Ludwik Bielawski

Time in Music and Culture

Volume 15

Eastern European Studies in Musicology

Edited by Maciej Gołąb

PETER LANG

From Aristotle to Heidegger, philosophers distinguished two orders of time, before and after, and past, present and future, presenting them in a wide range of interpretations. It was only around the turn of the 1970s that two theories of time which deliberately went beyond that tradition, enhancing our notional apparatus, were produced independently of one another. The nature philosopher Julius T. Fraser, founder of the interdisciplinary International Society for the Study of Time, distinguished temporal levels in the evolution of the Cosmos and the structure of the human mind: *atemporality, prototemporality, eotemporality, biotemporality* and *nootemporality*. Ludwik Bielawski distinguishes two 'dimensions' in time: the dimension of the sequence of time (syntagmatic) and the dimension of the sizes of duration or frequency (systemic). On the systemic scale, Bielawski distinguishes, in human ways of existing and acting, a *visual zone, zone of the psychological present, zone of works and performances, zone of the natural and cultural environment, zone of individual and social life* and *zone of history, myth and tradition*, and also provides a synthesis of these theories.

Ludwik Bielawski is ethnomusicologist and music theorist. He is a professor in the Institute of Art of the Polish Academy of Sciences and the Fryderyk Chopin University of Music. His works focus on the musical folk traditions of Poland and Europe, and also on theoretical aspects of time and space in music and in culture.

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Prologue

The dispute over time has recurred in philosophy and learning for centuries. It has concerned in particular the objective and relative nature of time. Newton, for example, taught that 'absolute, true, mathematical time flows on by virtue of its own nature, uniformly, and unrelated to any outward circumstance'.[1] That view was fundamentally revised by Einstein, who showed the relativity of time and space and their dependence on matter. In Einstein's own words, the meaning of the theory of relativity is as follows: 'It was formerly believed that if all material things disappeared out of the universe, time and space would be left. According to the relativity theory, however, time and space disappear together with the things'.[2] In demonstrating the relativity of time and space and their dependence on the point of reference, Einstein had in mind objective systems, independent of man. Fascinated by philosophical views and scientific advancements, art theorists sometimes forget about their own system of reference, which makes them humanists and not scientists. For humanists, that system of reference will always be humans, the way they exist in time and space, the way they observe and sense time and space, and the way they organise time and space, as documented in the products of their own activity, one of the crucial manifestations of which is artistic activity, including music.

Even if Einstein's theory to all intents and purposes shows the relativity of time and space only at velocities close to the speed of light, which allows us to treat our terrestrial time as absolute and constant, the postulate of the human point of reference in research into musical time has remained current. Whilst emphasising the fundamental difference that arises between the scientific and humanistic approaches to aspects of time, by no means do I wish to maintain that the adoption of that human perspective necessarily leads to subjective, unverifiable statements and to abandoning at the very outset the chief postulates of a branch of learning that aspires, after all, to establishing objective results. Although we have no proof of the boundless possibilities of scientific methods in relation to the problems of humans, their awareness of their own existence, their activities, notions, convictions, motives, etc., there certainly remains plenty of scope for objective methods and scientific study. As I see it, that objectivity in relation to musical time will be ensured by two basic factors: basing our enquiry

1 Quoted in Trattner 1942, 383.
2 Quoted in Spielvogel 2008, 452.

not on introspection, but on the observation of human behaviours, concretised in temporal musical and non-musical products, and comparing data with an objective scale of physical time.

The antinomy between the astronomical measure of time, from which the division of clock time derives, and the internal time of humans was already sensed by St Augustine, writing in his *Confessions*: 'in te, anima mea, tempora metior' ('it is in you, my mind [my soul], that I measure periods of time').[3] And it will hardly be barbaric to attempt to express that measure of the human soul or mind in the form of numbers and physical quantities, since humans reveal that measure in the products of their soul, and perhaps most distinctly in music.

This book arose during my work at the Institute of Art of the Polish Academy of Sciences, where successive directors have created favourable conditions for me to develop my individual research concepts, for which I am profoundly grateful.

I thank all those people from whom I have learned; those with whom I was fated to work and those who consider themselves to be my pupils.

Thank you for the TIME we have shared.

3 Augustine 2008, 242.

1 Introductory questions

1.1 The anthropological perspective and two hierarchies of time

The anthropology of music is the study of all manifestations of music in the world, irrespective of the degree to which that music is developed and how it functions in culture. It focusses on man's musical capabilities, exploited and developed in various ways in different cultures. Music anthropology is an emerging field of study, still seeking its own identity. Awareness of the need to establish it is quite widespread, but there is no agreement over the way that goal might be achieved. Great hopes are often invested in the experience and achievements of the most dynamic humanistic disciplines, which in recent decades have included modern linguistics and the related, but more general, field of semiology. Without negating the substantial and hitherto underexploited possibilities afforded by those disciplines, one must realise that different needs motivated their emergence and development. Consequently, when referring to music, they often impose an approach that is alien to its nature. There is also potential, of course, in interdisciplinary research into humans and human culture, including music. However, by no means do they lead in a natural way to the forming of syntheses; in practice, they increasingly expand the horizons of observation, multiply perspectives and tend to obscure the overall picture. It is my personal opinion that some positive effects may accrue from a return to the most basic categories of human thinking, action and existence in the world, which certainly include the categories of time and space. They are strongly linked to one another and interdependent. I will focus mainly on time, and more specifically on two hierarchies of time, which I believe may be of considerable service to contemporary musical knowledge. I have in mind here the concept of temporal zones, which I explored in more detail in earlier studies, and the interpretative proposition advanced by the American scholar Julius T. Fraser, presented in the natural philosophy of time, called the principle of temporal levels. These two concepts have completely different points of departure, but the same overall aims. Fraser distinguished the basic levels of nature, the temporalities of which are sustained by a given environment (Umwelts), and he stated that these natural temporal levels are also perpetuated in the structure of the human mind. Fraser passes from analysis of nature to humans and human culture, and he even touches on music. As for myself, I began with detailed analysis of time in music and arrived at the time of humans and human culture, at the most coming close to the time of nature. I realised just how complementary these concepts were thanks to the Dutch psychologist John A. Michon, who commented on Fraser's concept in an original and creative way. Fraser's concept of temporal levels is in principle an integral concept and much broader than my own. According to its author, all temporal phenomena can only be described in terms of the temporalities that he distinguished. I was not driven by such ambitions. On the contrary, I deliberately confined myself to the issues which seemed to me insufficiently diagnosed in the theory and philosophy of music and man.

The hierarchy of temporal levels is essentially very simple. It involves enhancing time with new temporal properties on a succession of ever higher levels or, conversely, reducing the properties of time as one descends onto increasingly lower temporal levels. Five such levels can be distinguished:

1 on the lowest level, the nominal, atemporal level, only simultaneity exists;
2 on the ordinal, prototemporal level, temporality is enhanced by the order of time, by succession;
3 on the intervallic, eotemporal level, the foregoing properties are joined by measurable sizes of time: duration and frequency;
4 not manifest until the organic, biotemporal level are the present, separating past and future, and the opposition between a living organism and its environment;
5 distinguished on the mental, nootemporal level are personal identity and an awareness of beginnings and ends. It is only here that the meaning of time for humans is fully revealed, in their individual and social life and in their worldview.

Music belongs to this last level, but is not confined to it, since the human mind has the capacity to descend onto lower temporal levels, as is reflected in our understanding of musical phenomena.

There is a general awareness of the hierarchy of temporal zones. It is manifest in the superiority and inferiority of the levels of temporal organisation. Each level employs a characteristic range of temporal sizes – a characteristic zone of time. Sounds on a higher level of organisation merge into motifs with their own temporal zone, motifs combine into phrases, also with their own temporal zone, phrases into sentences, sentences into periods and so on, until we reach a full musical utterance in the form of a work as a whole. As we pass onto a higher level of organisation, whilst gaining understanding, we lose information. We are less aware of the hierarchy of higher-order temporal zones, which is formed by the following:

1 the zone of the psychological present and of musical language,
2 the zone of musical works and events,
3 the zone of ecological time and the musical environment,
4 the zone of individual and social life,
5 the zone of history, myth and tradition.

These zones illuminate the problem of music and reveal its various meanings in a specific way.

The question arises as to whether such a general approach can really be successfully applied to music. Well, it appears that it can, as I have expressed in an earlier work published under the title *Strefowa teoria czasu i jej znaczenie dla antropologii muzycznej* [A zonal theory of time and its significance for music anthropology].[4] So can we speak of music anthropology as something existing and perpetuated in learning? I have my doubts. Admittedly, there are a number of works with such a title, including Alan P. Merriam's *The Anthropology of Music*.[5] Merriam combined two disciplines, cultural anthropology and ethnomusicology, to produce his anthropology of music. For him, anthropology was something obvious, and he felt no need to define it. What he saw as new and requiring definition was ethnomusicology. Compared to the rich anthropological literature, the literature covered by the name ethnomusicology seemed to him to be poor and less firmly established in theoretical terms. Merriam sought support in the established field of cultural anthropology, expanding its scope to include a subject that tended to be overlooked: music. He certainly did not argue that this was the only justified direction to research. On the contrary, he considered that the complex character of the object of study, with its dual anthropological and musicological aspects, justified approaching the problem from both angles. Traditionally, most published studies from the field of ethnomusicology were biased towards musicological issues, and that has essentially remained true to this day. Merriam consciously adopted the other perspective, approaching the subject mainly from the anthropological angle, and that was his original contribution to, and at the same time justification for, redefining the discipline as music anthropology.

Although my own thinking followed different paths, they led to a convergence in the titles of our studies. For me, the starting point was rather traditional musicological study, but combined with a certain wariness of the research methods employed in musicology and a criticism of its theoretical

4 Bielawski 1976.
5 Merriam 1964.

assumptions. The evolutionist, cultural-historical, functional and structuralist trends in ethnomusicology seemed to me to be one-sided, limited, offering too narrow a view of the task at hand, intolerant of other perspectives, too opinionated and overconfident, although by no means were they always the best grounded in theory. To me, it seemed most advisable to return to the sources and reconsider them, hence my own interest in such fundamental notions as time, space and movement in relation to music. My research into time convinced me that humans had their own perspective of time, proper to them as representatives of a particular species, setting the limits to their temporal behaviours, including their musical behaviours. For me, the most important issues were human capacities and how people realise them in different cultures, traditions, styles and individual preferences. They place people and their capacities at the centre of research, and that is the main justification for defining that research as anthropology. So music anthropology would be the study of human capacities; in this case, the capacities for musical behaviours limited in various ways and developed in different cultures and at different times. In this approach, music anthropology does not refer to a specific type of culture, such as primitive, traditional or more developed non-European cultures, as the scope of ethnomusicology was usually defined. The focus of music anthropology ought to be every kind of music. In practice, the European art music tradition is considered to a lesser extent. However, that results not from the premises of music anthropology, but from the specific situation and tradition of musicological research, which has often been confined to European art music. The need to expand the research perspective moves one to take account of those kinds of music which have often been passed over on principle by musicological research.

Yet anthropological study is distinguished not just by its different scope. Music anthropology approaches issues such as comparison in a different way. Comparative research is widely used in the human sciences. It reveals shared features and differences between the objects compared. In anthropological research, such comparisons are insufficient, and differences and common features are reduced to the common denominator that is man, to human capacities for musical behaviours manifest in various cultures and various styles, which always set constraints on human capacities.

The term 'constraint of diversity' perhaps requires explanation, so that it is not misunderstood. I admit to introducing it as a matter of principle, in order to oppose a practice that is quite widespread in the human sciences, involving the abuse of such generalisms as 'richness' and 'diversity' that reveals the immaturity of many research projects. For this reason, I think it will be safer to refer to music anthropology the statements on science in general contained in W. Ross Ashby's *An Introduction to Cybernetics*:

- science looks for laws,
- every law of nature is a constraint,
- a world without constraints would be totally chaotic.[6]

So one should not seek diversity or richness and conclude one's research by establishing their existence. Science, if it is to be science, must seek that which constrains that diversity. The more constraints there are on diversity, the greater will be the wealth of information; the more constraints there are on diversity, the more distinct tendencies will emerge. We deal with various constraints on diversity in music anthropology. The first constraint is the human perspective, human capacities for musical behaviours, which are so diverse in various cultures and yet possess a common, human denominator. From that perspective, culture is the constraint of diversity. No culture makes use of the full range of human capacities. Human capacities encompass all the cultures that exist, have existed or could come to exist in the world. Diversity is constrained by every style, every artistic trend, every fashion, every individual preference, every genre, every work, every performance, every formal property and every quality.

The term 'music anthropology' is justified also by the fact that such research deals not with music in general, with what music is in itself, but with what it is in relation to humans, seen from their normal perspective. Scientific methods are not excluded from research in music anthropology. On the contrary, they are put to suitable use. Yet it is important to realise that music is music only when referred to humans. Science has the capacity to alter its research perspectives. A special apparatus attuned to different parameters than those which apply to humans may show music from a different perspective. This occurs, for example, with the use of acoustic measuring devices, which are entirely different to the human perceptual apparatus. So not all music theory is covered by the anthropological perspective. Acoustics, defining musical phenomena from a different perspective than the human point of view, may facilitate our study and understanding of musical phenomena. However, its assertions do not directly concern phenomena seen from a human perspective.

6 Ashby 1956, 130–131.

Humans can be cognised partly through the products of their activities. The products of musical activities are also dealt with by music history. In historical research, facts are ordered in a particular way, in segments along the line of historical time. The primacy of that perspective is characteristic of the last centuries in our learning and culture. Its importance is unquestionable, but at the same time the limitations and one-sidedness of the historical perspective are becoming increasingly manifest, as is the possibility, and even the necessity, of complementing it with the anthropological perspective. The anthropological perspective requires that we pose different questions. For such a perspective, historical facts are merely individual examples of human capabilities. History distinguishes facts, whilst the anthropological perspective attempts to account for them conjointly and arrive at their pan-human foundations. Hence the main question concerns not what separates human behaviours, but what links them. It is not the diversity of facts itself that is essential, but what constrains that diversity, and constraints emerge from human capacities. Culture brings to them its own limitations. The anthropological perspective requires that pan-human limitations be distinguished from cultural limitations; it requires that cultural limitations be shown within the framework or against the background of pan-human limitations.

The term 'music anthropology' is also justified by an understanding of the object of research as not confined to musical matters as narrowly conceived, but taking account of a broad cultural context; ethnological or cultural anthropological aspects are paramount here and require theoretical generalisation. Yet there is no single theory of music. Every theory is to a considerable extent historically conditioned; it is linked to a specific development in the music that it seeks to interpret. If a uniform theory of music existed, it would be an anthropological theory. Yet it would have to be verifiable in every stylistic period and in every cultural area. It would be a very general theory, in which all previous theories would constitute specific examples of the possibility of constructing theoretical systems and would be subject to interpretation within the framework of such a metatheory.

Hitherto, theories of music have been severely limited not only in historical terms, but also with regard to the objects of study. They have dealt mainly with the relations between sounds in musical works. Such theories are only partial theories. A theory should concern everything that can be studied in music, so also man's relationship with music, the shaping of a cultural musical environment, the influence of music, its role in the life of individuals and social groups, assessments of music, historical and cultural change, and so on. All observable phenomena linked to music require theoretical generalisation.

1.2 Time in Ajdukiewicz's definition and in the zonal approach

In Poland, the most widely popularised definition of time is that of Kazimierz Ajdukiewicz in the PWN encyclopaedia.[7] That definition distinguishes four basic meanings of time: moment, period, duration and all-embracing time. One may be surprised at the lack here of such meanings as past, present and future, which play an eminent role in practical life and in many philosophies of time. Ajdukiewicz relegated them to linguistic problems speaking of temporal relations. In this, however, he is not alone. Albert Einstein famously expressed this idea in a letter to a friend: 'the distinction between past, present and future is only a stubbornly persistent illusion'. Einstein's shocking assertion is a consequence of his special theory of relativity, which does not grant the present moment any absolute, universal meaning. Let us quote Ajdukiewicz's definition:

> a moment – an exact date, a point in time – is a characteristic of some punctual event, such as a bullet hitting a target; a moment can be defined (by abstraction) on the basis of the notion of simultaneity as a characteristic shared solely by all events that are simultaneous to one another.

The notion of a point in time is fundamental. I use it in a different meaning as a (normally sudden) change in time that opens (and closes) an interval of time. In the real world, a moment or an exact date is never a point in the mathematical sense; its 'punctuality' is relative, depending on the point of view, on the sensitivity of the recording apparatus, etc. The striking of a piano key stimulates a string. We sense this as an impulse opening the time interval of the note's duration. However, if we look at that point from the perspective of a more sensitive apparatus, it reveals itself to be a complex process of the attack of a note, which incidentally has a crucial effect on its quality. Even the example of a bullet hitting a target involves a process, albeit a very short one. We find a similar phenomenon on the various levels of temporality of interest to the art theorist. From a specific temporal perspective, dates marking feasts in the calendar, events in a year and watersheds in an artist's life or in the history of styles are all points; they underpin the segmentation of time and periodisation. In Ajdukiewicz's definition, a moment appears to be associated with a specific way of seeing time as succession. In that approach, points in time are precisely located in a successive context. Defining a moment as simultaneity, Ajdukiewicz also emphasises the simultaneous context. As I see it, a point in time need not be associated with such an understanding of time. For me, the most important aspect is the function

7 Ajdukiewicz 1963.

of separating and distinguishing intervals of time. At this point, I must stress that I also understand a time interval slightly differently; it need not equate to a period, but may also be defined, for example, in terms of duration alone.

The most paradoxical conclusion that ensues from a definition of a point in time is that it coincides with the universe at a given moment. A point in time is ordinarily understood as the simultaneity of everything that occurred at a particular moment, everything that found itself in a specific state at a given moment; so it is like a momentaneous cross-section of the process of the developing universe. Einstein, in his detailed theory of relativity, questioned this assertion, demonstrating that simultaneity is relative. Two events which we see as simultaneous from one frame of reference may be perceived as occurring consecutively by an observer bound to another reference frame. In our considerations, however, we normally speak of a point in time in relation to local events, such as events of a musical type. Simultaneity is similarly located, for instance as the simultaneity of musical events in a particular work.

Let us turn to further definitions advanced by Ajdukiewicz. I consider the opposition of the second and third meanings of the distinctions he proposes, the opposition of period and duration, to be particularly significant. The second meaning reads as follows:

> a period of time, segment of time or interval of time is a dense and continuous set of moments located between two different moments; a specific time period can be indicated either by giving the moments that delimit it (for example, a period between 12:00 and 13:00 today in Warsaw) or by specifying the process that fills that period (for example, the period of the reign of Casimir the Great in Poland).

That definition leaves us in no doubt that we are dealing here with time as a context of events. The period is situated in the course of time and remains contiguous to its neighbouring events. In Ajdukiewicz's examples, periods are strictly located along a timeline stretching between the infinite past and the infinite future. Such an absolute location is unnecessary, since a segment of time can be located in relation to other time segments contiguous to one another, such as musical notes or phrases in a melody or the phases of any work that unfolds over time. Individual phases appear within a certain successive context, which colours them in terms of quality. That context can also be simultaneous, as in a polyphonic musical work. Everything that really exists in time exists in such a temporal context. Every human behaviour, every linguistic, musical or artistic utterance, every life or historical process involves filling in contiguous periods. Such a notion of time provides a good illustration of Heraclitus' *pantha rhei*. Manifest in this notion are processual aspects of time; all syntagmatic relations are based upon it. I have not dealt in detail with these issues, which are common in theory of art and music.

My considerations have dealt with time in the third meaning distinguished by Ajdukiewicz. This leads to a completely different set of issues. It concerns such a phenomenon as the following:

> the duration, or length, of a period of time (for example, the half-life of radium), as distinct from the period itself; two different periods of time can have the same duration, just as two different segments of a straight line can have the same length (for example, the period between 12:00 and 13:00 today is a different period than that between 13:00 and 14:00, but those two periods have the same duration); the duration of a period in a process can be defined (by abstraction), on the basis of the notion of the relation of the equality of duration, as a feature common solely to all those periods of time that have the same duration as the given period.

In this example, the periods between 12:00 and 13:00 and between 13:00 and 14:00 are contiguous, but we perfectly understand that this contact is not essential; all that matters is the equal duration of one hour. Yet durations can be not only equal; they can also be different, more or less similar. Thanks to their duration, they possess some quality; they are specific irrespective of their context. One can imagine such a scale of all possible durations: it would extend from infinitely short to infinitely long durations. Every actually existing interval of time is a selection of one value from a scale as thus conceived and at the same time a disposition on the scale of a time sequence within the context of other time intervals. So intervals of time, like the signs in Charles S. Peirce's concept evoked by Roman Jakobson and Morris Halle,[8] display two kinds of relationship, which provide them with two kinds of interpretant. One relationship is expressed in relation to a code (in our case, that code is the scale of all possible durations); the other is expressed in relation to a context. So each of these relationships links a time interval to another set of intervals: in the former case, through alternation; in the latter case, through alignment. A given time interval can be replaced by other intervals; this reveals its meaning, whilst the contextual value is determined by its relationship with other intervals of the same sequence. Roman Ingarden also approached this idea. Describing the qualitative phenomenal time of a musical work, he indicated that 'specific phases or moments are qualitatively determined in relation to what saturates those moments and in relation to the place of the given moments between other moments'.[9] It is not clear, however,

8 Jakobson and Halle 1964.
9 Ingarden 1986, 70.

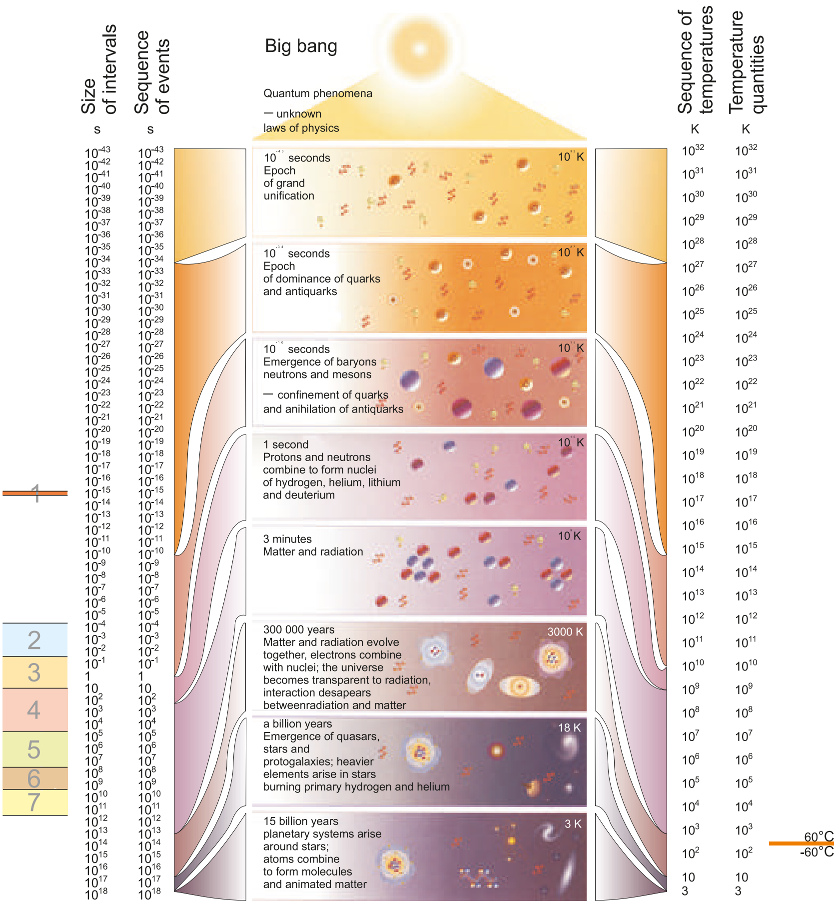
what Ingarden really had in mind when speaking of moments. He did not understand them as components of all levels in a work's segmentation; he compared them – but did not identify them – with bars. Yet he did not realise the heart of the matter, namely, that that basic musical filling or saturation of moments is duration as a specific quality, with its own temporal scale, different from the one-dimensional, homogeneous continuum in which all qualities, including temporal qualities, occur.

In the discussed definition, Ajdukiewicz distinguished duration, but we should also take account of the opposite of duration, that is, frequency or tempo. It is in those categories, *inter alia*, that we perceive the temporality of music. They are also not alien to other temporal configurations. After all, we speak of the tempo of a theatre show, the tempo of historical changes, changes of tempo, and so on. Of course, tempo is conceived differently here than the tempo of movement in space. Musical tempo is abstracted from actual space. It is frequency, that is, the number of impulses of changes or time intervals corresponding to one unit of time. The frequency of a basic metrical unit, that is, musical tempo, is measured in a number per minute (MM).

The ways of defining qualitative aspects of time, so duration through the use of time units (seconds, hours, years, etc.) and frequency by means of a number per time unit, have serious flaws: the units of such measures do not reveal the degree of similarity of duration (or tempo). With small numbers, the differences between neighbouring units are very large (for example 1, 2); with large numbers, the differences between neighbouring units are very small (for example 1001, 1002). Those shortcomings are absent from logarithmic scales, which express a scale of similarity in a mathematical way. On a logarithmic scale, the same similarity in the form of specific proportions, regardless of whether it concerns large or small numbers, is denoted by the same distance. So distance on a logarithmic scale is a natural measure of similarity. That scale is also justified by the Weber-Fechner law, a fundamental law of perception, which states that the size of impressions depends on the logarithm of the stimulus. No one doubts that this law applies to note pitches and to dynamics, but it has not always been realised that it also concerns such qualities as duration and frequency, and so time.

The whole range of the timescale available to the physical sciences covers sixty-two decades and in cosmology begins with 10^{-43} seconds and ends with the birth of the cosmos, estimated at 13.7 billion years (10^{17} seconds). Hawking presents the history of the universe in graphic form (Example 1.1).[10]

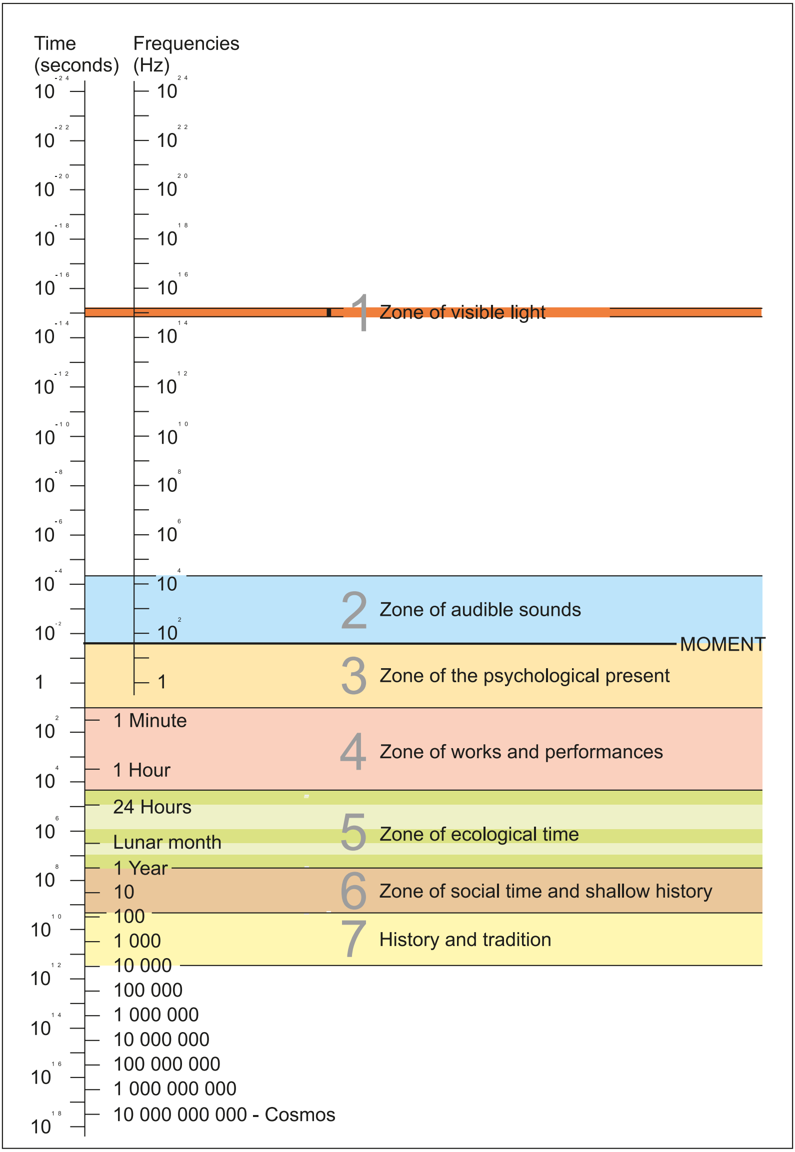
10 Hawking 1996, 148–149.



Example 1.1 The history of the universe according to Hawking distinguishes eight eras following the 'big bang'. Two logarithmic timescales are placed to the left of the drawing (measured in seconds). The first is the scale of the sequence of events which began with the big bang and have continued to the present day. According to the latest data, the cosmos is younger than Hawking believed: 13.7 billion years. The other scale, seemingly identical, represents the scale of sizes of time intervals from the shortest to the longest. Shown on this scale are characteristic zones or ranges of time interval sizes linked to the way in which humans exist and act over time. Placed analogously to the right are two scales of temperatures in Kelvin. The first characterises the evolution of the Cosmos, its gradual cooling. The other constitutes a system of temperature sizes from the largest to the smallest. Marked on this scale, by way of example, is the very narrow zone of the temperatures occurring on the Earth, from plus 60 to minus 60 degrees Celsius.

History is a sequence of eras, each of which replaced the preceding era, along the axis of time extending from the most distant past to the present day and turned towards the future; that is, the axis of the succession of time, the syntagmatic axis of time, showing its syntax. Time as thus conceived has a distinct time arrow pointing from the past towards the future. For the sake of convenience, history may be shown on a logarithmic scale, as partly done by Hawking. In the present work, however, when referring to a logarithmic scale, I have in mind a systemic timescale extending from Planck's time (approximately 10^{-43} seconds), the shortest duration of physical events known to science, to the duration of the cosmos (13.7 billion years), and on that scale there is neither past nor future. This is a systemic scale of all possible temporal sizes arranged according to their similarity, from the shortest to the longest. On this scale, homogeneous phenomena form characteristic zones or ranges of size. It is remarkable that phenomena defining the historical eras in the development of the cosmos have not vanished irrevocably. On the contrary, they have left traces in the world that exists today and can be scientifically studied in a great variety of scopes and can also be systematised on a logarithmic timescale. The seven main zones directly concern humans and their activity, including artistic activity (Examples 1.1 and 1.2). Two of these zones are of a temporal character solely from a physical point of view. They are the zone of lightwave frequency, which determines how we see colours

(its range is small), and the auditory zone, the basis of all sound-related activities, especially language and music. These zones are also of fundamental importance to the classification of arts that are visual or audio or audio-visual. I pass over the question of whether there exist any gustatory, olfactory or tactile arts. The next five main zones are actually of a temporal character. The first of them, the zone of the psychological present, is the most important from the point of view of the temporality of phenomena. Above all, it defines the human perspective of time, since it is the zone of all direct action. Within its limits, we speak, play and listen, although sound waves obviously have a different frequency range. Within this zone, we see (the frequency of light waves is completely different), we perceive phenomena, we move and distinguish movement, we use tools, paint, write and look at works of art, we react to the stimuli of the world around us and affect the outside world. Of course, we can think about a different time as well, but that thinking will also occur within the immutable present that always accompanies our conscious existence. The psychological present covers the range of durations from the human moment, approximately 50 milliseconds, to approximately 10 seconds. The centre of this zone is marked by average musical tempo, moderato (approximately two-thirds of a second or 90 MM).



Example 1.2 The seven temporal zones characterise human activity and existence. The first two zones are not perceived as temporal, but as light and sound, although from the point of view of physics they are temporal (the frequency of light waves and sound waves). The next four zones are experienced as temporal. The last zone is experienced solely as tradition and history.

The zone of the psychological present is of crucial significance to the emergence and resolution of many issues relating to art theory, including the classification of the arts. Each work of visual or audio art must be created and perceived within this zone; that is, of course, if we agree with the assumption that art is produced by man and for man. The arts differ, meanwhile, in that their works either develop or do not develop within the zone of the psychological present. Works that develop, or processual works, are commonly defined as temporal or quasi-temporal, according to Ingarden. They always include audio works, but they may also include visual works (for example, a dance without music). Only visual works can (but do not have to) develop within the psychological present. Of course, non-temporal works can be combined with temporal works, like artistic decoration and stage action in a theatre show.

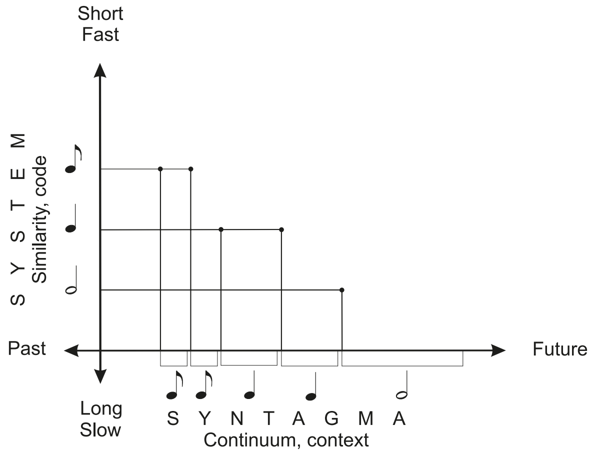
All the works and human activities developing in the psychological present have definite temporal dimensions, which belong to the next zone – that of works and of the time of performance, representation, dancing and so on. It is difficult to find a sufficiently general name for this zone. It covers a range between approximately 10 seconds and several hours. The fact that these works and performances are also located in time as a continuum, and so in a specific time of a day, a year or a performer's life, in an historical process, belongs to the domain of temporal context, like the unfolding of a work itself. Of course, so-called non-temporal arts are not completely free from time, from that fundamental category of all existence. Yet they do not show any changes in either the zone of the psychological present or the zone of the duration of specific activities, and that distinguishes them. Changes brought on by the 'ravages of time' are generally registered only in much longer durations, and the same applies to changes in the social reception of works of art. I will only mention the subsequent temporal zones, without entering into their complex problematics. The third of them, important also from the point of view of artistic activity, refers to ecological time, so primarily time that is marked by the rhythm of the days, the years and, to a lesser extent (at least in our culture), the moon. The fourth is linked to the shallow history to which the memory of living generations directly bears witness. Finally, the fifth zone is that of full history or tradition.

The temporal zones may differ in dimensions and in their location on the scale of possible durations or frequencies, but their formal structure is usually similar. It has central areas, those most often used – neutral, in a sense. Then there are the outer areas, of opposite colouring, such as short, medium and long duration or large, medium or small frequency. Of course, there is a smooth scale of transitions between these opposite qualities. Subzones or subranges can be distinguished within the large zones. These depend on the character of the phenomenon which they concern; more interestingly, however, certain ranges are characteristic of many different phenomena, attesting to their perhaps deeper, common determinants. In the zone of the psychological present, the subzone of the phonemes of language coincides in music with the subzone of minor melodic ornaments with no distinct rhythmic function. In music and dance, the subzone of syllables has its equivalent in the subdivision of basic metrical units; in experimental psychology, in so-called short times. The most important subzone within the bounds of the psychological present is the central subzone, which I have termed the subzone of the immediate present. This covers the basic logical units of language, words, the basic units of metre and tempo in music and dance, and in experimental psychology the so-called long times or the times of a person's normal reaction to external stimuli. There follow the subzones of syntactic units: bars, motifs, phrases and sentences in music and dance; clauses, phrases and sentences of linguistic utterance; film shots; segments of action on stage, and so on. In order to study the ranges of particular zones, their location, mutual relations, proportions, etc., I introduced a uniform scale of time and frequency based on the principles of twelve-degree tempered tuning. This revealed characteristic regularities in the breakdown of the zones linked to human activity, 'synchronised' in a specific way with the basic ecological cycle, that is, the daily cycle.

In our understanding of time, we employ – wittingly or not – two different scales: the linear scale of the continuum of time and the logarithmic scale in the assessment of similarities of duration or frequency (Example 1.3).

For humans, therefore, time has two dimensions, as it were – shocking, but true. And all temporal processes and shapes are most easily analysed on a plane with two coordinate axes: the axis of the continuum of time (linear scale) and the axis of similarities of duration or frequency (logarithmic scale). This will reveal the multi-layered segmentation of time. Projection onto the axis of the continuum of time shows the syntactic, syntagmatic properties of time; projection onto the axis of similarities between time intervals indicates the systemic properties of time.

Time and space are distinguished by their dual nature. On one hand, they form continua in which we distinguish particular qualities: note pitches and dynamics in music, for example, or colours and shapes in the plastic arts. At the same time, however, one of those qualities is time as duration or frequency, or space as distance or proportion. Le Corbusier realised this when defining his modulor as a qualitative scale, needlessly confining it to segments of the

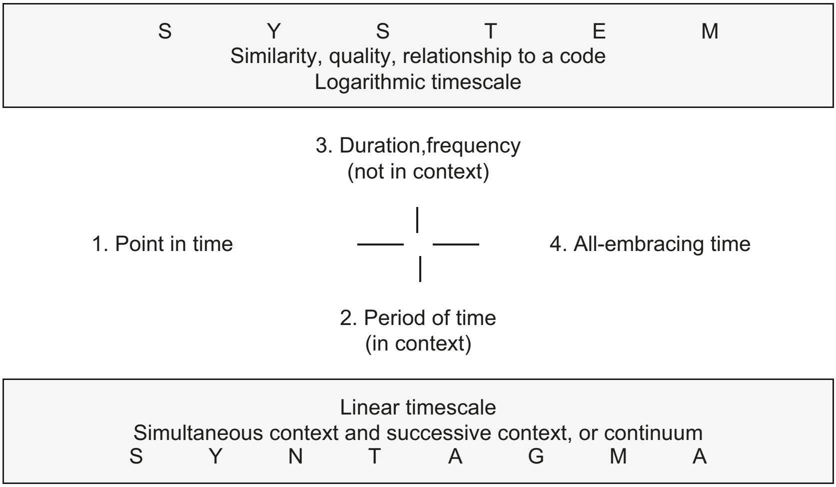


Example 1.3 The two 'dimensions' of time, the axis of the continuum of time (linear scale), which shows the syntactic, syntagmatic properties of time, and the axis of similarities of duration or frequency (logarithmic scale), the axis of the systemic properties of time.

golden ratio, whereby he considerably reduced the scope for employing it as a research tool.[11] (One example of analysis on the plane of time is a passage on the segmentation of folk melodies in the fifth chapter of the present work. That takes account of the systemic scale of similarities between intervals of time and frequencies and the scale of the syntagmatic continuum of time.) Philosophers and theorists are attached to the linear understanding of time as succession. We find such an approach to the problem in Ajdukiewicz's fourth notion of time: 'an all-embracing period of time, a limitless timeline, the set of all moments in time; in other words, a period of time of which every time interval is a part'. It should be added that the all-embracing period of time is also all-embracing duration. In the physical sciences, it corresponds to the existence of the cosmos, estimated at approximately 13.7 billion years. Thus one can say that all-embracing time is also the opposite of duration, the smallest frequency: once in the period of the existence of the cosmos.

All-embracing time is the polar opposite of a point in time. We define a time point as the shortest period of time or the shortest duration. Consequently,

11 Le Corbusier 1954.



Example 1.4 The four basic meanings of time distinguished by Ajdukiewicz, seen from the systemic and syntagmatic temporal perspectives.

time points also form the greatest frequency. In the physical sciences, this is the frequency of cosmic radiation.

If we now look at the various definitions of the notion of time in Ajdukiewicz's approach, together with our commentary to them, we obtain a set of two pairs of opposites, which may also be considered from two perspectives: the syntagmatic and the systemic (Example 1.4). The principal opposition here is between the period and duration or frequency. The period is part of a timescale as continuity, or succession, situated among other periods or the set of all other contiguous moments. It is an element of the successive and simultaneous contexts; it belongs to the syntactic and syntagmatic properties of time. Duration is an element of all possible durations sequenced according to their similarity. It is a qualitative aspect of time and belongs to its systemic properties. The other opposition is formed by the point in time and all-embracing time. This opposition may be considered from two sides. From the syntagmatic side, the time point is one of a dense and continuous set of contiguous moments; all-embracing time, meanwhile, is a linear scale extending from an infinite past to an infinite future. Seen from the latter perspective, the time point is an infinitely small duration, whilst all-embracing time is an infinitely long duration. The scale of similarities of durations extending between these two sizes, from the smallest to the largest, is a logarithmic scale. On that scale, there is neither past nor present. It is a different order, as qualitative time, as frequency and tempo abstracted from space.

Of course, the distinction between system and syntagma and the whole range of similar oppositions, such as similarity and contiguity, metaphor and metonym, link to code and link to context, is nothing new. It would appear, however, that no one has previously observed that such an opposition also underpins such fundamental aspects of reality as time and space. The problem of space displays very similar aspects, necessarily passed over here. The categorical, systemic and qualitative aspects in particular have not been sufficiently cognised, although they have been present in many different studies. I would mention just Nikolai A. Garbuzov's zonal properties of tempo, rhythm and listening,[12] Karlheinz Stockhausen's three basic ranges of homogeneous musical time,[13] and the discussion between Dieter Christensen and Mieczysław Kolinski regarding musical tempo[14] – issues not entirely elucidated. I would also mention the theoretical difficulties in which Claude Lévi-Strauss became embroiled when he questioned the continuity of history, juxtaposing it with various historical perspectives.[15] He did not realise that those perspectives are by no means at odds with history as a sequence of events; they are just another way of seeing temporal phenomena. History is also played out on many different levels, and it is referred to by the problem of the zonality of time. Fernand Braudel reveals such varying perspectives in his analysis of historical process, when he distinguishes short and long time.[16] Of course, time as a continuum remains regular in history; only historical process is changeable, occurring at different speeds. Tempo is the frequency of the events that are crucial to that process.

1.3 Zones of time: from theory to history

As already mentioned (Example 1.2), one can distinguish seven natural zones or ranges of time in the way people exist and behave. The first two zones, the visual and auditive, are of a temporal character solely from the perspective of physics. They are marked by the frequencies of light waves and sound waves,

12 Garbuzov 1948, 1950.
13 Stockhausen 1963.
14 Christensen 1960; Kolinski 1959, 1960.
15 Lévi-Strauss 1969.
16 Braudel 1971.

whilst in direct human experience they are responsible for the existence of the visual space and the auditive space with their peculiar dimensions, such as light tones and note pitches. Let us take a closer look at the zones of time, which encompass the traditional areas of the theory of music and the history of culture.

The first really temporal zone is the kinetic range or the range of the psychological present. This covers durations ranging from hundredths of a second to more than ten seconds (model sizes: 41 milliseconds and 10.5 seconds). Its middle region (on a logarithmic scale) is filled by the scale of the Maelzel metronome, and it is centred on the human second (approximately two-thirds of a second). It is only within the range of the psychological present that people actually see, although the frequencies of light waves are obviously much greater. People also hear in this range, although acoustic vibrations end precisely where human time begins. In the psychological present, people also react with all their senses; they recognise movement, set their own bodies and thoughts in motion, communicate with the world around them and become aware of their own existence. This is a fundamental zone for humans. All musical language belongs to it, as do John Blacking's discourse of music and discourse about music, as well as every language through which people enter into direct contact with other people and with the world around them. Of course, this is a categorically diverse zone, formed of many levels. In language, it covers phonemes, syllables, morphemes, words, clauses, phrases, simple and compound sentences, and verse feet and lines. In music, it covers notes, metrical units of various degree, tempo, motifs, phrases, sentences and the whole of musical morphology, including the perception of consonance and of harmonic functions. This zone forms the basis for all kinds of study relating to human activity and direct action. This zone was distinguished relatively well by the *theoretikon* of Aristides Quintilian, cited in the systematics of Guido Adler.[17] Today, the notion of theory has expanded a great deal, and there is no widespread term in musicology to define the whole of this psychologically and physiologically conditioned zone, common to the human race, manifesting its laws in all musical and non-musical actions.

The next zone of human time was relatively well distinguished in the second chapter of Aristides Quintilian's systematics, covering both *praktikon* and *paideytikon*, where it concerned musical compositions as a whole and the ways in which they were formed, as well as musical practice, so the creation of live

17 Adler 1885.

music through instrumental and vocal performance and through dramatic action. This zone covers sizes ranging from more than ten seconds to several hours. The musical shaping of this time is the aim of all music in every culture. The ways of doing this vary, of course, but they always take account of the general laws of human behaviour, human capacities and human needs. In modern musical knowledge, the unity of this zone has been lost. We do not know on what grounds musical works were annexed by music history and musical genres by music sociology. The musicological tradition bids us place musical works at the centre of attention, and live music and the ways in which it is organised in time are either left to the competence of critics or covered by the broad, and therefore rather insubstantial, term of musical life, which tends to be understood as a manifestation of history.

The sense of music cannot be fully interpreted solely within the zone of the psychological present and the zone of musical works and events. Its sense also emerges from the perspective of other temporal zones. For musical knowledge, covering the next natural zone, it is easier to find a name than to fill it with content. I have in mind musical ecology, which ought to concern the musical environment that every culture forms, incorporating musical behaviours in times of a day, month and year. The time of the human environment that depends on our life on Earth essentially organises and synchronises human activities, determining the rhythm of labour and daily rest, the seasons of various activities, and periods of celebration and music making. Traditional cultures regulated by beliefs, injunctions, prohibitions and preferences imparted a distinct form to the music environment, bringing order to it. Various kinds of music and forms of music making have held a specific place in time and space, which brought out their sense and meaning. The commercialised and technology-driven culture of today has disturbed that order, without forming a new one in its place. Today, the problem of the conscious shaping of the musical environment and its protection against devastation, noise and unwanted music is a matter of urgency and augurs a future of musical ecology which in turn is just a part of auditory ecology. Music always somehow fits into, comes to resemble or opposes the auditory environment, but it cannot become entirely dependent. The problem of the musical environment is neglected and unappreciated in the world of learning, and it has yet to be embraced by an elaborated methodology. Yet we are aware of the threat to our auditory and musical environment caused by the development of modern civilisation.

The musical environment is forged by everything that has the status of music in a given culture, everything that we encounter on a daily basis or only occasionally. By means of conscious selection, we can form our own micro-environment, but we cannot entirely liberate ourselves from the music of the world around us. Even when we succeed in defining our own musical world, we will not rid ourselves of the awareness that it is merely an island in the musical surroundings in which *nolens volens* we live. The sense of all music is affected by its surroundings. The same music in a different environment is completely different music.

We have come to regard as the environment above all space, yet that assumption has no profound justification. All the temporal zones I have distinguished here have their spatial equivalents, since they are dependent on human activity and the way humans exist, which is only possible in the dimension of time and space.

The next temporal zone is determined by people's individual and collective life. Within this zone, many disciplines deal with music: developmental psychology, pedagogy, biography and sociology. The shallow history attested to by the memory of living generations also falls within its range. Knowledge relating to this zone is dispersed and awaits suitable syntheses. The voraciousness of history, which belongs mainly to the next temporal zone, has influenced the relatively limited independence of knowledge about music in human life, and that has by no means proved beneficial to history itself.

Introduced into the project of a history of world music proposed by Zofia Lissa and realised under the auspices of UNESCO, originally under the title Music in the Life of Man (then The Universe of Music), was the distinction between diachrony and synchrony taken from linguistics (the advocates of such a distinction included Ingmar Bengtsson, from Uppsala). In linguistics, it is wholly justified; in relation to music, however, things become complicated, just as they would in relation to literature. So why such a difference? Well, it derives primarily from the very slow changes in spoken language – so slow that we are not normally aware that it is changing in our lives. From childhood to the grave, we speak the same mother tongue. Yet we cannot say that over that time literature or music has also been constantly the same. The processes of change in literature and music occur – at least in our times – much more quickly than changes in language. Hence it is difficult to define what exactly we should regard as synchrony in relation to music. One may assume that the propagators of that distinction had in mind the period of the last few decades or the last half-century. Yet we are perfectly aware that that period was by no means a synchrony and a great deal happened in music. Fifty years ago, music looked completely different than twenty years ago, and it looks different again today. That applies to both art music and popular music. Older folk musicians are equally aware of the magnitude of the changes that music has undergone in their environment over the

The present	
The shallow history of local communities preserved in the memory of living generations	
Myth, tradition	The history of a given culture or set of cultures
	Profound history, stages in cultural evolution
	Anthropogenesis

Example 1.5 The present time and types of history in the anthropological sciences.

course of their life. Perhaps synchrony is only the current situation without any historical depth? Then it would equate to the musical environment as we understand it here.

It appears, however, that the advocates of synchrony in music have in mind rather time as attested to by the memory of living generations, beyond which extends only mythical time or full history. Currently, in our culture, the First World War might constitute such an approximate caesura in immediate history, although the period between the two world wars is also increasingly acquiring the sense of a fully historical past, and only the oldest generations still remember it well and bear witness to it with their own experiences.

The shallow history attested to by the memory of living generations should be seen as particularly important in ethnomusicology, since it could be a common denominator of historical research referring to all existing musical cultures, regardless of the degree of their complexity, the existence or lack of documents of the past, and so on. The shallow history of local communities varies greatly around the world. It is that first look into the past, the immediate extension of the present. Registered by scholars over a lengthy period, it expands our perspective to times that are now fully historical, and therein lies also its significance for ethnomusicology. However, one must reckon with the fact that history perpetuated in living memory is not fully objective. In particular, it idealises the times of youth, which come across as flourishing periods for traditional folk culture and music. That musical heaven on earth has a more or less constant historical grounding: it existed already some forty or fifty years before the present day, as older generations confirm. The differentiation of shallow history within musical cultures and on the global scale can and should be subjected to comparative studies. It would be senseless to eliminate it from the historical perspective. Studies on history attested to by the memory of living generations are splendidly exemplified by Beverley Cavanagh's works on Eskimo music.[18]

18 Cavanagh 1982.

In traditional folk cultures, shallow history does not pass into full history in its scholarly understanding, but disperses in tradition and myth. If we wish to look at the past and the sources of music not just from the perspective of objective history, as we understand it today, but also from the inner perspective of a given culture (which is one of the premises of contemporary music anthropology), then its perspective of tradition, myth and faith, the perspective of musical awareness, cannot be alien to us and ought to be subjected to comparative study. These issues have recently become particularly current, to mention but Steven Feld's studies on the primitive Kalula culture.[19]

The perspective of myth and tradition, rooted in cultural awareness, is not confined to poorly developed cultures. It is my belief that meticulous research would reveal great swathes of that perspective in developed modern cultures – in the form of national and social myths, music derived from the spirit of the nation, from traditional folk proto-sources, from racial purity, from the spirit of truth, from the notion of beauty, and so on. The declarations of contemporary composers contain many features of such thinking about the sources of music.

The full history of a given culture or set of cultures, not attested to by the memory of living generations, is a traditional subject of music history and depends above all on historical sources, on the preservation of documents produced in the past. That is usually the perspective that one has in mind when speaking of the history of music. Of course, this is a central perspective of history – its only perspective, it sometimes seems. It is above all that perspective which ethnomusicologists envy historians for and would like to assimilate. Besides history as traditionally understood, there is also room here for all ways of arriving at retrogressive conclusions regarding the past on the basis of later sources, including contemporary sources. In Poland, this is exemplified by Anna Czekanowska's research into the ethnogenesis of Slavic music.[20] It is also worth emphasising that regardless of whether historical research seeks to document the past of great world cultures, aspiring to a universal history of music, there remains plenty of scope for comparative and systematic research into the histories of different cultures.

The history of human cultures seen from a very broad perspective is classificatory by nature and is expressed in the theory of the stages of development which those cultures pass through, beginning with the original community; the stages of cultural evolution also determine to a considerable extent the character

19 Feld 1981, 1983.

20 Czekanowska 1972, 1990.

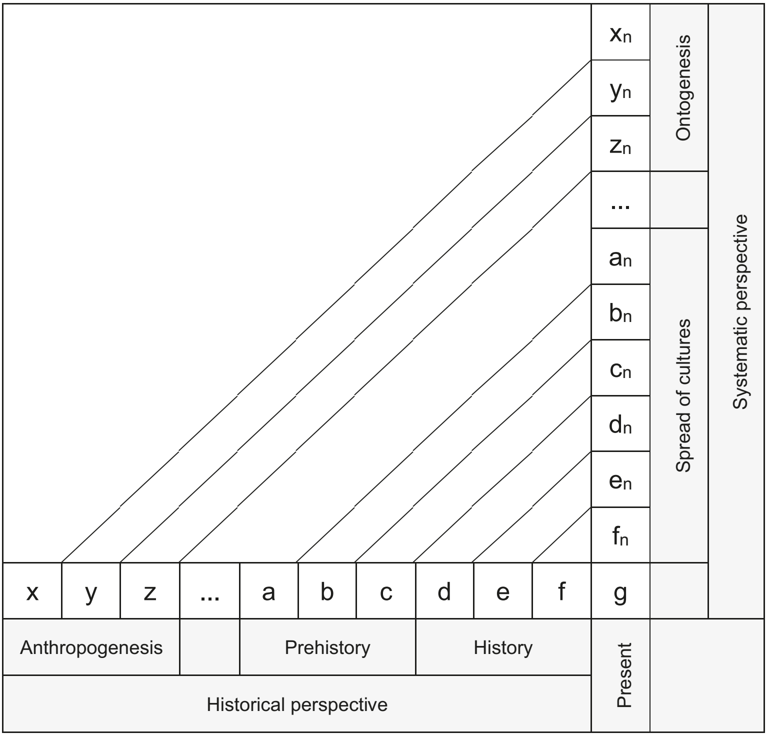
of music. That is a deep history, reaching back to the origins of human musical culture. And again we are dealing with a kind of history that is highly typical of ethnomusicological interests; traditional music history tended to eschew such issues. In earlier approaches, that deep history was replaced by speculative theories of the origins of music or by a schematic conception of evolutionism – ascribing unequivocally defined morphological musical properties, especially tonal properties, to particular phases in the development of cultures. In more recent approaches, scholars have attempted to recreate a picture of the past of the world's musical cultures from the cultures that have been preserved to the present day. One well-known attempt of this sort was announced by Alan Lomax and Norman Berkowitz as the result of a programme of cantometrics.[21]

There is no reason to eliminate from ethnomusicological interests the deepest perspective, linked to anthropogenesis. One may point here, for example, to the research conducted by Georg Knepler, who devoted the opening chapters of his history of music to this deepest historical dimension.[22] In ethnomusicology, this has attracted interest from scholars such as Doris Stockmann.[23] In this domain, various specialist fields, such as bioacoustics, cognitive psychology, neuropsychology and psycholinguistics, can provide valuable information.

We have come to see music history as a succession of eras, a, b, c, …, n, which have led to our era of contemporary music. From the perspective of ethnomusicology, such a simple model is utterly unacceptable, and not just because in non-European cultures that process has passed through different stages in development. In light of ethnomusicolo-gical data, the very idea of a straightforward succession of historical eras, with the disappearance of old eras and the appearance in their place of new, more complex, eras must be questioned. That simple succession may apply at most to the principal strand in the process of development, on which historians have usually concentrated, or to observations from a specific place on earth. The diversity of musical cultures proves that some highly primitive cultures, much less developed than the oldest musical cultures recorded in historical sources, have survived to the present day. Historical development is more dendritic in form than a straight line of succession (Example 1.6).

Contemporary music seems to be a more or less faithful reflection of the whole historical past of music in the world. Individual eras in history have left traces in contemporary times. There are extant remnants of primal hunter-gatherer

21 Lomax/Berkowitz 1972.
22 Knepler 1977.
23 Stockmann 1979, 1982, 1986.



Example 1.6 The historical and systematic perspectives in music anthropology.

cultures, of the early makers, and so on, with their characteristic forms of musical life. It would appear that contemporary cultures can tell us more about the deep past of the world's musical cultures than all the historical documents put together. It is not surprising that concepts of the development of musical cultures from that broadest perspective have been based on contemporary documentation. The model of Alan Lomax and Norman Berkowitz is based on the hypothesis that the historical depth of a culture is conversely proportionate to its diversity.[24] The less complex a culture, the deeper into the past its sources reach. Of course, it remains debatable to what extent this hypothesis is legitimate. To date, the Lomax-Berkowitz model can be interpreted solely in terms

24 Lomax and Berkowitz 1972.

of relative chronology. Contrary to the practice employed in music history as traditionally understood, the study of the past in ethnomusicology should be based both on historical sources and also on comparative studies of the contemporary diversity of the world's musical cultures. For the time being, those two directions to research into the past appear to be developing independently of one another. A synthesis of the two is essential, but it may be a long time in coming. Considerable hopes were invested in the project of a multi-volume history of music prepared under the auspices of UNESCO, with the participation of music historians and ethnomusicologists.

There are many different historical perspectives that are crucial to ethnomusicological research, and it is not important whether professional music historians will agree with such a systematics of those perspectives. They may well state that shallow history is not yet history, since it lacks the appropriate distance and is too subjective. Examining music from the perspective of anthropogenesis is not history, since the distance is too great, and anthropogenesis belongs rather to the biological sciences. The inner perspective of a given culture explaining the past of music, the perspective of awareness, myth and tradition, is not history, because it is not verifiable. The deep history of the stages in the development of the world's musical cultures is also not history, since it tends to use relative chronology and is too hypothetical. So there would remain just one 'true' history based on historical documents. However, one would then have to assume that perspectives on the musical past, including 'true' history as narrowly conceived, are merely domains of a broadly conceived theory; they belong to systematic knowledge – and ethnomusicology should be regarded as such. Yet it is easier to define research into the past as history seen from various perspectives. Moreover, terminological conventions are a secondary matter. What is important is to show the musical past from its various perspectives that are crucial to knowledge about music and about the world's musical cultures, from various historical perspectives, to which contemporary ethnomusicology ought to aspire.

1.4 Time and space. The ideal world and the material world

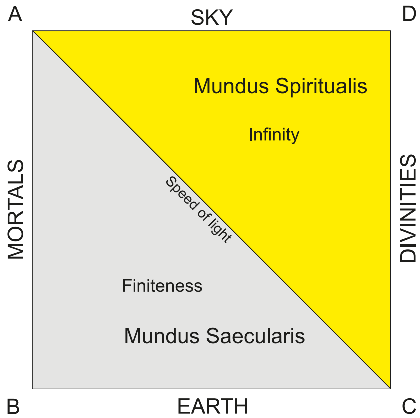
Before God created man, the angels in heaven were already singing. Their songs in praise of God represented a pure, unimaginable, supreme ideal, a synthesis of beauty, goodness and truth – and they did not require analysis or interpretation. Our earthly fate was forged only with the plucking of the apple from the tree of the knowledge of good and evil and the banishment of Adam and Eve from paradise. Adam and Eve did not remember the angels' song, but they communicated to us a yearning for that ideal, a sense of the need to painstakingly work one's way towards the ideal, partly through analysis and interpretation, separating beauty from ugliness, good from evil, and truth from falsehood.

When research into art is accompanied by faith in ideals, then masterpieces are chosen for analysis, and the scholar seeks pathways to that which constitutes the value in them, attempts to understand, sense and name it. But when, in the name of scholarly faith, the world of ideals is overlooked in research, the object of study is limited to that which is verifiable, tangible and measurable. Without an aspiration to ideals, no culture can exist. Ideals are a part of every cultural universe, although they are understood in very different ways.

St Thomas Aquinas (thirteenth century) distinguishes in the universe the *mundus spiritualis* and the *mundus saecularis*, in the affairs of which impious people are embroiled – *mundi habitatores*. Aleksander Baumgarten (1714–1762) opposes God the creator with *ens creatum*, a world that is the whole of that which is present. We find a similar distinction in Immanuel Kant (1724–1804), for whom *universitas* encompasses a 'transcendental ideal', but one that is deprived of Christian value judgment, juxtaposed with the world as the sum of all phenomena and objects that can be experienced. Georg Wilhelm Friedrich Hegel (1770–1831) associated music with the revelation of the Absolute in the form of feelings.[25] According to Martin Heidegger (1889–1976), the cosmos, or *mundus*, is the human *Dasein* in its reference to being as a whole. *Dasein* is being in the world. But in Heidegger, as well, we encounter a sort of *universum*, which is a characteristic 'fourfold' comprising the Earth, the sky, divinities and mortals. Those four elements belong to one another and precede everything that manifests itself. Heidegger describes it as follows:

> Earth is the serving bearer, blossoming and fruiting, spreading out in rock and water, rising up into plant and animal. When we say earth, we are already thinking of the other three along with it, but we give no thought to the simple oneness of the four.
> The sky is the vaulting path of the sun, the course of the changing moon, the wandering glitter of the stars, the year's seasons and their changes, the light and dusk of day, the gloom and glow of night, the clemency and inclemency of the weather, the drifting clouds and blue depth of the ether. When we say sky, we are already thinking of the other three along with it, but we give no thought to the simple oneness of the four.
> The divinities are the beckoning messengers of the godhead. Out of the holy sway of the godhead, the god appears in his presence or withdraws into his concealment. When we speak of the divinities, we are already thinking of the other three along with them, but we give no thought to the simple oneness of the four.

25 Fubini 1997, 269, 271.



Example 1.7 Heidegger's fourfold, comprising the Earth, the sky, divinities and mortals, breaks down into two triangles: *Mundus spiritualis*, the world of infinity, and *Mundus saecularis*, the world of finiteness.

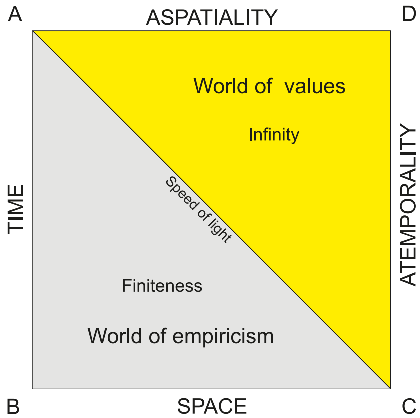
> The mortals are the human beings. They are called mortals because they can die. To die means to be capable of death *as* death. Only man dies, and indeed continually, as long as he remains on earth, under the sky, before the divinities. When we speak of mortals, we are already thinking of the other three along with them, but we give no thought to the simple oneness of the four. This simple oneness of the four we call the fourfold. Mortals are in the fourfold by dwelling.[26]

So for Heidegger the fourfold forms a oneness. When we mention any one aspect of the fourfold, we also think of it as a whole. That oneness is manifest in the reification of the world.

A thing 'things' the world unto itself as the fourfold of Earth, the key, divinities and mortals. The worlding of the world is expressed in its dominance over things and man, to whom, thanks to the world opening itself up, time and space are granted – thus states Heidegger. Let us try to draw this fourfold (Example 1.7).

Heidegger's fourfold breaks down clearly into two triangles, representing 'two worlds' which can be variously interpreted, in a way that departs from Heidegger's intentions to a greater or lesser extent. In the interpretation of Thomas Aquinas, these two worlds are *mundus spiritualis* and *mundus saecularis*; for Baumgarten, God, the divine world, is juxtaposed with *ens creatum*; according to Kant, the

26 Heidegger 2011, 246–7.

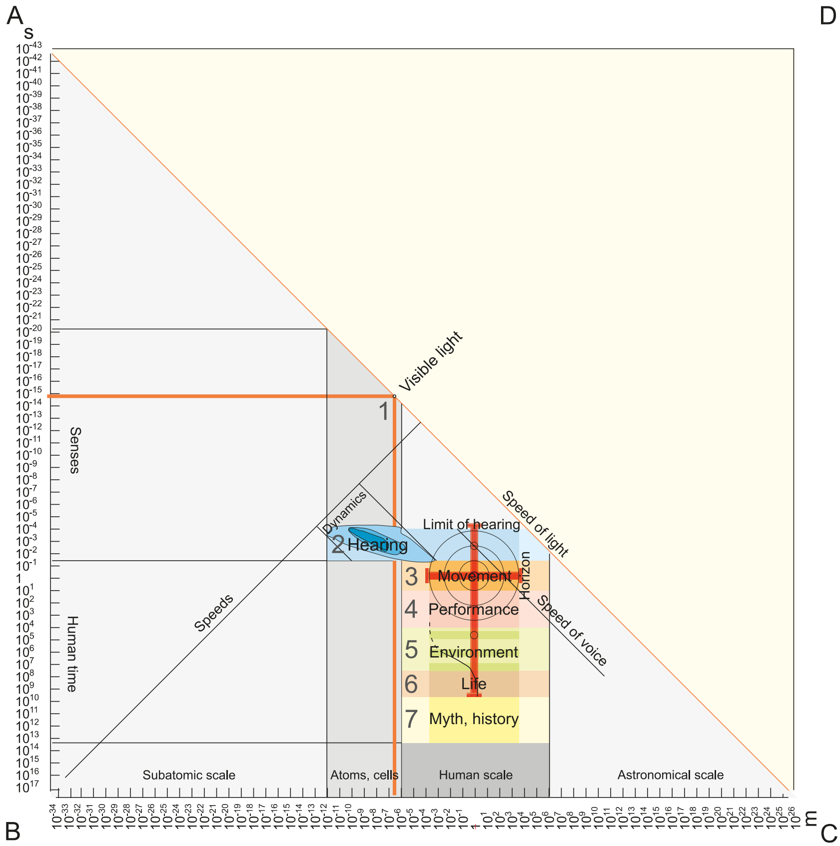


Example 1.8 Heidegger's fourfold distorted. AB – finite temporal quantities, from the smallest to the largest. BC – finite spatial quantities, from the smallest to the largest. AC – the speed of light. ABC – the triangle available to empiricism. ACD – the triangle not available to empirical study, which may represent the world of ideas, the world of values: truth, goodness, beauty.

'transcendental ideal' is opposed to the world of possible experience. When Hegel associates music with the revelation of the Absolute in the form of feelings, he also refers it to an ideal world.

Let us in turn attempt to open up the world in our own way to the categories of time and space, modifying Heidegger's fourfold. If we replace the divinities with all finite sizes of time from the smallest to the largest (on a logarithmic scale) and the Earth with all finite spatial distances, then the speed of light will divide for us the square-fourfold into two triangles: the triangle of the cosmos accessible to empirical study and a parallel triangle not accessible to empiricism (Example 1.8). It may represent an opening-up to mystery, to a world of ideals, a world of values: truth, beauty and goodness, without which art cannot be understood.

Die Kunst ist das Ins-Werk-Setzen der Wahrheit. Art is the truth that is put into work. Artistic value is built into the material foundation of the work – thus states Heidegger. He has in mind great art in its finest manifestations, and that is the interpretative tradition referred to by formalist musicology, ennobled by the very choice of an exceptional object of study. The anthropologist's faith is more modest. He believes, and finds confirmation of that belief, that every culture builds a world of ideals into its cosmos (and values its own



Example 1.9 The cross inscribed in the triangle of our earthly existence (ABC) is constituted by average human sizes (from the size of a newborn child to the size of an adult man, and in the temporal domain from the limit of hearing to the limit of life) and average musical tempi (from *largo* to *presto*, and in the temporal domain from the limit of sight to the limit of the horizon).

above all others), and the manifestations of this include music – all music. All music takes one beyond normal human behaviour; it represents an attempt at touching an ideal, at touching the other world. Not everyone regards those efforts as effective.

If we pass from the lofty regions of the triangle of divine and mortal ideals to the triangle of the empirical world and our earthly existence, that will reveal to us the cross of our good and ill fortune, which will serve as our signpost to the domains of our existence, including the existence of music – all music (Example 1.9).

The intersection of the beams of the cross defines in the most literal sense our here and now, the human second and the human yard, our *Dasein* in the narrowest sense. It defines the centre of the zone of our psychological present and immediate spatiality, in which people move and perceive. And it is worth bearing in mind that humans can do just two things: set their own body and their own thoughts into motion and, in certain conditions, transfer that motion from the somatic space to the auditive, visual and symbolic space, and thereby react to and affect the world around them with their movement. I will pass over here all medium and borderline sizes characteristic of man and mention merely the basic, natural time-space areas or the perspectives from which, *inter alia*, music manifests itself and in which it acquires its specific meaning:

(1) The domain of visible light, on which depends our vision of space, colours, shapes, situations of musical behaviours, musical notation, and so on. Marked on the graph are the frequencies (on the AB scale) and lengths (on the scale of spatial distances BC) of light waves.
(2) The domain of sounds, their material realisation, which breaks down into two areas. The first of these is the area of hearing, marked with the range of audible sound frequencies and with their amplitude, so the area of note pitches and dynamics. The other is defined by note pitches and the length of their sound waves. Those two areas, along with time, of course, enable one to create an auditory space in which music and language are realised. The area of visible light and the area of sounds are temporal solely from the perspective of physics. Only the next five areas are of a temporal character for humans:
(3) The area of human activity, of setting one's own body and thoughts in motion and recognising the effects in the form of singing, playing, listening and speaking. This is the area of natural language, musical language, dance language and the language of the analysis of works of art.
(4) The area of participation in the actual manifestation of art, the area of linguistic, musical and artistic events in specific cultural performance and perceptual events in which living people take part.
(5) The area of the natural environment, which man transforms into a cultural environment, including a musical, linguistic and artistic environment.
(6) The area of individual and social life, of the role within it of music and art, and of the fulfilment within it of human needs.

(7) The area that transcends direct human experiencing of time and space, the area of myth, tradition and history and of seeing manifestations of art within this area. History is essentially a scientistic version of myth. History generates myths and is sometimes cultivated in that function. Myth is a constant need in human culture. All attempts at eliminating myth end with myths being replaced by other myths.

Each of these natural domains of human existence opens up a specific system of musical possibilities, and being something in that system of possibilities is the ontological sense of music. So the ontological sense of music depends on the domains or levels of human existence in time and space, on the place occupied by music on those levels, on the function that it discharges within them. In other words, the ontological sense of music is determined by answers to the question as to what music is as a musical language, what music is in a given musical event in which living people participate, what music is in the musical and cultural environment, what music is in individual and collective life, and what music is in a view of the world from the perspective of myth, faith, tradition, history and learning.

2 The zonality of time

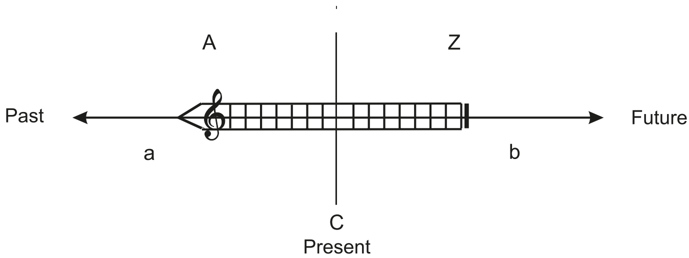
Zone of compound times regions, hours						Zone of works and performances regions, minutes, seconds								Zone of the psychological present, regions, seconds, hundredths of a second								Zone of musical pitches regions, octaves								
00	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
24	12	6	3	90	45	22	11	6	3	90	45	22	11	6	3															
													16	8	4	2	1	50	25	12	C_2	C_1	C	c	c^1	c^2	c^3	c^4	c^5	c^6

2.1 The processual and qualitative aspects of time, the logarithmic law

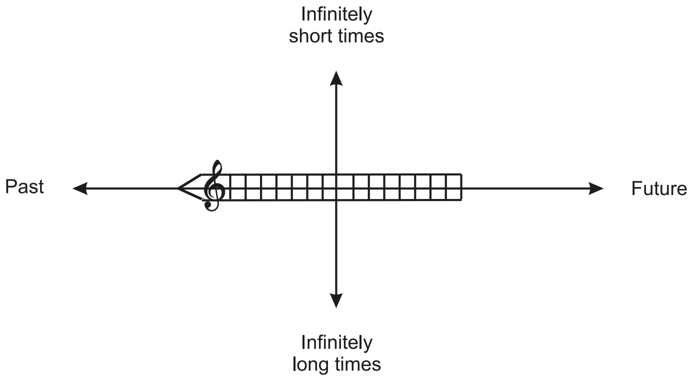
I would like to dwell on two basic ways of understanding time, conditioned by two different scales revealing different, even opposing, properties of time. Although I am dealing here in detail only with the latter scale, it is essential to the further argumentation that the reader be clearly aware of the differences that exist between them. From the theoretical point of view, both scales are very important. The limitations of previous theories of time were due precisely to the lack of their clear differentiation. With a degree of simplification, one can say that analyses of time have been grounded usually on the concept of a homogeneous, immutable continuum of physical time, onto which is superimposed our psychological time, understood as a continuously flowing pause. It is into that pause that the musical work, which begins at a specific moment and ends, composes itself. This situation is represented in Example 2.1. The timeline heads in two directions to infinity: to the past and to the future. A specific place on that line is occupied by a perceptual person, in relation to whom the work moves from the past through the present to the future. The work is bookended by pauses.

The scale of time as thus conceived is of course an arithmetic scale: regular segments of time correspond to regular segments of the line. Their size differs according to the kind of temporal phenomena. Smaller segments are filled with individual notes, larger segments with phrases, periods, movements and works. Human life is an even longer segment of this kind, and such a line is also formed by historical time measured in the dates delimiting periods and eras from the earliest times to present times. Dynamic aspects of time are always linked to an arithmetic scale, which shows the passing and changing of time.

This is the source of all processual theories of musical time. Of course, historical time is also such a process – at least in the way we understand it today.



Example 2.1 The axis of arithmetic or contextual time, time as a continuum. A, Z – beginning and end of a work; C – the human present, the actual moment when a work is played or listened to; a, b – pauses before and after a work; overview drawing.



Example 2.2 Axis of arithmetic time (horizontal) and axis of geometric or logarithmic time (vertical), that is, axis of temporal code; overview drawing.

Without negating such a concept of time, I wish to show that it is not the only way of explaining musical time in accordance with experience. It is possible to derive an incontrovertible theory of time from completely different premises, illuminating the problem of musical time, and of human time in general, in a different way – a theory which is in a sense anti-processual, capturing the passage of time in a fixed schema. One might say that this is absurd, that it is contrary to human nature, to our experience, to our perception of all temporal phenomena. Yet this way of understanding and sensing is by no means alien to us. After all, a sound is a process, consisting of a succession of vibrations, yet that process is utterly non-essential in our perception. For us, a sound will remain first and foremost a specific quality, in which pitch is a fundamental and – despite the processual character of vibrations – constant quality. The same applies to psychological time, to which some constant categories also apply. This problem will be best illustrated, perhaps, by the example of tempo. On one hand, tempo is changeable, a sequence, a process; on the other hand, however, we halt that process in a way, imparting to it a single fixed size, a specific quality. From this perspective, which is crucial to music, the processual character of a sound flow is as if outside the field of observation, but also from this perspective we note new properties of time. So we can already say that a static, zonal theory is not an alternative to processual theory; it is a different way of approaching the problem of time, showing different properties of time. The differences between these perspectives of time can be shown in graphic form. In relation to the horizontal quantitative axis of dynamic time, the axis of qualitative, logarithmic time would lie vertically (Example 2.2). The axis of logarithmic time also heads in two directions to infinity: in one to infinitely small times, so to zero; in the other, to infinitely large times. The point where these lines intersect is perceptual man with his psychological present, which forms a delimited zone on that axis, at the centre of which – as we can see – lies the human second.

The differentiation of two axes of time brings to mind the concept of Charles S. Peirce,[27] invoked by Roman Jakobson and Morris Halle in *Fundamentals of Language*. According to that concept, every linguistic sign displays two kinds of reference, which provide it with two series of interpretants. One reference is expressed in relation to a code, the other in relation to a (free or encoded) context. So each of those references links a sign to another set of linguistic signs: in the former case, through alternation; in the latter case, through alignment. A given signifying unit can be replaced by other signs of the same code; this reveals its general meaning. A contextual value, meanwhile, is defined by its reference to other signs of the same sequence. The components of every text are linked in a necessary way with a code (internal reference) and with a text (external reference). Language, in its various aspects, employs both references.[28]

The analogy here to our differentiation of two axes of time is obvious. In the temporal structure of music, its component parts also reveal two kinds of reference. Whilst the horizontal axis is the axis on which neighbouring moments are shown in a context that colours a particular moment in a particular way, the vertical axis of logarithmic time is formed by that code of temporal shapings.

27 Peirce 1932, 1934.
28 Jakobson and Halle 1964, 113–114.

Every temporal element of music is defined by its relationship to a code; it is a selection of a specific size from that code of temporal qualities. Specific temporal shapes are always dynamic, but the code from which they are selected is static, anti-dynamic. Every quality is anti-dynamic; the changing of qualities, their succession over time, is dynamic.

One may also refer here to Saussure's differentiation between language and speech.[29] Speech is a specific process shaped over time; it is a message in which the signs of a given verbal text stand next to one another; it is always formed on the axis of dynamic time. Language, meanwhile, is a system of rules; it is that code of linguistic possibilities, an anti-dynamic code. Speech shapes represent choices from among those rules. Scholars have at their disposal texts of speech, but from those texts they try to recreate the linguistic system that conditions the possibility of speech coming into existence and functioning. Similarly, in our study of musical time through specific musical texts, we will seek to understand the system that conditions them. This system-orientated approach will characterise our analysis of time in music. The general principles of this system are physiologically and psychologically conditioned; they are proper to all people. We can only choose within the bounds of those possibilities, since culture is a choice; it is a constraint of diversity – a constraint that is directed and variable in historical and geographic space.

One of the most characteristic features of music as a system of sounds is that relations of various kinds play a fundamental role. In contrast, for example, to the phonological system of language, which – without relinquishing relational features, but imparting to them, to some extent, the function of distinguishing features – is based on the inherent features of sounds, the phonological system of music employs primarily relational features.[30] The most thoroughly researched system of note pitches, for example, is based on such features, as is musical time – as we will see. So if the system of relations in music is so highly elaborate, for any kind of comparative study we need a suitable scale that makes such comparisons possible – a scale commensurate with the scale of our perceptions of phenomena.

The simplest scale available to science is the linear scale, which is formed by an arithmetic sequence. In relation to length, for example, this will be our normal measure, with centimetres, millimetres, metres, etc., in a regular linear pattern; in relation to time, it will consist of seconds, minutes, hours, hundredths

29 Saussure 1922.

30 Bielawski 1969; Jakobson and Halle 1964.

of seconds, etc. In relation to music, the use of such scales – the most widespread in the sciences – is very limited. That is because known or unknown psychological laws refer to music, which after all is strictly dependent on our perception. One of those basic laws, discovered by Ernst Heinrich Weber and then expressed in a mathematical form by Gustav Theodor Fechner, establishes the quantitative dependence of the increase in the intensity of an impression on the increase in the intensity of a stimulus.[31] Weber stated that the size of a stimulus capable of triggering a perceptible increase in an impression must be proportionate to a stimulus that is already acting. Fechner adopted that minimal increase in the stimulus, also known as the stimulus threshold, as the unit of measurement of the strength of impressions. In Fechner's formula, that law states that the strength of impressions rises proportionately to the logarithm of the stimulus (I is the intensity of the impression, s the intensity of the stimulus and c the constant size of impressions of a particular kind):

$$I = c \log s$$ [32]

Passing over the problem of the value c representing the size of the stimulus capable of triggering a change in the impression, the most important thing for us at this point is that the intensity of an impression depends not on the size of the stimulus, but on the logarithm of the stimulus. Hence a logarithmic law is at work here, which of course has consequences for the choice of a suitable method of research. The Weber-Fechner law has been verified by many experimental studies, including in the field of visual, auditory, tactile and muscular impressions, but it has not been generally applied to our perception of time; at least, music theorists are unaware that this law holds for musical time. That explains the insistent adherence to a linear scale when comparing temporal phenomena, as well as the lack of the assertion of basic regularities governing the temporal zone of music, the objective study of which requires above all the use of a logarithmic scale.

2.2 A uniform musical scale of pitch, tempo and time

We know very well how significant the introduction of the system of equal temperament was for music theory and practice. Particularly when it was supplemented with Ellis's system of cents, we obtained a convenient and practical, and at the same time accurate, method for comparing intervals, tunings, musical scales, etc.

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31 Weber 1849; Fechner 1860.

32 Cf. *Wielka encyklopedia powszechna PWN* 3 1963, 602–603.

Many scholars even consider that ethnomusicology as a separate discipline with its own object of study and its characteristic methods only began with Ellis's fundamental studies. In accordance with the interests of those times, attention was drawn in particular to the problems of scales, keys and harmony. For a long time, the question of musical time was neglected, or at best lay on the margins of study, particularly of scientific enquiry. Today, the situation is different. The problems of musical time lie at the centre of interest of both composers of new music and also theorists, including ethnomusicologists. The aspiration to elaborating new methods enabling scholars to pursue comparative studies are expressed in various propositions concerning not just tempo zones, but even reaching as far as the duration of larger musical elements and entire works. Everywhere – as already mentioned – a logarithmic scale is the most convenient, since only on such a scale can we see the main laws that govern temporal phenomena in music.

A fundamental role in music is played by the interval of an octave. The ratio 1:2 on which it is based is also the fundamental proportion in the area of note duration. Suffice it to realise that the whole system of note values, so for example the relationship of a quaver to a crotchet, a crotchet to a minim and a minim to a semibreve, is based on that ratio. It is also the basis of the metronome scale, in which an equivalent of the octave (60–120 MM) is the starting point for calculating the sixteen-degree logarithmic scale, the non-tempered scale. For some detailed studies, the tempering of the degrees of tempo would be essential. The basic question arises, however, as to whether there exist any crucial arguments in favour of the sixteen-degree system in the zone of tempo and whether the twelve-degree system – unrivalled in the zone of pitch – would not be equally efficient here. Let us take a closer look at this question.

In the sixteen-degree system, the only convenient division, and indeed the only one possible without any remainder, is a division according to even numbers: 2, 4, 8. As a consequence, such ratios as 2:3 have no equivalent on the scale in this system, and yet such ratios are very frequent not only in the zone of pitch, where they represent the interval of a fifth, but also in rhythm. This is manifest, for example, in the relationship of a crotchet to a dotted crotchet. In the twelve-degree system with minimum deviation it can be expressed in specific degrees, like the ratio 3:4. In the zone of rhythm, this fourth is expressed, for example, in the relationship between a dotted crotchet and a minim. In the sixteen-degree system, of course, this proportion cannot be represented in specific degrees. So it turns out that also in the zone of tempo, in the zone of the shaping of a rhythmic course, the tempered twelve-degree system displays many advantages. Consequently, there are no crucial reasons why a uniform twelve-degree system should not be introduced for the zones of pitch, tempo and time.

The traditional nomenclature relating to musical degrees contains many inconsistencies, particularly in relation to music based on tonal systems other than the seven-degree system. After all, an octave covers 12, not 8 semitones, a fifth 7, a fourth 5, and so on.

Although this does not cause any fundamental misunderstandings in relation to pitch, it would be senseless to transfer that nomenclature to the zones of tempo or duration. Of the many propositions, the following set of units seems the best:

1 tuz (octave) =12 ints (semitones) = 1200 cents

This system refers to the praxis employed by some theorists at the State College of Music in Warsaw.[33] Being not burdened by an age-old tradition, it can be easily extended to tempo and time. In this system, chromatic steps are defined as follows (the inverted 2 denotes ten and the inverted 3 eleven):

0 1 2 3 4 5 6 7 8 9 2 3 Ƨ Ɛ

Tuzes and ints define intervals and their size, but not necessarily their detailed location in a tuning. In our European system, located octaves have come to be designated with names: small, large, one-line, two-line, and so on. It is not very practical to expand that nomenclature to the zone of tempo and time. After much trial and error, the most advantageous seems to me to be a variant in which located octaves are called regions and their twelve constituent parts are called degrees. This nomenclature was introduced by Tadeusz Wójcik, solely in relation to note pitches, of course.[34] However, I adopt here a different numbering of the regions. Wójcik designated the region of the lowest notes (subcontra octave) as the zero regions and counted the regions up from there. In the proposed uniform system of pitch, tempo and time, the subcontra octave is region 20. The range from the 20th to the 30th region contains all audible sounds, and below the 20th region we have the regions of musical tempo and time. This is illustrated by a table with an arrangement of regions and degrees. This table contains both frequencies (per second or per minute) and durations (Example 2.3).

2.3 Natural zones of time in music

The uniform scale of musical pitch, tempo and time is of course entirely objective and mathematically exact. Its starting point is the second, a basic unit of time in the

33 Zalewski 1961.
34 Wójcik 1969, 160.

	Octaves	Regions	Degrees (semitones)												
			c	c sharp d flat	d	d sharp e flat	e	f	f sharp g flat	g	g sharp a flat	a	a sharp b flat	b	
			0	1	2	3	4	5	6	7	8	9	↊	↋	
	7-line	30	*16.38* 61.04	*17.36* 57.61	*18.39* 54.38	*19.48* 51.32	*20.54* 48.44	*21.87* 45.72							*kHz* µs
	6-line	29	*8.192* 122.1	*8.679* 115.2	*9.195* 108.8	*9.742* 102.6	*10.32* 96.89	*10.94* 91.45	*11.59* 86.32	*12.27* 81.47	*13.00* 76.90	*13.78* 72.58	*14.60* 68.51	*15.46* 64.67	*kHz* µs
	5-line	28	*4 096* 244.1	*4 340* 230.4	*4 598* 217.5	*4 871* 205.3	*5 161* 193.8	*5 463* 182.9	*5 793* 172.6	*6 137* 162.9	*6 502* 153.8	*6 889* 145.2	*7 296* 137.0	*7 732* 129.3	*Hz* µs
Zone of musical pitches	4-line	27	*2 048* 488.5	*2 170* 460.9	*2 299* 435.0	*2 436* 410.6	*2 580* 387.5	*2 734* 365.8	*2 896* 345.3	*3 069* 325.9	*3 251* 307.6	*3 444* 290.3	*3 694* 274.0	*3 866* 258.7	*Hz* µs
	3-line	26	*1 024* 976.6	*1 885* 921.8	*1 149* 870.0	*1 218* 821.2	*1 290* 775.1	*1 367* 731.6	*1 448* 690.5	*1 53* 651.8	*1 626* 615.2	*1 722* 580.7	*1 825* 548.1	*1 933* 517.3	*Hz* µs
	2-line	25	*512.0* 1.953	*542.5* 1.888	*574.7* 1.740	*608.9* 1.642	*645.1* 1.550	*633.4* 1.463	*724.1* 1.381	*767.1* 1.304	*812.8* 1.230	*861.1* 1.161	*912.3* 1.096	*966.5* 1.035	*Hz* ms
	1-line	24	*356.0* 3.906	*271.2* 3.687	*287.4* 3.480	*304.5* 3.285	*322.5* 3.100	*341.7* 2.926	*362.0* 2.762	*383.6* 2.607	*406.4* 2.461	*430.5* 2.323	*456.1* 2.192	*483.3* 2.069	*Hz* ms
	small	23	*128.0* 7.813	*136.1* 7.374	*143.7* 6.960	*152.2* 6.570	*161.3* 6.201	*170.9* 5.853	*181.0* 5.524	*191.8* 5.214	*203.2* 4.921	*215.3* 4.645	*228.1* 4.385	*241.6* 4.139	*Hz* ms
	large	22	*64.00* 15.63	*67.81* 14.75	*71.84* 13.92	*76.11* 13.14	*80.63* 12.40	*85.43* 11.71	*90.51* 11.05	*95.89* 10.43	*101.6* 9.849	*107.6* 9.291	*114.0* 8.770	*120.8* 8.277	*Hz* ms
	contra	21	*32.00* 31.25	*33.90* 29.50	*35.92* 27.84	*38.05* 26.28	*40.32* 24.80	*42.71* 23.41	*45.25* 22.10	*47.95* 20.86	*50.80* 19.69	*53.82* 18.58	*57.02* 17.54	*60.41* 16.55	*Hz* ms
	sub contra	20	*16.00* 960.0 62.50	*16.95* 1 017 58.99	*17.96* 1 078 55.68	*19.03* 1 142 52.56	*20.16* 1 210 49.61	*21.36* 1 281 46.82	*22.63* 1 358 44.19	*23.97* 1 438 41.71	*25.40* 1 514 39.37	*26.91* 1 615 37.16	*28.51* 1 711 35.08	*30.20* 1 812 33.11	*Hz* MM ms
Zone of psychological present		19	*8.000* 480.0 125.0	*8.476* 508.6 118.0	*8.980* 538.8 111.4	*9.514* 570.8 105.1	*10.08* 604.8 99.19	*10.68* 640.7 93.63	*11.31* 678.8 88.38	*11.99* 719.2 83.44	*12.70* 757.2 78.75	*13.45* 807.3 74.31	*14.25* 855.3 70.19	*15.10* 906.0 66.25	*Hz* MM ms
		18	*4.000* 240.0 250.0	*4.338* 254.3 236.0	*4.490* 269.4 222.8	*4.757* 285.4 210.4	*5.040* 302.4 198.4	*5.339* 320.4 187.3	*5.657* 339.4 176.8	*5.993* 359.6 166.8	*6.350* 381.0 157.5	*6.727* 403.6 148.6	*7.127* 427.6 140.4	*7.551* 453.0 132.4	*Hz* MM ms
		17	*2.000* **120.0** 500.0	*2.119* **127.1** 472.0	*2.245* **134.7** 445.5	*2.378* **142.7** 420.5	*2.520* **151.2** 396.8	*2.670* **160.2** 374.5	*2.828* **169.7** 353.5	*2.997* **179.8** 333.8	*3.175* **190.5** 315.0	*3.264* **201.8** 297.3	*3.564* **213.8** 281.0	*3.776* 226.5 265.0	*Hz* MM ms
		16	*1.000* **60.00** 1 000	*1.060* **63.57** 944.0	*1.123* **67.35** 891.0	*1.189* **71.35** 841.0	*1.260* **75.59** 793.6	*1.335* **80.09** 749.0	*1.414* **84.85** 707.0	*1.498* **89.90** 667.5	*1.587* **95.24** 630.0	*1.682* **100.9** 594.6	*1.782* **106.9** 562.0	*1.888* **113.3** 529.7	*Hz* MM ms
		15	30.00 2.000	31.78 1.888	33.67 1.782	35.68 1.682	37.80 1.587	**40.04** 1.498	**42.43** 1.414	**44.95** 1.335	**47.62** 1.260	**50.45** 1.189	**53.45** 1.123	**56.63** 1.060	MM s
		14	15.00 4.000	15.89 3.776	16.84 3.564	17.84 3.364	18.90 3.175	20.02 2.997	21.21 2.828	22.48 2.670	23.81 2.520	25.23 2.3.78	26.73 2.245	28.32 2.119	MM s
		13	7.500 8.000	7.946 7.551	8.419 7.127	8.919 6.727	9.449 6.350	10.01 5.993	10.61 5.657	11.24 5.339	11.83 5.040	12.61 4.757	13.36 4.490	14.16 4.238	MM s

Example 2.3 A uniform, twelve-degree musical scale of pitch, tempo and time, ranging from the frequency of the highest notes to the twenty-four-hour period. Regions and degrees. (scale modulus: 1 second)

	Regions	Degrees												
		0	1	2	3	4	5	6	7	8	9	2!!	3!!	
	12	16.00	15.10	14.25	13.45	12.70	11.99	11.31	10.68	10.08	9.514	8.980	8.476	s
Zone of works and performances	11	32.00	30.20	28.51	26.91	25.40	23.97	22.63	21.36	20.16	19.03	17.96	16.95	s
	10	64.00	60.41	57.02	53.82	50.80	47.95	45.25	42.71	40.32	38.05	35.92	33.90	s
	9	2’08.0	2’00.8	1’54.0	1’47.6	1’41.6	1’35.9	1’30.5	1’25.4	1’20.6	1’16.1	1’11.8	1’07.8	min
	8	4’16.0	4’01.6	3’48.1	3’35.3	3’23.2	3’11.8	3’01.0	2’50.9	2’41.3	2’32.2	2’23.7	2’16.1	min
	7	8’32.0	8’03.3	7’36.1	7’10.5	6’46.4	6’23.6	6’02.0	5’41.7	5’22.5	5’04.5	4’47.4	4’31.2	min
	6	17’04	16’07	15’12	14’21	13’33	12’47	12’04	11’23	10’45	10’08	9’34.7	9’02.5	min
	5	34’08	32’13	30’25	28’42	27’06	25’34	24’08	22’47	21’30	20’18	19’09	18’05	min
	4	68’16	64’26	60’49	57’24	54’11	51’09	48’16	45’34	43’00	40’36	38’19	36’10	min
Zone of compound times	3	2.16’3	2.08’5	2.01’4	1.54’5	1.48’2	1.42’2	1.36’3	1.31’1	1.26’0	1.21’1	1.16’4	1.12’2	h
	2	4.33’0	4.17’4	4.03’1	3.49’4	3.36’4	3.24’3	3.13’1	3.02’1	2.52’0	2.42’2	2.33’2	2.24’4	h
	1	9.06’1	8.35̓3	8.06’3	7.39’1	7.13’3	6.49’1	6.26’1	6.04’3	5.44’0	5.24’4	5.06’3	4.49’2	h
	0	18.12	17.11	16.13	15.18	14.27	13.38	12.52	12.09	11.28	10.49	10.13	9.38’4	h
	00							25.45	24.18	22.56	2.39	20.26	19.17	h

Example 2.3 Continued

international system of measurements. This scale is not an end in itself. On the contrary, its essence lies in the fact that it represents an efficient tool for studying physiologically and psychologically conditioned natural zones of a specific type aimed at the discovery of the natural scale of human time and for studying the ways in which those zones are used in the products of culture, above all in music. Of course, such extensive research should be based on experimental psychological and physiological studies, but equally as important is research into evidence of human behaviours, also recorded in musical works. The ultimate sense of studying culture is and will remain people and the way they see, express themselves, feel and exist in the world.

There are no longer any doubts, it would seem, as to the existence of such natural zones of human time. Karlheinz Stockhausen was fully aware of this, and he expressed it in his concept of a unified musical time. Unlike many theorists, he had no doubt that this time was based on a logarithmic scale. ‘I would like to discuss only the correlation of timbre, pitch, intensity, and duration. In the past, it has been customary to regard these correlative properties of sound as mutually independent, as belonging to fundamentally distinct spheres. They have appeared increasingly separate as our acoustical perception developed along such lines’.[35]

35 Stockhausen 1962, 39.

The principles of works composed in the laboratory conditions of an electronic studio impose a different approach to these categories, placing entirely new possibilities before the composer. 'With such a compositional procedure, then, one must proceed from a basic concept of a *single*, *unified musical time*; and the different perceptual categories, such as color, harmony and melody, meter and rhythm, dynamics, and "form", must be regarded as corresponding to the different *components* of this unified time'.[36]

Stockhausen distinguishes three basic ranges of musical time: the range of the frequency of vibrations, the range of rhythmic times and the range of formal times. Within these ranges, he places the above-mentioned musical categories.

> Harmony and melody correspond to periodic waves (that is, to sound-events of constant pitch) whose individual periods should not be greater than ca. 1/16 or less than ca. 1/6,000 sec. because beyond these limits they are no longer audible as 'pitches'.
> The color of harmonic spectra corresponds to the whole number fractions which, as 'fundamentals', refer to periods of between ca. 1/13,000 and ca. 1/16 sec.; the color of nonharmonic or noiselike spectra corresponds to more or less aperiodic successions of periods.
> Between ca. 1/30 and 1/16 sec. our perception of duration gradually changes into perception of meter and rhythm; i.e., *periodic* periods may then be considered as *meters*, and the *internal intervallic relationships* of the distances between pulses within any given meter – that which determines the tone color for periods shorter than ca. 1/16 sec. – may here be considered as 'rhythm'. Aperiodic relationships of periods, which are considered '*noises*' in the sphere of color, correspond, when the periods are longer than ca. 1/16 sec., to *aperiodic rhythms* having no recognizable meters – i.e. no recognizable periodicity (just as a deviation from simple periodicity in the sphere of frequency – '*dissonance*' – corresponds, in the sphere of duration, to *syncopation*).

According to Stockhausen, the accusations that many new compositions have no rhythm are unfounded: 'they may actually be considered to have "pure rhythm" without meter'. Those reservations are of the same kind as those levelled 'against the use of aperiodic sound waves, i.e. against "noises"'.

> Meter and rhythm correspond to the time intervals whose order of magnitude is between ca. 1/8 and ca. 8 secs. At about 8 secs. our ability to distinguish durational relationships gradually breaks down. With values of greater length we are no longer able to remember the exact lengths of durations or perceive their proportions as accurately as we can those that lie between ca. 1/8 and ca. 8 secs.
> 'Form' in a special sense – the time relationships of longer events – corresponds to durations of the order of magnitude of from several seconds to about 15–60 minutes (for 'movements' or whole 'compositions').

36 Ibid., 42–43.

> The transitions and overlappings between all the time spheres are quite flexible, but this is especially so with reference to 'form', which is most obviously an approximation (in the literature of music, of course, the durations of 'movements' or *continuous* works vary from several minutes to ca. one hour).[37]

Stockhausen, comparing the dimensions of the various zones, rightly indicates their seven-octave ranges, but he loses sight of the question of the more or less octave-size transitional zones, which impose an eight-octave rhythm on large zones, as we will see later. Here is what Stockhausen writes about this:

> Perhaps I should mention here that each of the three large musical time-spheres – *frequency duration*, *rhythm duration*, and *form duration* – are of approximately equal size: each has a compass of about seven 'octaves' (where 'octave' signifies a relation of 1:2). Between the highest note on the piano, whose fundamental wavelength is ca. 1/4,200 sec. and the lowest, whose wavelength is ca. 1/27 sec., there are just over seven octaves. Below this point sound waves gradually become audible as rhythms (a good illustration of this is the audible effect of the lowest notes on the organ), and from ca. 1/16 sec. to ca. 8 sec. – the span of rhythm durations – there are again seven octaves, as follows: 1/16" – 1/8" – 1/4" – 1/2" – l" – 2" – 4" – 8". The sphere of form duration, from ca. 8 sec. to between ca. 900 secs. (15 minutes, the approximate traditional duration of single movements of a work) and ca. 3,600 secs. also includes seven-nine octaves, as follows: 8" – 16" – 32" – 64" – 128" – 256" – 512" – 1024" … thus, the total musical time sphere encompasses the durations between ca. 1/4,200 sec. and ca. 900 secs., that is, 22(–24) 'octaves', or 22–24 progressions of 1:2.[38]

The natural character of the zones, or spheres, of musical time is confirmed in various fields. That is the only explanation for the many striking regularities in temporal phenomena considered on a logarithmic scale. For example, the seven-octave scale of musical pitches has its equivalent in the seven regions of 'musically sensible time', as Stockhausen calls it. The compass of more than two octaves of the scale of the human voice coincides with the scale of the metronome, also more than two tuzes. The human moment, defined very accurately (55.5 milliseconds),[39] is four tuzes from the average pulse, six tuzes from the delay time for stereophony and eight tuzes from the physiological time of growth.[40] The average time of a piece of popular music is eight tuzes from average tempo, and an average lesson is twelve tuzes from average tempo. It is probably coincidence that average musical tempo is exactly sixteen tuzes from the rhythm of day and night. Unless we are dealing solely with coincidence, the conclusion arises that human physiological

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37 Ibid., 43.
38 Ibid., 43–44.
39 Winckel 1967, 53.
40 Ibid., 176.

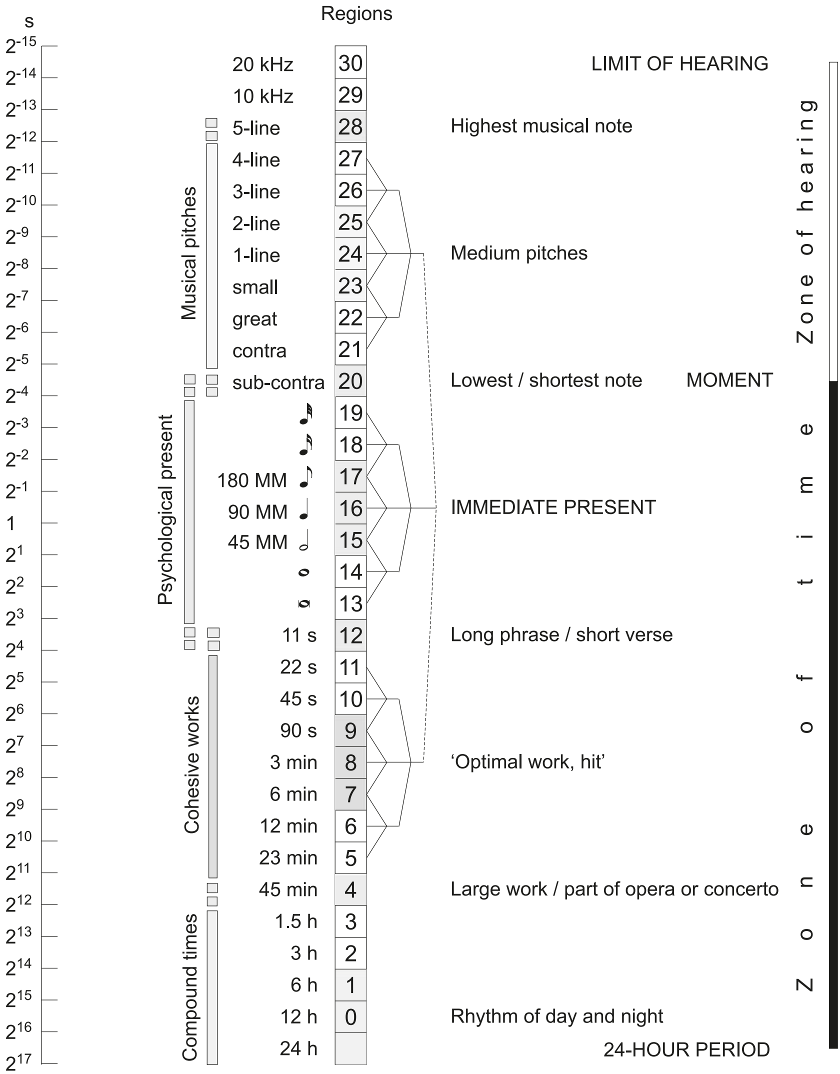
and psychological time is attuned to specific zones of frequency, in which the multiples of two octaves appear to discharge some important role. What is more, the whole of the large zone of time exploited in music could be expressed in a concise and uniform structure. This is represented graphically in Example 2.4. The extent to which this general model faithfully reflects reality will be shown by further considerations and the results of detailed research, in which are distinguished three basic large zones that are essential in every musical objectivisation. That is because music cannot arise unless it is shaped: (1) in the zone of musical pitches, (2) in the zone of the psychological present, or the zone of sounds, at the centre of which lies metrical tempo and our human time of the immediate present in general, and (3) in the zone of works, since it is only here that musical objects receive a closed form. Normally, we do not draw on the highest areas of audible sounds (29 and 30) in music, but we can fill with music the zone of large times below region 4. Then, however, musical sections in the form of works, sets of works or even large passages of operatic works, for example, will be separated by longer pauses, lasting at least several minutes.

There is a distinct eight-tuz rhythm of central regions (0, 8, 16, 24), intertwined with the same rhythm of the transitional or liminal regions (4, 12, 20, 28). It should be strongly emphasised here that not all the zones of the temporal phenomena of music have clear-cut boundaries. They are not entirely separate. On the contrary, they clearly overlap.

It is worth taking a look at the composition of the large zone shown graphically in Example 2.4. The whole of this zone is integrated by the central region. The directly neighbouring regions join together with that central region to form the medium areas of the big zone. The second region either side of the central region (together with neighbouring regions) defines the areas of high and low values. Thus is formed the set of seven basic regions, from which, on either side, transitional regions join to the next large zones. In exceptional circumstances, even those transitional regions can be crossed. As a result, we are dealing with an octave of octaves, as it were, in which we can also distinguish seven main elements, albeit elements of a completely different kind. In my opinion, this expresses man's way of perceiving and thinking, a natural, human way of organising and ordering phenomena.

2.4 Movement in music and the role of impulses of sudden change

All movement in nature is conditioned by time and space. In art theory, however, the problem of movement is more varied and is manifest mainly in the following forms:



Example 2.4 The regions and basic zones of time in music; overview drawing.

- full movement in time and space, for example in a march or a dance,
- movement solely in time, completely abstracted from space, characteristic of music,
- movement as if frozen in space, free from the category of time, although representing time through plastic art.

We will be interested in the first two kinds of movement, marked by succession in time, and especially in musical movement isolated from space. Admittedly, it is possible to show that musical movement is conditioned also by space. After all, for a sound to occur, a material source of sound must be stimulated, and a sound itself can only disperse in space, in the form of sound waves stimulating the human organ of hearing located in space. Corresponding impulses are then transmitted to the centres of the cerebral cortex, so the person can become aware of the sound, and so on. In this sense, not only sound, but even the most secret thought is conditioned by time and space, and it could not exist without space. So ostensible musical movement, occurring beyond space, as it were, is a trace of actual movement in nature. Yet analysis of the phenomenon of musical movement does not take us into the territory of scientific enquiry. Consequently, the spatial conditions of musical movement are utterly inessential to us, occurring as if on a different plane. That is because we are dealing not with movement in general, but with movement from the point of view of human perception, musical movement perceived through the auditory organs. Thus human beings, with their perspective of time and space, are most important for us, and from that perspective the difference between dance movement occurring in time and space and the movement of a sequence of sounds shaped solely in time is self-evident.

It might appear that constant, smooth, unchanging movement is the fundamental, most natural and most important kind of movement in music. In actual fact, music is based above all on discontinuous, interrupted movement measured in impulses of sudden change. That is the movement which people deal with most often. The most natural human movement, linked to the movement of our bodies in space, and stylised dance movement are measured in step impulses. Also regularly measured is the rhythm of the human pulse. Even the movements of our eye sockets when our viewpoint alters occur so quickly that they fall as if beyond time; they are a moment delimiting time. A distinctly impulsive character is also possessed by the movement of a sequence of syllables in speech. The contrast between a non-syllabic element, signifying a decline in sonorance, and the peak sonorance of a syllabic element is so great that each onset of a new peak of sonorance constitutes a sound impulse delimiting the language flow. A very distinct measured movement governs music as well. Each onset of a new note dividing time into segments determines above all the movement in music. Here, continuous, smooth movement is very limited, for two reasons:

- a note continuing in time, held for a long time, such as a drone-type note, automatically loses its mobile character, becoming a constant quality, duration without change, essentially immobile;
- smooth movement is really only possible in notes characterised by uniform change in one direction.

One example here is free glissando movement up or down, which inevitably ends when it reaches the limit of audibility. The movement of a wailing siren is not typical continuous movement. The moment when movement is broken off, however smooth it may be, disrupts, to greater or lesser extent, the homogeneity of continuous movement, in which it establishes a point of support for segmentation, introducing an impulse of change. The most perfect of instruments, the human voice, is capable of realising both kinds of movement, yet the principal use to which people put their voice is expressed in speech, and speech is typical discontinuous movement, the movement of a sequence of sound impulses. With our voice, of course, we can also realise smooth, regular movement, but the above-mentioned constraints apply, as does the constraint resulting from the need to take a breath, which breaks up the flow of the sound. In the development of instrumental music as well, movement defined by a sequence of sound impulses is more primary. Here is what Heinrich Husmann writes about this:

> The first musical instruments constructed by man emitted not continuous sounds, but short-lived sounds which soon faded. They arose, for example, from the striking of two bars, the plucking of the strings of a bow or the striking of the ground with a hollowed-out pipe. In order to obtain continuous sounds, people had to make bows, produce a special stirring of the stream of air in a flute, clarinet, trumpet, etc., to say nothing of the mechanically obtained vibration of columns of air in an organ. Many modern instruments, such as percussion instruments, pianos and others, also produce only short-lived sounds.[41]

Even in advanced instruments, however, in which the continuity of the sound would be practically unlimited, works are organised primarily by the movement of the sequence of notes. Avant-garde music sometimes strives to break free of this absolute domination of the impulse character to the flow of sound by seeking new possibilities for the development of musical language, be it by condensing the sound impulses to such an extent that they lose that selectivity

41 Hussman 1968, 51.

and merge into a single mobile sound mass, introducing long passages of stable sonorities or introducing a smooth flow of free glissando sounds, as in the sounds of a siren.[42]

From the perspective of the human present, a sound impulse is a sudden, timeless change, not so much lasting over time as limiting time. Seen from a different perspective, of course, the sound impulse shows itself to be a process, like every phenomenon in time. The sound of music, for example, does not appear in reality suddenly, as we perceive it, because it takes time to become fully formed. Husmann describes this process as follows:

> The fixed state, which is usually identified with the notion of a note, is preceded by the growth of the note, in which complicated unfixed states occur. The growth time depends on the pitch of the note; deeper notes grow more slowly, higher notes more quickly. In the middle register, a note is formed in approximately one-eighth of a second; in higher registers, this process is much quicker […] so the duration of a fixed note cannot be exactly defined. From a musical point of view, however, this fact is of no significance, since rhythm, which in a musical work is the factor that regulates the duration of particular notes, is a manifestation of a higher order, in which all units grow in the same way and so belong to a different category of phenomena than the temporal relations of particular vibrations under discussion.[43]

This 'higher order' is determined by the perspective of the human present.

Often emphasised is a peculiarity of the approach to rhythmic issues adopted by Arabic theorists, who treat a beat as an entirely timeless phenomenon, attributing specific temporal values solely to periods of silence between successive beats. According to Al-Farabi, 'Beats serve solely to help us define the length of the times of silence between beats'.[44] Perhaps the expressions are not too scientific, but the essence of the phenomenon is clear. No note in Arabic or any other music can occur outside of time. What is at issue here, however, is that every note entails a rhythmic impulse, introduces a moment delimiting time, closing one segment and opening another, that time passes between those moments of sudden change. Arabic theorists speak about silence between notes, but this is essentially time that can just as well be filled with sound as with a pause. So Arabic theory deals with general phenomena, concerning all music, although its wording is not the most felicitous.

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42 On stable sonorities, see Chomiński 1968, 146.
43 Husmann 1968, 49.
44 Żerańska-Kominek 1973.

2.5 The question of racial and cultural factors conditioning musical time

I have yet to discover any argument that would prove irrefutably that musical time and its perception, as well as human time in general, is racially conditioned in some fundamental way. On the contrary, everything seems to confirm that such is not the case. Irrespective of race, people see within the same range of light waves and hear within the same limits of acoustic frequencies, and everything suggests that they have an identical zone of the psychological present. The general foundations of the perception of the world are common to the human race, conditioned by human physiological and mental properties. Also common is the situation of a person in the world, in which time is regulated by the recurrence of days and nights, the succession of the seasons and the cycle of human development and life.

Despite those common foundations, certain physiologically and psychologically grounded individual deviations cannot be ruled out. We see this problem more clearly in respect to note pitches. We know that over time our range of hearing narrows somewhat, and we cease to hear the highest sounds, although this plays little if any role in music (the highest sounds affect the timbre of lower sounds). To my knowledge, science has yet to answer the question as to whether the zone of the psychological present narrows in a similar way or the selectivity of very short time intervals becomes reduced, with a corresponding shift in the human moment.

Whilst individual differences in the scale of the perception of note pitches are very small and almost negligible for music, people's vocal capacities are formed completely differently. Male voices differ fundamentally from female voices. On average, their compasses are a whole octave apart, and individual differences can also be considerable. This natural differentiation in the compass of voices is exploited in music, with voices divided in a choir, for example, into sopranos, mezzo-sopranos, altos, tenors, baritones and basses, which are assigned corresponding functions in a work. However, the compass of one's voice does not affect one's individual perspective of note pitches, since people are aware of the position of their own vocal compass in relation to the scale of perceived pitches and in relation to the ranges of other people.

A natural differentiation of voice pitches exists everywhere among people, but that does not necessarily mean that the proportions between low and high voices are always the same. We know that in some areas it is easier to find bass voices than in others. It is even possible that average voice pitches are somewhat differentiated across the world. Some opine, for example, that the Chinese have a higher speech position than Europeans (information from Zbigniew Raszewski). If that is indeed the case, it would be interesting to establish whether that results from the higher natural voice registers that dominate in China or is linked to a linguistic convention, to a more frequent use in speech of higher positions of the vocal range.

It would seem that the situation in the zone of the psychological present is in some respects similar, although we have far less knowledge in that domain. Like the zone of pitches, the zone of the psychological present is common to the human race, particularly with regard to our perception of time, whilst the human temporal activity characteristic of this zone may show individual differences. People differ somewhat in their mobility, the tempo of their speech and the time they take to react to stimuli. I refer here of course to untrained reactions, since specific training can considerably increase the efficiency of one's movements and one's mind. Phlegmatic characters have a tendency for slower temporal activeness than sanguine characters. However, those differences do not appear to cause any changes in the range of the human present; they do not affect the size of the human moment, for example. People are also aware of the tempo of their own activity, such as the tempo of their speech, compared to that of other people. In general, these differences are not too great when considered on a logarithmic scale, and consequently people can understand one another.

People have a fixed perspective of time and space from which they observe the world, and only indirectly can the world be seen from a different perspective. That applies to both space and time. Magnification makes it possible for us to see the world which in normal circumstances is invisible. This is possible because we bring a different viewing perspective to our human perspective. When magnified, an organic cell that is normally invisible, for example, clearly reveals to us its shapes and internal structure. We see it with our viewing apparatus, our eye, but we see it how it is seen by another apparatus, attuned to a different perspective, to much smaller sizes. The same applies to time. Here too people have their own perspective and can only experience the temporality of the sequence of phenomena from that perspective. However, technology makes it possible to alter one's temporal perspective. For example, when a match is shown in slow motion, we can observe a player's movements from a different temporal perspective than our own. We then see details that usually escape our attention. When a film is greatly speeded up, in turn, we can see a flower blooming from a bud. When speeded up on the screen, this process, which we know to be movement, but is too slow to be experienced as such, manifests itself in our human perspective of time as real-time movement.

People can only understand one another because they are attuned to the same lightwave frequencies, to the same soundwave frequencies and to the same frequencies of the present time. Their perceptual apparatuses are attuned to one another, and that makes communication possible. Even a small alteration in the attunement of our temporal perspectives can result in a lack of cohesion between information systems. We observe this, for example, when old films shot at a speed of sixteen frames per second are played back at the standard speed of twenty-four frames per second. The difference in tempo is just seven ints, but that is wholly sufficient for the scenes to appear comical, artificial, somehow inhuman. These are mainly silent films, but if such a procedure was applied to spoken films, the human voices would be just as unnatural. The difference of a fifth would make male voices similar to female voices, and female voices would become extremely shrill. Even more unnatural, however, would be the changes caused by a shift in the zone of the psychological present, in which the logical operations of language occur, words succeed one another and people's natural movement is manifested. This artificial shifting of the zone of the psychological present in a speeded-up film puts the communication systems out of sync, and there is a lack of complete agreement between our present and the present shown on the film. Suddenly, we see the human world from a different temporal perspective. We observe what appears to be a different human race, moving in a comical way, apparently like us, yet as if existing in a different world. Whilst the centre of the immediate present, of our temporal perspective, stands at 659 milliseconds (91 MM), as we will see below, the human world shown on a film is attuned to a different time, approximately 440 milliseconds (136 MM). Our moderato corresponds to allegro on a film, our allegro to the filmic presto, and so on. The zone of words in a speeded-up film clearly shifts in the direction of the zone of syllables, the zone of syllables towards the zone of phonemes, and phonemes are partially reduced, because they move clearly beyond the zone of the psychological present. On a speeded-up film, very quick periodic acoustic impulses would turn into low sounds, whereas the highest notes would be reduced, as they would fall beyond the zone of audibility. If a twenty-four-hour period were recorded onto film, it would last, for us, only sixteen hours, a century would last sixty-six years, and so on. This happens because on a speeded-up film we see from our normal temporal perspective. Let us imagine, in turn, our world from the perspective of the world of that film. Our voices would be unnaturally low, tenors would sound like basses, and basses would fall out of the normal range of human voices. Our speech would be unnaturally slow, our movements sluggish and our reactions to stimuli clearly delayed, a day would last twelve hours longer, and so on. As we can see, that small change of temporal perspective introduced by a speeded-up film produces a degree of incoherence between the information systems. Communicating with people whose psychological present is shifted by seven ints would cause us difficulties, to say nothing of larger differences, which would make direct communication impossible.

3 The zone of note pitches

Zone of compound times regions, hours						Zone of works and performances regions, minutes, seconds								Zone of the psychological present, regions, seconds, hundredths of a second								Zone of musical pitches regions, octaves								
00	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
24	12	6	3	90	45	22	11	6	3	90	45	22	11	6	3															
													16	8	4	2	1	50	25	12	C_2	C_1	C	c	c^1	c^2	c^3	c^4	c^5	c^6

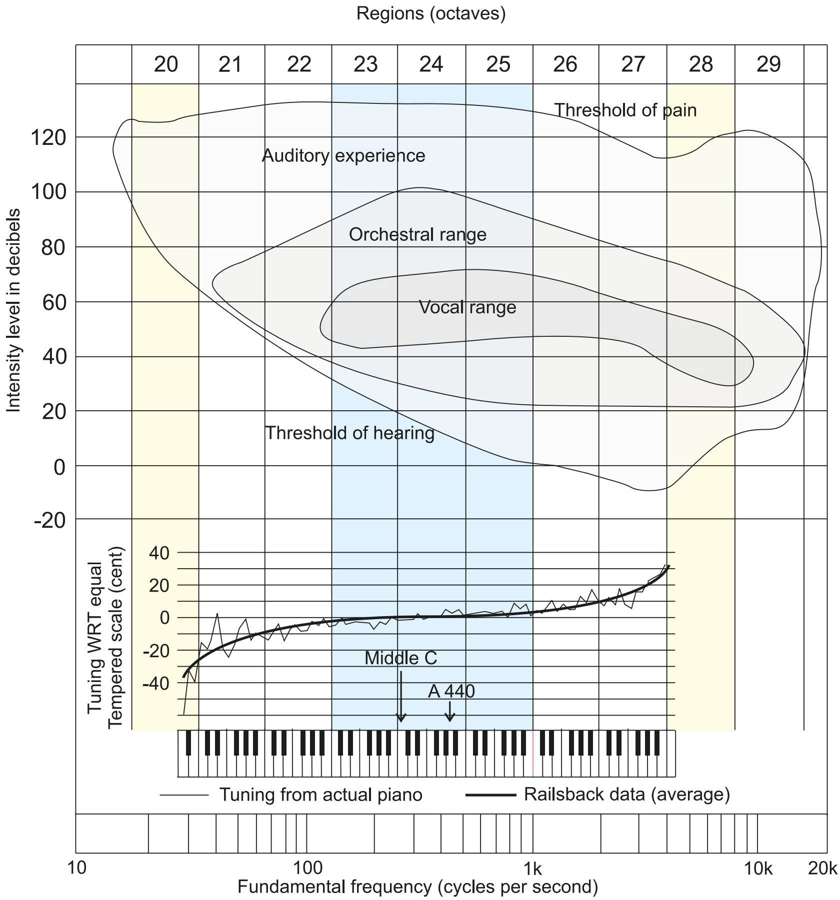
3.1 The zone of hearing and the zone of musical sounds

Strictly speaking, the zone of note pitches does not belong to the subject of the present work, which is devoted to aspects of musical time. After all, we know that from the point of view of human perception note pitches are not of a temporal character, although physics teaches us that pitches depend on the frequency of sound waves, so consequently on time. So it is worth realising, for the sake of comparison, how pitches considered on a logarithmic scale shape zones of different size, how our perception of notes depends on different zones, especially since we are much better acquainted with note pitches than with the zone of musical time in the full sense of the word.

Experimental psychology has established the area of audible sounds, presenting it on two axes of coordinates: an axis of logarithmic time, or more accurately of vibration frequency, and the logarithmic axis of the strength of notes. The range of hearing is generally well known and appears in all acoustics handbooks. I will cite it here, however, to compare it with other data, especially relating to musical practice (Example 3.1).

The whole zone of hearing forms a single large area. It conditions human orientation in the world of the sounds that people come across in life, not only in music. Humans are capable of defining sound phenomena in relation to the whole scale of hearing, but they do not have absolute pitch; they can only assess note pitches very generally. So they can say, for example, whether a note is high, very high, medium, low or very low in relation to the whole range of hearing. With practice, people can assess note pitches with much greater accuracy.

In addition, one's orientation in the zone of pitches is facilitated by assessments of pitches in relation to typical sounds familiar from experience, and especially in relation to the ranges of human voices. In general, however, the precision of



Example 3.1 The range of hearing. In the first part of the graph: the area of audibility with marked boundaries to the areas used in instrumental and vocal music, complemented with the regions (octaves) of our uniform musical scale. In the second part: the Railsback Curve, first measured by O. L. Railsback, indicating the deviation between normal piano tuning and an equal-tempered scale. Railsback 1938.

such direct assessments of pitch in relation to the entire zone of audibility is very low.

The zone of hearing covers an area from 16 to 20000 Hz. The extreme sizes are quite difficult to establish and depend to a degree on individual properties. We know, for example, that the zone of hearing narrows somewhat with age.

This concerns especially the uppermost sounds (see Example 7.2d in Chapter 7). However, this is not particularly significant, since extreme pitches are not normally used in music. Considerable differences in preference may occur in this respect in different cultures. However, this issue as a whole has been little researched to date. The most important constraints result from the compass of musical instruments. In the history of European music, the scale used in music has gradually increased, but it still does not normally occupy the whole of the area, mainly due to the negligible musical function of extreme sounds. Traditional musical instruments are not adapted to them. It is really only in electroacoustic music that there are practically no material or technical limitations, only perceptual and aesthetic constraints.

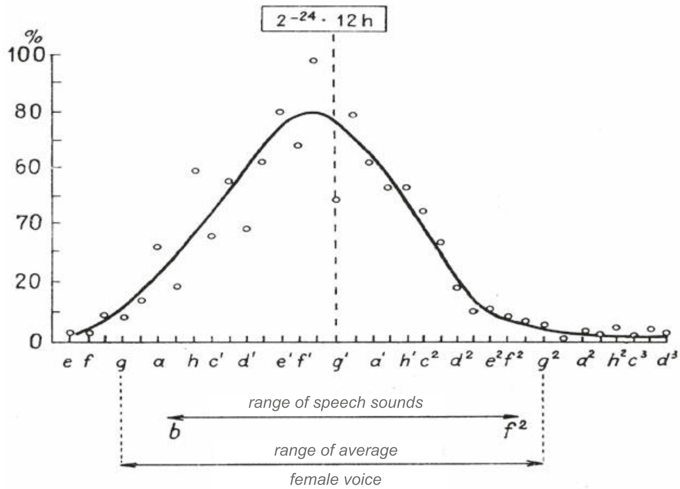
3.2 The zone of human voices

The most natural kind of music is the music which people perform with their own vocal organ; that is, vocal music. Of course, it is conditioned by people's phonic capacities. The compass of a human voice varies considerably; the differences are much smaller in children. Most significant here is the opposition between male and female voices, although there can also be considerable differences within each of those groups. Initially, the middle of the range of a child's voice stabilises in the one-line octave. Evgeny Nazaikinsky cites the range of note pitches in songs performed by a small girl during an early period of development (from two and a half years old), based on a diary in which her musical parents noted the intonation of the child's speech and her vocal improvisations.[45] In singing, the most frequent note was *f sharp*^{1}, which also centralises the main range of the notes used. Its regular distribution is disturbed by sporadically used high notes. The range of this girl's voice is very large (from e to d3), like the voice of Maria Callas (f to e flat3), gifted with a dramatic soprano and the ability to perform coloratura parts.

In the basic division of female and male voices into six choral voices,[46] the two octaves from *g* to *g*^{2} are assigned to mezzo-soprano, and that area can probably be regarded as central in the zone of musical pitches. That would incline one to regard the note *g1* as central in the whole musical scale (Example 3.2).

In musical folk studies, awareness of the need to note the authentic pitch of folk melodies appeared relatively late. Nineteenth-century collectors did not

45 Nazaikinsky 1972, 346.
46 Golachowski and Drobner 1953, 169.



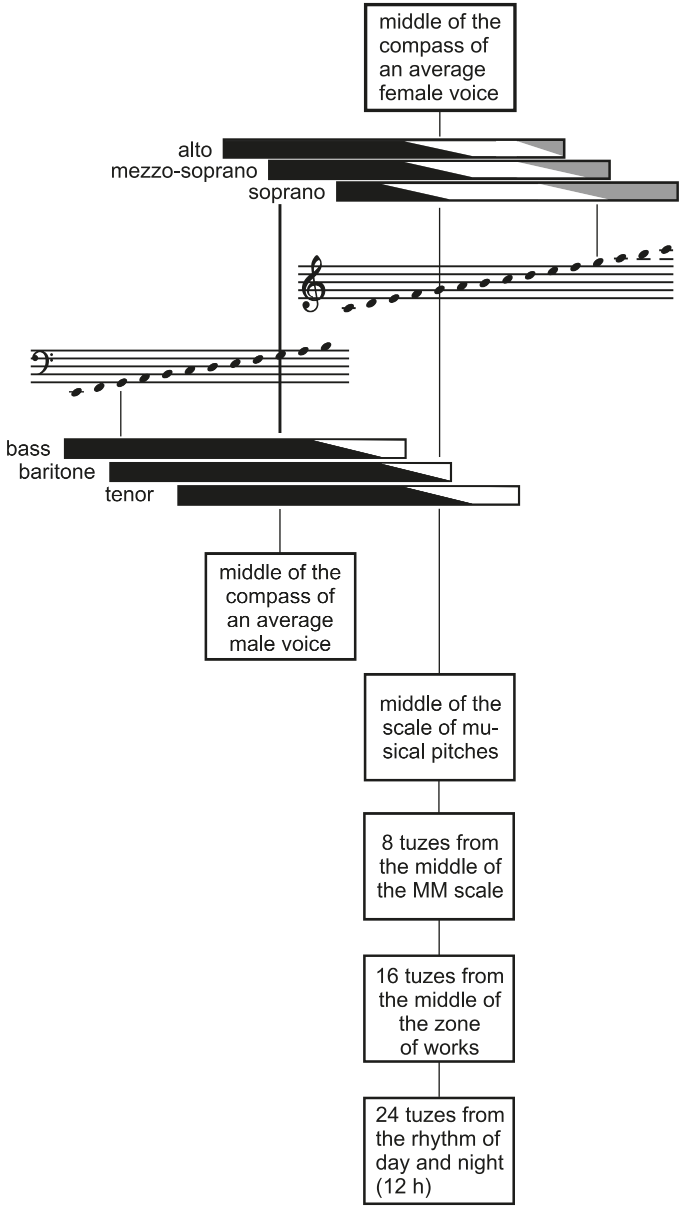
Example 3.2 The frequency of the use of notes of different pitch in the singing of a little girl and the compass of the sounds of her speech. Nazaikinsky 1972, 346.

attach any importance to this aspect, and it was really only the introduction of audio recording into research that brought a change in attitude in this respect, as indeed in every aspect related to performance practice. In Polish folk studies, Łucjan Kamieński was the first to note down melodies in their authentic pitch, when publishing songs from the southern parts of Kashubia in the form of detailed transcriptions from recordings on wax cylinders.[47] At times, that meant employing a considerable number of signs in the key signature and made it more difficult to read the notation. Today, for practical reasons of performance or comparison, melodies tend to be transposed to a suitable key (most often to g1), with the authentic pitch of the initial note given. To date, we have little research into the pitch of folk singing in various regions. Observations are usually based on general auditory impressions.

The impression of register pitch depends not only on objective pitches, but also on pitch in relation to one's own voice compass, as should also be observed in the future.

As an example, we will examine the singing of Cecylia Trybówna (aged twenty-two), whose repertoire was recorded in 1922 by Łucjan Kamieński and

47 Kamieński 1936.



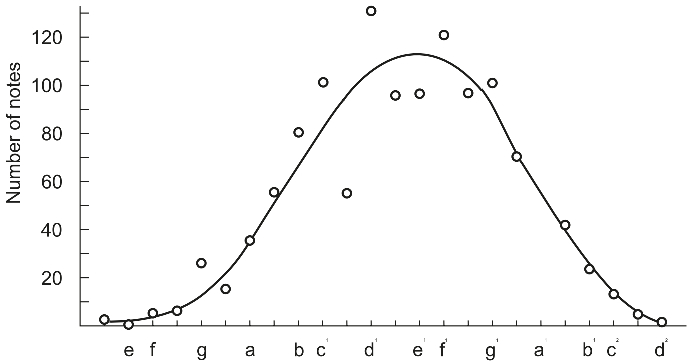
Example 3.3 Voice compasses according to Golachowski and Drobner and the middle range of musical pitches. Golachowski and Drobner 1953, 169.

No.		e	f		g		a	b flat	b	c^1		d^1		e^1	f^1		g^1		a^1	b $flat^1$	b^1	c^2		d^2
48											6		5		**7**	8		12		7			3	
51					4		4			**5**		6		8	3		2		2					
52					4		4		3	**7**		3		3	2									
53							3		**6**	3		9		7		6	8		4					
54						1		4		5	1		6		5		5	**7**		2				
55										5		**5**	4		11		6		2	2				
56												3	1	1	7		5		2	**5**		2		1
57				4				1	**9**	2	13	1	7	2		8		2						
58					1				1	**8**		4		6	3		7		6			4		
59									2		1		**4**	4		13		11		5	12		2	
60							2	1		**9**		6		5	7		6		1	1				
61								2		4		**6**	2		14		4		2	8		3		
62					6		4		13	4		4		2		2	**4**		2					
63						5		7	3		5		2		4	**5**								
64										1		1		**5**	3		9		6		2	2		
65							2		6	4		14		12		8	**7**		2					
66									11		4		5	**5**		3		3	1					
67								**4**		2		4	5		7		5	3		1				
68					2		**5**	3		13		9		3	8		5		3					
69					2		4	2		8		7		4	**5**		1							
70	2		2		6	5		15		4		3	**6**		13	4								
71			2					**6**		7		10	6		5	2								
72							3		**4**	5		9		5		3	3		1		1			
73								2				2	**5**		9		9	6		5		1		
74						**4**					4		5		9	5		11		2				
75				2				3	**7**		8		12	5		6		5						
76								1	**3**		9		8	3		3								
77								4		2		2	**4**		2		6	2		1		1		
78									**3**	2		8		3		2	6		4		2			
80							4					**14**		12	6		4		2					
81									**7**		3		8	2		13		8		3	4			
Total	**2**		**4**	**6**	**25**	**15**	**35**	**55**	**80**	**100**	**54**	**130**	**95**	**96**	**120**	**97**	**101**	**70**	**42**	**42**	**23**	**13**	**5**	**1**

Example 3.4 Note pitches in thirty-one folk melodies sung by Cecylia Trybówna, aged twenty-two, Rybaki, Chojnice county, Poland, 1932. Based on Kamieński 1936, no. 48, pp. 51–78, 80–81.

published in *Pieśni z Kaszub południowych*.[48] Example 3.4 contains the number of notes used in thirty-one songs. The voice compass in particular melodies – as we can see – changed within certain parameters. The tonal centres of melodies

48 Kamieński 1936.

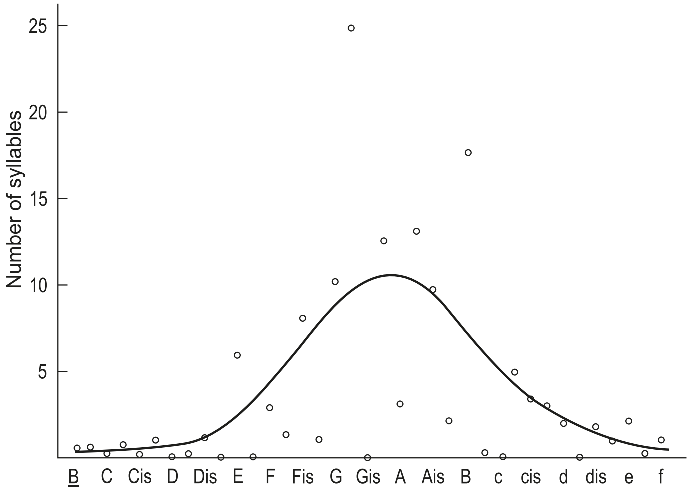


Example 3.5 Frequency of the appearance of notes in thirty-one folk songs from southern Kashubia; after Example 3.4.

are also highlighted (in bold). It is difficult to distinguish here any principles governing the change of register. Statistically speaking, however, when we take into account the entire repertoire, the profile of the pitch zone (Example 3.5) is quite regular. The compass does not cover a full two octaves; it coincides with the alto register, although the centre of the frequency of occurrence of particular notes tends to fall in the centre of the mezzo-soprano range. We do not know, however, what compass this particular singer had.

3.3 Note pitches in music and in language

Speech is the basic human sound system, the normal and most frequent way in which the voice is used in social life; hence our detailed knowledge of the use people make of the possibilities afforded them by language in ordinary and extraordinary situations. It is also of fundamental importance to music theory. The very fact that people employ the same vocal organ to form musical and linguistic utterances is of huge theoretical and practical significance, and it is particularly crucial here to be fully aware of the relationship between music and language on the level of sounds (and not only sounds). At this point, we are interested especially in note pitches. Their role differs fundamentally in language and in music. That is due to the fact that in language, from the point of view of the functioning of the system, note pitches are of secondary importance. Language phonologises, expresses above all timbres in a system of oppositional qualities, and it is based on features inherent to sound, whereas relational features, which include note pitch relations, fulfil a much more limited role in language. We know that languages, in their phonological systems, can make greater or lesser use also of note pitches. Some languages, on account of the role which pitches play in them, have even been called intonational languages. One must be aware, however, that even in those languages the way in which pitches are used is fundamentally different than in music, since different pitch features are phonemicised in each domain. In general terms, one may say that languages phonemicise pitch relations, but not the size of those relations. Even when a language employs a complex system of multi-layered intonations, it understands those layers differently than in music. Language does not create intervals as strictly defined pitch ratios. Only the direction and contour of lines of intonation can be phonemicised in language. The interval between those pitches is not musically defined. It does not form a second, a third or any other musical interval, although in many cases it no doubt coincides with such intervals. I do not have at my disposal statistical data relating to the pitch sizes of specific language intonations. It is likely, however, that their zones are much broader (when considered on a logarithmic scale of the frequencies of the main tone) than the zones of musical degrees. Additionally, in all languages, regardless of whether they employ intonations in their phonological systems, we are dealing with the differentiation of prosodic pitches, and it is mainly on that level that language converges with music. To simplify things, one might even say that music is phonologised prosody. Note pitches play a very important role in prosody. However, whilst in language prosodic note pitches form one large continuous scale, virtually coinciding with a voice compass, used freely for subtle shading, in music those same pitches are contained within a strictly defined system of oppositional qualities, expressed in a musical scale. In such circumstances, the passage from one scale degree to the next is not only a question of quantity or interval size. There is no smooth passage between scale degrees. Those passages are made in leaps; they are clearly qualitative. The number of those degrees is limited, but because they are oppositional, they make it possible to create various combinations in a piece of music; they are easily recognisable as different, and so allow one to create that huge diversity of motifs, phrases, and so on, in which even a single note can sometimes impose a different form on a whole piece. Only because language phonologised features of secondary importance to music and music phonologised secondary features in language is it possible for both sound systems to coexist in vocal music. The two systems are realised in simple folk music, yet each of them is forced to give up some of its secondary features. In singing, there is no freedom for the prosody of language, regulated by properties of the musical system, just as there is no freedom to shape the timbres of musical notes reserved first and foremost

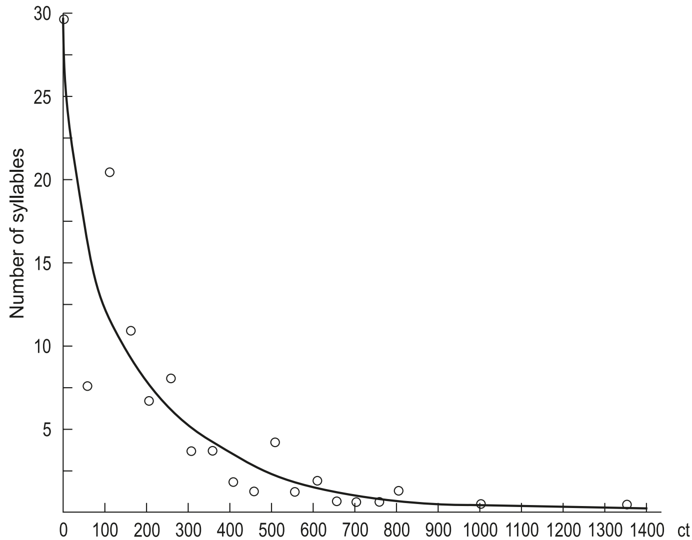


Example 3.6 Note pitches of speech according to the measurements of the short text of a spontaneous conversation made with an accuracy to 50 cents. Jassem 1962, 36–41.

for the realisation of the phonological system of language, which represents the sine qua non for its functioning and for the differentiation of morphemes and words as logical semantic units. If, therefore, we compare the differentiation of the pitches of linguistic utterance with the differentiation of musical pitches, we must always bear in mind this fundamental difference in the essence of those features in the two basic sound systems forged during the development of human culture. Their meaning is different, although on the surface it might seem that they are very similar. I do not have at my disposal reliable statistics relating to the way in which the zone of note pitches is used in language, so I will cite the example of a normal conversation recorded by Wiktor Jassem and measured in detail with an accuracy to a quarter-note (50 cents).[49]

The pitches of syllables and the frequency of their occurrence are illustrated by the line on the graph (Example 3.6). Although there was only a small amount of recorded text, it gives us a better idea of how humans shape the zone of speech pitch. The distribution is actually highly regular; medium pitches are more common, with extreme pitches rare. Since we are not aware of the whole range of

49 Jassem 1962.



Example 3.7 Size of melodic intervals of a syllabic flow of spontaneous speech. After a text analysed in Jassem 1962, 36–39.

the subject's vocal capacities, we do not know whether the most frequent pitches of the given text fall at the centre of the voice scale or not.

People normally speak in the most comfortable position, but only detailed study could precisely determine the position of this zone in relation to the whole scale of vocal capacities. Much food for thought is given by the fact that even in normal speech the pitch range is relatively large, to say nothing of emotional speech, in which the pitch range is considerably expanded. In the analysed text, the range encompasses almost a twelfth (*B̲*–*f*).

One is struck by the exceptionally low position of the voice in relation to singing voices, for example. It goes without saying that extreme pitches appear only exceptionally; a small percentage of sounds fall beyond an octave. Also highly differentiated are the pitch intervals of the syllabic flow of speech presented on the graph (Example 3.7), although they do display a characteristic regularity: the frequency is inversely proportionate to the size of the intervals. This fact is also significant for music. Melody and musical scales are influenced by this phenomenon, but also by the opposite phenomenon, since we know that the consonance of the intervals of the natural series (harmonics) is proportionate to their size.

3.4 The zone of musical sound

The zonal character of musical hearing was studied in detail by the Russian music acoustician Nikolai A. Garbuzov.[50] On the basis of numerous measurements of the actual size of intervals in melodies performed by highly qualified musicians playing on instruments with variable tuning (Garbuzov included wind instruments among them), he showed that musical tuning is not in essence a tempered or a Pythagorean tuning or any other theoretically grounded tuning. Every performance of a melody, even by the same performer, is only an intonational variant, the intervals of which, given exact measurements, display even considerable deviations from their theoretical sizes. According to Garbuzov, musical hearing is zonal hearing, and intervals within delineated zones are musically the same, although acoustically different. Garbuzov also indicated the width of the zones, but in my opinion he did not give a sufficiently clear presentation of the issue of their boundaries and of the character of such a zone in general.

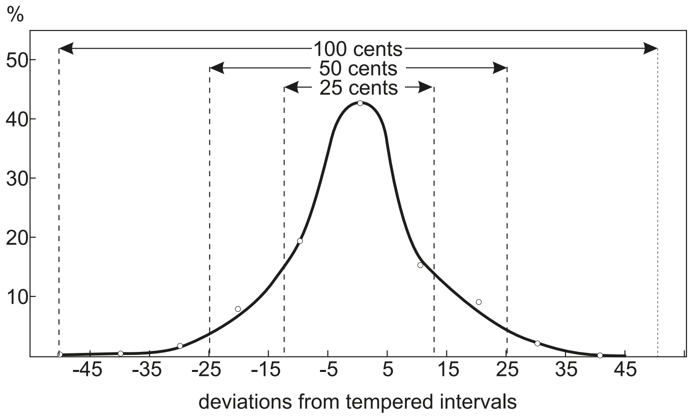
Wishing to highlight this aspect, I prepared Example 3.8, based on all Garbuzov's measurements presented in his work *Vnutrizonnyi intonatsionnyi slukh i metody yego razvitiya.* It shows that with a measurement accuracy of up to 2 cents only 13.8 % of intoned intervals accorded with equal tempered tuning, 42.8 % of intervals were reduced in performance and 38.8 % were increased. It is difficult to say whether this difference conceals some regularity. At this point, that is of no greater significance for our considerations. What is important is that such a large number of intervals (in this instance 81.7 %) display differences compared to tempered intervals, that we are not dealing with zones with clearly defined boundaries, in which intervals are musically treated as identical, but that the zone is of a statistical character and has its centre and regular distribution, close to the Gauss distribution – if considered, of course, on a logarithmic scale of frequency (or time). The picture of such a zone is best illustrated by the graph (Example 3.9), based on Garbuzov's measurements included in the above-mentioned table.

On the graph (Example 3.9), we have average deviations from the theoretical sizes of melodic intervals. That does not mean that the zones of individual scale degrees look identical, although they are no doubt of similar appearance. Adopting that assumption, it is worth theoretically considering the consequences of just such a character to the zones for the construction of musical scales. It ensues that the zones of degrees a major second (200 cents) apart are clearly delimited,

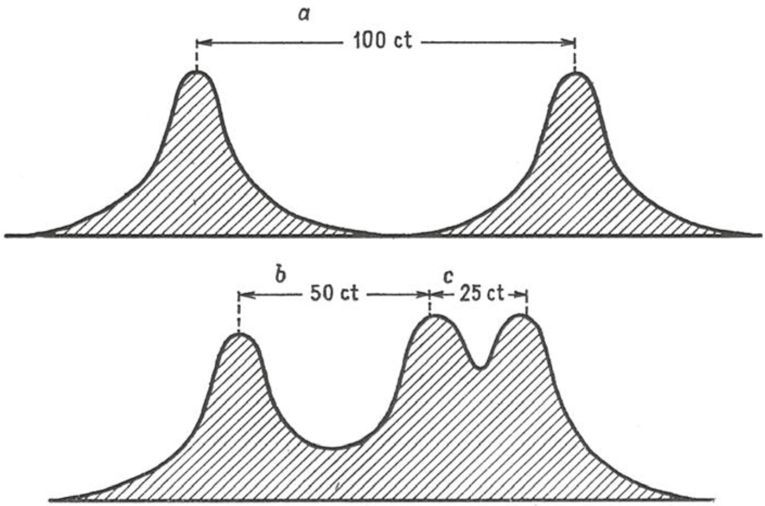
50 Garbuzov 1948, 1951.

		Intonation of melodic intervals by highly qualified musicians																				
		Intervals intonationally reduced in cents											Intervals intonationally increased in cents									
No. of tables		46–50	41–45	36–40	31–35	26–30	21–25	16–20	11–15	6–10	1–5	0	1–5	6–10	11–15	16–20	21–25	26–30	31–35	36–40	41–45	46–50
1	Violin				2	2	1	5	5	12	8	10	7	2	4	3	2	1	1			
2	Violin			1		1	2	5	4	10	5	17	5	6	6	3		1				
3	Violin			1	1	2	4	10	7	8	4	10	5	2	4	8	3	1				
4	Flute			1		2		4	11	12	11	23	14	13	5		3				1	
5	Oboe						4	7	1	11	13	8	8	3	7	8	2					
6	Clarinet					1		3	18	10	14	31	16	7	6	5	4	1				
7	Bassoon	1			2		2	4	6	7	12	14	14	5	7	9	3	3	2	1		
8	Tuba				2	1	2	5	6	13	13	10	14	13	16	14	1	6				
9	French horn						1	5	6	13	27	27	9	13	9	6	2	3				
Total		1	3		16		64		160		349			128		76		19		2		

Example 3.8 Melodic intervals irrespective of their size and direction, intoned in accordance with equal tempered tuning (0) and intonationally reduced or increased. Deviations from sizes of tempered intervals in cents. Disposition after measurements in Garbuzov 1951, Examples 1–9.



Example 3.9 Deviations of melodic intervals from equal tempered tuning; after Example 3.8.



Example 3.10 Zones of scale degrees (a) 100, (b) 50 and (c) 25 cents apart; overview drawing.

whilst the zones of degrees a minor second (100 cents) apart are contiguous, and in exceptional cases may even dovetail with one another (Example 3.10a).

However, that by no means signifies that neighbouring melodic notes not differentiated in terms of pitch could at the same time represent different scale degrees or that, in the case of dovetailing zones a semitone apart, a lower interval in direct contact could discharge the function of a higher degree and a higher interval the function of a lower degree. One must remember about the statistical character of the zones, the extreme sizes of which appear only exceptionally and are conditioned by a special situation in a melody. We have in mind here, of course, correct intonation; errors of intonation might blur the zones of neighbouring degrees, but here we are abstracting from them entirely. A fundamentally different situation arises in micro-interval scales. Unlike a major, or even a minor, second, the zones of degrees a quarter-note (50 cents) apart and especially an eighth-note (25 cents) apart very clearly dovetail with one another, as is shown on the drawing (Example 3.10b, c). This strong merging of zones a quarter-note or less apart has considerable practical consequences: it clearly limits the possibilities of their use and makes it difficult, if not impossible, for such degrees to be independent of one another. Hence in natural musical styles quarter-notes are strongly conditioned by the melodic and scalar context.

As yet, we do not have at our disposal any detailed results of research into the zonal structure of musical scales occurring in the folk practice of different cultures. That remains a matter for the future. There emerges here a whole range of issues that should be more closely examined. That is because we must take into account both the possibility of typical deviations of zonal centres from the sizes of tempered intervals and also the differentiation of zone widths. It is highly likely, for example, that in some types of scale the notes of the tonal skeleton have narrower zones than the degrees which flesh out that skeleton.

3.5 Perceived roughness

Natural fifths do not cause long beats (lower than 10 Hz), whilst equal-tempered fifths cause beating in both the zone of sound pitches and the zone of musical rhythms. Szczepańska-Antosik studied the beating of equal-tempered fifths in three regions (octaves): region 26 of very high sounds, region 24 of medium sounds and region 22 of very low sounds.[51] She presented the results of her measurements on a scale of beat frequency in Hertz and on a scale of beat intensity in decibels. The transferral of the data onto our scale of the regions of musical time reveals a characteristic regularity. Beats in the zone of rhythm are a distant echo of the beats of note pitches; they are a trace of their frequencies moved down by eight regions and a reduction of their intensity by ten decibels. And to think that this revolution in music theory was caused by the micro-interval of two cents that distinguishes the tempered fifth from the natural fifth! This is shown precisely in Example 3.11.

In presenting the graph of the zones and regions of time in music (Example 2.4), I had no grounds to suppose that the zone of the psychological present could also be encoded in the very structure of the zone of musical pitches, as is revealed by the beating of an equal-tempered fifth, which thereby supports my proposition. It is worth studying this phenomenon more precisely.

At the same time, we obtained an answer to the fundamental question of roughness in music. It is a dual phenomenon: in the zone of musical pitches, it is an inherent feature of a sound, a kind of its timbre; in the zone of musical rhythms, it is a relational intrasound feature. In the middle and slow regions of that scale, it is a gentle and very gentle undulation of sound intensity. In high regions, it is an increasingly acute form of roughness.

51 Szczepańska-Antosik 2013.

dB		Rhythm regions								Sound regions (octaves)								
	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
0														x	CG			
-5														x	xx	x		
-10							xx							x	xx	x	x	
-15							xx	x						x	xx	x	x	x
-25																		
0												x	CG					
-5												x	xx	x				
-10					xx							x	xx	x	x			
-15					xx	x						x	xx	x	x	x		
-25																		
0										x	CG							
-5										x	xx	x						
-10			xx							x	xx	x	x					
-15			xx	x						x	xx	x	x	x				
-25																		

Example 3.11 The beating of equal-tempered fifths in the zone of sounds and their echo in the zone of rhythms. Overview drawing based on a graph by Szczepańska-Antosik.

4 The zone of the psychological present

Zone of compound times regions, hours						Zone of works and performances regions, minutes, seconds								Zone of the psychological present, regions, seconds, hundredths of a second								Zone of musical pitches regions, octaves								
00	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
24	12	6	3	90	45	22	11	6	3	90	45	22	11	6	3															
													16	8	4	2	1	50	25	12	C_2	C_1	C	c	c^1	c^2	c^3	c^4	c^5	c^6

The zone of the psychological present holds the central position among the three large zones that are indispensable in every musical objectivisation. It borders on one side with the zone of musical note pitches (dependent on vibration frequency) and on the other with the zone of works. As already mentioned, the border regions of the zone of the psychological present are regions 20 and 12, and at its centre lies region 16. The musical phenomena contained in this large zone are quite diverse. It is here, above all, that the sound flow of music unfolds. Practically speaking, only long-held drone notes can go beyond this zone, although it also covers such phenomena as bars and motifs, and its boundary is defined by long lines or melodic phrases, whose role in the overall construction of musical works is of limited independence. Musical phrases belong to the next zone.

Perhaps the only homogeneous temporal musical phenomenon, covering the whole zone of the psychological present, is note duration, so the name 'zone of note duration' would also be justified. Of course, not in every kind of music is such a great diversity of note durations employed, but examples can be found in certain styles, and also in styles of folk music. It is easiest for me to refer to so-called Mongolian long songs, since this is one of the aspects considered in relation to those songs by J. Katarzyna Dadak-Kozicka.[52] Those songs are distinguished on one hand by their very long notes, held for several seconds, and on the other by very short melismatic sounds of various kinds and by specific trills in which the succession of notes comes close to the extreme quantities of this large zone. The basic movement of the work, meanwhile, is clearly located in medium quantities on the metronome scale. Here is an example of the differentiation of notes in the 'long chant' style of Mongolian songs (Example 4.2).

The idea arises here that since this zone can be filled with notes, it can no doubt also be filled by rests or pauses. However, the matter is more complex. It is doubtful whether rests could attain the extremely small quantities of this zone.

52 Dadak-Kozicka 1970.

	ZONE OF THE PSYCHOLOGICAL PRESENT																					
	Border region								Central region								Border region					
Regions	11		12		13		14		15		16		17		18		19		20		21	
Sec., millisec.	22.6s		11.3		5.6		2.8		1.4		707		353		176		88		45		22ms	
		16s		8		4		2		1		500		250		125		62		31ms	
	Duration of phonemes, syllables and words of spontaneous speech																					
1.Phonemes													+	+	5	10	27	25	22	5	4	+
2.No-final syllablesn													5	11	31	35	18	+				
3.Final syllables to 1s								1	1	2	3	4	6	10	30	27	15	+				
4.Words and prosodic words									3	16	19	21	24	9	8							
5.Word with coda +1s									11	21	16	17	20	8	7							
Maelzel Metronome			5.5		11		22		44		88		176		352		712		1424		MM	
				7.5		15		30		60		120		240		480		960		MM		
	Average tempo of syllabic flow in song (number of syllables per minute)																					
6.Wielkopolska												3	33	50	13							
7.Cracow region											+	16	47	35	1							
8.Warmia and Masuria											3	20	52	22	3							
9.Silesia										+	7	24	44	20	4							
10.Kashubia										+	6	25	44	22	1							
11.Lubelskie										+	9	23	50	16	1							
12.Podlasie										1	16	22	35	24	1							
13.Podhale									+	6	15	35	27	13	2							
14.Kurpie									2	6	17	23	44	8	+							
15.Belarus									1	6	21	29	22	14	1							
16.Bułgaria									5	14	19	21	36	4	1							
17.Kosovo-Metohija								7	17	25	30	13	6	1	2							
18.Turá Lúka											2	9	49	28	11	2						
19.Velke Zalužice										2	4	13	61	19	2							
20.Rejdová tempo									1	10	24	22	13	12	8							
	Average tempo of rhythmic flow (number of rhythmic values per minute)																					
21.Music of Dahomey													10	53	37							
22.Yuma folk songs											1	26	65	8								
23.Yuma deer dance											4	46	50									
24.North American Indian music										1	10	29	30	17	1							
	Metrical tempo																					
25.'Chodziła'													9	4								

Example 4.1 Zone of the psychological present (module 1 second). Key: **(1)** Duration of phonemes of spontaneous speech, based on Jassem's measurements;Jassem 1962, 74–91. **(2)** Duration of non-final syllables of spontaneous speech, based on Jassem's measurements; Jassem 1962, 74–91 **(3)** Syllabic flow of spontaneous speech, taking account of the lengthening of final syllables with interword pauses (up to one second), based on Jassem's measurements; Jassem 1962, 74–91 **(4)** Duration of words and prosodic words, based on Jassem's measurements; Jassem 1962, 74–91 **(5)** Duration of words, taking account of a coda up to one second, based on Jassem's measurements; Jassem 1962, 74–91 **(6–14)** Average tempo of syllabic flow in folk songs of Polish regions. A detailed list of sources on which the calculations are based can be found in my work on the rhythms of Polish folk songs; Bielawski 1970, 44–45. **(15–17)** Average tempo of syllabic flow in folk songs of Belarus, Bulgaria, Kosovo and Metohija; Bielawski 1970, 44–45. **(18–20)** Average tempo of syllabic flow in three locations in Slovakia, from the collection of Poloczek; Poloczek 1956; cf. Bielawski 1976, 114. **(21)** Average tempo of rhythmic flow (number of rhythmic values per minute) in the music of Dahomey, based on data from M. Kolinski; In Nettl 1964, 189; cf. Bielawski 1976, 30.

(22) Average tempo of rhythmic flow of folk songs of the Yuma Indians; Kolinski 1959, 52; cf. Bielawski 1976, 23. **(23)** Average tempo of rhythmic flow of the deer dance song of the Yuma Indians; Kolinski 1959, 52; cf. Bielawski 1976, 23. **(24)** Average tempo of the music of North American Indians; Kolinski 1959; cf. Nettl 1964, 189; Bielawski 1976, 30. **(25–27)** Metrical tempo of variants of three folk songs: 'Chodziła Maniusia ku ogródyszkowi' [Mary walked towards the garden], 'A wiernie ja Panu Bogu służyła' [And I served the Lord God faithfully], 'A żebyś ty chmielu' [O may you, hops]; Kujawy 1975, 52, 30, 44; cf. Bielawski 1976, 106. **(28)** Metrical tempo of Chopin mazurkas; According to Paderewski edition (not all of them have metronome markings), cf. Bielawski 1970, 120. **(29)** Metrical tempo of triple-time Wielkopolska folk songs: to three, to four, and to five–six syllables per bar; Sobieska 1957; cf. Bielawski 1970, 120. **(30)** Metrical tempo of triple-time Kurpian folk songs: to three, to four and to five–six syllables per bar; Skierkowski 1928–1934; cf. Bielawski 1970, 120. **(31)** Metrical tempo of Polish folk songs; Sobieski 1955. **(32)** Metrical tempo of Hungarian folk songs; Bartók 1925. **(33–36)** Duration of bars of Bulgarian folk songs in 5/16, 7/16, 5/8 and 9/16; Stoin 1928; cf. Bielawski 1976, 135. **(37)** Duration of bars of Polish folk songs; Sobieski 1955; cf. Bielawski 1976, 134. **(38)** Duration of bars of Hungarian folk songs; Bartók 1925; cf. Bielawski 1976, 134. **(39)** Duration of bars in piano sonatas by Beethoven; Cf. Bielawski 1976, 134. **(40)** Duration of phrases in Polish funeral laments; Cf. Trojanowicz 1979, 24. **(41)** Duration of musical phrases on the basis of representative musical cultures of the world, Cf. Lomax 1968. approximate data converted from a different scale of the duration of sections, quantities given in percentages; **(42)** Duration of musical phrases of Polish folk songs; Sobieski 1955; cf. Bielawski 1976, 138. **(43)** Duration of musical phrases of Croatian folk songs; Žganec 1950; cf. Bielawski 1976, 138. **(44)** Duration of musical phrases of Hungarian folk songs; Bartók 1925; cf. Bielawski 1976, 138. **(45)** Duration of themes of Bach fugues; Based on data from Hutchinson (1966, 66), converted into percentages; cf. Bielawski 1976, 31. **(46)** Duration of sonograms distinguished by Aleksandra Bartos-Chmielewska in Witold Lutosławski's Piano Concerto (soloist Paul Crossley)

In some notation, perhaps, one might indeed find examples. In addition, pauses of that size would no doubt be recordable using a physical apparatus. Yet they would not discharge the function of musical rests. In order for a musical rest to manifest itself, a much longer period of time is needed – one that enables us not only to perceptually distinguish a succession of sound impulses, but also to focus attention on the breaks between those impulses, which at a quick tempo is simply not possible.

Many authors attribute to the size of the human moment (given various names) a fundamental role in the perception of time. The human moment defines that transitional zone in which the frequencies of the vibrations of the lowest notes end and the shortest notes or quickest tempi begin. It is not easy to pinpoint the middle of this zone. Data relating to this zone that I am familiar with differ depending on the way in which an experiment was conducted and

26.'A wiernie'												1	11	2								
27.'Chmiel'												1	10	2								
28.Chopin Mazurkas, tempo 108–228												3	21	6								
29.Wielkop. to 3 syllab.													3	94	3							
to 4 syllab.												5	36	58	2							
to 5–6 syllab.											3	11	76	10								
30.Kurpie to 3 syllab.										4	4	4	22	66								
to 4 syllab.									1	13	32	20	23	11								
to 5–6 syllab.									2	17	40	39	2									
31.Poland										1	16	30	40	11	2							
32.Hungary									2	4	24	44	25	1								
Sec., millisec.	22,6s	16s	11,3	8	5,6	4	2,8	2	1,4	1	707	500	353	250	176	125	88	62	45	31	22ms	
	Duration of bars																					
33.Bulgaria 5/16									5	35	60											
34.Bulgaria 7/16									5	90	5											
35.Bulgaria 5/8								8	92	+	+											
36.Bulgaria 9/16								6	94													
37.Pol. folk songs						1	1	12	22	35	28	1										
38.Hungary folk songs						2	7	30	26	24	11											
39.Beethoven sonatas				1	4	9	11	9	20	18	22	5	1									
	Duration of phrases of Polish funeral laments																					
40. Laments 5–6 syl.							8	13	9													
7–8 syl.						1	11	13	8													
9–10 syl.						1	10	8	1													
11–13 syl.					1	3	8	6														
14–16 syl.						2	7	1														
17–20 syl.					1	4	2		1													
21–25 syl.					2	2																
Total %					3	11	39	33	15													
	Phrases (and themes in music), duration																					
41.Lomax world cultures	+	3	6	13	20	23	19	9	5	+												
42.Pol. folk songs			1	7	21	29	35	7														
43.Croatia folk songs			+	5	22	49	20	4														
44.Hungary, folk songs		+	1	8	24	40	19	8														
45.Bach fugue themes		2	4	15	13	11	1	1														
46.Lutosł. Piano Concerto	3	10	9	17	36	45	55	55	40	34	8	4										
Regions	11		12		13		14		15		16		17		18		19		20		21	
Sec., millisec.	22.6s	16s	11.3	8	5.6	4	2.8	2	1.4	1	707	500	353	250	176	125	88	62	45	31ms	22ms	
Maelzel Metronome							MM		44		88		176						F sharp2		F sharp1	
						MM		30		60		120		240				C2		C1		

Example 4.1 Continued

on the phenomena it concerned, but their distribution is not very large. The time we need to become aware of an impression received by one of our sensory organs is defined approximately within a range of 100 to 50 milliseconds. It turns out that the recognisability of a sound depends on its pitch, and for 100 Hz it is 50 milliseconds; for 1000 Hz, 20 milliseconds; for 4000 Hz, 14 milliseconds. Impulses of acoustic pressure succeeding one another at intervals greater than 50 milliseconds do not merge into one another, but are perceived separately. At this

11	12	13	14	15	16	17	18	19	20	21
		8	12	19	30	22	5	4	%	

30 60 120 240 MM C_2 C_1

Border region

Central regions of the psychological present

Border region

Example 4.2 Model structure of the zone of the psychological present. The first contains the numbering of temporal regions; the second contains the number of notes in Mongolian 'long songs', in percentages; Dadak-Kozicka 1970, 34. the third has the extreme values of the regions on the metronome scale and of note pitches.

15	16	17	18	19	20	21	22	23	24	25
					100%					

60 120 240 MM C_2 C_1 C c c^1 c^2

Central regions of the present

62 32 ms Moment

Central regions of pitch

Example 4.3 Model location of the human moment between central regions of the zone of the psychological present and the zone of pitches. The first row in the table contains extreme values of regions; the second row contains the central values in Hertz; the third row contains the numbering of the regions of time; the fifth line contains extreme values of regions.

point, an echo effect appears, and fundamental tones of a frequency less than 20 Hz lose the character of continuous tones. One's impression of timbre and space depends on the temporal constant, as does the ability to determine directions on the basis of a sound (Example 4.3).[53]

The size of a human biological moment differs from the moment of other organisms. A snail's moment is 250 milliseconds; hence the impression that a snail has very limited mobility, reacting to stimuli with a visible delay. The *Betta splendes*, meanwhile, an aquarium fish, can distinguish measures of the order of 33 milliseconds.[54] Although the difference in relation to the human moment is not great, it does make it difficult for a person to follow its reactions. The biological moment of some insects ranges from 3 to 4 milliseconds, so falls on the time of single vibrations at the centre of our note pitch scale.[55] Seen from this perspective, human reactions are much slower than a snail's reactions seen from our perspective. It should be emphasised, however, that the reactions of organisms depend not only on the size of their biological moment. They no doubt depend

53 Winckel 1967, 53.
54 Ibid.
55 Stockmann 1966, 222.

also on the size of the time of their immediate present. As far as I am aware, this question has never been posed in relation to other organisms. We do not know those sizes. Neither do we know whether the distance from the biological moment to the biological second is constant for different species. With humans, it is around 4 tuzes.

As a model size of the human moment, I hypothetically adopted the logarithmic mean of the average musical pitch (the average pitch of an average child's or female voice, that is, g^1) and of the average musical tempo (the average size of the metronome scale, that is, 91 MM). That model musical moment is 41 milliseconds. The results obtained by Cutting and Rosner confirm this size as central to the transitional zone in question with remarkable exactness.[56] In four different experiments, as we can read from the graphs, the average sizes were 41, 46, 38 and 40 milliseconds. So their distribution is very small, and they are concentrated near to the indicated model size, even though they concern the perception of quite different phenomena: sinusoidal- and instrumental-type sounds, as well as speech sounds. The authors studied categorical changes – oppositional changes, one might almost say – dependent on the onset time of sounds. The use of synthetically created sounds made it possible to form a series of sounds differing solely in their onset time in the following scale:

0, 10, 20, 30, 40, 50, 60, 70, 80 milliseconds.

These sounds were adjudged to be either detached or continuous (of the type of notes played with a bow on a violin). The authors presented the results of both answers on lines, and their points of intersection are the above-mentioned average sizes of the zone. Distinguished in syllables, depending on the onset time of a sound, were either the phoneme *cz* or the phoneme *sz*. For us, it is important that different musical, linguistic and motoric phenomena lead in perception to comparable results and concern temporal zones of a deeper, human foundation. In addition, the results provide an exceptionally transparent illustration of the character of the temporal zone in question, and it is my belief that the situation is similar in at least some other zones. This can be seen distinctly only when the results are transferred to a logarithmic scale (the scale of similarities of duration). The transitional zone is above all quite wide, covering around two octaves (two tuzes). Within the two approximate extremes of 20 and 80 milliseconds, categories gradually change. Outside those boundaries, phenomena are essentially unequivocal; within those extremes, they gradually alter; and in the

56 Cutting and Rosner 1974.

middle of the zone (on a logarithmic scale, of course) – here, approximately 40 milliseconds – the number of results concerning the two opposing categories is even. When adopting this central size, one must remember about the statistical, rather than punctual, character of such changes. In the responses of individual people, the centre of the zone might have displayed a greater distribution, and the transitional zones might have been narrower.

4.1 Upper regions, 'short times', units of movement, syllables and phonemes

Phonemes are the smallest functional segments of language (Example 4.1.1). Their values are so small that they not only reach the liminal region that is the region of the human moment, but they also go beyond that region. Even for vowels, Jassem notes values of 40 and 30 milliseconds, and some consonants reach up to 20 and 10 milliseconds, the duration of individual periods of the vibration of the notes of the large octave! So the measurements contradict the assertion that the duration of phonemes depends on the ear's integration time (50 milliseconds, 20 Hz). The centre of the zone of phonemes (78 milliseconds, 770 MM) does not reach that extreme; at the same time, however, too great a percentage goes beyond that limit to be able to ignore the problem. So how to explain this phenomenon? Well, it is possible because the segments of phonemes do not lie on the same plane as the basic units of the flow of the sound impulses of speech, that is, syllables. Phonemes colour syllables, so to speak; they qualitatively build up the peaks and troughs of sonorants characteristic of the syllabic flow without competing with that flow by means of separate impulses on the same plane. Otherwise, the quickest of them would merge into an indiscernible whole. One should also remember that language has at its disposal such a great redundancy of information that in normal speech one can get away with reducing or even eliminating some phonemes and still retain the comprehensibility of the text.

Syllables, the basic units of the sound flow of language, group themselves ideally in the middle between the human second (two-thirds of a second) and the human moment (40 milliseconds). This applies to non-final syllables (Example 4.1.2), since the inclusion of final syllables (Example 4.1.3), often supplemented with an interword pause, can considerably increase the value of the syllabic flow of spontaneous speech. The calculations were based on the above-mentioned text by Jassem.[57] More detailed research is needed, of course,

57 Jassem 1962, 74–91.

into the zone of the duration of syllables. Individual differences may occur here, depending on the manner of speech; different languages and dialects can also have their own characteristic deviations from the average norm common to the human race. One may doubt, however, whether such research would undermine the observed regularities.

It seems beyond doubt that the zone of syllables is directly connected to the zone of 'short times' (Fraisse) distinguished in experimental psychology, which are studied outside any linguistic or musical context, and to 'short notes' in music, defined by Stefan Szuman, although not distinctly located in time: 'short times' and 'long notes' are contrasted with 'long times' and 'short notes'. Fraisse gives the following characterisation of short notes:

> When an interval between two impulses is short (from 10 to 40 hundredths of a second), we perceive not a duration but a collectivity, as Schultz's analysis perfectly demonstrated. When a second impulse appears, the first is still present and touches it, so to speak. Within this temporal zone, two times differ not in a greater or lesser interval, but in the speed of the succession of notes. The perception of a collectivity is characteristic of times that we call short, and which in spontaneous rhythmisation have an average duration of between 18 and 29 hundredths of a second.[58]

The profile of short time intervals could also be referred almost entirely to the syllabic flow of language. In the case of syllables, we also notice not so much their duration as their merging in speech into predicative words. The latter more clearly manifest duration in time, and it is on them, as the bearers of content, that we focus our attention. Syllables are characterised rather by sequence speed than by duration. In scansion, of course, we also pay attention to individual syllables and sense their duration, but scansion involves, among other things, transferring the syllabic flow from the zone of 'short times' to the zone of 'long times', placing syllables in the zone of the immediate present.

On a comparative diagram of different tempi (Example 4.24), Nazaikinsky does not pose the question of short notes, but his graphs actually shed light on this question as well. We find an opposition between long and short notes in the contrasting of the tempo of walking and the tempo of running (graph B), and even more clearly in the division of medium tempi and quickest tempi (graph E). There is a distinct boundary here slightly below 150 MM, so essentially coinciding with the boundary defined by Fraisse. One should also add that this size stands in the golden ratio to the human second (in a similar ratio is also the boundary between medium tempi and slowest tempi).

58 Fraisse 1956, 81.

In singing, the syllabic flow of the verbal text is usually slowed, although substantial variation can be noted in this respect. The average tempo of syllabic flow is an important means of defining the stylistic properties of music; the differentiation of ethnic regions and areas manifests itself in that average tempo.

Items from 6 to 14 in Example 4.1 illustrate the average tempi of the syllabic flow of songs in different regions of Poland. Where the duration of a melody was given in seconds (t), the average tempo of the syllabic flow (p) was calculated on the basis of the following model (where s = the number of syllables in the melody):

$$p = \frac{s \cdot 60}{t}$$

Meanwhile, where the tempo of a metrical value was given on the scale of the Maelzel metronome (MM), the following model was used (where x = the number of values in the melody for which a tempo was given on the metronome scale):

$$p = \frac{s \cdot MM}{x}$$

Although the sets on which the calculations were based are not equally representative of particular regions, the results do allow us to gain some overall idea of the differentiation of the Polish area in terms of the tempo to the syllabic flow of folk songs. For the sake of comparison, we also give sample calculations for songs from Belarus and Bulgaria and from Kosovo-Metohija in the Balkans (Example 4.1.15–17), where the average tempo of the syllabic flow is the slowest in our examples.

Thus we see that the quickest singers in Poland are in Wielkopolska. In the studied series, only three per cent of melodies have an average tempo lower than 120 MM. Such a one-sided preference for quick tempi is unparalleled not only in the Polish ethnic area, but probably anywhere in Slavic music. The differences in relation to other regions of western Poland are perhaps slightly exaggerated. In the Wielkopolska series, the selected songs included few ritual melodies, the tempo of which is generally somewhat slower, although quick singing is highly typical of Wielkopolska. Moreover, scholars researching the folk music of this region have repeatedly drawn attention to the quick tempo of Wielkopolska songs, guided, of course, solely by metrical tempo. Łucjan Kamieński, for example, writes thus about the music of Wielkopolska:

> The tempo, generally brisk, gradually slows towards the west and the north, which corresponds to the gradual lowering of the tuning of bagpipes and the weakening of

> their ornamental tendency towards the west (bagpipes do not extend to the northern zone): thus the overall dynamics is lowered. The striking contrast between the laughing, sanguine, lively *koza* culture and the elegiac-romantic *kozioł* zone must be taken into account in research into the ethnogenesis of the people of Wielkopolska.
> We find even broader tempi and an even greater aversion to ornamental brilliance in the Kashubia area of Pomerania.[59]

In our table, the differences in terms of the tempo of the syllabic flow between Wielkopolska and Kashubia are all too distinct. As for the gradual slowing of the tempo of melodies towards the west – as Kamieński points out – it requires, particularly in relation to vocal music, more precise research. In Silesia, melodies of a slower syllabic flow are usually more prominent. That is less obvious in the Lubusz region. Jadwiga and Marian Sobiescy, characterising the music of that region, do not confirm those differences.

> As in Wielkopolska, the folk music of the Lubusz region is cheerful, joyful, of a brisk tempo. Those features are closely related to the eminently dance-like rhythms of this folklore. Here, the dance element is so strong that it has subsumed and dominated all kinds of text (secular texts, of course). They have become so thoroughly dominated by dance rhythms that even ballads and strictly ritual wedding songs are played in the rhythm of a waltz, *okrągły* or *chodzony*, with the characteristic tempo of those dances obviously retained. This supremacy of dance functionality is particularly characteristic of Lubusz folklore.[60]

The preference for lively tempi in Lubusz is indisputable, as it is in the whole of western Poland in general. However, published sources from that region (admittedly rather few in number) indicate a slightly slower tempo of singing compared to Wielkopolska. That assertion is important because it closes the region of Wielkopolska with eminently quick tempi to the syllabic flow also in the west. In a later work, Jadwiga Sobieska confirmed the slower tempi in Lubusz compared to Wielkopolska.[61] There is no doubt that towards the east the tempo of the syllabic flow generally slows, although in neighbouring regions – Kujawy, Łęczyca and Mazovia – they are still generally very quick. Sobieska confirms this as well. It should be stipulated here, however, that the published collections from those regions in which tempo or duration is given are very few in number, and they cannot form the basis for entirely secure conclusions. Even less is known about the situation in this respect south of Wielkopolska. Collections from Kielce indicate a considerable slowing of the tempo of folk songs. However, there are

59 Kamieński 1932, 142. See Dahlig 1992.
60 Sobiescy 1954, 7.
61 Sobieska 1961 ii:81.

considerable doubts over the representative nature of those collections for the repertoire as a whole. According to Sobieska, the Kielce region is characterised by lively tempi. In the Cracow region, tempi are generally quick: in our table, this region is in second place, albeit clearly lagging behind Wielkopolska. In terms of tempo, the Rzeszów region would appear to relate to Cracow, but here too we must caution that there is not a fully representative collection of published melodies including performance tempi from that territory. In the neighbouring Lublin region and farther afield, in Podlasie, the tempo of the syllabic flow clearly drops. The slowest songs in Poland have been noted in two regions far away from one another, namely, Podhale and Kurpie. The differences in tempo compared to Wielkopolska are huge. Whilst in Wielkopolska the average syllabic flow very rarely drops below 120 MM, in these regions such melodies account for around half of the repertoire, and there are more songs slower than MM 60 here than there are songs slower than MM 120 in Wielkopolska. In terms of the tempo of syllabic flow, Kurpie refers clearly to Belarus, where the tempi are even slower. A similar distribution of tempi can be observed in Lithuania, as well, judging by a small collection containing Lithuanian songs with the tempo given.[62] Podhale, meanwhile, has equivalents with regard to tempo on the southern side of the Carpathian Mountains. From this point of view, Slovakia would appear to be quite varied. One finds there areas where people sing more slowly than in Podhale, whilst in others the tempo is relatively quick. Here, by way of example, are tempi that appear in three locations studied monographically in a collection of Slovakian folk songs (Example 4.1.18–20). They appear to exhaust the scale of differentiation of the Slavic area. I give the results of the calculations in percentages. The area of low tempi to the syllabic flow is not confined in the south of Poland to Podhale; it also encompasses the neighbouring regions of Pieniny, Orawa and Żywiec, although we also have but few collections with given tempo from those regions.

Outside Poland, in southern Slavic lands, we find a tendency for even lower tempi than in Belarus, Lithuania and some parts of Slovakia. Here, low tempi to syllabic flow contrast with very high metronome values fixing their metrical tempo. However, this derives from the fact that in so-called Bulgarian rhythms, given the inequality of the main metrical units, the tempo is given for the lesser values, which are their common denominator.

The differentiation in the Slavic area in terms of the tempo of syllabic flow gives a picture that is deceptively similar to the results of the calculations of

62 Lietuviu 1954.

melody compass cited by Kazimierz Moszyński.[63] As one moves away from western Slavic lands towards the east and the south, there is a fall in both the tempo of syllabic flow and the compass. The highest tempo and greatest range is characteristic of the music of the western Slavs, whilst the lowest values are noted in southern Slavic lands. Exceptionally low tempi are shown by a collection from Kosovo-Metohija. It should be remembered, however, that we are still dealing here with the tempo of syllable flow and not the tempo of note flow. In general terms, one may state that an intensification of melismata is inversely proportionate to the tempo of syllabic flow. This all appears to support the hypothesis that an increase in the tempo of syllabic flow was part of the development of Slavic music. That hypothesis is probably no less justified that the generally accepted postulate that melody compass has expanded increasingly across the history of Slavic folk music. This quite one-directional development concerned above all western Slavic music. An increase in the tempo of syllabic flow affected, among other things, the growing predominance of the dance element in folk music, which concerned primarily the western Slavs. The increase in tempo foregrounded the increasingly rhythmic, mobile, motoric elements of songs, to the clear detriment of their songfulness and melodiousness.

The distinction of the zone of 'long notes', falling in the zone of the immediate present, and the zone of 'short notes', located at the centre of the upper areas of the psychological present, is of great significance for ethnomusicological comparative research. The differentiation of the world's rhythm systems should be sought in the different way in which the natural zones common to the human race are used, and not in some separate concept of time, in a different way of perceiving time, racially or psychologically conditioned. The difference between the general European metro-rhythmic system and the Balkan metro-rhythmic system and some oriental systems lies in the fact that in Europe the metrical unit contained in the zone of the immediate present generally remains unchanged in a work and lies adjacent to similar units. More frequently changing is the way in which that unit is divided or arranged into bars. Meanwhile, in Bulgarian rhythms, for example, small units of the zone of 'short times' are strongly highlighted and essentially unchanged, and it is the metrical units occurring in the central zone of the psychological present, comprising two and three units of motion, that are subject to change.

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63 Moszyński 1939, 1137–1139.

Mantle Hood's interesting distinction of systems characterised not so much by tempo as by note density, although not yet backed by detailed statistical research, is no doubt also rooted in the zone of 'short times'.

> In the European tradition of music, one is inclined to think of tempo as the *governing* aspect of time, which regulates such specific divisions as meter, rhythm, and density. Whatever the metrical, rhythmical, and density divisions of a Western score, the musician's first question is always 'What is the tempo?' It is possible that in some cultures such a question is either not of primary concern or even that it is altogether inappropriate. We should bear in mind two points: (1) many cultures of the non-Western world, especially those using some form of stratification, recognize only a few basic tempos, and (2) in the European tradition by contrast, as we observed in connection with loudness, there is a wide range of recognized tempos. To anticipate momentarily, I am suggesting that the Western range of tempos, like the Western range of loudness, may have little or no application to African and Asian music. Our Density Referent, on the other hand, seems to accommodate the situation quite well.[64]

I have already mentioned what the author means here by 'density referent' in the opening chapter. The widely used notion of the unit of motion would correspond to this if it did not derive (as is usually tacitly assumed) from the basic metrical unit.

The density referent is not only an objective indicator of musical movement, it also defines the rhythmic system that organises the rhythmic course of the note flow not in the zone of tempo, but in the zone of lesser values, often falling considerably outside the metronome scale.

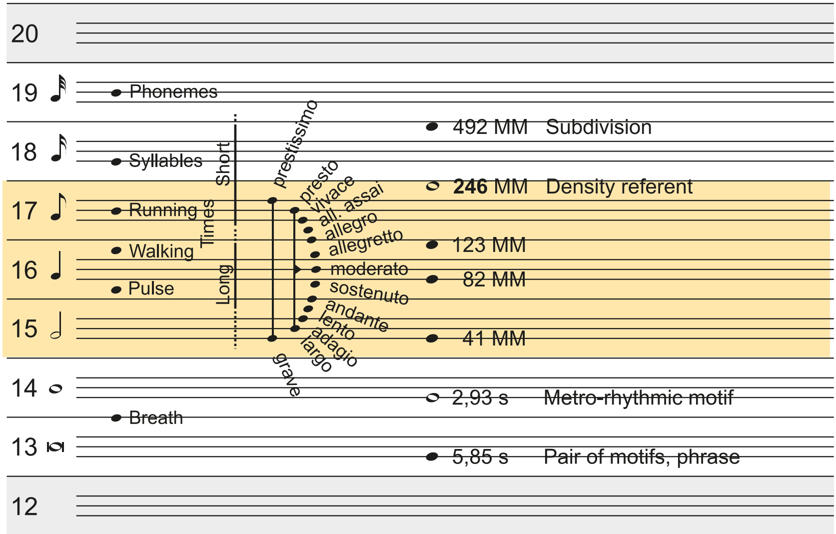
Mantle Hood illustrated the density referent by means of an example from James Koetting's study of Western African drum music.[65] The boxes on the graph represent that density referent, which in this case is 246 MM (Example 4.4–5).

Each box on the graph represents the size of the density referent, that is, the quickest regular pulse. Occasional subdivisions are marked with signs on the line. The different symbols denote different techniques of striking with the hand or a beater. For the fixed unit of motion, the value 246 MM was given.

So let us take a look at the values of time and tempo on our logarithmic 'time score' that complements the notation of drum music (Example 4.4). The unit of motion (the 'density referent') falls clearly outside the metronome scale. One might discern triple or double metrical units, but generally speaking the units on the metronome scale are not distinct. Highly distinct, meanwhile, is the time of the metrical-rhythmic motifs corresponding to long bars or short phrases.

64 Hood 1971, 114–115.

65 Koetting 1970; after Hood 1971, 240.

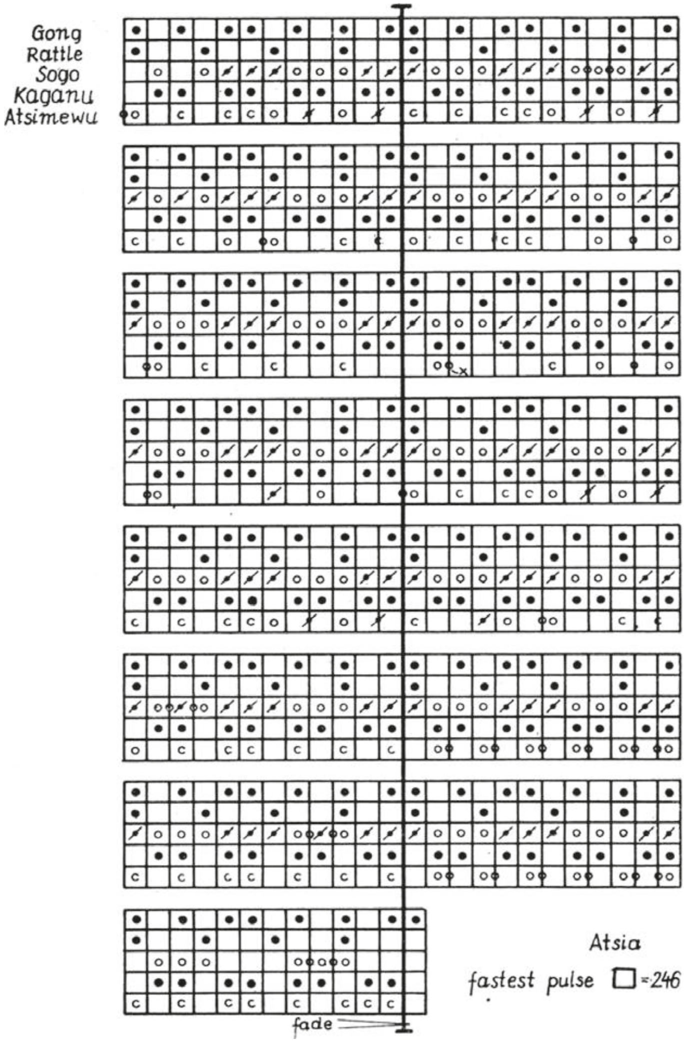


Example 4.4 Levels of the organisation of the playing time of an instrumental ensemble from Western Africa. Analysis of Example 4.5.

Phrases minimally longer than the average are pairs of motifs written on one line. We see here clearly the difference in the metrical-rhythmic principle governing African drum music from the principle familiar to us from European traditions, where the units in the zone of metrical tempo are usually very regular, and change tends to affect rather the criteria according to which they are combined in bars or subdivided.

Mantle Hood introduced another notion defining the character of musical movement, namely, *saturation density*. Availing himself of a suitable example (Example 4.6–7), he wrote:

> The DR [density referent] of Javanese gamelan remains fairly close to what I have termed 'saturation density'. That is, the fastest pulse of certain improvising instruments operates within the rather narrow limits of the fastest possible, but physically comfortable density. In several places, I have mentioned the Javanese sense of perfect time. […] Some musical ensembles in Ghana – for example, among the Ewe, the Ashanti, the Fanti, and other Akan peoples – also appear to be operating close to saturation density. But in these instances the DR is established, not by a single stratum of individual instruments, as in the Javanese gamelan, but by the resultant of interlocking pulses supplied by the total ensemble. In other words, the individual parts played by various drums, bells, and rattles may not have a particularly high density, but the manner in which they are combined



Example 4.5 Notation of the playing of an instrumental ensemble from Western Africa, according to James Koetting. Koetting 1970; cf. Hood 1971, 240.

> produces a resultant that approaches saturation density. It appears that these Ghanaian musicians have not developed 'perfect time' in the sense it is known among Javanese but instead have achieved a nearly absolute perception of saturation density. A master drummer perceives immediately even a fractional displacement of a stroke by any drum, bell, or rattle.[66]

Only detailed statistical analysis can provide an answer to the questions as to precisely what zone of time is filled by saturation density and what its relationship is with the whole orchestral stratification.

A description of the technique of playing Javanese gamelans and a transcription of a piece of music played by a gamelan orchestra give us some idea of the temporal structure of this music.

> A full Javanese gamelan has about thirty instrumentalists who perform on a variety of vertically or horizontally suspended bronze gongs of different sizes, an assortment of instruments with bronze keys – some with common trough resonators, some with individual bamboo or metal resonators, but all of them capable of a surprising sustaining power – a set of hand drums, sometimes a woodblock, a xylophone, one or two plucked zithers, a flute and a bowed lute (the rebab described earlier). To this rich mixture of sonorities is added a male chorus of a dozen or more voices singing in unison, but with deliberate individuality expressed through variety of ornamentation. From one to three female soloists complete the ensemble.
>
> The instrumentalists and singers perform according to a principle of orchestration that has been termed polyphonic stratification. In this practice, between thirty and forty different melodic-rhythmic lines form distinct layers or strata of sound, each maintaining its own character in melodic contour, rhythmic idioms, and relative density (the number of musical events occurring within an arbitrary time span). The resultant of all these interdependent melodic-rhythmic lines is a very complex harmonic texture. Traditionally, the Javanese regard singers and instrumentalists as being of equal importance. Vocal entries are not accommodated by a reduction in the dynamic level of the gamelan, but instead the singers are expected to blend with the instrumental timbres, so that in effect the vocal lines are like silk threads woven among the slightly coarser texture of the polyphonic instrumental tapestry.[67]

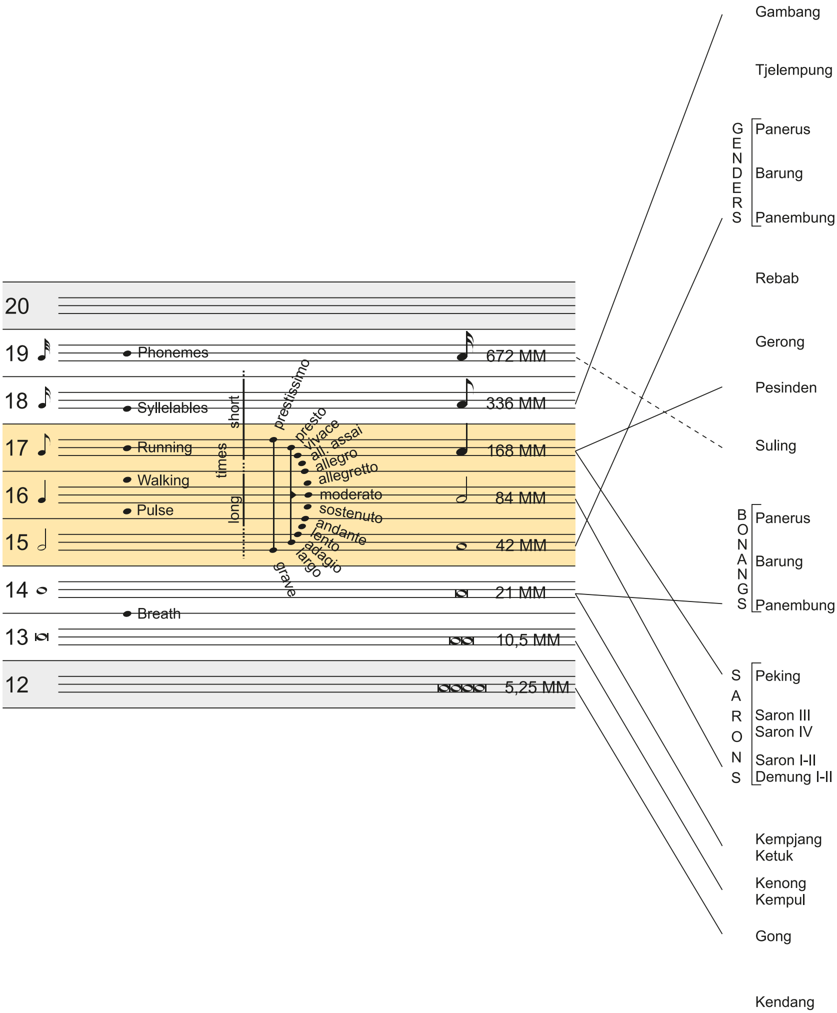
The temporal structure of this work (Example 4.6–7) is complex, but the principles underpinning its design are quite clear. We are dealing here with an exceptionally multi-layered, regular metrical structure that fills essentially the whole of the zone of the psychological present. In such a work, it is indeed difficult to discern a basic tempo, yet we have no doubt about defining the density referent, which is determined by quaver motion. In giving just one sample of the

66 Hood 1971, 115–116.

67 Ibid., 51–52.

notation of a Javanese gamelan, I believe the author selected a typical example which displays that saturation density, although he does not mention this in his discussion. If so, then the saturation density would be 336 MM and would coincide exactly with the middle of the zone of the syllabic flow of normal speech. So we would have confirmation of our assumption that saturation density is linked to the zone of syllables and in general to the zone of ‘short times’, and in particular with its middle and high regions. The distinct quaver, minim and semibreve motions fall within the zone of the tempo scale and correspond respectively to the metronome markings presto, moderato and largo. So minims fall almost ideally at the centre of the tempo scale, and for them Hood gave a metronome value, emphasising their significance as a basic metrical unit, although the specification of the time as 4/4 and the distinctly highlighted crotchet flow (in other voices, regularly subdivided) may distinguish this value as fundamental in the tempo zone. In other voices, the movement of units is then regularly merged into the larger values of the succession of sound impulses: whole-bar, two-bar, four-bar and possibly even eight-bar, signalled with a gong. So the outcome is a highly regular macro-metrical structure in which the metrical layers are synchronised to a considerable extent with the rhythm and the sonorities, which in turn depend on the kind of instruments. If we add to this the sporadic ornaments subdividing the quaver motion, which falls clearly within the zone of phonemes, then the whole area of the psychological present is indeed filled with rhythmic values merged into one saturated sound. Of course, non-syllabic phonemes of the sung text also fall within the zone of phonemes, but they do not form a layer of sound impulses, since those are determined in language by the flow of syllables, which in relation to the tempo of normal speech is in this instance slowed by a half, which imparts a slightly scansional character to the vocal melody. The whole score of metrical times is illustrated by our graph preceding Mantle Hood’s example.

Arabic theories of rhythm are also rooted in ‘short times’. Their point of departure was a small, elementary unit of time, and its multiples led to various rhythmic shapings. It is rightly emphasised that the unit of elementary time could not cross the limits of the perception of time determined by the size of the human moment. It should be added here, however, that on average its value was no doubt much greater and tended to be linked with the zone of ‘short times’, so with speeds of the syllabic flow of speech, the medium sizes of which fall in the middle of the upper areas of the zone of the psychological present. Here is a definition of the times of the first or model rhythm in Arabic theory: ‘If two beats occur at such an interval of time that does not enable a third beat to be placed between those beats, then that interval will be the unit of time measuring



Example 4.6 Analysis of the music of a Javanese gamelan. The work Sriredjeki.See Hood 1971, 53.

Example 4.7 Notation of the music of the Javanese gamelan. The work *Sriredjeki*.See Hood 1971, 53.

the times of the rhythm'.[68] Through the multiplication of this basic unit, a whole range of times that could be rhythmically deployed were obtained. Further time values were defined as follows:

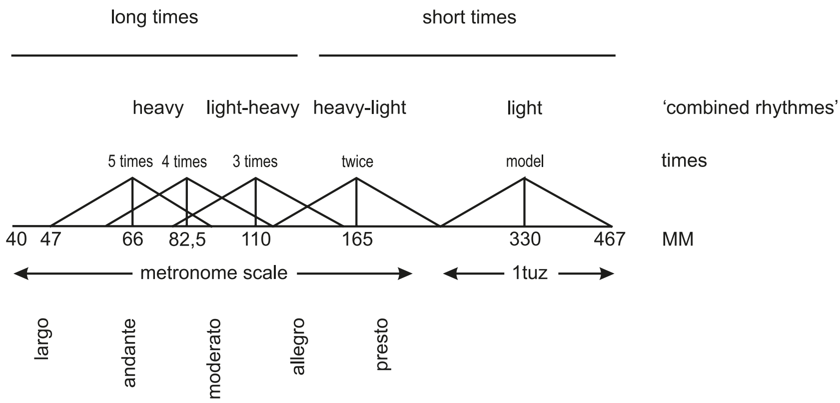
> If just one beat can be made in the time that separates two beats, then that time, being twice the model time, is termed 'double' time. If two beats can be made in the time that separates two notes, Arabic theory speaks of 'triple' time. If three and four notes can be played in that same time, then such times are called quadruple and quintuple times respectively. According to Arabic theory, a time that is five times the model time is the longest time that can occur between two notes, since that time is regarded as the upper limit at which the human ear can perceive intervals of time.[69]

Let us consider the classification of the times of Arabic rhythm theory on a logarithmic scale of time (and tempo), adopting two initial assumptions: the centre of the zone of the 'model time' coincides with the centre of the zone of syllable duration and the zone is one tuz wide, although extreme values no doubt exceeded that limit. The result is shown on the graph (Example 4.8). We see that the model time falls clearly outside the zone of the tempo of the Maelzel metronome scale, but all compound times fall within the limits of that scale. Double and triple times belong to quick tempi, and quadruple and quintuple times to slow tempi of the metronome scale. The zone of quintuple rhythms approaches the lower metronome limit and also the zone established in experimental psychology in which the need to rhythmically combine sound impulses is lost.

Also psychologically justified are the distinctions of the subgroups of the 'combined rhythms' covered by the joint name *hasadj*. They are characterised by the occurrence of beats at regular intervals that do not form groups.[70] Four basic rhythmic categories were distinguished, and the classification was based on the number of time units employed in the values of a given rhythm.

> If a rhythm consists of time intervals equal to the model time, that rhythm is called 'light' (*hafif*) (Al-Farabi terms it 'quick'); if a rhythm consists of times equal to twice the model time, it is called 'heavy-light' (*sakil-al-hafif*) (Al-Farabi: 'light'); if a rhythm contains times that are equal to three times the model, it bears the name 'light-heavy' (*hafif as-sakil*); finally, the last type of combined rhythm is a rhythm based on times that are four times the model time. This is a 'heavy' rhythm (*as-sakil*).[71]

68 Żerańska-Kominek 1978, 11.
69 Ibid.
70 Ibid., 12.
71 Ibid., 13–14.



Example 4.8 Arabic theory of rhythm and areas of the zone of the psychological present.

If we now compare the terms for the types of combined rhythms with the drawing (Example 4.8), we realise that the basic division into light (light and heavy-light) and heavy (light-heavy and heavy) covers the distinction between 'short times' and 'long times' introduced by experimental psychology. Fraisse set the boundary for those times at approximately 150 MM. Of course, that boundary is fluid, representing rather a zone where phenomena pass into one another than a specific size.

The question arises here as to whether the zone of 'short times' is equal to the zone of the immediate present or is simply a different zone proper to humans, one of the many that can be distinguished. Well no, it is not. It is a function of the existence of the zone of the immediate present. People do not focus separate attention on individual elements of the sound flow of the zone of 'short times', but combine them into a whole of a higher order; that is, they reduce the combined units to the zone of the immediate present or couch them in more general categories of speed. It is from the perspective of the zone of the immediate present – that fixed temporal perspective of humans, fundamental to their perception of time – that sounds in the zone of 'short times' have the characteristic properties of sounds that are in a sense devoid of the features of duration over time and characterised rather by the tempo of succession.

It is also worth pointing out that the range of the zone of 'short times' is similar to the compass of the metronome scale. According to Fraisse, it is slightly smaller, but its characteristic durations of the syllables of normal speech can also leave that zone on either side. Yet they represent merely a small percentage (extreme values of the metronome scale are also rarely used).

4.2 Central regions, 'long times', basic metrical units

The central areas of the zone of the psychological present are of marked significance for our perception of music. They contain the zone of the basic metrical unit, shape rhythmic structure and, as we will see later, also cover the immediate human present in general.

Although tempo is one of the basic musical categories that exert a decisive influence over our perception of works, it has yet to be thoroughly examined. Of course, we know generally in what zone musical tempo lies; after all, it is determined by the scale of the Maelzel metronome with the extreme values 40 and 208 MM. Yet even the question of average tempo is not unequivocally answered. Even more enigmatic is the source of tempo. There is a widespread opinion that the measure and cause of our sense of musical tempo is our heartbeat. That is expressed, for example, by Paul Schenk: 'Normal tempo corresponds to a normal pulse, which beats approximately 60 to 80 times a minute. The limits of tempo are determined by the limits of one's pulse (approximately 40 to 130 beats per minute) […] Andante (= walking slowly) constitutes a medium measure of time'.[72] However, when we compare the values given by Schenk with the metronome scale, serious doubts arise. Although the metronome scale does begin at 40 beats per minute (modern metronomes have here the lowest tempo – grave), it does not end at 130 beats per minutes, since 132 MM, for example, denotes allegro, and vivace (160), presto (184) and prestissimo (208) fall decidedly above the tempo value given by Schenk. Like many others, Schenk links average tempo with average pulse, which is approximately 60 to 80 beats per minute. Andante falls within that range (66 MM), but is it really a medium musical tempo? Although andante does fall in the middle of the tempo scale given by Schenk, it occurs just one-third up the metronome scale. Besides this, the possibility of free and regular deviations in the direction of a quicker or slower tempo does not seem to be in the nature of normal pulse. The normal rhythm of the heart tends to be calm, slow. That natural tempo tends to be exceeded mainly in one direction only: under the influence of effort or emotional experiences, the pulse clearly quickens and can even reach almost to allegro (132 MM), but after rest it returns to its normal low values. Within the bounds of average pulse (60–80 MM), we find such markings on the metronome scale as larghetto (60), andante (66), andantino (69), sostenuto (76) and comodo (80). Below that zone are distinctly slow tempi (lento 56, adagio 52, largo 46), and medium tempi (maestoso 84, animato 120) only begin above it, gradually passing into somewhat more

72 Schenk 1956, 11.

lively tempi (allegretto 108, animato 120). Quick musical tempi only begin beyond the bounds of accelerated pulse (allegro 132, vivace 160, presto 184). With the aim of effectuating a more precise analysis of the role of pulse in our sense of musical tempo, I will cite here the results of pulse measurements according to age presented by Stefan Klonowicz (Example 4.9). The author offers the following commentary to this data:

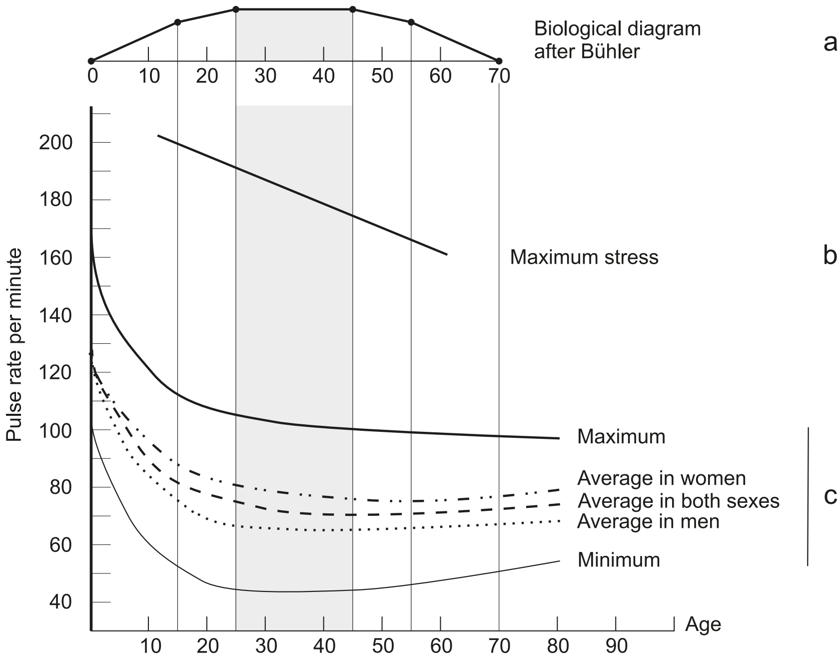
> Our resting pulse rate is at its highest during the first two decades of life. For the next few decades (to around the age of fifty or sixty), it remains relatively unchanged, before again increasing during the seventh and subsequent decades of life. These changes are represented statistically on the graph, on which are also marked the dynamic of average values and the range of variability (from medium-minimum values to medium-maximum values).[73]

Although the graph is somewhat distorted, because the wrong frequency scale was used (this would be visible if the data were transferred to a logarithmic scale, and it concerns mainly the extreme values of the graph), it does show distinctly the course of medium sizes. If our sense of tempo were dependent on our pulse, we would have to accept the rather absurd conclusion that musical tempo rises in both youth and old age. In physiology, a great deal of attention has been devoted to maximum heart rate values, which rise under the influence of physical effort (Example 4.9b). Those data may also be interesting for a musicologist, since at a young age they reach the limit of the metronome scale, but gradually decrease quite significantly as the years pass.

Klonowicz cites Erling Asmussen and his collaborators, who state (Example 4.9c) that during the period from 20 to 60 years of age, our maximum heart rate falls by 10–12 per cent compared to the value reached at the start of that period. Slightly different extreme values are given by J. Bosman: 190 for 20–29 years, 175 for 30–39 years, 165 for 40–44 years, 160 for 45–49 years, 150 for 50–54 years, 140 for 55–59 years.[74] One could hardly suppose, however, that such relatively small differences in maximum heart rate might have any direct bearing on our sense of musical tempo. In this respect, as far as I am aware, no such age-related differences have been noted. Besides this, people are aware of the size of their own pulse rate in relation to the scale of musical tempo, and that would also suggest that our sense of musical tempo is independent of our pulse.

It goes without saying that long before Weber and Fechner formulated their law, we were aware that our scale of perception in relation to some musical

73 Klonowicz 1973, 177–178.
74 Klonowicz 1973, 178–179.

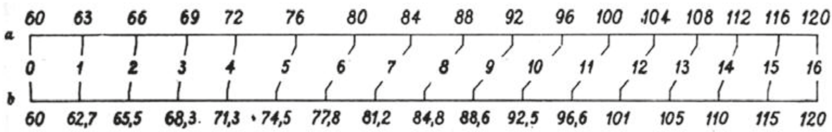


Example 4.9 Changes in heart rate according to age, interpreted on a biological diagram: **(a)** Biological diagram of man according to Bühler; **(b)** Maximum stress heart rate (according to Asmussen).After Klonowicz 1973, 178. **(c)** Normal heart rate values (according to Nicolai-Mellerowicz).After Klonowicz 1973, 178.

impressions depended on a logarithmic scale. That awareness was widespread above all in relation to note pitches. Everyone learns in secondary school that the pitch of a musical note is conditioned by the logarithmic scale of vibration frequencies, and the rudiments of the structure of the sound system take up a sizeable part of every textbook on the rudiments of music. At the same time, however, even the biggest music encyclopaedias do not explain, for example, the basics of the structure of the Maelzel metronome scale, which is universally used when defining the tempo of works, to say nothing of other temporal phenomena of music that are usually overlooked entirely. The question arises, therefore, as to the nature and foundation of the metronome scale. It indicates the number of beats per minute, but that does not explain the metronome scale, just as the musical scale would not be explained by the statement that it is a sequence of the number of vibrations per second.

a							40	42	44	46	48	50	52	54	56	58
b							38,9	40,6	42,4	44,3	46,3	48,3	50,5	52,7	55,0	57,5
a	60	63	66	69	72	76	80	84	88	92	96	100	104	108	112	116
b	60	62,7	65,5	68,3	71,3	74,5	77,8	81,2	84,8	88,6	92,5	96,6	101	105	110	115
a	120	126	132	138	144	152	160	168	176	184	192	200	208			
b	120	125	131	137	143	149	156	162	170	177	185	193	202			
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Example 4.10 Degrees of tempo: **(a)** according to the Maelzel metronome and **(b)** according to the sixteen-degree equal-tempered scale.



Example 4.11 Fragment of the scale: **(a)** of the Maelzel metronome and **(b)** of the sixteen-degree equal-tempered scale.

A closer inspection of the metronome scale convinces us that it is a logarithmic scale, but far removed from the equal-tempered scale, in which the equivalent of the octave, for example 60 to 120 beats per minute, is divided into sixteen degrees. We can see how great are the deviations in the metronome scale from the tempered scale on the table of metronome values and the values of the three-digit, sixteen-degree tempered scale (Example 4.10) and also a graphic representation of part of both scales (Example 4.11).

It is easy to divine, of course, what brought about the acceptance of such an uneven scale. It was prompted by a wish to avoid the highly inconvenient difficulty of dividing by three on a sixteen-degree scale (sixteen divided by three does not give a whole number) and of course to avoid using decimal fractions. Where the metronome scale serves the practical purpose of defining the tempo of works, deviations from the equal-tempered scale are of no great significance, but in some comparative studies the metronome scale can distort the results, for example, of statistical data. Yet that is not the main cause of the misunderstandings linked to the use of the metronome scale in comparative research. Those misunderstandings ensue first and foremost from the treatment of the metronome scale as an arithmetic, not logarithmic, scale. In other words, it is often the ordinary scale of the number of beats per minute that is used as the basis for comparison and not the number of divisions on the metronome scale (let us note that they do not even have fixed names; here, we will call them degrees). Such limitations apply not just to people incidentally concerned with problems of tempo, but even to specialists developing new methods of research into time in music.

In music, tempo is a continuous scale, perfectly suited both to subtle differentiation and to creating distinct contrasts. The number of different tempi in a work is usually limited. Tempo cannot be phonemised, expressed in a system of opposing tempi after the fashion of musical pitches. Stockhausen experimented in that area. His composition *Zeitmasse* employs a twelve-degree series of tempi (Example 4.12).

It is doubtless no easy matter to define exactly the scale of musical tempo and its mean size; that requires a great deal of experimental research. Yet we may perhaps assume that the scale of modern metronomes, established through musical practice over a long period of time, with its verbal indications more or less corresponds to the structure of the musical tempo of a basic metrical unit. Its range from 40 to 208 MM covers 2 tuzes and 4.5 ints. There are exactly two tuzes between largo (46) and presto (184), and one tuz separates such basic tempi as andante (66) and allegro (132).

Although logarithmic means of the range of the metronome scale and such opposite tempo markings as grave/prestissimo, largo/presto and andante/allegro give different sizes, those sizes are clearly grouped in the centre of the metronome scale, as is shown in Table 4.14. It is striking that the middle of the metronome scale coincides almost ideally with the size resulting from the division into tuzes (octaves) of the twenty-four-hour period or the rhythm of day and night (12 h).

$$12 \text{ h} \cdot 2^{-16} = 659.18 \text{ ms} = 91.022 \text{ MM}$$

So 16 tuzes separate the rhythm of day and night from the middle of the metronome scale. More exactly, the logarithmic mean of the extreme values of the logarithmic scale (40 and 208 MM) equals 91.22 MM, so the difference is so small as to be practically unnoticeable. Despite this, it is difficult to establish whether there exists some causative link between the time of the human present and the time of the environment in which humans live. Karl von Vierordt formulated a law stating that the sizes of small time intervals are usually overestimated, judged to be longer than in reality, whereas longer time intervals are underestimated. It follows that some medium interval is neither underestimated nor overestimated, but is neutral in this respect.[75] Although the results of the search for that

75 Vierordt 1868; cf. Woodrow 1965, 1225.

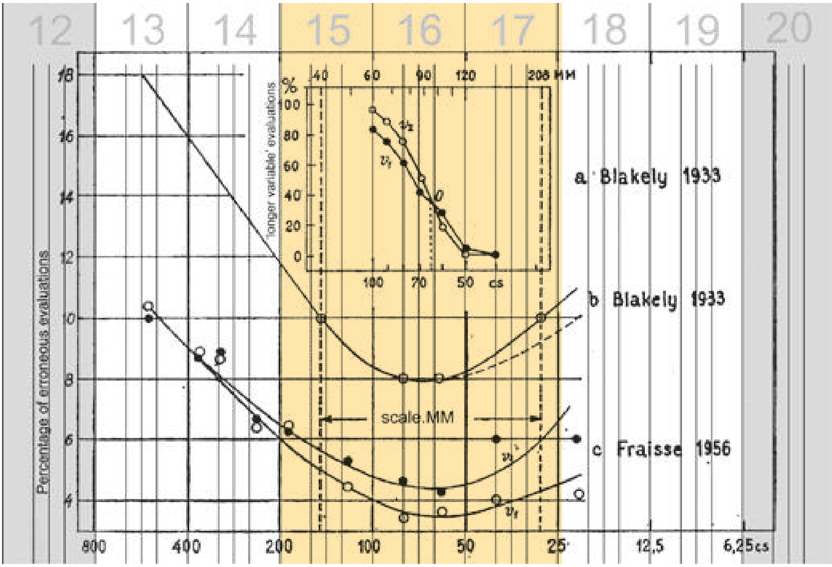
	Scale degrees of tempo	MM values	Full twelve-degree series of tempi in Stockhausen's *Zeitmasse*											
Systemic axis of time (tempo)	12	112	X											
	11	108			X									
	10	102												X
	9	96								X				
	8	90									X			
	7	84							X					
	6	80					X							
	5	74										X		
	4	70		X										
	3	66											X	
	2	63				X								
	1	60						X						
			1	2	3	4	5	6	7	8	9	10	11	12
			Syntagmatic axis of time											

Example 4.12 The full twelve-degree series of tempi in Stockhausen's work *Zeitmasse*. Based on Dorota Maciejewicz-Strojna (1995, 87).

indifference interval have yet to result in a clear-cut definition of its size, and various researchers have obtained slightly different data, mainly depending on their methods and the ways in which they have conducted experiments, those results have predominantly grouped around the centre of the logarithmic metronome scale. According to William Blakely,[76] for example, the neutral interval is 0.7 second, which equates to 86 MM, whereas from a graph based on his data, published by H. Woodrow in *Handbook of Experimental Psychology*,[77] we read a value of 0.65 seconds (92.3 MM), which coincides even more clearly with the average of the metronome scale.

Also interesting are the results of experimental statistical research into the accuracy with which time intervals are recreated, but again only when they are considered on a logarithmic, not an ordinary (as is usually done), scale of time. The accuracy of evaluations has been defined using various methods, which has

76 Blakely 1933.
77 Woodrow 1965, 1226.



Example 4.13 The neutral time interval and the accuracy of evaluations of intervals on a logarithmic scale of time: **(a)** the 'neutral interval' and **(b)** errors in evaluations of time intervals; According to Blakely, in Woodrow 1965, 1226. **(c)** errors in evaluations of time intervals according to Fraisse, calculated using two methods; v_1 denotes 'mean relative error' and a v_2 'mean relative difference'. Fraisse 1956, 13.

influenced the results obtained. Woodrow cited the data obtained by Blakely as the most representative.[78] They allow us to produce an evaluation accuracy (or error size) curve, which on our scale is shown by Example 4.13b. The results of Paul Fraisse (Example 4.13c), based on different methods, show different percentage sizes, but they confirm what is most important to us here, namely, that the accuracy of evaluations at the middle of the metronome scale is the greatest, and consequently the error is the smallest.[79]

From the graphs, it can be seen that the greatest irregularities are displayed by the curves in very short values, but it is also there – as we can surmise from the description of the methods – that the accuracy of the measurements was lowest (not without significance was the adoption of a linear scale of time). Hence the data do not allow us to state whether the curves of the accuracy of evaluations

78 Ibid.
79 Fraisse 1956, 13.

of time intervals are wholly symmetrical or whether the variable in the direction of larger values rises more quickly than in the direction of smaller values. Beginning with the low registers of the tempo scale, the graph seems to approach a straight line, which would indicate quite a proportional increase in the error of evaluations to the logarithm of the time interval. We do not know, however, whether such a regularity applies also to values smaller than the metronome scale or whether, in this instance, the error is approximately inversely proportionate to the logarithm of the time interval. In the Polish literature, we owe a more detailed differentiation of continuous and discontinuous sounds or of long and short sounds, as well as an indication of their distinct qualitative opposition, to Stefan Szuman. In his work *Ruch jako czynnik organizacji i wyrazu w utworach muzycznych* [Movement as an element of organisation and expression in musical works], he writes:

> A continuous sound in music involves the uninterrupted duration of some musical sound (or a set of such sounds) over a time that is sufficiently long for the listener to gain the impression that the sound is extended and continues for a certain time. I use the term 'discontinuous musical sound' for a sound that is so short that for the listener it seems one-off, not extended in time.[80]

It is difficult to fix the boundary between these two qualities to the duration of sounds, and Szuman is probably right in suspecting that the division is by nature rather blurred and dependent on various circumstances. In experimental psychology, similar, if not identical, issues have been considered for a long time. Research has concerned not so much the duration of notes as intervals of time separated by short sound impulses, of course entirely outside any musical context. Fraisse, for example, also citing earlier studies, defines the limits of the zones of both 'short times' and 'long times'. Here is his description of the latter:

> The times that we call *long* last on average between 44 and 90 hundredths of a second; they fall within a temporal zone defined approximately by the values from 40 to 100 hundredths of a second, in which we spontaneously perceive duration. When an interval between two impulses is shorter, we still perceive duration, but the need to combine two impulses is only realised with a degree of activeness and effort; above 2 seconds, our perception of duration fades, since it is impossible to combine two interval limits in a single act of perception. In the zone between 40 hundredths of a second and 100 hundredths of a second (with an optimum of approximately 70 hundredths of a second), we spontaneously perceive duration.[81]

80 Szuman 1951, 14.
81 Fraisse 1956, 81.

Fraisse rightly compares human reaction times with that zone:

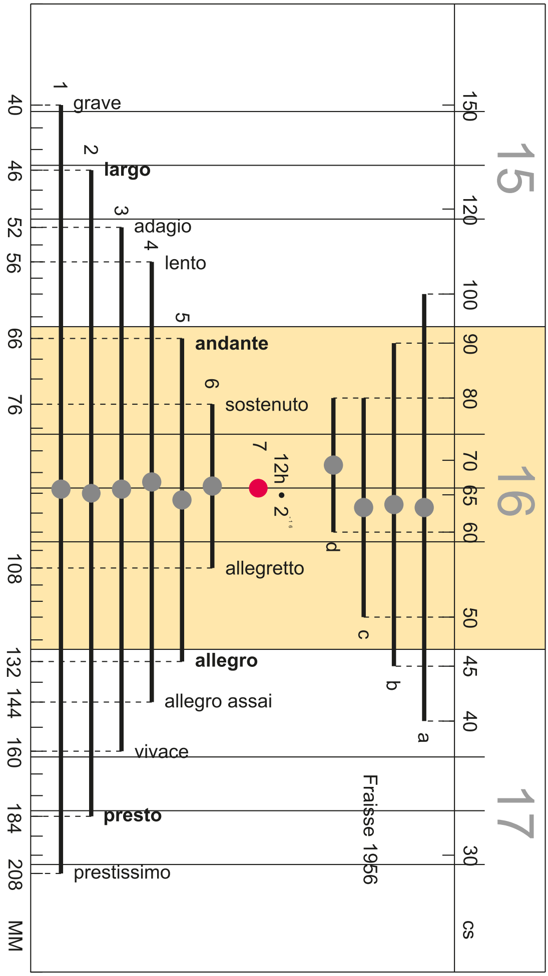
> If a reaction to a perceptual signal is not automatic and if the response requires adaptation, then it occurs within a time of the order of 50 to 80 hundredths of a second.[82] […] Long times correspond to the most spontaneous speed of a beat sequence; at this speed, movement occurs with ease and regularity. We also noted that the performance of a simple sequence is most regular at intervals between 60 and 80 hundredths of a second. Is that not precisely the time range of our steps and our heartbeat? In seeking to exploit that coincidence, many authors mix cause with effect, but in reality it is very well explained if we accept that motion sequence is subject to the same law as our perception.[83]

One might agree entirely with Fraisse were it not for the problem of heartbeat. It suffices to transfer Fraisse's data to our logarithmic scale to realise that this central zone, defined by so many results of experimental study, coincides also with the central zone of musical tempo. This is illustrated by the graph (Example 4.14).

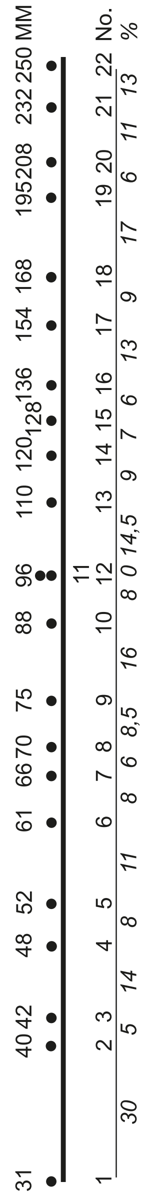
In all these cases, we are dealing with phenomena conditioned by perceptual capacities and conscious, controlled reactions, whilst the heart beats essentially independently of our will. As already mentioned, the normal pulse (60–80 MM) does not fall within the medium range of tempo. In this instance, however, we are dealing with a different steering mechanism.

New light is shed on this central zone by the temporal structure of language, but unfortunately that has also – to my knowledge – not yet been considered on a logarithmic scale. That is because we find here not syllables, which are the basic units of the sound flow of language, let alone phonemes, but the basic logical units, namely, predicative words or prosodic words. With no detailed results from the field of linguistics at my disposal, I refer to a text from Wiktor Jassem's book on accentuation in the Polish language[84] – a text that I previously analysed in my work on the rhythm of Polish folk songs.[85] There I defined the time of the intervals of the syllabic flow. Now those data will help me to investigate on a logarithmic scale the time of the intervals of the sequence of prosodic words, so not only the time of the words themselves, but together with any larger or smaller interword pause. The numbers of patterns are too small to form the basis for determining the exact frequency curve, but sufficiently large to demonstrate a link between the range of musical tempo and the sequence of the logical units of language. The flow of prosodic words, juxtaposed with the metronome scale, is shown in Example 4.14.

82 Ibid., 82.
83 Ibid., 83–84.
84 Jassem 1962.
85 Bielawski 1970, 75–80.



Example 4.14 Three central regions of the zone of the psychological present (regions 15, 16 and 17). Given in hundredths of a second (cs) in the top part of the graph are the ranges of human reaction time and their logarithmic means, based on Fraisse’s data: Fraisse 1956, 81–84. **(a)** ‘long times’; **(b)** average ‘long times’; **(c)** non-automatic reaction time, requiring adaptation; **(d)** the most accurately recreated time intervals. Given in the bottom part of the graph are opposite markings of musical tempo and their logarithmic means, based on the scale of the Maelzel metronome: **(l)** grave – prestissimo, the extreme values of the metronome scale; **(2)** largo – presto, terms 2 tuzes apart; **(3)** adagio – vivace; **(4)** lento – allegro assai; **(5)** andante – allegro, one tuz apart; **(6)** sostenuto – allegretto. Placed in the middle of the graph **(7)** is a value 16 tuzes away from the rhythm of day and night (12 h), adopted as the model value of the human second (0.659 s) and the model value of average musical tempo (91 MM)



Example 4.15 Range of the gradual acceleration of the tempo of conducting, supplemented with the int scale. Based on a drawing in Nazaikinsky 1972, 214.

It is significant that the time intervals of the flow of prosodic words exceed the lower limit of the metronome zone only when complemented by a distinct break. Marked with a broken line are those prosodic words in which the time interval of a final syllable, together with an interword break, lasts for more than one second (longer breaks are not included here). As we can see, prosodic words can exceed also the top limit of the metronome scale. In the analysed text, however, these are only two-syllable patterns, which probably have a very low independence. Perhaps they should be joined to neighbouring words in a larger predicative unit, clearly contained within the metronome scale. Also marked on the graph is the average time of the prosodic words, once with all the words included, once without the words complemented by a long pause. The space between those points falls exactly in the middle of the metronome scale, which is all the more notable in that the number of prosodic words was very small and consequently the scope for deviations from the basic regularities was considerable.

Within this context, it is also worth recalling the definition of basic metrical units given by Stefan Szuman:

> Most suitable for measuring with the ear the value of other notes in a work are medium values, so values that are not so short that the ear cannot still place within them several (2, 3 or 4) smaller note values, and not so large that they are no longer suitable for combining (in groups of 2, 3 or 4) in a larger note value (particularly within a bar) […] It is human nature that we tend to perform movements usually at a tempo which is comfortable, suitable for us. That is related to the tendency to measure time in units of duration that correspond to the tempo at which the human organism normally works and moves.[86]

Here, Szuman specifies the time of walking at average speed and, of course, of a normal heartbeat, and he defines that average size as approximately three-quarters of a second, which corresponds to the tempo of 80 MM. Detailed study of human movement would be highly significant also for our understanding of the essence of musical movement. It would cover not only the tempo of walking, running and dancing, together with their internal structure, but also the movement of arms, hands and fingers, the time of our conscious steering of those movements and our capacity for automating those movements, and also establishing the extreme ranges for them, and especially the optimum sizes. Here, one can predict the existence of tendencies of two kinds. The nature of movement appears to depend on one hand on the length of one's legs, arms and fingers and on the other on the time needed to consciously direct motoric processes.

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86 Szuman 1951, 25.

To date, we have but few statistical results relating to metrical tempo. In this respect, the range of folk cultures and of musical genres and types is great, although all cultural phenomena are grounded on the same or very similar psychical, perceptual and motoric human properties, lending the whole of that range a human dimension. If for example we look at a graph of the intensification of metrical tempo in Hungary (calculations based on relevant examples from *Das ungarische Volkslied*,[87] Example 4.1.32), we are immediately struck by the clear grouping at the centre of the tempo scale and the sparse use of extreme areas. So how do other locations compare? Some insight into the situation in Poland is provided by my work on the rhythms of Polish folk songs,[88] and those data are complemented by the present set of data, based on a two-volume collection of folk songs published by Marian Sobieski (Example 4.1.31).[89]

Compared to Hungarian repertoire, Polish songs display above all a distinct shift of the centre of intensity in the direction of quicker tempi. One should remember, however, that this concerns tunes in which, in many cases, a whole bar could be taken as the basis of the metrical movement. This is particularly clear in quick melodies, adhering to a simple triple time, such as tunes of the *walcerek* type (up to three syllables per bar). Despite that proviso, the high metrical tempo in Polish folk songs is undeniable, although its difference in relation to Hungarian folk material would no doubt be less striking using a different method. Moreover, the regional differentiation in this respect is also considerable within Poland.

All the above data appear to confirm that the zone of metrical tempo is also the basic zone of human activity. It seems that humans are not only attuned to specific light waves, thanks to which they see, and to specific pitches, thanks to which they hear, but also to a specific time – the time of their conscious reactions, the time on which they focus their attention, the basic time in which they think and feel, the time of the immediate human present. The middle of that zone roughly coincides with the middle of musical tempo. Many observed phenomena have their centre here, since they are all dependent on our conscious and controlled reactions to the stimuli of the world around us. In this zone we see, although the frequency of light waves falls within a completely different area; in this zone we hear, although sound vibrations have a much higher value. That is because we have only one channel for direct and conscious contact with the

87 Bartók 1925.
88 Bielawski 1970, 120.
89 Sobieski 1955.

outside world; that channel is our immediate present. One can admittedly forget about that channel; one can even conceive of the existence of a different present; but that conception must be effectuated in this central zone of human awareness. One can think about the past and the future, but the thinking will be done in the present, that invariable present of ours, utterly resistant to the changes of time, not subject to the process of ageing, accompanying us for as long as we are aware of existing. With our present, we pass through life's ups and downs and – *nolens volens* – we cannot tear ourselves out of it. We have our permanent place in the zonal structure of time; from this place alone we can observe the world and sense its changes. This time appears to weigh on contemporary composers, who would like to free themselves from it, to transport themselves into other regions. In vain. The foundations of perception are given to us once and for all, and we have no choice. Of course, we can create distinct structures from a different temporal perspective than the human perspective, since the process of creating those structures does not coincide with the process of their recreation and perception. Everything can be noted on paper or recorded on magnetic tape, but the effect will always be the same, determined by the perspective of our immediate present. And for all our pursuit of otherness and our fascination with various possibilities, ultimately humans will have to admit that those possibilities are by no means limitless. On the contrary, they are determined by our human perception of time, which is fundamentally immutable. Within the limits of the capacities given to us, of course, we can choose particular solutions at the expense of others; we can constrain diversity, get used to those constraints and regard them as our own, as common to a certain culture or epoch. And those cultural habits can alter; training can heighten our sensitivity to particular phenomena. Ultimately, however, the foundation of our existence in time and of our sensing of time remains unaltered, conditioned by the structure of our human awareness.

According to Garbuzov, the threshold of our perception of a change of tempo stands at four per cent.[90] Nazaikinsky, meanwhile, relates somewhat different results of his experiments. In those experiments, musicians were instructed to perform a metrical eight-bar or sixteen-bar segment at an even tempo, beginning with the lowest speeds, and, after a break of between 10 and 20 seconds (the length of time that normally separates the movements of a work), repeat the same segment slightly quicker, or the reverse, beginning with the quickest tempi, play it slightly slower, and so on throughout the whole tempo scale. Around seventy experiments were carried out, and the author cites one typical result in the

90 Garbuzov 1950.

form of a drawing,[91] which for the sake of comparison we have supplemented with our int scale (Example 4.15).

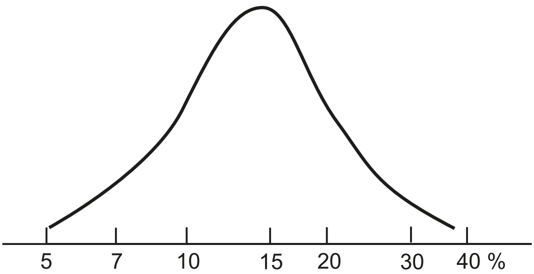
Nazaikinsky's results show the individual character of notions of tempo and changes of tempo in each person, yet they also allow us to speak of some general trends. For example, it turned out that minimal differences in tempo, where series of comparable tempi were separated by a pause lasting between 10 and 20 seconds, amounted on average to seven per cent, and not four per cent, as Garbuzov found. So Nazaikinsky obtained similar results to M. A. Alexeev, who studied perception thresholds by using periodic acoustic signals.[92] Most often, 20–30 degrees were distinguished within the tempo zone. With more numerous gradations, some degrees proved to be merely ostensible; objectively speaking, tempos were repeated or even returned to. Such 'treading water', in the form of a zero interval, is shown on the drawing. The conclusion here would be that subtle differences can be uncommunicative not only because they are subtle, but also because they can sometimes exist solely in the performer's intentions and conviction. According to Nazaikinsky, the size of the threshold is not uniform throughout the whole tempo scale. At slower tempi, the average sizes of the threshold increase from 7 to 10–12 per cent.

Nazaikinsky also conducted research into real changes in tempo, defined by composers as *poco più mosso* and *poco meno mosso*.[93] He stated that with Tchaikovsky and Rimsky-Korsakov such small changes averaged 20 per cent, falling to 15 per cent in quick tempi. He also gave a graph, which shows clearly that the tempo change 'poco' is much greater than the size of the threshold tempo defined as 7 per cent, since it stands at 14–15 per cent, even reaching as high as 36 per cent (Example 4.16).

Fritz Winckel analysed the metronome tempo of Hindemith's Third Quartet, Op. 22 on a recording in which the composer played viola (DGG cat. no. 29108). Here is his description of the results of his observations:

> The movements do not have exact metronome markings, but rather fixed metronome areas, e.g., first movement (Fugato) MM ♩ = 58–69. A fixed metronome beat is only momentarily synchronized in the course of the music, at most for one measure, since one cannot hold to a fixed meter even for short stretches. The basic measure simply runs from slower to faster, or conversely. It should be mentioned here that in the actual performance of the first movement of the above quartet Hindemith struck up a tempo of 69–100 and during the sections specially marked 'livelier' he went up to 138, giving

91 Nazaikinsky 1972, 214.
92 Alexeev 1956 6, 7–15.
93 Nazaikinsky 1972, 215–216.



Example 4.16 Size of tempo changes with the terms *poco più mosso* or *poco meno mosso*. Repr. from Nazaikinsky 1972, 216.

> meter variations in a ratio of 1:2. It is as if a musician guarded against being synchronized with a strictly periodic speed, but rather played around the speed within certain bounds, employing such fluctuations for personal expression.[94]

Winckel seeks some reference points for those continual fluctuations of tempo: 'First of all, these variations proceed hand in hand with the dynamics, but they also depend upon the sensual effect of sound, upon the concentration of the sound material, which is the same as the concentration of the spectral lines, and on the difficulty of the manual execution of the piece'.[95] A sense of the right tempo for particular works or musical genres is subject to change. Paul Farnsworth describes an example that I will quote here after Alan P. Merriam:

> Some years ago a Duo-Art player-piano, made by the Aeolian Corporation, was used in an attempt to learn if college students had one specific tempo well fixed in mind for waltz time. The subjects were blindfolded and told to move back and forth a large speed lever until the playing of the composition they were hearing was at the rate they deemed proper. The lever settings given by this group were generally in the neighborhood of 116 quarter-notes to the minute, just what the Aeolian Corporation regarded at that time as proper. The fox-trots were usually set at a considerably faster tempo, at approximately 143.
> Further research on dance tempo was carried on six years later by Lund with a similar sample of college students. Lund found that faster speeds were by this time considered proper, 139 for the waltz and 155 for the fox-trot.[96]

94 Winckel 1967, 83.
95 Ibid.
96 Merriam 1964, 28–29.

Merriam offers the following comment:

> Such a change in 'correct' tempo over time can in no way be attributed to factors inherent in the music structure or sound itself, for in taking such a position we would be forced into the attitude that music has some sort of existence by and of itself, as well as the tautology that music sound causes change in music sound. On the contrary, the factors which operate to make such a change in music are matters of taste and preference which derive from culture patterns that may have very little if any direct relationship to music tempo as such.[97]

It is difficult to say what actually affects changes of this sort. Yet the fact remains that they do occur, and not just in popular and art music; they are also characteristic of changes in folk music. According to Sobieska, for example, interviews concerning different generations in Polish folk music reveal that works were often played more slowly in former times than is the fashion today among representatives of a younger generation. The tendency for quicker tempi characterises virtually the whole of Polish folklore. Slow dances and slow melodies are more quickly falling out of use, leaving mainly quick and very quick tunes and dances. With regard to the tempo of folk songs and music, we observe substantial regional differences as well. Very quick tempi characterise the music of Wielkopolska (especially in singing). As we move towards the east, the tempo of singing gradually falls, and melodies become more songful. Attempts have been made to link this feature to the character or temperament of the people, but the very fact that these changes can occur very quickly seem to contradict any psychological conditions of the phenomenon.

A sense of the right tempo is also individually conditioned. Here is Wierszyłowski:

> Various outstanding conductors have led performances of the same works at different tempi, which has not been a matter of indifference for the perception of those works. Take Ludwig van Beethoven's Third Symphony, for example, which the composer felt should be performed at a tempo of 80 (movt I). Serge Koussevitzky conducted it at 74, Thomas Beecham at 62 and Arturo Toscanini at 52. The overture to Richard Wagner's opera *Tannhäuser* lasted twelve minutes when conducted by the composer, but twenty minutes with most maestri.[98]

97 Ibid., 29.

98 Wierszyłowski 1968, 25.

So the differences can be quite considerable. The extreme tempi among those relating to the first movement of Beethoven’s Third Symphony show a deviation of the order of eight ints; in the case of the overture to *Tannhäuser*, they even reach nine ints. (Witold Rudziński pointed out to me that the overture to *Tannhäuser* has two different versions, which may have affected the great variation in the duration of its performances.) In both cases, outstanding contemporary conductors clearly slowed the tempo of performances compared with the instructions of nineteenth-century composers.

In folk practice, such differentiations of tempo in a single time and in a single region are by no means surprising. They do not necessarily signify any fundamental change in the ‘sense of tempo’. Works simply function in such a varied way in traditional folk culture. Suffice it to compare the tempo of recordings of variants of one and the same melody. I refer here to the differentiation of several variants of a folk vocal melody from the Kujawy region of Poland, adhering to a mazurka rhythm (Example 4.1.25–27). Since tempo is thus differentiated, bars, phrases and motifs are identically differentiated on the logarithmic scale – that is, of course, if the variant changes do not concern the internal structure of those elements, such as the number of bars.

As already mentioned, Fraisse set the boundary between ‘long times’ and ‘short times’ at 40 hundredths of a second, which corresponds to the value 150 MM. It should be mentioned that Oskar Kolberg also set a boundary close to that time, noting triple-time melodies slower than 140 MM in 3/4 and quicker tunes in 3/8.[99]. Here, however, we are dealing not only with liminal values, since they coincide also with optimal values of a kind, confirmed by experimental psychological research. Neumann, for example, regarded the time interval of 40 hundredths of a second (150 MM) as the most advantageous for rhythmic grouping.[100] Fraisse, meanwhile, noted a relationship between the size of that interval and the number of impulses. According to him, in a group comprising three impulses, the optimal interval stands at 42 hundredths of a second (143 MM), whilst in a four-impulse group it is an interval of 37 hundredths of a second (162 MM).[101] Fraisse’s data show that in this instance as well we are essentially dealing with a temporal zone, the centre of which falls on a value approximately 150 MM. Boris Teplov, for example, placed the zone of the subjective rhythmisation of the sequence of regular impulses (as in the ticking of a

99 Kolberg 1857, p. VII; Bielawski 1967, 66.
100 Fraisse 1956, 14.
101 Ibid., 14–15.

clock) in a quite wide zone between 100 and 200 MM.[102] The rhythmic grouping of temporal intervals also signifies their merging into larger units. One must realise that with values in the order of 140 MM, which on a logarithmic scale represent the centre of Teplov's zone, two such merged intervals coincide with the average human pulse, and at the same time both intervals, the single and the merged, are almost equidistant from both sides of the 'neutral' temporal interval or the human second. The larger interval is slightly closer to the middle of the metronome scale, yet three intervals can also be merged (as in triple time), and then the compound interval obtained would be much farther away from the average tempo.

One is struck by the fact that the times of prosodic words taken from Jassem's text are also grouped around these opposite values, since one of their centres falls around 150 MM and the other around 60–70 MM. Is it possible that this is merely an instance that results from a lack of sufficient examples? It is hard to determine. An explanation may also be sought in a characteristic rhythm of the temporal zones of language. In the analysed text from Jassem's work, one can distinguish a centre of the zone of syllabic flow falling at approximately 18 hundredths of a second (334 MM) and a centre of the zone of phonemes with a value of approximately 7.8 hundredths of a second (770 MM). The most astonishing fact is that the distances between the centres of successive zones are almost identical, approximately 14 ints (coefficient approximately 2.3). Of course, these data should be tested on larger material, more representative for language.

4.3 Lower regions, measures and phrases

The measures of Polish folk songs are relatively short (Example 4.1.37). That is due to the quick tempo of Polish folk melodies and the strong separation of simple measures, rarely combined in compound measures. A clear shift in the direction of longer measures is typical of Hungarian folk melodies (Example 4.1.38); included here are melodies with a fixed metre and a given MM value. Particularly frequent among such melodies are quite free quadruple measures. In both instances, the scope of the zone is relatively small, and only exceptionally do melodies exceed the scope of two tuzes. A different picture is shown by the sizes of the measures of Beethoven's piano sonatas,[103] calculated from the given MM (Example 4.1.39). Here too, the greatest concentration occurs in medium values and in values slightly shorter than the average, reaching medium temporal values

102 Teplov 1952, 301.
103 Beethoven 1946.

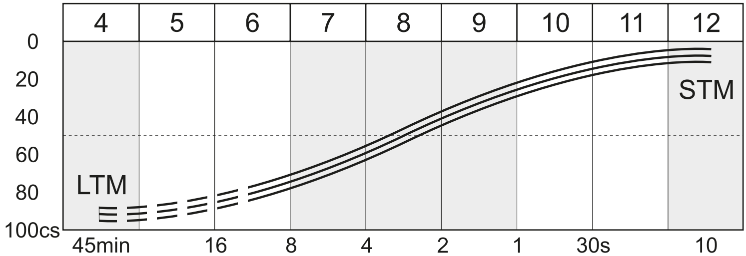
of musical phrases. There is also no lack of exceptionally short measures, even falling outside the middle of the metronome scale. In such extreme cases, of course, the measures also constitute the basic metrical unit. The span of the zone of measures in Beethoven's piano sonatas is exceptionally large and even exceeds four tuzes. It should be strongly emphasised, however, that the score was adopted as the criterion for measures, and scores are not always conditioned solely by the musical structure of works. A significant influence on measure division is also exerted by orthographic conventions and preferences among composers and collectors of musical folklore. Many inconsistencies can be cited in the notation of folk melodies, in which, for example, some collectors write out melodies in simple times (e.g. 2/4) whilst others write the same melodies in pairs in a compound metre (4/4), etc.

It goes without saying that the distinction of the zone of measures is not solely the domain of our Western European musical tradition. Even in the rhythmic system of Bulgarian folk music, so different in many respects, the zone of measures is employed in a similar way. This is exemplified by melodies taken from the collection of Vasil Stoin, adhering to such characteristic Bulgarian rhythms as 9/16, 7/16, 5/16 and 5/8.[104] They are clearly concentrated in the central areas of the zone of measures (Example 4.1.33–36).

Psychologists have long been interested in working memory, although they have called and defined it in different ways. Rakowski reminds us that over the course of more than a century of research into memory, attempts have been made to establish whether memory is a uniform system or a complex structure. James, for example,[105] distinguished two kinds of memory: primary memory, referring to the present, and secondary memory, concerning awareness of events that occurred in the past. When behaviourism was dominant, no great weight was attached to the question of the complexities of memory. The situation changed in cognitive psychology, according to which the structure of memory must contain a suitable short-term store, in which are performed mental operations making direct use of memory material.[106]

The literature on the subject of auditory memory is considerable, but it refers mainly to the memorising of verbal material and less to the memory of purely perceptual features of sound, such as pitch, loudness and timbre. Important for us is the assertion that most research into short-term auditory memory concerns

104 Stoin 1928.
105 James 1890.
106 Rakowski 1999, 11–32.



Example 4.17 Curves of the forgetting of note pitches, average results for a group of four listeners.According to Rakowski 1994; after Rakowski 1999, 28. Rakowski's data transferred to a uniform scale of temporal zones. Overview drawing.

durations of the order of a second, and even a fraction of a second, which tallies with our definition of the zone of the psychological present. Memorial phenomena that go beyond that zone, lasting even around 40 seconds, are termed by some authors 'intermediate-term memory'.[107] Rakowski is of a different opinion. According to him, the exact pitch of a sound can be remembered for a period of anything up to several minutes.[108]

Rakowski conducted experimental studies which demonstrated that for up to 10 seconds memory of note pitch is very exact, but thereafter the accuracy gradually lessens; for three minutes (the centre of the zone of works) the standard deviation is a quarter-note, thereafter it gradually approaches a semitone. This proves that short-term memory is active mainly within the zone of the psychological present, in the zone of (natural, musical and every other) language. In the next zone, the zone of works, short-term memory gradually fades. In my opinion, a similar effect can be observed in the gradual lowering of tuning in unaccompanied part song. Hence, after the duration of works, the conductor uses a tuning fork to adjust the tuning.

Czesław S. Nosal, citing psychological studies, distinguished three levels in mental representations of time: the neurobiological level, the psychophysical level and the existential level.[109] One may assume that the psychophysical level concerns mainly, if not solely, the zone of the psychological present. Referring to Pöppel,[110] Nosal writes:

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107 Wickelgren 1969.
108 Rakowski 1999, 28.
109 Nosal 2002.
110 Pöppel 1997, 17.

> On the psychophysical level, we focus on the overall mechanism of temporal segmentation, which is of an automatic and pre-semantic character. The division of time within the range of three seconds corresponds to our sense of 'now' and determines the state of 'being aware'. Every state of this kind represents 'an island of mental activity clearly separate from other temporally neighbouring islands'.[111]

Nosal stresses that this process is of a universal character, since it encompasses 'perception, memory, speech and movement control'. It also covers, one should add, all consciously controlled human movements, dance movements and also, of course, music. In Nosal's opinion, there are grounds to state that the mechanism of temporal segmentation 'discharges a crucial cognitive function, since it determines the number of elementary cognitive units thanks to which we distinguish figure/background relations'. A closer inspection of segmentation would reveal the complexity of its character; the segmentation occurs on different levels simultaneously. We can distinguish an elementary level, a sub-elementary level and a super-elementary level. Nosal considers that the problem of temporal segmentation is best studied in relation to the perception of speech, and he refers to the work of Szeląg. Pondering the origins of this mechanism, he asks:

> Does segmentation encompass all cognitive processes without exception or is it conditioned by the specificities of linguistic mechanisms? There are clearly more arguments suggesting that the mechanism of cognitive segmentation is superior to linguistic mechanisms. Fundamental arguments are constituted by the amodal and pre-semantic character of segmentation processes. These features also argue in favour of treating segmentation as a general mechanism conditioning the *temporal synchronisation of cognition* within elementary cognitive processes. Yet there is another possible interpretation. The mechanism of the segmentation and automatic separation of lexical units is identified as a crucial component in the process of the bilateral use of language; that is, understanding utterances and creating them. However, if we take into account the fact that all cognitive processes (but only on a certain level) are penetrated by linguistic mechanisms, a more justified view is that temporal segmentation is a general, formal mechanism of the organisation of cognition. One may also assume that effective segmentation is a condition of the effective working of any cognitive functions. The segmentation of lexical units is only a particular instance of the general mechanism of temporal organisation. So realised on the psychophysical level is the basic temporal segmentation thanks to which, through active awareness, the sequences of mental (cognitive and metacognitive) operations are performed. So this is the level closest to realistic evaluations of the passage of time on the short-term scale; that is, evaluations formulated in relation to the model duration 'now' and its multiple set on the scale of the passing of time.[112]

111 Nosal 2001.
112 Nosal 2002.

Given the model duration 'now', defined with the size of three seconds, and examples of the semantic segmentation of language (passing over its phonetic structure), one should assume that Nosal is thinking about segmentation on the level of syntax rather than morphology, and by no means on the level of phonetics, and probably also not about the segmentation of linguistic utterances longer than a sentence.

The distinction of the interval of three seconds, which supposedly corresponds to the sense of 'now' and determines our state of 'being aware' is an intriguing problem. Every state of that kind supposedly represents 'an island of mental activity clearly separated from other temporally neighbouring islands'. So what is that size? Examples of such islands of activity might be three-second sentences uttered consecutively; 'I am aware of the current present; I am aware of the current present; I am aware of the current present…'. Three seconds is also the duration of an average breath; it is a very large value in the zone of the psychological present as I traced it on the logarithmic scale of time. Perhaps it is the average time interval of basic human logical operations – the operations of musical phrasing. The given example of phrasing in spontaneous recitations of laments confirms the role of three seconds as an average size, but it also makes us aware of the sizeable range of this size, from 1.5 second to 6 seconds.

The question of laments in Polish folk culture has been explored by Alicja Trojanowicz,[113] whose measurements of phrases are shown in Example 4.18

One might suppose that the time of a normal breath, averaging between 3.75 and 3.33 seconds (16–18 per minute),[114] ought to coincide with the average musical phrase or with the average musical line (*Zeile*). As yet we have few detailed statistical calculations relating to musical phrases, but those which we do have seem to contradict this correlation. The average phrase is clearly longer than a normal breath. The model value of 8 human seconds (5.27 seconds) seems closer to the average musical phrase. An interesting experiment in this area was carried out as part of Alan Lomax's 'cantometrics' programme. One of the aspects considered in analysis of recorded vocal music of different world cultures concerned phrase length. A five-degree scale was used, and length was estimated auditively before the evaluations were verified using measurements, which showed that the evaluations of particular categories generally fell within the following time ranges:

113 Trojanowicz 1989.

114 Daenicke 1967, 904.

	13			14			15			Regions
Number of syllables	Duration in seconds									Total
	6.4 – 8.0	5.1 – 6.3	4.1 – 5.0	3.3 – 4.0	2.6 – 3.2	2.1 – 2.5	1.7 – 2.0	1.3 – 1.6	1.1 – 1.2	
4										
5–6				2	12	7	8	1		30
7–8			1	6	10	8	7	1		33
9–10			1	5	10	3	1			20
11–13		2	2	3	11					18
14–16			2	6	2					10
17–20	1		4	2			1			8
21–25		3	1							4
26–32										
Total	1	5	11	24	45	18	17	2		123

Example 4.18 Funeral laments. The length of phrases given in terms of number of syllables and duration, based on sixteen recorded laments. Trojanowicz 1989, 24.

1. very long phrases, which seem to reach the limits of a singer's breathing capacities (16–25 seconds and more);
2. phrases longer than average up to very long (10–15 seconds);
3. phrases of average length, normal, for example, for English ballads (5–9 seconds);
4. phrases shorter than the average (3–4 seconds);
5. short and very short phrases (1–2 seconds).[115]

Although we do not know the detailed statistical results of the verification of these definitions of phrase lengths based on subjective assessment, we can assume that Lomax adopted over-large numbers for his average length (5–9 seconds) on the basis of his own work, in which he published the results of detailed analysis of samples from nine musical cultures of the world. Those results also contain data relating to phrase lengths assessed according to a five-degree scale. If we transfer those results to a logarithmic scale and take account of the uneven ranges of the divisions of the scale adopted by Lomax, it turns out that the average phrase length in all these world cultures coincides almost ideally with my hypothetical model value of 5.27 seconds; that is, 8 human seconds, or the length of four

115 Lomax 1968, 61–62.

		Very long	Longer than average	Average length	Shorter than average	Short and very short
	Phrase length in seconds	16–25+	10–15	5–9	3–4	1–2
1.	Arctic Asia	2	4	25	**49**	21
2.	Africa	2	6	28	**42**	22
3.	South America	4	11	30	**42**	12
4.	Tribal India	–	17	**48**	22	13
5.	Europe	2	9	**47**	37	5
6.	North America	3	15	**41**	32	9
7.	Pacific islands	16	21	**37**	18	7
8.	Old high culture	12	24	**39**	21	4
9.	Australia	16	29	**36**	16	4
	Total	57	136	331	279	97
	Total %	6.33	15.11	36.77	31	10.77
	Total average %	7.88	20.91	31.58	32.17	7.44

Example 4.19 The lengths of musical phrases in the cultures of the world. Calculations based on data from Lomax 1971 (2nd edn).

two-time measures at an average tempo on the metronome scale. This result is revelatory for me, not because it confirms my assumption, but because perhaps for the first time in ethnomusicology it shows something which we may adopt, with considerable probability, as a statistical average of the musical cultures of the world. Having a summary breakdown of the phrase lengths of all musical cultures, we can characterise every culture, every tradition, every style, every genre and so on in terms of its deviation from that normal breakdown. Lomax's data relating to the lengths of musical phrases are shown in Example 4.19.

For the sake of comparison, I will give here the results of a similar experiment applied to Polish folk songs, from a two-volume collection assembled by Marian Sobieski,[116] so an experiment conducted not on recorded material, but on notations of melody with specified MM. To date, such sources have been used most often as the basis of comparative ethnomusicological study. Lomax's five-degree scale was adopted:

116 Sobieski 1955.

	Phrase length in sec.		16	12.7	10.1	8	6.4	5	4	3.2	2.5	2
	Regions		12			13			14			
1	Very long		+									
2	Longer than average			+	3	4	3	+	+			
3	Average			+	5	8	13	21	15	6	+	
4	Shorter than average						+	+	9	8	4	
5	Very short											
	Total		+	+	8	12	16	21	24	14	4	

+ denotes less than one per cent

Example 4.20 Subjective estimates of phrase lengths on a five-degree scale and their actual durations. Based on the collection of Marian Sobieski 1955. **Number of phrases given in percentages.**

1. very long phrases,
2. phrases longer than average,
3. average,
4. shorter than average,
5. very short.

However, no suggestions were made concerning the temporal values of particular degrees. The results of Sobieski's evaluations (in percentage) are shown in Example 4.20.

We can see how much the ranges of the evaluations of different degrees overlap, although their centres are distinctly separated and quite symmetrically distributed on the logarithmical scale of time. For the sake of comparison, I will give initial calculations of the lengths of musical phrases relating to Polish,[117] Croatian[118] and Hungarian[119] folk song (Example 4.1.42–44).

Phrases are most often grouped around the model value of 8 human seconds or slightly lower; the phrases of Polish folk melodies have their centre much lower.[120] So the graphic representation confirms what stands out in Polish songs

117 Ibid.
118 Žganec 1950.
119 Bartók 1925.
120 Sobieski 1955.

without any detailed analysis, namely, the frequent occurrence of melodies with short, independent phrases, sung at a quick tempo. A more balanced character in this respect is displayed by Hungarian songs, which are also dominated by four-bar phrases in duple time. Were it not for the fact that they are also dominated by tempi somewhat quicker than the average tempi of the metronome scale, the centre of the zone of phrases would coincide even more exactly with the model value of 8 human seconds. However, all these calculations should be treated as provisional, since this problem still requires much more detailed research relating not only to folk music. Interesting results might be given, for example, by research into the subdivision of periods in classical music. One cannot overlook non-European cultures as well, of course, particularly since we have very little in the way of statistical data in this respect. In the research of J. Katarzyna Dadak-Kozicka,[121] the phrases of Mongolian metrical songs are clearly grouped in the average range, similarly to the African song 'Akawalogoma', analysed by William Hutchinson.[122] In the 'long chant' style of Mongolian folk songs, however, the phrases reach extreme values of the stanzas of European folk songs or even exceed those limits. So we see that musical phrases, which in music are components of very limited independence, can clearly exceed the model value of 10.55 seconds that separates the zone of the psychological present from the zone of works; similarly, that model value can also be exceeded in the direction of lesser values by short musical phrases, which are often separate works.

Ingmar Bengtsson published very precise measurements of the duration of all the notes in a Swedish 'polska' folk tune performed on a reed pipe.[123] From those measurements, it is possible to calculate the value of all the levels of musical segmentation: metrical units, bars, two-bar units and so on. The melody is reminiscent of a rubato rendition of Polish mazurkas. It was obvious to me that the relative deviations from the metrical model on the level of metrical units were particularly large here. I did not realise, however, that this may also apply to such an extent to absolute values:

It is striking how the deviations lessen as we move onto the higher levels of segmentation. This shows how the organisation of time is determined primarily not by metrical units, not even by bars, but by even larger units, such as musical phrases (Example 4.21). In Poland, the principle of the regulation of time on the level of musical phrases was noted in relation to Podhale melodies

121 Dadak-Kozicka 1970.
122 Hutchinson 1966, 66 ff.
123 Bengtsson 1968.

<table>
<tr><th></th><th colspan="10">Shortened values (milliseconds)</th><th colspan="10">Extended values (milliseconds)</th></tr>
<tr><th></th><th colspan="1"></th><th colspan="2">-200</th><th colspan="2">-150</th><th colspan="2">-100</th><th colspan="2">-50</th><th colspan="2">0</th><th colspan="2">+50</th><th colspan="2">+100</th><th colspan="2">+150</th><th colspan="2">+200</th><th colspan="1"></th></tr>
<tr><td>Metrical units</td><td colspan="2">1</td><td colspan="2">1</td><td colspan="2">2</td><td colspan="2">10</td><td colspan="2">11</td><td colspan="2">9</td><td colspan="2">4</td><td colspan="2">5</td><td colspan="2">1</td><td colspan="2"></td></tr>
<tr><td>Bars ¾</td><td colspan="2"></td><td colspan="2"></td><td colspan="2">1</td><td colspan="2">4</td><td colspan="2">3</td><td colspan="2">4</td><td colspan="2">4</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>Two bars</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">5</td><td colspan="2">3</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>Four bars</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">2</td><td colspan="2">2</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>Eight bars</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">1</td><td colspan="2">1</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>Sixteen bars</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="1"></td><td colspan="2">1</td><td colspan="1"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td></tr>
</table>

Example 4.21 Deviations of performance in the duration of segments of the Swedish 'polska' melody (metrical units, bars, etc.), based on Bengtsson's measurements. Bengtsson 1968.

by Włodzimierz Kotoński.[124] In general, it appears that the role of phrases in shaping time in a piece of music is particularly important.

Within this context, it would be important to study phrase lengths, and periodic structure in general, in classical music. We gain some insight into this issue from initial studies based on measurements of performances of piano sonatas by Mozart. Here again, the length of musical phrases did not depart significantly from the model distribution. That demonstrates the exceptional sense of the natural sizes of the components of formal construction, which in relation to classical music was predictable.

Similar results were obtained in the improvisation of musical phrases according to an a priori established seven-degree scale of evaluation:

1. very short,
2. short,
3. shorter than average,
4. average,
5. longer than average,
6. long,
7. very long.

The phrases were improvised on the clarinet and always performed on a single breath. The order to the sequence of sizes of the improvised phrase was close to random. In this case, too, the results showed a highly regular picture. Deviations

124 Kotoński 1953–1954.

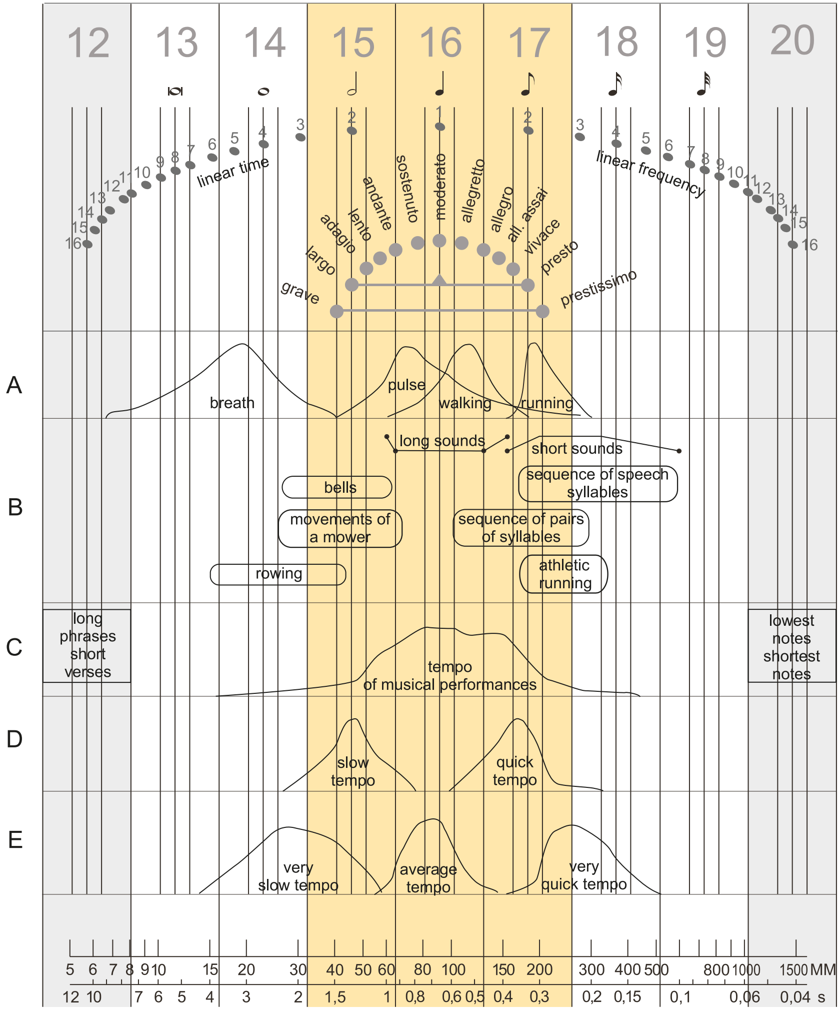
from the predicted values concerned mainly the shortest phrases. This was no doubt due to the fact that the phrases were improvised in isolated form. In a musical context, such short phrases would have to be separated by a distinct rest in order to fulfil their function. In general terms, one may state that the model breakdown of phrase lengths was borne out also in the case of improvised phrases. That provides further evidence that there exist natural temporal zones which are characteristic of the basic levels of musical segmentation. However, those zones are very broad.

The liminal character of region 12 is confirmed by the results of experimental research. Walter Reckziegel, for example,[125] cited Helmar Frank,[126] who defined the present time (*Gegenwartsdauer*) as a constant lasting approximately 8 seconds. Zofia Lissa, meanwhile, in an introduction to musicology, summing up the results of observations made by psychologists, stated that 'the recurrence of phenomena is termed rhythm, as long as the regularly recurring components are not more than 12 seconds apart. Other manifestations of the periodic nature of returns (the recurrence of days and nights or of the seasons) are only grasped by reason as rhythmic'.[127]

A very interesting set of statistical graphs of various phenomena concerning the whole of the zone that I have termed the zone of the psychological present is provided by the work of Evgeny Nazaikinsky,[128] and it is all the more valuable in that it shows the graphs on a logarithmic scale. The author defines the zone of the psychological present as a scale of the immediate perception of periodic structure. I reproduce the whole of Nazaikinsky's diagram here,[129] supplementing the tempo scale with centres of the regions according to a tuning derived from the rhythm of day and night, that is, 12 hours (Example 4.22).

From Nazaikinsky's data, we see how exactly the value which we have called the human second is shown to be correct. No other axis would show such symmetry to a diagram. The author states that the lines drawn on it result from a large amount of experimental data and observations, both original and also taken from the works of other authors, but it does not show exactly the way they were calculated. In particular, one would like to know the scale of the x-axis for the individual lines. The pulse line is highly characteristic. It begins at 40 MM, so exactly at the lowest value on the metronome scale, and according to the author

125 Reckziegel 1967.
126 Franck 1964.
127 Lissa 1970, 74.
128 Nazaikinsky 1972.
129 Ibid., 193.



Example 4.22 Comparative diagram of various tempi within the scope of the immediate perception of rhythmic periodic structure and regions (from 12 to 20) of a uniform musical scale (12h module).Data taken mainly from Nazaikinsky 1972, 193.

it ends at 200 MM, so on the highest value of the Maelzel metronome; the line goes considerably higher than that, but in wholly exceptional cases. One can also read accurately the average pulse values marked with the peak of the line. They fall at approximately 72 MM, so they agree with the results of many other authors. One could hardly overestimate the significance of the frequencies of the tempo of walking and running for musical tempo; hence Nazaikinsky's graphs are of considerable interpretative value.

The walking zone, based on more than 3000 observations, ranges from 60 to 180 MM. However, the question arises as to whether these are indeed absolute limits or whether walking might be slower than metronomic andante. It is likely that in exceptional situations it receives a lesser value, but it can probably reach the bottom values of the metronome scale (40 MM). More important for us, however, are the average values of walking, marked by the peak of the line, so with the tempo 112–116 MM. Significantly, it is precisely in the middle between average pulse tempo and average walking tempo that we find the middle of the metronome scale, that is, the human second. And that is not all. Average pulse, walking and running clearly form a sequence of golden ratios!

As material for preparing his graph of the tempo of musical performances (graph C), Nazaikinsky used oscillographic and chronometric analyses, and also partly data from other scholars, comprising a total of approximately 20,000 metronomic markings. We do not know what kind of music formed the basis for these calculations, and that is not without significance, since we happen to know how greatly not only styles and genres, but even entire cultural areas can differ in this respect. The core of the values of the tempo of musical performances clearly falls within the limits of the metronome (40–208 MM). The extreme values, however, are significantly outside that range, and the number of those exceptional tempi seems to be exactly the same on each side of the metronome scale.

4.4 Indian rhythm theory

Rhythm measuring time in the strict sense is a product of the Arabic world. From Arabia, it spread on one hand throughout northern Africa and on the other travelled via Persia as far as India.[130]

The oldest theories of musical rhythm refer to the theory of language and versification. Their starting point is the syllable. In Greek theory, a distinction is made between short and long syllables. A long syllable is defined by its ratio to the duration of a short syllable, being one and a half or two times as long. Combinations of short and long syllables formed metrical feet, and sequences of feet made up lines.

130 Husmann 1968, 193.

Arabic theories of musical rhythm also begin with the shortest rhythmical unit, known as the standard unit. Multiples of the standard unit create double, triple, quadruple and quintuple rhythms. Rhythmic phrases arise out of a sequence of such segments.

Indian theory of musical rhythm also derives from theory of language and versification, and it originally characterised vocal music. The notion of the average unit of musical time, the *mātrā*, became stabilised in that theory:

> the term *mātrā* is defined in the Nātyaśāstra (pre-5th cent.) as the time of five *nimeṣas* 'blinking of the eye'. The Sangītaratnākara (13th cent.) defines the *mātrā* as the time taken to pronounce five short syllables. […] The *mātrā* was originally a standard and notionally invariable time unit in Indian music: *tals* were composed of various time units (the *laghu* 'short syllable', *guru* 'long syllable', *druta* 'fast tempo', etc.), which were reckoned as fractions or multiples of the *mātrā*. Hence the ratio between the time units employed in a particular pattern and a globally fixed time unit (the *mātrā*) functioned as a practical measure of tempo.[131]

Gautam estimates the *mātrā* as 50 MM, Rowell as 60–72 MM and Clayton as 70–90 MM.[132] So originally the *mātrā* covered only slow tempos on the metronome scale, from adagio to moderato; that changed over the long history of Indian music.

'From being a fixed tempo unit, as Indian art music evolved the *mātrā* became an increasingly flexible measure of time'. Nowadays the *mātrās* cover a whole range of rhythmic times, similarly to *lays* (tempo, rhythm). This is exemplified by the ranges of Hindustani vocal and instrumental music, transferred to a scale of temporal similarities (Example 4.23).[133]

One peculiarity of Indian theory is *lay* (tempo, rhythm), representing musical tempo as broadly conceived, covering a range from the shortest rhythmic values to the longest metrical phrases. This also concerns, of course, metre, since 'metre is inferred (largely subjectively) on the basis of evidence presented by rhythm, while rhythm is interpreted in terms of its relationship to that metre', as Clayton states.[134] A similarly broad notion has been popularised in Europe by newer theories of musical time. Examples here include Stockhausen's rhythm range, opposed to the ranges of sound and form, and our own 'zone of the psychological present'.

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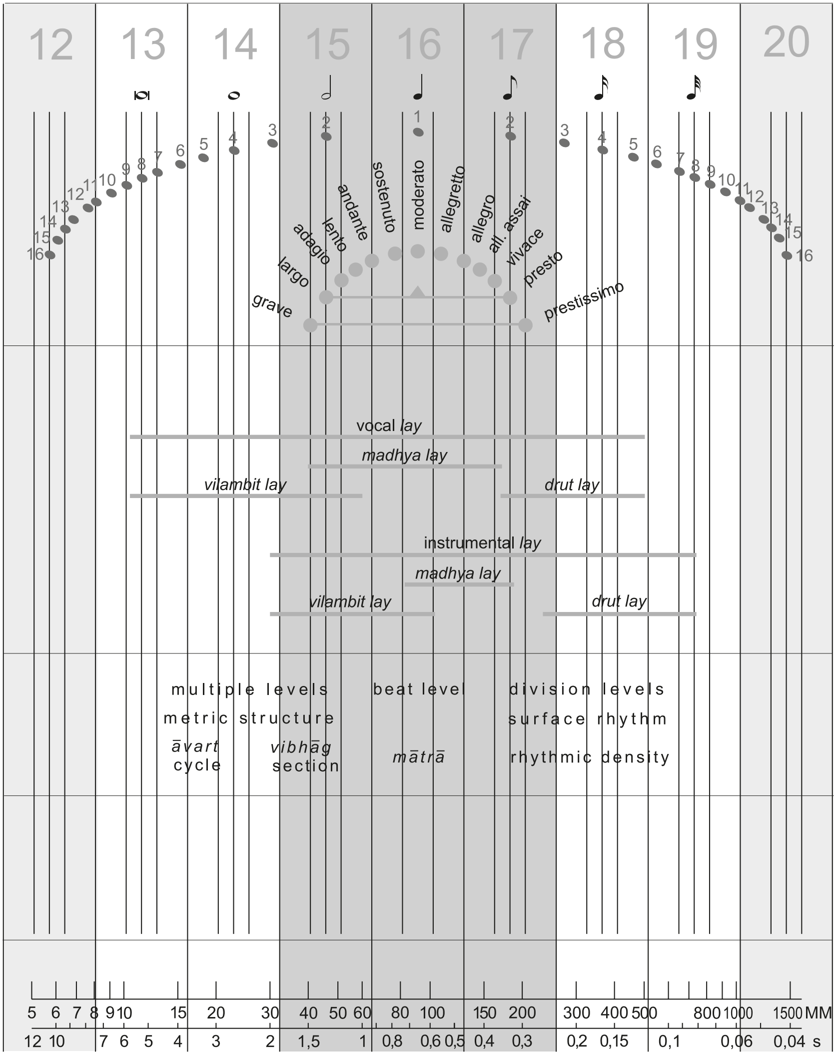
131 Clayton 2000, 77.

132 Gautam 1977, 341; Rowell 1988, 150.

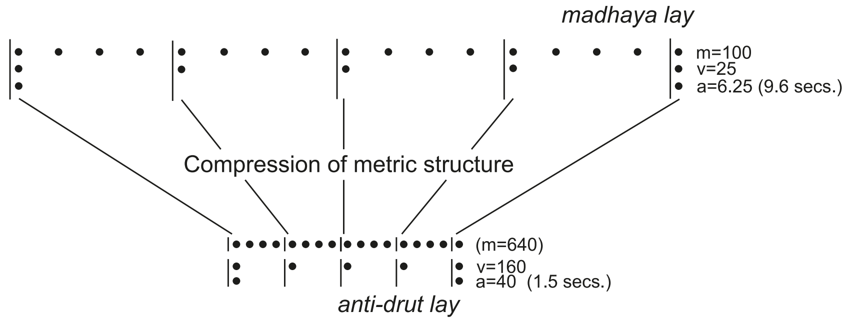
133 Clayton 2000, 86, Table 6.6.

134 Ibid., 42.



Example 4.23 Tempo ranges for Hindustani vocal and instrumental music. Clayton 2000, 86.

lay – tempo, rhythm; *madhya* – medium; *vilambit* – slow; *drut* – fast



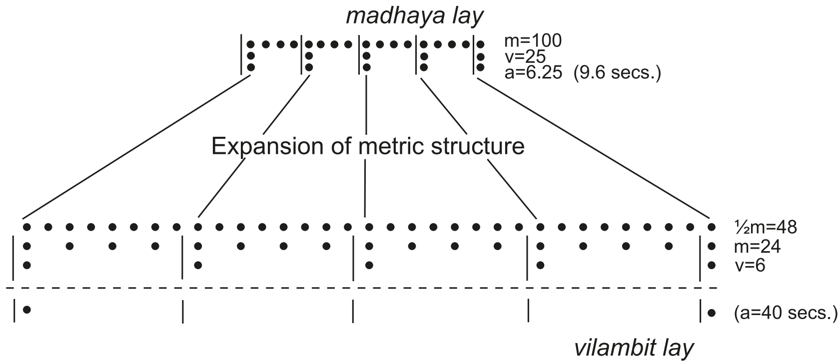
Example 4.24 Illustration of the compression of a *tāl* structure at a very fast tempo. Clayton 2000, 79.

The effective pulse of music was obviously focussed solely on the central regions of the psychological present, like perceived tempo or Renaissance 'tactus' in European culture, 'being the rate of succession of one of the pulse rates, selected according to psychological and/or physiological criteria. […] The listener tends to focus on one (or two) intermediate level(s) in which beats pass by at a moderate rate. This is the level at which the conductor waves his baton, the listener taps his foot, and the dancer completes a shift in weight'.[135] Indian theory, continued and developed for centuries, employs elaborate theoretical terminology and customary procedures. The accumulation of theory from different eras no doubt generates conflict between theory and musical praxis, which depends on human psychophysical capacities.

In Indian theory, the *mātrā* belongs to the block of metrical levels known as *tāl*. That block covers *mātrā* (beat), *vibhāg* (section) and *āvart* (cycle), so all the metrical levels, from the basic unit to a full phrase. Each metrical level displays its own tempo (MM).

The most curious feature of traditional Indian theory is the assumed possibility of freely moving a *tāl* structure to different *lay* tempo levels, within a range covering the whole of the zone of the psychological present and the two neighbouring regions of the zone of works, from 600 MM, and even 720 MM, to less than 2 MM, 40 secs. Clayton tries to justify this in terms of tradition and explain it with graphical examples on a scale of the succession of time; hence he speaks about the compression of a metrical structure (an increase in tempo) and the expansion of a metrical structure (a reduction in tempo).

135 Lerdahl and Jackendoff 1983, quoted in Clayton 2000, 48, 78.



Example 4.25 Illustration of the expansion of a *tāl* structure at a very slow tempo. Clayton 2000, 80.
madhya lay 'medium tempo'; *ati-drut lay* 'very fast tempo'; *vilambit lay* 'very slow tempo'

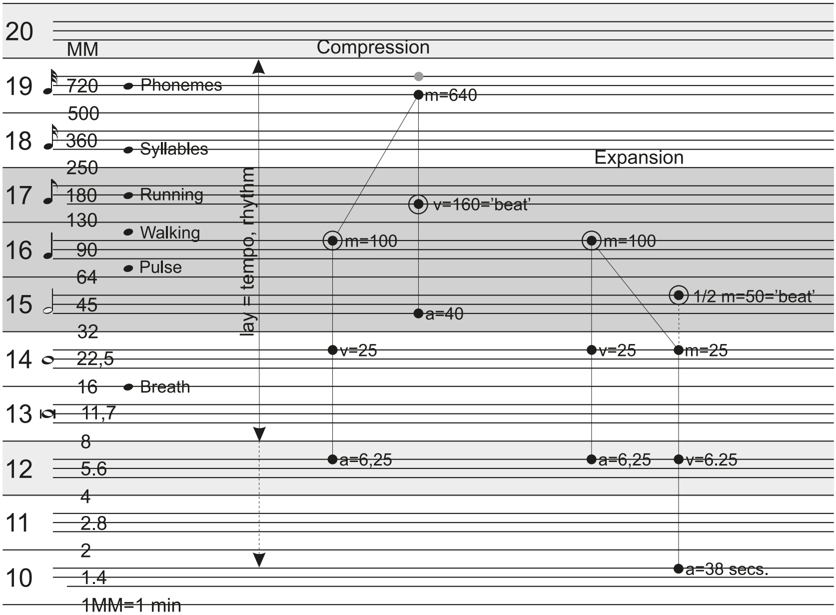
Examples 4.24 and 4.25 illustrate both the basic model and the effect of its distortion by extreme shifts in tempo:

> Example 4.24 illustrates how, when the metric structure is compressed at very fast tempi, the listener counts the *vibhag* as the 'beat', giving a tempo shift up to (in this example) 160 MM, rather than 640 MM (the higher rhythmic density in *ati-drut lay* would be significant in further influencing the listener's perception of speed but not 'tempo' in its strict sense as the rate of metric progression). […] Example 4.25 shows how, when the metric structure is expanded at slow tempi, the listener counts the half-*mātrā* pulse as the 'beat', giving a tempo shift down in my hypothetical example to 48 MM, rather than 24 MM. […] However, such designations have not become standardized or even consistently used; it may even be that the trend is now in the opposite direction, to standardize the number of *mātrās* designated for each *tal* while releasing the concept of *matra* from its functional significance.[136]

Example 4.26 represents the transferral of the data in the previous two examples from the scale of the succession of time to the scale of the levels of time, with the levels discharging different functions. The ultimate effect of these procedures is that the function of the basic beat was taken over by a different level than the *mātrā*, falling within our European understanding of the Mälzl metronome scale (40–208 MM).

Example 4.27 is a model representation of Indian music with many of its characteristic properties, shown in a system of similarities of time (logarithmic scale)

136 Ibid..

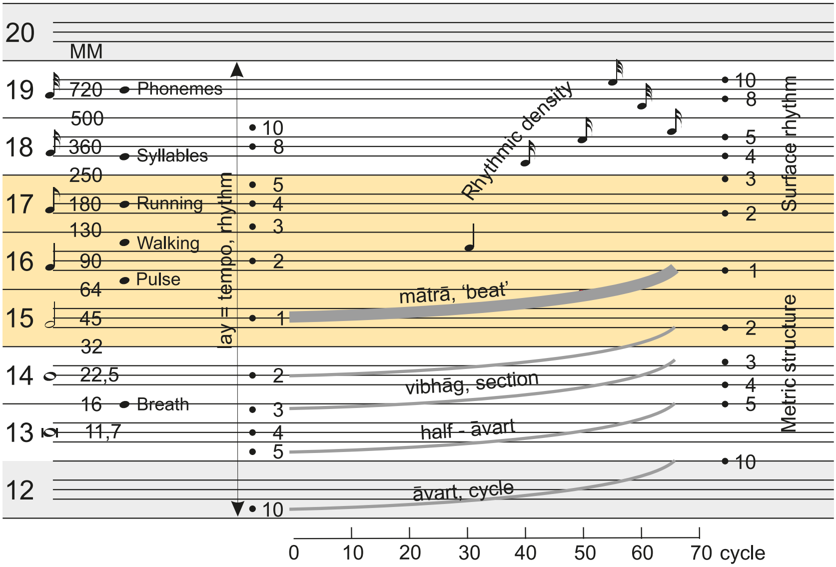


Example 4.26 The transferral of data from the previous two examples to the scale of the levels of time.

m *mātrā* 'beat'; v *vibhāg* 'section, clap pattern'; a *āvart* 'cycle'

and in the context of the succession of time (linear scale). Such distinctions, although not necessarily fully realised, are widespread in musical thought and theoretical reflection; it is only the habit of using a linear scale of time to measure its qualitative aspects as well that blurs the true picture. In our work, we consistently depart from that flawed tradition. We regard the similarity of time to be equally as important as the succession of time. Similarity is manifest in the generally adopted system of rhythmic values, in the degrees of the MM metronome scale, in the hierarchy of metrical levels, in its visualisation in dot notation (Lerdahl and Jackendoff), in the surface rhythmic density and in the *lay* ratio (x:1). This is shown by Example 4.27.

I gain the impression that the basic metrical order in Indian music is not the first order, the *mātrā* (beat, tactus), but the second level, *vibhāg* (section), of hand gestures, and the last level, *āvart* (cycle), of metrical phrases. Hand gestures divide the flow of *mātrās* into *vibhāg* sections (from 2 to 4 units), allocate them a function in the sequence and shape the whole metrical phrase of an *āvart* (cycle).



Example 4.27 Model representation of Indian music, based on various examples. Clayton 2000, 47, 158.

mātrā (beat), *vibhāg* (section) and *āvart* (cycle)

That is borne out by Clayton's analysis, beginning with the gestural structure of a phrase and only then representing the whole metrical hierarchy, from the *mātrā*, through the *vibhāg* and half-*āvart*, to the *āvart*. One might say that Indians do not 'beat' music, but 'phrase' it (cycles); they divide it into phrases of a cycle, repeated many times during a work. The repetitiveness of metrical phrases distinguishes Indian music. The ultimate goal of the metrical structure is the shaping of the phrase.

In Indian theory, a whole metrical structure, including the basic tempo of the *mātrās*, is contrasted with the surface rhythms and rhythmic density, measured in relation to the basic metrical unit (the *mātrā*) at a given moment, since its tempo may change over the course of a work.

Indian music has not developed the periodic design that came to dominate European musical culture, developed out of the sense of harmony. Harmonic functions and tensions and their resolution make it easier to distinguish phrases and merge them into periods and to build up larger formal units. In oriental cultures, various methods have been used to expand form, including agogics. The dominant principle is to begin a work in a slow tempo and gradually accelerate, and especially to accelerate towards the end of a work and conclude it abruptly at the moment of greatest tension. Also calculated for a structurally changeable tempo is rhythmic density. Kinds of tempo also differentiate musical genres internally; a division into slow, medium and quick is highly characteristic.

Within this context, it is worth citing, after Clayton, Jonathan Kramer's distinction between linear and non-linear time in music:

> Linearity, for Kramer is related to the functions of the brain's left hemisphere; it is deductive and sequential, and understands time as 'containing a sequence of events'. Nonlinearity is located in the right hemisphere, is holistic and continuous, and understands time as 'containing a complex of events'. Kramer lists characteristics of these two concepts as follows:

Linearity	Nonlinearity
teleological listening	cumulative listening
horizontal	vertical
motion	stasis
change	persistence
progressive	consistency
becoming	being
left brain	right brain

> His implication seems to be that music can exploit either or both of these complexes, and that any piece of music exhibits both linear and non-linear features. Linear features, for Kramer, are those aspects of music which seem to be determined by what has gone before, while nonlinear features are determined by characteristics of the piece as a whole. Thus harmonic motion, cadence, and closure are linear features, while (for instance) the metre of a consistently metrical piece, or the composition of an ensemble, are non-linear features. Tonal music (so far as it may be generalized) exploits linearity almost to the greatest possible degree, since it is built on logical development, teleological listening and development towards final cadence and closure. Closure, for Kramer, 'is most comfortably associated with tonality'. […] relative to Western tonal music, Indian music seems to display non-linear features more prominently and linear features less so.[137]

4.5 Music and language as sound systems

To being with, I would like to point to the perspectives of two scholarly disciplines, the problems of which appear to stand out. I have in mind here primarily music

137 Ibid., 24–5.

phonology, that is, the study of sound functions in musical texts, and a much broader discipline, namely, general phonology, understood as the study of the foundations of various sound systems created by man, not just linguistic systems. In particular, I will attempt to show the following:

- language is by no means the only phonological system, as linguistic studies usually suggest;
- music is an independent phonological system, as is versification, even though it is closely linked to the system of language;
- in this situation, there is a need for comparative research into different phonological systems and their consideration from the perspective of the general study of the sound systems that have taken shape as human culture has developed.

So the situation today looks similar to what occurred several decades ago, when through the study of language we became fully aware that language was by no means the only semantic system, and the aims of general semantics and semiotics thereby took shape. We know, however, that semantics in linguistics has still not been fully described. Many eminent linguists have even doubted whether it would prove possible to forge a semantics based on strictly scientific foundations. That pessimism was perhaps exaggerated, but it indicates the difficulties in semiotic research even in relation to such a par excellence semantic system as is language, not to mention other systems not defined in that respect which are nevertheless in some way semiotic, such as music. Happily, despite those difficulties, semiotic-type research is conducted into music, although one can hardly suppose that this field will advance without resistance. It will certainly be accompanied by ups and downs, flashes of inspiration and crises of doubt. Perhaps nowhere are there so many potential dangers in drawing rash conclusions. However, let us not play prophets but express our estimation of those not deterred by the difficulties.

At the time when the perspectives of semiotic research were taking shape, the aims of phonology were also crystallising. Phonology became the first discipline of modern linguistics. To a considerable extent, it was the successes of phonology that ensured linguistics of the reputation of a leading discipline in the human sciences with regard to modern and scientific research methods. It seems to have been overlooked, however, that language, just as it is not the only semantic system, is not the only phonological system. That at least is the thesis which I wish to posit here.

The premises of phonology were formulated during the thirties by representatives of the so-called Prague School: Nikolay S. Trubetskoy and Roman Jakobson.

The foundations had been laid several decades earlier by the Polish linguist Jan Baudouin de Courtenay.

The task of phonology, which is sometimes called functional phonetics, is to establish how language uses sound material, selecting some of its elements and adapting them to its own purposes. So phonology encompasses all the linguistic functions discharged by sound. The essence of phonology is above all distinguishing in sounds the layer of features that are particularly important with regard to the functioning of the system, namely, distinctive features serving to distinguish morphemes and words. That aspect of phonology is the domain of phonemics.

Interest in speech sounds dates back a long way. Yet phonology only arose when scholars learned, from the sound substance of language as described by phonetics, to distinguish the basic functional elements of the linguistic system. If phonetics aspires to gathering the fullest body of knowledge about the whole phonic mass occurring in texts, about its physiological and physical properties, then phonemics, and phonology in general, employs strictly linguistic criteria, sorting and classifying the material recorded by phonetics. Phonology studies not isolated phonetic facts, but language as a system. Its task is to define the invariants of the system and to study the elements combined in the complex network of relations.

These research postulates, according with general trends in the modern mathematical-natural sciences, bore a powerful influence over a range of human sciences, as well as forging a path for themselves in musicology. Yet it is not these methodological tenets that concern me at the moment. Here, I am posing a much more specific question. Is the phonological system of language, involving the distinction of layers of distinctive features among many other acoustic features, linked to specific features of language or, on the contrary, is music, with its own layer of distinctive features, also a similar phonological system?

Let us take a closer look at the overall structure of the distinctive layer of language. Initially it was phonemes that were considered to be the elementary units of a text, capable of differentiating words. Jakobson led others in breaking phonemes down into distinctive features and showing that they were bundles of such features, selected from binary oppositions such as vocalic/non-vocalic, voiced/unvoiced, nasal/oral, dark/light and stressed/unstressed. There are usually few such oppositional features in language. In known world languages, Jakobson counted around a dozen or so binary oppositions. Not all of them occur in specific languages. A number of them are common to nearly all languages, whilst others appear in just some. Selected distinctive features combine in bunches known as phonemes. There are usually several dozen of them in a language, and sequences of phonemes form compound units as morphemes and words, which are marked by a relationship to reality, so are semantic. Distinctive features, although they serve to distinguish words, do not possess semantic value in themselves; they are merely used to construct and distinguish the acoustic foundations of such semantic units. So they are linked in a specific way to the semantic aspect of language, which suggests that distinctive features are possible in language alone. It is my conviction, however, that the essence of distinctive features is not the fact that they occur in a semantic system, but that they are relatively few in number yet can be used to create many complex and qualitatively different structures, which depend upon the kind and combination of such fundamental, elementary oppositions. I will try to demonstrate that music also has such oppositional features at its disposal. The only difference is that in music other features are distinctive and are not used to forge a semantic system. So it is not the lack of phonological structure that makes music different from language, but a lack of morphemic and verbal structure. In order to prove this, it is enough to show that music possesses its own layer of distinctive features, distinguished among many other acoustic features.

So let us try to find those contrasting, elementary oppositional qualities of the sounds of a musical text. They are undoubtedly note pitches. After all, they do not form a continuous scale. Such a continuous character is possessed by the physical scale of pitches on which musical distinctive pitches form qualitative nodes. Every degree is clearly oppositional in relation to every other degree; it is a new musical quality. Different scales of oppositional pitches function in different musical systems; they are conventional to a similar extent that the phonemes of language are conventional.

Pitches, the so-called tonal features of language, can also be distinctive in language, but their structure is then completely different from what we observe in music. The differentiation of so-called pitch levels in language involves only the contrast of pitches. Pitches can be smaller or larger, but there is no fixed proportion between them. Even when the distinctive levels have many degrees, they do not form specific intervals.

Another kind of pitch also functions in languages: pitch linked to the intonation of phrases and sentences. Yet such pitches are not oppositional; they form a continuous scale and undulate freely within the soundspace. In music, a melodic line often receives such forms, but that line is based on strictly defined scale degrees. So non-distinctive features of language became clearly phonemised in the musical system, couched in a system of oppositions.

Distinctive musical pitches are of an eminently relative character; they are defined in relation to other sounds in a given sequence. Yet in sounds we can also distinguish inherent pitch features, since we can state that they are low or high in some absolute sense or in relation to the scale of a particular voice or instrument. However, these pitch features, unquestionably also musical, are not among the features which we are calling here the distinctive features of a sound system, in this instance a musical system. Oppositional are only the relations between pitches in a piece of music.

Another class of phenomena contained within the system of oppositional features in music consists of the temporal properties of the sound flow, but only if that flow is metrical. In such cases, the rhythmic values form a system of quantitative oppositions capable of creating various rhythmic sequences, depending on the choice and arrangement of the elementary distinctive features of the quantity. In an ametrical sound flow, even a quantitatively differentiated one, there are no strict rhythmic values, just as there are not normally any in language (incidentally, some recitation models can bring a musical-type quantity to language and versification). In an ametrical flow, the values differ only in terms of quantity, not quality, so they cannot be numbered among distinctive features. Only metrical values of fixed proportions are distinctive.

So is note duration another distinctive musical feature alongside pitch? Well no. Neither note duration nor the proportions of the lengths of the notes themselves is distinctive. Suffice it to realise that the same rhythm may be performed in notes in close contact, that is, legato, or in notes in open contact, such as staccato. The duration of the actual notes has altered, but the quantitative structure remains. Only in close contact is note duration a distinctive rhythmic feature. So it is not note length that is responsible for the quantitative structure of a work; it is not that which creates the oppositional quantitative features of a musical system. But I will return to these questions below. First I would like to continue the search for further distinctive features in music – besides the features referring to pitch and quantity.

As we know, pitch and quantity are prosodic features of language, which in some languages are distinctive. A third such prosodic distinctive feature can be stress (I pass over here intrasyllabic features of prosody). The question arises, therefore, as to whether stress is also distinctive in music. It would be premature to give a definitive answer, since we must first investigate all the phonemic systems in the various 'musical languages' of the world. Generally speaking, however, dynamic accents, like all phenomena relating to dynamics, are not distinctive in the sense that pitch and quantity are distinctive. They are rather culminative features, highlighting certain distinctive features. They form various degrees of intensity, differing in terms of quantity, not quality. So-called metrical accents also fall into a kind of hierarchy, but – as we will see – dynamic accents are only redundant, complementary features here, since metrical structure is of an eminently quantitative character. There also exist melodic and quantitative accents, but they refer to the above-mentioned distinctive features of pitch and quantity. In language, it is above all note timbres that are expressed in a system of oppositional features. Nothing of the sort can be discerned in music. Here, timbres can form subtle shades, colouring a piece of music; they do not form qualitative, oppositional nodes like pitches and quantity. Even contrasts between the timbres of different instruments function along different lines in a work than the distinctive features of a musical system. Perhaps more complex is the situation with regard to harmony and the opposition of harmonic functions, but they too are merely derivative features of the relations between note pitches. Tempo and agogic phenomena in general are based on continuous quantitative scales. So we find no distinctive features in music besides pitch and quantity.

I have already mentioned that we owe to Jakobson the demonstration that in language distinctive features form binary oppositions. In language, there are usually around a dozen or so such polar oppositions. So the distinctive features of a language form something like a number of two-degree scales, scales of polar opposites. In music, meanwhile, we are dealing with the binarism of two features, two qualitative planes, pitch and quantity, but expressed in multi-degree scales of oppositional qualities.

We know that distinctive features, those oppositional qualitative features, exist in language always in bunches known as phonemes. The number of such features in phonemes varies. There are usually several of them. Let us now look at how musical distinctive features exist.

Music may be understood as a filling in of musical time with notes of different pitch, duration, timbre, strength, and so on. The polar opposite to that note duration would be the lack of a note, that is, a rest, also with its duration in time. That duration of notes comes here to the fore. Such a view appears to be confirmed by physical analysis of a piece of music, defining the quality of the notes that fill the duration of the piece. But music is not physics. Although notes are physical and there would be no music without their physical character, music employs notes as elements of a musical language, in which those elements discharge specific functions. Looking at music from this point of view, we note that its flow is organised not through the essentially quantitative duration of acoustic qualities, but through the qualitative changes brought about by successive notes in a work. Those changes do not normally represent a gradual, smooth passage from one quality into another. On the contrary, they take place violently, so quickly that we do not sense their temporal character. It is only the specific qualities between those nodes or impulses of qualitative change that have any duration; it is the qualities fixed in those impulses of sudden change that last. So it is not the contrast between the duration of a note and the lack of a note in a rest that is the basic, elementary contrast of the musical process, but the contrast between a musical impulse and the lack of that impulse. The time between those impulses can be filled with a sound shaped in a musical impulse or with a soundless duration. Sounding and soundless duration are just two variants of the same musical duration, filling the space between musical impulses spread out over time. Such an impulse is formed by every appearance of a new note; more specifically, the culminative initial point of a note (not to be confused with the climactic point of a note, which does not necessarily fall at the beginning of a note), which constitutes a bundle of musical distinctive features; it is at the same time a melodic and a rhythmic impulse. That sound impulse, organising the sound flow in the pitch and time space, is followed only by the sounding or soundless filling of the musical time. So we have an answer to the question posed above. The phonemes of language have their equivalent in musical impulses, bundles of two musical distinctive features. In language, as we recall, phonemes were formed by a variable number of distinctive features, but that results from the above-mentioned structure of linguistic distinctive features, arranged in many binary oppositions. However, musical impulses can be compared also with another property of language, namely, with the sequence of syllables, with the flow of syllabic elements contrasted with non-syllabic elements. In syllabic song, impulses of the sequence of syllables coincide with musical impulses. Thus the syllables receive new, musical distinctive features.

I have already indicated that oppositional musical features organise a sequence of notes on two planes: pitch and time. Now I would like to turn attention to a crucial similarity in the construction of both those musical planes.

One normally thinks of comparing note pitch and rhythmic value as the two basic features of melody. Thus rhythmic value would be the equivalent of pitch in the temporal layer. Were that the case, one would have to assume that the structure of those equivalents was entirely different. A single sound impulse suffices to define a pitch. That impulse defines the pitch progressively; it begins the given value. However, a rhythmic value must be defined by two impulses: the beginning of the value and its ending in the form of a new impulse, opening another value. So what corresponds to pitch on the temporal plane? We have already ascertained this: it is the rhythmic impulse that coincides with the pitch. In light of this, what is the melodic equivalent of the rhythmic value? It is a melodic interval. This requires the same kind of definition; it measures the relationship between two impulses. The melodic interval measures it on the plane of pitch, and the rhythmic interval on the plane of time. In both cases, the interval is defined retrogressively, in relation to the preceding impulse.

Every note pitch has two kinds of interpretant (as does every other sign, not only musical), since it is defined in relation to a code of pitches, that is, the pitch scale, and in relation to the context. A note is a choice among other notes in a scale; it is a degree of that scale. On the other hand, it stands in a specific relationship to the notes of the given sequence with which it forms intervals. Intervals, in turn, can be defined absolutely, like the interval of a major third, or relatively, like the distance between the fourth and sixth degrees of a major scale. And how do things look on the quantitative plane? Are rhythmic features also defined in relation to a code and a context? What is the equivalent here of the scale? Is it perhaps an inventory of the rhythmic values used? No, since the inventory of melodic intervals corresponds to such an inventory, and that is not the same as a scale.

A metre has an eminently hierarchical structure; metrical units are arranged hierarchically within a metre. We usually come across a similar phenomenon in the pitch scale, which is not just an inventory of used pitches; in the pitch scale, notes discharge specific harmonic functions. In a scale, one can usually distinguish a tonal core, in relation to which other notes stand in dominant relations, requiring resolution to the notes of the tonal skeleton. There is a certain analogy here with the hierarchy of strong and weak beats in a bar. Impulses on weak beats require rhythmic resolution on strong beats; then a certain rhythmic equilibrium is maintained. If, however, rhythmic impulses fall on weak beats and are lacking on hierarchically more important beats, then conflictual rhythms arise, specific rhythmic dissonances, in the form of various syncopations, broken rhythms and so on.

I was supposed to have been dealing with musical phonology, and up to now I have been concentrating solely on aspects of musical phonemics, treating of musical distinctive features. The existence of layers of oppositional distinctive features in music proves its phonological structure, and that is what I was mainly concerned with showing. Yet that may create the impression that only the distinctive features of a system are crucial in musical texts. That is not the case. Besides those oppositional features, other musical features, such as configurative features, mainly culminative and demarcative, and especially sonoristic and expressive, play a very important role. Moreover, musical distinctive features can never occur independently. I have already shown that, besides a distinctive pitch, every note is defined indistinctively in terms of pitch; it is simply high or low in the absolute sense or in relation to the scale of a voice or an instrument. The same applies to quantity. Here too, only relational features are oppositional, but rhythmic and metrical values also have inherent features; they are short, long, very long and so on. Tempo is linked to these features. These are all non-distinctive features of a musical system, although they cannot be separated from specific musical texts – that is, of course, from texts in their normal, sounding form. Musical scores, as substitute forms of actual musical texts, are often confined to giving almost exclusively distinctive features, partly covered up by specific musical orthography, which does not fully reflect the actual structure of the musical text.

I was not concerned here with elaborating fundamental aspects of musical phonology, but rather with indicating issues for research. Besides, I was speaking only about general phonological differentiations, and musical phonology, like the phonology of language, has a crucial sense in the analysis of specific musical 'languages'.

I have cited a few comparative remarks concerning the phonological system of language and music, but I have passed over versification and its phonological systems. I will only state what I should be demonstrating, namely, that so-called versification systems differ in the selection of the distinctive features of the system. Evidence would also be required to support the claim that different phonological, linguistic, versification and musical systems exist because they make use of various features of sounds to build their own systems of distinctive features. That fact makes it possible for several phonological systems to occur simultaneously in the same sequence of notes – systems that can be and indeed are recognisable. In ordinary folk songs, for example, there exists a layer of distinctive features of language. Secondary, non-distinctive features of language are included in a versification system, and secondary linguistic and versification features function, or rather they are transformed into musical distinctive features. This all requires proof. It is my opinion, however, that these remarks already give rise to a certain area for research into both musical phonology and general phonology. If so, then our aim has been achieved.

The issues addressed here required new notions, and consequently new terms. I have employed in large measure the terminology of Roman Jakobson and Morris Halle's *Fundamentals of Language*,[138] although those terms, used in a new context, isolated from language, might not always seem felicitous. However, the retention of that terminology also had the advantage of revealing structural similarities between language and other sound systems, and that was one of my principal aims.

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138 Jakobson and Halle 1964.

For some time now, we have observed an invasion of linguistic and semiotic methods in research into music. The general question that underpins that research is the extent to which music is a language. Compared to natural language, either music seems to be a less perfect system, not fully developed in its basic linguistic functions, or else it is suspected of being a system equally well developed, but as yet insufficiently analysed. Of course, the question as to what music is as a language remains justified, and the answer to it may reveal properties of music of which we remain insufficiently aware. Generally speaking, however, it will lead us astray if it is not backed by the fundamental question as to what music is as music and counterbalanced by the equally justified question as to the extent to which language is music. This last question may seem paradoxical, but it is at least equally as justified as the first. That is because music and language are linked, above all, not so much by their semiotic character and the possibility of transmitting semantic content (that thesis has been questioned) as by the sounding character of the two systems (that thesis cannot be questioned).

Comparisons between music and language have been aimed mainly at discovering similarities. Yet what emerges most from them is the existence of a distinct opposition between the two systems. Music is often shown to be a mirror image of a linguistic system, or its reverse (which may be represented by the formula $M = L^{-1}$, in which M = music, L = language). These two basic sound systems created by man are highly specialised and mutually complementary, and they were designed to fulfil opposite functions. There was really no need to create similar systems. It was not similarity, but opposition and mutual complementarity that justified the sense of their distinction. Only in opposition to language is music music; only in opposition to music is language truly language and clearly reveals its specific properties. It should be remembered, however, that besides language and music there also exist other more or less developed sound systems of human behaviour, which may complicate the distinction of the domain of music in culture.

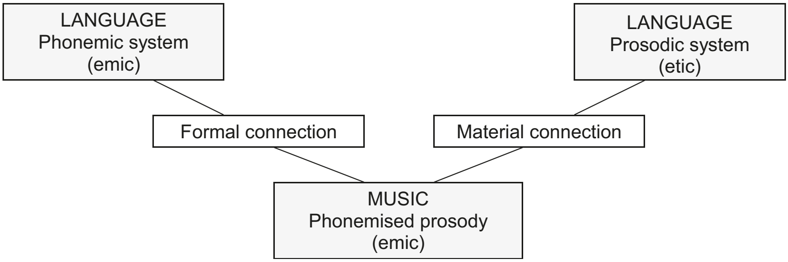
All the world's languages are created according to the general laws of the construction of linguistic systems, but the world's music is created according to the general laws of musical systems. Nowhere is it the case that the fundamental laws of linguistic systems formed the basis for the construction of a musical system or the fundamental laws of a musical system underpinned a linguistic system. In no culture is such an interchangeability possible; at most, certain similarities in secondary features are possible. The foundations of language and music are linked to the essence of our species; they evolved over the lengthy process of anthropogenesis and the development of culture. Anthropological foundations and their consequences determine the scope of our capacities, within which culture introduces certain constraints: not everything that is possible is used in culture.

The opposition between linguistic system and musical system does not preclude the existence of common features. The number of different qualities of sounds distinguished by humans is by no means limitless, and some features occur in both these systems. Language and music differ fundamentally from one another, however, in that different features in them are primary and secondary. In this respect, the two systems are clearly opposed to one another and mutually complementary. Generally speaking, one may state that often when some features are primary in language they are secondary in music and vice versa – when some features are secondary in language they are primary in music.

One specific quality of the sound system of language is its distinctly two-layer structure; those two layers differ fundamentally from one another. The first and more important layer is formed by the phonological system, without which language could not exist, since the phonological system encompasses distinctive features capable of differentiating elementary meanings. The other sound layer, based on different grounds, is formed by the systems of prosody, intonation and declamation, which also serve to build versification systems. Music is related to this sound layer of language. That similarity is based on shared sound material. The musical system is built of the same sound features from which the prosodic system of language is built. This carries serious theoretical and practical consequences. Music by its nature strongly interferes in the prosodic system of language; it seriously modifies it or transforms it entirely, but without the need for any serious interference in the phonological system of language. In song, the phonological system may remain untouched, whilst the linguistic prosody is replaced by musical prosody. The prosodic systems of language and music are largely mutually exclusive. One might even say that music is a specific, often much more developed, prosody compared to that which exists in language.

However, music is also related to the phonological system of language, through certain general principles governing the construction of its own phonological system, and to build that system music employs sound features that are not phonemised in language, but which serve in language to shape the system of prosody and intonation (Example 4.28).

The sound systems of language and music are based on the differentiation of discrete and continuous features. Discrete features (Example 4.29), known as distinctive in phonology, serve to build phonemic systems. In language, it is above all inherent features that are discrete, so the timbres of a sound; some relational features can also be discrete (features of intonation, quantity and stress). In music, meanwhile, it is primarily relational features that are discrete (pitch and quantity),



Example 4.28 Music's connection with the phonemic and prosodic systems of language.

whilst inherent features may additionally be discrete (note timbres and related inherent pitches). So the sound systems of language and music are in this respect clearly opposed to one another: music is like a mirror image of language. The situation is similar with continuous features (Example 4.30) (they might also be called phonetic or sonoristic features). These are also essential in every sound system. In language, it is above all relational features that are continuous (relative pitch and duration), whilst in music it is primarily inherent features (note timbres). More complicated is the question of dynamic features, which, with certain exceptions, are continuous in both systems. In respect to continuous features, as well, music appears to be the reverse of language. In addition, as one easily notes, the whole system of discrete features in language and music is a mirror image of their systems of continuous features. This is revealed by comparison of the two sets of data.

The opposite construction of the sound systems of language and music is distinctly visible in the way in which binarism and polinarism are manifest in them. In language, binarism is visible in the disposition of discrete qualities in opposing pairs. Each pair is like a scale consisting of two opposite qualities, two different degrees. Polinarism, meanwhile, is manifest in the multitude of such pairs of opposite qualities, in the multitude of two-degree scales (Example 4.31). In music, it is the reverse. Here, binarism is manifest in the opposition of the two basic scales: the scale of pitch and the scale of quantity. Polinarism, meanwhile, is expressed in the multi-degree character of each of those scales (Example 4.32).

Music has at its disposal discrete features of a specific kind, since they form nodes of qualities on the continuous scales of pitch and duration. So in this case one may speak of discrete-continuous features (or continuous-discrete) (Example 4.31).

The artificiality of such a term may jar somewhat, but it is difficult to find anything better. The most universal features are continuous features, since they

	Discrete features (emic)	
	Inherent (timbres)	**Relational (pitch and quantity)**
Primary feature	Language	Music
Secondary feature	Music	Language

Example 4.29 Discrete features (emic): inherent (timbres) and relational (pitch and quantity) in language and in music.

	Continuous features (etic)	
	Inherent (timbres)	**Relational (pitch and quantity)**
Secondary feature	Music	Language

Example 4.30 Continuous features (etic): inherent (timbres) and relational (pitch and quantity) in music and in language.

LANGUAGE		
Discrete features	Continuous features	Discrete-continuous features
	MUSIC	

Example 4.31 Discrete, continuous and discrete-continuous features in language and in music.

	Function of presenting	**Function of representing**
Primary feature	Music	Language
Secondary feature	Language	Music

Example 4.32 The functions of presenting and representing in language and in music.

occur both in language and in music. Language employs discrete and continuous features, music continuous and discrete-continuous features. Discrete-continuous features in music are the pitch and duration of notes. In both cases, the element of discreteness arises from relational features. In music, absolute pitches and absolute durations are continuous features (Example 4.33).

This issue can also be approached in a different way, distinguishing features of two different kinds in scales of pitch and duration: relational features of pitch and duration, which are discrete features, and inherent features of pitch and

1	Vocalic	Non-vocalic
2	Consonantal	Non-consonantal
3	Compact	Diffuse
4	Tense	Lax
5	Voiced	Voiceless
6	Nasal	Oral
7	Discontinuous	Continuous
8	Strident	Mellow
9	Checked	Unchecked
10	Grave	Acute
11	Flat	Plain
12	Sharp	Plain

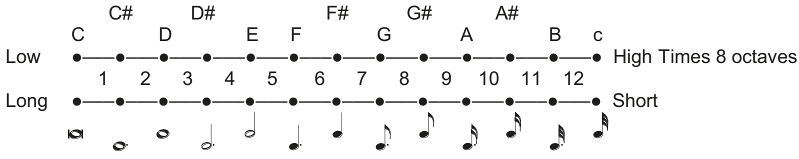
Example 4.33 The phonemic (emic) system of language – many binary 'scales'. Table based on data from Jakobson and Halle 1964, 6–82.

duration, which are continuous features. Inherent features of pitch are closely related to note timbres, forming a different kind of note timbre, as it were. In new music, when relational features of note pitches are relegated to the background, the timbral aspect of note pitches is automatically highlighted. Even inherent features of duration are close to note timbres.

When distinct relational features of duration and discrete rhythmic intervals are eliminated and values successively move towards the edge of the duration scale (to very short and very long durations), duration becomes clearly a sonoristic category. That is confirmed, for example, by Józef M. Chomiński in his theory of sonoristics.

Władysław Stróżewski prepared a list of seventeen oppositional features of musical sounds, which I present here in a different layout, in order to show their specific qualities to better effect (Example 4.35). The list is ostensibly similar to Jakobson's set of oppositional features used to construct linguistic phonemic systems (Example 4.33).

In actual fact, Stróżewski's list indicates the contrastive features of continuous (sonoristic) scales, with many possibilities of intermediate features, whereas in language we have discrete, clearly oppositional, features in which the lack of intermediate features is a crucial property of phonemic systems. Among the



Example 4.34 The phonemic (emic) system of music – two polinary scales.

performance features of music, Stróżewski also lists 'refinement', 'lightness', 'brightness' and 'darkness'.

Linguistic and musical utterances, as unfolding over time, have one feature in common: successiveness. What differentiates the linguistic and musical systems is the role played in them by simultaneity. Language is almost exclusively a system coordinating the succession of elements. Two ways of speaking are normally distinguished: monologue and dialogue. Dialogue can have more than two participants, but the principle holds that they speak one after the other and not 'all together'. In language, simultaneous coordination is something exceptional, artificial; hence, for example, the collective reciting of a text must be taught. That diverts attention away from the primary functions of language as a source of transmitting semantic content in favour of presentational aspects of the linguistic utterance. So it is a form of aesthetic behaviour, and in that respect it is close to music.

Although music can also confine itself solely to successive organisation, what distinguishes it is the huge tendency for various forms of simultaneous organisation. Harmony and polyphony are typical ways of shaping music in both individual and collective performance. Music also displays a strong tendency for simultaneous coordination with other forms of human behaviour, including dance, mime and language in the form of song or speech. All literary output is successively notated (with certain exceptions in experimental poetry), whereas music developed various ways of scoring that record both successive and simultaneous passages.

The aspiration to creating a uniform notional apparatus capable of encompassing both music and language is beneficial in every respect. There is a widespread conviction that semiology, the theory of signs, might be that apparatus. The fact is, however, that semiology arose as a generalisation of the regularities observed in language, and when transferred to music it shows its weaknesses. They lie at the very core of semiology, namely, in its definition of the sign as comprising at least two elements: a signifying element and a signified element that differs from it. The sign as thus conceived is not suited to music. It may appear in music, but it is then something exceptional, rare and peripheral. Despite this, convoluted attempts have been made to adapt this definition of the

	1	
Long		Short
	2	
Quiet		Loud
	3	
High		Low
	4	
Delicate		Resounding
	5	
Harmonious		Dull
	6	
Shaky		Fluent
	7	
Calm		Restless
	8	
Deep		Shallow
	9	
Soft		Hard
	10	
Heavy		Light
	11	
Fat		Thin
	12	
Blunt		Sharp
	13	
Warm		Cold
	14	
Rough		Smooth
	15	
'Velvety'		'Glassy'
	16	
'Wooden'		'Metallic'
	17	
'Dry'		'Lush'

Example 4.35 Continuous (sonoristic) scales, extending between contrastive musical qualities. Cf. Stróżewski 1987, 65; 2002, 270.

sign as a fundamental notion of analysis of the musical system. There are two possibilities for extricating ourselves from that situation.

1. Either one retains that narrow, one-sided definition of the sign, and then semiology will concern only the periphery of music and one will have to seek more fundamental notions and more general theory, in which semiology would be a specialist discipline.
2. Or one introduces a more general definition of the sign, in which the above-mentioned definition will apply to a special case of the sign, most frequent in language and exceptional in music. Such a solution seems the simpler and more appropriate. It would suffice to define a sign as comprising a signifying element and its signifying functions. At least several such functions could be

distinguished. One of them would be the function of referring to the signified element. A number of key functions of the sign are common to language and music.

- the diacritic function, distinguishing a given sign from other signs,
- the phatic function – initiating and sustaining communication,
- the function of referring to a code,
- the function of referring to the context of signs,

Two functions differentiate the systems in a fundamental way:

- the function of presenting the qualities contained in a sign and in combinations of signs,
- the function of representing, referring to other qualities, which is characteristic of the definition of a sign emphasising that it consists of a signifying and a signified element.

The distinction of the opposing functions of presentation and representation lends semiology a perspective apt to encompass the musical system, the linguistic system and many other systems of human behaviour, such as dance, mime and expression through figurative and non-figurative plastic arts. On account of the functions of presentation and representation, music again appears opposed to language (Example 4.32). Highlighting the function of presentation is the essence of the poetic and aesthetic functions, whilst highlighting the function of representation is crucial to the function of referring to the notions of verbal language.

It should be emphasised here once again that without the basic distinction of the functions of presentation and representation, semiology is a flawed product, which can barely satisfy the needs of linguistics (and is wholly unsuited to music analysis), relegating them to the periphery of study.

Language is essentially a sound system that is universal, customary and in a sense natural in human behaviour. That does not preclude the possibility of using language in unusual ways; for example, in highly emotional speech, in speech shaped through versification, in scanned speech, and so on. Music, meanwhile, is by nature a sound system that is far more exceptional, rare and occasional in human behaviour. Hence the seemingly paradoxical conclusion that the use of speech, as a common activity, is of little significance, whereas the use of song and of music in general, on account of its exceptional nature, signifies a great deal.

We say, quite rightly, that music and language are sound systems. If, however, we ask what the object of attention is in both those systems, we have to realise that only in music is the object of attention sounds and their forming. Language also uses sound shapes, but they are not the focus of our attention; they are tasked mainly with transmitting semantic content. In language, we observe not the sounds, but the meanings and their combinations. In a normal linguistic situation, sounds are presented to us. Our attention is focussed not on how the sounds present themselves, but on what the sounds represent, what they replace, to what they refer and what they symbolise. Hence sound shapes in language remain as if transparent in perception, allowing our attention to focus on the meanings.

It is only when a sound shape of language is distinguished by its unusual quality, when an utterance is appropriately declaimed, rhymed, rythmised or orchestrated with a thickening of timbres, that it becomes something like an additional object of attention. Yet that is not normal speech transmitting semantic content, but poetical speech, focussing attention at the same time on the manner of speech, the way the sound is shaped and the way the ideas are formed; so it assumes aesthetic functions. In this situation, speech presents itself to us in some way and does not only represent something or refer to something.

Music is by nature poetical; it attracts attention to itself and presents its sound shapes. Language is generally poetical only when it goes beyond its primary functions of communicating semantic content. Music can also mean or symbolise something, but that is a secondary function. In this respect, music is no competition for language; it cannot and does not wish to fully replace language. Even if music refers to something or presents something, the way in which it does so is less important than the transmitting of semantic content, and our attention focusses on how it does so. So even the semantic function of music – if music indeed possesses such a function – is strongly bound up with its poetical and aesthetic functions.

4.6 Music as the transformation of human movement

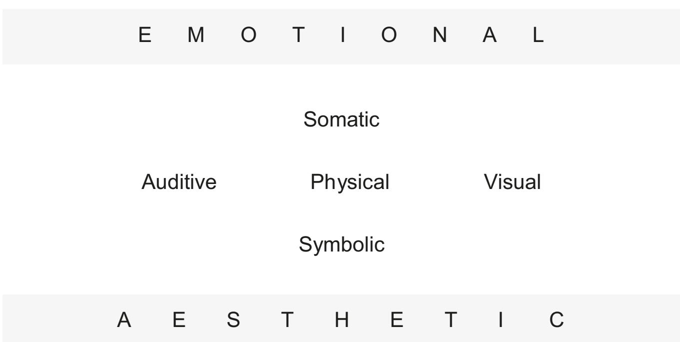
A common denominator of all movement experienced by people is time in the zone of the psychological present; apart from time, what distinguishes movement is the space in which it occurs. I have in mind here space in the broad sense, not only three-dimensional physical space. I will use the term ‘space of movement’ for all the dimensions in which movement is possible besides the dimension of time. Generally speaking, the spaces of movement depend on human capacities of perception. So in what spaces is movement possible in its human dimensions? (Example 4.36)

It goes without saying that movement is possible in the three-dimensional space which people perceive above all as visual space. So does visual space also have three dimensions of possible movement? Put on the spot, we would tend to answer in the affirmative. After some consideration, however, we would inevitably arrive at the conviction that visual space has more dimensions. To those three dimensions of physical space we must add the dimension of the intensity of light and colour. Changes in those dimensions, occurring over time, can also be a source of the impression of movement. Light is a basic condition of visual space; a lack of light eliminates that space. The possibilities afforded by the motoric properties of changes in light and colour have long been exploited, for example, in the theatre.

The intensity of light is one-dimensional; its scale extends from the lack of light to its maximum intensity. Changes in colour, meanwhile, can be multidirectional; they create a space of possible changes with an indefinite number of dimensions.

The dimensions of light intensity and colour variation offer broad scope for shaping movement, and with directed light they can even activate physical space.

With the movement of their own bodies, people can lead movement into three-dimensional space; mime and dance are particularly expressive of such movement. We do not possess such a command of the movement of light and colour. People are illuminated solely by reflected light. In order to introduce movement into the dimension of light, we need suitable transformers to turn the movements of our bodies into the movement of light and colour. One such transformer is the lighting deck in a theatre, connected to a system of spotlights.



Example 4.36 Spaces of movement: somatic, physical, auditive, visual and symbolic space, seen from the emotional and aesthetic perspectives.

So in visual space we have counted up to five basic dimensions of possible movement (without including the dimension of time). So what are the possibilities of movement in the auditive space? That space has primarily three autonomous dimensions. Movement can take place within it in the dimensions of the pitch, loudness and timbre of sounds; again, in colour, the variation occurs in multi-dimensional space. The pitch, loudness and timbre of sounds do not yet make use of all the possibilities for movement of the auditive space. Also present in the auditive space, albeit perhaps not in a very prominent way, are the dimensions of physical space in which auditive movement can develop. Experiments in new music are often aimed at activating three-dimensional physical space within auditive space. Again passing over the dimension of time, we have counted up to six dimensions of movement in the auditive space. It is in the auditive space, and not in the three-dimensional space of the loudness, pitch and timbre of sounds, that movement in speech and in music is manifest. In addition, live music and live speech introduce movement into the visual space through the kinetic behaviour of performers.

Does visual and auditive space exhaust all the possibilities of movement in music, language, mime and dance? Of course not. Movement is manifest also in another space, which I will generally call here the somatic or corporeal space. After all, we do not perceive the movement of our bodies solely in visual space; above all, we feel that movement inside. For humans, this is fundamental movement, since we can directly shape it. The movement that people introduce into the auditive and visual space has its origins in somatic movement. Speech and music represent the transformation of movement from the somatic space to the auditive space. This occurs by means of suitable transformers, in the form of the human vocal organs or special musical instruments. In speech, song and instrumental playing, people externalise somatic movements also in the visual space. We do this more distinctly in dance, and it is especially prominent in mime.

The dimensions of movement in somatic space are also associated with three-dimensional space: the space of the human body. Controlled movement can be located in different places in the body. Particularly crucial to our considerations is the autonomous dimension of the movement of somatic space: muscle tension. Variable muscle tension gives a strong sense of movement. In somatic space, it is above all dance movement that is structured and perceived; in terms of the strength of its effect, it outstrips movement in the visual space of dance. One of the fundamental differences between mime and dance is that mime forms mainly movement in visual space, with the somatic properties of movement relegated to the background, whilst in dance, in its most primary, communal form, a dominant role is played by movement in somatic space. Of course, in scenic, spectacular forms of dance, movement in visual space is more activated. Somatic space has also other dimensions in which movement can be realised, such as touch and the sense of ambient temperature; one may also number here taste and scent, with their own dimensions, in which movement can be realised, albeit to a limited extent. The somatic character of movement in dance is manifested in the touch of one's own body or the body of one's partner. Bodily contact and its change over time are highly characteristic of some dances. The corporeality of movement increases the temperature and scent of the body of one's partner.

It is hard to overestimate the significance of somatic space for our sense of movement. It is the origin, above all, of the dynamic, energetic aspect that is so important to the character of movement and is manifested in the changing states of tension and relaxation in the muscles. In music and in speech, the dynamic aspect is transformed into the auditive space in the form of the variation of the dynamic tensions of notes, but not only; the original source of our sense of rhythm also lies in somatic space.

The somatic, visual and auditive spaces do not yet exhaust all the possibilities of human movement. Movement is also possible in symbolic space. Here, one may speak of movement in a dual sense. First, our train of thoughts unfolds over time at different speeds. Thoughts can occur slowly, run in different directions, cluster together, and so on; this triggers movement in the symbolic space – movement on the layer of linguistic meanings, as Roman Ingarden would no doubt say. Secondly, movement can be contained in the layer of represented objects, of which it can be a crucial characteristic. It would perhaps be difficult to enumerate all the dimensions of symbolic space in which movement could be expressed. It is said that fleeting thoughts have no bounds. Besides this, every movement in somatic, visual or auditive space has its reflection in symbolic space, provided that we are aware of it.

Without the existence of this space, people would be incapable of making any consciously controlled movements. All creative activity – irrespective of the space in which it is realised, be it the visual, auditive or somatic space – must simultaneously activate the symbolic space. We have already said that people are capable not only of realising movement in a particular space, but also of transforming that movement, transferring it to a different space. Of course, that process also requires control in symbolic space.

The spaces distinguished here show on one side their relative independence and on the other their various interdependencies. So it is impossible to manifest any human activity, including artistic activity, which is confined to just one space. Various kinds of activity activate different spaces in different ways and to a different extent (Example 4.37).

	Spaces of movement			
	Somatic	Visual	Symbolic	Auditive
Music	xx	x	x	**xxx**
Language	x	x	**xxx**	xx
Mime	x	**xxx**	xx	x
Dance	**xxx**	xx	x	x

xxx – Primary space; xx – Secondary space; x – Tertiary space

Example 4.37 Spaces of movement in music, language, mime and dance.

Music activates above all auditive space, yet it is also not entirely independent of somatic space. It derives from that space and can also affect that space in turn, at least sometimes. We are familiar with the terms employed by virtuosi, including clarinettists, who assert with the utmost conviction that not only their respiratory organs, mouths and fingers take part in the playing, but that they play with their whole body, from the tip of their head to their feet. Sensory, bodily reactions to music are nothing out of the ordinary. The links between live music and the visual space need no justification. We are perhaps less aware of the connection between music and symbolic space. It cannot be contained within the framework of semiotics as traditionally understood. The same applies to linguistic activity. It is realised in auditive space, but above all in symbolic space. But is it entirely free from visual space? Mime could not exist without visual space, but at the same time it strongly shapes symbolic space with its narration. Somatic action is not alien to mime, and although it wishes, on principle, to free itself from auditive space, it does not do so consistently. Here, the constraints concern solely its filling with the human voice. It readily interacts, meanwhile, with a separately formed musical plan. Even more distinctly synchronised with music is dance. In dance, somatic movement comes to the fore, but movement is also clearly present in visual space. The largely mechanical nature of dance movement means that it is largely independent of symbolic space, but it is also not entirely able or willing to free itself from that space.

Let us try to round off these considerations with a conclusion: humans, who have essentially a single perspective on time, also have a single perspective on human multi-dimensional space, which they activate in various ways with their activity. The human world is one: the spaces distinguished here are interconnected; they are artificially abstracted aspects of our reality. Depending on its type, human motoric activity can leave an impression in one of the spaces mentioned here, but at the same time it is easy to indicate its connection with other spaces. Everything that humans can consciously do is movement of thought or movement of body. Conscious movement of the body requires the activation of thoughts, the engagement of the symbolic space in which the body's movements are encoded. They could have been encoded into thoughts through the cognition of their characteristic capacities. The range of those capacities was shaped as a result of motoric experiences.

The five spaces in which movement is possible are shown in the diagram, which also presents the system of connections and affinities between those spaces (Example 4.37). A central position is occupied by three-dimensional physical space. On one hand, it is encompassed by visual space, with its own two dimensions of light and colour; on the other hand, physical space also forms part of auditive space, which is distinguished by its autonomous dimensions of the loudness, pitch and timbre of sound. Also linked to physical space is somatic space, with one crucial dimension of muscular tension. There are more dimensions, if we include taste, smell, sense of temperature, touch and pain. The opposite of somatic space is symbolic space, with an indefinite number of dimensions. This space is also anchored in real, physical space, but at the same time it is linked to all the other spaces distinguished by us here. All movement in non-symbolic space also engages symbolic space, provided that we are aware of it, but not vice versa. Movement in symbolic, sensory space is not necessarily manifest in non-symbolic space.

It might seem that movement is conditioned primarily by three-dimensional physical space. However, such movement seen from the human perspective will not be movement if it is not a component part of visual, auditive, somatic or even symbolic space alone. It is patently clear to what extent three-dimensional physical space is an abstraction, a theoretical model isolated among the more complex spaces immediately experienced in the form of visual, auditive and somatic space. Three-dimensional space is insufficient for any human activity, including artistic activity. There is no purely spatial art in the narrow sense of the word, covering solely the three dimensions of physical space. So-called spatial arts must be at least visual arts, and then they are not contained with the three dimensions of physical space; as we can see, visual space has more such dimensions.

If you ask musicologists today what the main subject of their study is, they will tell you that it is music. If you ask organologists what the main subject of their study is, they will reply that it is instruments. That is a highly typical approach for our research traditions. In the pursuit of objectivity in our research, we lose sight of the fundamental subject: human life. Yet it is only through people that we are able to understand the sense of a musical instrument, since under no circumstances is it an autonomous subject; without people, neither a musical instrument nor music has any meaning. I would like to begin by underlining that human aspect of our subject.

Man, instrument and music. How to impart meaning to these three terms? The most varied definitions have already been tried, but they have always proved imperfect and will remain so for as long as learning about humans and human culture has a raison d'être and prospects for development. I will not dwell on the difficulties with constructing suitable definitions for our purposes. The exaggerated contriving of such obstacles is a fashionable mannerism of many contemporary studies. Here, I will proceed in defiance of that tradition and at once consciously formulate partial definitions of those terms, in order to set our subject on clearly defined tracks.

People are subjects of action aware of their activeness, disposers, executors and perceivers of the motoric gestures of their own bodies. People are capable of transforming some of those gestures into musical gestures, of perceiving them with their organ of hearing as the result of human motoric activity and of retaining them in their memory. Preserved in memory are both models of motoric gestures and models of musical gestures. People can also boost the capacity of their internal memory with external memory, in the form of the memories of other people, graphic notation, acoustic or cinematographic recording, and so on.

A musical instrument is a transformer of human motoric gestures, which always occur in time and in space, into musical gestures in musical, auditive time and space. That transformation covers the generating of sounds and the modulating of their parameters: pitch, dynamics, timbre and duration.

<table>
<tr><td rowspan="2">Transformation</td><td>Generation</td></tr>
<tr><td>Modulation</td></tr>
</table>

Every kind of instrument works according to its own code for the generation and modulation of sounds. Here are a few examples (4.38). In every case, the duration of movements modulates musical duration or tempo.

As we can see, the terms for the kinds of sound generation are taken from names relating to human motoric gestures (striking, plucking, rubbing, blowing) performed in relation to a specific object (instrument). The kinds of modulation can be described by indicating the mode of execution, that is, the kind of movement, the articulatory properties. However, it is qualitative features of sounds themselves that are subject to modulation, and the terminology is tailored to those features (the strength of a sound, pitch, timbre, duration).

Instrument	Generation	Modulation
Bagpipes	Pressing an airbag with the hand	Covering and uncovering the holes in the chanter with the fingers alters the pitch of a note
Violin	Drawing a bow over the strings	Changing strings or shortening them with the fingers alters the pitch; changing the strength of the rubbing alters the strength of the sound
Pipe	Blowing in air	Fingering and changing the strength of the blowing (overblowing) alters pitch and loudness
Drum	Striking	The kind, place and strength of striking with the stick or the hand alters the timbre and dynamics

Example 4.38 The generation and modulation of sounds on different instruments.

Music is the transformation of a sequence of human motoric gestures into a sequence of musical gestures, effectuated through the use of the vocal organs or special musical instruments.

A motoric gesture is a deliberate, elementary movement of the body, a person's only direct means of outward expression. So here I understand gestures in a very broad sense as all controlled movements of one's own body, assessed in terms of their human sense. So not all body movements are gestures. A heartbeat is not a gesture, neither is the flow of blood through the blood vessels, and so on. Breath can be, if it is clearly directed and used as a form of human activity, as in singing or playing wind instruments.

People can create motoric gestures using various parts of the body. Some parts are particularly useful for shaping such gestures, others less so. In addition, gestures can be more or less complicated and differ in many aspects. The most complex motoric gestures shaped at great speed are performed with the speech organs when they are used for linguistic utterance. Articulation is the system of such motoric gestures which are transformed into 'phonetic gestures'. Singing, and to some extent also playing on instruments, is linked to motoric gestures of the vocal organs. In playing wind instruments, people use mainly their lips and respiratory organs. Besides that, in playing instruments, it is most often the hands that are used, and especially the fingers, which are distinguished by great mobility and considerable mechanical strength; the legs have far lesser motoric capacities, and other body parts are used to make music only exceptionally.

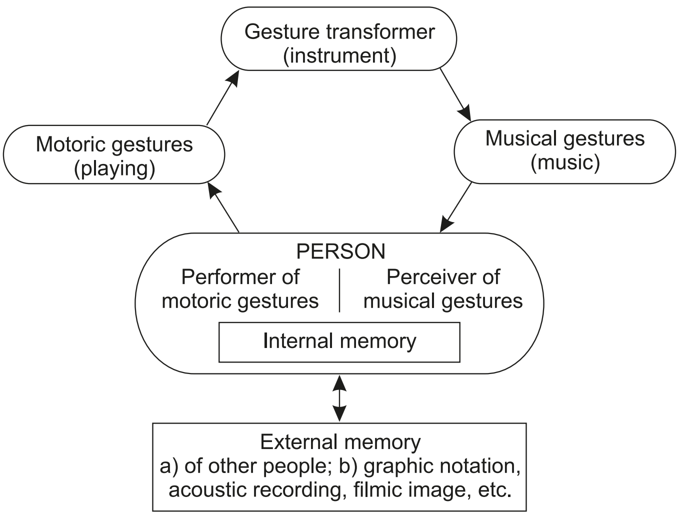
People are not capable of performing the motoric gestures of linguistic articulation on special instruments; to date, at least, they have not developed such technical capabilities. And no other human organ apart from the organ of speech is capable of performing such a multitude of aspects of movement at such a tempo. Hence it is impossible to develop instrumental speech after the fashion of instrumental music. Examples of 'instrumental speech' that are familiar from various cultures, such as the speech of drums, as yet have little in common with instrumental speech in the full sense of the word. People employing instruments and motoric gestures other than the gestures of the vocal organs are able to realise just a tiny fraction of the phonetic and prosodic system of language. It is another thing that this is sometimes sufficient for transmitting rather uncomplicated linguistic content.

I would like to emphasise once again that in instrumental music, as well as in vocal music and in speech, people are incapable of directly creating musical gestures or linguistic gestures in the form of articulated sounds. One can only create spatial gestures in the strict sense of the word, which in some circumstances are transformed into musical or linguistic gestures. This carries huge theoretical and practical consequences. The origins of the meaning of musical gestures should be sought primarily in human motoric gestures. Only those gestures are immediately available to people; only they can be directly controlled; only they can be transformed by people, recognising the source of those transformations in the movements of their own bodies. As a consequence, of crucial significance to our understanding of human expression in general is our understanding of motoric gestures. The only direct expression open to people is the movement of their own bodies: for example, dance or mime. All other kinds of expression, including musical expression, are the result of the transformation of actual human movement.

This allows us to offer a robust reply to the oft-posed question as to the sources and beginnings of music. They should be sought not in speech, not in syncretic art and not even in rhythm, but simply in people's controlled movement of their own bodies. Only that movement is primary in people. Musical movement is the transformation of that movement into another space – into musical space.

When playing an instrument, people employ certain motoric gestures. Those gestures are expressive of people's conscious activity, and they have their normal human meaning, their logic and their psychological content. It is on those gestures that performers' attention is focussed, since they are functional elements of the system that we call playing. However, motoric gestures understood in this way are also conditioned by complex processes of a purely physiological nature. They are externalised in the form of purely physical aspects, thanks to which they can affect their surroundings. Physical features can be measured, described in the language of physics and motion mechanics, assessed using criteria independent of people and recording using suitable apparatus. The controlling of human movement does not involve the ordinary controlling of the parameters of physical movement. Gestures are motoric complexes, elements of conscious action; they are a choice from the system of human motoric capacities, classified in a human way; they are of an alternative character. Because they have also physical aspects, they can affect a physical object such as an instrument, introducing certain changes into its disposition. They cause the stirring of the instrument as a source of acoustic vibrations and the modulation of those vibrations. In this way, human motoric gestures are encoded in the vibrations that reach people through the air, and they are decoded from that physical form, by means of the complicated physiological processes of hearing, and perceived as musical gestures. They stimulate the instrument as a source of acoustic vibrations and modulation (Examples 4.39, 4.40).

The question of distinguishing in human motoric gestures and in musical gestures, besides their human sense, also their physical properties is understandable. But is it possible to distinguish this human aspect in an instrument itself, which besides its physical construction has nothing that could be referred directly to people? Well, in this whole process of transforming human movement into musical movement, people also project their own logic into the instrument, that essence of movement which causes significant changes in the instrument's disposition. Among those crucial changes, we cannot include all the aspects of mechanical physical movement that can be ascertained while the instrument is being played. That is what prompted me to distinguish in the instrument itself not two, but three different aspects:



Example 4.39 General model of the transformation of motoric gestures into musical gestures.

- physical mechanical movement causing specific changes in the instrument's disposition,
- the essence of this movement and the essence of the disposition from the point of view of its action as a musical instrument,
- the physical vibrations of the instrument as a sound source.

This model reveals four perspectives for examining the process of the transformation of human movement into musical movement, perspectives that are characteristic of various scholarly disciplines. At the centre of interest in psychology is the person as a performer of motoric gestures and a perceiver of musical gestures. Physiology and playing technique are interested mainly in how motoric gestures, conditioned by various physiological processes, affect the instrument. Organology, of course, deals with the musical instrument, its construction, but also the playing technique that stimulates the instrument and the ways in which the parameters of those vibrations are modulated. Finally, music acoustics and the physiology of hearing are concerned with the instrument as a source of vibrations, the transmission of vibrations through the air to the human hearing organs and the process through which they become auditory impressions.

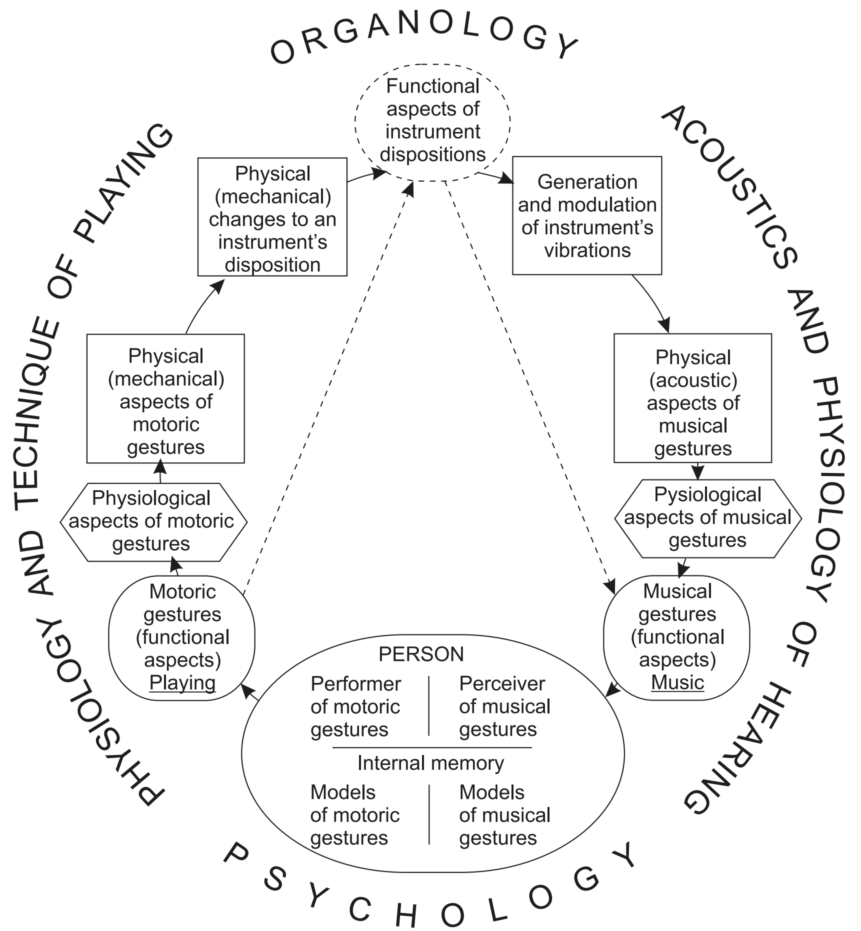
The common foundations of motoric and musical gestures are their temporal properties. The dynamic aspects of movement are often transformed into specific musical dynamics, into the strength of the sound, but they can also be used to shape note pitches. Different degrees of blowing, for example, can generate different notes in the natural series (Example 4.41).

It is primarily the spatial aspects of motoric gestures that undergo transformation, turning into a kind of musical spatiality in the form of musical pitches and at times also timbres. Musical instruments of different kinds, and even to some extent individual specimens, act in accordance with their own code for mechanically transforming human movement into musical movement. They introduce greater or lesser changes into the basic model of transformation, and that model looks as follows (Example 4.41).

The motoric operations performed by a person while playing an instrument cause changes in the instrument's disposition. The features and results of those changes are evaluated from two points of view:

- the system of features from which they were chosen,
- the disposition of those features in a temporal flow (in the simultaneous and successive contexts).

In all forms of human behaviour, music included, differentiation of this sort is entirely rudimentary. In many fields of learning, it has an established tradition,



Example 4.40 Elaborate model of the transformation of motoric gestures into musical gestures, functional, physiological and physical aspects.

although in my opinion not all of the theoretical consequences have been drawn from it. Peirce's linkage of signs with code and with context, de Saussure's selection (*in absentia*) and combination (*in praesentia*), and even language (*langue*) and speech (*parole*), Jakobson's metaphor and metonym, and system and syntagma in general belong to the same extended family of differentiations based on similar grounds. I have endeavoured to show that their origins lie in two different aspects of such fundamental notions as time and space. On one hand, time

Features of motoric gestures	Features of musical gestures
Temporal	Temporal
Spatial	Pitch-related
	Timbral
Dynamic (strength of movement)	Dynamic (strength of sound)

Example 4.41 General model of the transformation of features of motoric gestures into features of musical gestures.

and space form a system of different possible intervals (of duration, frequency, size and distance), from which all specific intervals are selected. Their similarities depend on the logarithmic scale of time and space. Le Corbusier's modulor, Stockhausen's theory of homogeneous musical time and my own zonal theory of time and space concern the systemic properties of these basic categories of all existence. On the other hand, time and space are continua in which all phenomena, features, qualities, elements and so on occur in a specific context and mutual relations. Of course, all temporal and spatial systemic properties (of duration, tempo, size, distance, etc.) occur within such a temporal and spatial context. Underpinning time and space as a context are linear scales of time and space.

Musicological analysis often aims to show the unique combinations of elements in an outstanding work of art. Ethnomusicological research is orientated primarily towards the systemic properties of phenomena. From specific shapings, texts, contexts, performances and so on, it aspires to recreating the systems that condition them. Such systems include all musical scales, human motoric capacities and the possible dispositions of an instrument used while playing. They can be studied from various angles; here, we will deal with their formal construction.

First and foremost, one should distinguish two basic types of scale, irrespective of the forms of human behaviour they concern: the discrete (discontinuous) scale and the continuous scale. In practice, one can also encounter a third type, formed by aggregates comprising heterogeneous elements arranged in a form close to a scale. In general, they can be broken down into homogeneous scales.

The functioning of the systems is based primarily on scales and discrete qualities. They usually have a limited number of easily recognisable elements, enabling a huge number of different combinations to be created and used in specific shapings. The small number of binary oppositions provide the building blocks for all known phonemic systems of languages (according to Jakobson's concept), allowing for the creation of the sound forms of their entire lexical resources. The limited number of scale degrees of musical pitches serves the creation of a great variety of melodic shapes, and the finite number of instrument positions and dispositions makes it possible to combine them in an infinite number of ways while playing. The action of discrete elements brings out the logical and structural aspects of shapings.

A different function is usually possessed by continuous scales, which act through their immediacy and spontaneity. In theory, there is an almost infinite number of different values in such scales, but there are only very limited possibilities for distinguishing among them. Continuous scales can serve both subtle shading and also large contrasts; they individualise identical structures – identical, that is, from the point of view of the disposition of their discrete features. Although their significance is limited with regard to the functioning of the system, they contribute substantially to determining such things as sensory and artistic values. In music, such scales include dynamics, colouring and agogics.

There is a need for precise research into how human motoric properties are transformed, through instrument dispositions, into musical forms. One tendency is particularly prominent: discrete musical features arise from some discrete motoric gestures and discrete instrument dispositions. Continuous musical scales also have equivalents in some continuous scales of motoric gestures and in continuous scales of instrument dispositions. It goes without saying that not all motoric gestures which can be observed during instrument playing are transformed into a musical form. Nor is it the case that a single musical scale corresponds to a single scale of human movement. On the contrary, sometimes two different scales of movement make up one musical scale. Binary oppositions – open vs closed pipe holes – and the number of pipe holes are used to create a scale of musical pitches.

Alicja Trojanowicz conducted detailed analysis of the motoric gestures of Polish pipers.[139] She distinguished three kinds of functional motoric gestures: (1) gestures providing energy to stimulate the instrument, (2) gestures stimulating the chanter and the drone, and (3) gestures serving to modulate the pitch of notes. The gestures of the first kind are linked to blowing air into the bag with the mouth, which is done using the breathing apparatus and the mouth, or pumping air by means of a manual bellows, which is the result of a movement of the right arm. These gestures have two parameters: (1) blowing or pressing

139 Trojanowicz 1979.

and (0) stopping the blowing or releasing the pressure. They cause respectively (1) air to be forced into the bag and (0) air to be drawn into the lungs or the manual bellows. Movements of this kind are regular, but they are not normally synchronised with the musical movement and are of no direct significance for it.

Motoric gestures stimulating an instrument performed with the arms have two analogous parameters, namely, the squeezing of the bag (Wo1) and the releasing of that pressure (Wo0). The pressure forces air into the drone and the chanter and consequently stimulates the acoustic vibrations of the pipes (Bu1, Me1), whilst releasing the pressure stops the vibrations (Bu0, Me0). On the plane of musical 'gestures', the impulse of blowing and the duration of a note or a sequence of notes (Dz1) correspond to the pressure, whilst the lack of a note (Dz0) corresponds to pressure release.

The strength with which the bag is squeezed does not really serve to modulate the strength of the sound. To obtain the effect of staccato, however, performers employ a stronger short press of the bag. In the Gostynin area of the Wielkopolska region of Poland, some pipers can obtain staccato through rapid and very strong pressure and by interrupting the pressure of the bag and the bellows simultaneously, which breaks up the flow of air into the pipes. We encounter a similar effect in the practice of pipers from the Żywiec region. In *kozioł* playing, a strong sudden squeeze of the bag (Wo2), synchronised with specific motoric finger positions on the chanter, enables overblown sounds to be obtained (seventh and eighth degrees of the scale).

The most complicated kind of gesture in piping is the third kind: finger movements serving to differentiate the note pitches. It is worth emphasising that in piping, unlike playing on plucked or struck instruments, the finger movements do not provide energy to stimulate the instrument; the stimulation position is independent of the pitch modulation position. In fingering, there are two functional positions: lowering the finger (Pa1) and raising it (Pa1). Hence the multitude of combinations depends on the number of fingers taking part in the playing, and consequently on the number of holes in the chanter. Lowering the finger (Pa1) causes the pipe hole to close, the sound channel to lengthen and so the vibration frequency to decrease. Raising the finger (Pa1) correspondingly shortens the sound channel and increases the vibration frequency. Each of these gestures is an impulse of changing note pitch. By making use of the two basic oppositional placements of each of the fingers taking part in the playing, we obtain a large number of possible combinations. In practice, only a few are used.

We refer anyone interested in the detailed results of analysis of motoric gesture systems and their effects, manifest in the form of instrument dispositions and musical 'gestures' characteristic of playing on bagpipes of various types, to

Alicja Trojanowicz's study. Yet it is worth pointing out that notations of movement do not take account of the actual movement as a process occurring in time and space, but only of the results of that movement in the form of specific gestures. Actual human movement causes actual movement in an instrument's disposition, which in turn triggers such movement in the acoustic environment. What is functional, however, is not the movement as such, but rather its effect in the form of successive gestures, instrument dispositions (positions) and notes. As in dance, movement in instrument playing is distinctly goal-orientated.

Besides the basic, functional motoric gestures, we can also observe during instrument playing a number of accompanying gestures which do not possess a clearly defined musical function. These are most often movements of the legs, torso and head.

Leg movements (marching excepted) comprise primarily pipers' tapping their feet on the ground, emphasising the metrical units of the beat. So in a way they have a musical function. Movements of the torso left and right, rocking while playing and slight inclinations forwards and backwards are quite characteristic of some musicians.

Twenty-six elementary motoric gestures can be distinguished in the playing of Polish pipers. Seventeen of them are functional gestures, including thirteen that serve the differentiation of musical pitches, two that stimulate the instrument and two that fill the bag with air; nine are accompanying gestures (one leg movement, four torso movements and four head movements).

The zone of the psychological present is also sometimes called the zone of rhythmic times. The present remarks on rhythm do not go beyond issues relating to this zone. Crucial additional remarks result from the theory of temporal levels.

The problem of rhythm is extremely complex and controversial. Discussion of this subject has been continuing for more than two thousand years, and no ultimate findings have been reached. Many different theories relating to rhythm have been advanced. This is partly due to historical changes in rhythmic systems functioning in human behaviours, which theorists have attempted to generalise. Of no lesser importance has been the adoption of the theory of different partial aspects of rhythm as the starting point; scholars have discerned in those aspects the most important and most secure foundations – indeed, the only foundations.

As the starting point for my own remarks, I adopt a very old definition formulated by Plato, according to which rhythm is the order of movement. That definition seems exceptionally apt, but it does have one serious flaw. It is very broad, and so rather lacking in substance. I will attempt to render it more concrete and to reduce it to the musical problems that Plato also had in mind, although he imparted a very general character to his definition.

According to Plato, rhythm is movement. The conditions essential to movement are time and space. There is no movement in time alone; there is no movement in space alone. Only in time and space can actual movement manifest itself. So in what time and in what space is rhythmic movement realised in music? I shall seek to give a brief answer below.

Not all movement in time and space is rhythm. Plato defined rhythm as ordered movement. So what is that ordering of movement? It assumes the interdependence of two different orders:

- a systemic order in the broad sense (a code),
- a syntagmatic order.

Rhythm is this dual systemic and syntagmatic ordering. It is the choice of qualities and sizes from a specific code of possibilities and their arrangement in a temporal order.

It should be noted here that time and space are distinguished by such a dual nature: they have systemic properties, they are quantities on which qualities depend; at the same time, they have syntagmatic properties, they create space (time-space) in which all actual quantities and qualities, including the temporal and the spatial, are located. Of fundamental importance to a definition of musical rhythm unfolding over time are the systemic and syntagmatic properties of time.

We have come to speak about time wherever we are dealing with changes of some kind. In conditions of a lack of any change, time would be suspended, so to speak. Most important for our subject here is the following distinction:

- a sudden, punctual change constituting a rhythmic impulse opening a time interval in a sequence,
- the filling-in of a time interval with duration without change or with slow change.

So impulses of sudden change cause time to segment into elementary units. We encounter such segmented time in relation to musical rhythm as well. Two scales are essential in order to characterise segmented time:

- a syntagmatic scale of time,
- a systemic scale of time.

Both have two variants, showing different, opposite properties of time.

The syntagmatic scale of time, the scale of the sequence of time intervals, extends from the beginning to the end of rhythmic action. In this scale, there is no past and no future. It suspends time, as it were, reveals its self-contained wholes and its internal ordering, enables the shaping of rhythm and shows its structural properties in this respect, in which they depend on the ordering in a time sequence. The syntagmatic dimension of time is not just sequence, but also simultaneity. Together they form a sort of 'space of time', in which several more or less synchronised rhythmic sequences can be realised simultaneously. In music, a score perfectly illustrates this 'temporal space' of rhythmic action.

In a different approach, the scale of time extends from the past to the future and is divided by the present. It reveals the processual properties of time. In this scale, time unfolds. In the present, rhythmic impulses segment the flow of time, which approaches from the potential future and, realised in the present, passes into the past. Retention, that is, preserving the immediate past in one's awareness, and protention, or encompassing the immediate future with one's awareness, ensure continuity to the rhythmic process.

Besides syntagmatic properties, time has also systemic properties, based on scales of temporal sizes. Two such systemic scales of time represent the inverse of one another:

- the scale of sizes of time intervals (duration), extending from very small to very large intervals,
- the scale of frequencies (tempo), extending from very large to very small frequencies.

On the systemic scale of time (in both its variants), different forms of human behaviour and existence in time fill characteristic zones of size. One can distinguish seven basic zones, each of which is further divided into a number of subzones characterising various phenomena in qualitative terms: (1) the zone of visual light, (2) the zone of audible sounds, (3) the zone of the psychological present, (4) the zone of works and musical events, (5) the zone of the temporal environment, (6) the zone of the time of individual and social life, (7) the zone of history and tradition. Each of these zones is characterised by some kind of movement; in each one, the movement can be ordered in some way, so according to Plato's definition it can be defined as rhythm. We are interested here, however, in musical rhythm, so rhythm directly shaped and felt by people, and rhythm in the zone of the psychological present, also known as the zone of rhythmic times, is just such rhythm.

A common denominator of all movement is time; what differentiates movement besides time is the space that it fills. That means not only three-dimensional physical space, but the sensorial spaces of movement that present themselves to people in direct experience. We should distinguish four basic spaces which, together with time, condition movement: (1) visual space, (2) auditive space, (3) somatic space, (4) symbolic space. The starting point for all consciously shaped human movement is symbolic space, which conditions our awareness, and somatic space, in which a movement is realised. People can only trigger movement in their own thoughts and their own bodies. Auditive musical movement is the result of the transferral of somatic (visual, so kinetic) movement into auditive space.

The listed spaces of movement are not entirely isolated in human experience and forms of behaviour. On the contrary, one can usually distinguish a dominant space of movement and also second- and third-level spaces. For example, language, music, dance and mime activate the spaces of movement listed in Example 4.34. Of fundamental importance to musical rhythm is auditive space; the source of rhythm should be sought mainly in somatic space.

Different parts of the human body have their own, characteristic mobility. For this reason, we should distinguish the following:

- articulatory movements,
- finger movements,
- limb movements: (a) arms, (b) legs,
- trunk movements,
- movements of the breathing apparatus

With no other organ is a person capable of realising at a rapid tempo as many dimensions of movement as with the articulatory apparatus of speech. It uses those capacities to realise the dual sound system of speech: the phonemic system and the prosodic system. Also highly mobile are the fingers, which – like syllables in language – are used to create elementary units of rhythmic movement. Limb movements, slower than trunk movements, and the even slower movements of the breathing apparatus, fall in the middle of the range of movement frequencies. Of course, people can consciously go beyond the range of the natural mobility of particular organs of movement. This is easy particularly when movement is slowed; it is much more difficult to accelerate movement. Exceeding the zone of normality in this way is always qualitatively tinged, and it lends movement a specific character.

The natural mobility ranges of the movement organs listed above fill the whole zone of the psychological present, which covers time intervals from several dozen milliseconds to around a dozen seconds. This is not a uniform zone; on the contrary, a number of categorically different ranges can be distinguished within it:

rhythmic impulse	–	no distinct rhythmic impulse,
tempo	–	no tempo,
duration	–	no duration

These three oppositions form five qualitatively different time ranges characterised by the following features:

- A lack of distinct rhythmic impulses; the impulses merge together or are not realised, as for example in a sequence of consonants in language. Here we find trills, mordents, vibrato and light melodic ornaments.
- Distinct rhythmic impulses and tempo to the succession of impulses with no possibility of perceptually distinguishing categories of duration between successive impulses. One should mention here the syllabic flow of language, the so-called short times of experimental psychology and units of rhythmic movement (subdivision of the basic metrical unit).
- Distinct rhythmic impulses, tempo of succession and duration of time between impulses. This is the central region of the psychological present. Here we find metrical units, words and verse feet.
- Distinct rhythmic impulses and duration, but a lack of differentiation of categories of tempo. Such features are possessed by long notes and the suspension of movement in pauses.
- 'Absolute', continuous duration, in which the span of the interval of duration is lost and there is also no tempo. Here we find drones. A fixed drone, of course, may go beyond the limits of the psychological present and encompass the whole of a musical work.

Rhythmic movement depends not only on the time in which it occurs and the space which it occupies, but also on the function it discharges. This is a complicated issue, which has not been greatly explored. I will dwell for a moment, by way of example, on the rhythmic function of the basic features of sound.

Rhythmic function depends in an obvious way on the duration of a sound. Yet time does not create a uniform energetic scale of rhythmic movement. What is more, one can distinguish within it two different forces, growing in opposite directions on the scale of time. One is the rhythmic weight of time; the other is the tension of rhythmic movement, or tempo. Weight manifests itself in the large differences of duration that occur between different rhythmic values. The weight of minims is greater than that of quavers, just as the weight of leg movement is greater than that of finger movement. Tempo, meanwhile, grows as rhythmic values decrease. We are dealing here with differences of a small scale of time within the movement of a given level, within the movement of quavers or within the movement of minims, the accelerated movement of fingers or legs. The energetic tension of movement grows as the duration of particular movements is shortened; so tempo is increased.

We are well aware of the differences in function between rhythmic values and tempo. Less obvious would appear to be the statement that similarly opposing forces are concealed in note pitches. Here, one can also distinguish the weight of notes and the tension of notes. Note weight concerns differences in the register of a voice or instrument and is inversely proportionate to pitch. The sounds of a double bass have a much greater weight than the sounds of a violin. Tension concerns the differences in pitch of a particular voice or instrument and grows in proportion to pitch. Raising a melodic line increases its tension, energising the passage. Tension is expressed in melodic accent.

Superiority ▶ ◀ Inferiority

Zone of the psychological present, speaking, playing	Zone of works and musical events, text, message	Zone of the environment, times of day, of the month, of the year, calendar	Zone of individual and social life	Zone of tradition, myth and history
Present	Organisation of time	Synchronisation of time	Changes of time	Presentation of time
Space of body movement	Space of musical performances and events	Space of environmental situation	Space of life	Space of myth, history and cosmos

▼

Zone of the psychological present, speaking, playing...

▼ ▼ ▼ ▼ ▼

<table>
<tr><td colspan="3">Tempo</td><td></td><td></td></tr>
<tr><td></td><td colspan="3">Rhythmic impulses</td><td></td></tr>
<tr><td></td><td></td><td colspan="3">Duration</td></tr>
<tr><td>Phonemes</td><td>Syllables</td><td>Words, prosodic words</td><td>Phrases</td><td>Sentences</td></tr>
<tr><td>Ornaments</td><td>Units of movement</td><td>Metrical units</td><td>Lines</td><td>Periods</td></tr>
<tr><td>Movement of speech organs</td><td>Finger movements</td><td>Limb movements</td><td>Trunk movements</td><td>Movements of the breathing apparatus</td></tr>
<tr><td></td><td></td><td>Conventional, representational meanings</td><td></td><td></td></tr>
<tr><td colspan="5">Ontological, existential, presentational meanings
Meaning = specificity in the system of possibilities</td></tr>
</table>

Example 4.42 Zones of time (and space). The first part of the table concerns the five large zones of time: the zone of the psychological present, the zone of works and performance events, the zone of the environment, the zone of individual and social life and the zone of tradition, myth and history. The second part of the table shows the internal structure of the zone of the psychological present, also comprising five subzones, visible in language, music and human kinetic properties. Conventional meanings, that is, words are concentrated in the centre of the zone of the psychological present. Ontological meanings depend on all human temporal zones.

Note timbres have different dimensions, but the dominant dimension – dark vs light timbres – shows tendencies similar to those which concern the pitch of notes. This does not hold for note dynamics, which do not have two opposite energetic directions of weight and tension in the sense that we saw in relation to time or pitch. However, it may be used to enhance note weight or increase the tension of note movement, as for example when dynamics highlight the energy of the direction to a melodic line.

The strength of weight and tension require detailed consideration. Generally speaking, note weight organises metrical hierarchy, and tension dynamises rhythm.

5 The zone of works and performances

Zone of compound times regions, hours						Zone of works and performances regions, minutes, seconds								Zone of the psychological present, regions, seconds, hundredths of a second								Zone of musical pitches regions, octaves								
00	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
24	12	6	3	90	45	22	11	6	3	90	45	22	11	6	3															
													16	8	4	2	1	50	25	12	C_2	C_1	C	c	c^1	c^2	c^3	c^4	c^5	c^6

5.1 The range of the zone and a synthetic table

The third large zone on the systemic (logarithmic) axis of time, indispensable to every musical objectivisation, is the zone of works and performances. The eight-tuz rhythm of the large zones dictates the distinction of regions 4 and 12 as the border regions and region 8 as the central region. Region 12, as we have seen, does indeed fulfil such a function, and even quite distinctly. In that region, such formal elements as long phrases and musical lines, essentially still of limited independence, mingle with works that are distinctly independent in the form of short musical verses or stanzas. Region 8 stands out in particular, especially in contemporary mass musical culture. It is here that we find the central zone of popular songs, hits, dance works and light music, but also many works of art music. Perhaps less obvious, but still noticeable, is the liminal character of region 4. This is where essentially cohesive, self-contained musical works end; larger works generally require distinct breaks for relaxation, lasting at least several minutes. Such long organised musical times are clearly influenced by another central region, delimited by region 0, featuring the rhythm of day and night, which bears a decisive influence on the organisation of human time.

I would recall here Dahlhaus's apt assertion of the crucial role played in the shaping of form by the scale of sizes. This refers both to the formal elements of a work and also to its overall structure. However, the role of temporal shapings is not uniform across all levels. Differing in particular are phenomena belonging to two basic temporal zones: the zone of the psychological present (which may also be called the zone of musical morphology or the zone of musical elements) and the zone of works. That is essentially how we should understand the passage from Dahlhaus quoted below, although I am not certain whether these words were written with full awareness of the existence of these two temporal zones.

	ZONE OF WORKS AND PERFORMANCES																					
	Border region								Central region									Border region				
Regions	3		4		5		6		7		8		9		10		11		12		13	
Minutes, seconds	96’32	68’16	48’16	34’08	24’08	17’04	12’04	8’32	6’02	4’16	3’01	2’08	1’30	64s	45.25s	32s	22.63s	16s	11.31s	8s	5.7s	
	Stanzas and songs in traditional folk music, duration																					
1.Poland, stanzas															+	+	15	33	30	11	10	+
2.Podhale, stanzas																6	12	34	28	18	+	+
3.Hungary, stanzas															+	8	23	33	30	5		
4.Pol. songs 1 stanza															2		9	16	13	4	5	
2–3 stanzas												1	1	16	33	40	27	11	11		1	
4–7 stanzas												9	9	25	21	5	5					
8–12 stanzas												4	5	2								
Total %												5	5	17	20	16	15	10	9	1	2	
5.Songs from the Polish borderlands										3	5	9	8	2	1	1						
	Microworks, self-contained or parts of a whole. Duration																					
6.Bartók, *Mikrokosmos*										1		13	26	32	40	28	8	5				
7.Schumann, *Carnaval*											1	1	2	4	2	7	2	2				
8.Schumann, *Kinder.*												2	4	1	4	2						
9.Schumann, *Dichter.*											1	4	2	6	2		1					
10.Chopin, Preludes										2	1	2	5	5	4	3	3					
11.Webern, Conc. movt												2		1								
12.Webern, Quart. movt											1	1		1								
13.Webern, 2 pieces												1				1						
	Popular music. Duration of works																					
14.Santor										2	25	7										
15.Skaldowie										5	12	24	3									
16.Szczepanik											11	14										
17.Ordonka											10	7										
18.Aznavour											6	13	2									
19.Bécaud										1	12	34	8									
20.Richard											2	27	5									
21.Haley											1	14	1									
22.Barclay											7	24	1									
23.Shadows											1	10	6									
24.Baja Marimba											1	6	1									
25.Dana Choir											9	16										
26.Duke Ellington										6	17	23										
27.Pop										4	30	58	8									
28.Värttina										2	7	3										
29.Namysłowski, Jazz									11	30	27	4										
30.Komeda, Sextet									1	2	2	2										
	Handel, *Messiah*(Highlights)																					
31. Messiah, highlights							1	1	2	3	5	2	1									
	Bach, *St Matthew Passion*, von Karajan (total 204 min.)																					
32. *St Matthew Passion*, excerpts								2	6	7	6	11	16	10	9	5		1	1			
Scenes				2	3	2																
Movts	1	1																				
	Works and movts																					
33.Bach, Preludes and fugues							2	7	14	12	12	1										
34.Beethoven, Piano Sonata, movt							3	10	20	25	21	12	5									
35.Beethoven, Symphonies movt					1	1	6	9	9	5	3											

Example 5.1 Zone of musical works and performances. Key: **(1–3)** Duration of stanzas of folk songs: 1. Stanzas of Polish folk songs, number of songs in

percentages; Based on Sobieski 1955. (2) Stanzas of Podhale folk songs; Based on Sadownik 1957. (3) Stanzas of Hungarian folk songs. Based on Bartók 1925. **(4)** Duration of Polish folk songs depending on the number of stanzas. Data indicate number of songs of 1 stanza, 2–3 stanzas, 4–7 stanzas, 8–12 stanzas; total number of Polish folk songs in percentages. Based on Sobieski 1955. **(5)** Duration – Polish songs. International School of Traditional Music. Foundation for Music of the Polish Borderlands. **(6–13)** Duration of microworks: Based on files of Polish Radio, Warsaw. (6) Bartók *Mikrokosmos*; (7) Schumann *Carnaval*, Op. 9; (8) Schumann *Kinderszenen*, Op. 15; (9) Schumann *Dichterliebe*; (10) Chopin Preludes; (11) Webern, movts of *Concerto for Nine Instruments*, Op. 24; (12) Webern, movts of String Quartet, Op. 28; (13) Webern, two pieces. **(14–27)** Popular music, duration of works by various artists, archive of Polish Radio, Warsaw: (14) Irena Santor; (15) Skaldowie; (16) Piotr Szczepanik; (17) Hanka Ordonówna; (18) Charles Aznavour; (19) Gilbert Bécaud; (20) Cliff Richard; (21) Bill Haley Dance Band; (22) Eddie Barclay Dance Band; (23) The Shadows; (24) Baja Marimba Band; (25) Dana Choir – old hits; (26) Duke Ellington Orchestra; (27) Popular music, total number of works in percentage. **(28)** Finnish folk music, duration of works, Värttina aitara. Mipu Music, MIPUCD 302. **(29–30)** Modern jazz, duration of works: Based on files of Polish Radio, Warsaw. (29) Zbigniew Namysłowski Jazz Rockers; (30) Komeda Jazz Sextet. **(31)** Handel *Messiah* (Highlights), duration of pieces, Battle, Quivar, Alter, Ramey. Toronto Mendelssohn Choir, Toronto Symphony Orchestra, cond. Andrew Davis. EMI CLASSIC. **(32)** Bach, *St Matthew Passion*, cond. Herbert von Karajan (total duration 204 min), excerpts, scenes, movts. **(33–35)** Duration of medium-length works: Based on files of Polish Radio, Warsaw. (33) Bach Preludes and fugues from *Das wohltemperierte Klavier*, perf. Wanda Landowska – harpsichord; (34) Beethoven, movts of piano sonatas, perf. Yves Nat; (35) Beethoven movts of symphonies, various artists **(36–41)** Duration of long works: Based on files of Polish Radio, Warsaw. (36) Bach *Brandenburg Concertos*, perf. Solistes de Stuttgart, cond. Marcel Couraud; (37) Beethoven piano sonatas, perf. Yves Nat; (38) Beethoven cello sonatas, various artists; (39) Schumann, song cycles, various artists; (40) Beethoven symphonies, various artists; 41. Television plays. Number of performances in percentage; based on Stradomski 1970. **(42–59)** Duration of works by Chopin: Based on files of Polish Radio, Warsaw.: (42) Preludes, perf. Géza Anda; (43) Mazurkas, Opp. 6–68, perf. Arthur Rubinstein, Op. posth., perf. Regina Smendzianka; (44) Songs, perf. Alina Bolechowska; (45) Etudes, Op. 25, perf. Géza Anda, Op. 10, perf. Vladimir Ashkenazy; (46) Waltzes, perf. György Cziffra; (47) Nocturnes, perf. Stefan Askenase; (48) Impromptus, perf. Claudio Arrau; (49) Polonaises, perf. Barbara Hesse-Bukowska; (50) Variations, various artists; (51) Rondos, various artists; (52) Ballades, perf. Claudio Arrau; (53) Scherzos, perf. Claudio Arrau; (54) Works for piano and orchestra, var. artists; (55) Chamber works, var. artists; (56) Sonatas, perf. Stefan Askenase; (57) Concertos, perf. Edward Auer; (58) Single piano works, var. artists; (59) Total works by Chopin.

36.Bach, *Brandenburg Conc.*						3	2	1														
37.Beethoven Piano Sonata				1	1	13	11	1	5													
38.Beethoven, cello sonatas					3	1	1															
39.Schuman, song cycles					3	2																
40.Beethoven, symphonies			2	2	3	2																
41.Television plays %	5	29	40	14	9	2	1															
	Duration of works by Chopin																					
42. Preludes										2	1	2	5	5	4	3	3					
43. Mazurkas										8	8	19	15	15		2						
44. Songs										2	1	4	4	8								
45. Etudes										1	4	8	8	6								
46. Waltzes										6	1	6	1									
47. Nocturnes									3	11	6											
48. Impromptus									2	2												
49. Polonaises							1	5	5	3	2											
50. Variations							1		2	3												
51. Rondos								3														
52. Ballades							1	3														
53. Scherzos							1	3														
54. Pf. and orch.							2	2														
55. Chamber					2		1	2														
56. Sonatas					1	1																
57. Concertos				1	1																	
58. Single piano works							2	1	1	3		3	1	1	1							
59. Total				1	4	1	9	19	13	41	23	42	34	35	5	5	3					
Minutes, seconds	96’32	68’16	48’16	34’08	24’08	17’04	12’04	8’32	6’02	4’16	3’01	2’08	1’30	64s	45.25s	32s	22.63s	16s	11.31s	8s	5.7s	

Example 5.1 Continued

Thus the statement, for example, that form is large-scale rhythm is a metaphor that should not be taken literally; it is of no use as a principle of a theory of form. The concept of rhythmic correspondence does not extend beyond the scope of the period. An antecedent and a consequent can just – and by no means always – be perceived as analogous to a weak and a strong beat, as rhythmically corresponding parts; correspondence between longer sections has to be justified thematically. The false assumption that form is a large-scale rhythm has the consequence that sections comprising hundreds of bars are seen as corresponding parts, though thematic connections are either lacking or only vaguely implied. The mere exactness or similarity of the continuation is supposed to be sufficient to justify a connection that corresponds to the relation of antecedent and consequent. The model of the period is blindly applied to stretches that are too long to be discernible as periods.[140]

140 Dahlhaus 1987, 249.

Dahlhaus's reservations are wholly justified. The period is not only a superior unit in relation to musical sentences. It becomes a new quality, thanks to its greater independence, which means that it often constitutes, as in folklore for example, a separate work in the form of a one-stanza song. Sentences and periods belong to two zones of musical time. Periods, like larger formal entities, can correspond to one another, since they form specific planes of comparable sections, manifesting more or less coherent zones on the systemic (logarithmic) scale. Analysis of the zones of temporal periods, particularly in classical music, where periodic structure displays the most transparent form, would give us good grounds on which to compare also temporal sections of music not based on periodic models; it would enhance our scale of musical time and increase its interpretative value. That problem must be left for detailed study. Here, I will illustrate the shortest times of the zone of works with examples of stanzas from folk songs.

5.2 The zone of microworks

In Polish folklore, as in European folk output in general, the zone of verses or stanzas is one of the basic zones in the temporal structure of works. We do not yet have at our disposal detailed statistical data showing the differentiation in this respect of the folk songs of Europe. Polish folklore is distinguished, for example, by its relatively high percentage of very short stanzas. That picture is affected by the numerous ditties consisting of four short lines of between six and eight syllables performed very quickly. Sometimes, pairs of such textual lines are combined in musical lines, giving rise to two-line forms or – as the Germans often put it – half-strophes (*Halbstrophe*). A two-line musical form can also be underscored by a versification structure, but the reverse may also occur: a four-line musical verse can be based on a two-line structure with caesura. The table shows, by way of example, the differentiation of the temporal structure of songs in Poland in general, in the Podhale region of Poland and in Hungary (Example 5.1.1–3).

The durations of Polish folk songs fall between the zone of the stanza and the centre of the large zone of works. By way of example, one may cite the two-volume collection of Marian Sobieski; the differentiation in terms of number of stanzas and duration of songs that is given there is shown in item 4 of Example 8.1. One is again struck here by the large number of very short songs, in terms of both the number of stanzas and the duration. Long songs, at least in contemporary Polish folklore documented since the war, represent a relatively small percentage; in Sobieski's collection, the number of verses does not exceed twelve, and the duration is under three minutes.

Some miniature forms of art music fall within a similar zone. In general, their zone tends towards larger values, but it begins with a medium folk stanza. Good examples are provided by such song cycles as Bartók's *Mikrokosmos* and Schumann's *Carnaval* and *Kinderszenen*. Also belonging here are Chopin's Preludes, movements of such works by Webern as the *Concerto for Nine Instruments*, Op. 24 and the String Quartet, Op. 28 and other minor works by that composer (Example 5.1.6–13). The use of the apparatus of a symphony orchestra to shape the works of this zone is one of Webern's original solutions.

The zone of microworks is also used, of course, for the segmentation of larger works. One example here is a performance of the Persian *dast-gah* analysed by Nettl and cited by Żerańska-Kominek.[141] That lasts more than ten minutes and comprises twenty-two parts lasting between five and ninety seconds.

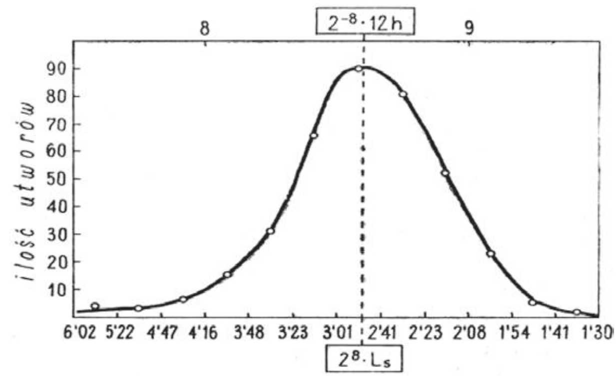
5.3 The central regions of the zone of works

As already emphasised, the central region of the large zone of cohesive works is region 8, situated eight tuzes away from the rhythm of day and night on one side and eight tuzes away from average musical tempo on the other. There is not the slightest doubt that in contemporary popular musical culture the central zone of works is absolutely dominant. And if all works popularised through the mass media were to be set in order, there would no doubt be most works in this central zone. It is here that we find popular songs, dance pieces and hits. To gain a better idea of the structure of this important temporal zone, I have included a number of recordings of popular music (Example 5.1.14–27). Although the ranges of the time of works by different artists are not the same, they are clearly concentrated in region 8. A graph obtained on the basis of Example 5.2 reveals the grouping of the time of works within a relatively compact area (Example 5.3). Only a small percentage of works exceed the span of a single tuz, and the centre of the zone falls almost exactly eight tuzes from the rhythm of day and night and eight tuzes from the centre of the zone of musical tempo, that is, the human second. This zone shows a tendency to expand in the direction of larger temporal values, which is linked, for example, to ambitions to 'artify' genres of popular music. Modern jazz, for example, has a distinct preference for longer works. To illustrate this, I invoke recordings made by Zbigniew Namysłowski's Jazz Rockers and Krzysztof Komeda's Jazz Sextet (Example 5.1.29–30), comparing them with typical works of popular music.

141 Nettl 1987; Żerańska-Kominek 1995, 257–258.

Regions	7				8						9			
		6'02	5'22	4'47	4'16	3'48	3'23	3'01	2'41	2'23	2'08	1'54	1'41	1'30
a. Irena Santor				2	6	7	12	4	2	1				
b. Skaldowie			1	4	2	2	8	11	7	6	2	1		
c. Piotr Szczepanik					3	4	4	3	8	3				
d. Hanka Ordonówna						3	7	5	1	1				
e. Charles Aznavour					1	2	3	1	6	6		1	1	
f. Gilbert Bécaud			1		4	6	2	13	12	9	6	1	1	
g. Cliff Richard						1	1	9	15	3	2	3		
h. Bill Haley Dance Band							1	4	3	7	1			
i. Eddie Barclay Dance Band						1	6	7	10	7	1			
j. The Shadows							1	4	4	6	6			
k. Baja Marimba Band							1	4	2		3			
l. Dana Choir– old hits						1	8	10	5	1				
m. Duke Ellington Orchestra		4	1	1		4	13	15	6	2				
Total		4	3	7	16	31	67	90	81	52	21	6	2	

Example 5.2 Duration of works of popular music, based on various performances, archive of Polish Radio, Warsaw.



Example 5.3 Duration of works of popular music (after Example 5.2) and a size eight tuzes from the rhythm of day and night (12h) and eight tuzes from the centre of the zone of the psychological present, that is, the human second.

Of course, the shaping and distinction of the central zone of works is not exclusive to our times, although there is no evidence that it has ever played such a fundamental role in musical culture. It covers such works as Chopin's mazurkas, waltzes, songs and etudes, Schumann's *Phantasiestücke* and *Frauenliebe und Leben* and no doubt many other works from different eras, although (as we can see in Example 5.1) examples from art music are highly dispersed, less concentrated in the central parts of the zone.

The fundamental question arises as to whether the dominance of the centre of the zone is conditioned by human mental properties, a marked facility for organising and perceiving music in such a time, or whether it is merely a feature of our culture, of our habits. It is difficult to say. We do not have at our disposal data from other cultures; nor do we have detailed knowledge of the role played by this zone in shaping parts of larger compositions or of the extent to which this zone is distinguished in folk music. One may suspect that in folk practice many works of instrumental music and many dances are contained within this zone. However, we have no detailed statistical data available. We also have no wholly reliable materials for studying this issue. In recordings, the duration of works is often shortened, 'so as not to bore the listener' or to save space. We quite often hear that a work used to be played much longer than today. It goes without saying that such general remarks can vary in their accuracy.

5.4 The zone of medium and long works

In our view – determined by our artistic musical culture – the works in the central areas of the large zone distinguished by us here, so for example popular songs and dances, are still rather short works. As already indicated, medium-length works of European art music and relatively long works in popular music do not begin until above the central zone of works. Besides miniatures, the core of art music occurs within an area ranging between regions 8 and 4. The nocturnes and impromptus of Chopin represent a transitional zone between short works, such as Chopin's own mazurkas and waltzes, and decidedly medium-length works, such as Chopin's polonaises and variations and Bach's preludes and fugues from *Das wohltemperierte Klavier*. Chopin's scherzos, rondos and ballades tend to fill longer values in this zone, which also includes movements of Beethoven symphonies. More varied are movements of piano sonatas, since they include plenty of very short pieces (Example 5.1.37).

Among the distinctly long works in our tradition, we may include Bach's *Brandenburg Concertos*, Classical sonatas and especially symphonies. For the purposes of comparison, also included in Example 5.1 are the durations of plays shown on Polish television in 1968. Their time span is very large, which attests to the internal diversity of the phenomena covered by this shared name. They include both full-length theatre plays and relatively short humoresques (Example 5.1.41).

Longer works, such as operas lasting up to two hours or more, are generally divided into acts, interspersed with breaks for convenience. It is probably no coincidence that lessons in school last forty-five minutes, which constitutes the centre of region 4, and that concert programmes are composed in such a way that an intermission occurs after approximately the same amount of time. We are clearly dealing here with a physiologically conditioned zone of human concentration. Of course, we can go beyond that zone, but at the cost of additional effort.

In our culture, such events as opera or theatre shows, film projections and concerts last on average approximately two hours. According to Zbigniew Raszewski (private information), such a duration for a theatre show has long been established, as has an intermission of around fifteen minutes. So the time of actual performance does not exceed forty-five minutes or the zone of cohesive musical works, essentially delimited by region 4. Beyond that limit, we find theatre shows taken as a whole, which are consequently influenced by the next large zone, the centre of which is formed by the rhythm of day and night (12 hours). In the case of shows, there is a clear influence from the daily cycle of ecological time. Regardless of their time span, we are also struck by their time as part of the organisation of the time of a day. It is undoubtedly more appropriate to compare shows with the time of day and night than with the time of an average work of popular music, lasting approximately three minutes.

Zbigniew Raszewski also drew my attention to the question of the dependence of the time of a show on the tempo of acting in the theatre of Shakespeare and Calderón and to related aspects of the reception of their output in Poland. From recent research into Shakespeare's oeuvre, we learn that his plays were performed at breakneck speed compared to the tempo that we observe in theatres today, especially in Poland. Works that we perform, after cuts, for more than two hours, did not last more than two hours in the original – without any cuts. The acting was incredibly dynamic. Today, efforts are being made to reconstruct Shakespeare's theatre. Special stages are being built in strict accordance with knowledge about the original stages for which Shakespeare wrote and on which his works were performed. There is also a trend for reconstructing the way in which actors performed, in order to replicate as faithfully as possible the actual theatre of Shakespeare's times. Raszewski believes that it is unlikely that we will be able to reconstruct that tempo in Polish theatres. That is because, although a great deal can be done with regard to developing acting technique, increasing the tempo of acting and approaching the virtuosity that characterised Shakespeare's theatre, it is probably impossible to overcome the differences inherent in the two languages. For Raszewski, English is by nature much better suited to quick acting. Its construction, allowing for the reduction of phonemes, makes it possible to increase the tempo of speech. Such reductions do not affect the comprehensibility of the text. In Polish, such reductions are impossible, and it is unrealistic to aspire to attaining similar effectiveness. In this respect, we are naturally hampered.

Our perception of the English as highly phlegmatic is not borne out – in the opinion of Zbigniew Raszewski – by the tempo of their language. Among the educated classes, slow speech is by no means fashionable. People tend to speak at a moderate tempo, not too quickly, but also not too slowly. Meanwhile, the average Englishman colloquially speaks much more quickly and ostensibly less carefully, swallowing parts of syllables, but understandably and economically. That economy of speech is the main condition that enables actors to deliver monologues at bewildering speed. Of course, this problem requires deeper study using scientific methods, which might definitively determine the accuracy of these observations and show quantitative differences in the capacities for increasing tempo in Polish and in English. The logarithmic scale is very useful for such research. English and Spanish in particular should be analysed in detail in this respect, since the theatre of those countries exerted a powerful influence over Polish theatre of the Romantic era, although it was familiar to Polish artists generally from scripts. Imitation based on such limited knowledge of those theatres gave rise to excessively long plays; no account was taken of the tempo of speech and the tempo of acting, which could not be grasped from reading alone.

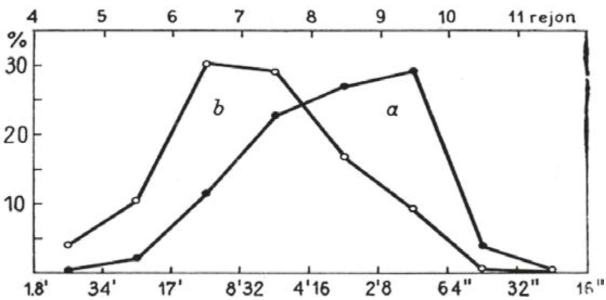
As we can see from this brief survey of issues relating to the time of the zone of works, the legitimacy of the logarithmic scale is confirmed here as well. It seems likely that wherever we are dealing with the human perception of temporal phenomena, it is based on this logarithmic scale or at least on a very similar scale. One may expect detailed research to reveal deviations from this mathematically determined scale, particularly in extreme phenomena of temporal zones, as in the case of note pitches. The highest octaves, for example, on the piano are slightly larger than would result from a mathematical logarithmic scale. Of course, such exceptions may only confirm the logarithmic rule in relation to both note pitches and also musical time in its different zones.

It is work taking a look at the temporal zone filled entirely with the output of a single composer. As an example, we will take Chopin (Example 5.1.42–58). It goes without saying that particular musical genres may differ in terms of the duration of works, but they may also belong to the same temporal zones. The whole of Chopin's oeuvre fills a zone covering approximately seven tuzes. The longest works do not exceed forty-eight minutes, and the shortest twenty-two seconds. The set of typical miniatures stands out. These include above all the mazurkas, etudes, songs, waltzes and of course preludes. They generally fall within a range of between one and six minutes. Only the preludes and two mazurkas exceed those limits, reaching the time of a stanza of a folk song. The preludes display an exceptionally large range of time – up to four tuzes. The number of works in genres characterised by longer duration is distinctly lower, as is the span of the temporal zones.

Comparing the number of works in particular temporal zones, we see that the picture is not symmetrical: the greatest concentration of works occurs in the zone somewhat lower than the average duration of all the works. We obtain a reverse image when taking account of the sum of the time of works in particular rubrics, multiplying the number of works by the average duration of a given rubric (Example 5.4).

After analysis of the temporality of musical works and events, it is worth taking a look at an example of a ritual event. I will invoke Piotr Dahlig's description of a *korowaj* ceremony from the eastern borderlands of Poland presented in the form of a 'score', which I reproduce here in modified form.

> *Korowaj* – among the Slavs this traditional wedding bread is a symbol of community, prosperity and family continuity […] It was based […] in Orthodox, Greco-Catholic and Catholic families […] Baking the korowaj in the Luboml area was sometimes called *babskie wesele*, because only *baby*, or married women (for example, a group of 10–12), could take part […] The korowaj would be prepared on the Monday or Tuesday for a wedding taking place on Wednesday and Thursday […] The stamping signified 'treading down', securing the success of the wedding, whilst the cries, roars and shouts were intended to chase away bad signs and forces, the evil auguries of ill-disposed people. In this safe space, very important for the wedding, even the singing itself can be understood as



Example 5.4 Duration of works by Chopin: **(a)** percentage of works in particular time ranges; **(b)** percentage sum of the duration of works in particular ranges; the calculations were based on the number of works and the average time of a given zone. Detailed data are given in Example 5.1.42–59.

'Score' of a *korowaj* ceremony													
				Sequence of events									
				1	2	3	4	5	6	7	8	9	10
System of events	Symbolic accompanying events	1	Blessing	X3				X		X		X	X
		2	Song		X	X	X	X		X	X	X	X
		3	Ritual gestures			X3	X			X3	X	X3	
		4	Dance			X		X		X		X	
		5	Leaps, stamping			X		X		X			
		6	Cries, clapping			X		X		X			
		7	'Barabanienie'			X				X			
		8	Playing on the violin							X	X		
		9	Playing by the band									X	X
	Events linked to the *korowaj*	10	Leavening the dough		X								
		11	Placing on the stove			X							
		12	Shaping and decorating				X						
		13	Placing in the stove					X					
		14	Baking						X				
		15	Taking out of the stove							X			
		16	Taking to the chamber								X		
		17	Bringing back									X	
		18	Sharing										X

Example 5.5 'Score' of a *korowaj* ceremony. Two levels of events: (1) the level of symbolic accompanying events; (2) the level of real events connected with the *korowaj*. Based on Dahlig 1997, 61.

casting a protective spell over the wedding rite […] Each woman with a special function in preparing the korowaj […] was obliged to dance with her work tool in her hand, such as a shovel, broom or poker […] to the accompaniment of rhythmic noise and singing […] The korowaj was placed in the oven before sunset, so that it would *brown in the evening glow* […] then a fertility dance was performed […] Placing the korowaj in the oven and *extracting* it were accompanied by a *barabanienie* with spoons (*kostrule*) on pots […] The whole time the korowaj was *sung around* […] The table was placed in the middle of the room, which made it easier to perform the ritual threefold circling with the bread. The korowaj was used to bless the four corners of the room, representing the four corners of the world, and it was then placed on the table and bowed to, before a candle-lit procession to the *chamber*; there the korowaj was left until the next day […]

> If the host of the home was to say an initial blessing, he would then remain outside the chamber […] The gradual admittance of men was linked to the appearance of normal musical instruments. Initially, women would play on substitute kitchen utensils, resembling instruments used at carnival time (e.g. the rhythmic rubbing of a rolling pin on a mangle, the striking of pots with wooden spoons). The smashing of a pot or the obligatory smashing of a pane of glass with a shovel was also part of the protective noise or – perhaps to greater extent – served to discharge the tension of the ritual. During the baking, when the korowaj was still in the oven, a violinist would sometimes be invited […] It was only the next day that the starosta or the wedding marshal, to the accompaniment of the usual wedding band, availed himself of his privilege to take the korowaj from the chamber, dance with it on his head and finally share it out […] The magic-sacred perspective was normally manifested, alongside bows and blessings, as well as a threefold (para-dance) circling of the table with the korowaj before it was placed in the oven and before it was removed.[142]

5.5 The multiple levels of time and the segmentation of melody

The flow of a folk melody by its nature represents a kind of segmentation of time. Every impulse marked at the start of another note segments time into rhythmic values. Although those values are sometimes strongly differentiated in terms of duration, we sense that they belong to the same layer, the same sequence, the same line joining the notes into a rhythmic and melodic flow. In the examples of melodies analysed on the logarithmic scale of time, the level of segmentation to the rhythmic flow is marked with the tails of the rhythmic values. All other segments comprising more than one note are always without tails.

In the flow of notes, we are usually dealing already with a scale of rhythmic values that belong to different levels of temporal segmentation. The multi-level character of musical structure is manifest even more distinctly when we take into account all other segments of melody, of metrical and formal units, when there may be many levels of segmentation. There are not normally any great difficulties with determining those levels and transferring them onto the logarithmic scale; problems occur more often when we seek to define the functions of the individual levels. At times, for example, it is difficult to establish whether a given level is a level of units of movement or of basic metrical units, or whether it forms phrases or parts of phrases. In folk melodies, we can usually distinguish the following levels of segmentation with different musical functions:

142 Dahlig 1997, 58–60.

1. The subdivision of units of movement, particularly frequent in ornaments, or the second-degree subdivision of basic metrical units.
2. Units of movement, that is, the first-degree subdivision of basic metrical units.
3. Basic metrical units, self-contained or comprising two or three units of movement.
4. Simple measures comprising two or three basic metrical units.
5. Compound measures comprising two or three simple measures or parts of phrases.
6. Phrases.
7. Sentences comprising two or three phrases.
8. Sentences and periods that can constitute self-contained stanzas.
9. Whole works of multiple stanzas.

Analysis of melodies reveals the fundamental two-level organisation of works. The core of the morphological level is formed by units of movement, metrical units and simple measures, whilst the syntactic level is centred on phrases, sentences, periods and stanzas (Example 5.6).

The ARUNAK project for a method of musical analysis, based on Armenian music, presented by Volodymyr Hoshovsky at an ethnomusicological seminar in Dilijan in 1975 and published in 1977, highlighted discussion on such issues as the segmentation of folk melodies. That system was based on a very distinctive position on the matter, which facilitated an exchange of views, although without leading to any conclusions. A range of proposals were put forward, since scholars approached the subject from different theoretical premises. The zonal theory of musical time shows this problem in a new light, although it by no means removes all the doubts. It fills in a serious gap in the theory of musical time in particular and of human time in general – a gap that led to various complications in analytical methods. That is no doubt what caused the universality of the Armenian analysis method in this area to be needlessly limited. Adopting the zonal theory of time as our starting point, it is easy to demonstrate that the tenets of Hoshovsky's system lead in effect to the different treatment of similar musical phenomena. This can be seen more clearly from the sample analyses of eight folk melodies submitted to participants in the seminar (see below). These examples will serve as the grounds for further analysis, which ought to help us understand the method employed.

Not all the examples are furnished with MM tempo markings making it possible to calculate the durations and frequencies of all the units of segmentation. It would probably not be a huge error to adopt the value ♩ = 180 MM for the Moravian song (Example 6) and 120 MM for the Estonian song (Example 4). As experience shows, recordings of variants of a melody even from the same region can differ considerably from one another in terms of performance tempo.

Various orthographic conventions and principles have been applied to the notation of rhythmic values in folkloristic practice. Defending the assumption that the object of musical analysis should be music, and not a more or less random graphic image of a score, we should try to ensure that the same musical phenomena are represented by the same signs. This inclines us to make adjustments to the notations of melodies, facilitating comparison of melodies and their constituent elements. In two melody notations (Examples 1 and 3), the rhythmic values require diminution, since only then does the crotchet or dotted crotchet constitute the basic metrical unit and the quaver a unit of movement, as in the other examples. In addition, it is advisable to adopt a critical approach to the placement of bar lines, since they hold different functions in notation: now separating individual metrical units, now dividing simple or compound measures, now even separating phrases or parts of phrases, where the level of measures is not clearly formed.

Hoshovsky distinguishes two basic levels of segmentation: the syntactic level S and the morphological level M; in the analysed examples, M is consistently divided into two levels, which we will designate with the symbols M_1 and M_2. Analysis of the examples shows that level S is also sometimes divided in practice into levels (Examples 7 and 8), which we will call S_1 and S_2. So Hoshovsky's project in effect distinguishes four levels of segmentation: S_1, (S_2), M_1 and M_2, one of which is optional.

If we take a more general look at the question of segmentation – as is done for example in analysis of the text of a linguistic utterance, where levels of phonemes, morphemes, words, phrases and so on are distinguished, up to the longest utterances – we can point to many levels of temporal segmentation in the analysed musical examples, although in music the situation is more complicated. In music, above all, the layer of the smallest segments does not discharge a function similar to that fulfilled by phonemes. We also cannot compare to phonemes the segmentation introduced through the flow of individual notes over time, which often belong to different rhythmic and metrical levels. Hoshovsky attempted to avoid those difficulties, starting not from the smallest, but from the largest elements of form, specifically from the stanza and its basic division called level S. The stanza is indeed easier to define, but any two stanzas are not necessarily equal. They may form two-line units, pairs of two-line units or even more elaborate entities. The adoption of the stanza as the starting point of segmentation and its division according to the three above-mentioned obligatory levels and one optional level meant that elements which are different from the point of view of their function in the formal construction found themselves on the same levels. Thus on level M_2 we find both basic metrical units from the middle ranges of the metronome scale (Examples 2, 3 and 4) and also simple measures consisting of two (Examples 1, 6 and 7) or three metrical units (Example 5), and even expanded components attaining the duration of medium-sized lines (Example 8), exceeding the duration not only of the elements of level S (Examples 2, 3 and 5) but even of a whole stanza (Example 4).

So if in music we are protected from obvious difficulties and paradoxes neither by starting with the smallest temporal units nor by beginning with the largest units in the form of a work or a stanza, the only possibility that remains is to seek comparable levels irrespective of their relationship to extreme levels. For this we must recognise that particular levels of musical segmentation are not exclusively of a relational nature with regard to extreme levels; their essence is determined at least by inherent features of elements belonging to comparable levels. Inherent, that is, recognisable by people from their very nature. That presupposes the existence of a scale of similarities that enables us to regard segments as belonging to this particular class and no other, ultimately depending on the scale of human feelings; it presupposes the existence of a natural human viewpoint and assessment of temporal shapings. Unfortunately, we know very little about this human perspective on time, although again not so little for that knowledge to be useless for our problem. Example 5.7 shows the levels of segmentation of eight melodies. To facilitate comparison, the levels of segmentation of Hoshovsky's system have also been marked here. Example 5.7 additionally takes account of the duration of segments. Subdivisions of units of movement in the form of melismatic notes of different intensity occurred in all the examples, except Example 4. In all the examples, this is a clearly formed level of the units of movement; in Example 1, it competes for importance with metrical units, which are highly distinctive everywhere. The lack of a clear formation of the level of metrical units, like the lack of a normalised level of simple measures, characterises only Example 8.

The level of simple measures is distinct in all the examples with the exception of Example 8. The level of compound measures or components of larger phrases is formed only in the last three examples (Examples 6, 7 and 8); in the remaining examples, the measures combine directly into self-contained, often very short, phrases. Only units of movement, phrases and stanzas occurred in all the analysed melodies without exception. Phrases combine directly into stanzas in Examples 2, 4, 6 and 8; in the others, one can also distinguish an intermediate level of connections between phrases forming part of multi-phrase stanzas. The most doubts arise with regard to Example 8, about which it is difficult to say whether it even belongs among stanzaic forms.

The fundamental two-level organisation of works that is distinguished in Hoshovsky's system by the levels S and M is also manifest in our analyses. This can be clearly seen in Example 5.19. We are inclined, however, to mark the ranges of

Levels of segmentation			Musical examples							
			1	2	3	4	5	6	7	8
	1	Subdivision of units of movement	+	+	+	–	+	+	+	+
I	2	Units of movement	+	+	+	+	+	+	+	+
I	3	Metrical units	+	**M_2**	**M_2**	**M_2**	+	+	+	–
I	4	Simple measures	M_2	M_1	M_1	M_1	M_2	M_2	M_2	–
	5	Compound measures, parts of phrases	–	–	–	–	–	M_1	M_1	M_2
II	6	Phrases	**M_1**	**S_1**	**S_2**	**S_1**	**M_1**	**S_1**	**S_2**	**M_1**
II	7	Combinations of phrases	S_1	–	S_1	–	S_1	–	S_1	$–S_2$, S_1
II	8	Stanzas	+	+	+	+	+	+	+	+
	9	Multi-stanza works	?	?	?	?	?	?	?	?

Example 5.6 Levels of segmentation of eight musical examples correlated with the segmentation of Hoshovsky's system.

these main levels and set the limits between them in a slightly different way. The core of the first level of organisation (I) is formed by units of movement, metrical units and simple measures; these are flanked by subdivisions of units of movement on one side and by compound measures of components of lines on the other. The core of the second level of organisation (II), meanwhile, consists of phrases, combinations of phrases and stanzas. These are framed by works as multi-stanzaic wholes and by compound measures or components of phrases, which delimit these two basic degrees of organisation and are of a distinctly transitional character, although it is easier to assign them to the first level than to the second. In other words, everything from which musical phrases are built would belong to the first level, which might be called the morphological level. The second level would be based on phrases and elements of more complex wholes, up to and including stanzas. The name syntactic level would also be appropriate here, although one traditionally speaks in this case about formal construction or the construction of stanzas. (The central regions of both levels are marked in the analyses with double lines separating the stanzas.) Adopting these principles to the delimitation of the two basic levels of the organisation of works, certain revisions should be made to Hoshovsky's analyses: in Example 1, 5 and 8, level M_1 should be moved to level S.

A uniform musical scale of pitch, tempo and duration formed the basis for the zonal theory of time.[143] Within that scale, the starting point was the second, a basic unit of time in the international system of measurements. The clock second, however, has one crucial flaw: it does not represent any temporal value characteristic of humans. The basic unit of the time of the environment in which people live on Earth is the day – and that size is adopted as the basis for the 'tuning' of the new version of the uniform musical scale adopted here. Within that scale, the disposition of units is modelled on the twelve-degree tempered scale of pitches and looks as follows:

octave (tuz) = 12 semitones (ints) = 1200 cents.

Example 5.7 shows the central values of the regions (i.e. fixed octaves, tuzes) numbered from 0 to 28. The eight- and four-octave rhythm is very distinct here. Central to this approach are the following:

- zero region (rhythm of day and night; mean value of the diurnal cycle);
- eighth region ('optimum' time of a work, an average-length work of popular music);
- sixteenth region (centre of the metronome scale; centre of the scale of the psychological present);
- twenty-fourth region (centre of the scale of musical pitches and average female or children's voice, mezzo-soprano).

The transitional regions are as follows:

- fourth region (a long, cohesive work, concerto movement or part of an opera);
- twelfth region (a long phrase or short stanza, a liminal value of the 'present time' of experimental psychology);
- twentieth region (delimitation of the ranges of musical pitches and temporal intervals);
- twenty-eighth region (top limit of musical pitches).

Example 5.8 shows the sizes of the uniform twelve-degree scale of pitch, tempo and duration, over a range that is necessary for detailed analysis of folk melodies. Marked on this 'score' of time are medium sizes of phonemes and speech syllables, medium running, walking, pulse and breath. Also shown are so-called

143 Bielawski 1976, Table 2.

'long times', crucial to our perception of musical phenomena, which we perceive solely as the tempo of a sequence. The graph of the Maelzel metronome scale, with the most important tempo markings, clearly displays its symmetrical design and central position within the zone of the psychological present. The axis of symmetry is 659 milliseconds or 91 MM; it may be called the 'human second'. It is sixteen tuzes away from the rhythm of day and night (12 hours) and eight tuzes (octaves) from the average musical pitch, designated as the middle note of mezzo-soprano: g^1. In music ethnography, folk melodies are often transposed to this note, to make it easier to compare them. Also marked on the table of the uniform musical scale are the ranges of human voices in singing, the scale of the piano and, departing from the centres of the zones of musical pitches and the psychological present, the linear scales of duration and frequency increasing symmetrically in opposite directions. (To my mind, they reveal the illusion of the still common conviction that the perception of temporal phenomena depends on a linear scale of time or, as others would have it, on a linear scale of frequency.) Of course, such linear rows can be derived from any value of the scale. Within the zone of pitches, a linear scale of frequencies is formed by the harmonic row. The linear scale of the time of particular vibration periods coincides with Riemann's hypothetical scale of 'lower harmonics'. Within the range of the psychological present, musical tempo is measured in the linear scale of frequencies (number per minute). That scale manifests itself also in rhythmic subdivisions (for example, 2, 3, 4, …, n rhythmic values falling on a metrical unit); measured on the linear scale of time, meanwhile, are entities comprising smaller units (for example, measures consisting of metrical units: duple time, triple time, quadruple time, and so on; phrases consisting of a different number of bars; stanzas of a different number of phrases, and so on). From rows of linear scales, one can easily read the distances (in ints or semitones) characteristic of various proportions, which eliminates the need to calculate derivatives of temporal values. It suffices, for example, to mark on our time score the values of a melody's metrical tempo, reading them from Example 5.8, and all the derivative sizes in specific proportions can be measured with a linear scale row (for example, 1:2 = 12 ints, 2:3 = 7 ints, 3:4 = 5 ints, 2:5 = 16 ints, 1:8 = 3 tuzes = 36 ints, etc.). To highlight this, the extreme regions of the large zones (regions 12, 20 and 28) and three central regions (15–17 and 23–25) are shaded.

It would be difficult to supplement the analysis of particular melodies prepared on a special linear system with all the characteristic values of the human scale of musical time and values. The results of analysis can always be compared with the model table 5.8. For the sake of convenience, however, the most important characteristic features are marked. The picture becomes clearer if we use double lines between stanzas to mark the three central regions of pitch (regions 23–25), the three central regions of the psychological present covering average units of movement, metrical units and simple measures (regions 15–17) and mean values of phrases, sentences and periods (regions 11–13). Bar lines can be used, meanwhile, to mark the compass of the average female voice (mezzo-soprano g-g^1) and the range of the Maelzel metronome scale (40–208 MM; the closest values on our scale are 40.5–204 MM). It is easier to define the structure of a melody's segmentation in terms of its relationship to all these characteristic sizes and average ranges.

Melody 1 The note pitches fall exactly at the centre of the average female voice. Crotchets MM = 144 were regarded as the metrical units; if the melody was used for dancing, they would constitute the basic dance step. Minims, however, lie closer to the middle of the tempo scale, so they would no doubt be more likely beat units. The phrases are shorter than the average breath. Two of these phrases form a very short stanza or a self-contained 'half-stanza'. Its repetition would complete the stanza.

Melody 2 The scale of the voice falls within the upper mezzo-soprano register, although it belongs rather to the middle soprano register. The metronome tempo is given for the unit of movement, quaver MM = 208 at the edge of the metronome scale. The basic metrical unit is variable; it is a crotchet (MM = 104) in the rhythm of walking, consisting of two units of movement, and at the end of a bar a dotted crotchet comprising three units of movement. This gives rise to 'limping' rhythms in the pattern 2+2+2+3, characteristic of oriental cultures, which Bartók called Bulgarian rhythms. Extended metrical units end semi-phrases, suspending the movement in a cadence. As a consequence, the symmetry of the next level in the pattern 4 + 5 units of movement is also disturbed. The superior units display a regular design. The phrases are decidedly shorter than a breath. Breathing is normally lengthened in singing, sometimes quite considerably. One may assume, therefore, that two phrases were performed on a single breath, if breathing was at all correlated with musical structure, which in folk singing is by no means the norm.

Melody 3 The scale of pitches appears in a slightly lowered mezzo-soprano register or slightly raised alto register. The levels in the organisation of time form a highly regular pattern. The metrical units fall exactly at the centre of the metronome scale, and the units of movement and simple measures also fall within the range of its scale. Melismatic subdivisions form another level in the organisation of time in the region of the average tempo of the syllabic flow of normal speech. In singing, that flow is slower and falls within the upper region of the scale of musical tempo. Seven-syllable semi-phrases make up the model length of an average musical phrase (four two-time bars in *moderato*).

Melody 4 The melody reaches the centre of the mezzo-soprano region. The temporal structure is highly regular, employing just five levels. The tempo of the basic metrical units 120 MM means that the units of movement go beyond the range of the metronome. The measures remain within the metronome range. The phrases are very short, and the length of a stanza is equal to the length of an average breath.

Melody 5 The melody falls within the upper mezzo-soprano or middle soprano register. The temporal structure is more complex. The time scale has twelve degrees, contained within seven 'octaves' (ratio 1:2). The tempo of the basic metrical unit adheres to the rhythm of a normal heart rate. The units of movement are clearly marked; they fall within the top region of the metronome range, whilst minims go beyond that range. Triple-time two-bar units in the third part of the melody were reduced to a single four-time bar. The duration of a stanza goes clearly beyond the range of the psychological present.

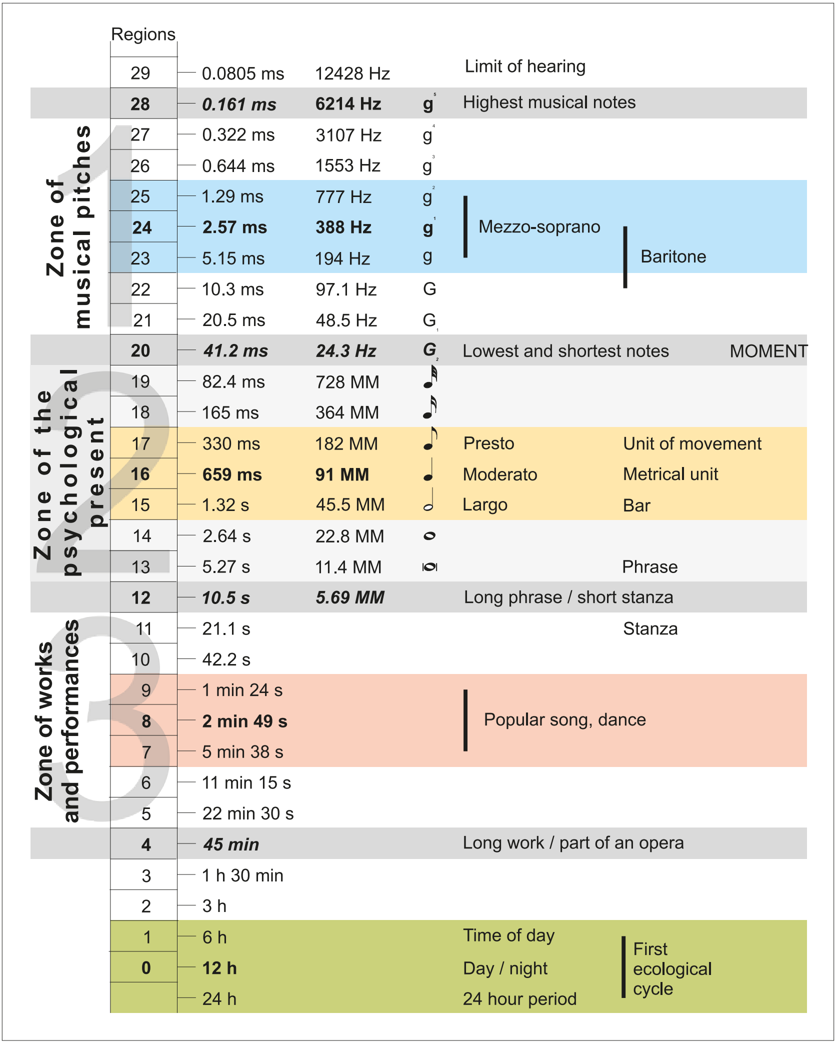
Melody 6 The melody falls at the centre of the mezzo-soprano scale. The complex temporal structure arises out of the tension between the deep ordering rhythm of the regular versification structure and the surface musical rhythm, which, isolated from the text, suggests a different phrase pattern:

Text: 4+6 4+6 4+6 ssss|ssssss||ssss|ssssss||ssss|ssssss||
Melody: 4+10 10+6 ssss||ssssss|ssss||ssssss|ssss||ssssss||

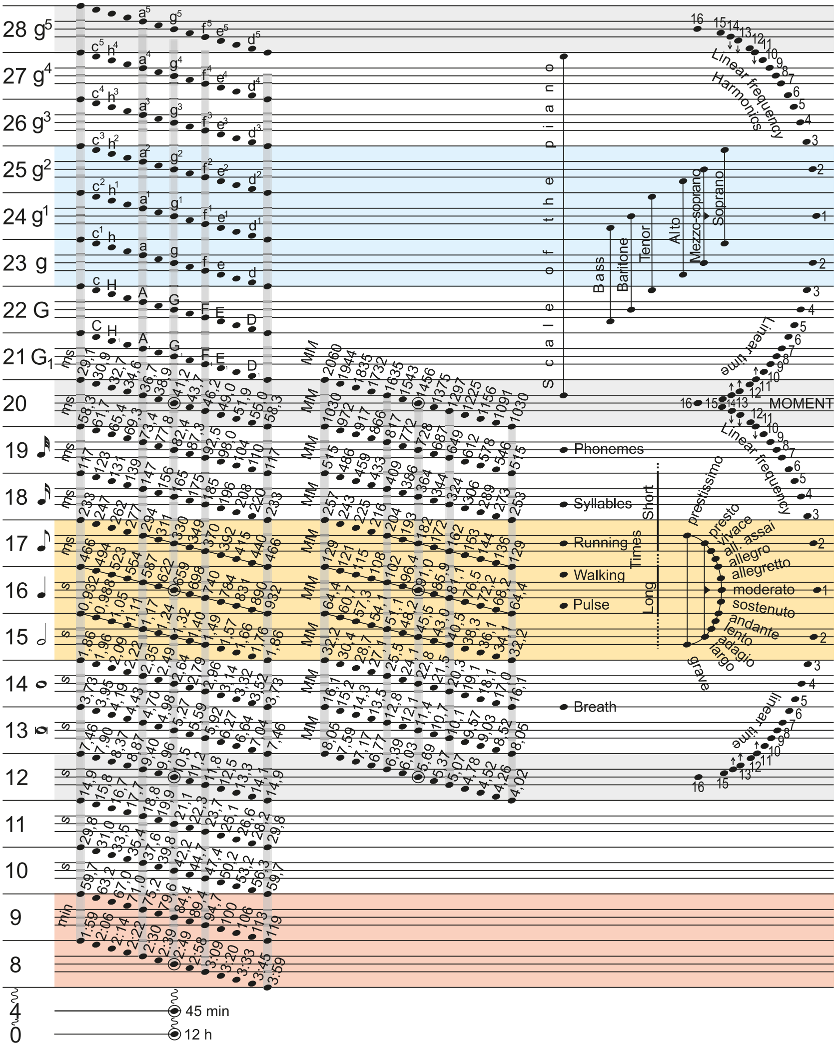
I based the time structure graph on the segmentation of the deep rhythm (ordinal rhythm) of the versification structure. The tempo of the basic metrical unit 108 MM means that the simple measures fall within the metronome scale, whilst the units of movement go minimally beyond that scale. The regularity of the flow is disturbed by pauses and rhythmic augmentation in the cadence. Six basic levels in the organisation of time can be distinguished (even seven with Nachschlagen), but individual levels have two or even three variants.

Melody 7 The scale of the melody falls within the upper mezzo-soprano register, and so also in the middle of the soprano range. The slow tempo of the basic metrical unit (60 MM) means that its first-degree subdivisions (quavers, 120 MM) come even closer to the middle of the metronome scale (the human second), but they do not assume the main rhythmic function, since they are weakly expressed in melismatic notes. The syllabic flow of the singing, marked with a broken line linking successive syllables, is concentrated in the lower regions of the metronome scale; in normal speech, it is decidedly quicker and goes beyond the range of the metronome. The simple duple-time measures maintain a regular metre. The notation in compound measures blurs that fact. In the formal structure, we find characteristic variation. The versification structure 4+4+R5 4+4+R5 in the simple measures takes the form 2 2 3 2 2 3, which may also be treated as 4 3 4 3. The three-bar chorus parts are shortened forms of the four-bar lines or extended forms of their two-bar components. The two-bar units are of the length of an average breath, whilst the three-bar units extend that breath, although it is doubtful whether a real breath in human singing was formed with such regularity. The eight-syllable (four-bar) lines and seven-bar sentences (counted in simple measures) fall within the extreme region of the psychological present; the stanzas go decidedly beyond that limit.

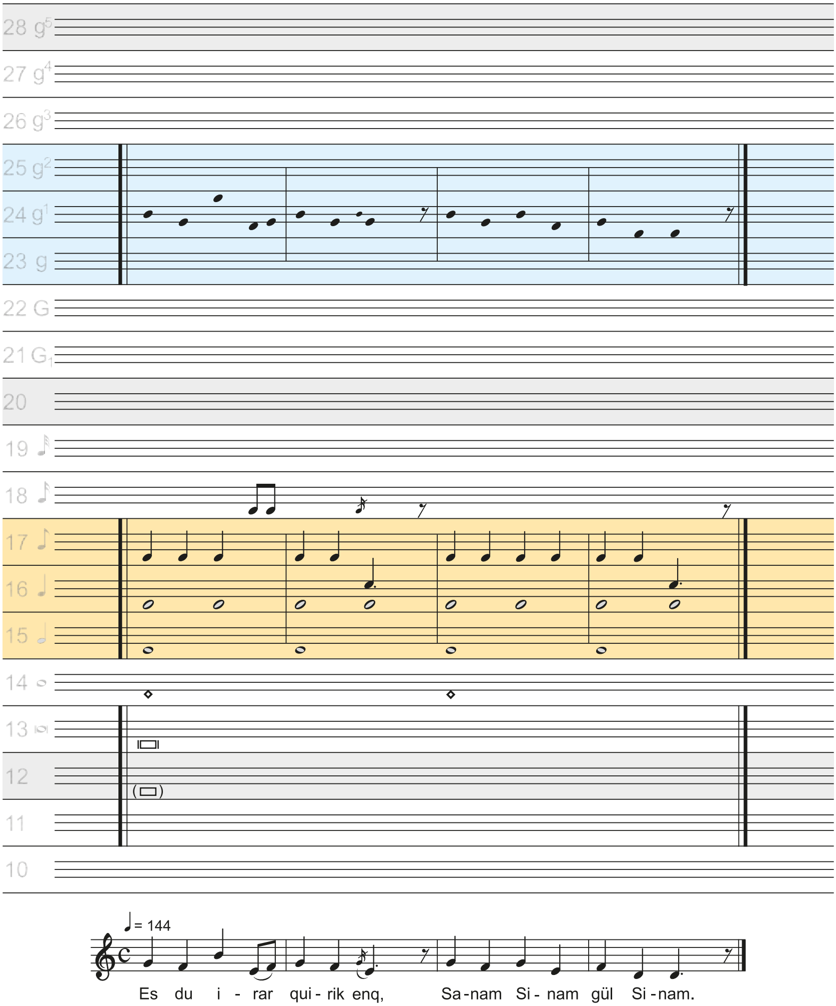
Melody 8 The melody circles around the centre of the mezzo-soprano scale, reaching its climax at the beginning, and descending into the lowest notes in the cadence. It does not have a regular beat structure. The value 78 MM was adopted as the metrical unit. That value stabilises, albeit not entirely, as this parlando and melismatic melody unfolds. The units of movement – quavers – seem more regular, but that is rather a suggestion derived from the notation. The syllabic flow of the singing, marked with a broken line linking successive syllables, leaps from short to long values within the range of the metronome scale, rarely exceeding it at the top and the bottom. Its average tempo is considerably slowed in relation to the tempo of speech, falling in the middle of the metronome scale, where in speech words and prosodic words normally occur. Parts of lines are concentrated in the region of average breath, which means that whole lines correspond to a second breath. The five-line stanza structure 9 10 12 11 12 was interpreted by Hoshovsky as asymmetrical, with its main caesura after the second line.



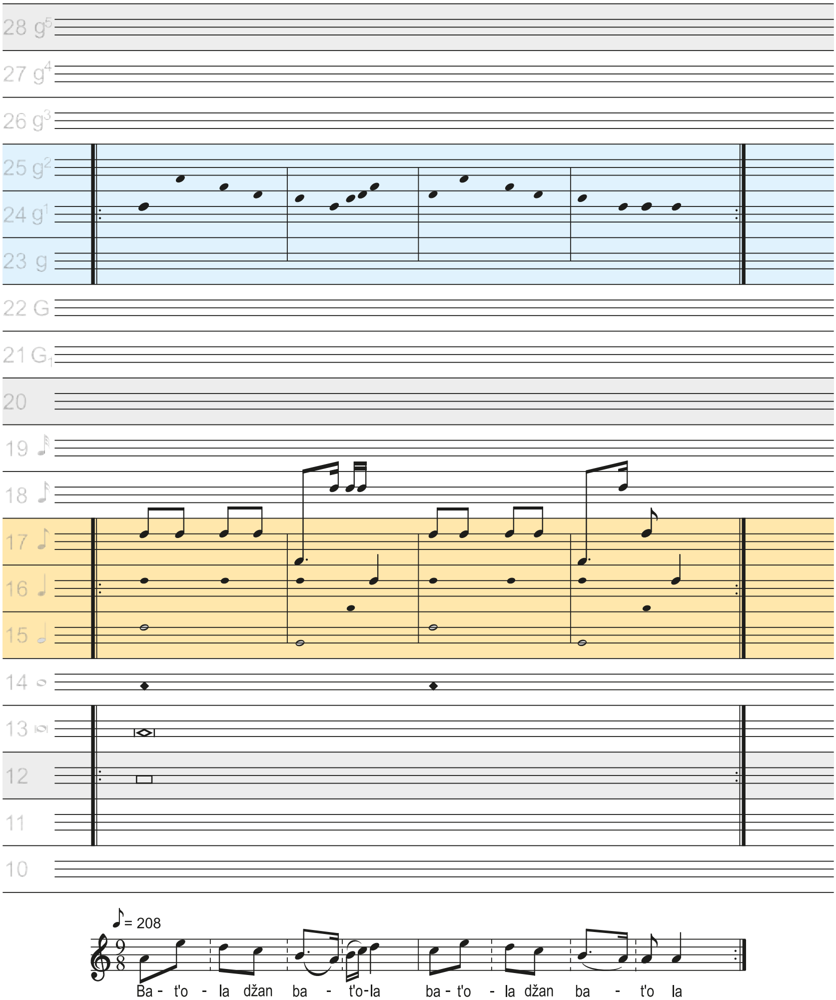
Example 5.7 Three basic zones of time used in every musical activity: the zone of audible notes (musical pitches), the zone of the psychological present (rhythmic times) and the zone of musical works and performances. Each of these zones can be divided into subzones holding various functions in music and in human activity. The location of these zones on the logarithmic scale of time was correlated with the first ecological cycle, the cycle of day and night.



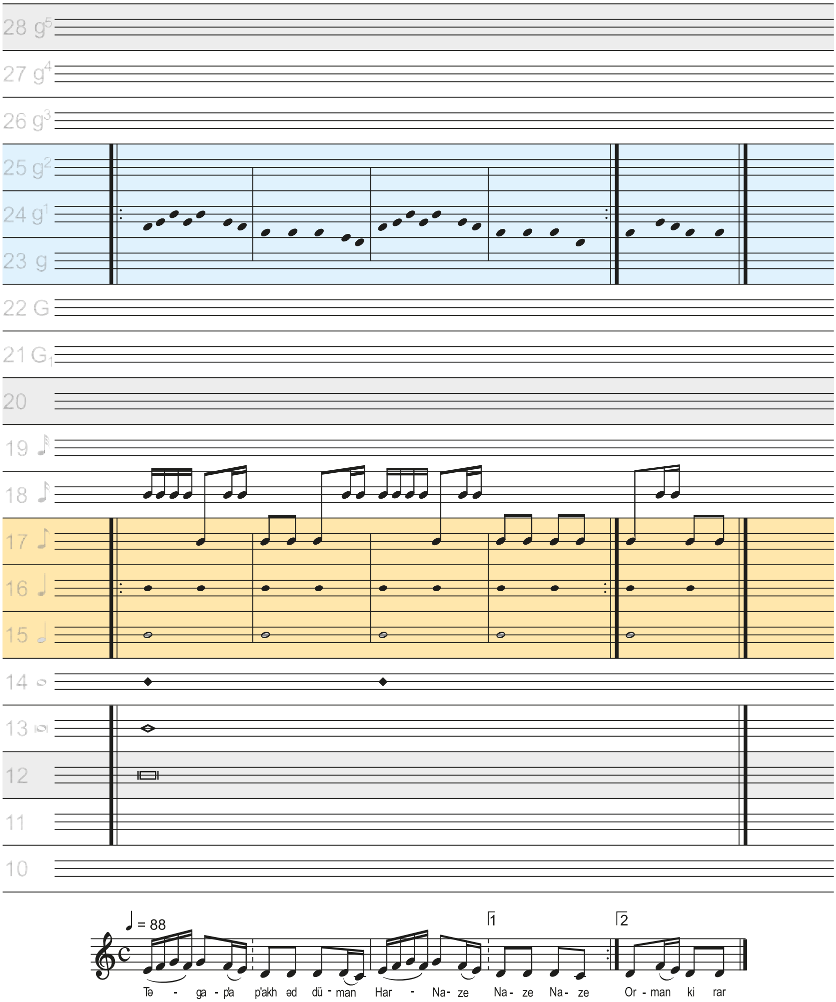
Example 5.8 Uniform musical scale of pitch, tempo and duration, twelve-hour module.



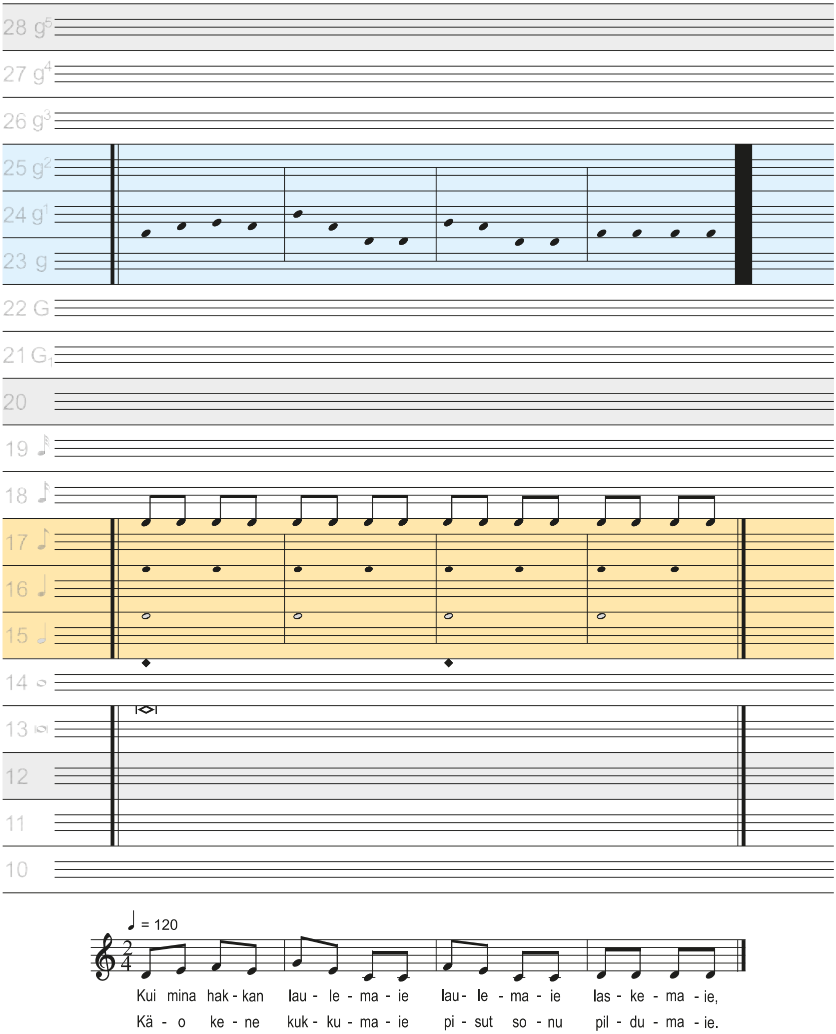
Example 5.9 Armenian melody. Hoshovsky 1977, no. 1.



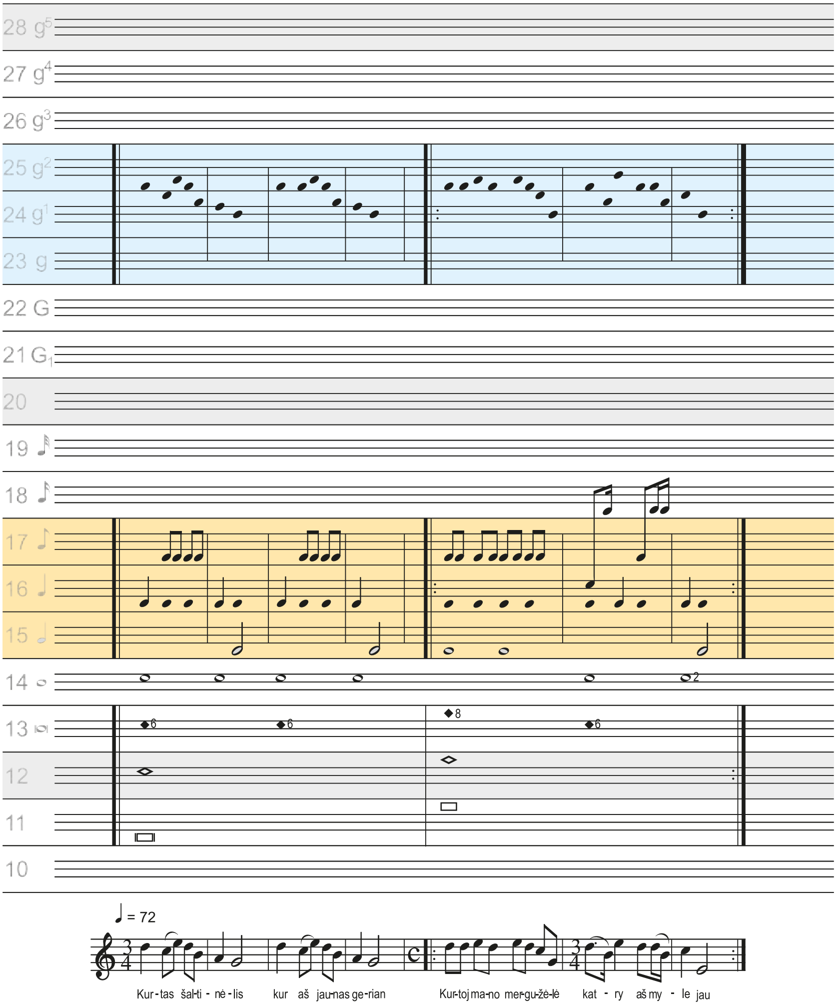
Example 5.10 Armenian melody. Hoshovsky 1977, no. 2.



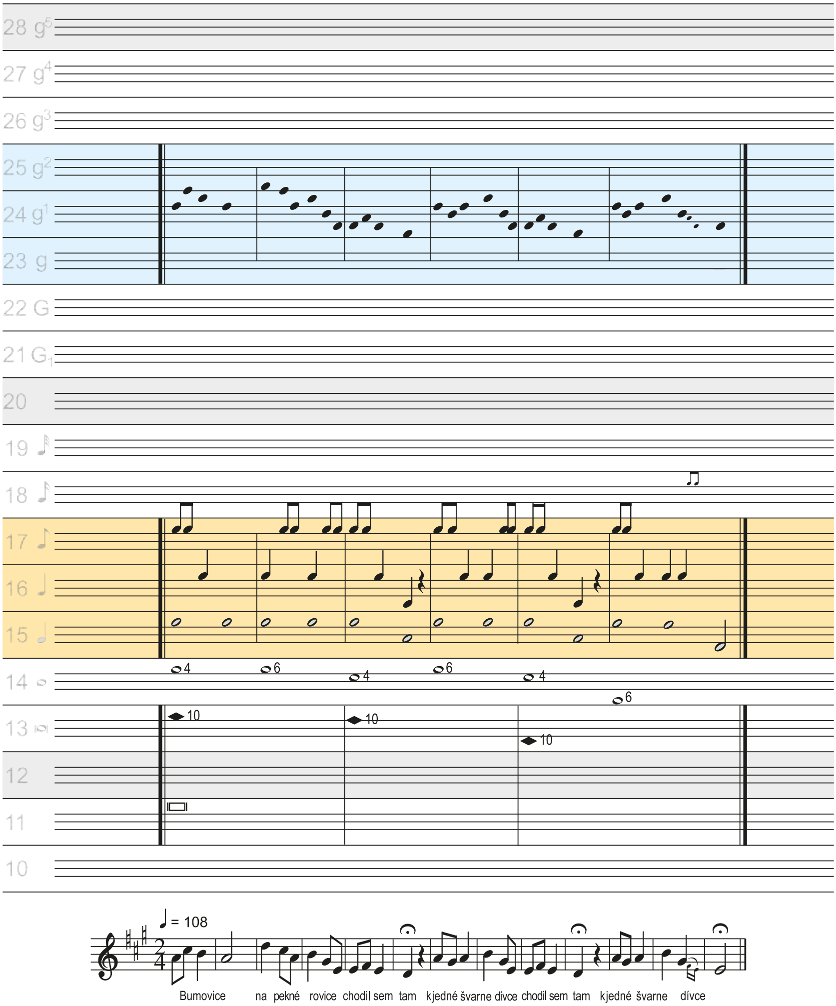
Example 5.11 Armenian melody. Hoshovsky 1977, no. 3.



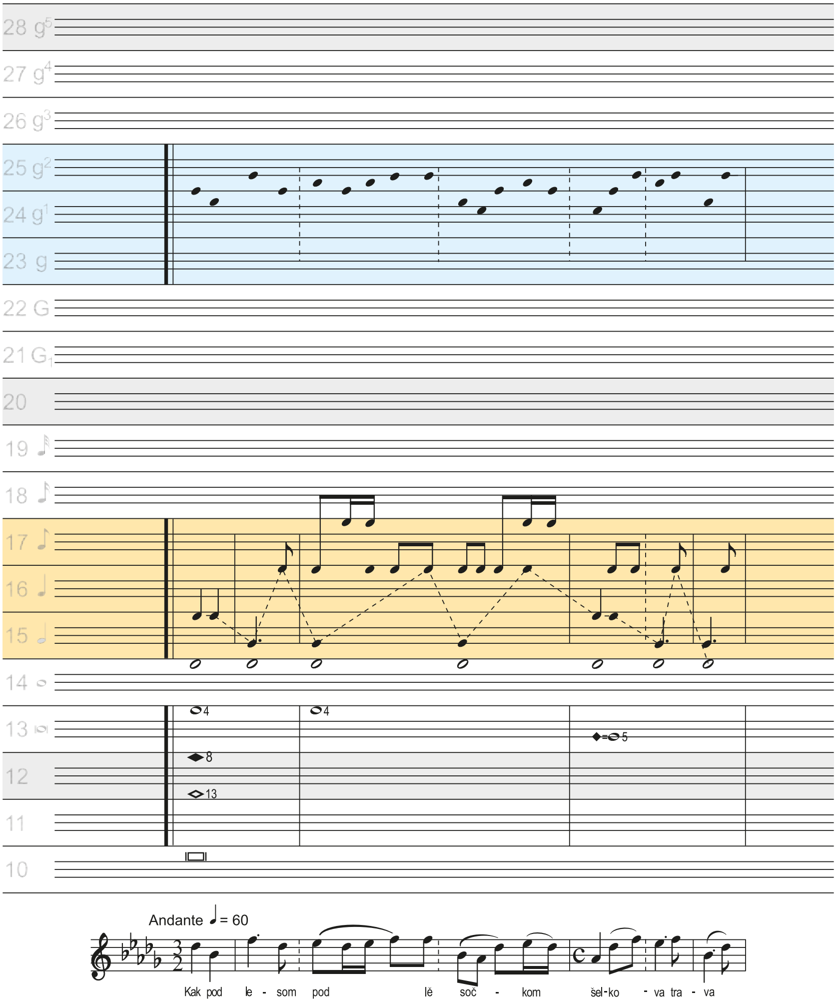
Example 5.12 Estonian melody. Hoshovsky 1977, no. 4.



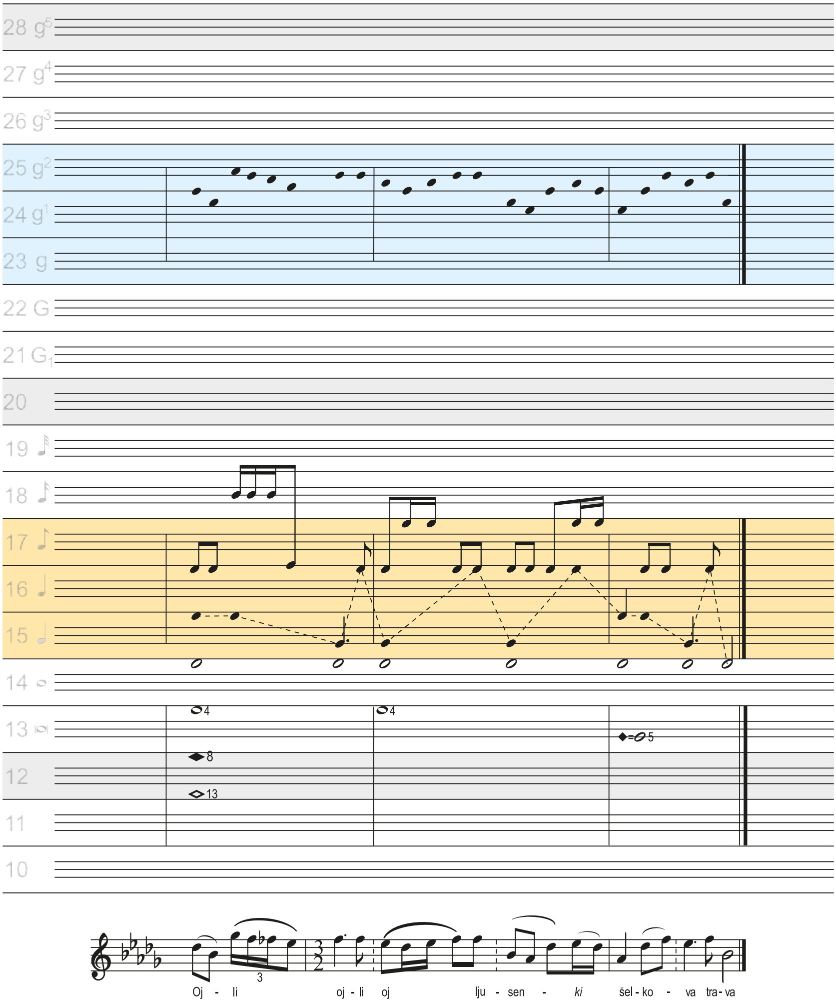
Example 5.13 Lithuanian melody. Hoshovsky 1977, no. 5.



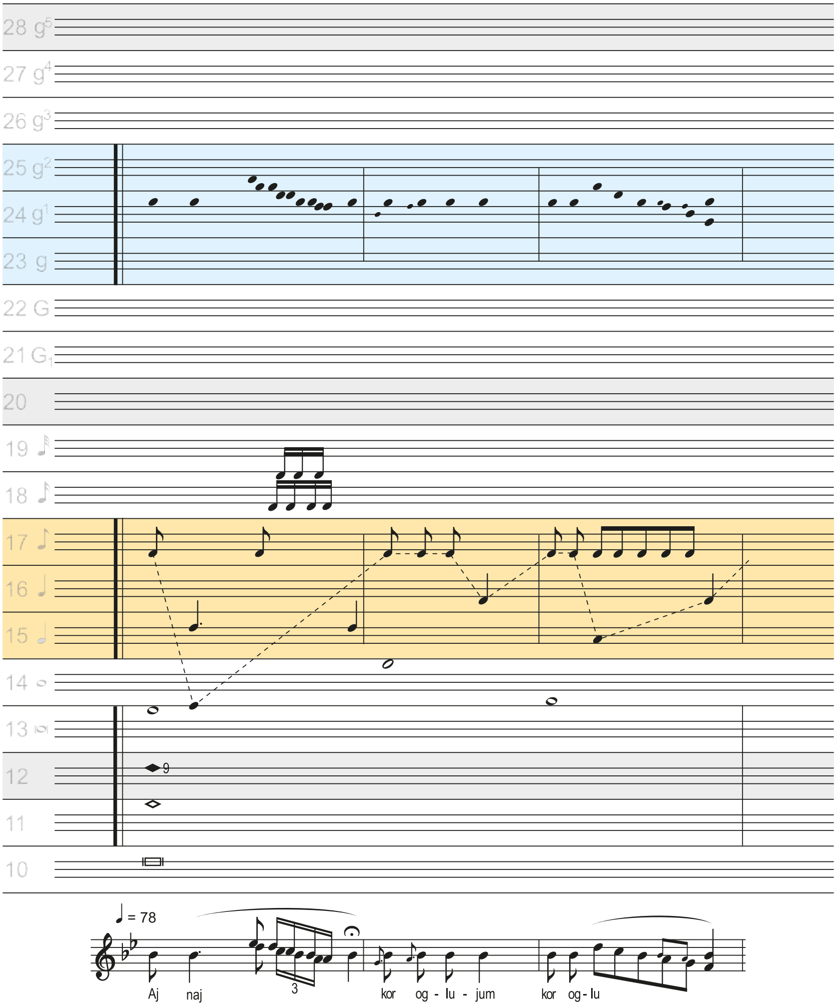
Example 5.14 Moravian melody. Hoshovsky 1977, no. 6.



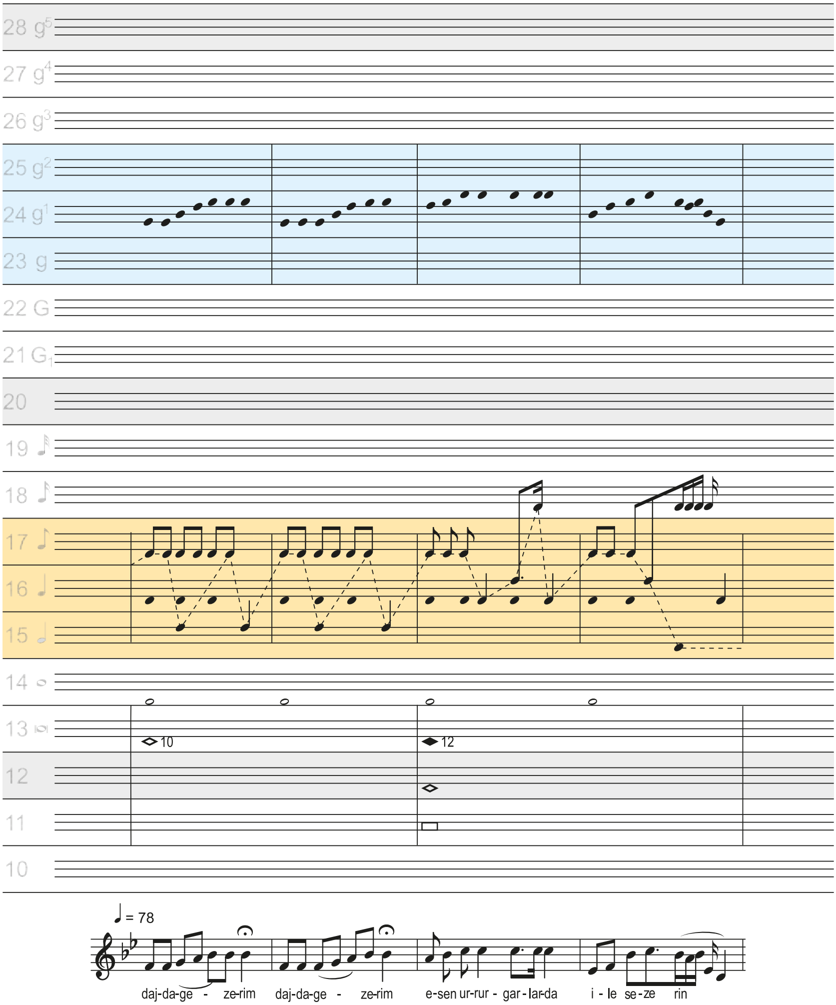
Example 5.15 Russian melody. Hoshovsky 1977, no. 7. The broken line denotes the syllabic flow.



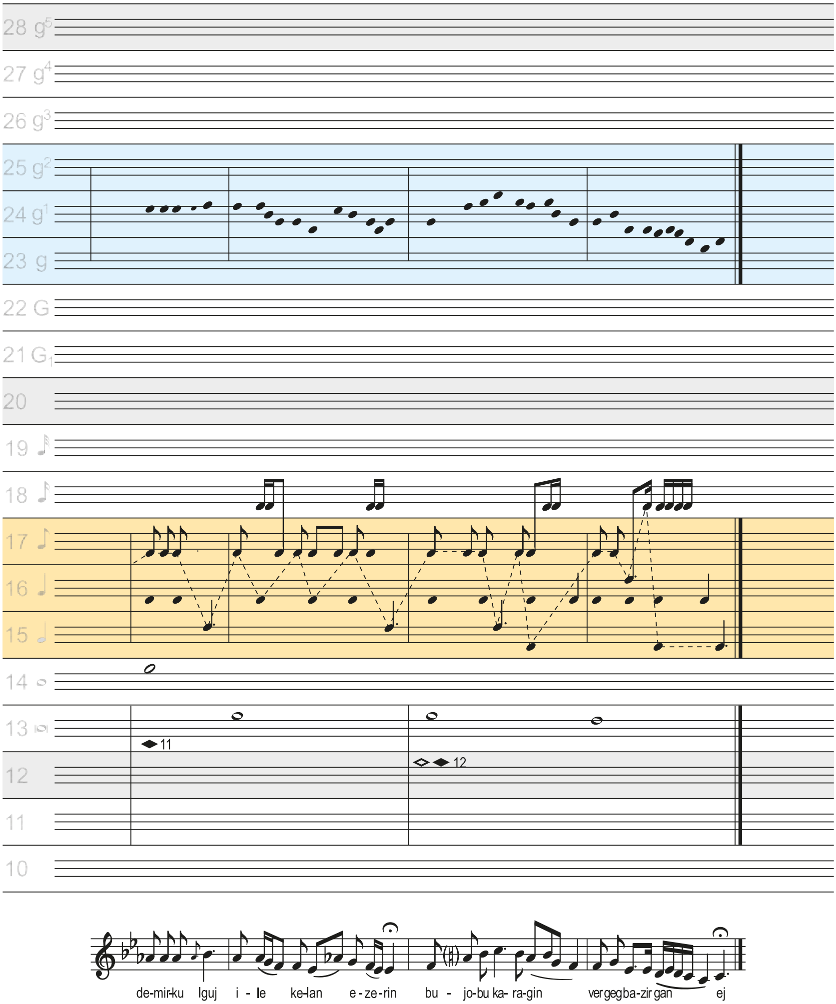
Example 5.15 Continued



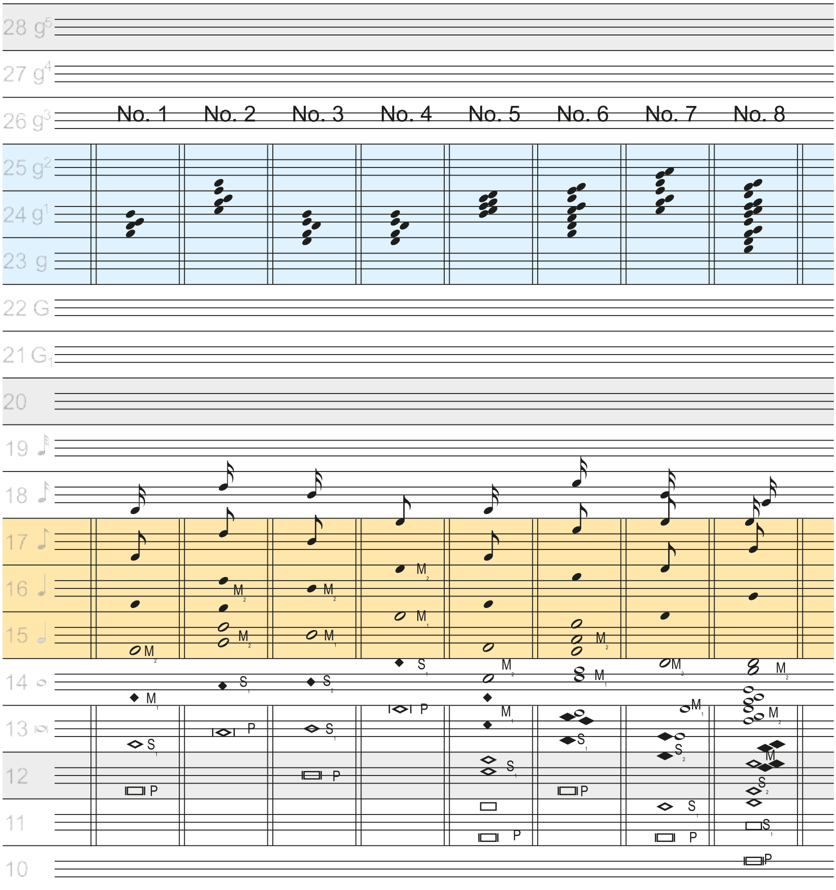
Example 5.16 Tatar melody. Hoshovsky 1977, no. 8.



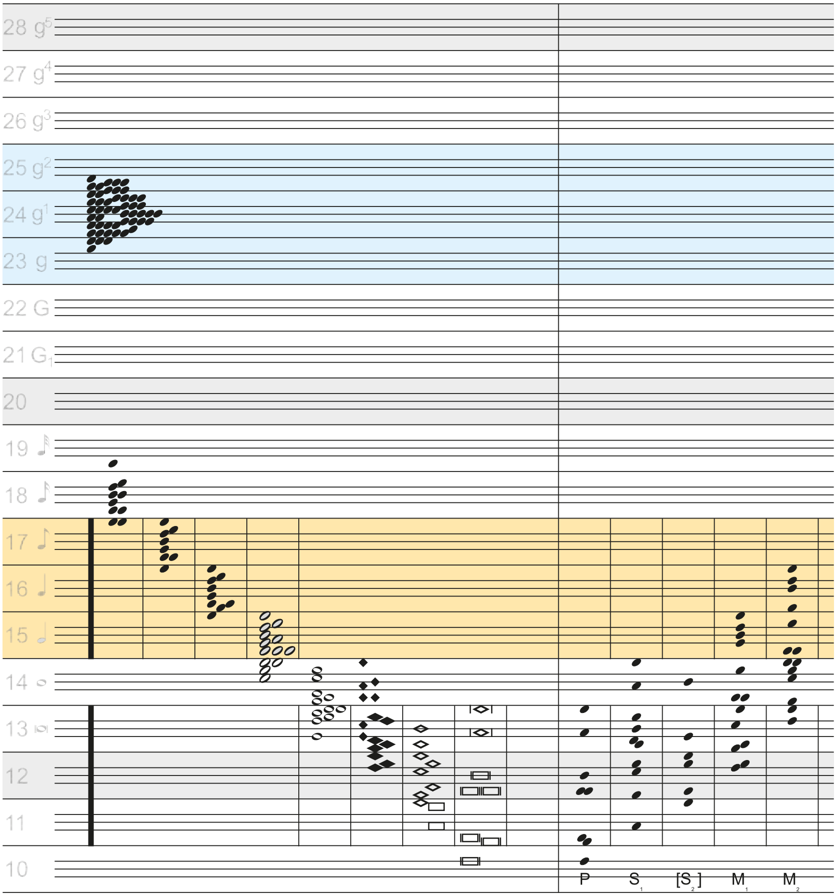
Example 5.16 Continued



Example 5.16 Continued



Example 5.17 Scales of note pitches and levels of segmentation of eight melodies.



Example 5.18 Collective representation of levels of segmentation after the project of the author of this work and the project of Volodymyr Hoshovsky P, S_1, $[S_2]$, M_1, M_2

6 The zone of ecological time

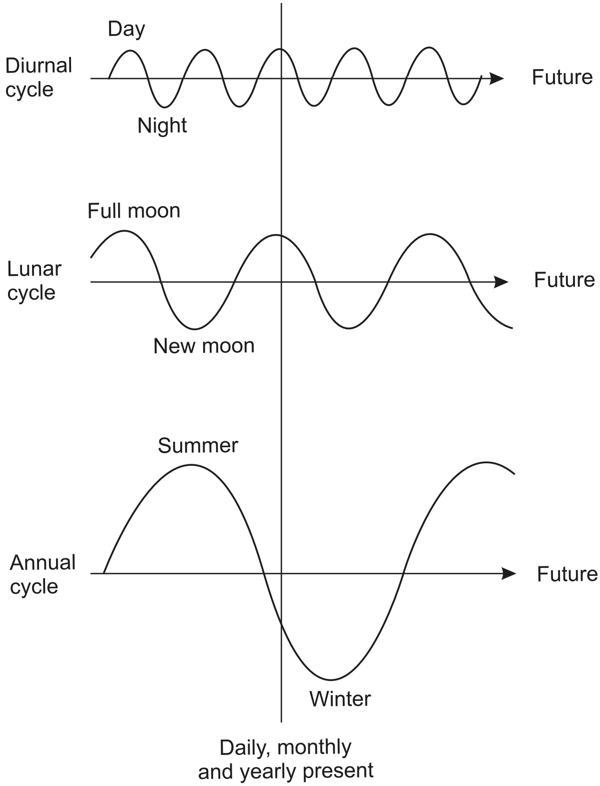
6.1 The cycles of ecological time

The large zone of ecological time is divided into three smaller zones: the zone of the diurnal cycle, the zone of the lunar cycle and the zone of the annual cycle. The times of day and seasons of the year, and to a lesser extent also the quarters of the moon, impose upon us a fixed temporal rhythm and, depending on climatic conditions and the type of culture, exert some form of influence on human activity, including musical activity. Ecological time constitutes the natural calendar of our environment, underpinning all historically and culturally conditioned formalised calendars. Even without them people are able to accurately assess their current place in ecological time, their diurnal, lunar or annual present. The fixed rhythm of the cycles of ecological time orders our past, enabling us to locate past events with relative precision, and the regularity of its sequence makes it possible to predict future time. Those properties relate, of course, to the dynamic character of time, time as a continuum, as a succession of changes, the contextual time in which segments of time are juxtaposed with other segments of the same sequence. That time is best represented by an axis of arithmetic time, extending from the infinite past to the infinite future, delimited by our present.

Ecological time considered in terms of dynamic time flows along on three levels at different speeds, marked by the length of the diurnal, lunar and annual cycles. This situation is illustrated schematically (without the correct proportions) by Example 6.1.

From the formal point of view, the basic internal structure is essentially identical in all the cycles of ecological time. It is based on a fundamental binary opposition (day – night, full moon – new moon, summer – winter), with transitional zones also distinguished (morning – evening, waxing moon – waning moon, spring – autumn). As a result, we obtain three main periods of ecological cycles (times of the day, quarters of the moon, seasons of the year). In a non-formalised calendar, the stages in the ecological cycles do not have strictly delimited boundaries, but flow smoothly into one another; hence their sizes fluctuate in certain zones.

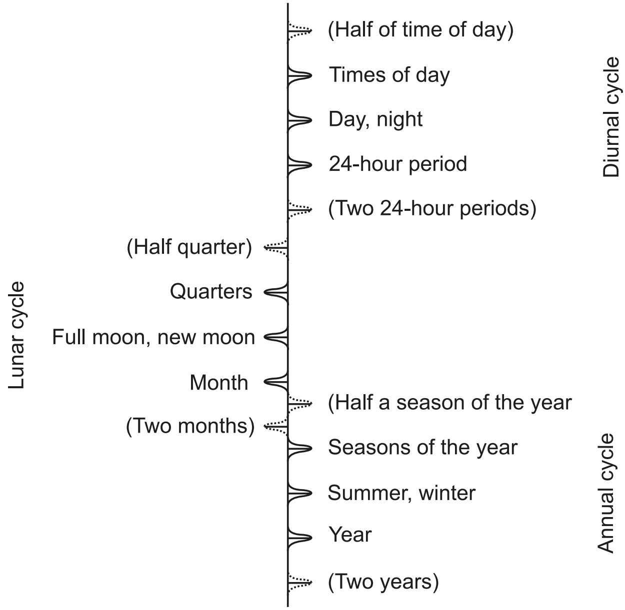
One cannot overestimate the role of feasts in the organisation of the calendar in early cultures. And that applies not just to the cultures of primitive peoples. Still today, even our most laicised calendar organises Sundays and feast days in a different way to the days of the working week.



Example 6.1 The three cycles of ecological time: the diurnal, lunar and annual cycles; overview drawing without actual temporal proportions.

Representations of time as a circle around which time continually moves or as continuous motion on an axis of opposites belong to the dynamic theory of time, although they do show to some extent its stable elements within that motion.

Of a completely anti-dynamic character is time considered on the systemic (logarithmic) axis of time, on the axis of the temporal code. On this axis, ecological time assumes a highly characteristic form. It comprises three asymmetrical temporal zones, each of which has an essentially identical internal design that segments its space in a natural way with the ratio 1:2, so it manifests itself in a tuz or octave rhythm, the same that underpins, for example, the main proportions of rhythmic values in music, so semibreves, minims and crotchets (Example 6.2).



Example 6.2 The zones of ecological time (the diurnal, lunar and annual zones); overview drawing.

Three sizes in each of these zones of ecological time impose themselves most evidently: the size of the full cycle (days, months, years), the sizes of the intervals of the basic contrast (day – night, full moon – new moon, summer – winter), the sizes taking account of the transitional stages between those contrasts, also adhering on average to the ratio 1:2, so dividing the full cycle into four periods (times of the day, quarters of the moon, seasons of the year). This tuz-based rhythm to the three zones of ecological time, of which the middle zone is based on the basic contrast, displays a tendency to spread out, as it were, into the neighbouring zones in tuz distances by doubling the full cycle or halving the quarters of the cycle. Thus the basic three-degree scale gives rise to a five-degree scale. As a result, the whole large area of ecological time, from around six hours to one year, and even from around three hours to two years, is filled with the rhythm of the natural temporal phases, which perfectly facilitates human orientation in this large temporal zone. This natural calendar of the human environment represents a 'deep structure' in one modification or another, manifesting itself in the 'surface structures' of the calendar of the various environments and cultures described by ethnography and history.

Ecological time is double coded: once in the form of a specific scale on the systemic (logarithmic) axis of time, once as an encoded context on the (linear) axis of arithmetic time, in the form of a continuous succession of times of day, quarters of the moon and seasons of the year. The constant rhythm of ecological time plays a crucial part in organising human activity and is by no means insignificant for music as well.

6.2 The temporal environment of Black Africa

The temporal environment of Black Africa has been profiled by Zajączkowski.[144] There, the elementary unit of time is not day and night, but only day:

> The day is divided into intervals, whereas the night is not subject to any divisions. The day is human – the night is the dominion of inhuman powers, most often hostile towards humans […] Among the Guere, for example, the start of the 'day' is the moment when the moon appears, so, according to our organisation of time, 'yesterday evening'. With some peoples, also belonging to the day is that part of the evening when people dance by firelight. The day is organised by natural and communal events – but not by religious events, which mark the start of the day among some peoples only.[145]

A larger unit of division in African time is the period of several days, which in African studies is called a week, although it does not necessarily last for seven days. It is determined not by the lunar quarters, but by periodically repeating event days. One such event is market week:

> For the Bakongo, market week lasts for four days […] the days of the week bear the names of the four most important markets, held on 'their' days in different parts of the country […] With the Kikuju, there is a double week system: a four-day market week and a six-day week corresponding to the six-day period of grazing cattle on a single pasture.[146]

The week is even more complex among the Komo:

> The first day of the week is market day, the second day is a day of work, the third day is an unlucky day, on which no one works, and the fourth to the seventh day are work days. With some African peoples, a week is a period between days devoted to religious cults, which recur after a specific number of days have passed […] However, there are peoples in Africa […] among which there is no weekly organisation of time at all.[147]

144 Zajączkowski 1988.
145 Ibid., 18.
146 Ibid., 19.
147 Ibid., 19–20.

The next unit of African time is the lunar month, which has no functional value, but determines the life of women, and procreation has considerable communal significance.

> Africans perceive the monthly cycle of the Moon as inducing the menstrual cycle. In many African languages, a menstruating woman is one who 'looks at the moon', 'goes to the moon', etc.[148]

From the point of view of the organisation of time, the most important category in Africa is the season of the year, but it is linked with the meteorological, not astronomical, calendar.

> Everywhere, there are two seasons of the year, the dry and the rainy, but in many regions that dual pattern is complicated by the presence of additional seasons: the small dry season and the small rainy season. However, the dual organisation of the year into rainy and dry seasons is not the rule, since wherever the production factor is more prominent (thanks to certain agricultural properties or for other reasons that are difficult to generalise), the division of the year into seasons is extremely complicated.[149]

The last unit of time is the astronomical year, determined in a way that is far from exact, and there is limited functional significance to the distinction of a full annual cycle.[150]

6.3 Sacred time and secular time

In the zone of ecological time, religious people distinguish ordinary, secular time, characterised by acts devoid of any religious significance, and special, sacred, holy time, belonging to the highest regions of temporality, defined in the systematics adopted here as the time of myth, faith and worldview.

> Between these two kinds of time there is, of course, solution of continuity; but by means of rites religious man can pass without danger from ordinary temporal duration to sacred time.[151]

The juxtaposition of sacred and secular time was created by the gods 'at the dawn of the world'. Sacred time is obviously atemporal, constant and invariable. Through religious rites, one can enter and leave that time; in this sense, it is said to be reversible time.

148 Ibid., 20–21.
149 Ibid., 22.
150 Ibid.
151 Eliade 1959, 68.

> Every religious festival, any liturgical time, represents the reactualization of a sacred event that took place in a mythical past, 'in the beginning'. Religious participation in a festival implies emerging from ordinary temporal duration and reintegration of the mythical time reactualized by the festival itself. Hence sacred time is indefinitely recoverable, indefinitely repeatable. From one point of view it could be said that it does not 'pass', that it does not constitute an irreversible duration. It is an ontological, Parmenidean time; it always remains equal to itself, it neither changes nor is exhausted. With each periodical festival, the participants find the same sacred time – the same that had been manifested in the festival of the previous year or in the festival of a century earlier; it is the time that was created and sanctified by the gods at the period of their *gesta*, of which the festival is precisely a reactualization. In other words the participants in the festival meet in it *the first appearance of sacred time*, as it appeared *ab origine*, *in illo tempore*.[152]

Sacred time, which we would like to regard as eternal, also has a beginning, since it was created, like secular time, by the gods. The annual cycle of ecological time is renewed and hallowed by sacred time:

> For religious man of the archaic cultures, *the world is renewed annually*; in other words, *with each new year it recovers* its original sanctity, the sanctity that it possessed when it came from the Creator's hands. This symbolism is clearly indicated in the architectonic structure of sanctuaries. Since the temple is at once the holy place par excellence and the image of the world, it sanctifies the entire cosmos and also sanctifies cosmic life. This cosmic life was imagined in the form of a circular course; it was identified with the year. The year was a closed circle; it had a beginning and an end, but it also had the peculiarity that it could be reborn in the form of a *new* year. With each New Year, a time that was 'new', 'pure', 'holy' – because not yet worn – came into existence.[153]

All human activity imitates divine models, as rituals are designed to remind us:

> On the level of primitive civilizations, whatever man does has a trans-human model; hence, even outside of the festival time, his acts and gestures imitate the paradigmatic models established by the gods and the mythical ancestors. But this imitation is likely to become less and less accurate. The model is likely to be distorted or even forgotten. It is the periodical reactualizations of the divine acts – in short, the religious festivals – that restore human knowledge of the sacrality of the models. The ritual repairing of ships and the ritual cultivation of the yam no longer resemble the similar operations performed outside of the sacred periods. For one thing, they are more precise, closer to the divine models; for another, they are *ritual* – that is, their intent is religious. A boat is repaired ceremonially not because it is in need of repair but because, *in illo tempore*, the gods showed men how to repair boats. It is a case not of an empirical operation

152 Ibid., 68–70.
153 Ibid., 75–76.

> but of a religious act, an *imitatio dei*. The object repaired is no longer one of the many objects that constitute the class 'boats' but a mythical archetype – *the very boat that the gods manipulated in illo tempore*. Hence the time in which the ritual repairing of boats is performed coheres with primordial time; it is the same time in which the gods labored.[154]

Sacred time is an eternal present:

> Religious man periodically finds his way into mythical and sacred time, re-enters the *time of origin*, the time that 'floweth not' because it does not participate in profane temporal duration, because it is composed of an *eternal present*, which is indefinitely recoverable.

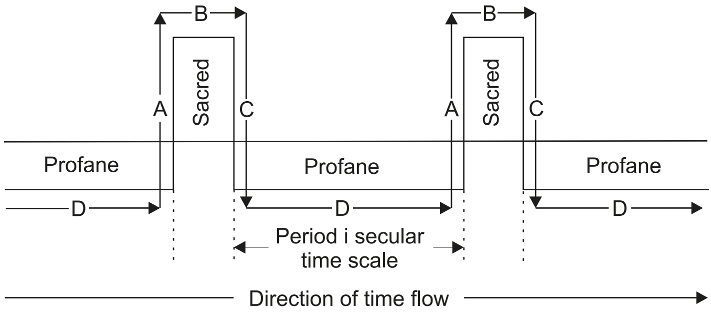
Profane duration derives from sacred eternity:

> Religious man feels the need to plunge periodically into this sacred and indestructible time. For him it is sacred time that makes possible the other time, ordinary time, the profane duration in which every human life takes its course. It is the *eternal present* of the mythical event that makes possible the profane duration of historical events.[155]

One may associate the regularity of the succession of the stages of ecological cycles not only with the axis of temporal flow; they best illustrate the dynamic character of time. Ethnographers researching primitive cultures have occasionally recorded facts that attest to a notion of time as a loop or a circle, on which time is continually renewed, forever passing through the same stages. Born of the basic contrasts in the cycles of ecological time are anthropologists' representations of time as perpendicular to the axis of unidirectional dynamic time, so time that assumes a reversible character, directed one way and back. This transverse and reversible direction of time, functioning in notions of time in some cultures, can also concern other opposites regulating human time. Edmund R. Leach illustrates reversible time based on Durkheim's opposition between sacred and profane time:

> The year's progress is marked by a succession of festivals. Each festival represents, for the true Durkheimian, a temporary shift from the Normal-Profane order of existence into the Abnormal-Sacred order and back again. The total flow of time then has a pattern which might be represented by such a diagram as this [Example 6.3]. Such a flow of time is man made. It is ordered in this way by the Societies (the 'moral persons' to use Durkheimian terminology) which participate in the festal rites. The rites themselves, especially sacrificial rites, are techniques for changing the status of the moral person

154 Ibid., 87–88.
155 Ibid., 88–89.



Example 6.3 Profane and sacred time. Reprinted from Leach 1961, 134.

> from profane to sacred, or from sacred to profane. Viewed in this Durkheimian way, the total sequence embraces four distinct phases or 'states of the moral person'.
> Phase A. The rite of sacralization, or separation. The moral person is transferred from the Secular-Profane world to the Sacred world; he 'dies'.
> Phase B. The marginal state. The moral person is in a sacred condition, a kind of suspended animation. Ordinary social time has stopped.
> Phase C. The rite of desacralization, or aggregation. The moral person is brought back from the Sacred to the Profane world; he is 'reborn', secular time starts anew.
> Phase D. This is the phase of normal secular life, the interval between successive festivals. [...] among the various functions which the holding of festivals may fulfil, one very important function is the ordering of time. The interval between two successive festivals of the same type is a 'period', usually a named period, e.g. 'week', 'year'. Without the festivals, such periods would not exist, and all order would go out of social life. We talk of measuring time, as if time were a concrete thing waiting to be measured; but in fact we *create time* by creating intervals in social life. Until we have done this there is no time to be measured.[156]

6.4 The temporal environment of the Middle Ages

Aron Gurevich gives a precise characterisation of the change in the temporal environment in mediaeval Europe. The archaic understanding of time was relegated to the background; a 'lower layer of popular awareness' was forged.

> The pagan calendar which reflected the seasonal changes of the year was adapted to the needs of the Christian liturgy. The church festivals, marking the turning-points of the annual cycle, go back to pagan times; agrarian time was also liturgical time. The year was

156 Leach 1961, 134–135.

> divided up by festivals recalling events in the life of Christ, and by holy days. In different countries, the year began at different times – at the time of the birth of Christ, as Holy Week, or at the Annunciation. Accordingly, time was measured by the number of weeks 'until Christmas', 'since Christmas', and so on. For a long time theologians opposed the fixing of 1 January as the beginning of the year, on the grounds that this was a pagan festival; but 1 January was also the day on which Christ was circumcised.[157]

The understanding of the twenty-four-hour cycle was also transformed. Traditionally,

> The twenty-four-hour period was divided, not into hours of equal length, but into hours of day, from sunrise to sunset, and hours of night, from sunset to sunrise. That is to say, in summer, the hours of day were longer than the hours of night; in winter, vice versa.[158]

Fundamental changes occurred as techniques for measuring time improved.

> Until the thirteenth and fourteenth centuries, instruments for measuring time were rare objects of luxury. Even scholars did not always possess such things. […] The most usual form of clock in medieval Europe was the sundial (the Greek gnomon), the sand-clock or the clepsydra (water-clock). The sundial was, of course, of no use in dull weather, and the clepsydra was more of a rare luxury than an instrument for the accurate measurement of time. If it was absolutely necessary to know the time at some point after sunset, it was measured by the burning down of a torch, of a candle or of oil in a sanctuary-lamp. Just how slow progress was in finding some means of measuring time can be seen from the fact that the use of candles for the purpose, adopted by Alfred the Great at the end of the ninth century (when journeying through his country he took with him candles of the same length which were lit one after another), was still being observed in France under Louis IX (thirteenth century) and Charles V (fourteenth century).[159]

The twenty-four-hour cycle was developed particularly in cloisters, and church bells perpetuated the religious order of time in society.

> Monks reckoned by the number of pages of holy scripture they had read, or by the number of psalms they had sung between two observations of the sky. For every hour of the day and night there were special prayers and invocations. For the mass of the people, the main time signal was the sound of the church bells, calling them regularly to morning prayers or other religious services. The twenty-four-hour period was divided into a series of sections – the canonical hours (*horae canonicae*), of which there were normally seven; these were signalled by the striking of the church clock. In this way, the recorded passage of time was controlled by the clergy.[160]

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157 Gurevich 1985, 104–105.
158 Ibid.
159 Ibid., 105.
160 Ibid., 105.

The sounds of bells discharged various functions and signalled various content.

> Local life was entirely regulated by the sound of the bells: 'harvest bell', 'curfew bell' and 'pasture bell', chiming regularly in rhythm with the liturgical year.[161]
> In as much as the tempo of life and of the basic occupations of the people depended on the rhythm of the seasons, there was no reason why it should ever be necessary to know the exact time, and the customary division of the day into broad sectors was quite sufficient. The minute as a division of time or as an integral part of an hour did not exist. Even after the invention of the mechanical clock and its spread in Europe, it was a long time before it had a minute hand. […] the basic temporal categories of the Middle Ages were the year, the season, the month, the day – not the hour, let alone the minute. Medieval time is protracted, slow and epic.[162]

Temporal environments could differ in various spatial environments.

> The agricultural calendar and the division of the twenty-four-hour period varied, as one might expect, from one area to another. It is hardly necessary to point out that medieval man's time was essentially local time, varying from one locality to another and independently observed in each.
> Agricultural time is natural time, not occasional or eventful time; hence it does not need to be exactly measured, nor indeed is it susceptible of exact measurement. It is the time of people who do not run nature, but who are subject to its rhythms. The contrasts peculiar to the medieval mind are also shown in the way the twenty-four-hour cycle was divided up.[163]

The times of day stood in distinct oppositions; they were marked by contrasting symbolic content. So they were interpreted from a different temporal perspective, a different worldview perspective.

> Night was the time of danger and terrors, of the supernatural, of demons and of other dark and mysterious forces. Night was particularly significant for the Germanic tribes, who reckoned time by the number of nights. Crimes committed under cover of night were punished with special severity. Christianity tried to combat and overcome the conception of night as the time when the devil ruled. Christ, it was taught, was born at night so as to bring the light of truth to those wandering in the night of their error. The light of day was seen as scattering the terrors engendered by the darkness of night. Despite this, throughout the whole of the medieval period, night remained the symbol of evil and sin, and if the Christian Vespers were designed to inspire the soul of the believer with tranquillity and the awareness of the nearness of God, the devil was still closer at hand and more dangerous under the cover of darkness. The contrast between day and night is the

161 Ibid., 106.
162 Ibid., 106–107.
163 Ibid., 107.

> contrast between life and death; 'The Lord gave day to the living, and night to the dead', said Thietmar of Merseburg.[164]

Like day and night, the contrast between summer and winter was ethically and sacredly tinged.

Lucky and unlucky days were distinguished in the calendar and were deferred to when beginning certain undertakings.

> Right up to our times people clung to the belief in the connection between man's fate and the signs of the Zodiac, upon whose position in the firmament the character of the time depended. A knowledge of the lunar calendar was necessary for successful dealings with magic.[165]

The mediaeval calendar was governed primarily by the cyclical rhythm of nature.

> The calendar which is so frequently portrayed throughout the Middle Ages in miniatures, in carvings on the walls of churches and cathedrals, in frescoes, in learned treatises and in poetry, is primarily the agricultural calendar, in which each month is indicated by particular agricultural occupations. This type of calendar was borrowed by the Middle Ages from antiquity, but did not follow its original model in all respects. In the classical models the months are represented by astronomical symbols combined with passive human figures; but in Western Europe of the early Middle Ages, a system of personifying the monthly tasks, showing real people hard at work, was elaborated. These are no longer allegorical figures but the 'labours' of the months. As a result there arose a significantly new genre in which man's earthly activity is shown as taking place under the gaze of heaven, and forming part, as it were, of one single harmonious rhythm of nature as medieval Christianity understood it.[166]

During the Middle Ages, time was understood primarily as the order to the sequence of various natural cycles. A lesser role was played by the dimension of time and its evaluation. Crucial changes in this respect occurred in the new environment of urban culture. Here again is Aron Gurevich:

> No need was felt in the Middle Ages to value and save time, nor was it necessary to measure it and identify its smaller components. The epic leisureliness of medieval life was conditioned largely by the agrarian nature of feudal society. But concomitantly another way of organising public life was taking root and developing within this society – a way characterised by its own special rhythms and requiring more precise measurement and more economical expense of time: the town.[167]

164 Ibid., 107–108.
165 Ibid., 108.
166 Ibid.
167 Ibid., 146.

The production cycle of a craftsman was considerably more independent of the seasons.

> The farmer was tied to the natural cycle, from which he could only with difficulty escape – and even then not completely; the town-dwelling artisan was connected to nature in more intricate and more contradictory ways. Between him and nature there already existed the artificial means he had created – tools of various kinds, all sorts of appliances and mechanisms, which acted as intermediaries between him and his natural surroundings. People living in a burgeoning urban civilisation were even in its early stages behaving according to patterns set by themselves rather than by nature. They were aware of the division they had created between themselves and nature; for them, nature was an external object.[168]
> As the town became the locus of a new way of looking at the world, a new relationship with time was engendered. Clocks made their appearance on town steeples and turrets, exemplifying not only the burghers' pride in their town but also answering a hitherto unheard-of need – to know the right time! The towns saw the growth of a new social sector with a totally different attitude to time from that of the feudal lords or peasants.[169]

During the Middle Ages, time became increasingly an exchangeable product with specific value.

> For merchants, time is money, and the employer needs to have an exact way of measuring the time during which his workshop is functioning. Time thus becomes a measure of work. It is no longer the tolling of the church bells calling to prayer, but the chiming of the town hall clock that regulates the life of the citizens, although for several centuries yet they will go on trying to reconcile traditional 'church time' with the newly discovered worldly time of practical life. Time acquires a new value, turning into a crucially important factor in the production process. The appearance of the mechanical clock was at once a completely logical result and a source of the new temporal orientation.[170]
> The mechanical clock was invented towards the end of the thirteenth century, and during the fourteenth and fifteenth centuries the town halls of many European cities were adorned with these new clocks. Inaccurate as they were, and lacking a minute hand, these clocks nevertheless marked a fundamental revolution in the arena of social time. Control over time began to slip from the clutches of the clergy. The town community made itself master of its own time, with its own special rhythm.[171]
> Mechanical clocks were installed in European towns when the need to know the right time made itself felt in influential social groups. The change-over was not sudden; but the tendency was for these groups to break, not only with 'biblical time', but with the whole world-view of the traditional agrarian society.[172]

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168 Ibid., 146–147.
169 Ibid., 147.
170 Ibid.
171 Ibid.
172 Ibid., 148.

The traditional sense of time was linked to man and his understanding of his own way of living.

> As apprehended in this older society, time was not an independent category which could be cognised independently of its real, objective content; it was not a 'form' of existence of the world, it was indivisible from existence itself. Time could not be cognised independently of what was happening *in* time; if represented, it took natural and anthropomorphic forms. Hence time could be qualitatively defined and distinguished: time could be 'good' or 'bad', sacral or mundane. The conception of non-qualitative time (time which is neutral in relation to its content and not dependent on the percipient subjects capable of imparting a specific emotional or axiological complexion to time) was not known to the ancients or to the people of the Middle Ages. Accordingly, the division of time into commensurate and interchangeable units was also unknown. The concrete-material character of the perception of time, an organic component in all 'transient things', militated against the formulation of any such abstract concepts.[173]

A pure form of time gradually emerged in the awareness of mediaeval people.

> Finally the invention of a mechanism for measuring time generated conditions favouring the development of a new attitude to time – time as a homogeneous, uniform stream which can be subdivided into qualitatively neutral units of equal size. For the first time in history, the European town is the setting for something quite new in history – the 'alienation' of time as a pure form from life, whose phenomena can now be timed and measured. […]
> Having acquired the means of measuring time accurately and, consequently, of reckoning it in equal intervals, the Europeans were bound sooner or later to graph and apply the radical possibilities inherent therein – changes prepared by the whole development of society, especially of the towns.[174]

Already in the Middle Ages, there developed an understanding of time as a straight line with a shifting point of the present, which became highly characteristic of the modern era.

> Time was at last 'stretched out' in a straight line, proceeding from the past to the future through a point called the present. In preceding epochs the distinctions between past, present and future time had been relative, with no fixed boundaries separating them. (In religious ritual, at the supreme moment of consummation, past and future coalesced in the present to become the non-ephemeral, fulfilling the higher meaning of that moment.) With the triumph of linear time the boundaries became completely clear, and present time 'shrank' to a point continually moving vectorially from the past towards the future, thereby turning the future into the past. Present time became transient, irreversible and elusive. For the first time in his history man came up against the realisation

173 Ibid.
174 Ibid., 149.

> that time, whose course he had been aware of only when something remarkable was happening, did not cease to flow when nothing was happening. So time had to be saved, used prudently, filled with activities useful to man. The regular chimes from the turret of the town hall were a constant reminder that time waits for no man, and a summons to use it profitably, to give it positive content.[175]

6.5 The temporal environment and music

In many traditional, popular and high cultures, the link between music and ecological cycles is very strong. Modern European culture freed itself from that influence considerably, but not entirely, although that connection is manifest perhaps in a less formalised way.

In the twenty-four-hour cycle, music is not an indispensable necessity for people as individuals or as an integrated social group. Its connection with everyday life can differ from one culture to another. The rhythm of the time of day imposes above all activity aimed at satisfying basic human biological needs, yet it often also imposes the time, and even the form, of music-making. In European cultures, for example, a separate musical folklore of rural and urban night-watchmen developed, which in Poland unfortunately all but entirely disappeared before it could be documented in the form of musical notation. In that folklore, the need for artistic expression was linked above all to the signalling function, which fundamentally shaped not only the content, but also the formal properties of that folklore. Dawn calls in particular inclined people to artistic expression, initially linked to a magical function.[176] This is music composed in the open air, projected over a considerable distance, performed with a great intensity of the voice or with the use of sonorous musical instruments; in our cultural circle, it is associated with trumpets and horns, and with the characteristic phrases of their natural scale. In Christian cultures, the function of this music was taken up by church bells.

A very strong link to the twenty-four-hour cycle is displayed for example by the music of India. There, ragas are defined not only by their structural properties and the internal organisation of time; they are also linked directly to a specific phase in the twenty-four-hour cycle. In our folklore, it might seem that music's links with the times of day are not essential, but here too one can distinguish a time that is fundamental to music making; it is above all the period after the basic time of production and before the main rest of the night. Long winter

175 Ibid.
176 Hernas 1961.

evenings in particular have provided plenty of opportunities for music making and merriment. Even in our modern culture, in which the need to make music is replaced to a considerable extent by the mass media, the dependence of the intensity and character of music on the time of day is very distinct.

In our formalised calendar, the role of lunar cycles is limited, although the genetic link between months and lunar cycles seems beyond doubt, as is indicated for example by the origins of the word 'month'. Still used today in large swathes of the globe, however, are lunar calendars in which the months are totally dependent on the moon's cycles. They are the basic instrument for measuring time and organising human activity, including musical activity, in one way or another. In our culture – as already mentioned – two main zones of ecological time impose their rhythm on us, namely, the twenty-four-hour cycle and the annual cycle. Traditionally, the latter is closely observed in ethnomusicological works. Oskar Kolberg, for example, assigned all his folkloristic material – music included – relating to annual rituals to separate groups; he was also convinced that it was exceptionally archaic. Anna Czekanowska devotes a great deal of attention to comparative studies of annual songs among the Slavs; in her research, she turns to the very sources of our calendar in order to shed light on the origins of the musical repertoire linked with it. In a work on folk melodies of a narrow compass among the Slavs, she writes:

> Cult cycles are no doubt founded on general cosmological laws and their related rhythm of crop cultivation (agrarian). However, the forming of those laws into specific sequences results from the influence of high cultures formerly developed in the Middle East and their cults. As we know, the development of the oktoechos is linked to Syrian culture, whence that principle was adopted directly by Byzantine culture before eventually influencing Western Europe and its cult music. One may assume that this explains how the conditioning of the church calendar was much stronger among the Southern Slavs than among their Western counterparts.[177]

Despite this, the link between our folklore and the stages in the annual cycle are quite distinct. A whole rich song repertoire for annual customs has been documented, and scholars have pointed to the specific role of music in those stages. Sometimes even distinct styles of folk music are linked to specific rites. The most highly developed and most enduring have proved to be customs and songs of the New Year and vernal equinox periods. Much more poorly represented is Midsummer Night folklore. Harvest folklore is of a separate character.[178]

177 Czekanowska 1972, 88.

178 Sobieska 1972, 88; Krzyżaniak, Pawlak and Lisakowski I 1974, II 1975.

In agrarian cultures, the life of traditional communities was very strongly linked to the annual cycle, which was manifest not only in the ritual year and the music linked to it. Quite simply, certain periods in the annual cycle less burdened with production were particularly conducive to the cultivation of music. Despite the egalitarian tendencies of our times, characterised by an aspiration to independence from ecological time, the calendar remains the basis of the organisation of musical life, which is clearly divided into seasons.

7 The zone of individual and social life

7.1 The zone of the time of human ontological development

The large zone covering the area between the year, as the longest unit of ecological time, and the period of a human life, extending for ninety or more years, is difficult to designate with a single common name, on account of the diverse aspects connected with it. Perhaps the most apt name would be 'zone of human life', the alternatives being 'zone of demographic time' or 'zone of communal time'. It is an object of interest for many academic disciplines: biology, developmental psychology, demography, sociology, biographic studies, history, anthropology and ethnography, including ethnomusicology. All those disciplines are more or less dependent on the ontological development of the person, which is why a survey of selected issues should begin perhaps with an anthropological classification. Napoleon Wolański distinguishes, for example, the following periods, phases and sub-periods in the development of the individual (cited here after Klonowicz):[179]

I. The period of intrauterine development
   A. The phase of the foetal egg (the first two weeks)
   B. The phase of the embryo (3–7 weeks of life)
   C. The phase of the foetus (from the eighth week of life till birth, on average to the end of a lunar month).
II. The period of progressive development
   A. The passive phase (from birth to around 5–7 months of postnatal life)
   B. The phase of expansion
      a) The period of mastering one's own body and the forming of homeostasis (from around 5–7 months to 2.5–3 years);
      b) The period of the development of control over one's surroundings (from 2.5–3 to 8–10 years);
      c) The period of preparation for reproduction and starting a family, the period of pubescence (from around 8 years to sexual maturity);
      d) The period of adolescence – strengthening optimal personal independence in equilibrium with the external environment (from reaching sexual maturity to the end of the processes of growth, that is, around 20–25 years).

179 Wolański 1970, cited in Klonowicz 1973, 337.

III. The period of stabilisation (prime of life) – from the end of the growth processes (20–25 years) to the end of relative equilibrium and the beginning of the involutional processes, up to around 40 years.
IV. The period of ageing and old age, also known as the period of senile vegetation or involution (from around 60 years).

The period of prenatal development falls entirely within the zone of ecological time, which is why I exclude it from our detailed considerations here; however, it is worth looking at overall personal development in order to gain a better idea of its irregular course. It passes through periods and phases of varying length, although one easily notices a general rule expressed in the tendency for periods to expand as the years of life pass. The changes in the first developmental phases occur so quickly that one cannot even compare them with the tempo of the changes of later periods, in terms of a normal time scale, of course. The process of human biological development also does not proceed in accordance with the logarithmic scale of time, although the periods distinguished by Wolański are quite regular on that scale. This is shown by the graph (Example 7.1), on which only the stages of postnatal development are shown.

The changing process of ontological development is linked to the notion of biological time, opposed to the notion of astronomical time. Here is Stefan Klonowicz:

> Astronomical time is measured by means of integrated units of a specific dimension, namely, seconds, minutes, hours, days, months, years and decades. However, even cursory observations show that an astronomical measure of time does not fully coincide with the biological measure. In early childhood, over the course of a single month, more serious changes occur than over the course of a year or even several years in the period of maturity […] Biological time or internal time is […] an expression of the changes in the body and its activeness over the course of life. However, since those changes occur during different periods in life at different speeds and with different intensities, the unit of biological time does not have equal 'weight', equal dimension. The variability of the unit of biological time is most distinct during the periods of pubescence and menopause (climacteric), when the human organism rapidly switches to a new level of activity, essential for further life and ultimately involving the triggering of powerful adaptational mechanisms.[180]

Zbigniew Brzeziński speaks of physiological age or developmental age, constituting a relative measure of time determined by biological criteria and not – as

180 Ibid., 13–14.

with calendar age – in relation to an absolute length of time passing since the moment of birth.[181]

The physiological processes conditioning human activity unfold very differently over the course of a human life, but many of them would show a greater regularity on a logarithmic scale than on an arithmetic scale. This is exemplified by the graphs (Example 7.2), interpreted in terms of Bühler's general biological schema. The culmination of a person's capacities in many areas is attained relatively early: the eye's light sensitivity at around 20, the eye's colour sensitivity and mental capacities at around 25, and creative work productivity at around 35.

In the case of biological or physiological age, however, let us consider whether we are really dealing with different time or whether this is generally about time as an attribute of phenomena. It seems to me that in such situations one might abandon the notion of time altogether, replacing it with the notion of process. So-called biological time is simply a process occurring over time, and the stages in that process are gauges of how it is proceeding. Biological time is essentially the reverse of time; it is a measure of the size of the changes occurring on a unit of time; it is the tempo at which this process unfolds, passing through fixed cycles of development.

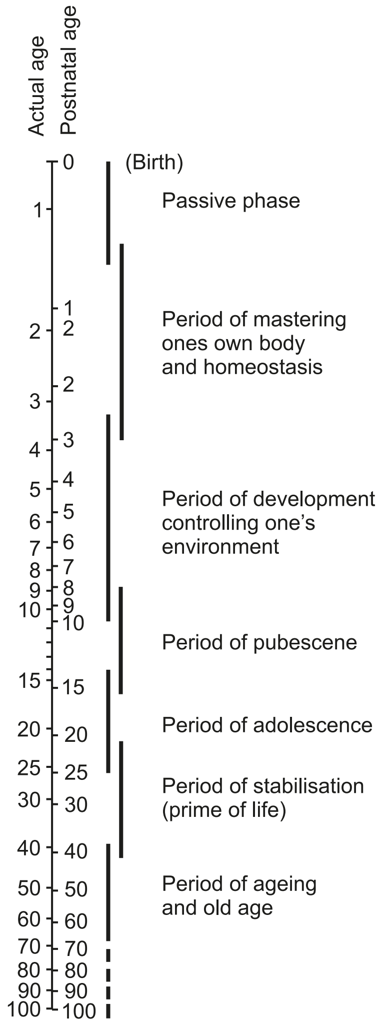
This process is genetically programmed, but – like every process – it is also dependent on different conditions. Hence it may vary from one individual to another, differing in tempo, for example. Biological age – as Klonowicz stresses – depends 'on climatic, ethnic and hereditary factors, on social conditions and the individual's lifestyle. A twenty-year-old Hindu differs in many respects from a twenty-year-old Englishman, and a sixty-year-old woman living in Ghana from her peer in Sweden'.[182] The processual character of biological time also engenders further methodological requirements, as Klonowicz writes:

> It becomes essential to study developmental processes in their strict relationship with ecological conditions, in relation to the effects of environmental, biological and social factors. The data in question should concern a population, a human collectivity, which is strictly delimited in time and space, the life of which is conditioned by the life of previous generations and by the effect of factors which have affected the development of a given community.[183]

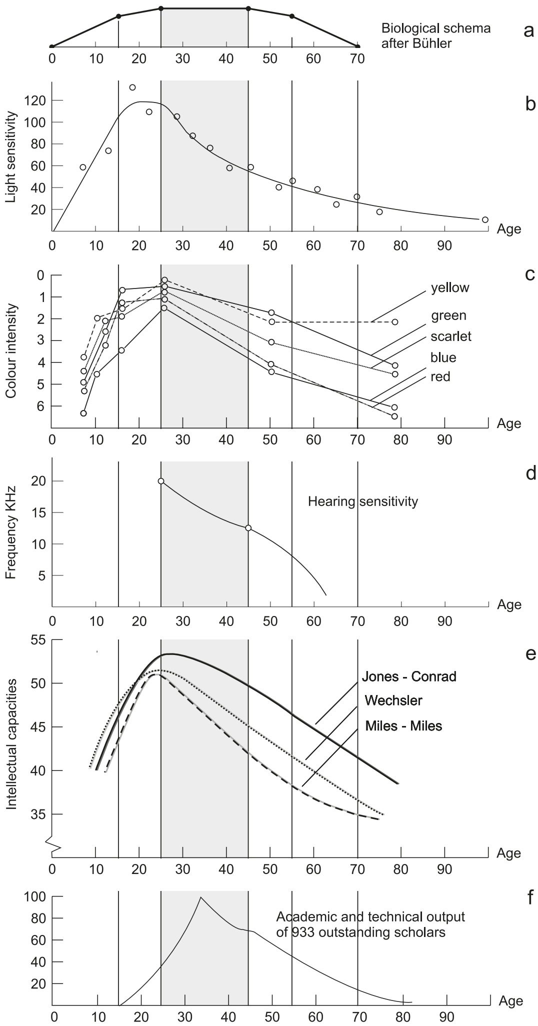
181 Brzeziński 1967; cf. Klonowicz 1973, 15.

182 Klonowicz 1973, 15.

183 Ibid., 16.



Example 7.1 Postnatal periods of personal development, after data in Wolański 1970. transferred to a logarithmic scale of time.



Example 7.2 Changes in human life interpreted through a biological schema: **(a)** Basic biological schema according to Bühler; Bühler 1933, 1999, 44. **(b)** Age-related changes in ocular light sensitivity, conventional units, after P. P. Lazarev; Cf. Klonowicz 1973, 222. **(c)** Age-related changes in ocular colour sensitivity, after Smith; Cf. Klonowicz 1973, 223. **(d)** Changes in hearing sensitivity in relation to high tones, after S. G. Hildermeister; Cf. Klonowicz 1973, 226. **(e)** Age-related changes in mental capacities, degrees of the T scale; After the cited authors; cf. Klonowicz 1973, 224. **(f)** Age-related changes in creative work productivity, after H. C. Lehmann. Cf. Klonowicz 1973, 253.

The last postulate for research into closed social groups in their natural conditions is difficult to reconcile with another postulate, the weight of which is emphasised by Klonowicz himself:

> It is worth mentioning the views of B. G. Ananyev and his associates. Those authors are of the opinion that the age of a particular organism can be defined as one of its most integrated features, measured on a scale of the average lifespan of all the people belonging to a given species. Linking the age of the individual with the average lifespan of other individuals in the species is the most striking component of the cited definition, opening up new paths for research into age.[184]

If I correctly understand Ananyev's thinking here, it contains an extremely important methodological pointer, not only for resolving issues relating to the human scale in the zone of the time of human life. It may be generalised to encompass all temporal phenomena linked to people. Everywhere, we encounter the problem of accessing the properties characteristic of the human race in general, since only when we have that overall profile can we suitably interpret the data relating to individual cases or closed social groups. That path is not easy, but the aim is distinct and aptly chosen. This requires the elaboration of a suitable procedure leading through research into selected and representative samples to those average results characteristic of the human race, before interpreting, according to the feedback principle, on the basis of overall results, particular deviations from those general regularities in individual cases and studying the conditions underlying those deviations, and so on.

Edmund Leach also refers to the biological time of human development, the tempo of which decreases with age. At the same time, however, Leach refers to our sense of the tempo of the passing of time, being essentially the reverse of biological time, since it increases with age. Leach outlines the problem thus:

> The feeling that most of us have that the first ten years of childhood 'lasted much longer' than the hectic decade 40–50 is no illusion. Biological processes, such as wound healing, operate much faster (in terms of stellar time) during childhood than in old age. But since our sensations are geared to our biological processes rather than to the stars, time's chariot appears to proceed at ever increasing speed. This irregular flow of biological time is not merely a phenomenon of personal intuition; it is observable in the organic world all around us. Plant growth is much faster at the beginning than at the end of the

184 Ibid., 15.

> life cycle; the ripening of the grain and the sprouting of the sown grain proceed at quite different rates of development.[185]

It is also worth noting that the immediately discernible age of a person is the most obvious, living sign of time, opening up a specific temporal perspective covering the size of time from birth to death. A person unerringly finds his or her bearings in this natural zone of individual and social life, without the aid of any formal certification, without compiling a chronicle of his or her life, without any objective measures of time. A person's age is literally an ontological sign, a natural sign, a sign of being in the world among other signifying beings, a sign that represents the greatest opposite to a conventional sign. Only incidentally do linguistic conventions establish names for different age categories, introducing a specific temporal order into human life, the order of the succession of the phases of life.

7.2 The temporality of the existential level in psychology

It is mainly the existential level distinguished in psychology that appears to belong to the zone of the time of human life. In accordance with the hierarchy of temporal zones, that level also encompasses lower zones, the zone of the natural and cultural environments of people, and even the zone of temporal events and situations, to which episodic memory relates. But that is not all. The existential level also seems to pass onto the superior level that goes beyond the zone of human life, the level of the temporality of worldview.

Our personal temporal perspective is linked in an obvious way to our personal development. As Czesław S. Nosal writes:

> As the temporal horizon (the scale of time) expands, it becomes increasingly crucial to draw conclusions relating to the passage of time based on external references, that is, clocks, plans, the structure of activities, and so on. Existential time appears, based on mental representations of a higher order. This new paradigm of temporal reference, arising on the *existential level*, depends largely on the hierarchy of a subject's activities, on motivational and volitional processes. On this level, an adequate orientation in psychophysical time and an assessment of the current passage of physical time discharges only a secondary function. The psychological time of the individual takes on fundamental significance. On the existential level, we create our personal time with its characteristic *metrum*, conditioned by our biological (health), biographical, professional and family situation, by the temporal pressure of our culture, environment, etc. Through

185 Leach 1961, 132–133.

> clocks and plans of action, we are in some way synchronised with the outside world, but at the same time, in a more or less efficient way, we resolve problems and conflicts resulting from the discrepancy between the passage and pressure of physical time, on one hand, and *our personal temporal perspective*, on the other.
> Within the context of the mechanisms of existential time, marked significance is acquired by our mental representations of time, the way in which we experience and express time as a psychological category. On this highest level, time is not a uniform size. This state of affairs is due to the existence of differentiated temporal perspectives and also the effect of many other factors on the tempo of personal time and the way we experience that time. In the subject literature, research into this interesting area has not been synthesised. However, there are many works analysing the structure of the dimensions of subjectively assessed temporality and the effect of different personality and situational variables on our experience of time.[186] Detailed analysis of the theory of existential time requires separate study […].

In my opinion, the differentiation of the natural zones of human time and temporal levels might prove their worth here. Nosal goes on to write:

> A key notion employed in descriptions of the existential level is *the personal temporal horizon* or personal temporal perspective. Fraisse (1963), in his classic study, presented the shaping of our temporal horizon as a dimension of personal dynamics. Taking the developmental aspect into account, we can state that after the forming of operational intelligence (Piaget's theory), our orientation in the passing of time 'becomes personalised', and our personal temporal horizon is built upon the order of physical time. An autonomous operator of temporal location begins to function in a person's mind. Parallel to this process, the system of episodic memory develops; our past and future are filled with experiences, events, predictions and plans. The father of the theory of episodic memory emphasises that the ordering of subjective time is key to the development of this form of memory (Tulving 1985). He also posits the existence of a separate neuronal system for episodic memory.

This is extremely interesting, as it points indirectly to the existence of a neuronal, so a biological, foundation to the distinction of the zone of temporal events and situations. On the existential level, Nosal discerns many paradoxes, which in my view cease to be paradoxes in light of the differentiation of the zones of time and temporal levels. Below, I add my comments to Nosal's text in square brackets:

> The personal temporal horizon is an interesting, but at the same time paradoxical, cognitive structure. The main paradox lies in the fact that on one hand this structure has an analogous character, since it enables us to create and gradate analogous representations

186 Cf. survey of research in Nosal and Bajcar 2004; Nosal 2000.

of time in different units of its physical passing [the eotemporal level]. On the other, meanwhile, within this structure, as a notional (abstract) schema, time is represented in qualitative terms, without numerical gradation [the nominal, atemporal level]. There then arise in a person's mind chains of events [the ordinal, prototemporal level] derived from the past or the present [the delimitation of past, present and future is introduced by the biotemporal level]. We encounter an even greater paradox in the creation of visions or predictions relating to the distant future [possibly even going beyond the zone of human life, into the zone of worldviews]. In the case of anticipations and visions, the temporal order is reversed, in a way, since the future is 'brought up' to the present [just as episodic memory is brought up to the present, since it can only be activated in the immediate human present]. The features of the personality of the person/author open to the past that were presented by Obuchowski (2002) are largely based on the effective 'bringing' of the future up to reality.

Thanks to the action of the 'temporal operator', we can move in time in different directions (past, future) and with different frequencies characteristic of different levels. We can also display different degrees of absorption in the past or the future, just as we can succumb to the pressure of the present. Yet the basic framework of those movements is set by our personal temporal horizon. That depends on many factors and conditions of external and internal provenance. The span of our temporal horizon is crucially affected by our age, health, temperament, mind and personality. Those tendencies, although already signalled in classic studies, still require systematic research and new syntheses.[187]

7.3 The psychology of musical development

In general terms, human musical development (up to adolescence) looks as follows:

The prenatal period – the period when the musical receptors are formed and the period of the first sensorial-motoric reactions to music.
Infancy – the period when the sensorial-emotional sensitivity to music develops and musical activeness begins (from birth to about eighteen months).
Post-infancy – the period when spontaneous, uncontrolled musical activity develops and basic musical categories of perception take shape (from eighteen months to three years).
Pre-school age – the period when musical memory and imagination, spontaneous musical expression and musical singing and fun develop (3 to 5–6 years).
Early school years – a period when fun-related activity changes to task-based activity, with a focus on results and achievements, the intensive development of musical skills

187 Nosal 2002.

> and the honing of musical aptitudes (6 to 12–13 years), covering three phases: from 6 to 7–8 years; from 7 to 9 years; from 9 to 12–13 years.
> Adolescence – the period when our conscious attitude to music develops, with our musical preferences and foundations (from 13 to 19 years), covering two phases: from 13 to 16 years and from 16 to 19 years.
> The boundaries between these periods are fluid, and phases often overlap. Their duration and the age at which they occur differ between individuals.[188]

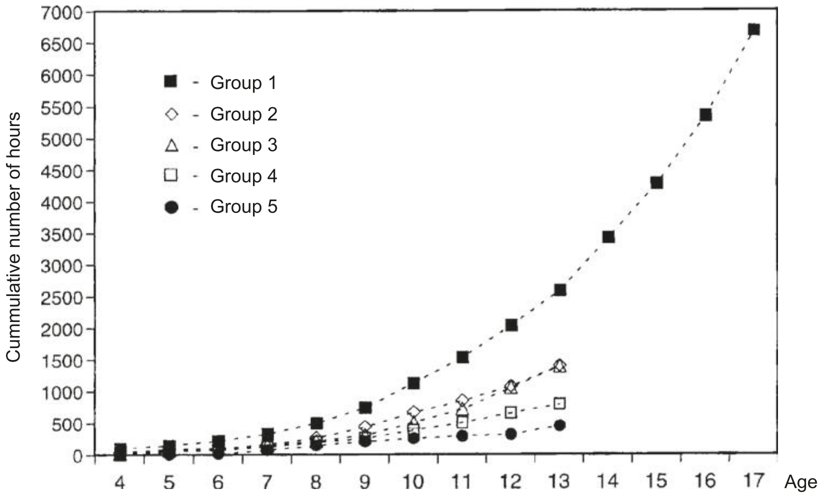
In many countries outside Western culture, music is of fundamental significance. I will cite here an anthropological description of one tribe from south-east Nigeria:

> We were constantly amazed at the musical abilities displayed by these people, especially by the children who, before the age of five, can sing hundreds of songs, both individually and in choral groups and, in addition, are able to play several percussion instruments and have learned dozens of intrinsic dance movements calling for incredible muscular control. We searched in vain for the 'non-musical' person, finding it difficult to make enquiries about tone-deafness and its assumed effects because the Anang language possesses no comparable concept […]. They will not admit, as we tried so hard to get them to, that there are those that lack the requisite abilities. This same attitude applies to the other aesthetic areas. Some dancers, singers and weavers are considered more skilled than most, but everyone can dance and sing well.[189]

The well-known music psychologist John Sloboda consequently asks: 'What is going wrong in our culture that someone at the age of 40 could not achieve a quarter of the things that the Anang Ibibo can achieve at the age of five?' He finds an explanation in the results of research into infants, which reveal that 'the new-born baby is incredibly sensitive and in some sense pre-wired for musical sensitivity'. That is also borne out by research into prenatal musical sensitivity. To date, no one has succeeded in scientifically demonstrating the existence of genetic bases for musical ability, but there is clear evidence that 'the thing which is crucial to the acquisition of any high level of skill is practice', asserts Sloboda,[190] citing the example of his own country:

> In England [being selected to attend a specialist music school] is a more difficult achievement than in Poland. In Poland you have two hundred schools. In England we have, I think, four, so the entrance to these schools is incredibly competitive. The candidates must play a recital and many fail this examination. So you may be sure that this first group was a group of children who achieved a very high level of competence. The second

188 Manturzewska and Kotarska 1990, 31–32.
189 Messenger 1958, 20–22, after Murphy 1999, 47.
190 Sloboda 1999, 13–14.



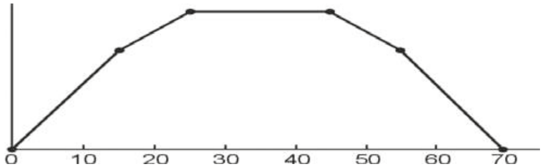
Example 7.3 Mean cumulative number of hours of practice done by each group of children on all instruments played, according to age. Sloboda 1999, 17.

> group were children who failed this examination. But because they were preparing for it, you may imagine that they were somewhat higher than average. The third and fourth groups were studying instruments in the general schools. The fifth group represents the vast majority of our population, those who began an instrument and then within two years they stopped. […] in England we have a national system of examinations in music performance from the beginning until conservatory level. The syllabuses are set nationally and all the examinations are conducted by nationally appointed examiners who travel around the country. This is an absolute and very reliable standard. There are eight levels of this examination and it is quite normal, for instance, for a high-achieving young child to take one examination each year. […] By the age of 11 the children who will succeed in the specialist schools have achieved level five, the middle groups have achieved level three, and the lowest group was achieving even less than level one.[191]

Pupils were interviewed in order to establish how many minutes they devoted to playing an instrument each day. The results are shown on the graph:

These results show that pupils from the group at the highest level of musical accomplishment practised on average two hours a day at the age of twelve. Pupils from the second and third groups practised one hour a day, pupils from the fourth group thirty minutes and pupils from the fifth group fifteen minutes.

191 Ibid., 15.



Example 7.4 Basic biological schema. Bühler 1999, s. 44.

Research into skills in other areas showed that 5000 hours were needed to become a professional in a given field. Children from the group with the highest musical accomplishments showed this level at the age of fifteen.[192] So it is not aptitudes, but the time which a child devotes to practice and the time spent with a teacher that determine the results of tuition. Another very important factor proved to be imperviousness to setbacks. As Sloboda states, one feature of successful individuals not just in music, but in every field is the ability to deal with failure.[193]

7.4 The course of life and phases in creative work

Before the emergence of academic psychology, the fundamental tendencies, course and determined structure of human life were pondered by philosophers, poets and religious leaders of all eras. They attempted to show regularities in that structure and to recognise its meaning and purpose, as Charlotte Bühler states in her classic work *Der menschliche Lebenslauf als psychologisches Problem*, published in 1933. Teresa Rzepa offers the following comments in her preface to the Polish translation (1999):

> The exceptional value of this work, written more than half a century ago, but still current today, lies not just in the author's humanistic vigour and boldness, but also in the methodology applied, referring to biographical studies, so useful not only in the process of psychological cognition, but also while acquiring proficiency in the art of life. And that is exactly what Charlotte Bühler had in mind. For her, the overriding aim of activity in the field of psychology was to make it the study of human life, which would show us how to live, what to live for and how to strike up contact with other people.[194]

192 Ibid., 16.
193 Ibid., 19.
194 Rzepa in Bühler 1999, 23.

That publication was based on around 250 biographies, 200 taken from literature and 50 acquired through interviews with ordinary people from an old people's home. Wherever possible, the author took into account the tangible output produced by an individual during their life. General biological and medical factors were taken account of during the research, considered as fundamental facts of life. They were analysed, from a general curve of biological development through to the role of illnesses and their effect on the course of a life.[195] The basic biological schema proposed by Charlotte Bühler is simplified to the utmost, and that is its great virtue.

Specific biographies can be defined and assessed in terms of deviations from this schema, which greatly facilitates comparison. The starting point was formed by two ternary divisions: the first concerned the development of the human body (progressive development, stabilisation of development, regressive development); the second concerned reproductive capacities (the lack of reproductive capacities, capacity for reproduction, fading of reproductive capacities). An intended synthesis of these divisions is hampered by the fact that they partly overlap, giving rise to the need to distinguish two transitional periods, which results in a symmetrical five-part division (Example 7.4).

A similar schema is used by Maria Manturzewska (Example 7.5), who conducted detailed research based on the biographies of musicians. Besides interviews, she gathered documents, photographs, press cuttings and publications. The data were then subjected to many detailed analyses. Manturzewska gives the following characterisation of the phases of creative work among musicians:

> Each of the distinguished phases appears to discharge a separate function and separate tasks in development, important from the point of view of the shaping of the personality and qualifications of a professional musician. Each of them seems to constitute a critical period, a period of marked sensitivity and readiness for developing and forming specific properties and skills and accumulating experiences important in the work of a musician […] The duration of particular phases differs from one musician to another, although it would appear that for each of them one can specify an optimal period from the point of view of the realisation of developmental tasks specific to a given phase.[196]

As a result of unfavourable circumstances or of pedagogic or tactical errors, musicians often fail to realise their potential and end their artistic career prematurely. According to Manturzewska:

195 Bühler 1999, 32–34.
196 Manturzewska and Kotarska 1990, 319.

Bühler (1933) 1999	**Manturzewska 1990**
I. Period (birth to 15 years) of progressive or generative development, involving mainly (longitudinal) bodily growth, but only up to reproductivity.	I. Phase of the greatest receptiveness to the development of sensorial-emotional sensitivity to music and of spontaneous musical activity (from birth to five years).
II. Transitional period (15 to 25 years), in which generative growth continues, including reproductivity, preparing for generational change.	II. Phase of the most intensive development of a musician's technical-performance proficiency and 'playing apparatus' (from 6 to 14).
III. Main period (25 to 45 years), period of stable development; regeneration still balances changes, and growth involves the broadening of the body.	III. Phase of the forming of a musician's self-awareness and of artistic preferences and aspirations (15 to 24).
IV. Transitional period (45 to 55 years), the start of regressive development and decline in reproductivity.	IV. Phase of the greatest concert activity (25 to 44).
V. Final period (55 to 70 years), development ceases and life gradually dwindles.	V. Phase of the greatest pedagogic achievements (45 to 65).
	VI. Phase of the gradual withdrawal from professional activity, of honours, awards and anniversaries (over 75).

Example 7.5 Periods in life according to Bühler and phases of output among musicians according to Manturzewska. Bühler 1933 (cf. 1999), 44; Manturzewska and Kotarska 1990, 319.

> A basic condition for the optimal artistic-professional development of a contemporary musician in every phase of his or her life is 'musical dialogue' carried on with a musically sensitive and competent person acting as a guide, patron or master or a faithful, sensitive friend. The lack of such a person, the lack of social-emotional support in any phase of a musician's life, appears to hamper the musician's functioning and further development. The passage from one phase to another constitutes a period in an artist's life when they face the threat of an emotional crisis. That threat is all the greater, the more creative a musician's personality and the richer it is in the intellectual-emotional sense. In favourable social-emotional circumstances, critical periods can pass unnoticed, at least to the outside world. In unfavourable circumstances, an artistic career can be violently buffeted and the artist can suffer a mental breakdown. Such a crisis can halt further development and musical activity entirely, irrespective of the phase of life in which the breakdown occurs.[197]

197 Ibid., 327.

Tomaszewski 2002	
1. Accepting childhood 'with reservations'	I. Phase of initial output.
2. Moment of fascination (with novelty) and its 'crystallisation' (Stendhal's term).	II. Phase of early output.
3. Moment of rebellion and rejection, or 'storm and stress'.	III. Phase of mature output.
4. Moment of significant encounter, or 'wind in the sails'.	IV. Phase of peak output.
5. Moment of threatened existence, or 'shadow line' (Joseph Conrad).	V. Phase of late output.
6. Moment of solitude and liberation 'towards new shores'.	VI. Phase of last output

Example 7.6 Watershed moments and phases of output among composers, after Tomaszewski. Tomaszewski 2002.

The question of the life of composers was recently addressed by Mieczysław Tomaszewski (Example 7.6), who invoked the biographies of Beethoven, Schubert and Chopin. He distinguished nodal moments that triggered new phases in creative output.[198] Unlike Bühler and Manturzewska, his schema does not refer, even approximately, to specific years of life.

Charlotte Bühler distinguishes the following three problem areas: 1. the course of life as a biological process, as the development and destruction of the body and its functions; 2. the course of life as individual behaviour and personal experience, studied on the basis of biographical information and subjective experience; 3. the course of life in its objective results, in its influence on others, its production and its historical role in the broadest sense of the word.[199]

One typology of biographies distinguishes four categories: 1. an early climax (as in the life of many sportspeople and the actress Charlotte Wolter); 2. a midlife climax (as with Edison, Verdi and Feuerbach); 3. a late climax (Kant, Bismarck); 4. regular activity over the course of a life without any distinct climax (Descartes, Richard Wagner).

The climactic point in life can easily be determined in the biological-behaviouristic aspect, although that does not mean that it corresponds to a climax in life as assessed from a subjective perspective or from the point of view of the qualities of works produced. One very bold approach proposes to assess

198 Tomaszewski 2003
199 Bühler 1999, 34.

life according to the criterion of the relations that occur between 'the process of life' and 'the process of creation', where life and work can remain in equilibrium or dominate one another. Also crucial are considerations of the typology of 'short' and 'faulty' life courses.[200]

As already mentioned, Manturzewska conducted many detailed studies of musicians' biographies. Some characteristic data are contained in the Example (7.8), interpreted through a schema of biological phases in life.

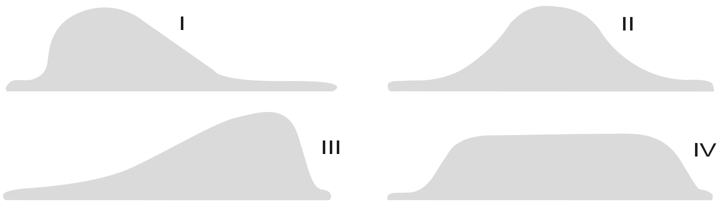
7.5 Age groups as a measure of time

Age-based population structure is often illustrated in demography with a characteristic pyramid. One example of such a pyramid concerning Poland in 1970 and predicted changes in 2000 is given here after Klonowicz (Example 7.9). Such pyramids can differ in terms of the width of the base and the irregularity of the lines, caused by various factors: uneven population growth or depletion due to catastrophes, wars, epidemics, etc. People are born, pass through successive stages, then die, and their places are taken by others; in spite of this continuous flux, the structure of the pyramid of age may not alter at all or may show only minor changes.

The pyramid of age-based population structure is also a specific natural model of social time. It attests to deep memory of past events experienced by people alive in the social present, usually covering three or four generations. As people pass through the degrees of this structure over the course of a lifetime, their experience grows and their memory encompasses increasingly large areas; the oldest people in a given social group carry directly experienced history. In our culture, bound to a calendar specifying years in ordinal numbers beginning with a specific point zero, we link the past, even the directly experienced past, with specific years; we define it in absolute terms. However, we are familiar with the concept of defining relative pasts in relation to events that are anchored in our memory. But even in cultures without a calendar like ours, people are by no means powerless to define the past, and they are aided by the stages in human life, a system of relations and a social structure. In his *Human Types: An Introduction to Social Anthropology*, Raymond Firth writes:

> In many primitive societies and in our own civilized society the grouping of people on an age principle is fairly fluid. But in some primitive communities a system of what are generally called age-grades is an integral part of the social structure. This is particularly

200 Rzepa in Bühler 1999, 19.

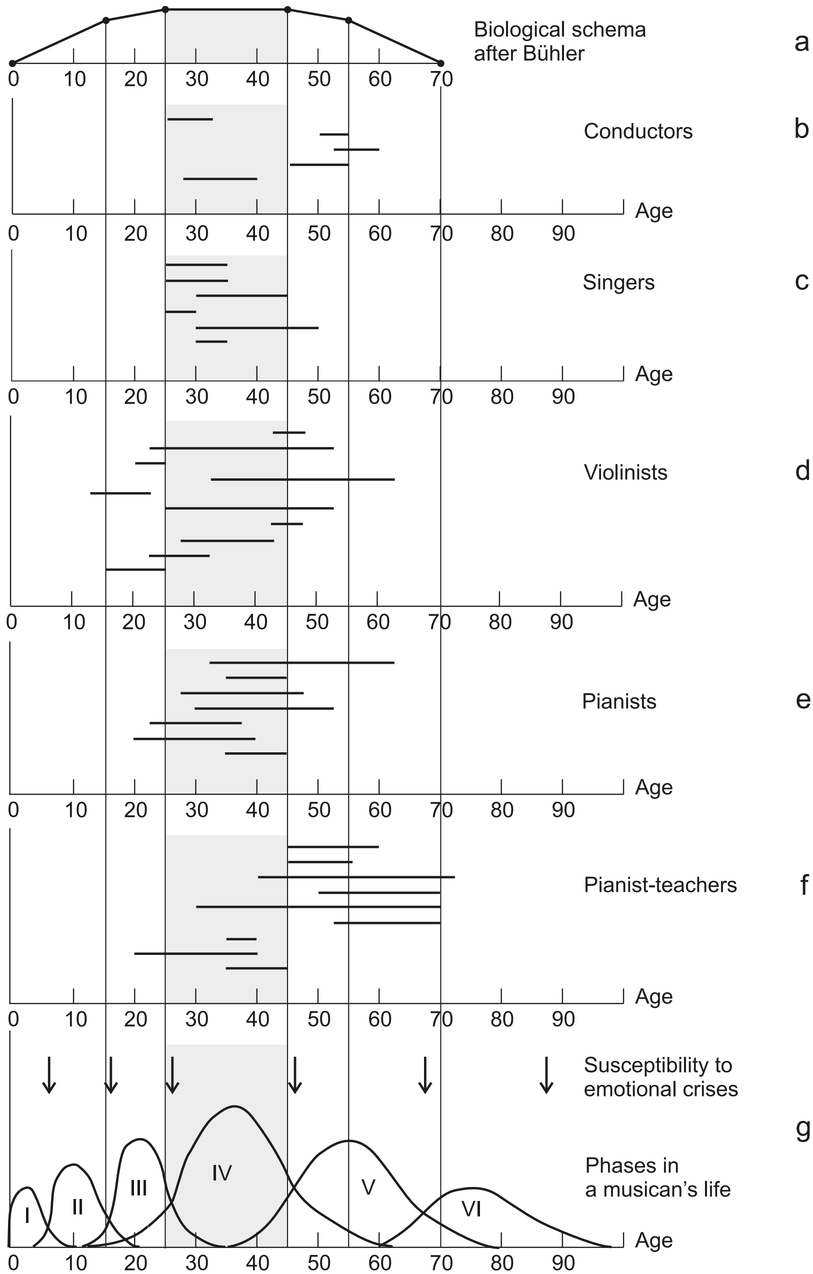


Example 7.7 Types of distribution according to the number of achievements. Bühler 1999, 303.

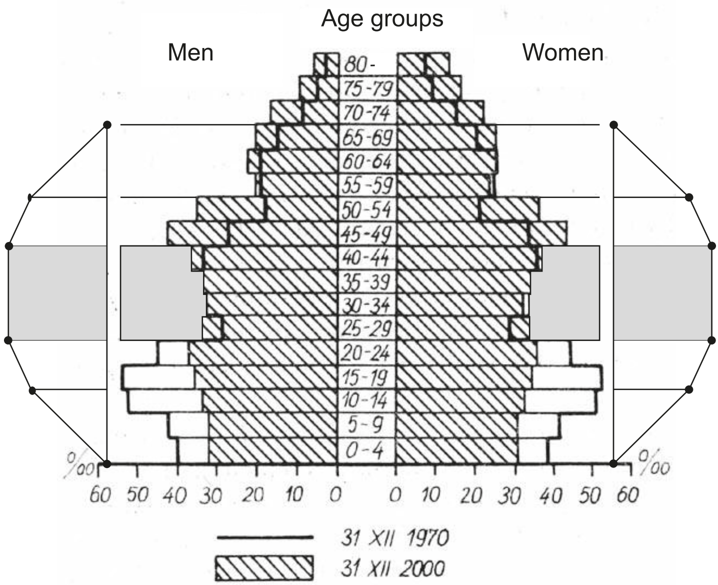
> so among some Plains Indians of North America and some East African tribes. The Nandi of Kenya, described by Hollis, may be taken as an illustration. When Hollis wrote, in 1909, there were seven grades of Nandi males, each made up of people whose ages were within about ten years of one another. The great event among the East African tribes which ushers people into this system is the initiation festival. This takes place, with the Nandi, every seven or eight years, upon a group of boys and adolescents aged from about ten to twenty, but mostly from fifteen to nineteen. Before initiation a boy belongs to the first grade, which does not count in the same way as the others […] Every one initiated at the same septennial ceremony belongs to the same grade, or 'set' as it is perhaps better called, which has a definite name, emblems, and ornaments. A man then goes through life together with his comrades, doing the same tasks as they do, having the same social status, and sharing the same privileges […]
>
> The age-grades are not really absolute divisions; there is always some overlap, and it is possible for wealthy orphans or for the sons of old men to be initiated earlier than usual. Some lads, on the other hand, may have to wait a long time. The common term 'age-grade' may be misleading. The sets of men do not move up from one grade into another as boys move through forms at school. They take their grade with them in a sense, name, insignia, and all; they change only the role which they have to play.
>
> What the age-grade system does as a whole in these tribes is to mark off in a broad formal way the generation levels, and institutionalize certain important social groupings and codes of behaviour by reference to advancing years. It provides for respect to seniors and training of juniors; it organizes sex relations and the time of marriage; sets up a specific grouping for warfare; and provides for a regular transfer of the responsibility for external security.[201]

Most crucial of all for us is that age-based social stratification also organises the past into a sort of macro-calendar. This is pointed out by Edgar E. Evans-Pritchard in his detailed description of the culture of the Nuer of southern Sudan (belonging to the Nilotic language group), organised into age groups of this sort:

201 Firth 1938, 101–103.


Biological schema
after Bühler
a
0 10 20 30 40 50 60 70
Conductors
b
Age
0 10 20 30 40 50 60 70 80 90
Singers
c
Age
0 10 20 30 40 50 60 70 80 90
Violinists
d
Age
0 10 20 30 40 50 60 70 80 90
Pianists
e
Age
0 10 20 30 40 50 60 70 80 90
Pianist-teachers
f
Age
0 10 20 30 40 50 60 70 80 90
Susceptibility to
emotional crises
g
Phases in
a musican's life
I
II
III
IV
V
VI
Age
0 10 20 30 40 50 60 70 80 90

Example 7.8 Optimal artistic achievements in the accounts of musicians, after Manturzewska, correlated with a biological schema: Manturzewska and Kotarska 1990, 317–319. **(a)** Bühler's general biological schema; **(b)** Conductors; **(c)** Singers; **(d)** Violinists; **(e)** Pianists; **(f)** The greatest pedagogic achievements in the accounts of pianists; **(g)** Hypothetical model of the phases in the life of a professional musician. The arrows above the graph denote periods of enhanced susceptibility to emotional crises.



Example 7.9 Population of Poland in the years 1970 and 2000 in per milles. Repr. from Klonowicz 1973, 403. Graph supplemented with Bühler's biological schema 1933, 1999, 44.

Nuer have another way of stating roughly when events took place; not in numbers of years, but by reference to the age-set system. Distance between events ceases to be reckoned in time concepts as we understand them and is reckoned in terms of structural distance, being the relation between groups of persons. It is therefore entirely relative to the social structure. Thus a Nuer may say that an event took place after the *Thut* age-set was born or in the initiation period of the *Boiloc* age-set, but no one can say how many years ago it happened. Time is here reckoned in sets. If a man of the *Dangunga* set tells one that an event occurred in the initiation period of the *Thut* set he is saying that it happened three sets before his set, or six sets ago. […] we cannot accurately translate a reckoning in sets into a reckoning in years, but […] we can roughly estimate a ten-year interval between the commencement of successive sets. There are six sets in existence,

> the names of the sets are not cyclic, and the order of extinct sets, all but the last, are soon forgotten, so that an age-set reckoning has seven units covering a period of rather under a century.[202]

Successive age groups pass through successive stages in the social structure, which itself does not alter. On the logarithmic scale of time, the rhythm of the succession of age groups forms a zone, the scope of which may vary between cultures. With the Nandi, that rhythm was seven or eight years on average; with the Nuer, it was around ten years. As we can see, the number of seven or eight basic units is repeated not just in the zone of musical pitches, and not just in the zone of the psychological present, but also in zones of much longer periods of time.

7.6 The period of human life and musical folklore

The role of music in particular periods and phases of personal development has been the subject of detailed studies. It is a subject from the scope of developmental psychology and other disciplines as well, including music anthropology and folklore studies. We know how the use of the voice develops from earliest childhood and how the zone of note pitches takes shape, as well as the differences in this respect and what conditions them. We know generally when a child's musical repertoire begins to take shape, the extent to which it is spontaneous output or imitation (the adoption of models functioning in the culture), and we can guess at what moment the folklorisation of repertoire begins, although there is still a lack of accurate studies on these questions.[203]

The main division of musical folklore, depending on personal development, separates children's folklore from that of adults. The boundaries are fluid, of course. In Polish musical folklore studies, research into children's repertoire is very poorly developed. Judging from existing publications, one might even suspect that it was almost non-existent in Poland. That would be a curious assertion in a situation where a great many children's songs have been documented and recorded among our immediate and more distant neighbours. Yet the cause lies elsewhere, namely, in the limited interest shown in this issue by our folklore scholars, Kolberg included. From our modest documentation and the rich collections in other European countries, a very interesting picture of that folklore emerges, displaying distinctive stylistic properties; we do not even know exactly

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202 Evans-Pritchard 1960, 105.
203 Cf. Kamińska 1997.

to what extent that folklore is ethnically differentiated. In our first impressions, we tend to latch onto common properties of that folklore, but detailed studies would differentiate that picture to a greater extent. So how does the zone of activity of children's folklore look within the age structure? Without detailed studies, it is difficult to say, particularly since a variety of factors complicate the situation. Besides children's songs, sometimes highly distinctive are lullabies, performed by adults for children, in traditional societies often by the oldest people, who most often look after children.

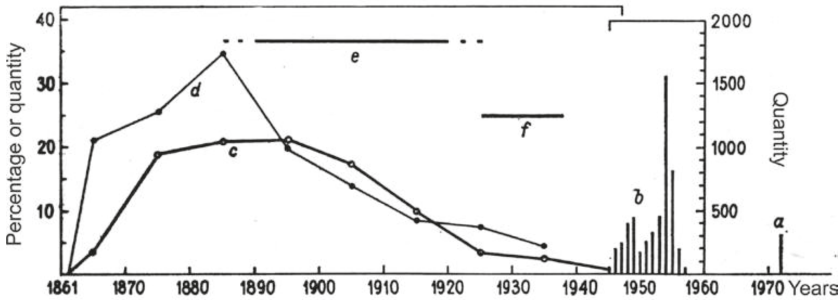
The greatest folkloristic activeness, in both singing and dancing, occurs during youth and the pre-marital period. There can be a great variety of genres, but it is songs of courtship and love that dominate, especially dances. In Poland, it is the wedding rite that represents the pinnacle of musical setting. The same applies in other countries as well. Anna Czekanowska describes the situation among the Slavs in general:

> Among the Russians and the western Slavs, the annual repertoire was reduced in favour of the family repertoire. Family customs, especially wedding traditions, and the related song repertoire are among the richest in all the Slavic nations. Despite the much greater differentiation into genres, the annual material, even among the Bulgarians and the Russians, is smaller than family, and especially wedding, material.[204]

Family rituals document changes in social structure and are reflected in the zone of social time. Like every other feast, however, they are also located within the zone of ecological time; they are moveable feasts in the calendar, feasts of local, and especially family, significance.

Age classes, formalised or non-formalised, differ in terms of activeness in music and dance and in terms of the longevity of memory and tradition. As already mentioned, the greatest activeness in singing and dancing is displayed by young people before marriage. During that time, they get to know the broadest repertoire and keep it in their memory until well into old age. The situation is different, of course, among professional musicians. Instrumentalists, for example, only hone their craft with age, but playing primarily for young people, they also have to tailor their repertoire to tastes, to the current fashion in a particular environment. When folklore becomes less vigorous, as is observed in Polish culture, its main bearers are not youngsters, but old people. Researchers recording folklore in a specific social present meet people from different age groups. They study the existing situation, but through the differentiation of people's deep memory, dependent primarily on age, they can also project that differentiation

204 Czekanowska 1972, 85.



Example 7.10 Musical folklore and the age of performers; After data in Sobieska 1972. **(a)** date of the publication of Jadwiga Sobieska's study; **(b)** annual growth in the number of recordings; **(c)** percentage of recorded performers born in particular decades; **(d)** average number of recordings per person born in particular years; **(e)** period of the greatest folkloric activeness among the majority of respondents; **(f)** people born in particular years who at the time of the research were theoretically the most active in singing and dancing.

onto the axis of the historical past of a specific depth. That is how Jadwiga Sobieska proceeded.[205] This example is worth analysing in detail, projecting the data onto a common axis of historical time, in order to become aware of the various temporal zones manifest in the analysis. The research was conducted during the years 1945–1957, so over a period of thirteen years. That is a small period in the life of a society, although certain changes can be noted here as well; we will leave aside the question of those differences, so as not to complicate the picture. During the research, a total of 5,614 items in the folk repertoire of the Wielkopolska region were recorded. The annual growth in the number of recordings is illustrated by Example 7.10.b. The dates of birth of the performers vary a great deal, from 1861 to 1947; the oldest person was aged ninety-four at the time of the recording, the youngest aged seven. The curve c shows the percentage of people born in the years 1870–1909. Statistically, there were 20.8 recorded repertoire items per person. As Sobieska adds, 'some provided a handful of songs, a proficient performer recorded twenty to thirty songs, and more active singers around fifty. The four most outstanding performers aged between sixty and seventy each sang more than one hundred songs into the microphone. With an exceptionally musically gifted performer, we recorded almost three hundred

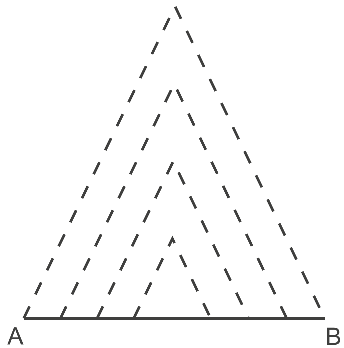
205 Sobieska 1972.

items'. Curve d shows the average number of recordings depending on the year of birth. So the highest average occurred among the oldest people, born before 1900. Among younger singers, represented by a large percentage of respondents, there is a clear drop in the average number of songs transmitted. Sobieska rightly links this to changes caused by the First World War, which disrupted traditional transmission in every domain, not just in musical folklore. Although we do not have detailed data relating to the period when performers were most receptive to repertoire and most active in its performance, that may be linked – as already mentioned – to youth; on average, the peak occurs around the age of twenty. That would indicate that the post-war documentation best recorded the vivid folklore of the last decade of the nineteenth century and the period up to the First World War (graph e), so a situation on average half a century prior to the moment when the research was carried out. Exceptionally poor, meanwhile, was the documentation of singers whose generation was theoretically the most heavily involved in singing and dancing at the time of the research, born in the late 1920s and the 1930s (graph f). This shows that in this generation authentic folklore was no longer current repertoire, having been supplanted by other fashionable songs and dances.

7.7 'Structural time' and tradition

From our European situation, even in folk culture normalised by a universal calendar, let us return to the Nuer of southern Sudan, to dwell a moment on the notion of 'structural time', ordering time from the deepest layers documented by tradition. Edgar E. Evans-Pritchard writes the following on this subject:

> The structural system of time-reckoning is partly the selection of points of reference of significance to local groups which give these groups a common and distinctive history; partly the distance between specific sets in the age-set system; and partly distances of a kinship and lineage order. Four generation-steps (*kath*) in the kinship system are linguistically differentiated relations, grandfather, father, son, and grandson, and within a small kinship group these relationships give a time-depth to members of the group and points of reference in a line of ascent by which their relationships are determined and explained. Any kinship relationship must have a point of reference on a line of ascent, namely a common ancestor, so that such a relationship always has a time connotation couched in structural terms. […]
> The base line of the triangle represents a given group of agnates and the dotted lines represent their ghostly agnatic forebears, running from this base to a point in lineage structure, the common ancestor of every member of the group. The farther we extend the range of the group (the longer becomes the base line) the farther back in lineage structure is the common ancestor (the farther from the base line is the apex of the triangle).



Example 7.11 Evans-Pritchard's triangle of structural time.

> The four triangles are thus the time depths of four extensions of agnatic relationship on an existential plane and represent minimal, minor, major, and maximal lineages of a clan. Lineage time is thus the structural distance between groups of persons on the line *AB*. Structural time therefore cannot be understood until structural distance is known, since it is a reflection of it […].[206]

Evans-Pritchard clearly indicates the anti-dynamic character of structural time:

> The movement of structural time is, in a sense, an illusion, for the structure remains fairly constant and the perception of time is no more than the movement of persons, often as groups, through the structure. Thus age-sets succeed one another for ever, but there are never more than six in existence and the relative positions occupied by these six sets at any time are fixed structural points through which actual sets of persons pass in endless succession […] the Nuer system of lineages may be considered a fixed system, there being a constant number of steps between living persons and the founder of their clan and the lineages having a constant position relative to one another. However many generations succeed one another the depth and range of lineages does not increase unless there has been structural change.[207]

In primitive cultures, where the past documented directly by the memory of living persons in a given social group ends, misty tradition and mythology gradually begin. I again invoke here Evans-Pritchard's description of the culture of the Nuer, although it essentially covers tendencies that are much more general.

> Beyond the limits of historical time we enter a plane of tradition in which a certain element of historical fact may be supposed to be incorporated in a complex of myth. Here

206 Evans-Pritchard 1960, 105–107.
207 Ibid., 107.

> the points of reference are the structural ones we have indicated. At one end this plane merges into history; at the other end into myth. Time perspective is here not a true impression of actual distances like that created by our dating technique, but a reflection of relations between lineages, so that the traditional events recorded have to be placed at the points where the lineages concerned in them converge in their lines of ascent. The events have therefore a position in structure, but no exact position in historical time as we understand it. Beyond tradition lies the horizon of pure myth which is always seen in the same time perspective. One mythological event did not precede another, for myths explain customs of general social significance rather than the interrelations of particular segments and are, therefore, not structurally stratified. Explanations of any qualities of nature or of culture are drawn from this intellectual ambient which imposes limits on the Nuer world and makes it self-contained and entirely intelligible to Nuer in the relation of its parts. The world, peoples, and cultures all existed together from the same remote past.
>
> It will have been noted that the Nuer time dimension is narrow. Valid history ends a century ago, and tradition, generously measured, takes us back only ten to twelve generations in lineage structure, and if we are right in supposing that lineage structure never grows, it follows that the distance between the beginning of the world and the present day remains unalterable. Time is thus not a continuum, but is a constant structural relationship between two points, the first and last persons in a line of agnatic descent. How shallow is Nuer time may be judged from the fact that the tree under which mankind came into being was still standing in Western Nuerland a few years ago.[208]

7.8 Shallow history, the example of Finnish folk music

The Finnish ethnomusicologist Vesa Kurkela discusses the two waves of a renaissance in folk music in Finland which began at the end of the 1860s and in the mid 1980s.

In Kurkela's opinion, the first wave brought many aspects about which we should remember when studying the current situation. They include the following.

– Individualistic amateurism. Amateur musicianship is very typical of musical activities connected to all kinds of mass movements, and the Finnish folk music revival was no exception. However, contrary to typical 'movement music', Finnish *pelimannit* [folk musicians] were quite individualistic amateurs, without any powerful organisations, as was the case in Sweden, for example.

208 Ibid., 107–108.

- Mythologies of authentic music. There were several references to authenticity in public folk music discourse. The most typical epithets of authenticity were 'old', 'beautiful' and 'national'. Since the writings of the German scholar J. G. von Herder in the 1770s, these qualitative terms were related to folk music, and apparently in all the European nation-states the political and artistic utilisation of the peasant tradition kept these terms alive and powerful through the centuries. It was no surprise, therefore, that Finnish folk music discourse was still eagerly using these very same epithets in the 1970s. Furthermore, authentic folk music was also defined negatively, i.e. through music which was not old, beautiful or national. This side of the myth of authenticity distinguished between folk music culture and commercial popular culture.
- Avoiding music technology. In the former folk music movement, there was a shared opinion according to which authentic folk music should be acoustic. This myth of unplugged music can be seen in the avoidance of all kinds of music technology in folk music production. The same attitude was typical of the former art music aesthetics, and this fact made it easy to combine folk material with musical arrangements made according to classical music, and used in choral singing and general music education.
- Festival publicity. In the late 60s, the Finnish folk revival coincided with a big international folk music festival at Kaustinen in Ostrobothnia, western Finland. In the next two decades, Kaustinen and some smaller festivals were the most important arenas for the public presentation of *pelimanni* music. With the aid of these appearances, many a village musician achieved at least regional fame, and *pelimanni* music, being originally music for community dances, developed in the direction of stage music. Folk music became more for listening to and less for dancing.
- Peasant image. The public image of the first folk revival was quite old fashioned and rustic, stressing national peasant culture and regionalism and trying to compensate for a lack of appreciation with a popular myth of mass power and collectivism. That image was quite well suited to the cultural climate of the 70s, since there were a lot of rootless first-generation town dwellers living in southern Finland susceptible to peasant nostalgia.

The second phase in the rebirth of folk culture – in Kurkela's opinion – occurred in Finland in the mid 1980s, when a new generation of musicians interested in historical folk styles gained publicity. In many respects, this second renaissance differed from the first, and its characteristic features were as follows:

- Professionalism. The most important and most prominent artists of new folk music came from the Sibelius Academy in Helsinki, where a new folk music course started in 1982, led by Professor Heikki Laitinen. Quite soon a new generation of folk musicians appeared. They were well-trained professionals forging their careers according to the rules of conventional popular music production. Even today, however, there is a difference between professional folk musicians and popular musicians, to say nothing of musicians playing classical music. The new study programme was based on the idea of folk music as a separate historical genre, which aesthetically differs from other musical traditions in Finland. Actually, this programme was very close to the aesthetics of the Hungarian *táncház* movement, stressing the importance of reviving all kinds of historical music, not only European classical music.
- Artistic eclecticism and crossover projects. Contrary to the earlier folk revival, which stressed the purity of Finnish *pelimanni* music, contemporary folk musicians tend to find new musical ideas from different sources, native and exotic, ancient and modern. Furthermore, the recent trend seems to be a crossover to jazz, rock or non-European musics, as well as new artistic combinations never heard before on the Finnish folk music scene: folk music and theatre, folk music and modern dance.
- Use of sophisticated sound technology. Finnish folk music sounds more electronic than before, due to the use of modern sound technology like computer-aided musical workstations and electronic or electro-acoustic instruments typical of rock music. The main reason for this development probably lies not in the changing aesthetics of folk music, but in the overall change in Western music during the last two decades: sound technology has become a compulsory part of contemporary music making, regardless of genre or tradition.
- Media publicity. Today Finnish folk music is nearly as dependent on electronic media as every other kind of music. However, media publicity is constructed by and based on the commercial mainstream, so it is not easy for more marginal genres like folk music to access the media. The abovementioned crossovers with rock and jazz music and contemporary theatre and dance have paved folk music's way for media publicity. The same holds true in the recording business. Today, Finnish folk music production is part of the nationwide recording industry. That means that every folk professional has to try to release her/his own album in order to get publicity. The albums are not commercially successful, but they are supported to a great extent by public funding.
- Global culture, Finno-Ugrian roots and individualism. If the first folk revival characteristically emphasised peasant, national and collective values, the

recent movement is quite the opposite. New folk music has typically a post-modern image stressing both global and local values, the ancient past and modernity. However, most folk music professionals emphasise their own uniqueness, individual sound and artistic expression. This artistic distinction is often based on Finno-Ugrian roots, the mythical and imagined soundscape of ancient Finns, which is produced with the aid of modern sound technology.[209]

7.9 On happiness in life

Contentment with one's life as a whole is contentment not only with that which is, but also with that which has been and will be, not only with the present, but also with the past and the future. A sense of happiness encompasses not just a positive current state, but also a positive appraisal of the past and positive views on the future. That multiplicity is crucial to happiness. The present moment, however pleasant it may be, cannot guarantee happiness for the thinking person, one who remembers the past and is anxious about the future. So an individual's happiness is determined not only by things that currently exist and have a direct bearing on that individual, but also by things that no longer exist or do not yet exist. Happiness is marked, by the nature of things, by retrospection and prospection.[210]

209 Kurkela 1999, 13–16.
210 Tatarkiewicz 2010, 204.

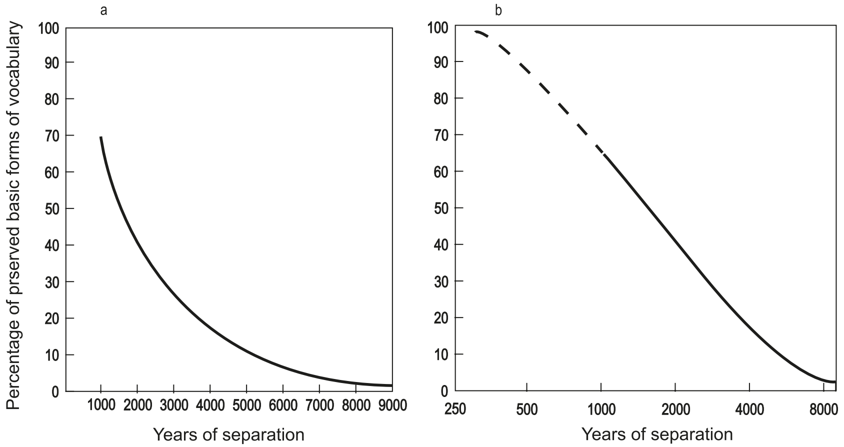
8 The zone of historical time and worldview

8.1 The tempo of historical changes and the logarithmic scale

Thinking about the phases in the course of history, we are inclined to conceive of time as an arithmetic sequence of days, years, centuries, millennia, etc., along which history marks out particularly important dates, segmenting that linear flow of time, dividing it into periods and eras. We tend not to consider that some other scale of time might be applied to history, namely, the logarithmic scale with all its characteristic properties. Yet history is not entirely free from that scale. The fact is that as we approach increasingly distant times, the detail of the results of historical research decreases, and the periodisation covers increasingly large segments of time. Even the output of historical writings tends to accord with the logarithmic scale of time: the closer to our times, the higher the number of works concerning comparable periods.

The sense of a logarithmic scale for history is all the greater in that certain historical processes seem to occur in accordance with it. Here I will draw on an example from glottochronology that gives plenty of food for thought. Detailed research into languages derived from a common source has shown that the percentage of the original vocabulary preserved depends on the length of time for which the languages have been separated. That dependency has even been presented in the form of a graph, which I reproduce here after Charles F. Hockett (Example 8.1a).[211] It was based on a normal arithmetic time scale. It is only when we transfer it to a logarithmic scale that it fully reveals the character and tempo of changes (Example 8.1b). To simplify the picture, I have confined myself to tracing only the line of the greatest probability. The dotted line extends the graph to larger percentage values of the preservation of the common vocabulary. This is justified also by Hockett's verbal description of the tempo of changes. Thus we see clearly that the percentage of the common language preserved depends on the logarithm of the time for which the languages have been separated. It is highly likely that certain processes of change in folk music also occur in accordance with a logarithmic scale of time. Stylistic changes, interchange of repertoire and many other phenomena should be researched from this point of view, and the tempo of changes that characterises them in particular situations should be established.

211 Hockett 1968, 606. Nomogram redrawn from Gleason 1955.



Example 8.1 Nomogram for the glottochronological specification of the extent of affinity over time: **(a)** on the axis of arithmetic time (only the line of greatest probability is included); Based on a drawing in Hockett 1968. **(b)** transferred to the axis of logarithmic time.

8.2 The zonal character of historical time

The logarithmic scale can be applied in history not just to analysis of the tempo of processes. What we are essentially dealing with here is a situation similar to that in the zone of the psychological present or the zone of works. The zonal character of time is manifest in history too. That fact is not fully appreciated by historians and culture theorists, yet one can cite examples in which scholars are at least very close to such an understanding of time. I have in mind here Lévi-Strauss, who, in taking up a polemic with historical method, especially as traditionally conceived, formulates accusations against it which from our point of view may be defined as an attempt at undermining the grounds for the existence in history of a continuous scale of arithmetic time, and thereby understanding history as a process and justifying the zonal theory of historical time, so time classified on various levels, anti-processual time. Of course, Lévi-Strauss thinks in different categories and employs different terminology, yet he adopts an almost identical viewpoint to that presented in this work. The principal misunderstanding lies in the fact that he was convinced that the new viewpoint, the new theory of time, had to overturn the traditional view of history. That is not the case. Lévi-Strauss simply noted aspects which had hitherto escaped the attention of historians. Yet they can coexist perfectly well with other aspects which have been traditionally highlighted in history. Thus Lévi-Strauss arrived at a new theory of historical time that essentially did not preclude the old theory, although he was convinced otherwise. Here is Lévi-Strauss:

> In what would the historian's code consist? Certainly not in dates, since these are not recurrent. Changes of temperature can be coded with the help of figures, because the reading of a figure on the thermometer evokes the return of an earlier situation: whenever I read 0° C, I know that it is freezing and put on my warmest coat. But a historical date, taken in itself, would have no meaning, for it has no reference outside itself: if I know nothing about modern history, the date 1643 makes me none the wiser.[212]

The inconsistencies here are obvious, and only they enable Lévi-Strauss to formulate an assertion that supposedly overturns the linear understanding of history. In actual fact, there is no great difference between the code of a temperature scale and the code of historical dates. Just as one date isolated in history tells us nothing if we do not know the whole scale (or a section of it) and we do not know what other phenomena occurred in those times, so reading a specific quantity on a temperature scale will also tell us nothing. It is only familiarity with that scale and linking quantity data with the facts to which they refer that lends substance to the temperature scale. Thus the code of a temperature scale acts similarly to a code of historical dates. The significance of the linear scale of time for history is obvious, and it is no lesser than its significance for our understanding of the processual character of the time of a musical work. However, the scale alone does not suffice for a full understanding of musical time, just as it does not suffice for a full understanding of historical time. Lévi-Strauss's arguments essentially prove – as he is not fully aware – that the systemic (logarithmic) scale of time, with all its properties, and especially its anti-dynamic, classificatory character, also applies to history. It seemed to Lévi-Strauss that he had to overturn the arguments in favour of the linear scale of history in order to prove that it was right to consider history in categories that could only be fully understood when taking account of the systemic (logarithmic) scale of time. From the arguments of the previous passage, Lévi-Strauss draws the following conclusions regarding the code of history:

> The code can therefore consist only of classes of dates, where each date has meaning in as much as it stands in complex relations of correlation and opposition with other dates. Each class is defined by a frequency, and derives from what might be called a corpus or a domain of history. Historical knowledge thus proceeds in the same way as a wireless with frequency modulation: like a nerve, it codes a continuous quantity – and as such an

212 Lévi-Strauss 1966, 259.

> asymbolic one – by frequencies of impulses proportional to its variations. As for history itself, it cannot be represented as an aperiodic series with only a fragment of which we are acquainted. History is a discontinuous set composed of domains of history, each of which is defined by a characteristic frequency and by a differential coding of *before* and *after*.[213]

So we have here a situation identical to that which manifested itself in our analyses of musical time conducted on the logarithmic scale, constituting a sort of code for different classes of temporal elements. The temporal elements of a work always enter into complex relations of interdependence and opposition with the elements of a given class. They form a class of phenomena which on the logarithmic scale manifests itself in the form of a specific zone with a whole distribution of mean and extreme frequencies. Cognition of the structure of a musical work compared with the action of an oscillograph set to a specific range of frequencies is no less meaningful than in relation to historical cognition. The temporal structure of a musical work considered on the logarithmic scale is also a discontinuous set, created from fields of theory each of which is defined by its own frequency of studied phenomena and by a differential coding of before and after. We are orientated to different frequencies when we consider the work as a phonological structure, so on the level of sounds, when we study the morphological structure of a work, its motivic, phrasal and formal design, or when the object of our interest is a work as representative of a particular genre.

From his argumentation relating to domains of history, Lévi-Strauss draws one-sided conclusions, since he has a one-sided understanding of historical time:

> It is no more possible to pass between the dates which compose the different domains that it is to do so between natural and irrational numbers. Or more precisely: the dates appropriate to each class are irrational in relation to all those of other classes.
> It is thus not only fallacious but contradictory to conceive of the historical process as a continuous development.[214]

Lévi-Strauss formulates this idea even more clearly and forcefully thus:

> Given that the general code consists not in dates which can be ordered as a linear series but in classes of dates each furnishing an autonomous system of reference, the discontinuous and classificatory nature of historical knowledge emerges clearly. It operates by means of a rectangular matrix:

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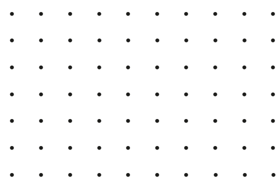
213 Ibid., 259–260.
214 Ibid., 260.



> where each line represents classes of dates, which may be called hourly, daily, annual, secular, millennial for the purposes of schematization and which together make up a discontinuous set. In a system of this type, alleged historical continuity is secured only by dint of fraudulent outlines.[215]

Such is the scale of the difficulties in which Lévi-Strauss embroiled himself. They are caused by gaps in existing theories of time, one-sided theories based on a linear, arithmetic scale of time, theories that are exclusively dynamic and processual. Lévi-Strauss's merit is that he noticed different aspects of historical time and even crossed the threshold of the zonal theory of time, and that in history, where it might have seemed that this step was considerably more difficult than on the level of musical time, for example. Of course, he was not fully aware of this new theory, and above all he did not notice that it failed to automatically eliminate processual theories of time but merely showed other aspects of time, just as quantum theory does not preclude the wave theory of light. So he did not eliminate history and did not overturn its foundations, although he did undoubtedly show the one-sidedness of its premises as understood up to that point in time. Showing history from a different perspective enabled Lévi-Strauss to observe new properties relating to the zonal theory of time. For example:

> each class taken as a whole nevertheless always refers back to another class, which contains the principle of an intelligibility to which it could not itself aspire. The history of the seventeenth century is 'annual' but the seventeenth century, as a domain of history, belongs to another class, which codes it in relation to earlier and later centuries; and this domain of modern times in its turn becomes an element of a class where it appears correlated with and opposed to other times: the middle ages, antiquity, the present day, etc. Now, these various domains correspond to histories of different power. Biographical and anecdotal history, right at the bottom of the scale, is low-powered history, which is not intelligible in itself and only becomes so when it is transferred *en bloc* to a form of history of a higher power than itself; and the latter stands in the same relation to a class above it. It would, however, be a mistake to think that we progressively reconstitute a

215 Ibid., 260–261.

> total history by dint of these dovetailings. For any gain on one side is offset by a loss on the other. Biographical and anecdotal history is the least explanatory; but it is the richest in point of information, for it considers individuals in their particularity and details for each of them the shades of character, the twists and turns of their motives, the phases of their deliberations. This information is schematized, put in the background and finally done away with as one passes to histories of progressively greater 'power'. Consequently, depending on the level on which he places himself, the historian loses in information what he gains in comprehension or vice versa, as if the logic of the concrete wished to remind us of its logical nature by modelling a confused outline of Godel's theorem in the clay of 'becoming'.[216]

We do not know whether Lévi-Strauss, in characterising history in this way, was aware that his assertions were of considerably broader scope, since they refer essentially to all temporal phenomena connected with humans and human culture. So they are borne out already in the time of the psychological present, beginning with the human moment and – as we have seen – ending with the longest historical times. They refer, of course, to the logarithmic scale of time, the scale of qualitative time, the scale that classifies temporal phenomena. It is there that homogeneous phenomena form particular zones, zones in a hierarchical arrangement from the shortest to the longest times. Let us take the example of language. The class of phonemes, as the smallest segments of a linguistic flow, refers to the class of syllables and morphemes, and only in this superior class, employing larger units of time, do phonemes obtain the principle of comprehensibility, because they discharge a distinctive function, differentiating syllables, and especially morphemes, the smallest semantic units of language. Morphemes, meanwhile, refer to words, words to sentences, sentences to utterances, and so on, and it is always in a higher class, employing longer times, that one should seek the principle of comprehension for a lower class.

The same is true in music. Indeed, it is not a new idea. Carl Dahlhaus, invoking an ancient philosopher, wrote about form: 'Form, according to Aristotle, is relative. In contrast to individual notes, the motif represents a form, as does the period in relation to the motifs and the movement in relation to the periods. And the conditions of formal concision are different on each level'.[217]

Incidentally, Lévi-Strauss's observations made in relation to history do not refer to the zone of note pitches, which also depend on time, namely, on the time of particular vibrations. From this point of view, the whole pitch zone is homogeneous, and lower notes, such as bass notes, by no means contain the principle

216 Ibid., 261–262.
217 Dahlhaus 1987, 249.

of comprehensibility of higher notes, of a soprano voice, for example, although those voices have clearly demarcated zones on the logarithmic scale of time or frequency.

In relation to long, 'historical' times, Lévi-Strauss distinguished domains of history; in language, meanwhile, we distinguish domains of theory. They are phonology, morphology, syntax, etc. The situation is identical in music as well. Here too the domains, from the weakest to the strongest, form a hierarchical ladder of domains of music theory, each of which refers to specific temporal zones. The layer of the sound flow contains the most information, but understanding of the essence of sounds and their functions comes only on the level of motifs and phrases, which in turn are only elements of formal construction. The higher the rung, the greater our understanding, although the less information we have. Lévi-Strauss formulated this dilemma in relation to history. The relative choice of historical domain

> is always confined to the choice between history which teaches us more and explains less, and history which explains more and teaches less. The only way [the historian] can avoid the dilemma is by getting outside history: either by the bottom, if the pursuit of information leads him from the consideration of groups to that of individuals and then to their motivations which depend on their personal history and temperament, that is to say to an infra-historical domain in the realms of psychology and physiology; or by the top, if the need to understand incites him to put history back into prehistory and the latter into the general evolution of organized beings, which is itself explicable only in terms of biology, geology and finally cosmology.[218]

This dilemma is by no means specific to history alone. It also applies to theories employing smaller units of time than history, including theory of the musical work. Depending on the level adopted by the theorist, when gaining understanding, he or she loses information. Here as well two ways out of the dilemma are mentioned, exiting the theory of the musical work either downwards, into psychology and the physics of sound, or upwards, when the need to understand moves one to place the work within the composer's biography, an artistic trend, an historical period, a given culture, and so on.

According to Lévi-Strauss, however, there exists one other way of avoiding this dilemma without the need to demolish history and without – one might say, referring to the above-mentioned analogy – the need to do away with theory.

> We need only recognize that history is a method with no distinct object corresponding to it […] In fact history is tied neither to man nor to any particular object. It consists

218 Lévi-Strauss 1966, 262.

> wholly in its method, which experience proves to be indispensable for cataloguing the elements of any structure whatever, human or non-human, in their entirety. It is therefore far from being the case that the search for intelligibility comes to an end in history as though this were its terminus. Rather, it is history that serves as the point of departure in any quest for intelligibility.[219]

Lévi-Strauss and his opinions stand in clear opposition to the processual understanding of history and of human culture. One might even discern in his approach a return to original concepts of anti-dynamic, classificatory time. Two theories of time – dynamic, that is, arithmetic, and static, that is, geometric or logarithmic – often recur in various domains. Each has its advocates, and at the same time its intolerant opponents, to whom logic suggests that only one of the theories is right. It has not been noticed that these theories are not actually mutually exclusive; on the contrary, they complement one another, merely showing different aspects, equally important for a fuller understanding of time and temporal phenomena.

8.3 The 'circling of times'

A fully historical understanding of time, so as a process that is continually unfolding and is consequently associated with a linear, arithmetic scale of time, has not always been obvious to man. It only appears in historically-shaped conditions. Here is Wilhelm Koppers:

> In the classical ancient world, as in other highly developed pagan civilisations, no universal history developed. There is no doubt that the Greeks were not lacking in distinct inclinations towards historical thinking and studies in that domain; still today, we draw on the achievements of Herodotus, Thucydides, Polybius and others, but none of them gave a universal historical approach in the full sense of the term; none of them went beyond the bounds of the learning of the cyclical courses of phenomena that was peculiar to the ancient world. These are the cycles of times (*circuitus temporum*, as Augustine called them), 'in which there should be a constant renewal and repetition of the order of nature; and [some philosophers] have therefore asserted that these cycles will ceaselessly recur, one passing away and another coming'.[220]

Historical thinking developed earliest at the origins of our culture. European scholars observed long ago, as Koppers asserts, that nothing noteworthy developed in this domain in Indian intellectual life. The pantheism (Brahmanism-Hinduism) typical

219 Ibid., 262.

220 Koppers, 1969, 309–311; Augustine, *De civitate dei* 12:13–14; 20, quoted in R. W. Dyson 2001, 41.

of India was not conducive to interest in history. A general observation led him to the assertion that historical thinking and reflection on history was best developed, relatively speaking, on the foundation of a theistic understanding of the world:

> Universal historical thinking first appeared in the Bible, so on a religious foundation […] That thinking is expressed in an unevenly more robust way, bigger in consequences, in the New Testament […] Let us mention, by way of example, the New Testament teaching on the creation of the world in time, which present-day teaching confirms to the extent that it takes the beginning of the cosmos to have occurred more or less five billion years ago.

The age of the cosmos is currently estimated at 13.7 billion years. Also confirmed has been Augustine's assertion regarding a specific time of man's emergence. 'Given that we are rejecting the eternal circling of times, there is no longer anything that might force us to deny the beginning of man in time'.[221]

This 'eternal circling of times' is not directly linked to the systemic (logarithmic) scale of time, but it does display some common features with it, since it is time that has no beginning and no end. Time as thus understood is as if attuned to a constant rhythm of returns, constituting a closed circle; it is attuned to indefinite frequencies or even to frequencies that are very specific, such as the sequence days and night, the seasons of the year, human birth and death. The constancy of returns in this time is more prominent than the directional, dynamic passing that is characteristic of the arithmetic axis of time. That directing of time was introduced and reinforced especially by Christianity, and it was confirmed by science. It was most fully expressed in the historical understanding of historical processes that is characteristic of modern-era science and is currently totally dominant in the humanities.

8.4 Historical time in the Christian Middle Ages

Gurevich states that time linked to ancestral relations, which held a dominant place in people's awareness during the age of barbarity, retained its significance also in the feudal society:

> Feudal lords were deeply interested in genealogies, by means of which they traced their pedigrees back to distant, often legendary or semi-legendary princely ancestors. This way of securing the family's prestige by means of an appeal to the length of its genealogical tree exhibits the ruling class's attitude to time: the powerful, noble, influential man in the Middle Ages is the man with many generations behind him, the man in whom

221 Wagner 1951, 45; Koppers 1969, 309–311.

> family time – and therefore historical time – has condensed. History in the Middle Ages remained the history of the old feudal families and dynasties. It was not for nothing that the medieval French word *geste* meant both 'history' (history of feats and exploits) and 'noble kin', 'heroic family'.[222]

The time of earthly kingdoms and successive events was not treated as the only time. Sacred time existed on a par with secular time:

> The category of the divine archetype which determines the minds and the behaviour of people in archaic societies, continues to be central to the world-view of medieval Christianity. The personages and the events recorded in the Old and New Testaments are endowed with reality of a very special nature. Biblical time is not transient; it represents an absolute value. With Christ's act of redemption, time acquires a special duality: 'the time' is at hand, or already 'fulfilled', time has reached its 'fullness', the 'last times' are at hand, it is the 'end of time': the kingdom of God exists already, but earthly time is not yet concluded, and the kingdom of God remains the final end, the aim towards which all must strive.[223]

Christian time and pagan time differed fundamentally from one another. Gurevich characterises the differences thus:

> Pagan time, it would seem, was apprehended exclusively in the forms of myth, ritual, seasonal change and the succession of generations, while in medieval society the category of mythological, sacral time ('history of revelation') coexists with the category of secular, worldly time; and both of these categories are united in the category of historical time ('history of salvation'). Historical time is subordinate to sacral time, but is not dissolved in it: the Christian myth gives a *sui generis* criterion for defining historical time and evaluating its meaning.[224]

Christianity broke with the cyclicity of the pagan view of the world. In the Old Testament, time was experienced as an eschatological process. People eagerly awaited the coming of the Messiah as the great event determining history. The New Testament shared Old Testament eschatology, but formed the concept of time in a new way.

> First of all, in the Christian world-view the concept of time was detached from the concept of eternity, which in other ancient cosmological systems had absorbed and subjected secular time. Eternity is not measurable in temporal units or components. Eternity is an attribute of God; time is created and has a beginning and an end, which circumscribe the duration of human history. Secular time is correlated with eternity, and at certain crucial moments human history 'breaks through' into eternity. The Christian

222 Gurevich 1985, 108–109.
223 Ibid., 109–110.
224 Ibid., 110.

> strives to pass from the time of the earthly vale of tears into the abode of eternal bliss enjoyed by God's elect.[225]
> Secondly, historical time acquires a definite structure, being divided both quantitatively and qualitatively into two main epochs: up to the birth of Christ and after the birth of Christ. History moves from the act of divine creation to the Day of Judgment. In the centre of this process is the decisive sacramental fact, which determines its direction, giving it a new meaning and predetermining all subsequent developments – the coming of Christ and his death. Old Testament history is seen as the epoch of preparation for the coming of Christ; subsequent history is the result of his Incarnation and his Passion. This event is once and for all, non-repeatable, and unique in its significance.[226]

The Christian orientation of time differs from both the ancient orientation to the past alone and from the Old Testament messianic, prophetic conception orientated to the future.

> The new conception of time is based on three decisive factors: the beginning, the culmination and the end of the existence of mankind. Time becomes linear and irreversible […] The presence of these nodal points of reference has a profound effect on time: time is 'straightened out', 'stretched' and vectorially directed; their presence engenders a tension field between the ages, proclaiming – in the shape of history – the immanent and harmonious grand design which will bring about the resolution of these tensions.[227]

Despite such a strongly emphasised vectoriality of earthly history, time in Christianity did not rid itself of cyclicity. In the time of the environment, cyclicity is obvious, but it also appears on the broadest scale: 'this same earthly history, taken as a whole, in the framework formed by the creation and the end of the world, also appears as a complete cycle: man and his world return to the Creator, time returns to eternity'.[228] Historical time in Christianity becomes dramatic:

> The beginning of the drama is man's first free act – Adam's fall. Intimately connected with this is the coming of Christ, sent by God to save mankind. Judgment follows at the close of man's earthly existence. The interpretation of earthly history as the history of the salvation of mankind gave it a new dimension. The life of man unfolds on two temporal planes at once: on the empirical and transient plane of earthly existence, and on the plane of the realisation of God's predestined plan. Man is a protagonist in a cosmo-historical drama, in the course of which the fate of the world and the fate of his own individual soul are decided. It was this awareness that gave a special and distinctive character to the world-view of medieval people, who felt their personal involvement in history.[229]

225 Ibid., 110–111.
226 Ibid., 111.
227 Ibid.
228 Ibid., 111–112.
229 Ibid., 112.

The drama of becoming aware of time in Christianity is based on a dualistic relationship with the world and history:

> Earthly life and the whole of history are seen as the arena of a struggle between good and evil. These are not impersonal cosmic forces; on the contrary they are rooted in man himself, and if good is to emerge victorious in history and in his own soul, man's free will and goodwill are necessary. From the recognition of man's internal freedom of choice there follows the central drama of the Christian view of time and history. Earthly life with its transient joys and sorrows is not self-sufficient and acquires its true sense only when it is incorporated in the sacramental history of the salvation of mankind. Thus, past and future are of greater significance and value than the present, which is fleeting. A similar attitude to the current events of the present inheres in the mythological world-view which sees in them no more than the reflection of the original forms, a repetition of the divine archetype. The Christian myth, however, differs radially from the pagan 'nature' mythologies, in that the Christian myth is a *historical* myth; earthly history is not left to the whim of supernatural beings, but is cast in a specifically dualistic mould from the fusion of sacral and secular elements. Hence, within the framework of the Christian world-view a philosophy of history becomes feasible, as does the construing of time as an irreversible historical sequence.[230]

8.5 The Darwinian revolution in the understanding of history

A decisive influence on historical thinking was exerted by Darwin's theory of evolution. Before it appeared, mathematical time was entwined with teleological time in the understanding of history. As Haber states:

> The mathematical time was used for establishing the chronology of actual historical events, but teleological time set the pattern in which the events had their temporal existence. As long as it was believed that God had created the world for a purpose and according to a plan that would be unfolded and reach completion in a preordained course of time, the time of history was transcendental and teleological. This belief had been maintained in Christian cosmology from the Patristic period, especially through the influence of St. Augustine. It was strongly reinforced in Natural Theology during the seventeenth and eighteenth centuries through the Argument from Design, the argument for the existence of God based on the hypothesis of an ultimate design and purpose in the universe. As science brought ever new proofs from nature of the complexity in the Design of the Creation, the conclusion seemed inescapable that only the intelligence of God, and not the play of chance, could have wrought such intricacies as were manifest in the world. If Nature revealed such careful planning, it was easy to assume that history too was the unfolding of a design. Such had been the received view of Christianity, at least since St. Augustine, but even in the secularization of the Enlightenment when

230 Ibid., 112–113.

salvationist history was under attack, it was easy to retain the concept of a transcendental time pattern in history through a divinized Nature.

According to Haber, Darwin's theory, explaining the history of organic life on Earth, presented the first acceptable possibility for thinking about historical time in non-teleological terms, and in that sense it represented a revolution in our understanding of time. Historical facts took on secular significance. Traditional phrases such as 'the times called men forth', 'the time was ripe' and 'in the fullness of time' became purely rhetorical figures. Of course, it was not Darwin himself who caused those changes. His predecessors did a great deal to support the theory of evolution.[231]

> A Time Revolution had already begun early in the nineteenth century and was in full tide in the middle of the century. The closed temporal world of biblical chronology was stretched into vast epochs of geological time. The enormity of time in the history of life on earth that was revealed from the reconstruction of fossils was as staggering to the imagination in the early nineteenth century as the spatial magnitude of the universe had been in the seventeenth century. […] The culture of man was historicized as language, literature, religion, the arts, legal institutions, and even history were brought under the idea of a development. The rate of change in the state of knowledge during the decades just prior to Darwin was almost explosive.[232]

Darwin's *On the Origin of Species* caused a shock both to the author's closest colleagues and to the public at large. For Darwin's supporters, it was a cognitive shock; for his opponents, it was alarming:

> In spite of all the romanticization of time and the process of development in time, in spite of all the detailed reconstructions of history, pre-history, and natural history, the genetic idea had not made a direct challenge to the Design Argument and its clock analogue, at least in terms of the hard-headed scientific view of the age […] The paleontologist put the arrow of time in geology, but most of the leading paleontologists worked within the Design framework, even trying to retain something of the Days of Creation as Epochs.[233]

Darwin was opposed to the Design argument. He did not agree with the Platonic concept of ideas or with vitalist theories of evolution, which were linked to an idealistic view of reality, as Haber writes:

> There was no final term [in Darwin's new model] for the completion of man's perfection. Perfection itself was redefined to mean the ability to adapt the most advantageously within the ecology. The process of time was left open-ended. As historians adopted the

231 Haber 1972, 384–385.
232 Ibid., 399.
233 Ibid., 399–400.

> Darwinian view of time and process, teleological time in history gave way to the simple linear mathematical view. Eschatons of one sort or another, such as the perfection of man, have lingered on, but in critical history they were eschewed as speculative, philosophical or metaphysical, and were eliminated from the proper business of the historian.[234]

And how do things look today, following the turmoil of the twentieth century? Eighty-five per cent of the world believes in some religion; Christianity has the largest number of followers.

234 Ibid., 400–401.

9 Time and space

9.1 Le Corbusier’s modulor and music

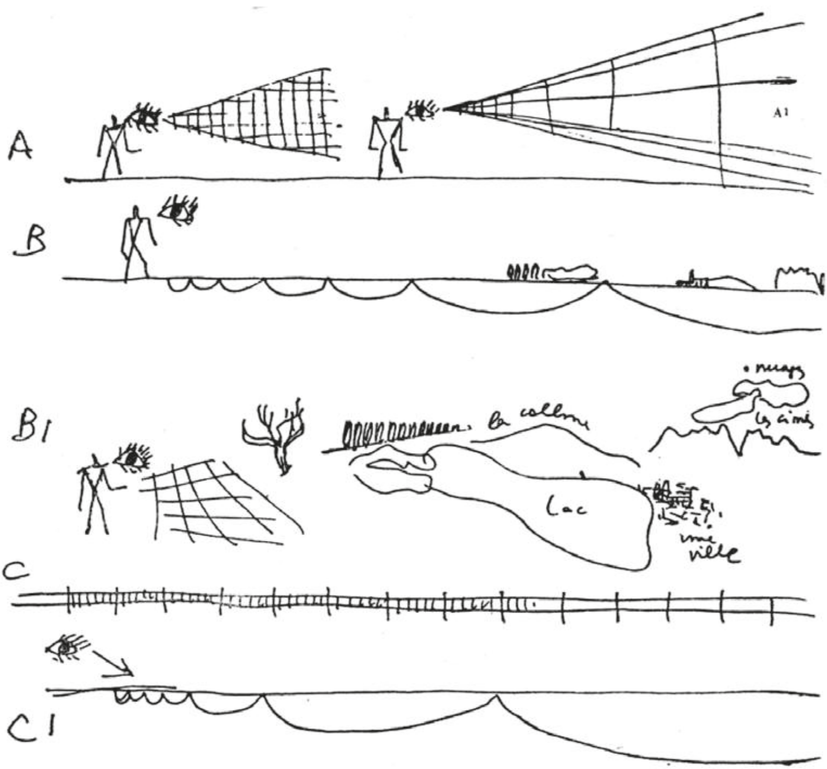
Like time, human space is dependent on perception. It is subject to the general tendencies characteristic of our species and of life on Earth in general. Perhaps nothing has been measured so precisely as the spatiality of various phenomena. Yet it has been done in a manner that we normally encounter in science, using the most objective methods possible, independent of humans. In the human space, as it reveals itself to us and as it conditions our existence within it, the human factor is indispensable. If we as humanists are interested in space, it is mainly as the space of people and their environment. So most important for us is the human perspective of space in the broadest sense of the word.

As already mentioned, space has been studied using the most objective methods possible and a scale as independent of people as possible. That has usually been a normal arithmetic scale. In relation to human space, however, its use is limited and often no more than a starting point, an initial tool for recording the facts, the interpretation of which requires transferral to another scale, the scale of human perception. Everything suggests that the foundation for such a scale, in space as in time, may be a logarithmic scale. The most important role on the human scale is played not so much by isolated sizes as by the proportions or ratios occurring between them, and those proportions, irrespective of the sizes they concern, always correspond on a logarithmic scale to the same distances.

Le Corbusier was well aware of the logarithmic character of spatial vision. He illustrated the difference between a normal arithmetic scale, with which we measure objects, and a geometric or logarithmic scale of vision with an overview drawing, which requires no commentary.[235]

Humankind has long been interested in the question of proportion and harmony in the universe. Research in this domain has brought rich theoretical and factual material in the form of discoveries of various proportions existing in the world of nature. The problem of proportion, perhaps with varying intensity, has recurred throughout art history, be it in the form of the discovery in proportion of a divine order or in a more laicised form as the expression of the need for harmony and beauty or of some programme, be it only a negative programme, in

235 Le Corbusier 1954, 79.



Example 9.1 Vision of space on a geometric (logarithmic), not arithmetic, scale; overview drawing. Repr. from Le Corbusier 1954, 79.

relation to those categories. I will pass over older history here, referring instead to our times, to a very symptomatic example, in the form of the work and theory of Le Corbusier, as seen mainly through his modulor.

The book devoted to his theory gives us insight into the endeavours of an author possessed by a veritably Renaissance need to penetrate the human scale of space. He states categorically that it is not conveyed by the scale employed by a construction engineer, so a scale in metres, centimetres and millimetres. That scale is essential, of course, but it cannot satisfy the soul of the artist, and not only the artist. Le Corbusier was convinced that the human scale which he strove to discover and which he defined in his own way by means of the modulor should govern not just the world of architecture, but also everyday human life, and so it should be used consciously wherever space was directly linked to people, so for example in industry, the standardisation of functional objects, and so on.

Considering the modulor in the context of music might seem odd, but it has a deeper sense. The very essence of architecture, according to Le Corbusier, is linked to music. In his book about the modulor, which deals with issues relating to space, the author felt the need to clearly define his attitude to music. In autobiographical reflections, he profiles himself as follows:

> Being free from the academic spirit, he had an open mind and an alert eye. Being a cubist, he had a bent for plastic phenomena, and his reasoning was *visual*. He came from a family of musicians, but he could not even read music; yet he was a musician through and through, and knew just how music is made; he could speak about music and pass judgment upon it. Music, like architecture, is *time and space*. Music and architecture alike are a matter of measure.[236]

Let us note that Le Corbusier does not set the temporal aspect of music in opposition to the spatial dimension of architecture. His statement in its entirety concerns at the same time both those forms of art. Hence, when emphasising that analogy, he did not translate the temporal phenomena of music, such as its rhythm, into the spatial rhythm of architecture. Elsewhere, he explains what he had in mind when speaking of the temporal character of architecture: 'Architecture is judged by eyes that see, by the head that turns, and by the legs that walk. Architecture is not a synchronic phenomenon but a successive one, made up of pictures adding themselves one to the other, following each other in time and space, like music.'[237]

Yet it was not in the temporal character of architecture as thus defined that Le Corbusier saw its main similarity to music. He drew many more consequences from the scale of musical pitches, constituting the source of musical spatiality, as it were. He set himself the task of creating a similar scale for architectural space. Two matters struck Le Corbusier in particular. First, although note pitches objectively form a continuous scale, in music they are used as discontinuous; they are ordered in a system of intervals, expressed as oppositional qualities. Secondly, that human musical scale is based on mathematical principles. Le Corbusier speaks about a system of musical notation, but he means of course the foundations of the musical system, in relation to which the question of notation is of only secondary importance. The author gives the following justification of the need to create a human spatial scale, which he goes on to define in his own peculiar way in the form of the modulor:

236 Ibid., 29.
237 Ibid., 72–73.

> Sound is a continuous phenomenon, an uninterrupted transition from low to high. The voice can produce and modulate it; certain instruments can do the same, the fiddle for example, or the trumpet; but others are incapable of it because they are based on an order of artificial intervals invented by man: the piano, the flute, etc.
> For thousands of years men used sound to sing, or play, or dance. That was the first music, transmitted by the voice, no more.
> But one day – six centuries before Christ – someone first thought of making music permanently transmissible in another way than from mouth to ear: that is, to write it down. No method or tool was available for this […].
> How to divide into sections the continuous phenomenon of sound? […]
> Pythagoras solved the problem by taking two points of support capable of giving both certainty and diversity: on the one hand, the human ear, the hearing of human beings […]; on the other, numbers, that is to say mathematics in all its forms: Mathematica, herself the daughter of the Universe.
> Thus the first musical script was created, capable of encompassing sound compositions and transmitting them through time and space […] Johann Sebastian Bach […] created a new system of musical notation: the 'tempered scale', a new and more perfect tool, which gave a tremendous fresh impulse to musical composition. […]
> That brings me to the theme of this work: how many of us know that in the visual sphere – in the matter of *lengths* – our civilizations have not yet come to the stage they have reached in music? Nothing that is built, constructed, divided into lengths, widths or volumes, has yet enjoyed the advantage of a measure equivalent to that possessed by music, a working tool in the service of musical thought.[238]

That is precisely the measure – to be employed as a practical tool of spatial thinking – which Le Corbusier strenuously sought. That scale was to be not so much a generalisation of all architectural practice as a tool for efficient activity in design. The most important thing for him was the human factor in space, representing the ultimate measure of all human architectural doings and their evaluation.

> One thing remains to be explained: the Parthenon, the Indian temples, and the cathedrals were all built according to precise measures which constituted a code, a coherent system: a system which proclaimed an essential unity. Primitive men at all times and in all places, as also the bearers of high civilizations, Egyptian, Chaldean, Greek, all these have built, and, by that token, measured. What were the tools they used? They were eternal and enduring, precious because they were linked to the human person. The names of these tools were: elbow (cubit), finger (digit), thumb (inch), foot, pace, and so forth… Let us say it at once; they formed an integral part of the human body, and for that reason they were fit to serve as measures for the huts, the houses and the temples that had to be built.

238 Ibid., 15–17.

> More than that: they were infinitely rich and subtle because they formed part of the mathematics of the human body, gracious, elegant and firm, the source of that harmony which moves us: beauty (appreciated, let it be understood, by the human eye in accordance with a well-understood human concept; there cannot and could never be another criterion).[239]

According to Le Corbusier, that human point of reference was entirely devoid of the metrical system introduced after the French Revolution. It lost its expression, became abstract, symbolic. A metre was defined as a forty-millionth part of the Earth's equator. That was laden with consequences for architecture:

> In the matter of building houses – or huts or temples – meant for men, the metre seems to have introduced a strange and unreal method of measurement which, if looked at closely, might well be found to be responsible for the dislocation and perversion of architecture. 'Dislocation' is quite a good word for it: it is dislocated in relation to its object, which is *to contain men*.[240]

Given that the task of architecture is to create space with the purpose of containing people within it, it is understandable that Le Corbusier sought above all a basic spatial unit that would satisfy that condition. That unit depends on the height of a man, but it is not identical to it. It would be difficult to contain a man in a space equal to his height. And here we are at the source of the original measure introduced by Le Corbusier, namely, the height of a man with raised arms, indicating, as it were, the limit to immediate human space, in which a person comfortably fits. That size stands in a specific proportion to a man's height, and it became the starting point for the new measure. The first thing to be established was the model height of a man. In the first version, Le Corbusier adopted as that height 175 cm, without giving any justification. Its sense became clear when the author abandoned that first model size in favour of a new height that corresponded better to the idea that guided him. He was faced with an accusation which he quotes word for word:

> 'The values of the "Modulor" in its present form are determined by the body of a man 1.75 m. in height. But isn't that rather a *French* height? Have you never noticed that in English detective novels, the good-looking men, such as the policemen, are always six feet tall?'
> We tried to apply this standard: six feet = 6 X 30:48 = 182.88 cm. To our delight, the graduations of a new 'Modulor', based on a man six feet tall, translated themselves before our eyes into round figures in feet and inches![241]

239 Ibid., 18–19.
240 Ibid., 20.
241 Ibid., 56.

And this was important in that it gave the scale a more universal character, independent of the metrical system.

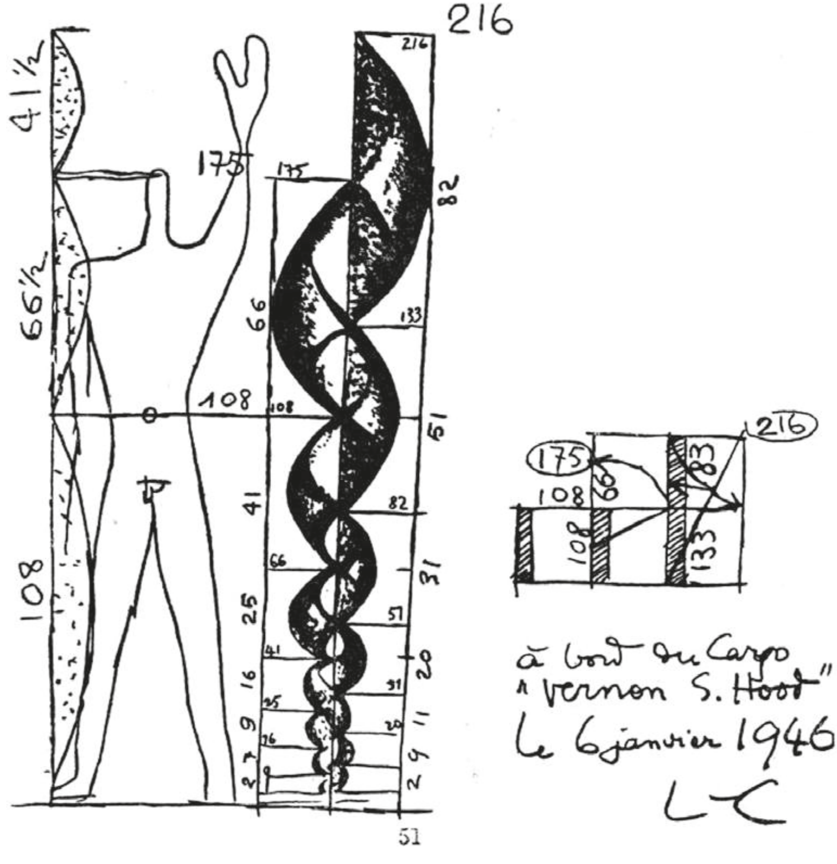
So Le Corbusier did not seek average human height, some neutral height as his starting point. He was clearly after a size of a qualitative character, in the most positive sense possible. Average height is neither 175 cm in France nor 183 cm in Anglo-Saxon countries. Those are clearly values greater than the average, but they were linked, as Le Corbusier saw it, with a positive quality, an optimal human value, which he wished to incorporate in architecture.

9.2 The modulor and the twelve-degree scale

Le Corbusier defined the modulor with two series of the golden ratio. The first series, which the author called the red series, adopts human height as its starting point; the second series, the blue series, starts with the characteristic height of a man with his arms raised, and that value is defined in the modulor as double the value of the golden section of human height (Example 9.2). In actual fact, analysing the modulor, one may discern in it a single basic series of golden ratios, attuned to the height of a man (the red series), since the whole of the second series, and not just that value of a man with raised arms, is automatically double the value of the first series. So each value of the first series has a value twice as large in the second series, and each value of the second series has a value half as short in the first series, but not vice versa. There is no doubling of a value of the second series in the first series and no halving of a value of the first series in the second, although there are sizes close to them – imperfect sizes, to use terminology employed in music. It ensues from this that the modulor does not admit of a series of the ratio 1:2, the octave or tuz ratios that play such a dominant role in time and in musical pitches.

At first glance, it might seem that the modulor is the result of two series of golden ratios half a value (of the golden ratio) apart on the logarithmic scale, that it forms a tempered series of values of a symmetrical logarithmic division of the golden ratio, but that is not the case. The modulor is an untempered scale. Within that scale the red series is unsymmetrically divided in both the logarithmic scale and the arithmetical scale; the second series, the blue, is constituted by values of the first series divided symmetrically on the axis of arithmetic space. Hence the pairs of identical series (on the arithmetic scale) that are characteristic in the modulor.

Comparing the modulor with the twelve-degree tempered scale, we see basic and characteristic differences. A logarithmic scale underpins each of them. The musical scale is based on the interval of an octave, divided into those twelve



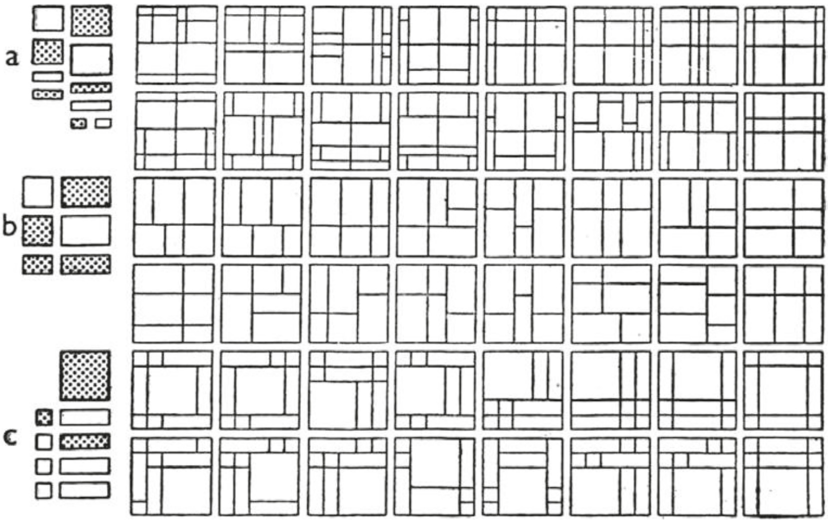
Example 9.2 Modulor, version I – a man's height 175 cm. Repr. from Le Corbusier 1954, 51.

equal parts. In the modulor, in which not all the octaves are perfect, they are divided only into three parts, namely, into major thirds reduced by around one-third of a semitone and a major third increased by two-thirds of a semitone, as a result of which we obtain the interval of a slightly diminished fourth. There are no smaller degrees in the modulor. The smallest section in Le Corbusier's scale is divided into four semitones, and those in turn, theoretically, into one hundred cents. More crucial, however, is the fact that the modulor displays a dearth of various ratios employed widely not just in music, such as 2:3, 3:4 and 4:5, and contained in the twelve-degree scale, although sometimes theoretically in a form that is not entirely perfect. However, the deviations are so small as to be of no practical significance. The modulor does not contain either these ratios or even the highly spatial proportion of a standard size sheet of paper, but it is contained in the twelve-degree tempered scale. However, that ratio sounds exceptionally unharmonic, since it forms the interval of an augmented fourth, avoided in traditional European music (*diabolus in musica*), and thanks to its dissonance readily employed in avant-garde new music. The twelve-degree musical scale is an exceptional phenomenon. It harmonised most of the widely used ratios, rendering them in a relatively perfect form, from every scale degree up and down. A more serious exception is the golden ratio, constituting a slightly (approximately one-third of a semitone) augmented minor sixth. So it does not play the same role in music as it enjoys in spatial arts, although it is not foreign to music. Series of the golden ratio can be discerned in the zone of the psychological present, as already pointed out.

9.3 The sense of the discretisation of space in the modulor

The limitations existing in the modulor seriously hampered its popularisation in practical architectural design and essentially prevented it from being adopted as a universal scale in the standardisation of industrial products, as Le Corbusier dreamed of and for which he fought with limited success. The adoption of the modulor's scale, rather lacking in various ratios, was of a primarily artistic sense. The self-imposition of strict rigours made it possible to reveal the mastery of their application and helped impart a greater stylistic unity to a work. It may also have resulted from a deliberate abandonment of ratios that were perhaps too facile and overused and corresponded to a tendency in new music to avoid consonant chords and traditional rhythmic solutions. Whatever the case may be, the modulor does not possess the qualities of a universal scale, particularly as a research tool. In this respect, it cannot compete with the twelve-degree tempered scale complemented by Ellis's system of cents or with the scale of decimal logarithms. We have also usefully adopted the twelve-degree scale, widely used to analyse musical intervals and pitch scales, for studying temporal phenomena. It will also be usefully applied to the study of spatial phenomena in a zone that is particularly close to people. That will facilitate comparison of the ways in which people organise time and space.

Perhaps nothing describes Le Corbusier's modulor better than the assertion of Albert Einstein, who encapsulated its practical purpose in the words: 'It is a scale of proportions which makes the bad difficult and the good easy'. Le Corbusier offers the following comment on that opinion:



Example 9.3 Spatial studies – elements based on the sizes of the modulor. Repr. from Le Corbusier 1954, 94.

> There are some who think this judgment is unscientific. For my part, I think it is extraordinarily clear-sighted. It is a gesture of friendship made by a great scientist towards us who are not scientists but soldiers on the field of battle. The scientist tells us: 'This weapon shoots straight: in the matter of dimensioning, i.e. of proportions, it makes your task more certain.'[242]

The sense – for Le Corbusier – of the constraint of diversity that resulted from adopting the scale of the modulor is shown by studies of different compositions of the same surface through the use of several repeated elements based on selected sizes of his scale. It turns out that employing these clearly differentiated model sizes gives huge possibilities for combining them in a spatial context and creating new configurations every time (Example 9.3). In generalising the problem of the purpose and sense of the constraints, Le Corbusier stated:

> Good composition requires the use of a very few elements, but each of these should have a distinct personality, and a strong one at that. It takes only twenty-six letters to write tens of thousands of words in fifty languages. The Universe, at our present state of knowledge, is composed of ninety-two elements. All arithmetic is written with ten

242 Ibid., 58.

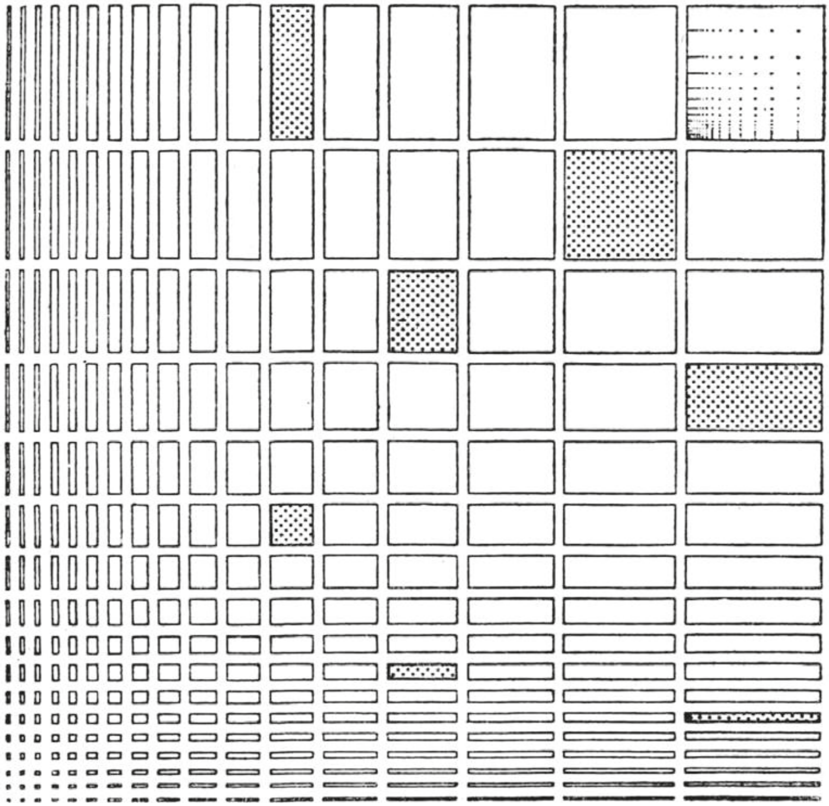
> figures, and music with seven notes. The year has four seasons, twelve months, and days composed of twenty-four hours. It is by means of hours, days, months and years that we draw up the programmes of our work. All this is the fruit of the marriage of the human and cosmic orders. Order is the very key of life.[243]

I have already pointed out that the modulor divides an equivalent of the octave into just three parts, whereas in music there are twelve parts. In light of this, the purpose of the limitation of the number of different dimensions is clear. It was to lend them that separate, strong individuality. Lesser differences could have blurred those distinctions. This is best illustrated by Le Corbusier's drawing, based on the modulor's scale (Example 9.4).

Neighbouring sizes differ sufficiently in visual assessment and could be recognisable even in a different context. Only with such substantial differences can the continuous scale of space, which has not been divided by humans in a natural way into discrete sizes (proportions) after the fashion of the scale of musical pitches, in some way discharge similar functions. This way of using it renders architecture similar to music. Whilst in the musical work one can discern an encoded temporal context, the work of architecture is an encoded spatial context. A space composed of model sizes functions as a system of signs. I would recall here what I mentioned elsewhere in relation to temporal phenomena. Signs have two kinds of interpretants; they are linked to a code through an inner connection and to a context through an external connection. In the case of Le Corbusier's spatial 'studies', the code is formed by the values of the modulor, from which the used sizes were chosen, and that already imparts a meaning to those values; at the same time, however, those elements (spatial signs) come together to make a spatial context that fully reveals their meaning. This way of spatial thinking is manifest in Le Corbusier's theory, and it is also key to understanding the essence of his architectural works.

A fundamental question arises here. Is an understanding of space as a system of signs with distinct relations to a context and a code conditioned solely by the use of discrete and clearly oppositional spatial sizes? Well, not necessarily. I would even hazard the assertion that those two connections are an integral part of human thinking, regardless of whether they concern temporal or spatial phenomena or any other perceived phenomena. For people, spatial size is not just an abstract number; it is a size of a specific zone of a spatial code, and that, together with the context in which it is manifest, determines its human sense. Studying the zones of space that are of significance for people is a task for the

243 Ibid.



Example 9.4 Diagram based on successive sizes of the modulor. Repr. from Le Corbusier 1954, 89.

anthropological sciences; it is also crucial to our understanding of music, which is by no means devoid of spatial aspects. In light of Le Corbusier's modulor, certain features of the code of spatial sizes are clear. Like the code of time, it is of a logarithmic character.

9.4 Neutral human size

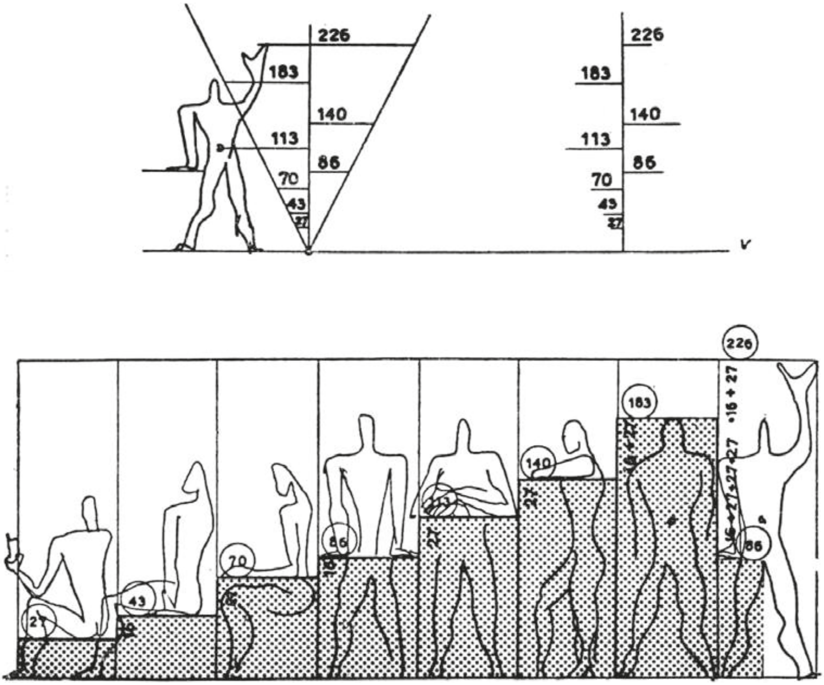
The detailed definition of the zones of space and their character would require a great deal of empirical research and statistical data that goes significantly beyond the scope of this work and might be made the subject of many monographic studies. Hence I will confine myself here to a few comments regarding above all the zone that is closest to people and of greatest significance to us, as well as being crucial to music.

The starting point for analysis of human space must be the person – Le Corbusier's feeling was right and remains unquestionable, although other methods must be elaborated to achieve our goal. It is not about selecting a single measure like the modulor, but about detailed research into how humans exist in space and what trace they leave in it with their activities.

Much food for thought would no doubt be provided by the results of anthropometric and anatomical measurements, if they were presented on a logarithmic scale and if detailed data were projected onto sizes characteristic of the human race in general. The average sizes of people and their body parts most directly impose upon us an assessment of the size of the world around us, and the creation of objects and the organisation of space are obviously linked to human sizes. Consequently, even a person without a formalised measure like a metrical system can find their bearings in the world around them and evaluate sizes cognised in experience.

As with our considerations of the zones of time, the basic questions in relation to space will concern not so much extreme as medium, neutral sizes of particular zones. But does there really exist something like a neutral human size? And if so, how can one arrive at its specification? Without any detailed research, it is difficult to give a precise answer to those questions, but there are some clues to a possible solution. On the human scale, a newborn child is distinctly small, and a grown person is clearly tall; distinctly tall is a man with his arm raised, representing a characteristic size in Le Corbusier's modulor, just as a curled-up infant is decidedly small. So if a grown person and an infant constitute opposite sizes on the human scale, there must exist a neutral human size, neither too big nor too small – that medium size that we are looking for. I think that half the height of a man from Le Corbusier's modulor is roughly that size. The limbs of a grown person, their trunk, are comparable with that medium size, but the head would be clearly on the edge of those sizes, even if it did not belong to a different zone of the human scale.

The zone of direct human sizes is also manifest in objects that serve people and are dependent on their natural scale – furniture, for instance. On that human scale, a wardrobe is eminently large, whilst a chair is clearly low. The height of a table or slightly bigger would approximate to that neutral size. The set of typical sizes of the scale of the modulor shown on Le Corbusier's overview drawings (Example 9.5) give a good idea of the basic zone of the human scale. At the middle of the set are the sizes 86 cm and 113 cm. If we bear in mind, however,



Example 9.5 Sizes of the modulor and direct human space; overview drawing.
Repr. from Le Corbusier 1954, 67.

that we are dealing here with the second version of the modulor, based on a height significantly greater than the height of an average man (183 cm), then the first of these average sizes (86 cm) would tend to be closer to the neutral human size. The basic zone of the human scale is also manifest in the plastic arts. A central position among them is held by easel painting, which uses primarily medium sizes of this basic zone. Large canvases on one hand and miniatures on the other represent the extreme sizes, which in this sense are peripheral.

The neutral size is manifest in direct interhuman contacts, in which the distances may have a very distinctive qualitative colouring. In a normal situation, when meeting one another, people talk while standing a step apart or the distance of an outstretched arm away. Closer proximity may express familiarity, whilst a greater distance may express reserve or, on the contrary, respect or servility. The physical distance may reflect distance in a social sense. This is clear in the formalised behaviour of strictly hierarchically formed groups, as in an army. The history of written or unwritten rules would no doubt confirm the hypothesis that the greater the distance in that hierarchy, the greater the distance, generally speaking, at which reports are given, for example, or orders received. And again, if there exists a space of contacts between people that expresses distance on one hand and familiarity on the other, there must also exist a space which in that sense is neutral for people, falling between those two extreme sizes, oppositionally coloured in qualitative terms. That medium size might be the definition of the human metre (after the fashion of the human second), representing an approximate length, but rather less than an actual metre.

Semiology, as the science of all sign systems, also deals with the space that is significant for people. A special term has even been coined for knowledge of certain kinds of spatial and temporal signs: proxemics, which Pierre Guiraud describes thus:

> Linguistic communication uses not only gestures but also space and time; thus the distance that we place between ourselves and the person we are talking to, and the time we take to consider or reply to his remarks, in themselves constitute signs. These are the signs which are studied under the name of proxemics. The 'language' of proxemics is particularly interesting because, although like all sign systems it is conventionalized, it varies from culture to culture and thus may give rise to numerous misunderstandings.[244]

Guiraud invokes an example drawn from Edward T. Hall's core study in the field, *The Silent Language* (New York 1959), concerning eight significant kinds of distance separating two American interlocutors (Example 9.6).

A mere glance at these eight kinds of significant distances suffices to realise that they are based on a logarithmic scale. On that scale, one can see the relatively symmetrical structure of this whole qualitative human space. The two central zones are defined as neutral distances and fall within the range from 50 cm to 1.5 m. Were we to mark the centre of this zone on a logarithmic scale, it would be very close to that human metre. Lesser distances from those neutral, central regions of the scale are used for confidential information, whilst distances greater from the neutral are for clearly public information.

It goes without saying that the distances between interlocutors are generally determined by acoustics, to which the strength of the human voice is adapted. The voice also has its neutral, soft and loud regions. Incidentally, they also depend on a logarithmic scale, namely, the logarithm of acoustic pressure. Of course, within these general tendencies of the significant space common

244 Guiraud 1975, 88.

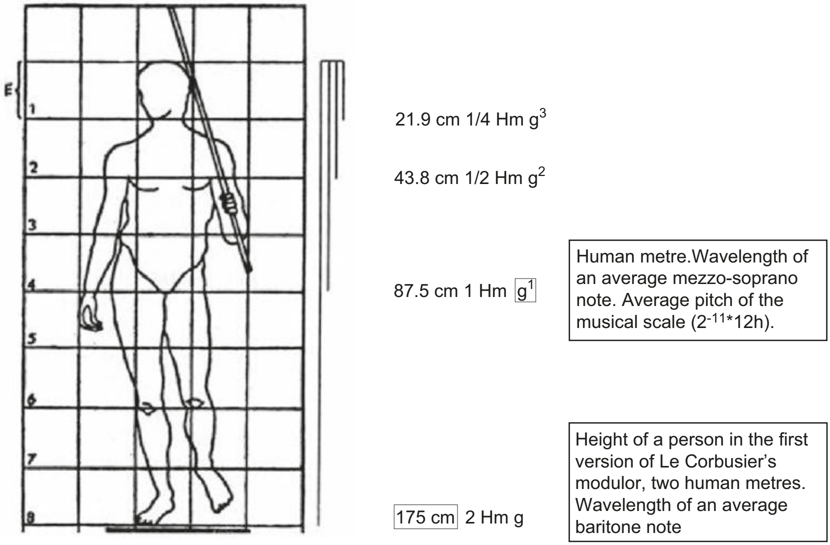
E. T. Hall *The Silent Language*		
1. Very close (5 to 20 cm)	Slight whisper	Very secret
2. Close (20 to 30 cm)	Audible whisper	Confidential
3. Fairly close (30 to 50 cm)	Low voice indoors Full voice outdoors	Confidential
4. Neutral (50 to 90 cm)	Low voice, low intensity	Personal subject
5. Neutral (1.30 to 1.50 m)	Full voice	Impersonal subject
6. Public distance (1.60 to 2.40 m)	Full voice with slight emphasis	Public information intended for people other than person spoken to
7. Across a room (2.40 to 6 m)	Loud voice	Speaking to a group
8. Beyond these limits (from 6 to 30 m)	Loud voice	Greetings at a distance, departures, etc.

Example 9.6 Speech in space. Edward T. Hall, *The Silent Language* (New York 1959)

to the whole of the human race, conventional cultural differences may occur, visible for example when comparing norms of behaviour in North and South America. Anglo-Saxons maintain a greater distance between interlocutors; Latin Americans tend to reduce it. Guiraud quotes Hall on the differences between interlocutors (Example 9.7).

> In Latin America the distance is smaller than in the United States. In fact, people cannot speak comfortably unless they are very close, a closeness which evokes aggressive or erotic intent in the USA. The result is that when they approach we move away, and they think that we are distant, cold, reserved and unfriendly. We, in turn, perpetually accuse them of cornering us, of breathing down our necks, or of spluttering all over us.
>
> Americans who have lived in Latin America for some time use subterfuges: they barricade themselves behind their desks and use furniture to keep the Latin-American at what they consider to be a comfortable distance. The result is often that the Latin-American may go so far as to climb over the various obstacles until he reaches a distance that he finds comfortable.[245]

245 Guiraud 1975, 89.



Example 9.7 Proportions of human height (Polykleitos' canon) and the length of musical soundwaves; overview drawing.Based on a drawing in Rzepińska 1967, 469.

It would be difficult not to see the significance of distances for various forms and kinds of music making. That domain also has its conventions, but they have not yet been subjected to systematic studies. Neutral sizes manifest themselves in playing styles and in the musical situation of performers, as well as in the design of musical instruments. The most surprising thing of all, however, is that music coincides with human space somewhere that we would not have expected it, namely, in the length of the acoustic waves of average musical pitches. Let us recall that Le Corbusier, in the first version of the modulor, adopted as his starting point for calculating series of the golden ratio the height of a man equal to 175 cm. It turns out that at the average speed at which voice waves disperse in air (340 m/s), corresponding to half that size (87.5 cm) is the length of the wave of an average sound, which we previously adopted as the pitch g^1, eight tuzes from the human second (Hs = 0.659 of a second). This results from the following calculation:

$$\frac{340 \cdot 0,659}{2^8} = \frac{224}{256} = 0.875m$$

The result 87.5 cm corresponds largely to the previously determined sizes of average human distance, and that is the size which we will adopt as the model human metre (Hm = 87.5 cm).

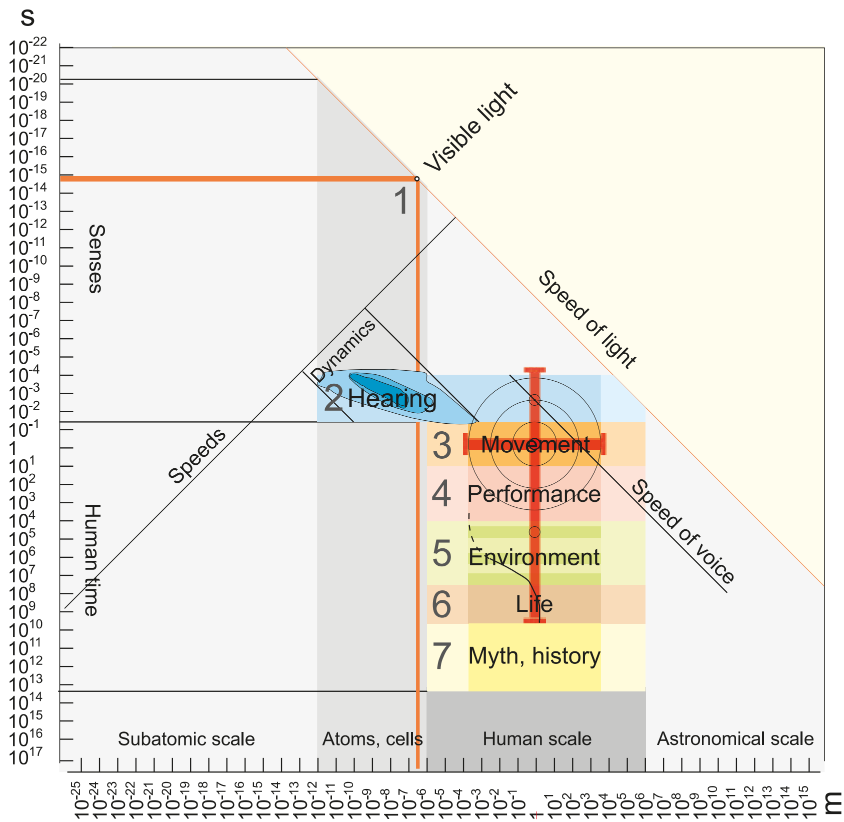
Le Corbusier's modulor, based on the proportions of the human body, does not admit of the series of 1:2 ratios that underpins the octave row; it can be admitted, however, by Polykleitos' canon,[246] shown on the drawing; its starting point is the height of the head. If we adopt the modulor size 175 cm for human height, we obtain lengths of acoustic waves synchronised with human proportions and with note pitches (Example 9.7).

9.5 Humans in the scale of time and space

If we present the whole logarithmic scale of time (A B) and the whole logarithmic scale of spatial sizes (distances) (B C) as two axes of coordinates (Examples 1.9, 9.8), we obtain the square (A B C D) of time and space, in which the diagonal A C is the speed of light and all the lines parallel to it are constant speeds. So the diagonal B D would be the scale of theoretically possible speeds from the smallest to the greatest. Einstein's theory shows, however, that there are no greater speeds than the speed of light, and if that is true then our square falls distinctly into two triangles, only one of which (A B C) is constructed with phenomena from the natural world, the material world. So what is the other triangle (A D C)? We know that speeds are impossible in it, since they end at the speed of light. But can there exist any other phenomena falling within this triangle? The answer is probably also no, although that question should be left to more competent scientists to solve. Thus the world of time and space appears to be enclosed within a characteristic triangle that can be expanded only by accessing phenomena even larger in space and even longer in time or spatially even smaller and temporally even shorter. Incidentally, there is something alarming about this homogeneity and symmetry of time and space shown in the 'triangle of the world' in which space is a mirror image of time and vice versa. Within this triangle, man – his time and his space, the centre of which is marked by the human second and the human metre – has a fixed position, a fixed perspective that accompanies him for as long as he is aware of existing.

Located on the axis of the speed of light are electromagnetic spectra of different kinds: ranges of cosmic radiation, alpha and gamma radiation, ranges of visible light, individual lengths of radio waves, and so on. On one axis of

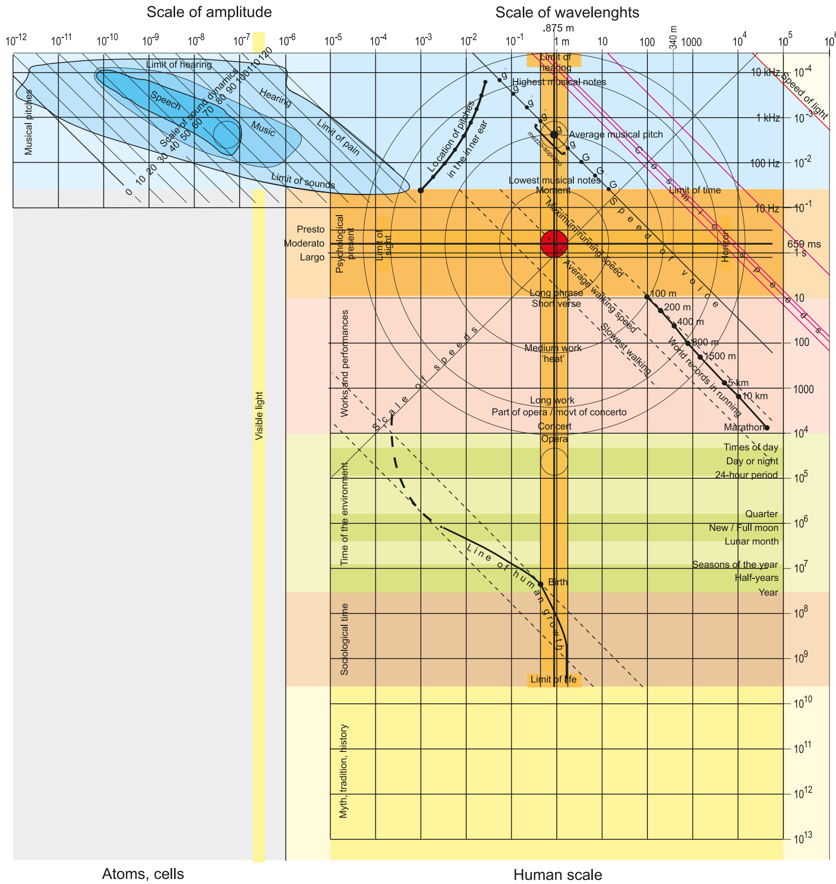
246 Rzepińska 1967.



Example 9.8 Physical coordinates of the scale of time and of spatial distances and the human perspective of time and space. See Example 1.9.

coordinates we can read their temporal value (or frequency); on the other, the length of the waves.

Phenomena linked to the axis of the speed of light are of secondary importance to our subject; we show them mainly in order to form a suitable background to strictly musical phenomena, for which fundamental importance is held by frequencies of air vibration and lengths of acoustic waves, depending on the speed at which voice waves disperse. It averages 340 metres per second and – like every constant speed – forms a straight line on the field of coordinates of logarithmic time and logarithmic space. There we can locate individual



Example 9.9 The human perspective of time and space. Basic zones of human time and human space. Time and spatial distance on a logarithmic scale.

musical notes. The graph shows octaves of the note *G*. Projection onto the axis of time and frequency and the axis of space (length) allows us to read the speed of vibrations and the length of waves.

More detailed analysis of the area of human time and human space is made possible by the drawing (Example 9.9), which represents part of the 'triangle of light'. The axis of logarithmic time is terminated by the limit of hearing on one side and by the limit of human life on the other. Five large basic zones are marked on the axis of time: (l) the zone of hearing, and within it a slightly narrower zone of musical notes, (2) the zone of the psychological present, (3) the zone of works and of the time of music making, (4) the zone of ecological time, with three basic cycles, the diurnal, lunar and annual, (5) the zone of demographic and sociological time and the time of human life. Beyond that axis begins the area of increasingly misty tradition and mythology or of full history not documented by the memory of the oldest people living in a given social group.

No external time imposes an organisation of human time in such an obvious way as the rhythm of day and night. From that size, we have also marked on the graph a series of tuzes (octaves) in the direction of smaller temporal values. An eight-tuz rhythm marks the centres of the large basic zones of time: the zones of works, the psychological present and musical pitches. The centre of those three large zones, indispensable to every musical objectivisation, is the human second, coinciding with the centre of the scale of musical tempo (the metronome), covering just over two tuzes. This area directly delineates the human perspective of time.

Tuz sizes (based on the ratio 1:2) are also traced on the axis of spatial distances, and the starting point was the previously defined human metre, synchronised with the length of the wave of the average musical note g^1, 87.5 cm. This constitutes the central vertical axis on the graph. Eight-tuz areas are also marked from that point in both directions. This gave rise to a uniform grid of time and spatial distances that makes it easier to compare various phenomena. The speed of a voice forms a diagonal of large (eight-tuz) squares and corresponding small (one-tuz) squares of the grid of time and space.

Of fundamental importance for our perception of temporal and spatial phenomena is the point of intersection of the human second and the human metre. We already know the temporal relations in which various characteristic phenomena stand in respect to this point, and especially their central and transitional areas. If these sizes of the logarithmic scale of time are projected onto the logarithmic scale of space by means of concentric circles, we obtain also spatial sizes that at least to some extent are crucial to humans and human perception, although issues relating to human space should be subjected to much more detailed research. The largest circles passing through the points of extreme sizes of audible sounds (20000 and 16000 Hz were taken into consideration) and musical notes (marked is g^5), projected onto the axis of space, occupy the area of the limit of the eye's resolution, and so also of human sight. This zone is no doubt fluid, but in general a size of 1/10 mm is taken as the limit of sight, and sizes of that order are the same distance from the human metre as extreme note pitches are from the human second. In the entry 'Horyzont' [Horizon] in the PWN encyclopaedia, we read: 'a line along which the sky appears to touch the earth's surface; the diameter of this so-called visible horizon increases in proportion to the elevation of the point of observation, and at the height of the eye of an adult human on flat ground it is approximately 5 km'. If we now look for that size on our graph, we will see that it also falls in a borderline area more or less the same distance from the centre of the scale of human time and space as the limit of the eye's resolution is from the same point. The world of immediate human space is enclosed between those two extreme sizes. I would also recall that analogously distant from the human second on the logarithmic scale of time is the end of the area of cohesive musical works, as well as the start of the time of concerts, operas and theatre shows, generally divided by internal breaks.

The middle of the scale of musical pitches, which we took as the note g^1, is equal to eight tuzes away from the human second; also situated the same distance away is the 'optimal' work (around three minutes). Corresponding to those sizes on the scale of spatial sizes are 3.42 mm on one side and 224 m on the other. We still know too little about the scale of space. Without detailed research, it is difficult to state whether these are in some way optimal, medium sizes, as on the scale of time. The first of them seems to be the size of an average typeface, and that size is surely not accidental. I cannot state whether a distance above 200 m stands out in any way (the size 224 m falls beyond the range). In sport, 200 m is the medium distance among the so-called short distances (100, 200 and 400 m).

The region where the perception of the shortest temporal values intersects the perception of the shortest notes is approximately four tuzes away from the human second, as is the area where long phrases pass into self-contained stanzas or verses. A similar spatial area in relation to the human metre is defined by the distances 5.46 cm and 14 m. The world of that space is fundamental to humans. The objects produced by people and the immediate surroundings which they organise fall within these limits, which also encompass nearly all paintings, from miniatures to large canvasses, although the greatest number of paintings fall within the central regions of this area. Just as the two central tuzes contain speeds ranging from largo through moderato to presto, so in space, sizes range from a bust to the height of an adult person. All postnatal development also occurs within those boundaries. Humans adapt the tools of their activities, including musical tools, to the central sizes.

Also requiring detailed study on a logarithmic scale is the problem of actual human tempo, so tempo linked to movement in space. Up to now, we have been interested in tempo in the musical sense, being essentially a frequency, so the converse of time (number of impulses, vibrations, etc. per unit of time). Actual tempo is movement in space, and not in time; it is measured by the distance to a unit of time. The scale of speeds forms diagonal lines on the field of the logarithmic coordinates of time and space, parallel to the speeds of light and voice (Example 9.8). The problem of human tempo clearly goes beyond the scope of our study. Hence I will confine myself to stating that the average tempo of walking, so that basic movement linked to the displacement of our body in space, also passes through the intersection of the human metre and the human second. Purely for the sake of comparison, marked on the graph is the line of Olympic records in short (100 m, 200 m, 400 m), middle (800 m, 1500 m) and long distances (5000 m, 10000 m) and the marathon (42.195 m). Very small tempos are represented on the graph by the line of human life, manifesting human growth from a single cell measuring 0.25 mm to adulthood and to death. We know that human growth is movement, but it is too far from the central regions of human time, space and tempo to be directly observed as movement. Just as humans have a fixed perspective of time and space, so they also have a perspective of the tempo of movement in space. The centres of all these perspectives converge at a single point. Is that convergence actually ideal? No doubt it will be quite some time yet before we obtain a definitive answer to that question, and many experimental studies would have to be carried out. Even if future detailed calculations based on methodically conducted studies were to show that these various central sizes do not coincide exactly, they would no doubt confirm that their dispersion is minimal.

9.6 Time and space and the difficulties with classifying the arts

'Space and time are the framework in which all reality is concerned. We cannot conceive any real thing except under the conditions of space and time. Nothing in the world, according to Heraclitus, can exceed its measures – and these measures are spatial and temporal limitations'. That is how Ernst Cassirer opens the chapter on human time and space in his *Essay On Man*.[247] Those assertions also apply fully to human artistic activity. Hence the division into temporal arts (music and literature), spatial arts (painting, sculpture) and temporal-spatial arts (theatre, ballet), apparently so obvious and universally employed, on deeper consideration reveals a great variety of difficulties, since it is too easy to show that there are not and could never be any forms of art free from categories of time or of space. Attempts at overcoming those difficulties sometimes lead to utterly unexpected solutions. Tadeusz Kowzan attempted to circumvent the problems by referring to a modern apparatus of information theory, specifically, the notion

247 Cassirer 1944, 62.

of communication.[248] That was not a fortuitous route, since communication, the transmission of information, is also strictly linked to time and space, and it can only occur in time and space. In this respect, the definitions given by Kowzan leave us in no doubt. According to George A. Miller, communication occurs when a source of information transmits signals via a channel to a receiver at a destination.[249] Also unequivocal is the definition in the PWM encyclopaedia: 'In sociology, communication is understood as the process of transmitting content in the symbolic form of signs addressed to someone with the ability to receive them'.[250] Even such a general definition as that given by a French dictionary, 'all dynamic relations occurring in functioning',[251] is impossible to understand outside time and space. Finally, the definition most important to Kowzan's argumentation was put forward by the linguist Algirdas J. Greimas: 'Semantic structures […] reveal themselves, that is, they present themselves to us during the process of perception – in communication, in the event-communication, a signified [*signifié*] element finds a signifying [*signifiant*] element'.[252] Here is Kowzan's commentary to this definition: 'It should be emphasised here that, without eliminating the notion of perception (which he calls a process), Greimas clearly separates it from the notion of communication (which he calls an act or an event)'.[253] Even if we accept that distinction between perception and communication, it clearly ensues from Greimas's definition that communication is conditioned by the process of perception, and no process is possible outside of time. Even the act and the event are strictly related to time. In this situation, Kowzan's conclusion is unacceptable:

> Whilst in the case of the temporal arts the communication of their products *assumes* [my emphasis] a certain duration (e.g. a musical work as a sequence of notes over time), a flexible notion of communication allows one to disregard the factor of time in the case of the spatial arts. When we say that a picture or a status is communicated to a receiver, that is, transmitted to him or her, so given for perception, that does not imply duration.[254]

On the contrary, it does imply duration. So the definitions leave us in no doubt that communication is the result of a process occurring over time, and every observation also implies time. Even if we were to accept communication as the

248 Kowzan 1970, 3–12.
249 Miller 1954, 701.
250 *Wielka encyklopedia powszechna PWN*, vol. 7, 1966, 98.
251 *Petit Robert* 1967.
252 Greimas 1966, 30.
253 Kowzan 1970, 10.
254 Ibid.

effect of some process abstracted from time, we would have to refer this to an effect that is the result of both musical and pictorial transmission. Thus Kowzan's device does not eliminate the difficulties. Essentially, the author took a complicated route back to his point of departure. By means of the notion of communication, he *assumed* (literally) what others assumed without that notion, namely, that temporal arts are given to the receiver to observe in time, and spatial arts to be observed in space. Kowzan's ultimate distinction between arts 'whose products are communicated in space' and arts 'whose products are communicated in time' is only a rather infelicitous wording of that assumption which was to have been subjected to criticism. No escape from time will solve the problem of time. The sole path can lead only through precise analysis of how the categories of time and space are manifest in various forms of art, since no art is free from them. The question thus arises as to where the above-mentioned difficulties come from. Well, they are born first and foremost of the limitations of existing theories of time and space, essentially reduced to just a single basic aspect, linked to time and space as a continuum. The zonal theory, as a theory of the temporal and spatial code, removes the basic difficulties in classifying the arts, since it shares with previously elaborated theories of the temporal and spatial context a language capable of describing temporal and spatial aspects manifest in various art forms much more precisely. Different kinds of art differ not in terms of a lack of time or space, but in the way in which various zones of those basic categories of all existence are involved. The zonal theory enhances our language, removes ambiguity in the use of such terms as time and space, and removes the basis for many of the misunderstandings that have hitherto arisen.

9.7 Spatial aspects in music

Today, the existence of spatial aspects in music is not generally questioned. The trends in new music in particular seek to engage the spatial element more strongly, expressed through various means. Yet music has never been free of space. Some basic issues in this area remain to be studied, and in this the human scale of space can be of considerable service.

Music is linked to space already by the spatial character of musical instruments. Organological research has secured for itself a permanent place among musicological disciplines, and spatial measurements play a crucial role in that research. Unfortunately, to my knowledge, those measurements have not gone beyond the arithmetic scale, and, in comparisons, differences of size have even rarely been expressed in percentages. Yet there are no grounds to assume that the laws of human perception do not refer to the size of musical instruments and especially that the logarithmic scale is alien to them. Its effects are entirely obvious wherever the pitch of a note depends on the length of an instrument. Besides this, knowledge of the principles behind the production of traditional musical instruments convinces us how often dimensions are gauged by eye; hence the differences in their size. In folk practice, the standardisation of dimensions is rarely strictly observed. A sufficient number of measurements characteristic of the sizes of instruments and their details display a regular distribution on a logarithmic, not an arithmetic, scale. The breadth of the zone on a logarithmic scale may serve as a measure of the integration of a group of instruments. An inverse proportion occurs here: the narrower the zone, the greater the similarity between instruments.

Musical instruments transform human movement into musical sounds. Consequently, they must satisfy two basic conditions: they must be suited both to the acoustic demands (the physics of sound production) and also to people, to their space and motoric capacities. Both human space and human movement display regularities on a logarithmic scale.

An instrument as a whole forms a specific context of spatial elements, each of which has its corresponding dimensions expressed in metres, centimetres and millimetres, and that manifests their meaning, although without exhausting it. That external link of the spatial context of elements is complemented by an internal link, connecting sizes of elements to the scale of the spatial code, to specific zones on a logarithmic scale, which is obviously also not without significance. Numerous problems arise here, requiring more detailed study.

Human space is directed. That is undoubtedly linked to directional human vision and to progressive action in space. And that fact is not without significance for music. A person sings and plays in a specific direction, organises the space of music progressively. This direction of musical space is partly acoustically justified, since in singing and playing on some instruments the sound does not carry evenly in all directions. Of no lesser significance, however, is the psychological sense of space and its conscious filling with music.

One of the important functions of music is to maintain a connection between the performers and the audience at a musical event. That goal is achieved mainly through participation in the acoustically and psychologically shaped musical space. The spatial regularities of the musical event require closer study, for which the logarithmic scale of human space could prove very useful in determining general tendencies and cultural differences, as well as changes in that area caused by the differentiation of the function of music. In authentic folklore, for example, we often encounter singing by all the participants. In such a situation, a circular arrangement is desirable, in which everyone faces the middle. When folklore loses that primary function, however, when it is performed for listeners on a stage, for example, the original concentric circle opens up to encompass the musical space of the passive participants in the musical event.

Instrumental folk music is clearly directed towards the audience, and especially towards the dancers, who in turn form the space of the dance within the musical space.

Limiting the space with the walls of a room or a concert hall is not a condition for creating a psychologically closed musical space. That is possible even on a steppe, and it need not equate to the distance of hearing. The spatial situation of music is formed by the people who take an active or passive part in it, defining the framework of that space. The musical space as thus conceived is directly linked to the question of space in so-called temporal-spatial arts, in which the human scale manifests itself in various ways. The varied significance that can be held, for example, by the actual space between people can be easily shown from analysis of films. Even without such detailed analysis, we are aware that the shaping of space is an important factor in the expression of a cinematographic work; it is an artistic sign used to convey relevant content.

Detailed study is required of scenic space, especially the actual space of the stage, since in the theatre, as in painting, we come across illusory space, expressed through various scenographic devices. The size of a stage, the way it is filled with actors and props, the specific distances between living or still 'signs of the theatre space', and their changes in action help to shape the content of a production, colouring it in qualitative terms. We are dealing here not just with functional and phenomenological analysis of space in the theatre, but also with studying it using more empirical methods, through the use of measurements and statistical presentations, with defining certain zones of the spatial code that has a crucial effect on the significance of a specific, contextual stage space in the course of the action.

10 Levels of time and levels of existence

10.1 Levels of knowledge

As already mentioned, Julius T. Fraser distinguishes five levels of temporality, based on five levels of nature:

(1) the level of particles with zero rest mass (photons) – this is dealt with by the special theory of relativity, (2) the level of particles with non-zero rest mass, being the object of quantum mechanics, (3) the level of aggregates of matter, constituting the domain of the general theory of relativity, (4) the level of organisms, which is addressed by biology and physiology, (5) the level of the senses, which is the object of learning about the mind, knowledge, culture and society. Each of those levels of nature forms its own environment (Umwelt), sustaining a separate temporality (Example 10.1).

Corresponding to the five levels of nature are five temporal levels: (1) atemporality, which contains only simultaneity, (2) prototemporality, which contains also order (partial or complete), (3) eotemporality, where duration (size) comes in, (4) biotemporality, which adds to the foregoing also 'now' and timing, (5) nootemporality, which contains also (personal) history (beginnings and endings; Example 10.2).

The temporal levels form a specific hierarchy (nested hierarchy), in which each higher level, besides its own specific temporal properties, contains all the temporal properties of the lower levels. On the nootemporal level, for example, the biotemporal, eotemporal, prototemporal and atemporal levels may appear. And vice versa, lower levels, such as the atemporal, prototemporal and eotemporal levels, although referring to relevant integrational levels of still life, can also be encountered among the organic functions of life, in the perceptual functions of fauna and people and in conscious experiencing, so on the bio- and nootemporal levels. Of course, this has important consequences for music. It exists in the human sense only on the nootemporal level, but properties characteristic of lower temporal levels, up to and including atemporality, can also be distinguished in music.

Fraser essentially demonstrates the material status of time. The temporalities that he shows emerge in various manifestations from the temporal properties of matter itself. Michon, meanwhile, endeavours to show that Fraser's temporal levels may be treated as cognitive representations of a basic set of subjective interpretations of the real world. Such cognitive representations are familiar in cognitive psychology as worldviews or cognitive metaphors.

Temporal levels	Temporal properties	Integrational levels of nature
Atemporality	Simultaneity	Particles with zero rest mass (photons)
Prototemporality	Order (partial or complete)	Particles with non-zero rest mass
Eotemporality	Duration (size)	Aggregates of matter
Biotemporality	Now, the passing of time	Organisms
Nootemporality	(Personal) history, beginnings, endings	Minds

Example 10.1 Links between Fraser's temporal levels and stable integrated levels of nature.

Levels of temporality	Simultaneity	Order	Duration Interval	Now	Awareness of time
Atemporality	**X**				
Prototemporality	x	**X**			
Eotemporality	x	x	**X**		
Biotemporality	x	x	x	**X**	
Nootemporality	x	x	x	x	**X**

X – *Properties specific to a given level;* x – *Available properties*

Example 10.2 Fraser's temporal levels, as interpreted by Michon. Michon 1983, 7.

Michon invokes in this context the six basic metaphors of Stephen C. Pepper,[255] namely, animism, mysticism, formism, mechanicism, contextualism and organicism, as well as Marc De Mey's later proposed taxonomy of the 'natural' development of scientific theories,[256] distinguishing monadism, structuralism, contextualism and cognitivism (Example 10.3). Michon links atemporality to both animism and mysticism, prototemporality to formism and monadism, eotemporality to mechanicism and structuralism, biotemporality to contextualism, and nootemporality to organicism and cognitivism.

Michon emphasises that the quantitative relations proper to every metaphor are defined through relevant measurement scales, and if metaphors are expressed

255 Pepper 1942.

256 De Mey 1982.

Principal metaphors (Pepper)	**Models of the world (De Mey)**	**Principal domains of discourse**	**Representative system**
Animism	–	Individual spirits	Magic wand
Mysticism	–	Absolute spirit	
Formism	Monadism	Facts	Library
Mechanicism	Structuralism	Relations	Clock
Contextualism		Functions	Thermostat
Organicism	Cognitivism	Self-organising systems	

Example 10.3 Pepper's principal metaphors and De Mey's models of the world. Michon 1983, 13.

Scale of measurement	**Individual identity**	**Order**	**Intervals**	**Natural zero**	**Natural unit**
Nominal	**X**				
Ordinal	x	**X**			
Intervallic	x	x	**X**		
Quantitative	x	x	x	**X**	
Absolute	x	x	x	x	**X**

X – *Properties specific to a given level;* x – *Available properties*

Example 10.4 Types of measurement scales.

in their temporal context, they manifest Fraser's temporal metaphors. That is because corresponding to his five levels of temporality are the five canonic scales, the formal properties of which correspond to the properties of the levels distinguished in Fraser's natural philosophy of time:

(1) A nominal scale corresponds to atemporality, (2) an ordinal scale to prototemporality, (3) an interval scale to eotemporality, (4) a quantitative scale with a specific point zero to biotemporality and finally (5) an absolute scale with a defined unit to nootemporality (Example 10.4).

Michon's interpretations alter the sense of Fraser's temporality in a crucial way and introduce elements that are very important for musical knowledge in general and for knowledge about musical time in particular. They also prompt one to go a step further.

In the next chapter, we will return to the issues outlined here in a more detailed survey of Fraser's temporalities and their consequences for our knowledge about music and art from the cultural perspective, taking analyses of a musical form, a musical instrument and a work of art as examples.

Within the context of the above-mentioned distinctions, the following systemisation of the levels of musical knowledge seems justified: (1) The metaphoric, metaphysical level of knowledge about music is based on beliefs, convictions and non-rational foundations. It is characteristic of the musical knowledge of primitive cultures, but also survives in higher cultures and manifests itself in the way in which contemporary composers, theorists and critics think; (2) the formist, monadist level of musicology is based on facts, classification schemes, rational orders and systematic observations; (3) the study of the mechanicist, structuralist level of musicology is based on the mutual relations and interactions of elements as components of a mechanical system; (4) the contextual level of musicology takes account of the functioning of systems in their environment; (5) the cognitivist level of musicology studies the processes of musical thinking and the cognitive schemas of knowledge about music and takes account of the influence exerted collectively by scholars on the shape of musical knowledge.

The temporal levels that emerged over the evolution of the universe and became embedded in the structure of the human mind enable us to distinguish the basic levels of knowledge in its various manifestations. Let us take the example of rhythm. One can distinguish five levels of rhythm depending on temporal levels.

1. The nominal level (atemporality), among the properties of time, contains only simultaneity, and takes no account, above all, of the order of the succession of time that makes all structuring of rhythm possible. On this level, rhythm can be named, isolated from everything that is not rhythm and expressed in some overall category, including metaphorically, but also vice versa, it can be considered from the point of view of rhythmic elements not divisible in time that are isolated from a rhythmic context. Just such a fundamental element of musical rhythm is rhythmic impulse. A rhythmic impulse in a linguistic flow is every new vowel (consonances do not form separate rhythmic impulses). A rhythmic impulse is a strike of a drum, a pluck of a string, every sudden change in the pitch of a sound flow. Impulses can also differ in terms of quality and form distinct oppositions. That occurs in languages and versification systems, in which rhythmic impulses (syllables) can be: (a) long and short, as in classical Greek and Latin and in the feet of ancient poetry (which should not be confused with the rhythmic intervals of music); (b) high and low, as in intonational Eastern languages, Sanskrit, Chinese and versification systems

based on them. Feet and lines are then characterised by an arrangement of vowels on different pitches. There can be two different pitches, and there can be three or even four such pitches, depending, of course, on a given language's phonemic system; (c) stressed and unstressed, as in most modern European languages, including Polish. Matters are complicated by the fact that accents can be not only dynamic, but also intonational and mixed. Accents can also combine with linguistic quantity, as occurs in ancient Greek and Latin.

2. The ordinal level of rhythm (prototemporality) contains, besides simultaneity, also the order of time that makes possible a sequence of rhythmic impulses, which may be qualitatively differentiated. On this level, certain rhythmic structures are possible, dependent on the quality of the rhythmic impulses and their disposition in the sequence. The rhythms of natural languages (including quantitative and intonational languages) are of such a character, and versification forms (syllabic, syllabotonic, tonic, quantitative, intonational) are also of such a rhythmic character. In addition, ordinal rhythms can form deep rhythmic structures (or rhythmic pre-structures), which on the next level can receive various surface rhythmic forms, dependent on the kind and arrangement of the rhythmic values.
3. The intervallic level (eotemporality) contains, besides simultaneity and temporal order, the differentiation of time intervals between rhythmic impulses (and units of a higher order). This is the surface level of rhythm, the level of musical rhythm in the narrow sense. It falls into three characteristic elements or ranges: (a) Musical rhythm in the narrow sense, defined by a sequence of relatively defined rhythmic values, with the omission of absolute duration values; (b) Metre in the musical sense, based on the repetition of metrical units (when speaking of rhythm as an element of musical language, one usually has in mind rhythm and metre as thus conceived); (c) Tempo dependent on absolute time values and interpretations of rhythm in performance. This is the last structural level and range of rhythm. Only on this level is time fully a dimension.

A feature of all the levels thus far has been the treatment of rhythm as an object independent of man. The remaining two levels alter the perspective entirely.

4. The psychological level (biotemporality) is linked to people as living organisms. It contains all the properties of the preceding temporal levels, and it is distinguished by the existence of a human, psychological present – that constant now which enables us to sense the passing of time; now as a fixed point of reference and orientation in time. It is only when seen from this

perspective that rhythm is expressive of human activity, can be performed and can trigger specific emotions.

5. The level of the awareness of time (nootemporality), of personal history and of history in general is linked to the existence of the human mind and its functioning in the environment of the minds of other people. It is only on this level that the meanings of rhythm for people are fully revealed – its cultural meanings, also conditioned, of course, by all the temporal properties of the lower temporal levels.

Mieczysław Tomaszewski has distinguished four kinds of musical text:[257] (a) the musical text of an intentional character, as an equivalent of a creative concept, (b) the sound text of a real character, as an equivalent of the act of performance, (c) the auditory, sensory text, as an equivalent of the act of individual perception, (d) the cultural text, as an equivalent of the act of a work's reception in a given culture. These four kinds of musical text are grounded on four temporal levels (from prototemporality to nootemporality). There is no equivalent here of atemporality, but one should note that a text as such must first be identified, and that identification occurs on the nominal, atemporal level, where it is treated as a whole and can be named. Only then do the conditions arise for a text to reveal its internal order (musical text) or its grounding in the sound material of a performance (sound text), be perceived by the receiver (auditory text) or function in culture (cultural text). Besides this, the musical code manifest in musical messages (texts) is also atemporal.

On the basis of what we have said thus far, we may generalise things and present five levels of existence dependent on the way in which the category of time appears within them: (1) potential existence, (2) intentional existence, (3) material existence, (4) organic existence, (5) spiritual, existential existence. Of course, each one illuminates existence in a different way, including musical existence.

Since the levels of temporality can be treated formally, like measurement scales, there is nothing preventing us from distinguishing levels of spatiality, and by the same stroke temporal-spatial levels. (1) On the nominal level, time-space can be identified, can manifest itself as potential, as an internally unorganised whole, as chaos, as the eternity of existence without beginning and end and without spatial limits, but also as a time-space point. (2) On the ordinal level, time-space is an order manifest for example in the intentionally conceived time-space of a theatre show. (3) The next level is conceived in strictly material terms; it is formed by a four-dimensional time-space. A specific feature of this level is

257 Tomaszewski 1982, 192.

that it has no natural zero point. That point can be freely chosen and can be used to measure intervals of time and space. The situation alters fundamentally on the next level. (4) On the organic level, time-space is clearly centralised; it has that fixed point of reference in the form of a living organism here and now, constituting that window on the world which opens up a spatial and temporal perspective of a living organism contrasted with the environment in which it lives and acts. Organic time-space, unlike physical space, is of a clearly qualitative character. The *Distanzfeld* and the *Nahfeld*, drawn from ethology, have – as indeed they must have – their musical sense, as is addressed, for example, in the works of Doris Stockmann.[258] (5) Finally, the last time-space, enhanced with awareness of personal, social and cultural history, is specifically human, qualitatively conditioned by a distinctive human mind. Historical time is not, of course, isolated from living, social, cultural and geographical space.

The noetic level of time-space is also grounded in lower levels of time-space, which the human mind reaches through the reduction of temporal-spatial properties. Each level reveals a different system of possibilities and defines the sense of music in a different way.

In the history of musicology, many methods of music analysis have been developed. Their distinctness may have been grounded in a variety of sources, but those sources have often been informed by different ways of understanding time. Traditionally, for example, style analysis has been contrasted with work analysis. Works are characterised by the fact that they have an internal order of time, which appears on the prototemporal level and is available on all higher temporal levels. Style analysis disturbs that order, breaking down a work into stylistic properties, into a set of stylistic possibilities used to shape the work. In this sense, it belongs to the nominal, atemporal level. That also applies to all categorical analysis.

Most frequent, perhaps, is a division into autonomous and heteronomous methods of analysis. Autonomous methods are those which employ properties of the first three temporal levels: simultaneity, order of time and temporal dimension. Heteronomous methods, meanwhile, confront music with the biotemporality of a living person, with his or her psyche, with nootemporal awareness of time, with life experience and culture.

Among autonomous analyses, the central area is occupied by formal, structural and distributive analyses. These treat the work intentionally; they do

258 Stockmann 1982.

not identify it with the physicality of the sound. They reveal internal orders, prototemporal orders, and analysis is then usually based on notation.

In our times, physicalist methods of analysing the sounds of music are becoming popular. These treat music as a dimension, which is characteristic of eotemporality. Under the sway of new music, sensitive to sonoristic properties, methods intentionally departing from formal schematicism and focussing on the concreteness of sound have developed, as is characteristic, for example, of the sonorism of Józef M. Chomiński.[259]

Heteronomous analyses are quite markedly differentiated. They are divided into (a) energetic, processual analyses, so biotemporal analyses, and (b) hermeneutic, nootemporal analyses and interpretations. Let us take as an example the methods of analysis considered by Zofia Helman.[260] She cites Jean Molino,[261] according to whom a musical 'fact' has a threefold existence: it exists as *objet produit*, *objet isolé* and *objet perçu*. The second of these is clearly intentional and can be read from the score itself. In this instance, analysis concerns the prototemporal order of the musical message, and Molino calls such analysis neutral. The *objet produit* presupposes, of course, the existence of a creator with his or her individual awareness and culturally shaped personality. *Poiésique* analysis is designed to reveal that creative process which brought about the existence of the musical message. This is based, of course, on nootemporality. The existence of the musical fact as an *objet perçu* is linked to the *esthésique* method of analysis, on the levels of perception and reception, corresponding to biotemporality and nootemporality. So of the five basic distinguished forms of existence dependent on temporal levels, Molino reveals only three. He overlooks atemporal and eotemporal existence. Molino is aware that his levels are not entirely isolated, which should also be stressed in relation to temporal levels.

A distributive method runs 'from message to code'. In this method, the musical work is divided into its smallest syntactic units. Then the relations which they form among themselves are established and their hierarchy defined. So the prototemporal order of the message is revealed, as are the exploited possibilities of the musical code. One then ascertains the rules of transformation that cause the passage from one form to others in the biotemporal process. Of course, the system of rules also refers to the atemporal code.

259 Chomiński 1956, 1968.
260 Helman 1985, 81–88.
261 Molino 1975.

The generative method is regarded as the reverse of the distributive method, which heads 'from code to message'. It is based on hypothetical-deductive theory, assuming the possibility of providing a specific set of basic units and syntactic rules. Of crucial importance here is cognition of the code and its rules. One defines the potential possibilities, so that which is characteristic of atemporality. Both methods highlight aspects of the message and the code.

Methods of categorical analysis, in which works are broken down into categories, can also be numbered among the 'from message to code' methods. The same may be said about the mathematical methods of Wilhelm Fuchs and R. C. Zaripov.[262] Their results shatter the prototemporal order of a work as a whole (they often refer solely to isolated passages of a work). Interpretation of the results, meanwhile, takes place on the level of historical time, which of course belongs to nootemporality.

Interpretation contrasted with analysis aims to reintegrate that which analysis breaks down; it seeks to address the work as a whole and characterise it integrally in aesthetic and expressive categories. That is how it is described by Janusz Sławiński, who is cited by Helman.[263] It goes without saying that the totality of the work and its qualities are manifest on the atemporal level, but at the same time they presuppose the existence of humans with their system of values shaped in individual and collective life, and in this sense they also refer to nootemporality.

Clearly nootemporal is the functional method developed by the Prague School,[264] in which artistic and social systems are taken account of and musical structures are considered together with their social and historical functions.

The basic notions of communication theory are linked to differentiated temporal levels. (1) The code is clearly atemporal, exiting in simultaneity; it is a system of possibilities exploited in a message. The code exists potentially, so to speak; it is only manifest on the level of the message. (2) The message requires a higher temporal level, in which simultaneity is enhanced with temporal order, order that is intentional and conveys an intention, (3) The notion of the channel and the source of information presupposes the existence of time as materially conceived, enhanced with the concreteness of physical time intervals. Thanks to this anchoring in physical time, the intention of the message can be transmitted. (4) The emitter and the receiver are first and foremost living organisms, attuned to their own present, which represents that temporal window on the

262 Cf. Michalski 1975.

263 Helman 1985, after Sławiński 1974, 1976.

264 Sychra 1973.

world, making it possible both to emit and to receive messages transmitted via a physical channel. On the organic level, the past and the future separated by the present acquire meaning; the time flow of the emitted message has meaning, and its specific processuality is manifest.

Of course, the chain of emitter – message – receiver (which assumes also the existence of a channel and a code) is also possible only here. (5) The emitter and the receiver are not only living organisms communicating with one another and revealing, for example, their emotions. The participants in communication are living people conscious of their existence, possessing their own history and the history of the social group in which they live, where messages acquire a cultural sense. This all occurs on the nootemporal level, on the level of reflected time, historical time, the time, for instance, of the reception of messages in the form of musical works functioning in culture. Contemporary musical knowledge often finds support in notions of communication theory and with their help shows music in various lights and reveals various meanings and ways of existing.

As I have already emphasised elsewhere, the linguistic functions distinguished by Roman Jakobson are at the same time functions of music;[265] their hierarchy, meanwhile, is the reverse. That which is of primary importance in language is secondary in music and vice versa. Primary in language, of course, is the referential, communicative function. That is expressed in the referral of the message to a designated object. In music, this is a secondary function, which does not preclude the fact that music theorists, especially those inspired by semiotics, have gone to great lengths to highlight the role of the referential function in music as well. The most contrasting function in relation to the referential function is the phatic function, which involves maintaining the process of communication. This is expressed in the message's relationship to the channel; it takes care of its duration and continuity. In language, this is mentioned at the end of the distinguished functions, whilst in music is it perhaps the most elementary function. It is symbolised by the continuity to the duration of a drone and the measured rhythm of Indian drums. Ensuring the duration of a sounding message is the first requirement of all music. Most debatable here is the issue of the metalinguistic function, often regarded as an exclusively linguistic function.

One can perhaps discern the semblance of a metalinguistic function, for example, in the free melodic formulas that begin and end dance works performed on the bagpipes. Those formulas also show the possibilities of the musical code

265 Jakobson 1960; Bielawski 1985; idem 1999, 104.

1	Atemporal level	Prototemporal level	Eotemporal level	Biotemporal level	Nootemporal level	1
2	Simultaneity	Simultaneity Order of time	Simultaneity Order of time Dimension of time	Simultaneity Order of time Dimension of Time Now	Simultaneity Order of time Dimension of time Now Awareness of time	2
3	Special theory of relativity	Quantum mechanics	General theory of relativity	Biology, physiology	Humanities, sociology	3
4	Particles with zero rest mass	Particles with non-zero rest mass	Aggregates of matter	Organisms	Minds	4
5	Nominal scale	Ordinal scale	Intervallic scale	Quantitative scale	Absolute scale	5
6	Individual identity	Individual identity Order	Individual identity Order Intervals	Individual identity Order Intervals Natural zero	Individual identity Order Intervals Natural zero Natural unit	6
7	Musical code	Musical message	Channel	Emitter, receiver	Meaning of the message	7
8	Identified text	Conceived text	Sounding text	Perceived text	Text of reception	8
9	Potential existence	Intentional existence	Material existence	Organic existence	Spiritual, existential existence	9
10	Nominal, potential time-space	Ordinal, intentional time-space	Four-dimensional time-space	Organically centralised time-space	Personal, social time-space	10
11	Categorical analysis	Formal analysis	Physicalist, sonorist analysis	Processual, energetic analysis	Hermeneutic analysis, interpretation	11
12	Metaphysical musical knowledge	Formist, monadist musicology	Mechanistic, structuralist musicology	Contextualist, functionalist musicology	Cognitive musicology	12

Example 10.5 Levels of time and their analogies in various manifestations. Collective list.

<table>
<tr><td colspan="7"></td></tr>
<tr><td rowspan="5">EXISTENTIAL MEANINGS</td><td>Metalinguistic, metamusical function?</td><td>Aesthetic, poetic function</td><td>Phatic function</td><td>Emotive, appellative function</td><td>Pragmatic, evaluative function</td><td>13</td></tr>
<tr><td>▲</td><td>▲</td><td>▲</td><td>▲</td><td>▲</td><td></td></tr>
<tr><td>CODE</td><td>MESSAGE</td><td>CHANNEL</td><td>EMITTER
RECEIVER</td><td>INDIVIDUAL
COMMUNITY</td><td>14</td></tr>
<tr><td>▲</td><td>▲</td><td>▲</td><td>▲</td><td>▲</td><td></td></tr>
<tr><td colspan="5">MESSAGE</td><td rowspan="5">CONVENTIONAL MEANINGS</td></tr>
<tr><td></td><td colspan="5">▼</td></tr>
<tr><td>16</td><td colspan="5">DESIGNATED OBJECT</td></tr>
<tr><td></td><td colspan="5">▼</td></tr>
<tr><td>17</td><td colspan="5">Referential, communicative function</td></tr>
</table>

Example 10.5 Continued

in the form of progressions of a musical scale from the lowest notes to the highest and back down. In avant-garde music, composers pursuing technical innovation sometimes appear to demonstrate the possibilities of the musical code more than shaping the form of the musical work. A substantial role is played in music by the emotive function (the relationship between the message and the emitter), the appellative function (the relationship of the message to the receiver) and the pragmatic function (the relationship of the message to a person conscious of their existence). Usually highlighted is the significance of the aesthetic function in music (expressed in the relationship of the message to itself). One might say that music is aesthetic by nature, just as language is by nature referential, and aesthetic only at times.

I would like to emphasise here another opposition, perhaps the most important, namely, the contrasting of the referential, communicative function and all the other functions conditioned by the various temporal levels, as is shown at the end of Example 10.5. If the referential function is secured by an established convention, then all the other functions result from music itself, as it were, from the ways in which it exists, dependent on temporal levels. Each of those levels determines a different system of possibilities, and the simplest definition of existential meaning (as distinct from conventional meaning) is specificity within a system of possibilities.

0	I	II	III
Anthropology of art	Art	Work, manifestation of art	**1. Totality,** atemporality, simultaneity, nominal level, identity of the work, properties, values
			2. Order of time and space, composition, intentional level
			3. Materiality, dimensions of time and space, existential foundation
		Participation in the manifestation of art	**4. Action,** centralisation of time and space, here and now, milliseconds, seconds, short-term memory
	(Cultural) anthropology		**5. Event,** time and space of activity, participation, artistic event, minutes, hours
		Human culture	**6. Environment,** times of day, month, year, time and space of work, rest, celebration
			7. Life – individual, social life, changes, experienced history, personal identity, space of life
			8. Cosmos, time and space beyond direct experience, myth, tradition, faith, history, learning, worldview, world of values

Example 10.6 Structure of art anthropology: model I distinguishes only two levels: art and (cultural) anthropology; model II distinguishes three levels; model III distinguishes eight basic levels.

10.2 Anthropology of art

What is anthropology of art? What most distinguishes it: the object of study or the method? What are the relations between art anthropology and art history, art theory, philosophy and aesthetics? What is art anthropology for art history, and what is art history for art anthropology? Does art anthropology draw strength from an anchoring in European thought or, on the contrary, bring mainly new ideas to it? Is art anthropology a temple of lofty new knowledge or, on the contrary, a convenient arena of combat for dilettantes? The questions may be multiplied, and various answers sought. I will express my own answers in the form of a schema with a brief commentary, which will also serve as a synthesis of the whole chapter, illustrating, through various examples, the basic levels of existence, defined through various ways of understanding the categories of time and space (Example 10.6).

Art anthropology may be understood in various ways. The dominant way can be defined as the historical-ethnographic. This differs from ordinary art history in that it focusses to a greater extent on contexts and willingly turns to manifestations of the art of primitive, traditional cultures and to the beginnings of history. There it seeks inspiration, archetypes, strands of thought and schemata, which it then observes in historical process and in contemporary art.

The second model is different. It may be defined as theoretical, philosophical. It attempts to capture the fixed ways in which art manifests itself in all cultures. The paths to this may vary; we will concentrate on the way in which art exists, on the general ontological model of art, compared with man and with culture.

The simplest model of art anthropology is the one suggested by the name itself: the anthropology of art. This looks at people not physically, but culturally, and in that context it distinguishes art and all its manifestations. In such an approach, art and culture form a complementary whole. This model is the simplest, very widespread, useful and handy, but in its generality of limited substance. It is contrasted, of course, with those approaches which absolutise art, wishing to consider art in itself, without the ballast of cultural implications.

The next model is more elaborate. It distinguishes an intermediate component between the two components mentioned above, in the form of direct human participation in the manifestation of art, in its performance, perception or creation. Of course, such an approach automatically alters the sense of the work of art, since it separates it from the performance and reception of art. For the same reason, it alters also the sense and range of our understanding of culture, since it separates from culture people's living contact with art in a specific situation.

Let us return to the work of art, in which we can distinguish three different levels of existence, defined here as totality, internal order and materiality. On the first level, which may also be called the nominal level, the work of art is an integral whole, an identity, distinguished from everything that it is not. On this level, it can be named and defined in qualitative terms and may be expressive of values. Here, temporality and spatiality are reduced to the utmost. Of the properties of time, it contains only simultaneity; of the properties of space, only totality.

On the second level, the ordinal, intentional level, the work is an order, a disposition, a structure, a composition; it is an internally organised whole. It is an order in time *or* in space, or in time *and* in space. Here, neither time nor space is as yet a dimension. Time is quasi-time, space is quasi-space; the dimensions are relative, lacking absolute size.

It is only on the third level that the work of art is a material product, existing in the dimensions of time and space. This is not just about the existential foundation of the work, but about the full work, which may be perceived and may also manifest all the properties of the previous levels.

The levels of existence distinguished up to now have one thing in common: they approach the work of art as an independent entity. The situation alters diametrically on the next levels, where the work is compared with the living person. This manifests the middle component: people's participation in the manifesting of art. From the point of view of the categories of art and space, two different levels are distinguished in this component: the fourth and the fifth.

The fourth level is the level of action, of the movement of thoughts and body, of perception, performance and creation. These actions are possible only in the immediate present and in the immediate spatiality of man. The biological organism centralises time and space. The centralisation of time enables us to distinguish the present and to contrast it with the past and the future, to set the course of time. The centralisation of space lends it a centrifugal character, leading from the living organism outwards; it sets the organism against the environment in which it is active. That activity is also revealed in the manifestation of every work of art; it is expressed in the 'reading' of art, of every form of art, including plastic art, in the recognition of elements in art and in the compiling from them of integrated wholes. This is the level of language, of the morphology of art.

The fifth level is the level of artistic expression, of the development of meanings and moods over time; it concerns artistic events, in which living people participate in a specific time and space.

The final component of the model of art anthropology, encapsulated as human culture or humans in culture, also breaks down into three levels. Above all, the sixth level is distinguished here – the level of the natural, geographical and temporal environment, marked by the times of day, month and year, which people transform into a cultural environment, with places of work, rest and celebration distinguished in time and space. The arts are entrusted with a special role particularly in sacred time and sacred space.

The seventh level is the life of people from birth to death, individual and communal life, history experienced by living generations. This exists in every culture, and in it art acquires specific meanings.

In every culture, there also exists awareness of time and space that goes beyond the experience of even the oldest generations (the eighth level). People fill it with imagination, myth, tradition and faith; in time beyond time, people find support for the world of values expressed in art. In our culture, history seeks to manage the traditional area of myth. It is only partly successful. History also sometimes manifests its role in generating myths.

So we have eight basic levels of the manifestation of art from the anthropological perspective. Each level is a system of possibilities, and the choice from among those possibilities determines the sense of all art.

10.3 Ethnochoreology

Time is a common denominator of music and dance; the differences between them concern space. I have dealt with time in music many times. Here I will attempt to show its significance for our understanding of dance. I will again employ two hierarchies of time: temporal levels and zones of time. They allow us to distinguish eight basic ways of understanding time, differentiating the way we see dance. Thus arises a system of mutually linked and interdependent perspectives, which in a natural way organise the foundations of our knowledge. We are dealing here with deep structures, encoded in the structure of the human mind and conditioned by the way in which people exist in the world, although we need not be aware of them and they can be conceptualised in various ways. Concrete knowledge is often a choice from among those perspectives, a choice that is historically changeable, highlighting some perspectives and dimming others. It can also employ notions that are ambiguous from the point of view of this systematics.

In general terms, one may say that European choreology is dominated by the morphological perspective, which underpins, among other things, the systematics of dances, and the historical perspective as broadly conceived, which shows dance in time and in geographical, cultural and ethical space; American dance anthropology focusses on the role and meaning of dance in the cultural environment, on the life of the individual and of social groups in their value systems and worldviews.

10.3.1 Text

1. Nominality, atemporality The first level, the nominal level, enables us to identify a musical work or a dance, to distinguish it from everything that is not music or dance, to name it ('In the beginning was the word'). It includes, of course, terminology, and not just external scientific terminology, but also internal cultural terminology, and it also covers metaphoric terms, and even symbolic meanings of a dance itself – magical, metaphysical meanings, if a dance is expressed in such categories. On this level, a dance is treated as a whole distinguished from its surroundings, but not internally differentiated. The temporality here is atemporal, and of the properties of time it contains only simultaneity. Similarly internally undifferentiated is the spatiality of dance.
2. Intentionality, prototemporality On the second level, a dance is a dance form, an intentional product, isolated from the materiality of performance, an internally organised order of movements. It is described in normative, classificatory,

typological categories. The whole systematics of dances is based on such categories. The temporality is prototemporal, with its internal order of succession and simultaneity, and the spatiality is similarly ordered. Here, there are no specific temporal intervals, spatial intervals or physical sizes. Traditional teaching on folk dances has drawn heavily on this level.

3. Physicality, temporal and spatial dimensions On the third, mechanical, level, a dance is a concrete physical object, a mechanical structure, the movement of which is described in terms of physical parameters. The laws of Newtonian mechanics hold sway here. The concreteness of a dance emphasises its individual, unique features. Here, the interval scale, the scale of sizes, underpins measurements of the most varied physical, spatial and temporal properties, including acoustic features. The temporality is eotemporal, differentiating simultaneity, sequence and temporal size, so it is simply a temporal dimension. Treated in a similarly physical way is three-dimensional space. Four-dimensional time-space characterises this level. Here, a person dancing is a material object moving around that space.

In choreology, there is growing interest in the physicality of dance movement. Without that physicality, dance could not exist visually, for example, or be recorded using audiovisual apparatus onto magnetic tape, which enables various measurements to be taken.

Characteristic of all the levels of approaches to dance discussed thus far has been the fact that it has always been treated as an isolated object, independent of context, a physical, model, notional, symbolic object always existing as if outside of people as a living organism. The situation changes diametrically on the next level.

10.3.2 Process

4. Organicity, biotemporality The fourth, organic, level concerns dance movement performed by people; that is, dancing. Here, people are living organisms setting their own bodies in motion. The temporality (biotemporality), besides all the properties of the previous levels, so simultaneity, sequence and size of temporal intervals, is also naturally centralised with the human 'now' that merges retention and protention, making it possible to distinguish the past and the future and to sense the passing of time. From this constant 'now', this temporal 'window', people communicate with the outside world. The spatiality is also centralised with the human organism as an active subject in the surrounding world. From this centrifugal, somatic space, internally felt through

muscle tensions, people act on their surroundings. Dancing is such an active activity, expanding outwards. Rooted in the laws of centralised human space is proxemics, with its signifying neutral, intimate and official distances. Proxemic properties are particularly activated in dance.

Dance movement, dancing, like playing, singing and speaking, is a form of human communication that takes place within the zone of the psychological present, with its extreme sizes (on average from 40 milliseconds to 10.5 seconds) and central sizes covered by the metronome scale (from Largo 40 MM to Prestissimo 208 MM, with its centre at Moderato 90 MM). Music and language also result from human somatic movement. Unlike dance, in which this movement is externalised mainly in visual space, in music and language it is externalised in auditive space. Dance and musical movement share common temporal foundations in which that movement is coordinated. That coordination may take various forms. The principles behind the coordination of dance and musical movement have attracted the interest of musicologists and choreologists.

5. Performance situations and dance events The fifth level defines dance within the context of the performance situation in which living people participate. This concerns the whole dance, musical, ritual situation and everything that characterises it. Here are formed emotional tensions, moods, elation and ecstasy. The temporality and spatiality are defined by joint musical and dance activity in a given time and a given space. The spatiality is determined by the relations that arise among those participating in the situation.

Traditional musicology and choreology have tended to place the work of music and dance at the centre of their interests. Nowadays, the work is losing that dominant, seemingly inviolable, position in favour of culturally conditioned music and dance performance. The music or dance situation is something more primal than the work. It can be defined, for example, using a method of creating a dance situation different from the performance of a dance work.

10.3.3 Context

6. Cultural environment The sixth level shows dance within the context of the cultural environment in which dance behaviours are inscribed, thereby acquiring a specific sense. The common foundations are formed by the temporal cycles of the natural environment, the daily, monthly (lunar) and annual cycles. They

organise and synchronise all human activity, ordering it according to fixed rhythms. This environment is organised into an agrarian, cultural or religious calendar. Within it, distinctions are made between profane and sacred time and the seasons of various activities. In this dance environment, the time of celebration is of particular importance. Annual ritual and celebration and the part played in them by dances are traditional themes.

Similarly culturally varied is the spatiality of the environment of the activity of a given social group, with places of work and rest, of family and social life, with sacred and secular sites. One cannot dance everywhere; there are places where particular dances are preferred.

Knowledge about dances in cultural environments is perhaps the most neglected field, and one that is urgently needed today. We associate the environment mainly with the natural space of life on earth, with nature devastated by humans, with their exploitative actions. No less important is the human temporal environment, shattered by information noise, no less pernicious for people's mental health.

7. Individual and communal life On the seventh level of knowledge, dance is seen within the context of individual and communal human life. It is only here that humans are fully manifest, with their identity, their full awareness of time and their personal history perpetuated by memory and by communal history experienced by living generations. It is only here that a dancing person appears with his or her full cultural baggage, lost, by some curious turn of events, somewhere in ethnochoreology, then rediscovered in dance anthropology.

The meaning of dances depends in an obvious way on the age, sex and social standing of its participants and on their dependence on the power structure. Dance in family rituals has been a traditional subject. The process of learning to dance, of acquiring qualifications and skills, of shaping dance preferences and the system of socially endorsed individual aesthetic values, changing over time and leading to changes in dance and musical life, are just some of the issues in which dance occurs.

A person's life from birth to death is a universal model of change. Awareness of change is documented by the memory of living generations. Socially experienced history is an absolutely universal perspective, existing in every culture, regardless of the degree of its development. It also concerns dance and dance music, of course, where such music exists in the culture. Dances are often differentiated into traditional dances, which are clearly conservative, dominant and fundamental in a given culture, and fashionable dances, which are only becoming more popular.

The temporality of the zone of life is quite distinctly differentiated, which is not always the case with living space, determined by an individual's biography and by the past spatial experiences of the living generations of a given social group. At times, the regions of the activities of travelling musicians, players and dancers have been very extensive. Such performers have often been active among various ethnic groups, not necessarily their own. Modern-day nationalisms have heightened the divisions in ethnically mixed territories. Scholarship has also played an active part in disintegrating local traditions along national lines. Today, it is consciously seeking to remove the national, ethnic, religious and cultural barriers which, until recently, it was helping to perpetuate.

Also linked in an obvious way to the zone of life is choreology as an academic discipline. The oldest among us have witnessed it changing over recent decades. Knowledge about dances is based also on preferences, established paradigms, chosen perspectives and fashions in scholarship.

8. Tradition, myth and history The eighth and final level of knowledge comprises the past that extends beyond the memory of living generations. Awareness of this past exists in every culture, and it helps to define worldviews, including the role of dance. That past is manifest in two ways: either as a mythical and traditional past, when it is always seen from within a given culture, or else in a fully objective way, as is postulated by the modern-day understanding of history. History seeks to manage the traditional areas of myth, but is only partly successful. Indeed, it sometimes disseminates its own myths – national, racial, social and political – in which dance behaviours may be involved. A great deal of mythical thinking functions not just in traditional culture, but also in the modern world, particularly in artistic life. Dance may be considered from both these perspectives. Mythical and historical times also have spatial equivalents in the form of mythically understood space or the historical space of a given culture and the diffusion of particular dances.

We live in an age of historicism, in which we are inclined to ascribe to historical explanations the status of final explanations. Historicism is also manifest in reconstructions of historical processes by means of retrogressive deductions from present-day facts about their past; we make judgments about the origins of phenomena based on the range over which they appear. Within this context, knowledge about dances has played and continues to play a significant role. Today, however, the superiority of the historical perspective is often questioned, as is exemplified by anthropological trends. Huge efforts are being made in current research to view the past of symbolic behaviours (including dance) from the inner perspective of a given culture, perpetuated in the tradition of its bearers, and to view it from many different perspectives, which I have attempted to systematise here. None of these perspectives stands alone. Only to a limited extent can a particular perspective be abstracted from the whole. Together, they form a system in which the distinguished levels condition one another. Although they do constitute a hierarchic order, it should not be identified with a hierarchy of scholarly weight, let alone with the preferences of modern research into cultural traditions.

Changes in ritual dance Adrienne Kaeppler shows how, in Hawaii, the *ha'a* ritual sequence of movements performed in temples turned into the *hula* system, performed to commemorate special events or individuals and then to express Hawaiians' ethnic identity during festivals and *hula* contests.

> The primary reason for the change was the introduction and acceptance of Christianity. Then, after going underground for two generations, the ritual movement sequences reemerged with new meanings – and with different intentions. What was once sacred ritual that necessitated certain specified movement sequences that could not be changed survived as the special province of a restricted *hula* elite. In recent years, these movement sequences, now known as *hula pahu*, have been reprocessed as a new kind of identity ritual and are performed at important *hula* festivals such as the Merrie Monarch Festival, The Prince Lot Hula Festival and others. Although the movement sequences remained essentially the same for both the ritual and the dance (at least until recently) – it is the context, the audience, and the intention that has made them different.
>
> For *ha'a*, the context was a socio-political ritual process performed in an outdoor temple; the audience was the gods and a congregation of believers; the intention was to worship the gods, who would look favorably on the performers and the congregation, and would accede to their requests for the fertility of land, sea, and people, as well as for special interests of the chiefs such as success in warfare. The hierarchical structure of the society was encoded in the ritual process, and the gods who were part of this hierarchical structure gave it efficacy.
>
> For *hula*, the context was socio-political enhancement in which the meaning was aesthetically encoded in the product and had to be derived by a culturally knowledgeable audience that was engaged by the words and movements. While being entertained and engaged, the hegemony of the chiefs and the socially stratified system was aesthetically constructed, evaluated, and usually accepted.[266]

266 Kaeppler 1995, 109.

	Levels of existence	Temporality	Zones of time	Description of musical instruments
1	Nominal, potential level	1. Atemporality		1. Terminology
2	Ordinal, intentional level	2. Prototemporality		2. Ergology and technology
3	Intervallic, physical level	3. Eotemporality		
4	Level of action and perception, now	4. Biotemporality 5. Nootemporality	1. Zone of the psychological present	3. Playing technique and musical possibilities
5	Level of events, participation		2. Zone of works and performances	4. Repertoire
6	Level of the natural and cultural environment		3. Zone of the natural and cultural environment	5. Use 6. History and distribution
7	Level of individual and communal life		4. Zone of individual and communal life	
8	Level of worldview, myth, history and learning		5. Zone of myth, history and learning	

Example 10.7 The five temporal levels and five temporal zones forming eight basic levels of the existence of manifestations of music and art from an anthropological perspective. This concerns also such objects as musical instruments, described by Ernst Emsheimer and Erich Stockmann in six points. Sárosi 1967, 8; cf. Bielawski 1989, 1990c.

10.4 An example of a musical form, an instrument and a work of art

The arts are traditionally divided into spatial and temporal. Among the temporal arts, music holds a privileged place, since time is both a factor in the organisation of music and a manifestation of the ways in which it exists. Hence knowledge about time is to a considerable degree knowledge about music, and even vice versa, knowledge about music is also knowledge about time in its human sense. In light of this, I wish to refer musical form to the problem of human time, and more specifically to the five temporal levels and five temporal zones. Their synthesis reveals eight basic levels of time, since the zones of time are essentially an expansion of the last two temporal levels (Example 10.7). I will refer to European traditions in the understanding of form, and to an even greater extent to the Asian way of understanding form, based on the example of the Tajik-Uzbek maqam (shashmaqam) analysed by Sławomira Żerańska-Kominek.[267]

The problem can also be expressed in different words, and other examples invoked. One of the definitions of knowledge declares that it is the environment of the human mind, in which the mind functions as an active subject. Order is brought to that knowledge by cognitive schemata, some of which have even unlimited applications; they are manifest, for example, in such basic categories as the categories of time and space. The two hierarchies of time mentioned above have shown their remarkable usefulness here. I have in mind, of course, the levels of temporality identified by Julius T. Fraser, founder of the International Society for the Study of Time, and the zones of time which have exercised by mind for years. Entirely unexpectedly, it turned out that they also underpin organology, which is concerned with objects that are so patently material. As I have endeavoured to show, the levels of organological knowledge form a complete system of possibilities. I emphasise here the completeness of that system, which on one hand ensures a certain comfort to our thinking and on the other alarms us with its finiteness. In this sense, the system is closed and exhausts the range of possibilities, although each of those possibilities is internally open to various aspects. In relation to organology, on such foundations, we can distinguish eight basic perspectives comprising that closed system. The problem is that they form a system of interconnected perspectives, which can only be isolated or abstracted from that whole to a certain extent. It would seem that these perspectives always exist in human knowledge; they are encoded in the structure of the human mind, although we are not always aware of them and they can be conceptualised in various ways. Concrete knowledge is often a choice from those perspectives, a choice that is historically variable, highlighting some perspectives and dimming others. It can also employ notions that are ambiguous from the point of view of that systematics. In general terms, one may say that organological knowledge is dominated by the morphological perspective, on which is based, among other things, the systematics of instruments, and by the historical perspective as broadly conceived, showing instruments in time and in geographic, cultural and ethnic space. The sense of the multitude of perspectives is borne out by the points in the description of specific kinds of instruments adopted by Ernst Emsheimer and Erich Stockmann in their handbook of European folk instruments. There are six points: Terminology, Ergology and Technology, Playing Technique and

267 Żerańska-Kominek 1987.

Musical Possibilities, Repertoire, Use, History and Distribution. This is not a complete system, and its foundations are unclear, as I demonstrated in another study.[268] Here, I will focus on clarifying these perspectives or levels. There are a few more of them here than in the handbook, and their ranges do not fully coincide (Example 10.7).

The expansion of the perspective to encompass all manifestations of art is no accident. It is a logical consequence of my studies to date, which have been rooted in questions of time and space as categories of all existence. I am fully aware that the propositions I am advancing are not popular; on the contrary, I am proposing a new way of thinking about the work of art. Therefore, I will not just be considering what the work of art is, what world it creates, what content it expresses, what it refers to and what it evokes. Eminent scholars have done that and continue to do so. My point of view will be different. I will start not with the work, but with people, with the way they exist in time and space. I will begin by distinguishing the natural ways of existence, always present, although not always in our awareness, which impart meaning to people's existence and to the products of their activities. A special kind of such a product is the work of art, all art in every culture – assuming, that is, that the work functions in that culture. I will focus on what underpins the existence of a work of art, what connects all its manifestations, what imparts meaning to works of art in culture. So culture will be a crucial part of my vision of the work of art, but not according to the principle of an opposition between the work and culture. I will treat the work and culture conjointly and apply a common, human measure to them. In this I will be helped by categories of time and space, which enable the basic levels of existence to be distinguished. My thesis will be that there are always eight such basic levels, each of which opens up a specific perspective of possibilities, and a specific character in this system of possibilities will determine the meaning of the work of art. Those will be meanings dependent on the natural ways in which the work of art exists – existential, real, essential, ontological meanings, decidedly different from conventional meanings. I will pass over the question of conventional meanings. I cannot fail to notice, however, that they appear also to refer solely to these distinguished levels. Different theories of the work of art define the object of interest in different ways. Seen from the perspective adopted here, they usually focus on issues relating to selected levels only. Some theories are easy to decipher; others are complicated and ambiguous. I have no evidence to suggest that there have

268 Bielawski 1989, 1990c.

ever existed such theories in light of which the levels of existence would be entirely helpless. That would attest to the universality of the adopted criteria. One common feature of the distinguished levels is that they form a specific hierarchy, in which each successive level contains all the properties of the previous levels and enhances them with new properties, characteristic of the given level. I should warn at the outset, however, that the existence of humans and the existence of the products of human culture form a complementary whole. Only theoretically can one distinguish individual levels and focus one's attention on them; they cannot be entirely isolated. The other levels will always be there in the background, complementing the picture of the whole; one cannot, for example, isolate individual degrees of the musical scale without depriving them of musical sense. We have come to approach the work from the phenomenological perspective, influenced by Roman Ingarden. Phenomenological distinctions to a considerable extent harmonise with the levels distinguished here, as exemplified by the distinction in the work of art of the intentional object, the existential foundation and the aesthetic object. By way of contrast, I will also refer to the concept of Hans-Georg Gadamer, who, wishing to explain the problem of the work of art, evokes the notions of play, symbol and celebration, seeing in them the anthropological foundations of his concept. I would also wish to refer to the three worlds distinguished by Karl Popper, on which ethologists, acousticians and theologians have drawn to their advantage. Those three worlds are as follows: (1) the objective physical and biological world, (2) the subjective world of human awareness and (3) the objective world of the products of human culture, to which belong, of course, works of art. Then it would befall me to show how multi-layered is that objective world of the products of human culture and how much the work of art is anchored also in Popper's other worlds. I will pass over that problem, however, so as not to blur the overall picture. Given that I have hitherto emphasised the role of five temporal zones and five temporal levels, it should be explained where the eight levels of the existence of a work of art come from. Well, the zones of time and the temporal levels dovetail with one another and can be reduced to eight basic levels of existence (Example 10.7). Those levels also form a hierarchy characteristic of temporal levels and zones of times, in which each successive level contains the properties of the previous levels.

10.4.1 The atemporal, nominal level

Atemporality is characterised by the absence of time as a sensible attribute of events. It corresponds to our understanding of chaos. In the atemporal world, relations between events can be qualified only as coexisting or as simultaneously present or absent.[269] Here is Fraser:

> There are processes which determine Umwelts [environments] that must be regarded as *atemporal*. By this is meant that there are no means, even in principle, whereby time can be recognized if such processes are examined entirely from within. In these worlds nothing can correspond to the idea of event, to conditions of before/after, to future/past/present, to causal connections, or to beginnings and endings. The foremost example of atemporality is the world of first signals,[270]

so 'the basic substratum of the world is the universe of particles of zero restmass, traveling with the speed of light'. Its model is 'an idealized, relativistic gas made up entirely of photons, neutrinos, and gravitons (if they exist)'.[271] This level is the domain of the special theory of relativity.

> Special relativity teaches that in the life of a particle traveling at the velocity of light all events are simultaneous. What we recognize, for instance, as events along the path of a photon are changes, recognized after they happened, from within Umwelts of higher temporalities – such as when a physicist interprets certain lines on a photograph. It follows that a universe of purely relativistic energy, containing only photons, gravitons, and neutrinos, as judged from the point of view of any of the traveling particles, is one single happening. Of course, photons have no opinions but we may have some on their behalf, through the extended Umwelt principle. Thus, a universe of particles traveling with the speed of light is the true Parmenidean One of physical cosmology. In terms of the theory of time as conflict, such a universe determines an atemporal Umwelt.[272]

Within this context, however, it is worth realising that Fraser employs a very broad concept of the event. Kazimierz Ajdukiewicz, speaking about events, had in mind punctual events. Fraser does not have temporal limitations for them when he writes:

> The idea of atemporality is implicit in the ordinary use of the concept of 'event'. The meaning may be made explicit by defining event as any thing or condition that remains identical with itself through a period of time, in terms of the system which makes the determination. When so recognized events may be given names and may be quantified. 'One shot in the dark' as perceived by a listener is one event even though instrumental measurements may reveal, ex post facto, that there were two shots. 'One particle emitted' as defined by a competent physicist is an event, as is 'one night' or 'one day' as understood in the Book of Genesis. While the event endures no variation is permitted

269 Michon 1983, 4.
270 Fraser 1978, 23.
271 Ibid., 21–22.
272 Ibid., 30.

> in its character: 'one night' ceases to be that if interrupted by the rising sun. One life is also an event as understood and declared by a midwife or an executioner, but it ceases to be that if interrupted by death. 'My life' is the primary reference of simultaneity in the world of selfhood; within this single event 'my birth' and 'my death', from the point of view of 'my life', cannot be separated. In general, then, an event is a chronon and all chronons are single events; they are simultaneities or atemporal Umwelts without distinguishable inner temporal structures, such as succession or directed order.[273]

In that case, I see no obstacle to regarding every time interval that can be named and distinguished from other intervals in the sense of preserving its own identity as an atemporal chronon. That would be a specific and performed work, where we do not enter into its internal structure, but only name it; it would be a specific bar, a specific phrase; but it would also be an historical period marked by the preservation of its own identity. Neither is there any obstacle to calling the existence of our cosmos an atemporal chronon. Ajdukiewicz distinguished the moment, or punctual event, and all-engulfing time. As a consequence of Fraser's approach, one might accept that they are only the two poles of a line encompassing the dimensions of all chronons. So that would be a scale of all possible durations from the smallest to the largest, a scale on which categorically different phenomena linked to humans and human culture form the characteristic zones which I have attempted to describe in my works. The punctual event, taken out of context, is atemporal, as is eternity without beginning and end. Between those sizes are situated the shortest event in the physical world (10^{-43} seconds) and the longest, equal to the duration of the cosmos (10^{17} seconds). In my opinion, however, that quantitative definition of the event is an interpretation made on the eotemporal level. I would be inclined to regard the size of time as foreign to atemporality. Proper to atemporality are qualities and the principle of the preservation of identity.

Michon showed that the formal properties of temporal levels correspond largely to the properties of the levels of measurement; that is, of course, when atemporality is linked with a nominal scale, the measurement structure of which is formed solely by elements and wholes. Such a nominal time does not contain an internal differentiation; it can be named but not measured; it is qualitative but not quantitative; its specific property is simultaneity.

Michon also links atemporality with animism and mysticism. According to Stephen C. Pepper, the world can be interpreted in spiritistic, animistic or mysticistic terms, depending on whether one is postulating the existence of

273 Ibid, 43.

many individual, personal spirits as causative agents or the existence of a single overall spirit. This has a profound sense. Time seen in spiritistic categories is devoid of all the flaws of the earthly time of passing; it is unmeasurable, indestructible; it is eternal. (De Mey does not have an equivalent for atemporality, since he is concerned with structures that have formal, scientific meaning, providing a framework for philosophy of science and for empirical research into the science of cognition).

In my view, musical time in general, in its deepest and no doubt primal sense, as opposed to non-musical time, is by nature atemporal. Musical time is essentially unusual time; it represents getting away from the everyday time of work, speech and normal existence. This time is determined not by a temporal measure, but by its quality. In this experiencing of time, there is no sequence, there is no change. As Judith Becker stresses, such time depends on

> the intimation of eternity, of Nirvana, the sense of being outside of any time framework at all. This is the time invoked by the music of many religious rituals, the 'time out of time' one may experience in prayer, in meditation or in trance. The experience always seems to be accompanied by great joy and peacefulness, a feeling of sanctification and blessedness. Among the Australian aborigines, eternity is the reenactment of original creation, a going backwards in time, or bringing primordial time into the present so that the individual may live his mortal life within a mind-set of eternity. For the Christian or Moslem, eternity lies after the final judgment and must be anticipated through good deeds, ritual and prayer. For the Buddhist, timelessness is possible at any moment and comes with the attainment of enlightenment and the release from the timebound cycles of birth and death. The notion of timelessness, while not usually in the forefront of our minds, has, nevertheless, a universality that clearly allows us to identify it as one of man's common modes of perceiving time, if one can forgive the linguistic and logical violation involved in calling timelessness a kind of time.[274]

It might seem that timelessness is ideally suited to the sense of atemporality. However, Fraser is clearly opposed to such a view, distinguishing between those categories.

> Atemporality is *not* a way of talking about nothingness, or non-existence. The idea is isomorphic with an empty set which is a set, albeit empty. And since it has no discernible structure, the idea must also be taken as isomorphic with the idea of continuum. In classical cosmology it would represent the primordial chaos.[275]

274 Becker 1981, 163.
275 Fraser 1978, 30.

Fraser discerns levels of temporality also in the moods documented in the products of human culture. He cites examples from various fields of art, sometimes from music as well, although he does not give a musical example for atemporality. He finds the most primitive and consequently most alarming mood of chaos and emptiness in the words of the Japanese poet Nishida Kitaro:

> The bottom of my soul has such depth
> Neither joy nor the waves of sorrow can reach it.[276]

Atemporal is the world of the values that are ascribed to music and art, such as the world of aesthetic values, but also atemporal are entirely prosaic identifications of works by means of titles or generic terms. Wherever we depart from concrete musical material and from its inner structure and we pass, in notional reduction, into the general categories with which we characterise music, we descend from higher levels to lower levels of temporality, as far as the atemporal level, in which time is globally defined as a single quality.

In definitions of musical form, normally named in first place are properties attesting to its belonging to the nominal, atemporal level, in which only simultaneity exists. They are such terms as unity, wholeness and harmony. In definitions of form, they are often contrasted with their opposites. 'The first requirement of all formation, including musical formation, is unity', states Hugo Riemann. Form is 'a whole identical to itself', adds Susanne Langer. Jean Piaget also puts the 'idea of wholeness' at the forefront of his definition of structure, whilst Yuri Lotman attributes 'global meaning' to the notion of the text. Musical form is 'unity in diversity', 'unity in multiplicity', a 'harmony of opposites' and the 'attuning of parts'.

On the nominal, atemporal level, one can distinguish musical form from everything that is not musical form; it can also be named. The names sometimes indicate the atemporal character of form; the Arabic word 'maqam', for example, means a place where music is performed. In old treatises, the maqam was seen as reflecting Absolute Unity, Universal Harmony, Immutable Eternal Reality, and it was given a metaphysical sense. Also today, it can function as a symbolic object bearing various content.

The nominal level also allows one to identify a musical instrument. It obviously covers terminology, and not only scientific and ethnic terminology, but also metaphoric terms, and even symbolic meanings of an instrument, magical meanings and spiritual forces, if an instrument falls into such categories. On

276 Ibid., 284.

this level, an instrument is always treated as a whole that is isolated from its surroundings, but not internally differentiated. The nominal scale is applied to it; the temporality is atemporal, devoid of all other temporal properties except for simultaneity. The terminology, like every other aspect of organological knowledge, cannot be confined to its own level alone. It is usually subordinated to a systematics of instruments, and systematics, as we will see, belongs to the next level of knowledge. In relation to terminology, the question has been posed as to what names a given type of instruments is defined with. We confront terminology with a different level when we ask about its historical, geographic and ethnic scope. In Poland, we have Szydłowska-Ceglowa's excellent work on instrument names in Old Polish literature and a number of other studies on the scope of nomenclature.[277] We do not have, to my knowledge, a comparative work on instrument nomenclature in Slavic lands, to say nothing of any broader perspective. Organologists are naturally interested also in the more linguistic aspects of instrument nomenclature, the life of those names, the role of metaphors in their formation, and so on. We know a little about instrument symbolism in different cultures, but we are far from any synthesis in that respect. In any case, the range of issues relating to this level is much broader than that which is set out by the first point in the description of an instrument in the entries of *Handbuch der europäischen Volksmusikinstrumente*, defined as terminology (Terminologie).[278]

'In the beginning was the Word', we read in the Gospel according to St John. Word with a capital letter, but also the ordinary word referred to the work of art opens up the first level of interpretative possibilities. That level may be called the nominal level. On this level, we discover only the identity of a work of art. We are dealing here with the actual existence of a work of art as an object that can be cognised, identified, distinguished from everything that it is not and defined in qualitative terms. On this level, temporality and spatiality are reduced to the utmost; of the properties of time, we find only simultaneity, and of spatial properties only wholeness, which precludes any internal organisation. In such an atemporal and aspatial situation, of course, there is no temporal or spatial order, let alone temporal or spatial dimensions. Those are properties which only manifest themselves on higher levels of being; here, their existence is merely potential. The nominal level is usually overlooked, taken as something obvious. From the theoretical point of view, however, it is very important, for at least two reasons. First, it is a starting point, an initial condition of all higher levels of the existence

277 Szydłowska-Ceglowa 1977.

278 Emsheimer and Stockmann 1967.

of a work of art. Only with the existence of the whole can we speak of internal structure on the next level. Secondly, it is a point of departure, a quintessence, a synthesis, which leads from internal structure to an overall perception of the work of art and its qualitative definitions. Without the nominal level, it would be difficult to imagine the functioning of knowledge about works of art. Cognition, naming and defining properties are basic actions in life and in learning. The masters in this field are eminent critics, philosophers and hermeneuts well versed in the art of interpretation. Art teachers cannot do without this level, although showing things directly can often be a simpler way of communicating.

Eternity and the temporal point are atemporal, as was the original chaos before the cosmos emerged from it. Also atemporal is the code, in contrast to the message. Atemporal is meaning as opposed to an event. Atemporal is the linguistic system as opposed to the discourse realised in a particular place in time and space. An atemporal quality is also possessed by values, beauty, good and truth, but when associated with the world of ideas or transcendence they refer also to the last level. Symbolic meaning in a way binds the first level with the last.

10.4.2 The prototemporal, ordinal level

The next level is prototemporality. Only here does the order of time appear and only here can events be defined as earlier and later. However, prototemporality is a limited, local form of time: 'disconnected fragments of time' dominate in the prototemporal universe.[279] As Fraser writes: 'There are processes which determine Umwelts [environments] in which time and space are distinguishable, even though events and things are often interchangeable. Events and positions may be specified only statistically and causation is probabilistic'.[280] Fraser called such primitive conditions prototemporal, from proto, meaning the first or lowest in a series. 'In prototemporal Umwelts our ideas of here versus there and now versus then are only loosely applicable. The inhabitants of prototemporal Umwelts are countable but they are not orderable by number'.[281] According to Fraser, the chief example of prototemporality is 'the world of particles with nonzero restmass'. His model is 'a pure monatomic, non-relativistic gas made up of countable but indistinguishable particles',[282] and that world is dealt with by quantum mechanics. Yet examples of prototemporality can also be found among physiological

279 Fraser 1982, 31.
280 Fraser 1978, 23.
281 Ibid.
282 Ibid., 22.

processes, among the perceptual functions of animals and people and in conscious experiences, so also in music. Fraser invokes the second movement of Alban Berg's *Lyric Suite*, entitled Desolato: 'its construction is unpredictable, the sounds are purposely incoherent'. Fraser readily cites examples from painting. He mentions Dadaism, for instance: 'a revolt not against any specific method of organization, but against organizability itself', but – as he states – 'Dada seldom succeeded in reaching pure prototemporality, because a striving for meaninglessness remained meaningful'. Berg too 'could not get rid of all formal structuring'.[283] Aleatory music, collages and assemblages of incoherent, heterogenic fragments are examples of such prototemporality in music. In Fraser's approach, prototemporality takes on unusual, foreign and forbidding features:

> Prototemporal moods seem to communicate with the archaic levels of our mind. They correspond with the world from which aggregate matter, life, and man himself evolved. For the mind, a descent from its noetic environment to a prototemporal one is a feat of anguish. Functioning in a prototemporal environment, whether demanded by art or by politics, involves the dissolution of the self, that is, an attack on personal integrity.[284]

Michon's suggestions alter the sense of prototemporality to quite a significant extent, when he links it to Pepper's formism and De Mey's monadism. Those are ways of interpreting facts and relationships, of distinguishing themes and categories, schemata of classification and ordering based on rational principles or systematic observations. That classificatory way of approaching time, seeing within it qualitative categories and not sizes, distinguishes prototemporality. Michon also states that prototemporality is based on an ordinal scale. He does not distinguish, however, the time sequence and the order of sizes of time, which in turn underpinned my considerations of the zones of musical time. The order of that scale is systematic, whereas Michon speaks of order that is successive, so syntagmatic or contextual. Also, Michon does not presuppose the fragmentary nature of time and the incoherence that is characteristic in Fraser, and he speaks of full or partial successiveness. In so doing, he lends prototemporality more distinctive formal features, but he also deprives it of that unusual quality, of that mystery and menace, that distinguishes Fraser's prototemporality. Prototemporal successiveness is 'pure'; it contains neither an arrow of time nor temporal sizes. Unlike atemporality, prototemporality is internally differentiated; it employs temporal qualities and their order of sequence, but it does not contain sizes of duration, tempo and frequency.

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283 Ibid., 285.
284 Ibid.

It ensues from the hierarchic nature of temporal levels that prototemporality, besides the property that is specific to it, also contains the feature of the atemporal level, so simultaneity. Sequence and simultaneity undergird all music, although on the prototemporal level music is seen in qualitative, not quantitative terms. In prototemporality, certain syntagmatic relations are possible. Abstractly conceived musical forms are prototemporal, such as ABA form, sonata form and suite form, with their internal differentiation; also prototemporal are the changing moods of a musical event, even those suggested by the list of works on a concert programme. Wherever we treat music in isolation from specific, measurable material, its proto- and atemporal properties appear to us. In stratified approaches to the musical work and in reductive methods of the Schenkerian type, the higher level of reduction often means descending to a lower level of temporality.

Previously mentioned definitions of form created according to the principle of combining opposites show that the notion of musical form covers at least its belonging to the first two temporal levels. Form is at once both atemporal (it is a unity, a whole) and prototemporal. Only on the prototemporal, ordinal level, in which the sequence of time exists, does that which is different become possible (otherness, multiplicity, opposites, parts, elements). Here, the wholeness of form is broken down into its constituent parts.

However, multitude in form cannot remain chaos; hence it is unified, a certain order is introduced into it ('out of Chaos comes Cosmos'). 'The order that reigns in sound material', 'bringing order to the disorderly' and 'limiting the limitless' are common definitions of form. In the Polish folk tradition, form is called *ład*, meaning order. *Ład* denotes the foundations of musical order and the outline of form called the *nuta*, or tune.[285]

A compositional idea can be of a prototemporal character. Susanne Langer states that at the moment when the essence of a form is discovered by a composer a musical work already exists embryonically as the 'commanding' form of a work.[286] Sławomira Żerańska-Kominek refers a similar idea to the maqam, which exists as an archetype beyond its immediate realisation in sound. The pre-idea of the maqam constitutes a potential source of energy and musical expression. The structure of a maqam contains nothing that would not have been previously given in its archetype.[287]

285 Dahlig 1987, 16, 21.
286 Langer 1953; Whittall 1980, 710.
287 Żerańska-Kominek 1986, 237.

Orders of a kind are formed by temporal proportions abstracted from specific temporal sizes, on which are based the rhythmic orders expressed, for example, in the score. We should not be misled by the notions of rhythmic intervals. They are intervals in the physical sense; they are not specific temporal sizes. They are orders of proportions without physically measurable intervals. Roman Ingarden would define such structures as quasi-temporal.[288]

The level in question also refers to the musical instrument as an internally organised order. In such instances, the instrument is presented in normative, classificatory, typological terms. The entire systematics of musical instruments is based on such categories. On this level, an instrument is devoid of its individual, material concreteness; it is treated as a representative of a certain type; it reveals itself in the logic of its structure. The ordinal measurement scale is linked to this level. The temporality is prototemporal, with its internal order, and the spatiality is similarly ordered. They are lacking, however, temporal intervals, spatial intervals, physical sizes. This is by nature the level of all norms and regularities.

Traditional organology has been fascinated with the possibilities of treating the instrument as an intentional object, anchored in matter, but different from that matter, defined by the logic of its construction, relatively easy to define, describe and systematise. Not by chance did organology systematise its object of study sooner than many other fields of musical knowledge, and that on the broadest, global scale. Although many systematics have already been created, and nearly every one displays some advantages, one of them stands out for its widespread use in present-day organology. That is, of course, the systematics of Hornbostel-Sachs, where this level is well distinguished. It is contained in ergology and technology, but it does not coincide with them.

The ordinal level of the work of art, of all art, contains the properties of the nominal level (simultaneity and wholeness), but it enhances them with new, characteristic properties: temporal and spatial order. Here, the work of art is an intentional product, internally differentiated, organised and ordered. That order may be partial or full, simple or complex, deep or superficial, on one layer or more, and so on. The temporality is the order of a sequence (before – after) and simultaneity; the spatiality is order in two- or three-dimensional space, assuming that we are dealing with quasi-dimensions, enabling only the ordering, and not the defining, of objective spatial sizes. The temporal arts organise above all order in time; the plastic arts organise above all order in space; the audiovisual arts organise both temporal and spatial order. The work of art as an intentional product is

288 Ingarden 1966, 224.

devoid of dimensions in the strict sense. In it, dimensions are quasi-dimensions, temporality is quasi-temporal, spatiality is quasi-spatial. The essence of those dimensions consists of orders, proportions, relations and qualities, not sizes as objectively understood. Possible here are quasi-sizes, relative sizes, qualitative sizes, small, large, medium, very large, and so on. That applies to time and space, and to all other relative dimensions of a work.

Manifest on this level is the form of a work of art, which may be variously understood. In the classicist approach to painting and music, form was a bearer of beauty, and visual and auditory colours were regarded only as a sensory mixture of emotions of a subjective character. Today, we are convinced that colours can be crucial components of pictorial or musical structures.

The work seen from the perspective of this level has its own temporal and spatial structures, which are not determined by measurable sizes. Phenomenological and structuralist thinking in particular have highlighted this level. Roman Ingarden defines the work of art as an intentional entity and contrasts it with the real existential foundation of the work and the subjective aesthetic object. Those differentiations converge to a considerable extent with the levels of the existence of the work shown here. The same may be said about the concept of Mieczysław Tomaszewski, who distinguishes the musical text, the sound text, the perceptual text and the receptual text. Only the first of these, the musical text of an intentional character, belongs to the level under discussion – and that with certain provisos. Tomaszewski identifies the musical text with the creative concept, and the latter cannot be fully detached from the composer with his or her own temporality, and so on.

Ingarden, like other art theorists, distinguished internal layers within the work of art. In the literary work, they are the layer of linguistic sound products, the semantic layer, the layer of represented objects and the layer of schematised views; in the theatrical work, there are also the recreation and presentation of the represented world, functions discharged by real objects and people, and what happens has a full and specific course (as in mime and film). According to Irena Sławińska, in the theatrical work there exist dramatic events (action), character structure, organisation of time and space, the poetical world of the play (the theatrical macrocosm), the theatrical form of the play and the structure of the word. Various aspects are displayed by Zbigniew Raszewski's theatre score. In a painting, the internal layers are the pictorially depicted appearance of objects, the objects presented through their appearances, the literary subject, the genre situation and the arrangement of the figures in their mutual relations. The work of architecture, besides the existential foundation represented by the building, also possesses a spatial form and a multitude of views. In the musical work, according to Ingarden, there is just one layer, the layer of sounds, whilst Michał Bristiger distinguished, in a vocal-musical work, as many as seven different texts (levels), but he understands them in a completely different way. They all afford insight into the inner form of the work, so they do not go beyond the level of the existence of the work of art profiled here. Bristiger distinguishes the small verbal text (verse or prose), the large verbal text (transformed verse or prose, treated as an element of the musical work), the large verbal-musical text (the whole of the work), the accompaniment text (the instrumental part of the work), the small verbal-musical text (unaccompanied song), the small purely musical text (vocalise, vocal line without words) and the large purely musical text (vocalise plus accompaniment, vocal musical work without words).[289] According to Ingarden, the cinematographic work contains schematised appearances and sequences of views, represented objects and a phono-photographic audiovisual layer; according to Bolesław Lewicki, there are layers of images, sounds, human speech and music. Alicja Helman compares a film to a musical score, distinguishing horizontal infrastructures (phases, course) and vertical infrastructures (factographic form, situation, people's actions, people's voices, music, etc.). She also lists rhythmic infrastructure (the shaping of film time) and dynamic infrastructure, but to my mind these are contained within the previous infrastructures.

We ought not to be deceived by the occasional association of this level with life, since it is lacking the features most distinctive of the temporality of life. Here, life is sometimes associated solely with one of its features, which is by no means specific to life, namely, the perfection of internal order, 'organic unity', the closed structure, in which:

> Every detail or aspect of the picture, text, or whatever it is, is so united with the whole that it does not strike us as something external […], we understand a living organism as a being that bears its center within itself in such a way that the various parts are not subordinated to any particular external purpose, but simply serve the self-preservation of the organism as a living being.[290]

Life, as we will see, is distinguished by its centrifugal direction and its contrasting of the living organism with the environment in which it acts, and those are properties of higher levels of existence.

289 Bristiger 1986, 21.
290 Gadamer 1986, 42–43.

10.4.3 The eotemporal, intervallic level

Eotemporality is the next level up in the hierarchy. It is 'the time represented by the physicist's t in equations usually described as not responding to the direction of time'.[291] In other words, eotemporality is in essence Newtonian time; it is metrical, even isometrical, and is reversible. It is simply the fourth geometric dimension and has no purpose other than simplifying the equations of classic dynamics relating to the non-organic world of Newtonian mechanics. And although in physical time one can define a point zero (t_0), that point is essentially arbitrary and does not hold such a privileged position as now or the present, which define the next level – of biotemporality.[292] Fraser writes thus about eotemporality:

> There are processes which determine Umwelts [environments] with temporalities of pure succession, that is, of succession without a preferred direction. In such Umwelts two events need not happen at once, yet there is no way of telling which event came first. Time may be said to flow, but past-present-future cannot be distinguished from future-present-past. [In other words] […] in eotemporal Umwelts events may be distinguished and identified as well as arranged by sequence, but only succession has any meaning.[293]

Fraser compares this kind of time to a series of notches cut in trees along a route, and not to an arrow pointing in a particular direction. The ends and beginnings of processes can be identified, but they cannot be distinguished one from the other; they should both be described with the same word, which we do not have, since our experience of time is not eotemporal. Here, the causality is deterministic, and the dynamics of this world are expressed in action and reaction. The most representative eotemporal environment is the Newtonian universe of the astronomic solids that form stars, clusters, galaxies and sets of galaxies. The model of this universe consists of 'heavy, cosmological particles distributed in the substratum of first signals and tenuous gas'. This level is the domain of the general theory of relativity.[294]

I would like to note here that the lack of a temporal arrow results in another sense from the very essence of the temporal scales specific to eotemporality. The intervallic scale, understood as the scale of the sizes of time from the smallest to the largest, does not have such an arrow. On that scale, there is neither before nor after, neither past nor future. It extends from infinitely small intervals to infinitely large intervals. In the broadest sense, it constitutes the code of all

291 Fraser 1982, 30.
292 Michon 1983, 4.
293 Fraser 1978, 23.
294 Ibid., 21–24.

temporal sizes that could be manifest in the specific temporal structures of any mechanical system. Also devoid of such an arrow is the reverse of the intervallic scale, the scale of frequency or tempo (in the musical sense, abstracted from space). That scale also extends between infinitely small and infinitely large frequencies, and the categories of before and after do not apply to it. One might accept that scales of duration and frequency have their directions in accordance with an increase in duration or an increase in frequency. Of course, those scales have opposite directions of growth, since frequency is the inverse of duration. It is worth remembering here that the same temporal phenomena can often be defined either with a scale of duration or with a scale of frequency; that depends solely on our decisions, on practical considerations, and there is no answer to the question as to which approach is correct. In real time, it could occur that nothing changes, and our approach to time is different every time. That is because time itself can be defined using different metaphors. Choices and preferences can be individually or culturally conditioned.

The question of the arrow of time is highly complex. The arrow of time only has any meaning if it indicates the direction of movement in relation to something that does not have that direction, something that is a neutral structure, has the inverse direction or even the exact same direction but proceeds at a slower tempo. But what in this time is a neutral structure, conditioning the definition of the arrow of time in relation to it? That will only become clear in bio- and nootemporal time.

The specific properties of the eotemporal level – duration, frequency and tempo – are also musical qualities, but as such they are only manifest when referred to people. In eotemporal time, only physical sizes, measurable on objective scales, are independent of people. All the temporal components of every musical structure can be strictly defined on this level. Here, the musical work is treated as a temporal object independent of humans and the environment, subject to quantitative measures. In the layered understanding of the musical work, the lowest layer, the layer of the sound material, can be assigned to this level of temporality. In accordance with the hierarchic structure of the levels of time, eotemporality encompasses also the properties characteristic of prototemporality and atemporality. The whole of the 'eotemporal space' contains three 'dimensions', as it were: simultaneity, succession and the size of time expressed in duration, frequency and tempo. In Fraser's approach, it would also have to be devoid of direction, which essentially imparts to its eotemporality that unusual expression, but also the limited application to music. It is worth noting, however, that physicists' interpretations in relation to the arrow of time are by no means univocal. Stephen Hawking, in *A Brief History of Time*, has a distinct opinion on this:

> The laws of science do not distinguish between the forward and backward directions of time. However, there are at least three arrows of time that do distinguish the past from the future. They are the thermodynamic arrow, the direction of time in which disorder increases; the psychological arrow of time, the direction in which we remember the past and not the future; and the cosmological arrow, the direction of time in which the universe expands rather than contracts. I have shown that the psychological arrow is essentially the same as the thermodynamic arrow, so that the two would always point in the same direction. The no boundary proposal for the universe predicts the existence of a well-defined thermodynamic arrow of time because the universe must start off in a smooth and ordered state. And the reason we observe this thermodynamic arrow to agree with the cosmological arrow is that intelligent beings can exist only in the expanding phase. The contracting phase will be unsuitable because it has no strong thermodynamic arrow of time.[295]

We will return to the obviousness of the psychological arrow of time in our discussion of the next temporal level, the biotemporal. As we can see, however, an arrow of time is also possible in physical time. A work recorded onto phonographic tape is such a physical object. Its temporal structure can be subjected to comprehensive quantitative analysis. We can measure within it literally everything we like, and with an objective measure independent of humans. We cannot assign to eotemporality, meanwhile, the quasi-temporal structure of the musical work as Roman Ingarden understands it. Although it does have those three 'dimensions' of time – simultaneity, succession and time sizes – those sizes are crucially limited. A fundamental role in the work of music is played not by absolute, physical sizes of time, but by proportions of time, proportions expressed in note values, devoid of physical temporal matter. In live music, musical time is always directed. However, live music belongs to the next level, to biotemporality. Of course, not the live music which is preserved in the form of a recording, constituting an eotemporal physical object, but that which is manifest in a live musical situation, in which living people participate.

A characteristic feature of the atemporal and prototemporal or quasi-temporal levels was that musical form was devoid of physical concreteness and manifested itself in the logic of its structure. The situation alters dramatically on the intervallic, eotemporal level, which employs concrete physical sizes, such as duration, frequency and tempo in the musical sense. In a word, this is the temporality of Newtonian mechanics, identified with the fourth dimension of physical time-space. As Immanuel Kant observed, a single note is a form of vibrating matter. That vibrating matter of sounding music can be subjected to detailed

295 Hawking 1988, 152.

measurements. The physicalist approaches to music typical of modern science are directed towards profiling musical form using scientific methods. So on the eotemporal level, music is a concrete physical object, a mechanical structure, the formal relations of which are described using physical parameters. The concreteness of music is emphasised by its individual, unique features. This is particularly distinct in improvised forms. The model of the maqam, for example, 'realised in individual performances, takes on a different form of musical materialisation each time', asserts Żerańska-Kominek.[296]

As already mentioned, time on the eotemporal level is essentially geometrically conceived of as the fourth dimension of physical time-space. The spatialisation of time is quite common in music. Mozart stated that when composing he imagined the whole of a work: he heard not one element after another, but all of them at the same time. This is borne out by Arnold Schönberg, who asserted that although music is played out over time, the composer conceives of a work as spatial. So this differs from the perception of the listener, who can only survey a work as a whole – its ideas, form and content – after it has played out over time.[297]

The spatial understanding of form is documented in the score. Musical space is often understood in two-dimensional terms, where one dimension is time and the other is note pitches. An additional dimension enables us to represent time in the form of a curve. Arab theorists represented the recurrence of segments of time of various durations in the form of circles of appropriate size. Żerańska-Kominek represented the first instrumental sections of a Bukharan shashmaqam in the form of a spiral on a cylinder or a cone.[298] The height of the cone represented the pitch of the notes, and the spiral represented the succession of time and its duration in particular recurrences.

The same applies to musical instruments. On the structural level, an instrument is a concrete physical object, a mechanical structure, in which relations are described using physical parameters. The laws of Newtonian mechanics apply here. The concreteness of instruments is emphasised by their individual, unique features. Here, the intervallic scale forms the basis for measurements of all kinds of physical properties, including acoustic features. The temporality is eotemporal, distinguishing simultaneity, sequence and temporal sizes; it is a temporal dimension. The spatiality is treated in a similarly physicalist way. This level

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296 Żerańska-Kominek 1986, 239–240.
297 Cf. Rudziński 1987 I, 108.
298 Żerańska-Kominek 1986, 104.

is characterised by four-dimensional time-space. Modern organology strives to be a science, based on experiments and measurements. It is conscious of the role of matter in the construction of an instrument and in the material character of acoustic vibrations. Without physics and its scientific and analytical apparatus, it could not develop.

The physical level of the work of art contains all the features of the previous levels and enhances them with new features. The work as an intentional product receives here an existential foundation, a material form; it becomes a thing. Time and space are understood in physical terms as temporal and spatial dimensions. The time is one-dimensional; the space is three-dimensional. The laws of Newtonian four-dimensional time-space apply. On this level, there is no natural point zero; that point can be set at will, and one can measure sizes from it in the form of temporal and spatial intervals. Neither time nor space has natural directions on this level. Understanding time as a dimension, time without a direction, causes us considerable difficulty. It is hard to grasp it, since our human time is biological time, and that is distinctly centralised and directed; but it belongs to the next level. Physical time does not have these properties – they are superfluous to description of the physical world.

The work of art, although it is an autonomous, intentional product, is also a physical object, and as such it is not devoid of the dimensions of time and space. It is worth bearing in mind the dual nature of time and space. They are dimensions of all existence, including the existence of the work of art, but at the same time they are also autonomous properties of the work of art, its qualities, and as such they also exist in objective dimensions of time and space. So on this level we are dealing not with the existential foundation of a work, but with the full work, in which the properties of the work as an intentional product are materially realised. Without intentionality, a work would be devoid of its own identity; without existential foundation, it could not be noticed, perceived or recorded, its intentional essence could not be revealed. The material realisation of a work of art in the form of a painting, a sculpture, an uttered verbal text, a performed musical concert and so on is not just a replication of an autonomously existing work of art, but of its essence it complements the work of art with new qualities. Nineteenth-century aesthetics introduced a vast distinction between a work and its mediation. In our times, such a standpoint is represented by phenomenology, which hermeneutics, in turn, regards as invalid.

Of the four texts of the musical work distinguished by Tomaszewski, one should invoke here the sound text, were it not so distinctly opposed to the (intentional) musical text and were it distinctly separated from the process of realisation, which requires that the performer be considered, with his or her separate temporality and spatiality. The materiality of the work of art is that which can be recorded from a particular perspective and from a place situated in time and space using a physical apparatus in the form of a photographic, phonographic or cinematographic image. Yet that would be merely the work's existential foundation, different from the actual work, if we did not discern the very essence of the work in its material realisation. Unlike Ingarden, Gadamer regards materiality as a constitutive feature of the work. Such an approach is supported by the hierarchy of the levels of the existence of the work of art, a characteristic feature of which is that each higher level contains also the features of all lower levels.

Scientific discoveries, from Pythagoras onwards, have occasionally triggered a fascination with the physical aspects of music. In our times, the invention of the phonograph was one such milestone. Łucjan Kamieński, for example, tried to reduce scores of folk melodies, transcribed from recordings, to the registering of physical parameters. The creation of music in electronic studios boiled down to manipulating the physical parameters of sounds. Out of the concreteness of physical sound arose the sonoristics of contemporary music and its theoretical expression by Józef M. Chomiński. Scientists are fascinated by physicalist interpretations of music and art.

I would tend towards the idea suggested by Michon, who linked eotemporality with mechanicism and structuralism. Pepper's mechanicism deals with the world in terms of the mutual relations and interaction of elements as components of a mechanical system. That was the dominant view of the world in the eighteenth century, and it is best expressed by the mechanical clock. With De Mey, the equivalent is structuralism, which deals with systems independent of contexts. In philosophy, it is represented by logical positivism. If we add to this the ascribing of the intervallic scale to eotemporality, as is highlighted by Michon, then the sense of this time becomes very clear, although different than how Fraser saw it.

Characteristic of all the levels of relating to music and art discussed thus far was that they were always treated as distinct objects independent of context, as physical, model, notional, symbolic objects, always existing as if outside of people as a living organism. The situation changes diametrically on the next level.

10.4.4 The biotemporal level; the present, past and future

Biotemporality contains the present. Yet for the present to come into existence, a sine qua non is awareness, be it only embryonic. In biotemporality, temporality arises out of life. 'The physiological present is the phenomenological witness to the simultaneities of need which must be maintained if the autonomy of a living organism is to be assured'.[299]

> Organisms are, somehow, capable of displaying organized behavior on the basis of reasonably accurate predictions about what is going to happen, which they derive from an internalized model of the environment. The physiological present represents the necessary 'tuning' interface between the sequence of outer world events and those in the simulated, inner world. This 'tuning' is essential for survival. […] Biotemporality is characteristically the time of irreversible processes: the organic world constitutes the principal battlefield against the increase of entropy. Thus biotemporality has a direction, although it has only very vague 'beginnings' and 'endings'.[300]
>
> As we progress from the simple and cyclic to the complex and aging order of life we observe a series of nows, or 'creature presents', that differ in their quality and scope. Futurity and pastness become increasingly polarized, beginnings and endings increasingly asymmetrical, and the action-reaction connectivities of the eotemporal open up to final-, as well as multiple causation.[301]

Michon links biotemporality to contextualism. Pepper distinguishes contextualism from the mechanicist view, which holds that the functioning of a system depends on the environment. One example of a contextualist system is a thermostat, and one explanatory science is cybernetics. Contextualism is also the 'model of the world' of De Mey, who stresses that knowledge and its objects are influenced by the environment in which they function. On this level, musical time ceases to be an independent object, but functions in a broader system.

Michon also links biotemporality to a quantitative scale, in which zero is defined, and he identifies that zero with the present. Analysis of the zonality of time shows clearly that the present cannot be identified with zero, since it is not a temporal point, but covers a certain zone of time. The present results from our 'attunement' to a range of sizes in which we can only perceive all movement directly. That zone is physiologically conditioned, common to the human race and invariable; hence our present accompanies us for as long as we are aware of our existence. It is to the present that we owe the phenomenon of the flow of time and its division into past, present and future.

On the biotemporal level, the arrow of time (the asymmetry of time, the anisotropy of time), which of course has its correct, formal formulations, is self-evident. The human experiencing of time, however, is richer and changeable. The distinguishable orientations of time appear to head in different, including

299 Fraser 1982, 30.
300 Michon 1983, 5.
301 Fraser 1978, 24.

opposite, directions. They are conditioned by the existence of something that may be called attunement. Time in active attunement, delineated by a sequence of actions, heads from the past through the present to the future; it is expansive and covers ever newer areas of the future. In passive attunement, time passes and heads in the opposite direction, from the future through the present to the past, where it reaches ever farther limits of that past.

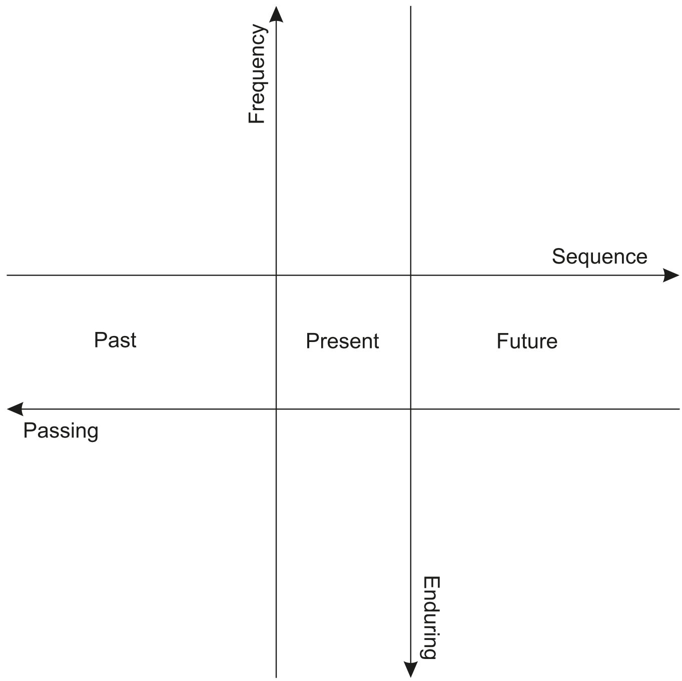
Past	**Present**	**Future**
	SEQUENCE►	
	◄PASSING	

The question arises as to which of these arrows is the right one, according with the passing of time. Is time optimistic sequence or pessimistic passing? Is time memory of the past or anticipation of the future? Is it by nature regressive or progressive? Of course, these are not properties of the nature of time as such, but our temporal attunements. They are metaphors of temporality, to which we may be susceptible in various ways. This is expressed, for example, in the following aphorism:

> Time passes, you say? Oh no!
> Alas, time stands till; it is we who pass.

So not only can time head in different directions, it can also stand still. That is how the time of our present behaves – invariable in that duration for as long as we are aware of existing. Such time is also the result of our temporal attunement. It is a metaphor of temporality to which we may succumb despite our awareness of our passing or our active, purposeful actions. Individuals can have a tendency towards certain attunements of temporality; what is more, entire cultures can differ in this respect. Our world, dominated by production and action, prefers active attunements. We are overcome by a mania for planning and shaping a better tomorrow, to which we are prepared to sacrifice not only the past, but even our present. We hold it against representatives of other cultures that they do not wish to be swayed by this 'only right' (because creative) idea; they would rather live in the present and not worry about the future. Birds do not sow or plough, but they also live. *Carpe diem*. Many such mottos, which from the point of view of our culture appear suspicious in their overtones, have become established in human experience.

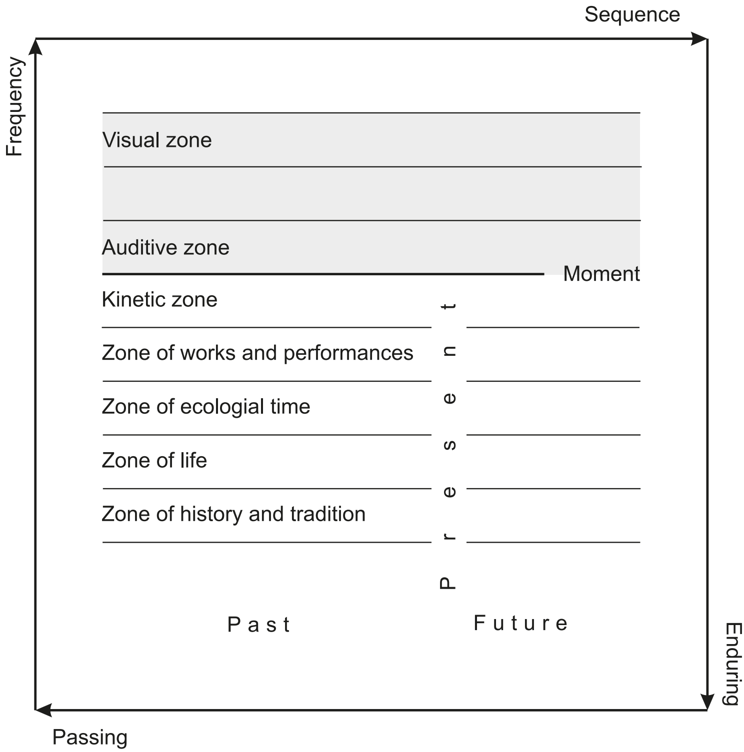
If we attempt to represent the 'directions of time', both the sizes and sequences, we obtain a set of coordinates of two pairs of arrows with opposite directions, and their intersection constitutes the immediate human present.



Example 10.8 Directions to the properties of time.

A fuller model of the directions of time is presented in the next diagram. As we can see, the present has many references; it concerns (1) the kinetic zone (the psychological present), (2) the zone of events (performances of works, musical behaviours and events), (3) the zone of the temporal environment (times of day, month, year), (4) the zone of human life, (5) the zone of history.

There is no present, however, in the succession of periods of acoustic vibrations, so in the auditory and visual ranges. Physics dealing with the frequencies of sound or light waves does not employ the notions of past, present and future; for physics, they are superfluous notions, foreign to the eotemporality which physics essential deals with. The human present may be compared with the attunement of a radio to a particular frequency. Of course, the problem of the perception of musical time has biotemporal foundations. Retention, the recording in the memory of the immediate past, and protention condition our sense of the passing of time and enable us to represent it.



Example 10.9 Zones of time and directions to the properties of time.

As already mentioned, one characteristic feature of the levels of the understanding of musical form discussed hitherto was that a form was always treated as an object independent of context, a physical, logical (notional), symbolic object existing as if outside humans as a living organism and outside the human environment.

The situation alters diametrically on the biotemporal level, on which time is seen from the human perspective. Here, the temporality is centralised; it has a fixed point of reference in the form of the human 'now'. The distinction of the present enables us to distinguish the past and the future, and to experience in our human way the passing of time. (Similarly centralised and centrifugal is the spatiality of the human organism contrasted with its surroundings.) A living organism is attuned to the present, which accompanies it for as long as it is aware of existing. The continuous changing of future into present and past lends time a dynamic, processual character. Musical form receives psychological conditioning. Some theorists approach it in a deliberate and processual way, which at one time was considered to be the modern and scientific way. With Asafiev, 'musical form as process' is contrasted with all static approaches to form, typical on lower temporal levels. For Viktor Zuckerkandl:

> Music freed from the material bonds of visuality represents movement and time in their pure form, since it is movement and space alone. It creates a picture that cannot be seen or touched, a non-spatial form of becoming. Music opens up for humans a completely new world of symbols – symbols of time, movement and change. Constructed from movement and time, it presents the temporality of the phenomena of the outside world, at the same time recreating psychical and physical, subjective and objective experience. In reality, however, it goes beyond both those domains; it belongs to a third level, in which the distinction between that which is physical and that which belongs to the psyche ceases to exist.[302]

Susanne Langer draws particular attention to the emotional character of music, conditioned by the existence of a living subject, and the assertion that music is a sounding analogy of feelings becomes the main thesis of her philosophy of music.

> The tonal structures we call 'music' bear a close logical similarity to the forms of human feeling – forms of growth and of attenuation, flowing and stowing, conflict and resolution, speed, arrest, terrific excitement, calm, or subtle activation and dreamy lapses – not joy and sorrow perhaps, but the poignancy of either and both – the greatness and brevity and eternal passing of everything vitally felt. Such is the pattern, or logical form, of sentience; and the pattern of music is that same form worked out in pure, measured sound and silence. Music is a tonal analogue of emotive life.[303]

That 'pure, measured sound and silence' is a trace of a return to the eotemporal level in this distinctly biotemporal description.

The external relations of musical form could be considered more systematically; in that, the zonality of human time would be helpful. This is important in that the cultural sense of musical forms is manifest in those relations. I have already spoken about relations to musical language. Language obviously affects the sense of a maqam, and that sense can shed light on the way in which maqams are spoken of in a particular environment. The zonality of time inclines one to distinctly separate natural or musical language and linguistic or musical

302 Żerańska-Kominek 1986, 235, after Zuckerkandl 1973.
303 Langer 1953, 27.

utterances, which belong to the next large zone of human time, the zone of works, performances and musical events.

On the biotemporal level, a musical instrument is seen within the context of the person playing it, and it becomes that which it is in essence – a tool of human action, a transformer of human motoric gestures occurring in a somatic (and physical) space into motoric gestures in auditory space. This is covered by playing technique. An instrument is characterised by a whole system of performance and musical possibilities. The temporality is biotemporal, centralised with the immediate human present, enabling us to distinguish the past and the future, to experience the flow of time on the elementary level of direct human action, and to recognise movement (this is possible in the zone of the human present). Similarly centralised is the spatiality of the human organism as an active subject in the surrounding world. From this centrifugal space, people act on the external object that is the musical instrument, and through the instrument on the environment, on the whole musical event.

Playing on specific instruments has always attracted interest, not just in practice, but also in scholarly reflection. One peculiar feature of our times is that a general science of instrumental playing is beginning to emerge. It is far from the systematisation of its own object of interest. One can study the effect of playing instruments in the form of music brought to life, the actual process of playing, manipulating an instrument with the organs of the human body, an effect of which is a musical form, and also the psychology and physiology of playing. One can also study the mental patterns that enable the playing process and its effectiveness to be controlled.

On the organic level, an instrument becomes a means of musical communication, distinguishing between emitter and receiver; the conditions of the existence of a physical channel making transmission possible are also fulfilled (this was ensured by the previous level); the process of communication is possible.

Musical instruments and instrumental music are usually contrasted with the human voice and vocal music. Paradoxically, our knowledge about the human vocal organ as a natural musical instrument is rather limited, incomparably poorer than our knowledge of the organ of speech. Thus far, the musical possibilities of the human voice have yet to be systematised. We know the foundation of the sound system of language relatively well; we have yet to obtain solid theory of the foundations of vocal music, the musical possibilities of the human voice and the way it is used in different cultures.

Descartes's famous *cogito, ergo sum* opens up new possibilities for interpreting the world, including the work of art, since it compares the work as an object of awareness with the living organism of people, with their own temporality and spatiality. This is temporality and spatiality centralised with the human here and now, so it has its fixed, natural point zero; it is centrifugal, orientated and directed, so it has a distinct arrow of time. The present enables us to distinguish the past and the future, to recognise movement and all processes. Thus it differs decidedly from the four-dimensional time-space of the physical world; it contains its properties, but it adds to them new properties, which alter its essence entirely. Life enriches and varies the temporality and spatiality of the work of art.

The work of art is realised and manifest always in the time-space of direct activity. It represents the fixed temporal perspective of people and accompanies them for as long as they are aware of their existence. From this perspective, people hear, although acoustic waves have much higher frequencies than can be captured through direct observation. From this perspective, people see, although light waves have unimaginably high frequencies and disperse with the speed of light. Only from this perspective do people set their own body and their own thoughts in motion; from this perspective, people receive signals from the outside world; it is also solely from this perspective that people are able to influence the outside world with their actions. Because every person is attuned to the same range of the immediate present, to the same range of audible sounds and visible colours, communication is possible among people.

The level of the immediate present and spatiality is determined by the range of the human organs of movement and the range of short-term (seconds-based, operational) memory. It manifests itself in every field of art. It enabled us to separate the language realised in the immediate present from linguistic utterance exceeding the immediate present, and consequently to distinguish linguistics and literary studies. In other fields of art, similar distinctions are also fully justified, and their lack attests to a theoretical paresis of those disciplines.

The time-space of direct action is a crucial property of humans as living organisms. All creative, performance and perceptual activity is only possible in the immediate present, where thinking, speaking, singing, playing, dancing, playing theatrical roles, sketching, painting, sculpting, constructing, observing the behaviours of living creatures and perusing artistic objects take place. Only in this time-space is it possible to communicate with the outside world. All human activity can only occur in the immediate present and the immediate spatiality of the human organism.

All creative activity imparts meaning to action; it speaks, as it were. This applies, of course, to language different from natural language. It is breaking up action, perceiving its elementary components and using them to build complex figures that in turn serve to construct or to receive the whole of a work. A work becomes a message, which reaches the receiver through the process of transmission; it becomes a language of communication, and only through such a process of sensory hearing or sensory seeing is reception possible.

Every work of art speaks to human self-understanding. All art arises out of playing; without playing, no work could come into existence. Play is a feature of life,

> a self-movement that does not pursue any particular end or purpose so much as movement as movement, exhibiting so to speak a phenomenon of excess, of living self-representation […] The genuine reception and experience of a work of art can exist only for one who 'plays along', that is, one who performs in an active way himself. [The identity of a work of art] consists precisely in there being something to 'understand', that it asks to be understood in what it 'says' or 'intends'. The work issues a challenge which expects to be met. It requires an answer – an answer that can only be given by someone who accepted the challenge. And that answer must be his own, and given actively. [Interpreting a work involves] performing a constant hermeneutic movement guided by the anticipation of the whole, and finally fulfilled by the individual in the realization of the total sense.[304]

As a result of creative and performance activity, people forge an intersubjective work of art in the outside world. As a result of perceptual activity, people shape in the inside world a monosubjective aesthetic object, which requires a constant memory. The products of activity cannot be identified with the processes of their creation; artistic utterances cannot be identified with the language used to make them; products have their own spatiality and temporality; they belong to the next level in the existence of the work of art.

10.4.5 The level of artistic events, participation

The work of every art lives and manifests its sense in performance and perceptual events. It opens up before us a new area of interpretative possibilities. Here, the temporality and spatiality are conditioned by all the properties of the previous levels and enhanced with their own properties, determined by the duration and place of an event in which living people participate. The time of a musical event and of artistic events in general is an unusual time, a time of exceeding normal existence, a time of participating in a game, which the work initiates. As Gadamer states: 'everyone involved in play is a participant. It should also be true of the play of art that there is in principle no radical separation between the work of art and the person who experiences it'. The work has its own internal time and its own internal space, which are activated in performance and perception events. The

304 Gadamer 1986, 23, 25–26, 28.

drama of the process is played out over phases of tensions and releases; it engages one's thoughts and feelings, triggers moods and emotions. 'The word "event" is associated with a gift. What is "given" in an event is a new meaning, a new order to the world that surrounds people, a new sense to the uttered words', claims Józef Tischner.[305] Not only words – one might add – but every artistic utterance.

Performance arts in particular create situations of collective participation and coordinate the course of a perceptual process. They create their own spatiality and temporality, but conditioned also by the properties of all the previous levels in the manifestation of the work of art. The plastic arts leave viewers the freedom to shape the perceptual process; guides in galleries attempt to regulate and coordinate that process with their commentaries.

Spatial works make it easier to embrace the whole of a work, but they require that the receiver activates the process of imparting meaning to them, listening intently to what they are saying. Performance works essentially speak their own language, but capturing the sense of their totality requires the receiver's activeness, their capacity for synthesis. It is not easy to grasp a work of music in its entirety.

Each work of art has its own time, which we recognise, and that applies not only to ephemeral arts, such as music, dance and speech. Also when looking at paintings, we read and build in a way. This becomes even more obvious when we consider the work of architecture: 'we have to go up to the building and wander round it, both inside and out. Only in this way can we acquire a sense of what the work holds in store for us and allow it to enhance our feeling for life'.

So the effect of this experience leads us onto a higher level of existence. The same will occur in our experiencing of art, in which, thanks to the work, we learn a specific manner of dwelling.

> When we dwell upon the work, there is no tedium involved, for the longer we allow ourselves, the more it displays its manifold riches to us. The essence of our temporal experience of art is in learning how to tarry in this way. And perhaps it is the only way that is granted to us finite beings to relate to what we call eternity.[306]

Here again, the effect of this dwelling will lead us onto a higher level of existence, in which eternity will reveal its sense. The same may be said about the vivid description of a musical scene that Umberto Eco included in his novel *The Name of the Rose*. It is night in a mediaeval abbey, and the monks are learning part song:

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305 Tischner 1998, 120.
306 Gadamer 1986, 45.

> When we reached the end of the office, the abbot reminded monks and novices that it was necessary to prepare for the Christmas High Mass; therefore, as was the custom, the time before lauds would be spent assaying the accord of the whole community in the performance of some chants prescribed for the occasion. That assembly of devout men was in effect trained as a single body, a single harmonious voice; through a process that had gone on for years, they acknowledged their unification, into a single soul, in their singing.
>
> The abbot invited them to chant the 'Sederunt' […] On the first syllable, a slow and solemn chorus began, dozens and dozens of voices, whose bass sound filled the naves and floated over our heads and yet seemed to rise from the heart of the earth. Nor did it break off, because as other voices began to weave, over that deep and continuing line, a series of vocalises and melismas, it – telluric – continued to dominate and did not cease for the whole time that it took a speaker to repeat twelve 'Ave Maria's in a slow and cadenced voice. And as if released from every fear by the confidence that the prolonged syllable, allegory of the duration of eternity, gave to those praying, the other voices (and especially the novices') on that rock-solid base raised cusps, columns, pinnacles of liquescent and underscored neumae. And as my heart was dazed with sweetness at the vibration of a climacus or a porrectus, a torculus or a salicus, those voices seemed to say to me that the soul (of those praying, and my own as I listened to them), unable to bear the exuberance of feeling, was lacerated through them to express joy, grief, praise, love, in an impetus of sweet sounds. Meanwhile, the obstinate insistence of the chthonian voices did not let up, as if the threatening presence of enemies, of the powerful who persecuted the people of the Lord, remained unresolved. Until that Neptunian roiling of a single note seemed overcome, or at least convinced and enfolded, by the rejoicing hallelujahs of those who opposed it, and all dissolved on a majestic and perfect chord and on a resupine neuma.[307]

Let us pass to an example from oriental culture. The maqam is a highly organised musical utterance of impressive dimensions; in Tajik-Uzbek tradition, it is a kind of suite, at least it was at the end of the nineteenth century.

The shashmaqam existed in oral transmission as a collection of six large cyclic works, each of which consisted of one instrumental part (an instrumental cycle) and two vocal (vocal-instrumental) parts. That collection fulfilled two functions: each of the six maqams was treated either as a cyclic work of impressive dimensions, lasting around two or three hours, or as a collection of works performed separately.[308]

On this level of time, we are interested primarily in the fact that the maqam is a way of organising a specific musical situation, a specific musical event, in which living people take part. The maqam cycles of the Tajik-Uzbek tradition

307 Eco 2004, 403–405.

308 Żerańska-Kominek 1986, 46.

were performed in ensemble; their presentation was characterised by a strict observance of the division of performance roles.

> The instrumental ensemble was specialised in the performance of vocal parts. This ensemble comprised around seven instrumentalists, playing on the tanbur, tar, kobuz, gidjak, 'nay' flute and dojra […] or two tanburs, dutar, kobuz or sato and dojra […] The vocal parts were accompanied solely by tanbur and dojra, as was noted in the oldest publications and recordings from 1909 and 1939.
> The singers performing the vocal cycles were divided into specialists in particular types of part (nast, talkin, sawt); this was strictly dependent on their vocal dispositions. One vocalist could not bear the weight of the vocal difficulties (mainly due to the distribution of the melody over several registers), which is why two or three singers helped present a shashmaqam, swapping over as the performance unfolded. It should be stressed that the specialisation of musicians in the performance of maqams represents a very important feature of Tajik-Uzbek musical practice, and at the same time a peculiarity of that practice in the tradition of the Middle East; no performer had to know the cycle from beginning to end, which probably contributed to its subsequent disintegration.[309]

In the zone of musical events, measured in minutes, and even hours, the maqam form develops, and emotional states, moods and symbolic meanings take shape. The maqam served as a means of rousing people to meditation and prayer. It helped to tear people away from the realities of everyday life, and in states of ecstasy it could be a source of atemporal experience, free from awareness of the time of passing or simply a source of aesthetic experiences. Here is Żerańska-Kominek again:

> It is in music above all that the main idea of Arabic-Muslim art concentrated on the Sacred is realised, the idea of art that is meditative prayer. In traditional cultures, however, understanding an artistic act as prayer is not a romantic metaphor. The common goal that is the projection of the Absolute determines the unity of the means employed, which include the conscious steering of mental processes through ritual acts based on a constant model. The process of creative meditation does not differ from the creative artistic act that materialises an inner vision, subordinated to the structure of the 'canon of mental iconography'. Yet music does not represent iconic forms; it is not the visual materialisation of signifying internal images; it represents the actual process of creation, the 'movement of awareness', its development and change. So the dynamism of the musical form represents the dynamics of the ritual meditative process, and the structure of mental experience that it contains determines the canon, the model of artistic musical expression.

309 Ibid., 46–47.

The completion of a process of ritual transformation in a dynamic interplay of tensions, forces and sound expectations equates to the fulfilment of the musical work as an autonomous aesthetic entity, and also to the definition of its meaning as a dynamic symbol of the creativity of God, the Holiest Sound, from which derives music and all that exists. The medium of creative dynamism in the classical music of the cultures of South-Western and Central Asia is the mode (maqam), which, when interpreted in the context of a formulary musical process, reveals the real sense of the symbolic meanings attributed to it.[310]

Also belonging here is the problem of represented time, which exists even in musical genres, as Zofia Lissa attempted to show.[311] I would also include here the issue of the changeability of the tempo to the flow of time depending on the intensity of attention. Time as thus conceived may be consciously shaped by the composer, as Andrzej Dobrowolski indicated in analysis of his musical works.

On this level, the musical instrument is also defined within the context of specific musical events in a specific place and time, in which living people take an active part. In the handbook of European folk instruments,[312] there is mention solely of musical repertoire (*Spielrepertuar*). In reality, we are dealing here with a whole musical event and everything that belongs to it. This may be solo playing or ensemble playing. We will recall that ensembles are distinguished in the handbook as a separate problem, earmarked for discussion at the end of particular volumes. From the point of view of the adopted systematics of knowledge, ensembles also belong to this level, as do all active and passive participants in a musical event. Here, the temporality and spatiality are defined by joint musical activity in a given time and a given space.

In musical knowledge in general, there is increasing awareness of the distinction in research of the process of playing, which belongs to the previous level, from the results of that playing in the form of works; an awareness of the differentiation of musical language and musical utterances.

Traditional musicology has tended to place the musical work at the centre of its interests. Today, the work is losing that dominant and seemingly inviolable position in favour of culturally conditioned musical performance. The musical event is something more primary than the musical work. The musical event can be defined, for example, in terms of the method of its creation, and it need not involve the performance of a particular work.

310 Ibid.

311 Lissa 1964.

312 Cf. Emsheimer and Stockmann 1967.

It is worth invoking here the differentiation of discourse as event and meaning. Discourse as event is what interests us above all at this point, since it belongs to this level of existence; it is realised materially here and now between the participants in the discourse, whereas its meaning is of a different nature; it is essentially atemporal. If all discourse is actualised as an event, then all discourse is understood as meaning. Thus states Ricoeur, who also writes:

> Some linguists have attempted to reformulate all the functions of language as variables within an all-encompassing model for which communication is the key. Roman Jakobson, for example, starts from the threefold relation between speaker, hearer, and message, then adds three other complementary factors which enrich his model. These are code, contact, and context. On the basis of this six factor system he establishes a six function schema. To the speaker corresponds the emotive function, to the hearer the conative, to the message the poetic function. The code designates the metalinguistic function, while the contact and the context are the bearers of the phatic and the referential functions.
>
> This model is interesting in that it (1) describes discourse directly and not as a residue of language; (2) describes a structure of discourse and not only an irrational event; and (3) it subordinates the code function to the connecting operation of communication.
>
> But in turn this model calls for a philosophical investigation, which may be provided by the dialectic of event and meaning. For the linguist, communication is a fact, even a most obvious fact. People do actually speak to one another. But for an existential investigation communication is an enigma, even a wonder. Why? Because being-together, as the existential condition for the possibility of any dialogical structure of discourse, appears as a way of trespassing or overcoming the fundamental solitude of each human being. By solitude I do not mean that fact that we often feel isolated as in a crowd, or that we live and die alone, but, in a more radical sense, that what is experienced by one person cannot be transferred whole as such and such experience to someone else. My experience cannot directly become your experience. An event belonging to one stream of consciousness cannot be transferred as such into another stream of consciousness. Yet, nevertheless, something passes from me to you. Something is transferred from one sphere of life to another. This something is not the experience as experienced, but its meaning. […]
>
> The instance of discourse is the instance of dialogue. Dialogue is an event which connects two events, that of speaking and that of hearing. It is to this dialogical event that understanding as meaning is homogeneous. […] What can be communicated is first of all the propositional content of discourse […] Because the sense of a sentence is, so to speak, 'external' to the sentence it can be transferred; this exteriority of discourse to itself – which is synonymous with the self-transcendence of the event in its meaning – opens discourse to the other. The message has the ground of its communicability in the structure of its meaning. This implies that we communicate the synthesis of both the identification function (of which the logical subject is the bearer) and the predicative function (which is potentially universal).[313]

313 Ricoeur 1976, 15–16.

The same applies to ecstasies as to discourse: they are events in which living people participate, but their sense and meaning are detached from the reality of this level of existence; they become specific qualities that are by nature timeless. Fraser,[314] after Lewis E. Rowell, invoked relevant examples referring to music, which I will outline here.

The ecstasy of the forest is characterised by concentration on a single invariable object or process. 'The being-like component of the existential stress is thus emphasized and the becoming-like repressed; the unresolvable conflict of individuation lessens and the Umwelt of the mind becomes one that resembles the eotemporal', in which disappears not only the direction of time, but also the sense of the sequence of time; the definition of the present and of personality becomes loosened or the present becomes absolute, disconnected from the past and the present. The ecstasy of the forest is suggested, for example, by Kinto Minezaki's work *O Zangetsu* [Morning moon]. Its melody, in a traditional Japanese ensemble comprising koto, shamisen, shakuhachi and female voice, conveys the atmosphere of the timelessness of a landscape. In the context of being outside time, Fraser also invokes the orchestral introduction to Benjamin Britten's opera *Peter Grimes*. That is a metaphor of the quiet contemplation of the infinity of the sea merging on the horizon with the vault of the sky.

The ecstasy of the bower generated by sexual intercourse triggers a mood of timelessness combined with a drop in the level of awareness, which is characteristic of sleep. A vivid description of the ecstasy of the bower is the orchestral introduction to Richard Strauss's opera *Der Rosenkavalier*. According to Fraser, a careful listener will discern both female and male orgasms transformed into music and will notice a blissful post-coital languor, after which the curtain rises to show the Marschallin and the young Octavian in bed.

The ecstasy of the dance, meanwhile, confines attention to constantly changing continuous movement. This is a different, very old method for loosening the weight of individuation. The tension of one's personality decreases, the direction of time fades from one's awareness and the environment of music is atemporal. In these ecstasies, claims Fraser, natural selection comes to the fore, with the tendency to pursue actions that ensure people of the survival of their species. A sexual attunement causes people to fall into the timelessness of the dance, which is often followed by the ecstasy of the forest and the ecstasy of the bower. One musical representation of the ecstasy of the dance is Maurice Ravel's *Bolero*,

314 Fraser 1978, 282–283.

a brilliant, masterful orchestral work consisting of the uniform, insistent, hypnotic crescendo of a single repeated rhythmic pattern.

Fraser links the ecstasy of the chalice to religious and political systems, which employ many methods to helping weaken the irremovable tension of personality.

> The promise of lessening tension attracts and keeps people in the fold. The *ecstasy of the chalice* of Christianity is one means whereby the individual may experience an oceanic feeling of eternity and then journey back to self-awareness and serve the ideology of the chalice.[315]
> The ecstasy of the chalice may be exemplified by the waves of Gregorian chant. Its melodies speak of a period when eternity was the most important category of time.[316]

Fraser mentions that when listening to *Ubi caritas et amor, Deus ibi est*, a hymn sung during the washing of the feet on Maundy Thursday by brethren of the Monastery of St Pierre de Solesmes, he felt united with God in Christ. A Pagan version of that ecstasy might be the orchestral introduction to Richard Wagner's *Das Rheingold*. This is music of the creation of the world in Teutonic cosmogony: the surging waves of the Rhine flow forth from its original spring.

Fraser calls drug-induced states the ecstasy of the mushroom. He does so in tribute to the mysterious and poisonous fly agaric.

> Alcohol was the not-so-secret weapon of the slave traders of the 17th and 18th centuries, and has remained that of some of the slave states of the 20th century. Heroin has been a weapon of Oriental militarists of our own epoch, both Japanese and South East Asian. Drug-induced loss of the sense of time has often been regarded as divine in origin. In our secular epoch drug-induced states of consciousness are often described as transcendental.[317]

A musical depiction of this ecstasy is *Ork Alarm*, a 'mind-blowing, experimental rock composition' by the Turkish composer Jannik Top.

The ecstasy of the mob, in Fraser's opinion,

> places the individual in a prototemporal situation, because from the point of view of the collective, he is countable, but otherwise indistinguishable from other members of the mob. Appropriately, the frenzy of mob action appears to the participant as an experience of a long present without well-defined futurity or pastness, wherein the gnawing issues of hope, memory, guilt, and responsibility have little or no significance.[318]

315 Ibid., 282.
316 Ibid., 300.
317 Ibid., 282.
318 Ibid., 283.

> […] what can better illustrate the ecstasy of the mob than the stirring music of *La Marseillaise*: 'Allons, enfants de la patrie! Le jour de gloire est arrivé!' From the point of view of 'la patrie', 'les enfants' are countable but otherwise indistinguishable members of a prototemporal ensemble. In terms of 'la jour de gloire' there is only a long present, without future or past.[319]

Distinctly atemporal are ecstasies not just illustrated by music, but triggered by music, such as a trance. Trance was a common phenomenon in primitive cultures, but it is by no means exceptional today. Many people, when listening to or performing any music, experience some degree of trance; one can enter into a mood of meditation, elation or detachment from reality. Musical means for expressing timelessness are encountered all over the world. There also exist kinds of music aimed mainly at inducing a trance (*trance music*).

10.4.6 The level of the natural and cultural environments

Marcelino Cereijido describes the role of cosmic cycles in shaping the time of the natural environment of life of Earth, and as a result also in the evolution of the human sense of time:

> The steady flow of solar energy through prebiotic chemical systems forced them to undergo material cycles, and this cycling was inherited by living organisms. Organisms whose cycling synchronized with periodic phenomena, such as day/night and seasonal variations were favored. At a later stage, evolution also favored organisms that, besides of a synchronized cycling, developed a 'sense of time' to cope with non-cyclic and unique events in the environment. In the case of human beings, this 'sense of time' was used to detect causal chains (cause → effect), combine them to produce dynamic models of reality, and transform real time scales into mental time scales (it takes a moment to remember a year-long phenomenon). The 'sense of time' constituted a decisive evolutive advantage, because it enables humans to analyze a multitude of future possibilities, and choose the most promising one.

Cereijido takes the opportunity to pose an even more fundamental question. What essentially is time? Is it a feature of objective reality or perhaps just a property of our mind? He does not give a final answer. Continuing his previous idea, he writes:

> Yet 'sense of time' is just an empty metaphor, because it is not a true 'sense', and we ignore what 'time' really is. Most scientific disciplines simply take for granted that there is a 'time flowing from future to past'. Biologists […] cannot adopt this attitude because

319 Ibid., 300.

> ‘time’ may very well be an intrinsic property of our mind, i.e., a peculiar aspect of brain physiology.[320]

In our opinion, there is no unequivocal answer to this question. That is precisely why we broke down the problem of time into many levels and zones, since each of them has a different profile and essentially leads to different conclusions.

The natural environment of life on Earth, the temporal environment delineated by times of day, phases of the moon and seasons of the year, and the spatial environment are managed by humans through their activities. Differentiating the functions of specific places in time and space, people have adapted them to meet fundamental life needs and shaped the cultural environment in which a specific role is played by works of art and manifestations of aesthetic behaviours. There is no need to justify how much the sense and meaning of works of art depends on their place and function in that environment. Also manifest in the environment are the relations between works, which are revealed by comparative studies, classifications, typologies and genologies.

The human environment has been shaped by lengthy processes, about which we do not normally remember. It is characterised largely by constant elements of life on Earth. The changeability of the temporal cycles of the environment has been formed into a fixed calendar defining the periods of work and rest, everyday life and celebration, heightened artistic activity and its relinquishment; the calendar is regulated by preferences, injunctions and prohibitions. The natural spatial environment has also been transformed, adapted to human life. Places of work, dwelling and rest have been designated, as have places of celebration and of the satisfying of artistic needs. Works of art play an eminent role in differentiating space, and their function is specialised.

The environment is a place of creative activity, where people add their contributions to what others created before them. In the environment, that which is new exists within the surroundings of that which is old and represents a lasting reminder of past times. In the environment, deep past time is preserved in the present. The mother of the Muses, Mnemosyne, goddess of memory, preserving and reminding, has inscribed her products in the environment.

With regard to art, a special role is played in the environment by the time and place of celebration. Art has a great deal in common with celebration, above all multiple levels of existence. A celebration distinguishes the cultural environment in time and space, but at the same time it manifests the social sense of that

320 Cereijido 2001, 107.

environment; a celebration expresses a worldview and introduces into the environment the properties of the highest regions of existence.

> It is of the nature of the festival that it should proffer time, arresting it and allowing it to tarry. That is what festive celebration means. The calculating way in which we normally manage and dispose of our time is, at it were, brought to a standstill.[321]

In some situations, the natural environment of humans can underpin aesthetic experiences. Gadamer points out that 'Kant's definition of the autonomy of the aesthetic […] provided an orientation for further advances in this respect'. More profound analysis of aesthetic experience shows that it is not nature itself that is the source of beauty; rather, our culture, our artistic behaviour, has taught us to observe nature in that way. Gadamer reminds us that still in the eighteenth century travel reports described the Alps as

> terrifying mountains whose ugly and fearful wildness was experienced as a denial of beauty, humanity, and the familiar security of human existence. Today, on the other hand, everyone is convinced that our great mountain ranges represent not only the sublimity, but also the exemplary beauty of nature.[322]

So the aesthetic experiencing of nature is a property of humans shaped by their life in culture, of personal experience and social history, and as such it belongs to the next zone of existence. Close to our understanding of the environment is what Tischner calls the 'scene of the human drama'.[323] The human drama is the drama of human life played out from birth to death and so belonging to the next level of existence. Yet that drama is also played out on the stage of the culturally shaped environment.

Music ecology, knowledge about culturally shaped musical environments and their conditions, is perhaps the most neglected of fields, and at the same time its cultivation and penetration is becoming a matter of urgency. We associate the environment primarily with space, with the natural space of life on Earth, devastated by humans' exploitative activity and destruction of nature. That understanding has been imposed upon us by modern science and by social ecological movements. Yet the environment is not only the natural space managed by humans. It is also time; it is a natural zone of time, regulated by cosmic rhythms. The natural temporal environment has also been upset by our activities, polluted by noise and unwanted music, disorganised by the mass media, by

321 Gadamer 1986, 42.
322 Ibid., 30.
323 Tischner 1998.

information noise, which fosters personality disorders and a loss of individual and social identity. But here we come to the next level of knowledge. Remaining within the zone of the temporal environment, I would like to invoke the example of the maqam.

The maqam is an element of a specific culturally shaped musical environment within the natural temporal human environment, delineated by the cycles of the times of day, month and year. Within that space of time, a variety of music can be heard. In traditional culture, the time and space of the performance of particular music are regulated by customs, prohibitions, injunctions and preferences. The maqam is something else entirely in traditional culture and today in the new environment, and that would be true even if its form in sound had not become altered. A connection with the annual cycle is manifest, for instance, in the linkage between maqams and the signs of the zodiac. Darvish Ali Changi puts it as follows:

> Maqam Rost – Aries; maqam Isfahan – Taurus; maqam Irok – Gemini; maqam Kuchak – Cancer; maqam Buzurk – Leo; maqam Hijoz – Virgo; maqam Busalik – Libra; maqam Ushshok – Scorpion; maqam Navo – Sagittarius; maqam Husayni – Capricorn; maqam Zangula – Aquarius; maqam Rahawi – Pisces.[324]

Al-Ansari, meanwhile, lists seven maqams that correspond to the seven days in the week:

> Maqam Hijaz – Sunday; maqam Nuruz – Monday; maqam Rast – Tuesday; maqam Zawil – Wednesday; maqam Kuwasht – Thursday; maqam Rahawi – Friday; maqam Shaynez – Saturday.[325]

In addition, maqams have been linked to the times of day; there have been maqams of the day and of the night or indefinite in that respect.

These remarks can also be referred to instruments, which can thus be seen within the context of the musical and sound environment in which every culture exists and which culture forges, incorporating musical behaviours in qualitatively differentiated diurnal cycles, menstrual (lunar) cycles, with days and weeks, and cycles of the seasons, organised into agrarian, cultural and religious calendars, in which playing on various instruments is regulated by customs and preferences, injunctions and prohibitions. Particularly important for music in general is the time of celebration. This covers annual rites and the place of musical instruments within them, but not just that. All musical activity is somehow ordered in the

324 After Żerańska-Kominek 1986, 24.
325 Ibid., 107.

temporal cycles of our environment. There are times of day and seasons of specific musical activity, when suitable instruments are played and hold specific functions, whereby they acquire their peculiar meanings and constitute something in the overall picture of a given culture. Similarly culturally differentiated is the space of the environment, with sacred and profane places. Not everywhere can one play on all instruments, while there are places where a specific playing is preferred.

> The Umwelt [environment] of the mind is *nootemporal*. Beginnings and endings are well defined and form the bases of private cosmologies whose central theme is personal identity. The 'mental present' of man is lodged between his future and past. Its boundaries are ill-defined, for its contents vary continuously with the changing scope of expectation and memory. This is the Umwelt of the symbolic transformation of experience into signals and signs through which man communicates his thoughts and feelings. The connectivities of lower Umwelts are enlarged to include the functions of free will. This is the world often described as that of human time, or the arrow of time, or time asymmetry.[326]

Let us remember that the arrow of time manifests itself in biotemporality and that awareness of its existence is only fully manifest in nootemporality. Fraser asserts that: 'Out of many organic forms a single one evolved into human life, characterized by a highly developed central nervous system, including a very complex brain'. He defines this system, which is marked by 'the mental activity of the human brain', as noetic. Fraser is inclined to distinguish another less distinctly differentiated level, namely, the societal level, 'comprised of the collective work of human minds'. However, I am more inclined towards Michon's suggestion that we do not distinguish that level from the noetic level, since it is only in the environment of the minds of other people that the human mind is capable of revealing its properties and capacities. Of course, sciences of the mind, knowledge and society deal with this more broadly conceived level of nature.[327]

Michon links nootemporality to organicism and cognitivism. Pepper's organicism recognises the structural and functional dependency of the organism on the environment. He takes into account development and learning, and he recognises the uniqueness of personal history and focusses on concepts referring to self-organisation. In De Mey, an equivalent of organicism is cognitivism. In the writings of Thomas S. Kuhn, meanwhile, this is manifest in a paradigmatic approach to the philosophy of science.[328] According to that view, knowledge is not

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326 Fraser 1978, 24.

327 Ibid., 22.

328 Kuhn 1970.

influenced by external factors alone, but also by the (self-organising) pressures of an academic community. The object of study on this level consists of 'models of the world' or 'basic metaphors'. It is stressed that subjects arrive at knowledge and experience by relying on their perception and action.[329]

There is nothing preventing us from applying such models also to music and musical knowledge. It is more difficult, meanwhile, to divine any justification for linking with nootemporality the absolute scale containing a specific unit of measurement. Michon regards the identity of the human individual as such a specific unit.

According to Fraser, it is only in nootemporality that awareness of the present and the future are fully constituted. That awareness spawns the whole existential problem of time. It is here that human anxieties and fears manifest themselves, as does the problem of responsibility and freedom. Humans create for themselves a vision of the time of existence, of their own beginning and destiny; they fill it with faith, conviction and knowledge. Time fully acquires a human sense.

Views of time and of its role in human life are subject to historical and cultural change. Culturally reinforced visions of time help to shape music and its sense for people.

I wish to stress that neither the hierarchy of the zones of time nor the hierarchy of temporal levels is a hierarchy of values. Each range or level is important in the system of musicology and has different tasks to accomplish. It should be remembered, however, that musical knowledge is immune to changing fashions; hence specific research trends determine their own preferences within that system.

In general terms, one may say that the ranges of time show the superior and inferior levels of the segmentation and organisation of time, whilst the hierarchy of the levels of time is a model for the elaboration and reduction of the properties of time. Time ranges make it possible to define the real structures of musical time, whereas the levels of time serve as metaphors of the temporality of music. Time ranges make it possible to define the subject ranges of musicology, whilst the levels of time determine the cognitive schemata forming the methodological foundations of musical knowledge.

10.4.7 The level of individual and communal life

Life is a universal model of change. People are born, pass through the various stages in life – infancy, childhood, youth, maturity and old age – and die. The stages of life are linked to various experiences of spatiality. We are aware of how

329 Michon 1983, 15.

experiences, competences and aesthetic preferences change within that time-space of life, of how different meanings are revealed even by the same artistic works when compared to the ages of man. People aware of their own identity, aware of their personal history and of history in general, have their own attitudes toward works of art. In contact with works of art, people form their aesthetic awareness.

Generations linked by a common living space may differ from one generation to the next in many respects, including preferences in relation to works of art and the ways in which they are seen. Individuals and social groups preserve memory of experienced history in which artistic works and experiences discharged their roles. It is said that the time of a given era permeates art and vice versa, works of art express their time. Then, however, the category of time becomes something mysterious and intuitive; it exceeds the bounds of direct experience and opens up a new level of temporality and spatiality.

We have previously described celebration as a property of the culturally shaped human environment. Yet celebration also has a social character. 'A festival is an experience of community and represents community in its most perfect form. A festival is meant for everyone'. Gadamer emphasises that such a marked distinction of celebration is something that we in our time, as a society, are unable to feel or experience.

> Celebrating is an art, and one in which earlier and more primitive cultures were far superior to ourselves. If we ask ourselves what the real nature of this art is, then obviously we must reply that it consists in an experience of community that is difficult to define in precise terms. Furthermore, it is a community in which we are gathered together for something, although no one can say exactly for what it is that we have come together.

Here, the similarity to the artistic event and the communal experiencing of a work of art is obvious:

> celebration has its own specific kinds of representation. Its established and customary forms have all been hallowed by ancient usage, so that we have become accustomed to doing things in a given way.[330]

Already on the level of environment, we have pointed to the material media of memory and remembrance. Memory and remembrance are linked in an obvious way to human life; they belong to human nature. Actual remembrance has a shallow memory; it depends on a person's age and has a span of just decades. Thanks to the materiality of the products of man, the depth of that remembrance

330 Gadamer 1986, 40.

is incomparably greater. Incidentally, wherever that remembrance exceeds personal or communal remembrance, it becomes a symbol, and the symbol takes us onto the highest level of existence. I would also like to point out that Tischner, in his *Filozofia dramatu*,[331] when analysing the drama of human life, situates himself in the central zone of human life, finding support above all in the neighbouring zones: the zone of the environment (Tischner's stage of the drama of life) and the zone of time beyond time, the zone of values and worldview.

Like every work of art, every musical instrument seen within the context of human life – the life of the individual and of society – reveals in a specific way its sense ensuing from awareness of time, awareness of beginnings and ends, personal history preserved in memory and social history experienced by living generations. It is only on this level that the musical instrument appears within the context of music-making people, which organological knowledge has somehow lost along the way. We do not find people in the descriptions of instruments in European monographs. They have been lost in playing technique and in musical capacities or application (Verwendungszweck); they have been lost and need to be rediscovered for musical knowledge, which has become dominated by the morphological and historical perspectives. The individual musician has been absorbed by the romantic idea of the common folk – the collective medium of tradition. The dependence of an instrument on the cycles of life is obvious, and the role of instruments in different age groups is a crucial issue. The process of learning to play an instrument, of acquiring musical qualifications and skills, of shaping musical preferences and the system of socially endorsed individual aesthetic values, changing over time and leading to changes in musical life – those are just some of the issues that are affected by instruments. Human life is a universal model of change. Awareness of change is documented by the diaries of folk musicians. History preserved in the memory of living generations is an absolutely universal perspective, existing in every culture, regardless of its level of development. It also concerns, of course, musical instruments and instrumental music, wherever such music exists in a culture. Instruments are often differentiated into traditional, clearly conservative instruments, which are fundamental and dominant in a given culture, and modern instruments that are only now becoming popular. Innovations made to instruments have been preserved in memory; sometimes we know who initiated them, and we know the consequences they have brought. Successful innovations have become a social norm. In early documentation of folk culture, the role of instruments and instrumental music is

331 Tischner 1998.

spoken of in relation to various family rituals. Music accompanies people from birth till death, and musical instruments play a suitable role in a person's life. The temporality of the zone of life is quite clearly distinguished. That is not always the case with life spatiality, determined by a person's biography and by the past experiences of the living generations of a given social group. The regions of activity of settled musicians were often very great, to say nothing about that of itinerant musicians. They often worked among various ethnic groups, not necessarily their own. Modern nationalisms heightened the divisions. Scholarship also played an active part in disintegrating local traditions along national lines. Today, a conscious effort is being made to remove the national, ethnic, religious and cultural barriers which until recently scholarship had helped to perpetuate. Also linked to the zone of life in an obvious way is organology as a science. The older members of our fraternity can attest to how the discipline has changed over recent decades.

One example of musical form being contrasted with objective understanding and the subject's role being highlighted is the definition offered by Hugo Leichtentritt: 'Form in its general sense cannot be the subject of a systematic study. It is a matter of musical instinct, of taste, and of artistic intuition'.[332]

Musical instinct, taste and artistic intuition can still be treated as the biological baggage of a subject, which is characteristic of biotemporality, although it seems just as likely that they are features developed in people's experience in life and culture, which in turns leads us to nootemporality, in which awareness of personal history and of history in general and of all external contexts manifesting the sense of musical form are crucial. That is emphasised, for example, by the assertion that 'no view of form (or structure), however, is separate from an understanding of the creative process itself'.[333] The creative process refers distinctly to personal history, to the subject conscious of his or her own existence, to the creator.

The maqam developed in the feudal social structure which it served to maintain. It was highly elite music, based on professional performance. It was expressive of the ways of life and the systems of values and religious, philosophical and aesthetic views characterising the individual or social groups; it was expressive of creative imagination. As S. M. Weksler writes:

> Tajik-Uzbek maqams presented as monumental vocal-instrumental works required highly trained performers, who were trained for their profession over many years

332 Leichtentritt after Whittall 1980, 709.
333 Whittall 1980, 710.

> (7–10 years). The art they represented was highly elite, accessible to only small circles of listeners. The elite nature of the musical profession and of the art of the maqam was enhanced by the nineteenth-century practice of isolating the most outstanding musicians at the emir's court. They lost the right to perform before an ordinary audience, thereby becoming a mainstay of the most refined artistic tradition, largely resistant to outside influence.[334]

The maqam transmitted by tradition was also subject to change. The changes were slow, although no doubt individually or socially discernible, before the maqam began to disintegrate abruptly with the disappearance of the traditional system of values. By the time people set about documenting it in the form of scores and recordings, it was already a largely disintegrated form. Efforts were made to reconstruct it, drawing on the memories of the finest musicians.

To close these remarks, let us return for a moment to Polish culture; specifically to Władysław Tatarkiewicz's remarks on happiness.[335]

> Contentment with the whole of life is contentment not just with that which is, but also with that which was and will be; not just with the present, but also with the past and the future. A sense of happiness encompasses not just a positive current state, but also a positive appraisal of the past and positive views on the future. That multiplicity is essential to happiness. The present moment, however pleasant, cannot ensure the happiness of a thinking being, one that remembers the past and is anxious about the future. So it is not just things that exist at the present time and act directly on the individual that determine his or her happiness, but also things that no longer exist or do not yet exist. Happiness is characterised, quite naturally, by retrospection and prospection.

10.4.8 The level of our vision of the world, time beyond time

Tradition seen from within a given culture is not defined in temporal terms. It represents a former past preserved in inviolable rules that hold for eternity, so it is close to the notion of atemporality. This is emphasised in particular by the sacred aspect of art and music. According to Gregory Bateson,[336] that sacredness need not be realised, since the adequacy of the forms of sacred art is guaranteed by the laws of artistic craftsmanship, a set of regulations enabling the creation of symbolic forms, the ultimate sense of which may remain outside the sphere of the creative artist's intellectual awareness.[337] For Titus Burckhardt, 'Tradition holds within itself a secret force which is communicated to an entire civilisation

334 Weksler 1965 after Żerańska-Kominek 1986, 47.
335 Tatarkiewicz 2010, 204.
336 Bateson 1973, 111.
337 After Żerańska-Kominek 1986, 240.

and determines even arts and crafts'.[338] Żerańska-Kominek adds that the mysterious force of tradition also protects the forms of the art of music, which of all the arts is the most sacred.[339]

The past that extends beyond the memory of living generations is expressed by myths. Arabic-Muslim versions of the biblical tale of water bursting from a rock served to explain the origins of the maqams. It tells of how, when Moses entered the water and in anger struck a stone, twelve holes appeared in it, 'and from each hole a spring burst forth. And each spring sounded. And that is where the maqams come from. Allah knows the truth better'.[340] In another detailed translation of Darvish Ali, we read:

> In the beginning there were seven maqams, which derive from seven prophets […] The maqam Rost came from Saint Adam, who wept because of his separation from Eve. And that crying was in the maqam […] The maqam Ushshak comes from Noah […] The maqam Nawa came from the prophet David […] when David sang, every note that came from his blessed throat turned into seventy melodies. The birds and animals gathered around him and grew meek as they listened. Those melodies of Saint David were in the maqam Nawa […] The maqam Hejaz was initiated by the blessed Solomon. It is said that when Saint David died, power fell into the hands of Solomon, who sang for joy. And that melody was in the maqam Hejaz. The maqam Iraq comes from Ajuba […] The maqam Husayni from Saint Jacob. The maqam Rahawi came from Muhammad Mustapha Abdulcosima, who in this maqam recited the Quran. The maqam Busaliq came from Umar, who drove his camel in the Busaliq maqam.[341]

The ultimate past in the religious view of the world that conditions understanding of the maqam is eternity, endless lasting. Żerańska-Kominek states:

> A maqam projected onto a static image of Nature contains everything which can be captured in music as lasting, which is outside of time and change, symbolising eternal reality. In essence, only that which is unchanging truly exists according to the traditional concept; becoming, movement and the process of transformation define those intense aspects of being from which people seek to free themselves, integrating with the permanent present. Yet unification with Absolute Immobility is attainable solely through a satisfying mental experience that is process, movement, transformation.[342]

So it is conditioned by the existence of the lower levels of temporality.

338 Burckhardt 1967, 8.
339 Żerańska-Kominek 1986, 241.
340 Ibid., 19.
341 After Żerańska-Kominek 1986, 196.
342 Ibid., 234.

In the modern depiction, the true history of the maqam is internally fractured, since it essentially breaks down into two incoherent stories: one profound, based on early musical and philosophical treatises, reaching deep into history, but very murky; the other, relatively recent, which began with the documentation of the living tradition at the end of the nineteenth century.

So we see that the maqam, like every other musical form, changes kaleidoscopically, depending on the temporal perspective from which we behold it. When changing perspective, we also change the system of possibilities, and specific character in the system of possibilities determines the meaning of musical form and the meaning of the maqam. That applies to every culture and to all music, whether it is realised or not. It is a different matter that some kinds of music impose specific 'metaphors of temporality' upon themselves. It suffices to compare extreme examples to realise the range of possibilities, such as the dynamic, processual character of the opening of Beethoven's Fifth Symphony and the static, hierarchic construct of musical fixity of the Javanese gamelan.

The past that stretches beyond the range of the memory of living generations manifests itself in two ways: either as a mythical past and tradition, when it is always seen from within a given culture, or in a fully objective way, as is postulated by the modern understanding of history. Instruments can also be considered from both these perspectives. Mythical and historical time have their spatial equivalents in the form of the mythically understood space or historical space of a given culture and the dissemination of particular instruments. We live in the age of historicism, in which we are inclined to accord historical explanations the status of final explanations. It is worth noting that organological knowledge has an exceptional historical depth, documented in sources; it reaches back to the Stone Age and – unlike most ranges of musical knowledge – does not really have an arch of continuity from the earliest times to the present day. Archaeological sources are complemented by relics of art and iconography, by descriptions in historical and literary sources and by extant museum specimens of instruments from various eras and various world cultures. The situation is worse, of course, with performance practice and music performed on early instruments. Historicism is also manifest in reconstructions of historical processes by means of retrogressive inference from extant facts about their past; the range of the occurrence of phenomena points to their origins. In this context, knowledge about musical instruments has played and continues to play a significant role. Today, however, the superiority of the historical perspective is often questioned, as is exemplified by anthropological trends. Great efforts are being made in research to see the past of music (and of instruments) from the internal perspective of a given culture, preserved in the tradition of its bearers, and to examine it from many different perspectives, which I have sought to systematise here. They form a system of knowledge in which mutually conditioned levels are distinguished. Although they form a hierarchic order, in no way should it be identified with a hierarchy of scientific weight, let alone with the preferences of modern research into cultural traditions.

In every culture, even the most primitive, humans have a full vision of the world that goes beyond the framework of the previous levels of existence, and they express it, among other things, in works of art. The capacity for transcendence is perhaps their most important function. People complete the vision of the world with intuition, sensing, myth, faith and … learning. Contemporary learning strives its utmost to go beyond direct human experience, to capture the greatest possible range of myth and construct a scientific worldview. It only partly succeeds, since it always fails to find answers to many crucial questions. Reaching the limits of its own cognition, science erects its own myths; as progress is made, new myths replace others.

The work of art goes beyond the limits of the known world and illuminates a fragment of the mystery we are faced with. Gadamer states that the work of art, in speaking to us, reveals something hidden and represents a moment of transcendence, that it is in the true sense experience; 'the significance that attaches to the beautiful work of art refers to something that does not simply lie in what we immediately see and understand before us as such'.[343]

We live in an age dominated by historical thinking, which is supposed to replace our eternal need for myth. Historicism spreads before us mirages of the past; progressivism replaces them with mirages of the future. According to Gadamer:

> The appearance of art as something historical can be described as the delusion of a culture that holds that only what is already familiar to us from our cultural tradition is significant. The appearance of art as something progressive, on the other hand, is sustained by the delusion of the critique of ideology. It claims that history should now begin anew, since we are already thoroughly familiar with the tradition in which we stand and can safely leave it behind. But the riddle that the problem of art sets us is precisely that of the contemporaneity of past and present.[344]

True art, with which we stand face to face, wants to reconcile those opposites. 'Art represents an overcoming of time'. A quality of existence proper to man is a

343 Gadamer 1986, 32.
344 Ibid., 46.

> union of past and present that constitutes the contemporaneity of all ages, styles, races, and classes. […] in our relationship with the world and in all our creative labors – forming or cooperating in the play of form as the case may be – our accomplishment lies in retaining what threatens to pass away.[345]

In wishing to explain the essence of the work of art, Gadamer invokes the notion of the symbol. He reminds us that in Greek, 'symbol' meant 'token of remembrance':

> The host presented his guest with the so-called *tessera hospitalis* by breaking some object in two. He kept one half for himself and gave the other half to his guest. If in thirty or fifty years' time, a descendant of the guest should ever enter his house, the two pieces could be fitted together again to form a whole in an act of recognition.

So we are not dealing here with direct memory, with the recognition of people whom we met a very long time ago. The descendant is to meet someone whom his or her ancestor met. The symbol is a reminder that reaches back further than human memory, as literally understood. It is a reminder of that which has not been directly experienced. The symbol is memory preserved in tradition, and at least in some interpretations it reaches even deeper, when it is held that basic symbols have natural foundations. Symbols, tradition, values, beauty and good obviously concern our vision of the world and lead us into the highest regions of existence; art serves that end. Gadamer writes:

> In the case of the symbol […] for our experience of the symbolic in general, the particular represents itself as a fragment of being that promises to complete and make whole whatever corresponds to it. Or, indeed, the symbol is that other fragment that has always been sought in order to complete and make whole our own fragmentary life […] the experience of the beautiful, and particularly the beautiful in art, is the invocation of a potentially whole and holy order of things, wherever it may be found.[346]

The loftiness of beauty and art can be gauged from the fact that in our contact with works of art we experience not so much that which is particular as

> the totality of the experienceable world, man's ontological place in it, and above all his finitude before that which transcends him […]. Nevertheless, this seems to me to be an idealistic temptation that fails to do justice to the fact that the work speaks to us as a work and not as the bearer of a message. To expect that we can recuperate within the concept the meaningful content that addresses us in art is already to have overtaken art in a very dangerous manner […] the symbolic in general, and especially the symbolic in art, rests upon an intricate interplay of showing and concealing. In its irreplaceability,

345 Ibid.

346 Ibid., 31–32.

> the work of art is no mere bearer of meaning – as if the meaning could be transferred to another bearer. Rather the meaning of the work of art lies in the fact that it is there.[347]

The work is concretely here, in its full reality. It can be recognised as this very work; it can be named and defined in qualitative terms. One can examine its structure as captured in matter, carry on a dialogue with it in a perceptual situation, see it in the natural and cultural environment, in individual and communal life, in worldviews, continually rediscover its senses and meanings, and read its symbolic content. The many levels of its existence and its ability to reveal our condition in a complex world is the essence of the work of art.

347 Ibid., 33.

Epilogue

In primitive culture, people had a sense of existing at the centre of the world. As they conquered ever more distant geographic and historical spaces and got to know more and more human cultures, people's central position became less secure. The discovery of new lands, and especially the global shape of the Earth, altered their situation. It is difficult to speak of a place that is the central point in the world. People's position was disturbed even more by the discoveries of Copernicus. They found themselves on the Earth like on a ship circling and soaring around the Sun. The discovery of galaxies and their centrifugal motion and the awareness that our solar system is part of one such galaxy led to people becoming utterly lost in the universe. In times when the natural sciences are completely dominant, the field of cultural anthropology, including musical anthropology, may seem absurd, since it heads back in the opposite direction, as it were, attempting to restore people's central place in the world, partly by reaching back to their natural situation, not yet marked by the stamp of science, and by showing – through more profound analysis of man himself – his central position in this scientifically cognised world of nature. For humans, the outside world has by no means ceased to be primarily the environment conditioning their existence, not expressed in terms of cosmic time and cosmic space, but forming the basis of their natural human scale of time and their natural human scale of space.

The anthropological sciences deal not with the outside world independent of man, but with man and his perspective on time and on space. The human scale of time and space requires detailed research. Such was the goal, particularly in relation to time (which cannot always be isolated from space), pursued in the present work. I leave it to the reader to judge to what extent, if at all, we have succeeded in approaching that goal.

List of examples

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