . l'Histoire Naturelle doit leur [i.e. aux jeunes gens] être présentée à son tour, et précisément dans ce temps où la raison commence à se développer . . . rien n'est plus capable de rabaisser leur amour propre, et de leur faire sentir combien il y a de choses qu'ils ignorent.

But it was Kant, in his lectures on physical geography, who most forcibly impressed upon Herder the need for more concrete studies, such as natural history and geography, during the formative period of the youthful mind. Kant wrote in 1765, while Herder was studying under him:[63]

> Als ich gleich zu Anfange meiner akademischen Unterweisung erkannte, daß eine große Vernachläßigung der studirenden Jugend vornehmlich darin bestehe, daß sie zu frühe *vernünfteln* lernt, ohne gnugsame historische Kenntnisse, welche die Stelle der *Erfahrenheit* vertreten können, zu besitzen: so faßte ich den Anschlag, die Historie von dem jetzigen Zustande der Erde oder die Geographie im weitesten Verstande zu einem angenehmen und leichten Inbegriff desjenigen zu machen, was sie zu einer praktischen Vernunft vorbereiten . . . könnte. . .

As Herder himself believed, younger minds may be incapable of grasping the abstractions of pure science, yet the many curious and tangible details of natural history rarely fail to intrigue them; for the senses and emotions should be cultivated before the abstract reason comes into play. In this respect, natural history provides an invaluable introduction to science as a whole.[64]

In the *Journal,* Herder draws up a fairly detailed plan for a realistic course in the secondary school, intending to apply it in Riga at the 'Lyzeum', the headship of which institution he hoped before long to obtain. The three 'Realklassen' for which he outlines a curriculum begin with one which is adapted to the needs of younger children, and natural history, of course, is specially prominent.[65] Natural history must be related to daily life, to household commodities such as coffee, tea, sugar, spices, bread, beer and wine. Herder adds: 'Hier kommen lebendige Sachen und Kupfer zu Hülfe . . . hier wird alles lebendig'.[66] He does not abandon his customary historical approach either, for he includes 'Geschichte der Künste, der Handwerke, der Erfindungen' in the time-table of this class. Mathematics should be taught at this early stage only in relation to practical, applied science, which can be readily illustrated by examples such as sound, colours, water, air, machines and the like. In short, his aim is as follows:[67]

> . . . es wird Hauptzweck, dem Knaben von alle Dem lebendige Begriffe zu geben, was er sieht, spricht, geniesst, um ihn in seine Welt zu setzen, und ihm den Genuß derselben auf seine ganze Lebenszeit einzuprägen.

In the second 'Realklasse', the pupil is introduced to 'Naturlehre' or to science proper.[68] Instruments and experiments are essential (Herder intends to procure 'einen Schatz von Instrumenten und Naturalien' for the school), and the pupils should study physical and human geography, again with many concrete illustrations.[69] Mathematics should still be taught in conjunction with applied (physical) science, which must include astronomy, chronology, optics, hydrostatics, mechanics, etc.[70] (The latter list is already familiar to us from Herder's early manuscripts on mathematics, and Kant's influence is again marked.) The scientific subjects covered in the third 'Realklasse' include pure physics and pure mathematics, and natural history now deals with systems of classification.[71] Natural philosophy and the works of the great scientists of the age are introduced, and the pupils round off their study of geography with a review of its general implications.[72] They should never lose contact, however, with practical things, but should look into trades, inventions and technology at first hand.[73] The three classes, he concludes, represent stages of mental development from 'Sinn und Gefühl' to 'Phantasie', and finally to 'Vernunft'.[74]

Other subjects such as languages, history and religion are also included in the curriculum, of course. What is really remarkable about it, however, is that science is allowed to stand on an equal footing with these more traditional subjects. The entire conception is closer to that of a modern 'Realgymnasium' than to those of the usual secondary schools of Herder's times. And although one can in part explain his preoccupation with science by saying that he wished to cater for the exigencies of practical life in Riga, he himself said in 1773 that utility must never be the main motive behind education.[75] He sought a balance between theory and practice, and he maintains in 1781 that 'schöne Wissenschaften', which help to develop our senses and our tastes, must be studied before 'höhere Wissenschaften', the abstract disciplines of knowledge, otherwise the latter will have no solid foundation.[76] He believed not only that the concrete and the abstract, the senses and the reason, and natural history and pure science should complement one another, but also, as befitted one who regarded the mind and all knowledge as unified wholes, that arts and sciences are equally necessary in the ideal education.

4. Science and religion

(a) Retrospect

In dealing with the diverse meanings of Herder's concept of 'Kraft', with his ideas on teleology, chronology, diluvialism in geology, the origin of man, immortality and palingenesis, the relationship of the soul and the body, and a few other topics, we have seen how he tries to reconcile science and religion. In most cases, he does not attempt to impose orthodox theology or a literal interpretation of the Scriptures upon scientific observations and hypotheses. He usually tries, especially with his concept of 'Kraft', to modify both standards of truth and to reconcile them through a common factor, without subordinating either of them completely.

But although both religious and scientific standards are frequently distorted, especially by the 'Kraft' concept, some of the doctrines named above, for example his own variety of teleology, simply add a complementary religious or providential interpretation to what is described first and foremost as a natural, causal process, and others, like his belief in a divine first cause and in the immortality of the soul, deal with questions which, by their very nature, cannot be answered by science, and cannot therefore come into direct conflict with it. In such cases, scientific standards can be offended only indirectly, in so far as inductive methods are misused to 'prove' something upon which no empirical evidence can have any bearing. But others again of Herder's ideas, like his belief that the Book of Genesis contains an acceptable account of the creation of man, or his (albeit vacillating) belief that the Noachian Deluge actually took place, compete with naturalistic ways of accounting for phenomena upon which empirical evidence is, at least in principle, available. These latter beliefs trespass directly upon the province of science, substituting Scriptural texts for empirical enquiry, and it is over questions of this kind that most of the great battles in the past between science and religion have been fought. Few religious beliefs of this kind appear in Herder's writings on science, however, and those which do appear were ideas commonly accepted by most thinkers of the age.[77] All in all, it is obvious that metaphysical, mystical, aesthetic and emotional factors distorted Herder's scientific ideas far more than did traditional Christian orthodoxy.

Having dealt with the influence of religion on Herder's scientific ideas, let us now examine some of his central theological beliefs, in order to determine whether they are in themselves opposed to naturalistic or scientific principles, and to decide how orthodox his personal religion was.

(b) The influence of naturalistic standards on theology

Herder's attitude to the doctrine that the Holy Writ is divinely inspired, or the doctrine of 'Theopneustie', as he himself calls it,[78] affords a good example of the way in which his theology develops. In some of his early sermons, he explicitly accepts the doctrine. For example, he says in a sermon of 1765 of the miracle of Pentecost: '. . . es *besiegelte* die Eingebung der Göttlichen Schriften'.[79] Yet already in 1768, in another sermon, he tries to combine the doctrine of literal inspiration with natural psychological causes, emphasising now the one, now the other, throughout the sermon. Thus, he first tells us:[80]

Sie [i.e. divine grace] brachte entweder im Traume oder in einer wachenden

> Erhebung der Sinne Bilder vor das Auge ihrer [i.e. the Biblical writers'] Einbildungskraft und heftete ihre Aufmerksamkeit auf dieselben. So entstanden Gedanken in ihrer Seele, und mit den Gedanken sogleich Worte. . .

Shortly afterwards, he says: '. . . ich müßte den Augenblick das Wesen meiner Seele vernichten können, wenn ichs erwarten wollte, daß Gott in die Reihe meiner Gedanken Zwischengedanken einschieben [wollte]'. He later goes even further, saying: '. . . alsdenn werden die Empfindungen deines Herzens reden, . . . denn [sic], und anders nicht, redet der Geist Gottes in dir'.[81] And after various attempts to explain it, he concludes that the way of inspiration is unknown: 'Derselbe Allwissende, . . . der auf eine uns unbekannte Art ihre [i.e. the Biblical writers'] Seelen in seiner Hand hielt, damit sie aus dem Grunde derselben das hervordachten, was sein Wille war . . . [etc.]'.[82] But in a fragment written in the following year, and entitled *Über Moses,* he is much more radical, calling Moses' dialogue with God 'eine Monologe mit sich unter dem Namen Gottes'.[83] In the Bückeburg years, however, he returns to that hybrid theory of divine inspiration and natural expression he had put forward in 1768: 'Freilich musten auch in der Seele oder im Gehirn Johannes Bilder bereit liegen, die Gott zu dieser neuen Offenbahrung weckte. . .'.[84] But in 1780, in the *Briefe, das Studium der Theologie betreffend,* he writes of the Old Testament prophets:[85]

> . . . die Worte, die sie sprachen, kamen aus dem Drang ihres Herzens und also aus *veranlassenden Zeitumständen*; die *Gestalt,* die sie *in der Reihe der Zeiten* hatten, *sahen sie nicht,* sah oft ihre Zeit nicht; dies erblickte erst die *Zukunft.*

He tries in his *Vom Geist der ebräischen Poesie* in 1783 to portray the prophets as men who predicted the future from the ordinary, available evidence of the past and present, yet calls this natural, historical development 'die künftige Zeit der Regierung Jehovahs'.[86] By the same reasoning, he tried in the *Ideen* to show that history is both a natural process and a moral order or providence. But most noteworthy of all, in an earlier manuscript for the *Ideen,* he says of the means by which the creator communicated with newly created man: 'Nicht durch Engel und Wunderstimmen sprach er [i.e. der vorbildende Verstand Gottes] zu ihm: sondern durch sichre deutliche bleibende Wunderwerkzeuge, die Thiere. . .'.[87] (In another discarded manuscript for Part II of the *Ideen,* written in 1784 or 1785, he writes that religion is the 'Produkt' (erased) then 'Bedürfniß der Menschheit', and that it was 'erfunden' (erased) then 'modificirt' by man.[88]) Man, that is, learnt by imitating the animals. Finally, in 1798, he abandons all attempts to combine the natural and the supernatural, saying: 'Die Verschiedenheiten, ja die Widersprüche der Evangelien selbst bezeichnen den *eignen Standpunkt* jedes Evangelisten so augenscheinlich, daß unter der Maske eines einhauchenden Geistes sich in ihnen nichts erklären läßt . . .'.[89] He now secularises the word 'Offenbarung' completely: '. . . wer eine Wahrheit hell ans Licht stellet, der offenbaret'.[90]

One may therefore conclude that the development of Herder's beliefs concerning the inspiration of the Scriptures bears witness from the start to the influence of naturalistic modes of thinking upon theological doctrine rather than vice versa, and that his attempts at compromise were never permanent or satisfactory, even to himself. For this state of affairs, the idea of environmental determinism in psychology, already familiar to us from his remarks on science, is chiefly responsible.

Herder's attitude to miracles in general follows a similar pattern. In the *Journal*, in 1769, he calls for 'eine Genetische Erklärung des Wunderbaren und Abentheuerlichen aus der Menschlichen Natur'.[91] Yet in 1773, in Bückeburg, he appears to believe in miracles, although such statements as the following are not entirely unambiguous: 'Propheten waren . . . oft Wunderthäter, d.i. im allgemeinen Verstande Beweiser der göttlichen Macht für seine [i.e. Gottes] Religion und Menschenvorsehung'.[92] Nevertheless, even in these years, in an older manuscript for the *Erläuterungen zum Neuen Testament*, his most orthodox work, he explains away the Pentecost miracle of the gift of tongues: 'Keine neue Sprache war die Gabe: sondern die Freudigkeit, Richtigkeit, Bündigkeit, Einfalt, Herzrührung, mit der er [i.e. Peter] in der gewöhnlichen, gelernten Sprache sprach. . .'.[93] In the *Theologische Briefe* in 1780, he says, however, that the Scriptural miracles cannot simply be explained away,[94] and in his *Vom Geist der ebräischen Poesie*, two years later, he says of the Tower of Babel: 'Ich nehme also die wunderbare Erklärung unsrer Sage an, weil ich keine natürliche weiß'.[95] The word 'Sage' and the admission that it is not the divine authority of the Scriptures but the lack of a convenient natural explanation which prompts him, clearly show the drift of his thought. In 1783, later in the same work, he says of Moses' miracles: '. . . sie gehören . . . auch nicht unabtrennlich zum Amt eines Propheten'.[96] Referring to the divine legislation of Sinai, he goes on to say that *all* miracles have a natural explanation: '. . . denn auch kein Wunder wirkt Gott ausser durch Naturmittel und Kräfte'.[97] He says the same thing in another passage written around this time, but admits that none of the miracles of Israel has yet been completely explained in terms of natural agencies.[98] As for the *Ideen*, Haym declares that the theory of the divine origin of language is the only instance in this work in which Herder invokes direct divine intervention.[99] We have already seen, however, that some form of divine intervention in the natural evolution of the universe takes place with the creation of man. Yet only in one passage is there a hint, and it is only a hint, that such intervention is possible after the time of man's origin, and this is in the section of the *Ideen* devoted to demonstrating that the soul is immortal:[100]

> Je mehr aber die menschlichen Kräfte selbst in Uebung waren: desto weniger bedorften sie theils dieser höhern Beihülfe, oder desto minder wurden sie ihrer fähig; obwohl auch in spätern Zeiten die größten Wirkungen auf der Erde durch unerklärliche Umstände entstanden sind oder mit ihnen begleitet gewesen.

The nearest approach elsewhere in the *Ideen* to ideas of this kind is in some of those teleological passages which were analysed in Chapter II of this work. Finally, it is no surprise to find that Herder dispenses completely with miracles in his later writings. On one occasion, he even secularises the word 'himmlisch':[101]

> Diesem Frommen [i.e. one of the saints of the Church] z.B. liessen sich Stimmen vom Himmel hören. Wer hörte diese Stimmen nicht in seinem Herzen? wenn sie gleich das Ohr nicht vernahm; sobald ihr Inhalt nur *himmlisch,* d.i. aufmunternd und erquickend ist.

And in 1794, he once more explains away the miracle of Pentecost as non-miraculous, claiming that the words usually translated as 'new tongues' were really only 'neue Auslegungsweisen der alten Propheten'.[102]

One may accordingly conclude from Herder's attitude to miracles, as also from his attitude to the divine inspiration of the Scriptures, that his theological beliefs on some of the most important doctrinal matters were profoundly influenced by naturalistic or even scientific principles rather than vice versa. The two doctrines discussed above are particularly illuminating, because they neither of them readily lend themselves to the sort of reconciliation with scientific standards which was possible in some other cases with the help of the 'Kraft' idea. Where he had to choose directly between the natural and the supernatural, Herder nearly always opted for the natural, even if denial of the supernatural meant deviating considerably from orthodoxy.

Herder's views on such matters can be better appreciated if one realises that such eminent thinkers and scientists as Leibniz, Christian Wolff, Euler and Haller had accepted the authenticity of miracles,[103] and that even the materialistic psychologist Hartley could declare:[104]

> If anyone should affirm or think, as some Persons seem to do, that a Miracle is impossible, let him consider, that this is denying God's Omnipotence, and even maintaining, that Man is the supreme Agent in the Universe.

Zöckler, in his history of theology and science, shows that a fair number of thinkers did repudiate the miraculous in the eighteenth century, but adds: '. . . daß viele Celebritäten des naturwissenschaftlichen oder des mathematischen Fachs zu denselben gehört hätten, läßt sich nicht sagen'.[105] All this is further evidence that Herder was not what Max Rouché calls him, a man striving to impose orthodox theology upon science, but that he was, in fact, less orthodox than many contemporary scientists.

To take yet another instance, one of the surest signs of rationalism or liberalism in theology is the tendency to emphasise the ethical value of religion rather than its transcendental aspects. This is what has been called 'that rationalistic spirit which regards doctrines simply as the vehicles of moral sentiments'.[106] W. H. Bruford notices just such a tendency in Herder, saying: 'An enthusiastic moralism was in fact the heart of his religion'.[107] (Herder shares this with Lessing, whose religious ideas he came to admire increasingly as he grew older.) Bruford likewise points out that Herder never seriously believed in original sin, which is another sign of his marked heterodoxy, and describes his mature philosophy as 'secular humanism'.[108] It may truthfully be said that, in the Bible itself, the main attraction for Herder, apart from the aesthetic and emotional appeal of its poetry, the mystical power of passages such as the beginning of St. John's gospel, and the historical interest of the Old Testament as a commentary on Hebrew customs and society, is its ethical content, particularly in the New Testament. This moralism, which reveals itself in the *Ideen* in the concept of 'Humanität' and in the historical optimism which runs through the work, becomes increasingly conspicuous in his later years. In 1799, for example, he defines religion as follows: 'Religion ist *innere Gewißenhaftigkeit*'.[109] In the previous year, he had written: 'Ginge der Name des Christenthums unter, so müßte dieser Glaube *Religion der Menschheit* heißen'.[110] Yet in his most religious phase in Bückeburg, he had written: 'Ist *Moral* die Hauptsache des Predigers und etwa Bibel und Rede Jesu nur Citatum . . . lebe wohl, *Christenthum, Religion, Offenbarung*. . .'.[111] But after he left Bückeburg, he himself increasingly treated ethics as the main object of religion.

(c) Natural religion

God is the first cause, the soul is immortal, and man's will is free: such are the three central tenets of natural religion. Herder pays service to them all at various times, but even they are always introduced with some qualification. Thus he accepts the doctrine that God created the universe and man, yet combines it on the one hand with his conception of quasi-physical creative 'Kräfte', thereby coming at times very close to pantheism, and on the other hand, with naturalistic theories about the evolution of the universe and of lower forms of life. Secondly, he combines the religious doctrine of immortality with his own vitalistic 'Kräfte' and with heterodox, often Platonic theories of planetary habitation etc. And thirdly, he acknowledges the freedom of the will only in a qualified sense (cf. the section of causality and teleology in Chapter II of this work), disposing of the time-honoured problem with a solution which has more in common with nineteenth-century determinism than with traditional religious teachings.

From an early stage in his life, Herder tends to invest all scientific pursuits with the sanctions of natural religion. For example, in the *Journal,* he calls Newton and other eminent scientists 'Propheten der Natur, Ausleger der Gottheit'.[112] This does not mean that he is forcing religion upon science; as Bertrand Russell says: 'Science itself does not become religious, even if the pursuit of the scientific way of life is endowed with religious significance'.[113] He does seem, however, to have accepted the doctrine of a transcendental God as the first cause, even in 1769, the year in which his ideas were at their most radical, although his views on immortality, that other pillar of natural religion, were rather ambivalent at the time. He thus tends, around this time, to introduce religious doctrines where science ends, or to lend the support of natural religion to avowedly naturalistic interpretations of the workings of the universe, and declares in his *Archäologie des Morgenlandes*: 'O es ist mit Eine der schwächsten Krankheiten des Menschlichen Geistes, eine übernatürliche Physik und Metaphysik der Schöpfung aus dem Verstande Gottes auch nur erwarten . . . zu wollen'.[114] He adds: 'Religion wird in der Natur und die Natur in der Religion herrlich'.[115] During the same period, he rejects traditional physico-theology, with its endeavours to reconcile the findings of natural history and science with literal interpretations of individual Biblical texts,[116] and says that the Mosaic narrative of the creation is 'offenbar nichts als Gedicht, Morgenländisches Gedicht'.[117]

He changes front in the *Älteste Urkunde* of 1774-76, however, and himself indulges in that physico-theology he had earlier condemned,[118] attempting to correlate modern scientific theories, such as those of Haller, with the details of the first chapters of Genesis.[119] 'Alles wirst du in Adam finden', he says of the origin of man.[120] But in the *Theologische Briefe* in 1781, he is more cautious with regard to physico-theology, and says that, while the preacher may read the better works on science and on physico-theology, he should 'nur die Kanzel verschonen . . . mit Astronomischen Predigten'.[121] He is now moving away from physico-theology towards his more characteristic position, that of a broad natural religion. At this time, as later in his *Gott,* he is uneasily aware of how close natural religion can become to pantheism or even atheism, and, in the work last quoted, he adds that we should beware of theories of (mechanical) necessity, of the deification of nature or 'Natur-Atheismus'.[122] We must accept a transcendental God as the first cause, and as a religious guarantee for the invisible creative 'Kräfte' of the universe, otherwise we cannot escape that theory of machine-like necessity which Herder loathes.

In the *Ideen,* he applies Scriptural texts directly to science on a few occasions, especially when writing on the creation of man and the Biblical Flood, but it is usually only in connection with first causes and the immortality of the soul, those basic tenets of natural religion, and with the 'Kraft' which lends these doctrines an aura of scientific respectability, that religious arguments involving transcendental factors appear. Otherwise, the words 'Natur' and 'Gottheit' are used interchangeably, and no specific theological doctrines encroach upon the scientific theories which Herder himself formulates or borrows from other writers of his age. This is the strategy he adopts in most of his later works, although he becomes, of course, more outspokenly rationalistic towards theology as a whole in his later years. In the *Ideen,* he is constantly at pains to preserve a balance between a personified nature and the transcendental God whom he invokes as the first cause, and his efforts are apparent even in his choice of words; but the balance inclines, especially in the spontaneously written first drafts of the work, towards the side of nature, which is invested with many of the divine attributes associated, in orthodox theology, with the transcendental.[123] And it is well known that, in his *Gott* of 1787, Herder, by means of his ubiquitous, invisible 'Kräfte' (which partake of both natural and transcendental attributes), depicts God as so closely involved in the workings of nature that it becomes nearly impossible for the reader to distinguish clearly between the two. He seeks to attenuate the differences between opposites in order at last to reconcile them.[124]

(d) Conclusion

Kant, in his *Kritik der reinen Vernunft,* dealt a severe blow to natural religion, i.e. to all attempts to derive religious truths from the natural world, and subsequently reinstated its main tenets on a somewhat more critical basis than before. But, in rescuing these tenets by arguments based exclusively on moral considerations, he destroyed the older natural religion itself. In the impasse which natural religion reached in the later eighteenth century in Germany, men such as F. H. Jacobi, however, recommended another solution, that of basing religion entirely upon faith and ultimately upon the Scriptures, as Hamann too had tended to do. But Herder was never content with a religion of faith alone. He did not try to maintain orthodox views by keeping religion separate from science, as a religion based solely on faith would have required, but tried to preserve the main tenets of natural religion, especially those of God as the first cause and of the soul's immortality (both of which, incidentally, were recognised even in Robespierre's 1795 constitution in revolutionary France[125]), by 'proving' them from the workings of nature. Concentrating on natural religion in his mature years, he moved further and further away from orthodoxy, and the Leibnizian doctrine of metaphysical 'Kräfte', which he used in support of natural religion, brought him close to pantheism, which eventually became the new natural religion of many Romantics. In the course of its development, natural religion in Europe was progressively watered down, from the deism of Descartes, and the English school of deists in the first half of the eighteenth century onwards, passing directly into materialism in France, and, with Spinoza in Holland, Shaftesbury in England, and the pseudo-Spinozists of Weimar and of German Romanticism, into pantheism in several other quarters. In fact, as Carl Becker has shown in his work on eighteenth-century rationalism, the natural religion of that era inexorably led on towards atheism, although even the most radical among the *philosophes* retained many secularised Christian values (especially in their ethical views and in their faith in nature's order and benevolence).[126] The natural religion of the rationalists represented an unstable synthesis, which proved untenable in the long run, and called either for a return to revealed religion, or for the admission that neither transcendental nor ethical postulates can be proved from the workings of nature. In the illuminating case of H. S. Reimarus, natural religion made revealed religion superfluous – the respected Hamburg theologian finally alleged that much of the story of Christ was deliberately forged by the apostles.

In the 1780's, Herder, no doubt encouraged by Goethe, became more and more preoccupied with nature as the basis of religion. He stood precariously at the end of a development by which natural religion was transformed, in some German circles, into nature pantheism, and, uneasily aware of the inconsistencies of his position, which Kant attacked in his review of the *Ideen,* Part I, and Goethe, Knebel, and probably Einsiedel criticised orally or in letters, he made a final attempt to demonstrate their truth by pseudo-scientific arguments. His early pietistic background, his profession and Hamann's influence all encouraged him to retain certain features of orthodoxy and theism; traditional natural religion, in parts of the *Ideen,* drew him towards deism; and the logical difficulties inherent in natural religion, together with his desire to reconcile the natural and the transcendental in a monistic synthesis, brought him uncomfortably close to pantheism, and even, as in 1769, to materialism. In the long run, his complex and contradictory system – if we can call it a system – broke down; the turning-point was reached when he repudiated teleology in 1787. In his later years, his natural religion tended to give way to a secular moralism and to a form of cosmic mysticism. When he returned to the study of revealed religion in his *Christliche Schriften* of the 1790's, the effects of his preoccupation with nature became obvious. Like Reimarus, he could no longer find room for the supernatural, and tried to explain it away or secularise it.

5. Science and mysticism

Few critics have given much attention to the mystical aspects of Herder's writings. This is probably because Herder himself speaks of religious mysticism in an uncomplimentary manner. For example, in the *Ideen*, he says of medieval mysticism: 'Glücklich, daß die Zeiten beinahe vorbei sind, in welchen dies Opium Arznei war und leider seyn mußte'.[127] In fact, he is not a religious mystic in the sense of those who labour to lose themselves, by contemplation, in the transcendental. His religion is too bound up with this world to leave him much scope for passive contemplation of the absolute.[128] Nevertheless, some of his Bückeburg writings do exhibit religious mysticism, as when he goes into raptures over the divine logos and light, as well as the more usual nature mysticism which we have noticed in connection with his scientific ideas. But neither in religious nor in nature mysticism does he seek oblivion through contemplating the permanent or the static. Even in his religious works, his mystical inclinations are directed towards the dynamic, and he believes that the divine logos manifests itself in 'Wirkung' or 'Werden', just as he sees nature itself as eternal flux. For nature is really the source of most of his mystical emotions, even when he relates these to Christian doctrines. Like Goethe, he venerates the permanent only in the regularities which arise in change itself; the permanent takes its meaning only from change, and the two are always inseparable, as they are in the workings of nature. Like Goethe in the 'Prolog im Himmel' in *Faust,* he writes of God in his *Maran Atha* of 1779:[129] 'Alles lebt unter ihm und eilet zum Leben . . . Und Gott der Schöpfer ruht auf ihrem rastlosen, vermischten, wilden Gesange'. The permanence of God is akin to the changeless order behind all natural change.

Thus it is not so much to his theological writings that we should look for his mystical ideas, especially those of his mature and later years. Those who deny that he has any mystical leanings[130] presumably denote by the word 'mysticism' an unusually contemplative form of devotion within the Christian tradition, and naturally enough, they find relatively little of it in Herder's thought.

Bertrand Russell points out that the first principle of mysticism in general is 'that all division and separateness is unreal, and that the universe is a single indivisible unity'.[131] The word 'universe' here at once supplies a link with Herder's mysticism, which is not usually focussed upon the transcendental, but upon the ultimate unity of the visible universe, the universe he sought to comprehend through his studies of science. Furthermore, one of the consequences of the above proposition, as Russell points out, is religious unorthodoxy:[132]

> For Christians, there is the . . . difficulty of avoiding pantheism: if the world is *only* apparent, God created nothing, and the reality corresponding to the world is a part of God; but if the world is in any degree real and distinct from God, we abandon the wholeness of everything, which is an essential doctrine of mysticism, and we are compelled to suppose that, in so far as the world is real, the evil which it contains is also real. Such difficulties make mysticism very difficult for an orthodox Christian.

In short, mysticism cannot readily separate nature and the transcendental. Anyone who has read Herder's *Gott* will recall how he grapples with these very difficulties, trying to uphold his pseudo-Spinozistic monism (and monism, in its pre-materialistic forms, is always close to mysticism) without denying the transcendental God of Christianity.[133]

Herder considered the universe to be made up of 'Kräfte' and of the visible forms or configurations which they produce through their interaction. As he sees it, we can therefore describe the universe as a whole only if we take into consideration its outward form as well as its intrinsic content. Thus, he envisaged the Chain of Being both as a series of 'Kräfte' or soul-like entities and as a series of visible forms or 'Organe', for 'Seele' and 'Organ', he always insists, are inseparable. False mysticism or 'Schwärmerei' results from an obsession with 'Geistigkeit', whereas 'Abgötterei' results from an exclusive preoccupation with 'Körper' or outward form, as Herder, quoting a remark of Lavater's to this effect in 1776, agrees.[134]

In the pre-Weimar years, especially in the 1770's, he was himself much more preoccupied with dynamic 'Kräfte' than with the visible forms which are produced by them. The most mystical of his theological writings, the *Älteste Urkunde,* is infused with a strange theology of 'Kraft', for he considered that 'Naturkräfte' were the object of the supposedly purer devotion of the earliest worshippers, and, at other times, he associates such 'Kräfte' with the logos of St. John and with the divine light.[135] 'Kraft', in this sense, is equivalent to creative power or spirit, and for Herder in his Bückeburg years it is the object of a thoroughly emotive mysticism, quite different from the intellectual mysticism of a Pythagoras or a Kepler, which took for its objects the clear forms of geometry.[136] His enthusiasm, in those years, for the 'Gärung' of the Dark Ages, his poetic raptures over the 'Gottesfülle der

Natur',[137] his assurance that life itself persists even when individuals, who may see only chaos and transience, are destroyed or assimilated by higher beings, his delight over the teeming plenitude of the ever-changing universe – in short, all that is Lucretian or Dionysian in his thought is related to this emotive mysticism, which venerates in all things the universal 'Kraft'.[138]

But already in the hexagonal 'hieroglyph' of the *Älteste Urkunde,* Herder employs a symbol which mediates between his 'Kräfte' and the form which their interaction supposedly creates. And from the time of the *Ideen* onwards, he often uses geometrical (formal) symbols to describe the mystical unity behind the main processes of the universe – the circle with radii converging upon the centre,[139] the Golden Mean, or balance between opposites, the sphere, that ancient symbol of unity and self-sufficiency,[140] and a few others. From the time of Pythagoras geometrical figures and mathematical formulae have always tended to appear in more abstract mystical writing. For they are, by definition, universal, formal generalisations, and the more intellectual as distinct from intuitive or emotional mystics have often found them convenient for expressing the widest generalisation of all, the mystical vision of the entire universe as One. Whitehead's definition of the first step in mathematics would also apply to the first step in this kind of mysticism:[141]

> . . . when we have put aside our immediate sensations, the most serviceable part – from its clearness, definiteness, and universality – of what is left is composed of our general ideas of the abstract formal properties of things.

Such mysticism always resorts to formal *symbols* to describe the unity of the universe; only extreme religious mystics, whom Herder would have classified as 'Schwärmer', attempt to dispense with symbols altogether.

Another of Herder's favourite mystical symbols, one which he used for his signet, and which later adorned his tombstone, was that of the snake biting its tail, the ancient symbol of infinity or eternity. Like the geometrical symbols, it is related to the natural universe and thence to science, and it appears in Bode's *Anleitung zur Kenntnis des gestirnten Himmels* of 1768, a work from which Herder borrowed many ideas on astronomy. Bode writes of a vignette of the stars which appears in his book: 'Diese Figur wird durch das alte Sinnbild der Ewigkeit, nemlich einer Schlange, welche das Ende ihres Leibes im Munde hält, begrenzt, um den für uns unendlichen Umfang des Weltgebäudes anzudeuten'.[142]

We have often had occasion to observe how Herder's sense of form develops more fully in his mature and later years, and this, of course, also affects his mystical conceptions. During this period, he strives more and more to find a balance between form and content, between the principles of order and his creative 'Kräfte', between unity and variety. He expresses the harmony of unity and variety in the *Ideen* through the old mystical image of a central body upon which all creation converges: 'Also ringet wahrscheinlich auch hier die größeste Mannichfaltigkeit zur Einheit und die allumfassende Natur wird ein Ziel haben, wo sie die edelsten Bestrebungen so vielartiger Geschöpfe vereinige. . .'.[143] He is most successful in his attempts to harmonise form and content on a mystical level in his late poems, and in some of those curious visionary pronouncements which he makes in his later years, for example in the piece entitled *Kalligenia,* already discussed in connection with his mysticism of light (a symbol which for him represented the unity of 'Kraft' and visible form). Manifold, ever-changing 'Kräfte' and ultimate balance or harmony are the two sides of his later mystical perceptions, and it is always the natural universe, often the universe of astronomy and mathematics, which provides their framework. In 1802, he writes in the style of a visionary that 'der prüfende Blick des Weltalls' has appeared to him. (One is reminded here of his Masonic affiliation.) He continues:[144]

> Durchdrungen vom Gefühl des großen Gleichgewichts, das in der Natur Alles hält und trägt, das das Bewegte zur Ruhe bringt und das Ruhende beweget, . . . erwachte ich zum zweitenmal und freuete mich einer Welt, die, auf so veste Gesetze gegründet, Allem Maas und Ziel giebt und zu der auch ich gehörte.

In 1785, he had given voice to similar mystical feelings, on this occasion, however, using the language of astronomy (and music, that perennial expression of universal harmony): 'Mein Gang ist die Bahn des Weltalls: dazu leuchtet mir jener letzte Stern, dazu klingt mir, in geistigen Begriffen und Verhältnissen, die Harmonie aller Sterne.'[145] Like Kepler, he believes that the astronomer, rather than the artist, is the greatest seer. For in the *Kalligenia* sketch, it is the astronomers, not the artists (whom he leaves behind him), who reveal to him the mystical unity behind the dynamic cosmos. He concludes:[146]

> Ich genoß und empfand hohe und höchste *Einheit,* die *Uebereinstimmung* und *rastlose Wirksamkeit der Natur, ewige Palingenesie, immer junges Leben.* Ich sah, daß nichts sich übereilen *könne,* daß Alles sich folgen *müße* und ewig folge. Maas, Zahl, Gewicht, Bewegung schwanden mir mit den Sinnen dahin; Eines lösete sich in das Andre auf.

Science therefore ultimately ends in mysticism for Herder. Both science and mysticism are occupied with the 'Kräfte' and regularities of the universe, but mysticism is the level upon which the widest conclusions of scientific thinking are further generalised, almost to the point where they become meaningless. The symbols which Herder uses to express the unity of the universe, like light, equilibrium, harmony, the circle, the sphere, etc., are usually closely associated with science. His characteristic aim of synthesising all his extensive knowledge finds expression first of all in his monistic philosophy, and often, on a more general level, in mysticism. For the ultimate generalisations of his thought are not exact and particular enough to be scientific, and they are too abstract to lend themselves readily to poetic treatment. He did not have quite the same facility as Goethe for discerning the universal in the particular, although he does usually think of everything holistically.[147] Instead, he felt that he must comprehend the universe directly as a whole, and his resulting perceptions could be expressed only in the language of mysticism. Natural religion merges easily into cosmic mysticism, and Herder's scientific thought is much more influenced by mysticism than by orthodox Christianity. Again and again, his scientific ideas broaden out into mystical perspectives; this is true of his concept of 'Kraft', his holistic principles, his dialectical formula, his mathematical symbolism, his conception of an 'ether' or universal medium, his views on astronomy and the analogy of gravitation in the spiritual world, his ideas on light, his theories of palingenesis, planetary habitation and the universal Chain of Being, his Platonic conception of the body as the expression of the soul, and all the other notions he culled from the Platonic and neo-Platonic traditions. All his aspirations towards synthesis and reconciliation were bound to end on this dimension, and science, which studies the changes and regularities in nature, provided him with much of his mystical inspiration and symbolism. But, being so general, mysticism usually begins where science stops, and it did not always interfere with his individual theories and observations. Herder was too interested in all the detail and profusion of knowledge and experience ever to become a complete mystic; his mystical leanings became most pronounced in his later years, when he became disillusioned in so much of what he saw around him. But these leanings are always apparent whenever he expresses his lifelong conviction that the universe, like knowledge itself, is fundamentally one.

6. Science and art : nature and aesthetic values

(a) The influence of art and aesthetic values on science

Reviewing a work by the aesthetician Sulzer in 1774, Herder approves of the aim 'Wahrheit und Schöne, Schöne und Tugend zu gatten, und Alles als Eins, als verschiedenes Phänomen Eines Wesens zu betrachten'.[148] And in 1782, he says, like Shaftesbury: 'Schönheit ist nur die äußere Gestalt der Wahrheit'.[149] Since, therefore, he associated truth so closely with beauty, we should expect to find some traces of aesthetic values in his scientific ideas. Such traces are, of course, in evidence, although he insists that science must never allow the desire for beauty to interfere with exact observations: 'Eine verschönernde Zoologie arbeitet ihrem Zweck entgegen; eine verschönernde Anthropologie nicht minder.'[150] For the links between scientific and aesthetic methods, between art and nature, are given, for Herder, in the very nature of reality, in that intimate relationship between truth and beauty mentioned above, so that there is no need for the scientist to distort his observations in order to find beauty in nature.

It is one of his axioms that all great scientific achievements share something with artistic creativity. Kant's theory of the universe and Whiston's theory of the earth, he says in 1766, both have the quality of 'Einbildungskraft'.[151] He also says on several occasions that great philosophical systems, such as those of Berkeley, Spinoza, Leibniz and Descartes, likewise have an imaginative quality, and calls them 'Fiktion' or 'Dichtung', without necessarily wishing to belittle them.[152] In

1774, he commends the style of Haller, even that of his physiological works, as 'dichterisch',[153] and, around the same time, he speaks of 'Buffons Romane der Thiererzeugung',[154] probably echoing a remark of Hamann, who had written: 'Wer Mose und den Propheten nicht glaubt, wird daher immer ein Dichter, wider sein Wissen und Wollen, wie Buffon über die Geschichte der Schöpfung. . . '.[155] Hamann had used the word 'Dichter' pejoratively, just as Herder uses the word 'Roman'; but, on most occasions, Herder mentions the imaginative and creative qualities of science (and philosophy) only with praise. For example, he writes in 1776 of Copernicus: '*Zeichnungsgefühl* nehmlich [sic], sein *Sinn* für *Symmetrie* und *Verhältniß zum Ganzen* war der Finger Gottes, der ihm das Weltall wies'.[156] He generalises this principle as follows: 'Zu den größten Entdeckungen also, die wir dafür halten, winkte *Einbildung, Malerei, Poesie* herauf und hielt die Leiter!'[157] He repeats this conclusion in 1800, referring now to Newton's physical system: 'Wer in Wissenschaften *erfindet*, bringt eben sowohl etwas Eigenthümliches, Neues aus sich hervor, das er nicht lernte (sonst hätte ers nicht *erfunden*), als der Dichter.'[158] Such utterances are surprising, not only because they come from Herder, who tends to emphasise inductive methods in science (at least in his theoretical pronouncements), but also because they strike us as modern. Only relatively recently has the part played by imagination in formulating scientific hypotheses and theories been properly appreciated. But in a passage shortly after the previous one, in 1800, he again stresses the external, stylistic qualities of great scientific writing, just as he had praised Haller's style in 1774 as 'dichterisch'. He writes:[159]

> Euklids Elemente, Newtons Principien, la Place Werke sind ihrer Art nach im größten Geschmack, Kästners mathematische Schriften mit eben dem treffenden Geist, wie seine Vorlesungen und Epigramme geschrieben. Kein Ungeschmack im Vortrage sollte erlaubt seyn. . .

The scientific virtues of 'Genauigkeit, Ordnung, Klarheit' are the same as those of good taste, he later maintains.[160] And again, bringing us back to his axiom that truth and beauty, science and imagination are inextricably linked, he declares: 'Die stärkste, reinste Aussprache der Wahrheit, wird ihrer Natur nach allenthalben *Dichtkunst*; jedes System ist selbst ein Poëm, so fern es mit sich bestehend, ganz und rein ist'.[161] Thus he believes, with justice and originality, that great scientific achievements are not lacking in something akin to artistic imagination and creativity, that certain aesthetic criteria, such as a sense for symmetry and proportion, may aid the scientific theorist (e.g. Copernicus), and that the finest qualities in great scientific writing, notably its order and clarity, are the same as the virtues of good taste and style in other fields.

In Herder's opinion, some of the aesthetic qualities we may discern in science are derived from the nature of perception itself. In his unusual essay *Über Bild, Dichtung und Fabel* (1787), he notices how subjective elements supervene when, in the very act of perceiving, we unconsciously construct ordered 'Bilder' out of what we see, and when we unwittingly project ourselves into the things we see, and thus personify non-human, natural agencies. He observes that primitive peoples especially are inclined to personify nature, and adds:[162]

> . . . indessen bleibt auch bei uns jede Physik eine Art *Poetik* für unsre Sinne, aus unsern Erfahrungen geordnet; und sobald unser Geist in andern Organen die Natur sähe, würde er nothwendig anders classificiren.

It is indeed true that earlier science especially is full of personifications; even a 'force', if treated as real in itself, is a personification. Goethe too notices this connection between poetry and early science, saying: '. . . nirgends wollte man zugeben, daß Wissenschaft und Poesie vereinbar seien. Man vergaß, daß Wissenschaft sich aus Poesie entwickelt habe. . . '.[163] Herder further notices that science, like primitive mythology, itself tends to divide nature into two principles or even sexes[164] – he is doubtless thinking of the theories of magnetism current in his day, and of concepts such as 'Wahlverwandtschaften' in chemistry. But although he realised that such ideas are produced by the subjective imagination, he does not condemn them as unscientific, and, as we have repeatedly noticed, himself personifies 'Kräfte' etc. on many occasions. In such cases, therefore, he allowed his conviction that imagination can lend support to science to do violence to the empirical principles he had learnt from Bacon, the early Kant, and others. He is perfectly correct in his remarks on personification so far as the older science is concerned, but he does not seem to realise that science has to free itself from personifications wherever possible, that it had already largely succeeded in doing so, and that the more obvious personifications surviving in his day were already obsolescent.

Herder believed not only that the scientist shares certain values in common with the artist, but also that the object of science, i.e. nature and its laws, displays aesthetic qualities.[165] For that universal harmony he believes in is the object of his aesthetic as well as his mystical admiration. The *Kalligenia* sketch mentioned above ends with a vision of 'Kalligenia, die Mutter der Schönheit', whom the writer has sought and found in the workings of the universe:[166]

> 'Ich bin, die du suchest', sprach sie mütterlich-freundlich, '*Kalligenia,* die Mutter der Schönheit: mein Kind ist die *Natur*. . . ' Mein Traum entfloh; aber ihr Bild – allenthalben suche ich es auf in Gesinnungen, Thaten und Gestalten; sein kleinster Abglanz entzückt mich, mich erinnernd an Sie. . .

Herder here uses the ancient symbol of the mother-goddess and her child to express not only the mystical unity and harmony of the universe, but also the ideal of beauty, which, he believes, is fulfilled in nature itself rather than in art; for in his dream, he leaves the artists behind, and finds greater enlightenment with the astronomers. (His disillusion in Goethe and Schiller during his last years is no doubt partly responsible for this.) He believes that nature itself provides the primary models of beauty, and it is always to nature that the artist should turn for inspiration.

But in what exactly does the beauty of the universe consist? Max Caspar's words on the 'forma mundi' of Kepler, whom Herder greatly admired, could just as well apply to the older Herder's ideal of beauty:[167]

> In it the idea, form, does not have the pale meaning of today's usage. It concerns the principles of order and configuration, that which makes the chaotic material into a cosmos, and also the epitome of the idea of the lovely, made real in the world.

To express this universal form or order, Herder, as we have already seen, uses certain general expressions borrowed from mathematics or science. Such expressions may have an aesthetic as well as a mystical content. Indeed, the mysticism of rational forms usually has a strong aesthetic bias; this should be obvious when Herder uses musical expressions such as 'Harmonie' or 'Wohlklang' to describe the universe, and in Kepler's (originally Pythagorean[168]) theory, which Herder mentions,[169] that the hypothetical ratios of distance between the orbits of the various planets must correspond to intervals in the harmonic series. Herder uses scientific terms, like Lambert's 'Maximum', as formulae for beauty,[170] in this particular case as a dynamic equivalent for the traditional (static) Golden Mean, which, however, he also applies to nature on many occasions.[171] The idea of unity in variety, which he often uses in describing the universe, is another aesthetic criterion.[172]

The objections which can be raised against Herder's theory that science, like art, must personify natural agencies, also apply, however, to his theory that the universe must conform to aesthetic principles. Our standards of scientific accuracy need not be impaired if we happen to add to our empirical findings the observation that certain natural regularities are aesthetically pleasing; but it is a different matter when we apply aesthetic tests to scientific *hypotheses*, and say that the more aesthetically conceived hypothesis is likelier to be the correct one. The Platonic and Aristotelian principle that the motions of the heavenly bodies, which are more 'perfect' than the earth, must be more regular than earthly motions,[173] was a hindrance to astronomy for centuries.[174] Bacon rightly impugned this *a priori* scheme as an example of the *idola* which he listed as impediments to knowledge. Another ancient preconception, the notion that the universe in its entirety must be a sphere, the 'perfect' shape and the epitome of self-sufficiency,[175] survives in Herder's theory that the magnet is like a sphere, and his predilection for the image of the 'Kugel' when extolling the perfections of the universe.[176] As Galileo, that matchless champion of common sense, once exclaimed: 'For my own part, never having read the pedigrees and patents of nobility of shapes, I do not know which of them are more and which are less noble, nor do I know their rank in perfection'.[177]

But not only in the question of forms and shapes was Herder fond of introducing aesthetic values into science. He writes in 1778:[178]

> Ich . . . glaube übrigens, daß Homer und Sophokles, Dante, Shakespear und Klopstock der Psychologie und Menschenkänntniß mehr Stoff geliefert haben, als selbst die Aristoteles und Leibnitze aller Völker und Zeiten.

Shortly afterwards, he includes in his list of data which are useful to the psychologist not only 'Bemerkungen der Aerzte und Freunde' (of the pathological patient), but also 'Weissagungen der Dichter'.[179] And in his famous essay on Ossian, he had considered elaborating a 'Psychologie aus den Gedichten Oßians'.[180] We must remember that he believed that psychology can and ought to become a science, which means that he has here allowed his interest in art to modify his more strictly scientific ideals. There can be no doubt that, by present-day standards, he overrated the value of works of art for psychology – they usually tell us more about the artist himself than about psychological types in general – and that he underrated the value of exact and extensive statistical observation, to which he was by nature disinclined.[181] By eighteenth-century standards, however, he had more justification for some of these observations, because the poets and novelists of the day were often far ahead of the professed psychologists in psychological insight, at least so far as character and motivation are concerned. Even in 1857, Buckle (who resembles Herder in many ways) could write: 'The most accurate investigators of the human mind have hitherto been the poets, particularly Homer and Shakespeare'.[182] Until relatively recent times, psychology as such was tied all too closely to abstract philosophy, whereas literature has always been more concerned with living experience.

But besides all this, we have repeatedly noticed that Herder's scientific ideas are often influenced by aesthetic judgements. This happens when he tries to classify racial and animal types: in this case, aesthetic standards (Camper's craniological angle, for example, was originally an aesthetic criterion) conflict with morphological ones. Even the traditional conception of a universal Chain of Being, with man in the centre and two symmetrical series of beings above and below him, is full of aesthetic significance. Herder's (and Kant's) theory that the axis of the earth must originally have occupied a position at 90° to the plane of the ecliptic,[183] and his idea that the earth's magnetic and rotational poles must once have coincided, are just as much aesthetic as scientific in origin. The attempts of both Herder and Schelling to reconcile the theories of Newton and Euler on light and colour also arose, as Rudolf Haym observes, 'aus Gründen des ästhetischen Gefühls'.[184] And even the plan and style of Herder's greatest work, the *Ideen*, is influenced by aesthetic as much as by logical and objective standards.[185]

To sum up, Herder was unusually alive to the positive contribution which creative imagination can make to scientific thinking as well as to art, and to the influence of aesthetic feeling upon science. He not only pointed this out in theory, but also put his ideas into practice, sometimes passing general aesthetic judgements upon the regularities of nature, but at other times allowing his aesthetic sense to influence his scientific theories to their detriment. His style, in the *Ideen* and other works dealing with science and nature, is often affected by artistic feeling more than by dispassionate logic, but stylistic idiosyncrasies alone neither add to nor detract from the validity of scientific conclusions, and we should not refuse to take his scientific ideas seriously simply on account of his style. But as Russell puts it: 'Preconceptions that have an aesthetic origin are just as misleading as those that are moral or theological. . . '.[186] Too many critics have analysed Herder's theological preconceptions, but too few have given attention to his aesthetic standards and their influence, which is at times harmful, upon his scientific ideas.

(b) The influence of science on art

'Man macht beständig Unterschied zwischen Naturkunde und Aesthetik; und im Grunde muß Aesthetik eine Naturlehre und zwar die simpelste Naturlehre des Schönen seyn.'[187] Thus Herder writes in 1769. In the fourth *Kritisches Wäldchen* of the same year, he says that the objective aesthetics of the future will be based upon physics,[188] and, as we have seen, he himself went some way towards fulfilling this aim by applying optics and acoustics to the aesthetics of sense-experience. Thus, to an extent unusual for his day, he attempted to apply science directly to aesthetics.

But he believed that science should influence art in a further way. Like a few others among the poets and critics of his age, he was aware that the mythological conventions passed down in poetry from classical antiquity were rapidly becoming threadbare and devoid of their original significance. The message he delivered to Goethe in Strassburg was that such artificial conventions must be abandoned, and that the new art must take its inspirations directly from nature. The results of his exhortations are too well known to need mention here, and they were indeed momentous. Nevertheless, poets and critics continued to feel the lack of a new symbolism to replace the antique devices, and the Romantics continued to search for a new mythology.[189]

Klotz had suggested that 'Entdeckungen der Naturlehre' might replace traditional mythology in poetry.[190] Herder approves of imagery borrowed from science (usually from natural history) in poetry, and he recommends the works of Haller, Withof and Dyer as examples. But unlike Klotz, he does not wish to replace mythology entirely by scientific facts and images. He claims with reason that such works as Grainger's didactic poem on sugar-cane are often over-technical and tedious.[191] New data provide new images, but poets should learn how to use these by studying the older mythological poetry:[192]

> Gleichnisse also machen hier keinen Gegensatz, nicht die Mythologie unnöthig, nicht die Naturlehre zur Mythologie . . . Aus der Mythologie eben lerne man, die Naturkunde dichterisch zu bilden, nicht aber aus der Naturkunde die Mythologie zu verbannen.

In 1772, he renews his suggestion and even adds that discoveries 'in der wissenschaftlichen Physik' might lend colour to the abstractions of some armchair nature-poets.[193] Again in 1773 and 1774, he calls for a poetry which will use the facts and discoveries of natural history and science, but adds that it still remains to be explained why, despite the great advances in these subjects, the poets of the Orient and of antiquity could make so much better use of images drawn from nature.[194] He tries to explain this himself in 1782, and notes that primitive peoples have a more intimate and personal view of nature. (This reminds us of how he later attempted to link science and art by saying that both of them personify natural agencies.) He writes:[195]

> Ich zweifle nicht, daß aus Copernikus und Newtons, aus Buffons und Priestlei Systemen sich eben so hohe Naturdichtungen machen liessen, als aus den simpelsten Ansichten; aber warum hat man sie nicht? . . . Nicht wahr, weil jene [unwißende] Völker in lebendiger Ansicht dichteten, weil sie Alles, Gott selbst, sich gleichförmig dachten, die Welt zu einem Hause verengten und in ihr alles mit Haß und Liebe beseelten.

Science and art have both become too abstract and impersonal for such poetry now, he believes. This is true, as most of us would agree. But while personification and anthropomorphism may help to create great poetry, they cannot but harm science; this Herder apparently failed to realise. He mentions Aikin's *Essay on the Application of Natural History to Poetry*[196] in 1783, but again insists that technical details do not enhance poetry, since they tend to destroy its unity.[197] In 1794, he hails von der Lühe's poem *Flora* with praise, exclaiming: '. . . du bist werth, . . . eine neue Stuffe zu betreten, auf der die Wissenschaft der Natur sich mit der Kunst des Gesanges verbindet'.[198] As further examples, he names the ancient Georgics, the works of Spenser, Cowley, Haller, Brockes, Kleist and Thomson, and the *Botanical Garden* of Erasmus Darwin.[199] He renews his appeal for 'scientific' poetry with more vehemence in his *Kalligone* of 1800, and, mentioning the discoveries of Herschel and Galvani, asks: 'Wenn der Pythagoräischen, der Orphischen Schule, wenn einem Empedokles, Parmenides und Lukrez die Wunder der Natur, die wir kennen, bekannt gewesen wären, würden sie mit ihnen gespielt haben?'[200] According to the editor of his works, he himself planned to compose a great poem, *De rerum natura*,[201] and there seems to be a hint of this plan in a passage from the *Adrastea* of 1801:[202]

> Erscheint einst ein solches [philosophical and scientific] System, sind die Wahrnehmungen der Astronomie und gesammten Naturlehre, der Chemie und gesammten Naturgeschichte, so wie die Geschichte des Menschen von innen und aussen so gebunden und geordnet, daß in Allen die höchste Reinheit und Einheit, ein Unendliches an Folgen in jedem Punct erscheinet; kein Zweifel, *ein solches System ist selbst die reinste und höchste Poesie an Würde und Klarheit.*

Here, he seems to be looking for aesthetic qualities in science itself once again, perhaps beginning to doubt whether a new 'scientific' poetry will ever appear. But he appeals once more in 1803:[203]

> Im Drange des Systems selbst sind manche ihrer [i.e. Newton's, Dollond's, Herschel's, Linnaeus', Haller's, Werner's, etc.] Darstellungen so neu-poetisch, daß sie gleichsam rufen, zur Handlung mit Empfindung beseelt zu werden.

The words 'zur Handlung mit Empfindung beseelt' show that he still believes it is legitimate to personify the natural agencies analysed by science.

It is curious that, in both the preceding quotations, and in several similar ones, the word 'System' appears. It is only when a quantity of scientific data is welded into a coherent system that it becomes capable of being rendered poetically. Goethe too realises this when he writes:[204]

> Da im Wissen sowohl als in der Reflexion kein Ganzes zusammengebracht werden kann, weil jenem das Innre, dieser das Äußere fehlt; so müssen wir die Wissenschaft nothwendig als Kunst denken, wenn wir von ihr irgend eine Art von Ganzheit erwarten.

Herder is likewise aware that science lacks 'das Innre', the dimension of subjectivity, to a great extent. Thus, to become poetry, it must be 'mit Empfindung beseelt'.

Herder was not entirely alone in his reflections on poetry and science. Hamann had also suggested that the discoveries of science might replace traditional mythology in poetry.[205] Herder himself says that Fontenelle had had similar ideas,[206] and his own great admiration for Lucretius' poetry must also have encouraged him in his wish. But he had read not only Lucretius' poem and the other works he names in the above quotations as examples of poetry based upon natural history and science. Giordano Bruno, with whose ideas he appears to have been conversant, wrote several scientific works in verse, in imitation of Lucretius,[207] and, according to the editor of the collection *Aus Herders Nachlaß*, the work of Boscovich to which Herder refers in his letter to Lavater in 1772 is a didactic, 'scientific' poem entitled *De solis ac lunae defectibus.*[208] Besides, it was Herder who persuaded Knebel to translate the work of Lucretius, and he tried to induce another acquaintance to translate Erasmus Darwin's *Botanical Garden.*[209] He even suggested to Knebel that he ought to write a poem of his own on nature, following Lucretius' precedent.[210]

But, as Herder early realised, the difficulties in writing a modern poem equal to that of Lucretius were great. In his much discussed Rede Lecture, C. P. Snow has said of such undertakings:[211]

> . . . there was a time when 'refraction' kept cropping up in verse in a mystifying fashion, and when 'polarised light' was used as though writers were under the illusion that it was a specially admirable kind of light.
>
> Of course, this isn't the way that science could be any good to art. It has got to be assimilated along with, and as part and parcel of, the whole of our mental experience, and used as naturally as the rest.

Herder said something very similar in his comments upon Klotz's suggestions in 1768, as well as in later works. Unintegrated technicalities are the destruction, not the making of great art. (Some of the grotesque products of 'technological' sculpture and painting in recent times are good examples of this.) But even while, in his last years, Herder was calling for a new poetry of science, Goethe was recording the results of his own scientific investigations in poetic form. Even he, in poems such as that on the metamorphosis of plants, tended to become abstruse in describing the technicalities of his scientific theories in the language of verse, and it is in his poems on the wider aspects of nature, and their significance for man, that he is most successful. As Herder realised, poetry must not lose contact with man and his emotions. And it has become increasingly difficult to write poetry on scientific themes not only because didactic poetry in general has passed out of vogue, but also because, as science becomes more abstract and specialised, it becomes harder and harder to relate it to human situations and emotions without distorting it. Nature in the widest sense, especially as it affects our feelings, will always inspire greater art than will the undigested details of pure science.

(c) Art and science

Herder, following Kant, classified the mathematical sciences according to 'Raum', 'Zeit' and 'Kraft'. In 1768, he carried this scheme over into the arts, and classified them in the same way:[212]

> . . . so, wie in der Metaphysik *Raum, Zeit* und *Kraft* drei Grundbegriffe sind, wie die Mathematischen Wissenschaften sich alle auf einen dieser Begriffe zurückführen lassen; so wollen wir auch in der Theorie der schönen Wissenschaften und Künste sagen. . . [etc.]

Accordingly, the visual arts work within 'Raum', the medium of music is 'Zeit', and that of poetry is 'Kraft'. It need hardly be repeated that 'Kraft' is conspicuous in Herder's theories of art, particularly in the 1770's, just as it is prominent in most of his scientific theories. It is enough to say that, as well as trying to apply science to art and art to science, in many different ways, he used the same theoretical concepts in classifying them both, thus showing how closely they were connected in his mind.

But art and science are alike not only in their media. Certain formal principles, like the geometrical formulae for beauty, are applicable for both. Moreover, art should reflect nature, in Herder's opinion (as any reader of his essays on Shakespeare and Ossian will realise). And art, as he sees it, is usually related to the living, as opposed to the inanimate and mechanical world; it is thus understandable that he uses many biological metaphors or analogies in criticising works of art. On one occasion, he speaks of 'dieser organische Geist' in the greatest art of antiquity,[213] and, as one critic points out, he 'shared Goethe's conception of "inner form"'.[214] Form, for Herder, is not a static, ready-made pattern, but a regularity which emerges from the workings of dynamic forces. In this sense, the form we encounter in nature, particularly in the biological world, is parallel to that which governs all great poetry. Poetic form must never be that of empty convention, but must grow out of living experience. In both art and nature, a subtle and eternal order is manifest, even behind apparent chaos. This same spirit inspires all the great poetry of Goethe.

Art and nature are therefore parallel for Herder. Similarly, science, whose object is nature, and all learning devoted to the arts, are complementary. The 'schöne Wissenschaften', which, in education, develop the senses and aesthetic discernment, must prepare the way for the 'höhere Wissenschaften', the abstract disciplines of knowledge.[215] For, as he often says: 'Alle Kräfte unsrer Seele sind nur Eine Kraft'.[216] The truly educated mind has learnt to develop and employ them all. In this sense, Goethe too speaks of 'höchst erfreulichen Thätigkeiten, wo Kunst und Wissenschaft, Erkennen und Bilden sich auf sehr hohem Puncte gemeinsam wirkend, zutraulich die Hände bieten'.[217] Like Goethe, Herder was convinced that science and art are complementary activities of the human mind, and that neither should lose sight of the other. His views on this are of special interest to us at the present day, since the whole problem is now particularly acute. Some of the ways in which he associates science and art, nature and the aesthetic, are still worthy of consideration, and in these respects, his efforts were by no means unproductive. Other means he adopts or suggests, however, do violence to science, to art, or to both.

7. Man's relationship with nature, and the aims of science

Caroline Herder writes: 'Herder sagte oft: "wenn ich mein eigener Herr wäre, ich würde mich wo einschließen und eine Zeitlang ausschließlich mit Naturwissenschaften beschäftigen".'[218] He was interested in science for its own sake, quite apart from any material benefits which, in the shape of applied technology, it might confer upon man, and from the possibility of exploiting it himself for physico-theological purposes. In his notebooks and works, there are detailed references to such specialised and often technical writings as Klügel's mathematical disquisition *Über die Figur der Erde,*[219] Herschel's articles on the polar regions of Mars and the structure of the universe,[220] Ingenhouß's study of respiration and photosynthesis in plants,[221] Crawford's observations on the conservation of animal heat,[222] and dozens of others. He can have read them only in order to extend his knowledge and to satisfy his curiosity about the natural world.

He believed, however, that the study of science also has a moral worth. Caroline confirms this in her memoirs: 'Er lebte in diesen Ideen; an Auffindung, Verbindung und Harmonie der Gesetze der Natur unter einander und mit dem Ganzen, auch in moralischer Hinsicht, hing seine ganze Seele.'[223] He also quotes with approval the following words of the writer Realis de Vienna: 'Lust zu Natursachen ist ein Merkmal der Großmüthigkeit. Naturkünste machen aufrichtig; Schulkünste stolz und grausam.'[224] Like Bacon, he connected *a priori* philosophy with Scholastic pedantry and bigotry, which the study of natural science is admirably equipped to dispel. In his *Gott,* he also writes:[225]

> Je mehrere Dinge er [i.e. man] kennet; desto besser verstehet er seine eignen Kräfte und der Natur Ordnung; je besser er seine Kräfte versteht, desto leichter kann er sich selbst ordnen und sich Regeln vorschreiben; je besser er die Ordnung der Natur versteht, desto leichter kann er sich vom Unnützen zurückhalten.

The study of nature also tells us about ourselves, for we are linked in every way to the rest of nature, which conditions and sets bounds to our activities.

Herder, as we have seen, had great hopes for the advancement of learning, and he optimistically believed that technology, despite its many abuses, must produce good effects upon society in the long run. But while his friend Einsiedel looked on science purely from the utilitarian point of view, hoping that technological progress would free the mass of humanity from labour,[226] Herder shared with Bacon other more idealistic hopes. He was able to entertain these because he was certain that, behind even the most chaotic appearances, order ultimately reigns. His own poems, as well as his *Nachdichtungen* and the poems he selected for translation,[227] are full of references like the following to order and harmony in nature:[228]

> . . .   Im weiten Welten-Raum
> Gehöret Alles Allem. Droben, drunten
> Herrschet ein gleich Gesetz: 'was irgend lebt
> Und wirkt, *wirkt für einander*.' . . .

Only within the context of the whole universe can we understand the apparent irregularities and arbitrary events which puzzle and oppress us. Chaos exists, but only in a qualified sense; it seems to rule all-powerful in isolated areas of nature whenever we fail to relate these to the law-governed whole: 'Das Chaos der Natur sah niemand . . . Chaos und Natur heben einander auf. Die Dichter schildern es also nur als einen Uebergang zur Ordnung.'[229] (One is reminded of the scheme to reclaim the sea in *Faust,* Part II).

If we realise that nature is basically orderly, we learn to look for order in everything. This, above all, is the task of science for Herder, as the following words, written in 1781, reveal:[230]

> Wenn der menschliche Geist in Etwas den Funken seiner Gottähnlichkeit spürt, so ists in Gedanken, womit er Himmel und Erde umfasset, die Sterne wägt, den Sonnenstral spaltet, sich in die Geheimnisse der Tiefe wagt, die Körper theilt, die Gesetze der Natur erräth und die Unendlichkeit berechnet.

In 1768, in a sermon on the nature of prayer, he had exclaimed with a burst of poetic sentiment:[231]

> O Herr, . . . ich will Dich in der Natur sehen, forschen und aufsuchen, und Dich im Frühling und Dich im Sturm des Herbstes und im Segen des Sommers und im Schnee des Winters Dich, Herrn der Werke Deiner Hände, sehen, und entzückt alsdenn nach Deinem Himmel blicken. . .

But in the later passage previously quoted, the search for God in nature is no longer primary; man studies nature to realise his *own* 'Gottähnlichkeit'. Thus in the *Ideen* he again says:[232]

> Die verborgensten Kräfte, die er [i.e. der Mensch] von innen gar nicht kennet, hat er in ihrem äußern Gange belauscht und der Bewegung, der Zahl, dem Maas, dem Leben, sogar dem Daseyn nachgespürt, wo er dieselbe im Himmel und auf Erden nur wirken sah. Alle seine Versuche hierüber, selbst wo er irrte

> oder nur träumen konnte, sind Beweise seiner Majestät, einer Gottähnlichen Kraft und Hoheit.

These words of the mature Herder are filled with a self-confidence like that of the most optimistic thinkers of the Renaissance, who presaged for mankind the most glorious of destinies.

Where order and form are not apparent or fully developed, it is up to man to create or further them: '. . . das Formlose schätzen wir nur in Absichten, daß es durch uns Form erhalte oder zur Verschönerung unsrer Form diene'.[233] Much remains to be done in this direction:[234]

> Was ist durch Menschen bildbar? – Alles. Die Natur, die menschliche Gesellschaft, die Menschheit. . . Wer wagts die Grenzen zu bestimmen, wie weit die Natur und zwar *Alles* in ihr cultivirt werden könne und werde?

For although order is always present in theory behind nature as a whole, the separate parts we experience confront us with a gigantic task.

Man himself is the highest product of the rational powers at work in nature: '. . . müßte nicht auch der *Vernunftgeist* der Schöpfung sich ein Organ bereiten, worin *Er* wirke?'[235] These words, written in 1800, show how unorthodox Herder became in his later years. They imply that the creative power becomes a conscious and free agent only in man, and are obviously akin to the ideas of the Romantic philosophers of the early nineteenth century. (It is possible that Schelling, whom Herder read in the 1790's, influenced him here.) Ideas of this kind, with Hegel and others, culminated in the theory that the deity progressively evolves as the consciousness of man develops. In his later years, Herder does seem to have believed that the whole of nature becomes conscious through man, for he had written in 1795:[236]

> Die ganze Natur erkennet sich in ihm [i.e. dem Menschen], wie in einem lebendigen Spiegel; sie siehet durch sein Auge, denkt hinter seiner Stirn, fühlet in seiner Brust, und wirkt und schaffet mit seinen Händen.

And in a draft for his *Humanitäts-Briefe,* he writes: 'Der Mensch wird die Seele, das Herz, die Hand der Natur, sofern diese auf ihn trift und sich ihm zeiget'.[237]

But man is not only the conscious mouthpiece of nature. He is also its ruler and second creator. In 1801, Herder calls man the 'Haushalter' of nature.[238] Shortly afterwards, he exclaims: 'Mensch! du bist der Ausleger der Natur, ihr Haushalter und Priester'.[239] And in another passage, he calls man 'der Schöpfung *Bildner* und *Vollender*',[240] while as early as 1787, he refers to him as a 'Priester der Natur'.[241] These scattered utterances have a certain unity about them, a unity which receives its clearest expression in a poem Herder wrote for his *Adrastea* towards the end of his life. In this poem, his final views on man's position in nature are set forth. Nature itself is filled with a divine spirit, a spirit which comes fully to life in man. Man is not just a passive servant of nature; he is a second creator, a Prometheus, one whose task it is to interpret nature, to comprehend its order, to control it and raise it to perfection through his activity. In these verses, Herder brings together the Keplerian mysticism of his last years, the Spinozistic nature pantheism of his own *Gott* of 1787, and the self-confident humanism of Francis Bacon:[242]

> . . . Blick auf und höre jene Harmonie
> Der Welten! Hohe Ordnung singet sie.
> Wo Sternenkreis an Sternenkreis sich hängt,
> Und liebend sich zur Mitte Alles drängt;
> In allen Kränzen jener hellen Flur
> Wohnet Ein Geist, blüht Ein Gedanke nur.
>
> Von Allem, was der Weltgeist regt und pflegt,
> Hat Er Bedeutung Dir ins Herz geprägt.
> Bedeutung ist der Götter Element
> Ein lebend Wort, das keine Sprache nennt;
> Dein innres Wort, Dein Ahnen dieser Spur,
> Nennt Dich, o Mensch, Ausleger der Natur.
>
> Ausleger nur? Nein! Deiner Regung Kraft
> Enthüllt in Dir die höh're Eigenschaft
> Das Triebwerk der Natur kannst Du allein,
> Ihr Meisterwerk, der Schöpfung Schöpfer seyn.
> Voll Mitgefühl in Freuden wie in Schmerz
> Schlägt in Dir Ihr, der Schöpfung, großes Herz.
>
> Erkenne Dich! Auf Deiner weiten Flur
> Ward Deine Brust der Pulsschlag der Natur.
> Erfüllen sollst Du, was sie Dir zu thun verhieß,
> Einholen, was sie Dir zu thun verließ
> In Geist und Liebe nur vollendet sie
> Sich selbst, der Wesen Einklang, Harmonie.

Thus Herder, especially in his later years, had great faith in man's ability to control nature, and to improve himself and his whole environment by means of increased knowledge, especially of science. The further he moved away from the religious ideas of his Bückeburg years, the more the influence of Bacon, which is evident in his thought from the earliest date, reasserted itself, and the more he valued science for its own sake, and for the betterment of mankind. His faith in scientific progress was eventually prodigious. He writes in his *Gott* in 1787: 'Die bemerkende Naturlehre, die noch so jung ist, wird in diesem allen [i.e. in the discovery of natural laws] einmal weit reichen, so daß sie zuletzt jede blinde Willkühr aus der Welt verbannen wird. . . '.[243] The spell of Hamann, whose power over him had always been far from complete, was now irrevocably broken.

To sum up, we have seen that Herder earnestly tried to relate science to the rest of knowledge, and that some of his suggestions are still relevant. He believed in the importance and value of science, especially in education, more than most thinkers of his age, which still paid more homage to classical traditions than to the study of nature. He saw science as a great historical force, with which man must come to terms, and empirical ways of thinking, encouraged by his studies of nature and science, produced far-reaching effects upon his beliefs, particularly upon his religious convictions, which he tried, with varying success, to reconcile with the naturalistic and scientific sides of his philosophy. Above all, he was filled with an (at times mystical and aesthetic) admiration for the universe as a whole, and for its fundamental order, which he believed that science must progressively reveal. He became more interested in the formal properties of nature as he grew older, paying less attention to its invisible 'Kräfte', which, however, he always regarded as the agents of natural change. In his last years, he fervently extolled the greatness of man, whose mission, he believed, is to acquire progressive dominion over nature, by learning to understand and apply its laws. In his ideas on the unity of all knowledge and his optimistic views on man and nature, he is greatly influenced by Bacon's philosophy of science, which he studied, quoted and admired from his university years onwards.[244] For us of today, who find it difficult to share to the full his optimism, the lasting value of Herder's ideas on the place of science is that he insisted that it can and must be related to the rest of knowledge, and tried, if not always successfully, to demonstrate this by his own example.

NOTES

1 SW IX, 300.
2 SW XI, 91-92, *Theologische Briefe*; cf. SW IV, 383.
3 SW II, 357, *Über Thomas Abbts Schriften.*
4 Caroline 65 I, 63, Kurella to Puttlich, 2 April 1805.
5 SW I, 5.
6 Cf. SW I, 474-476 and editor's note thereto.
7 SW I, 363, *Fragmente.*
8 SW IV, 353, *Journal meiner Reise.*
9 SW IV, 368.
10 Herder's MSS S.P.K. D.S.T. Kapsel XXV Nr. 45-46 and N.F.G. (G.S.A.), *Anfangsgründe der Sternkunde.*
11 E.g. Bailly's histories of the astronomy of the ancients and that of India and the Orient (1777 and 1787; *Bibl. Herd.* 3 Nos. 3334 and 5721), Weidler's history of astronomy (1741; *Bibl. Herd.* 3 No. 3156), Gmelin's history of chemistry (1797; *Bibl. Herd.* 3 appendix Nos. 58-60), Murhard's history of physics (1798; *Bibl. Herd.* 3 appendix Nos. 56-57), Priestley's history of electricity (1772; *Bibl. Herd.* 3 appendix No. 44), Kästner's history of mathematics (1796; *Bibl. Herd.* 3 appendix Nos. 52-55), and numerous works on science in the ancient world and by scientific thinkers of antiquity (e.g. *Bibl. Herd.* 3 Nos. 1640-41, 1648-49, 1767, 1799, 1868, 1977-79, 2040, 2049, 2080, 2093, 2243-45, 2252, 3272, and appendix Nos. 105 and 151-155).
12 Cf. SW XX, 60, *Christliche Schriften.*
13 SW XIV, 129.
14 SW IX, 505.
15 SW XIV, 420, *Ideen.*
16 SW XXX, 53, *Schulreden,* 1780.
17 SW XIV, 443-444, 482, and 552-553; cf. also SW IX, 340.

18 SW XIV, 482.
19 SW XXX, 402.
20 SW XIV, 36.
21 Goethe 274 I, p. XV.
22 SW IV, 443 and 445.
23 SW IX, 348 (1780).
24 SW XIV, 491, *Ideen.*
25 SW XIV, 633-634.
26 Cf. Rouché 172 p. 66. Pascal 169 p. 39 remarks that Herder, around this time, sees technological inventions as proving the irrationality of historical development.
27 SW VIII, 472.
28 SW XIII, 368.
29 Herder's MSS N.F.G. (G.S.A.), *Anfangsgründe der Sternkunde,* p. 10. Herder, of course, was not alone among earlier and contemporary writers in stressing the role of chance in technological discovery. Rouché 172 p. 66 points out that Helvétius, Hume, Voltaire and Bacon had said much the same, and in a work referred to in Herder's notes for the *Ideen* (SW XIV, 620, ref. 'magnetische Abweichung'; the reference is to *Schwedische Abhandlungen* 251 IX, 90), it is stated that the Chinese would not have invented so much 'wenn es ihnen ein glücklicher Zufall nicht vor die Nase gelegt hätte'. Goethe 274 XI, 255 similarly writes: 'Zum Entdecken gehört Glück, zum Erfinden Geist, und beide können beides nicht entbehren'.
30 SW XIII, 369.
31 SW XIII, 374.
32 Cf. Birkner 138 pp. 100-101; cf. also Haym 64 I, 548 and Rouché 172 pp. 65-66.
33 SW V, 534.
34 SW IX, 406.
35 SW XIII, 370-374.
36 SW XIV, 490.
37 SW XIV, 241-243.
38 Cf. Birkner 138 p. 100 and 104-105.
39 SW V, 533, *Auch eine Philosophie.* He emphasises printing in particular at this time, saying that anyone using it to the full as a means of disseminating ideas can become a 'Sokrates unsrer Zeit' (SW V, 568). This is probably because he had found it impossible in the parochial world of Bückeburg to exercise the kind of direct influence on society that he wanted, and sought a substitute for it in his authorship.
40 Cf. Bacon's *De augmentis,* Book II Chapter II; cf. also Farrington 253 p. 95.
41 SW XIII, 314, *Ideen.*
42 SW XIII, 317.
43 SW XVIII, 290, *Humanitäts-Briefe.* As Roy Pascal notices, he had already in 1774 treated major inventions and great historical occurrences as equally important (Pascal 169 p. 38).
44 Cf. Bacon's *Novum organum,* aphorism 129, and Farrington 253 p. 6.
45 SW XIV, 240.
46 SW V, 546.
47 SW XIV, 221-222.
48 SW XVII, 118.
49 Einsiedel 270 pp. 37 and 176.
50 SW XXIV, 341, *Adrastea.*
51 SW IV, 351.
52 Gillies 10 p. 127.
53 Kant 294 p. 5.
54 Cf. Haym 64 I, 82; also Bürkner 61 p. 26.
55 Cf. his unpublished MSS on mathematics, already mentioned, and the MS *Anfangsgründe der Sternkunde,* which consists of notes taken by one of Herder's pupils in Riga.
56 Cf. Bojanowski 19 p. 427, Herder to Großherzogin Luise, 13 December 1797.
57 Cf. also Andress 132 Chapter XV.
58 Caroline 65 III, 21.
59 In the *Journal,* he considers from this point of view works by Buffon (SW IV, 373) Büsching (SW IV, 377) Eüler (SW IV, 381) Hoffmann (SW IV, 373), Kästner, Maupertüis, Newton (SW IV, 381), Réaumur, Rösel (SW IV, 377), Rothe (SW IV, 373) and Swammerdam (SW IV, 377).
60 Cf. Reisiger 70, family tree at the end of the volume.
61 SW XXX, 16, *Von der Grazie in der Schule.*
62 Buffon 262a p. 8.

63 Kant 297 p. 312.
64 Cf. SW IX, 301, *Über den Einfluß der schönen in die höheren Wissenschaften,* 1781.
65 SW IV, 372.
66 SW IV, 373.
67 SW IV, 374.
68 SW IV, 376.
69 SW IV, 377-378.
70 SW IV, 378.
71 SW IV, 381.
72 SW IV, 382.
73 SW IV, 383.
74 SW IV, 385.
75 SW V, 652.
76 SW IX, 295.
77 Cf. Günther 229 p. 40: 'Selbst Aufklärer vom reinsten Wasser gaben dem biblischen Berichte den Vorzug vor den anderen damals bekannten Schöpfungsberichten, weil er auf die Schilderung von "Götter- und Halbgötter-Äonen" verzichtete.'
78 E.g. SW IV, 370.
79 SW XXXII, 254.
80 SW XXXI, 112.
81 SW XXXI, 120.
82 SW XXXI, 119.
83 SW XXXII, 210.
84 SW IX, 91, *Johannes,* 1774 version.
85 SW X, 203.
86 SW XII, 296.
87 SW XIII, 62.
88 SW XIII, 457.
89 SW XX, 52, *Christliche Schriften.*
90 SW XX, 131.
91 SW IV, 360.
92 SW VII, 185, *Provinzial-Blätter.*
93 SW VII, 470.
94 SW X, 164.
95 SW XI, 446.
96 SW XII, 44.
97 SW XII, 69.
98 SW XII, 312-313.
99 Haym 64 II, 225.
100 SW XIII, 198.
101 SW XVI, 389, *Zerstreute Blätter,* 1797.
102 SW XIX, 33, *Christliche Schriften.*
103 Cf. Zöckler 250 II, 71.
104 Hartley 283 II, 149.
105 Zöckler 250 II, 72; Zöckler also says that most scientists of that era were 'entweder bestimmt christlich oder wenigstens entschieden theistisch gerichtet' (Zöckler 250 II, 39).
106 W. E. H. Lecky, *History of the Rise and Influence of Rationalism in Europe,* second edition, London, 1865, II, 61.
107 Bruford 140 p. 187.
108 Bruford 140 p. 188.
109 SW XXIII, 10, *Aurora*; cf. SW XXIII, 471 and XXXI, 562 and 605.
110 SW XX, 191, *Christliche Schriften.*
111 SW VII, 250, *Provinzial-Blätter.*
112 SW IV, 382.
113 Bertrand Russell, *The Wisdom of the West,* London, 1959, p. 21.
114 SW VI, 86-87 (1769).
115 SW VI, 104.
116 Cf. SW VI, 31-32, *Archäologie des Morgenlandes,* 1769.
117 SW VI, 32.
118 Cf. Haym 64 I, 705.
119 Cf. SW VII, 9 and 17.
120 SW VII, 115.
121 SW X, 329.

122 SW X, 331.
123 Cf. Suphan's comment (Suphan 185 p. 69): 'Als ein persönliches Wesen, als Mutter alles Lebens, als Schöpferin, Künstlerin, wird die Natur in den *Ideen* so häufig genannt und angeredet, daß der Verfasser sich in der Vorrede deswegen glaubt entschuldigen zu müssen. . . Noch viel öfter aber hat er in der unbefangenen ersten Niederschrift die "schaffende Mutter" genannt, wo wir im Druck das Wort "der Schöpfer", "der Allmächtige" lesen.'
124 Sell 178 p. 95 is therefore correct in calling Herder a 'Vermittlungstheolog' whose greatest gift is 'die Zusammenschau scheinbar und oft auch wirklich entgegengesetzter Dinge'. The same attitude is evident in all areas of his thought.
125 Cf. J. B. Bury, *A History of the Freedom of Thought*, London, 1913, reprinted 1942, p. 113.
126 Carl L. Becker, *The Heavenly City of the Eighteenth-Century Philosophers*, New Haven, 1932. Becker (p. 69) says of the reason in which that century had so much faith: 'She is pointing in two directions; back toward Christian faith; forward toward atheism.'
127 SW XIV, 483.
128 Rouché 172 p. 249 rightly comments: 'Ce qu'il réprouve sous le nom de mysticisme, c'est une religiosité purement spéculative qui dédaigne l'action'.
129 SW IX, 130-131.
130 E.g. Clark 62 p. 393, who writes: 'Neither in Bückeburg nor in Weimar was Herder a mystic.'
131 Russell 239 p. 179.
132 Russell 239 p. 185.
133 Franz Koch, whose short study of Herder's mysticism is still the best contribution in this field, notices some of the disturbing consequences of his (ultimately mystical) monism, and refers in particular to the heterodox scheme of the universe Herder sets forth in his important essay of 1777, *Über die dem Menschen angeborne Lüge*: '[Diese ist] eine Auffassung, die alles andere als orthodox genannt werden muß und, wenn sie die Kontrareität des Menschen in der ganzen Schöpfung vorbereitet sieht und Gut wie Böse in die Einheit des göttlichen Wesens verlegt, viel eher an Jacob Böhme, an das Luziferische im Menschen – daher auch die Vorliebe für das Prometheus-Symbol – anzuknüpfen scheint als an das Dogma' (Koch 158 p. 18).
134 SW IX, 423, review of Lavater's *Physiognomische Fragmente.*
135 Cf. Kühnemann 66 p. 228 'Auf einem mystischen Abgrund vollends ruht unser Wissen, wenn von dem Universum der göttlichen Kräfte die Rede ist, das als immer dieselbe Gotteskraft in allen Erscheinungen lebt.'
136 Herder's mysticism of 'Kraft' reminds us rather of Giordano Bruno, with his 'cosmical piety, finding its object in the creative energy manifested in the universe' (Lovejoy 233 p. 126).
137 SW XXIX, 113 (This phrase occurs in a poem entitled 'Die Natur' which he wrote in Bückeburg.)
138 The same kind of mysticism infuses the 'Naturhymnus' of Shaftesbury, translated by Herder, and it appears again in Tobler's *Naturfragment* (formerly attributed to Goethe) and in many passages in the *Ideen.* The following words from the 1777 essay *Über die dem Menschen angeborne Lüge* are of the same kind: 'Alles Leben entspringt auf solche Weise aus Tod, aus dem Tode niedrigerer Leben, alle Organisation aus Zerstörung und Verwandlung geringerer Kräfte, alles Ganze der Ordnung und des Plans aus Licht und Schatten. . .' (SW IX, 537; cf. SW XXIII, 534).
139 SW XIII, 20; cf. Pamp 168 p. 34: 'Oftmals finden wir in seinem Werke Symbole der mathematischen Mystik: den Kreis, die Kugel.'
140 SW XIII, 25. The dialectical triad is another ancient formula for expressing the union of opposites.
141 A. N. Whitehead, *An Introduction to Mathematics,* London, 1911, ninth impression, 1939, pp. 12-13; cf. also the words of one of Kepler's biographers: '. . .mysticism, indeed, in the lucid brightness of its contemplation, comes closer to the transparency of mathematical observations than is known to or suspected by the many representatives of a meagre and obscure interpretation of that intellectual domain. What comes first is not emotion seeking expression, but the clear thoughts, which rouse and fire emotion' (Caspar 308 p. 278).
142 Bode 257 p. XVIII, preface; see also *ibid.* p. 393 for the vignette itself.
143 SW XIII, 20.
144 SW XXIV, 57, *Adrastea.*
145 SW XV, 278, *Gespräche über die Seelenwanderung.*
146 SW XXIV, 574.
147 Holism itself, as Popper remarks (Popper 209 p. 78), is akin to mysticism.
148 SW V, 377.

149 SW XXX, 80, *Schulreden.* Cf. his words in a recently published MS: 'Innere, mit sich bestehende *Wahrheit* ist die einzige und höchste Poesie...' (Irmscher 13 p. 305).
150 SW XIV, 597, *Ideen.*
151 SW I, 116.
152 E.g. SW V, 461 (1772) and XXIII, 482 (1802). He may have been influenced here by Kant, for the following words occur in his notes to Kant's lectures: 'In der Philosophie, insonderheit Physik, erdichtet man sehr. Daher entstehen Hypothesen...' (Irmscher 12 p. 66).
153 SW VI, 268, *Älteste Urkunde*; cf. SW VII, 11, note.
154 SW VII, 17.
155 J. G. Hamann, *Sämtliche Werke,* ed. Josef Nadler, Wien, 1949-1957, II, 64.
156 SW IX, 506.
157 SW IX, 507.
158 SW XXII, 199, *Kalligone.*
159 SW XXII, 218, *Kalligone.*
160 SW XXIII, 54.
161 SW XXIII, 245.
162 SW XV, 533.
163 Goethe 274 VI, 139, *Schicksal der Druckschrift.*
164 SW XV, 534-535.
165 Cf. Pamp 168 p. 182 note, who rightly observes that Herder, like Charles Bonnet (and Shaftesbury, we might add), sees something aesthetic in the order of nature.
166 SW XXIV, 575.
167 Caspar 308, p. 389.
168 Cf. Jeans 232 p. 60.
169 SW XXIII, 527.
170 E.g. SW XXII, 78.
171 Cf. Dobbek 143.
172 Cf. also Siegel 179 p. 203 who adds: 'Es werden ferner insbesondere die Linien und die Lagen, die sich unter gewöhnlichen Voraussetzungen als Ergebnis der einwirkenden Kräfte darstellen, uns am angenehmsten berühren und als schön bezeichnet werden, so z.B. die Kettenlinie als Verbindung zweier Punkte . . . oder wieder die symmetrische Anordnung entsprechend dem mechanischen Gleichgewichte'.
173 Cf. Nordenskiöld 237 p. 90.
174 Cf. Forbes 226 p. 40.
175 Cf. Lovejoy 233 p. 105 (note 11 on p. 343).
176 E.g. SW XIII, 25.
177 Galileo 273 p. 263, *Il Saggiatore.*
178 SW VIII, 171.
179 SW VIII, 180.
180 SW V, 168.
181 Cf. Götz 78 p. 33: '. . . die Dichter werden von Herder in ihrer Bedeutung für die Psychologie überschätzt'.
182 H. T. Buckle, *History of Civilisation in England,* second edition, London, 1858, I, 22, note 22.
183 Cf. SW XIII, 477, *Ideen*; see also Willey 247 p. 28 on the same idea in the works of Thomas Burnet.
184 Haym 64 II, 785.
185 Cf. Gillies 63 p. 82: 'The thought-progression is . . . that of poetry not of logic... The thought *is* coherent, and *is* understandable. The unity is an artistic one.' Cf. also Kühnemann 67 p. 167: 'Es ist ein ästhetisches Gefühl, in dem Herder alle Teile seiner Welt empfindet, ästhetisch wirken sie auf ihn'. Kühnemann tends, however, to exaggerate this point (cf. *op. cit.* p. 172).
186 Russell 239 p. 29.
187 SW VIII, 99, *Plastik,* 1769 version.
188 SW IV, 89.
189 Cf. Haym 64 I, 162.
190 Cf. SW III, 260, *Kritische Wälder,* 1768.
191 SW III, 262.
192 SW III, 261-262.
193 SW V, 295, review of Creuz's poems.
194 SW V, 320 (1773) and V, 390 (1774).
195 SW XI, 293, *Vom Geist der ebräischen Poesie.*
196 Translated Leipzig, 1779.

197 SW XII, 10, *Vom Geist der ebräischen Poesie*; cf. SW XV, 546 and XVIII, 99.
198 SW XVII, 222, *Humanitäts-Briefe.*
199 SW XVII, 224-225.
200 SW XXII, 331-332.
201 SW XXII, 331, editor's note.
202 SW XXIII, 244.
203 SW XXIV, 299, *Adrastea.*
204 Goethe 274 III, 120, *Farbenlehre* (Historischer Teil).
205 Cf. Haym 64 I, 162.
206 SW V, 390 (1774).
207 Cf. Nordenskiöld 237 p. 49.
208 Düntzer 23 II, 20 and editor's note.
209 Düntzer 23 I, 251, Herder to Gleim, 18 January 1799.
210 Varnhagen 53 II, 279, Herder to Knebel, 6 May 1799.
211 C. P. Snow, *The Two Cultures and the Scientific Revolution,* Rede Lecture, Cambridge, 1959, p. 16.
212 SW III, 137, *Kritische Wälder.*
213 SW XVIII, 85, *Humanitäts-Briefe,* 1794.
214 Clark 62 p. 372.
215 SW IX, 295.
216 SW IX, 295.
217 Goethe 274 VIII, 222, *Tibia und Fibula,* 1824. Cf. Herder's words in his *Adrastea* of 1801: 'Wie aber? Fügen sich auch *Wißenschaft* und *Dichtkunst*? ist zwischen Wahrheit und Dichtung, wie zwischen Waßer und Feuer nicht ein ewiger Streit? Nach der neuern Chemie giebt es keine durchaus streitende Elemente; alle nehmen an einander Theil, sie verjagen und ersetzen einander' (SW XXIII, 244).
218 Caroline 65 III, 109.
219 Herder's MSS S.P.K. D.S.T. Kapsel XXVIII Nr. 13; the original article appeared in Bode's *Astronomisches Jahrbuch auf das Jahr 1788,* p. 208 *et seq.*
220 *Ibid.* Kapsel XXVIII Nr. 1 p. 47, recto and verso; cf. *Philosophical Transactions* 74, 1784, Pt. II, 233 *et seq.* and 437 *et seq.*
221 SW XIII, 58.
222 SW XIII, 267.
223 Caroline 65 III, 195.
224 SW XVII, 218, *Humanitäts-Briefe.*
225 SW XVI, 577.
226 Einsiedel 270 pp. 147 and 156.
227 Cf. SW XXVII, 397 *et seq.* for his translation of Shaftesbury's 'Naturhymnus'.
228 SW XXVIII, 333.
229 SW XXII, 245, *Kalligone,* 1800.
230 SW IX, 351-352.
231 SW XXXI, 88.
232 SW XIII, 148; cf. SW XXII, 233, *Kalligone,* 1800.
233 SW XXII, 88, *Kalligone,* 1800.
234 SW XXII, 314.
235 SW XXII, 128, *Kalligone,* 1800.
236 SW XVII, 343, *Humanitäts-Briefe*; other utterances suggest that he came to see nature as already possessing some kind of pre-conscious life of its own: 'Es schlägt ein großes Herz in der Natur' (SW XXIX, 209; 1803).
237 SW XVIII, 341; Herder is here freely rendering the opinions of his friend Knebel, which he himself shared, for Knebel had written in an essay which Herder incorporated in revised form in the draft for the *Humanitäts-Briefe* just quoted: 'Des Menschen wahres Selbstgefühl ist kein andres, als das die Natur, als Grund und ewige Ursache aller Dinge, aller Ordnung und Vollkommenheit, durch ihn, als durch sich selbst, von sich hat' (Varnhagen 53 III, 226).
238 SW XXIII, 247, *Adrastea.*
239 SW XXIII, 259.
240 SW XXIII, 252.
241 SW XXVI, 312.
242 SW XXIII, 309-310. Cf. also the following late verses (SW XXIII, 252):

> Dazu verlieh die große Mutter ihm [i.e. dem Menschen]
> Ihr Wohnhaus; zu ersetzen was gebricht,
> Zu ordnen es und zu beseligen.

Sein Werk ist neue Schöpfung; seine Kunst,
Sein Ziel die Bildung edlerer Natur.

Man must learn to control the elements, as Herder declares in 1793 (SW XVII, 119): 'Also *stehen ihm oft die Elemente der Natur entgegen*, daher er mit ihnen kämpfet. . . Alle dies ist ihm in den Weg gelegt, damit ers *überwinde*.' (Cf. Goethe 274 XII, 102: 'Die Elemente daher sind als colossale Gegner zu betrachten, mit denen wir ewig zu kämpfen haben . . . hier hat uns die Natur aufs herrlichste vorgearbeitet und zwar indem sie ein gestaltetes Leben dem Gestaltlosen entgegen setzt.')

243 SW XVI, 557.

244 For further details of Bacon's influence on Herder's views on nature and science, see Nisbet 102.

CHAPTER VII: HERDER'S PLACE IN THE SCIENTIFIC TRADITION

1. Herder's influence on science

(a) Herder's friends and critics in the scientific world, and the reception of the *Ideen*

Herder had many contacts with scientific circles. He was personally acquainted with the great anatomist Blumenbach,[1] with Chladni, the founder of modern musical acoustics,[2] the naturalist and traveller Georg Forster[3] (who offered to collect, on his proposed world-tour, any observations which Herder might find useful), the astronomer von Hahn,[4] the mathematician Lichtenberg,[5] the biologist Sömmering,[6] the geologist Werner,[7] and many others. Apart from his wide reading in the literature of science, he derived some of his scientific knowledge from such personal contacts.[8] His *Ideen,* apart from their philosophical implications (which Kant so severely criticised), were in fact applauded by several scientists whose subjects were discussed in the work. For although Blumenbach emphasised the scientific shortcomings of the work more than most critics,[9] and Lichtenberg actually condemned it as scientifically inadequate,[10] the anatomist Camper wrote a well-known letter of praise to Herder,[11] his pupil Herbell dedicated to Herder the second volume of Camper's *Kleinere Schriften,*[12] and Sömmering wrote Herder a letter (still unpublished) praising his work highly.[13] Sömmering actually cited him with approval in his *Über die körperliche Verschiedenheit des Negers vom Europäer* in 1785,[14] and Forster wrote to him enthusiastically about the *Ideen,*[15] although he qualified his praise as follows in a letter to Sömmering:[16]

> . . . mir hat das Buch sehr gefallen, bis auf die gar zu sichtliche Anhänglichkeit an sein [i.e. Leibnizian and metaphysical] System von Philosophie, und die Unbekanntschaft mit Naturgeschichte, wo ihn bisweilen die Autorität eines unzuverlässigen Schriftstellers irre geführt hat.

For as we have seen, Herder himself lacked a thorough training in scientific observation and experiment, and he sometimes indiscriminately adopted theories which were already obsolete and discredited. But the famous neurophysiologist Gall, whose name has been somewhat unwarrantably associated with the school of pseudo-scientific phrenologists in the early nineteenth century who appropriated many of his ideas, looked on Herder's work with approval, and Caroline remarks: 'Gall hat an mehrern Orten, wo er Vorlesungen hielt, Herders mit Hochachtung gedacht und gesagt, daß ihn seine *Ideen zur Philosophie der Geschichte* auf seine

Forschungen und Entdeckungen geführt hätten'.[17]

From these facts, it is evident that Herder's *Ideen* did not meet with complete disapproval in the scientific circles of his day, and that several eminent scientists received the work with praise. The influence of his *Ideen* in particular upon those around him was considerable (we have seen how much the work influenced Goethe), and Knebel writes to him as follows: '. . . wenn ich etwas Gutes hervorbringe, so kann ich es größtentheils als Zweige und Absenker ansehn von dem, was Sie uns gegeben haben'.[18] And finally, it is not commonly realised that Herder was also accorded official recognition for his contributions to scientific thought. Caroline records the following:[19]

> Von andern öffentlichen Ehrenbezeugungen melde ich nur noch, daß er am 23. August 1787 als Mitglied in die königl. Akademie der Wissenschaften zu Berlin . . . – 14. Juli 1793 in die physikalische Gesellschaft zu Jena . . . aufgenommen worden.

(b) Herder's influence on the sciences

So far as can be ascertained, Herder's influence upon the physical sciences was negligible. This, of course, is what one would expect, because his imprecise generalisations and his qualitative 'Kräfte' rendered most of his physical theories worthless for exact scientific purposes. Only in the fourth *Kritisches Wäldchen*, unpublished in his lifetime, are there some more positive ideas, and there are some grounds for agreeing with Zöckler[20] that (in physiological optics and acoustics) he can be regarded, in relation to the state of knowledge in his age, as a 'Vorläufer Helmholtzs', although Helmholtz reached his own conclusions independently. In geology, some of his ideas recur in later works, but few of them were original to Herder, and he did not support them with adequate empirical data.

In biology, however, his influence was more considerable. His *Ideen* influenced the biologist Kielmeyer, and through him, his illustrious pupil, the comparative anatomist Cuvier.[21] One critic even contends: 'Herder's *Ideen* were the starting point for the whole biological movement around 1800 including not only Kielmeyer but also Goethe, Cuvier and Pfaff'.[22] As we have seen, Herder was probably the first to use the word 'Protoplasma' in biology, but it is uncertain whether or not those who later gave it currency had found it in his works. And his interesting observations on animal instinct, set forth in his treatise *Über den Ursprung der Sprache,* were taken up and partially refuted by the younger Reimarus, as we earlier noticed, in a later edition of his father's work on the same subject. Furthermore, F. H. Jacobi's first independent work was entitled *Betrachtung über die von Herrn Herder in seiner Abhandlung vom Ursprung der Sprache vorgelegte genetische Erklärung der thierischen Kunstfertigkeiten und Kunsttriebe.*[23] Herder is also cited by such biologists as J. C. Reil, J. F. Meckel (1815), Gall and Spurzheim (1810-19), and von Baer (1864),[24] and Lotze, in his *Mikrokosmos,* renews his anthropological theory that man's upright stature is responsible for many of his characteristically human attributes.[25]

But in general geography, Herder's influence was much greater than in anthropology. The 'botanical geography' for which he appealed in his *Ideen* was eventually established by Alexander von Humboldt.[26] It is well known that Herder significantly influenced the geographer Carl Ritter (1822), especially with his theory of environmental determinism[27]; the author of an article on Herder and Ritter writes: 'Wenn Herder die geistigen Voraussetzungen für das Entfalten und spätere Aufblühen der geographischen Wissenschaft schuf, so wurde Carl Ritter der eigentliche Begründer der wissenschaftlichen Geographie'.[28] Rudolf Haym also notices that Herder's ideas influenced the geographers F. Ratzel and Paul Lehmann[29]; in fact, Ratzel himself wrote an article on Herder,[30] and quotes him several times in his famous *Anthropo-Geographie* (1882). He approves of Herder's definition of history as 'in Bewegung gesetzte Geographie',[31] and defends his (and Ritter's) 'immanent' teleology, saying:[32]

> Der Forscher sucht die Ursachen der Wirkungen zu erkennen, welche den Gegenstand seiner Forschungen bilden, und es kann ihn nicht in diesem Forschen beirren, ob das letzte Ziel dieser Wirkungen ein von höherer Macht gesetztes und ob das Spiel dieser Ursachen und Wirkungen ein von höherer Intelligenz geleitetes sei. Das Wesentliche, auf das allein wir alle ausgehen, ist . . . zu erkennen, ob . . . die Schicksale der Völker in einem gewissen Maße von ihren Natur-Umgebungen bestimmt sind.

In his article on Herder, Ratzel also notes that Herder's influence is apparent in O. Peschel's *Völkerkunde.*[33]

Herder's psychological theories had little direct influence upon the progress of psychology, perhaps partly because some of his best psychological observations appear in the fourth *Kritisches Wäldchen,* which remained unpublished during his lifetime, and whose central object, the attack on the little known Riedel, was unlikely to inspire interest. But it has been claimed that Wundt's ideas reflect some of Herder's,[34] and that Lotze's *Mikrokosmos* 'developed further Herder's ideas. . . '.[35] Furthermore, F. A. Carus, in his *Geschichte der Psychologie* of 1808, shows a considerable knowledge of Herder's works, and praises certain ideas from his *Vom Erkennen und Empfinden,* especially the notion that mental functions are distinguishable only in behaviour or 'That', and the idea that harmful psychological effects are produced by the division of labour.[36]

Thus Herder's scientific theories did influence the various sciences in some respects, but that this influence must not be overrated, or presumed where there is no evidence to prove it. Herder was rather a general theorist of science than an exact scientific investigator, and his particular theories could have produced greater effects only if they had been more detailed and supported by quantitative experiment and observation.

(c) Herder's influence on Goethe's scientific writings

In the course of this work, the influence of many of Herder's particular theories upon Goethe's scientific writings has been discussed in detail, so that little need be added here to what has already been said. So far as particular theories are concerned, we have seen that Herder influenced Goethe on innumerable occasions.

Haym maintains that Herder, in the *Ideen*, is more influenced by Goethe than vice versa,[37] but Suphan rightly points out that this is untrue, and that there is every indication (including the halting, spontaneously written manuscripts for Part I of the *Ideen*) that Herder reached most of his conclusions independently.[38] The conclusions reached earlier in this work confirm that Goethe was much more influenced by Herder in his particular theories than vice versa, while Goethe's influence upon Herder is usually evident in his general attitudes, making itself felt, for example, when Herder becomes more preoccupied with form than with invisible 'Kräfte', when his interest in nature, with all its religious implications, increases so greatly in his Weimar years, and when he abandons his teleological and catastrophist theories on the history of the earth. These were tendencies which Goethe undoubtedly encouraged.

But certain of Herder's general attitudes, as well as his particular scientific theories, also influenced Goethe. Goethe's interest in science can be traced back in part to his association with Herder in Strassburg,[39] and the ideas of the genetic, the organic, of development and of dynamic form, all of which are fundamental to Goethe's scientific thought, were all present in Herder's writings by the time of his stay in Strassburg.[40] Moreover, traces of Herder's idea of environmental determinism can be detected in some of Goethe's scientific writings.[41] If we consider both these wider influences of Herder upon Goethe the scientist as well as the many particular ones discussed earlier in this work, it is not too much to say that, without understanding Herder's scientific thought, one cannot fully appreciate that of Goethe, who was more influenced by Herder's ideas than was any other student of science.[42]

2. Herder's influence on the philosophy of nature and science

In 1828, Goethe calls Herder's *Ideen* 'ein vor fünfzig Jahren in Deutschland entsprungenes Werk, welches unglaublich auf die Bildung der Nation eingewirkt hat'.[43] Some of Herder's utterances may now strike us as truisms, but not all of these were truisms when he wrote them. He is himself largely responsible for this change, because his *Ideen* achieved an immense popularity, and many of his thoughts became part of the common heritage of the German mind. So far as his scientific ideas are concerned, the attitudes and methods he brought to the study of nature in the widest sense exercised a greater influence than his particular scientific theories, but because of their very generality, they cannot easily be traced as direct influences upon the works of later thinkers.

One can with little difficulty discover Herder's influence in the *Naturphilosophie* of the Romantics, however.[44] For although he was not himself a *Naturphilosoph* of the same sort as the Romantics, his philosophy of nature has affinities with their fanciful and often mystical ideas. (On the other hand, he was much influenced by the earlier metaphysical theories of Leibniz, as well as by those of the empirical philosophers such as Bacon, Locke, and the early Kant.) As Haym says, Schelling's philosophy has the same (pseudo-)Spinozistic basis ('Spinozismus der Physik') and poetic inspiration as Herder's mature thought, and one of his early works echoes in its title (*Ideen zu einer Philosophie der Natur*) that of Herder's *magnum opus.*[45] Herder's ideas on ontogeny and phylogeny influenced Schelling,[46] and his *Gott* in particular helped to shape Schelling's thought.[47] The physicist and Romantic J. W. Ritter was a welcome guest in the Herder household at the turn of the century,[48] and he paid a warm tribute to Herder in his *Fragmente aus dem Nachlasse eines jungen Physikers* of 1810.[49] G. H. Schubert was another *Naturphilosoph* who admired Herder[50]; he acknowledges his debt to him in his autobiography.[51] Baader too, it has been claimed, was influenced by him,[52] and the thought of Oken and of Steffens resembles Herder's in ways which may or may not indicate a direct influence.[53] Oken, it will be recalled, put forward a rather more anthropomorphic version of Herder's theory of a universal 'type'; he was also addicted to the notion of polarity and to number-mysticism.[54]

Herder's thought on nature and science will always appeal to those who, like the Romantic scientists, envisage nature, ultimately in a mystical sense, as a unified whole. This tendency is present in many German works on nature from Herder's *Ideen* to A. v. Humboldt's *Kosmos.*[55] But to depict nature as a whole without falling back upon empty or mystical abstractions means that one must adduce data from many branches of learning, and, as knowledge advances, it becomes increasingly difficult to do so without lapsing into dilettantism. Dilettantism, especially in science, is one of the least praiseworthy features of Romantic *Naturphilosophie.*[56]

We have already seen in the first part of this work how various general ideas in Herder's scientific thought influenced later thinkers – such were his theory of environmental determinism, his comparative method, and his belief in constant change and development. Ideas of this kind came into general currency in the nineteenth century, and it is extremely difficult to say where Herder's influence is at work, for these are general attitudes and methods rather than specific theories, and their earliest exponents are rarely acknowledged by those who later become indebted to them. The most interesting features of Herder's philosophy of science, however, also include his analogical method, his dialectical formulations, his ideas on teleology, natural wholes and the organic, and his theories of natural law and what are now called 'levels of organisation'. It is difficult to say whether he influenced the modern equivalents of these ideas in any way. It seems probable that most of them arose independently in his thought and amongst later theorists, largely as a consequence of that organic view of existence which has figured so prominently in some recent philosophies of science, especially those associated with biology. It is worth noticing, however, that one leading organicist, Joseph Needham, quotes Herder in his work.[57] Herder's organic view of the natural world, with all its ramifications, is his greatest contribution to scientific thought, and one can still find in it much that is valuable.

These, then, are a few of the more obvious ways in which Herder influenced later philosophies of science, especially the *Naturphilosophie* of the Romantic era in Germany. A detailed study even of his influence on *Naturphilosophie,* however, would go far beyond the theme and intended length of this work. There can nevertheless be no doubt that he directly influenced the *Naturphilosophen* more than any other philosophers of science (apart from Goethe), and the next section, in which it is proposed to define his place in the history of scientific thought as a whole, will perhaps help to explain why his influence did not extend further beyond the thought of the Romantics than it actually did.

3. Herder and the scientific tradition

In the eighteenth century, two extremes can be distinguished in scientific thought. These are the mechanistic and the spiritualistic (or vitalistic) interpretations of nature. The mechanistic conception, which was fostered by the tremendous advances in mechanics during the previous century, culminated in France in an extreme mechanistic materialism, whose supporters included Holbach and Lamettrie; it proved incapable, with its crude and unsophisticated analogies, of explaining biological and psychological phenomena satisfactorily. The other extreme, which descended from the ideas of Paracelsus, Stahl and others, explained all natural events by means of hypothetical spiritualistic agencies, invisible to the observer. Herder, of course, with his concept of 'Kraft', was nearer to the latter extreme than to the former, although, while he rejected mechanism, he was not so implacably opposed to materialism itself. Nordenskiöld, in his history of biology, admirably summarises the merits and demerits of the spiritualistic conception of nature, and most of his conclusions apply to Herder:[58]

> This attempt to regard nature as a living entity, to look for connections in phenomena where, when viewed superficially, none are apparent, has constituted this tendency's greatest service, besides which the freedom from [text reads 'of', which seems to be a misprint] mechanical principles, in many cases, admitted of greater liberty in the interpretation of special phenomena, as Wolff's embryological and Sprengel's botanical investigations proved. The weakness of this spiritualistic view of nature has lain in the frequent desire to solve by mystical formulae problems the solution of which would have required observation and deep thought, and, generally speaking, in its tendency to degenerate into meaningless phrases.

In the latter respect, Herder is indeed a true precursor of Romantic *Naturphilosophie.*

Herder's theories of nature can also be described as 'dynamistic'. He belongs to a long tradition of dynamism, a tradition which extends from Heraclitus and Plotinus to Leibniz, and on to Hegel and later evolutionary philosophers, such as Bergson, the psychologist Jung and the theorists of emergent evolution. All of these have regarded the universe as dynamic, and in the dynamic process, some ideal principle supposedly manifests itself.

There are two sides to Herder's dynamistic philosophy of nature. There is firstly the 'Kraft', the invisible principle behind all natural changes, and secondly, the formal principles by which such changes are described and classified. Herder's 'Kräfte' and ideal entities were valueless to science in the long run, although, as we have seen, they once had some use in counteracting over-simplified mechanism. The 'Kräfte', like the ideal Chain of Being, were an *a priori* scheme which broke down as science advanced, although the 'Kraft' concept survived in certain vitalistic theories, like those of Driesch, until early in the present century. Since many of Herder's particular scientific theories were based upon metaphysical assumptions of this kind, they could not long survive the ordeal of empirical tests. But secondly, the formal or methodological side of his scientific thought was of much greater value, and in many ways, it looks out beyond *Naturphilosophie* to modern theories of science. For example, he coupled his vitalistic 'Kräfte' with dialectical descriptions of natural change. Later, the vitalistic substructure was forgotten, but the dialectical formulations survived, reapplied to pure materialism, in Marxist theories of science. But even the Chain of Being, so far as it encompassed visible forms, was a necessary forerunner of modern systems of classification, and, when it became 'temporalised' in the philosophies of Leibniz and Herder, helped to prepare the way for the modern biological theory of evolution.

Herder's ideas on nature and science are of special relevance to theoretical biology. They were too divorced from mathematical and quantitative methods to describe the inanimate world satisfactorily, while they treated psychology as an extension of biology or physiology. When modern biology began to emerge out of natural history, many traditional dualisms broke down, and from Herder's day to ours, biological thinkers, whose interests lie – to use the old dualistic terminology – between matter and mind, have tended to advocate some form of monism. Herder's monism, so far as it depends on the concept of 'Kraft', the hypothetical content of the natural world, is closer to mysticism than to modern scientific thought, but in its formal, methodological aspects, it anticipates many later developments. The mystical branch of monism lost itself in the vagaries of Romantic *Naturphilosophie,* but the methodological equipment with which it had been associated in Herder's thought points forward to modern organic theories of nature. When this equipment was applied to exact data of observation and experiment, it produced a way of thinking which superseded both mechanism and vitalism in theoretical biology. Herder's (not always consistent) relativism and opposition to anthropomorphic and anthropocentric conceptions, his advocacy of comparative methods and the classification of natural forms according to their relative complexity, his analogical method, his ideas of development and of environmental determinism, his holistic and organicistic theories, his final stand against teleology, his bold but premature attempts to apply mathematical formulae to biological and social changes, his 'dialectical method', his theories of natural law and of levels of organisation in the natural world all recur in later philosophies of science, often in relation to biology. Here lay elements of a philosophy of nature and science which was superior both to the mechanism of the French materialists and the mysticism of the Romantics.

But even the organic way of thinking is by no means restricted to theoretical biology. It sprang originally from a monistic attitude, from an unconditional desire to see nature in its entirety as a unitary whole, which, when considered as dynamic, is readily described by the analogy of the organism. In Whitehead's philosophy, organic terms are applied not just to biology, but to the physical and social worlds as well. Joseph Needham writes in an essay on Whitehead: 'It may well be that we are on the threshold of a long period, lasting perhaps for several centuries, in which the organic conception of the world will transform society. . . '.[59] The same writer observes that a fundamental change in this direction has already taken place:[60]

> This change of view, occupying four hundred years, may be characterised as the transition from Space and Matter as the fundamental notions, to Process conceived of as a complex of Activity with internal relations between its various factors.

In this sense, instead of biology being threatened with engulfment by physical or mechanistic principles, as it was in Herder's day, an attitude normally (but not necessarily) associated with biology is now extended by some thinkers to the physical world and to the universe at large.[61]

Another important influence made itself felt in scientific thought from the late eighteenth century onwards, and particularly in the nineteenth century – the Kantian philosophy. Herder's thought is pre-Kantian in that it lacks a critical epistemology such as Kant gave to the philosophy of science. The problems with which Herder deals are often the same as those which Kant tackled in his mature philosophy, but Herder's solutions are simpler, more unquestioning and more self-confident, for he fails to perceive many of the logical difficulties with which inductive methods are fraught, and he does not clearly distinguish between the logical and the empirical. To this day, organic theories of nature and all forms of dogmatic monism are open to many logical objections similar to those which can be raised against Herder's philosophy, as Sir Karl Popper and others have shown.

In the great synthesis of knowledge and experience which Herder's ideas on nature and science represent, there are many contradictions. He was filled with a belief in the ultimate unity of all knowledge, and tried to demonstrate this in practice, without allowing one organ of truth to eclipse the others. This makes his thought not only contradictory in itself, but also unusually challenging to others. His unstable synthesis did not outlive him, but elements of it reappear in many later philosophies of science, including those of Romantic *Naturphilosophen*, dialectical materialists, evolutionary monists, modern biological vitalists, and supporters of holism and organicism. Herder dealt with very many of the problems which will always confront the scientific thinker, and he was one of the last to deal with them within the context of human knowledge and experience as a whole.

NOTES

1 Cf. Düntzer 25 II, 331, to Caroline, 30 September 1789.
2 Cf. Haym 64 II, 809.
3 Cf. Düntzer 23 II, 401, to Herder, 1 September 1787.
4 Cf. Caroline 65 I, 255-256.
5 Cf. Schauer 46 II, 222, Herder to Caroline, 9 September 1772.
6 Cf. Düntzer 26 II, 35, Caroline to Knebel, 5 November 1802.
7 Cf. Düntzer 25 I, 306, Caroline to Gleim, 6 January 1803.
8 Cf. Haym 64 II, 334: '. . . den Füßen andrer Leute seinen Kopf aufzusetzen – das war sein Ehrgeiz und darin bestand seine Genialität. . . So wurde er der Schüler der Camper und Sömmering, um sich als ihren Lehrer anerkannt zu hören. . . '.
9 Cf. Haym 64 II, 263, note, who refers to a letter of 3 May 1785 from Blumenbach to Sömmering. I have been unable to consult the work in which this letter was published (R. Wagner, *Sömmerings Leben,* Leipzig, 1844), but Wells 130 p. 156, note, says that Blumenbach had written of the zoological observations in the *Ideen* that the author had 'assembled his materials too hastily and thus totally misunderstood many details'. This would certainly apply, for example, to Herder's interpretation of Haller's physiology.
10 Cf. Haym 64 II, 262. Lichtenberg dismissed Herder's work as a mere 'Stümpern in höherer Wissenschaft'.
11 Cf. Düntzer 25 III, 294-297.
12 Cf. Haym 64 II, 263.
13 Cf. Haym 64 II, 249; Herder's reply can be consulted in Dobbek 22 p. 249.
14 Cf. Wagner 54 p. 474, letter of 11 November 1785.
15 Cf. Düntzer 23 II, 402.
16 Hettner 32 p. 206, to Sömmering, 5 March 1785.
17 Caroline 65 III, 109.
18 Düntzer 25 III, 127, to Herder, 4 December 1798. On the influence of Herder's *Ideen* in a wider sense, particularly on the development of sociological and historical thought, G. A. Wells' *Herder and After* (Wells 130) should be consulted.
19 Caroline 65 III, 255.
20 Zöckler 250 III, 268.
21 Cf. Witte 191 p. 249 and Sauter 114 p. 88.
22 Temkin 126 p. 241.
23 Cf. Düntzer 23 II, 235 and Jacobi 36 VI, 243.
24 Cf. Temkin 126 p. 243.
25 Cf. Siegel 179 p. 231 note 4.
26 Cf. Hansen 81 p. 14 and Nordenskiöld p. 315.
27 Cf. Bruntsch 74 p. 84.
28 Schwarz 119 p. 152.
29 Haym 64 II, 263.
30 Ratzel 107.
31 F. Ratzel, *Anthropo-Geographie,* I, Stuttgart, 1882, pp. 6 and 27.
32 Ratzel, *op. cit.,* p. 55.
33 Ratzel 107 p. 46.
34 Götz 78 p. 175.
35 Schütze 117 p. 554.
36 F. A. Carus, *Geschichte der Psychologie,* in *Nachgelassene Werke,* III, Leipzig, 1808, pp. 676-678.
37 Haym 64 II, 203.
38 SW XIV, 696-697, editor's postscript. A. Gillies has done much to show that Herder

influenced Goethe in countless ways throughout his life (cf. Gillies 63 p. 115 and Gillies 146 *passim*), and R. T. Clark likewise believes that Herder influenced Goethe more than Goethe influenced him (Clark 62 pp. 300-301); Rouché 172 p. 533, note, also declares: 'Le rôle de Goethe dans l'élaboration des *Idées* a été parfois fort exagéré.'

39 Cf. Jacoby 154 pp. 22-23.

40 Cf. Rasch 69 p. 128 and Haym 64 II, 206.

41 Cf. Bruntsch 74 p. 81.

42 For further studies of Herder's influence on Goethe's scientific ideas see Nisbet 103. The influence of Herder on Goethe is a subject which, although far from neglected, still awaits a comprehensive study.

43 *Goethes Werke*, Weimar edition, I. Abteilung XLI^2 p. 345.

44 Cf. Siegel 179 pp. XIV-XV, who says that Herder's ideas are scarcely less important for 'Naturphilosophie' than for the philosophy of history, adding: 'Und eben hierin scheint mir vor allem, rein historisch genommen, Herders Stellung in der Geschichte der Naturphilosophie zu liegen. . . : Herder läßt als Bindeglied die Kontinuität der Entwicklung von Leibniz über Schelling bis zu unsern Tagen auf das deutlichste hervortreten'.

45 Haym 64 II, 296 and 784; cf. *ibid.* I, 675-676.

46 Cf. Temkin 126 p. 241.

47 Cf. Siegel 179 pp. 79-80 and p. 232, note.

48 Cf. Hoffman 33 p. 69, Caroline to J. von Müller, January/February 1804.

49 *Fragmente aus dem Nachlasse eines jungen Physikers*, hg. von J. W. Ritter, 1. Bändchen, Heidelberg, 1810, pp. XXXII – LI; cf. also Caroline 65 III, 260-263. Ritter tends, however, to project his own extravagant and mystical ideas into Herder.

50 Cf. O. Walzel, *Deutsche Romantik*, 2. - 3. Auflage, Leipzig, 1912, p. 11.

51 Cf. Sell 178 p. 71.

52 Cf. Bürkner 61 p. 198; cf. also Wilhelmsmeyer 189 p. 234.

53 Cf. Witte 191 p. 255.

54 Cf. Nordenskiöld 237 pp. 288-289.

55 The latter work bears the imprint of Herder's *Ideen* throughout, but particularly in the first volume. Cf. the following passage: '. . . es lag mir. . .ob, zu entwickeln, wie, ohne dem gründlichen Studium specieller Disciplinen zu schaden, den naturwissenschaftlichen Bestrebungen ein höherer Standpunkt angewiesen werden kann, von dem aus alle Gebilde und Kräfte sich als ein durch innere Regung belebtes Naturganze offenbaren. Nicht ein todtes Aggregat ist die Natur. . . [etc.]' (Alexander von Humboldt, *Kosmos*, I, Stuttgart und Tübingen, 1845, p. 39).

56 Sell 178 p. 100 rightly remarks: 'Man kann auch von einem Fortwirken der Herderschen universellen Geistesrichtung in Verbindung mit dem davon unzertrennlichen Dilettantismus in gewissen deutschen Denkern sprechen. Es sind m.E. C. K. J. Bunsen, Max Müller, Moritz Carriere'. Max Müller admired Herder's idea of development, and was one of the first to hail him, mistakenly, as a precursor of Darwin (cf. Max Müller, *Natural Religion*, The Gifford Lectures, 1888, published London, 1889, pp. 261-264).

57 Needham 206 p. 233.

58 Nordenskiöld 237 p. 269.

59 Needham 206 p. 186.

60 Needham 206 p. 198.

61 This is not to suggest that Whitehead, Needham and their adherents, for all their claims, are the most important influences in contemporary thinking on nature and science. Since Whitehead wrote his major works, organic models of nature have declined in prestige, and cybernetics has helped to reinstate mechanical models in a new guise.

CONCLUSION

In Herder's philosophy of nature and science, the general methods he uses to describe and classify natural phenomena are his greatest contribution to the scientific tradition, and, from the point of view of today, his particular scientific theories are of secondary importance. Nevertheless, these theories are backed up by a very extensive reading, and they provide us with a remarkably full picture of the state of science in the eighteenth century and the age of Goethe, who was more profoundly influenced by Herder's ideas than has hitherto been suspected.

As for influences at work upon Herder, it has emerged in the course of this study that the earlier ideas of Kant, his old teacher, were by far the greatest single influence upon his own scientific thought, even in matters of detail. On a more abstract level, the influence of Leibniz is only slightly less obvious.

Herder, we have seen, was neither an exact scientific investigator nor a theologian bent upon imposing his beliefs upon the scientific world. This becomes clear if we study him first and foremost within the context of his own age, and do not seek to interpret his works exclusively in terms of later problems or to read our own favourite ideas into them. Since it lay in his innermost nature to try to reconcile the many conflicting areas of his wide knowledge and experience, his thought is complex, often contradictory, and imprecise in detail. But his unwavering belief that all knowledge is connected and that science is an essential, but by no means exclusive, organ of truth, is still worthy of consideration today.

His scientific thought has, on the whole, been much neglected. For this, there are probably three main reasons. Firstly, it has been thought that his adversary Kant had shown that his theories of nature and science are fundamentally misguided; secondly, too many critics have made the mistake of searching in his works for modern scientific theories, especially for a Darwinian theory of evolution, thereby misrepresenting his thought and discouraging further serious enquiry; and thirdly, he has repeatedly been depicted as an irrationalist and disciple of Hamann. But Kant's criticisms detract little from the most valuable part of Herder's scientific thought, from that methodological equipment which, as we have noticed, has in many cases been inherited by subsequent scientific thinkers down to the present century; furthermore, the discovery that Herder is not a Darwinist merely proves what certain critics should have recognised from the start, that he is not an exact scientist and that historians of science should look first to the history of scientific methods before trying to find precursors for every modern discovery which improved techniques and an increased knowledge of the natural world have made possible; and finally, it can be shown that Herder never repudiated reason, and that his allegiance to Hamann was always far from unqualified. None of these objections invalidates what is enduring in his scientific thought, although they have caused it to be neglected more than it has deserved. Many of his methods and aims are still relevant today, because he grappled with numerous problems which still confront us. Yet he was himself seldom completely satisfied with his own conclusions. This explains why so many of his works are unfinished, several times revised, or full of contradictions. They have been and always will be peculiarly stimulating to later generations largely because they leave as many questions unanswered as problems solved.

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