STUDIES IN ART & MATERIALITY 7

The Matter of Mimesis

Studies of Mimesis and Materials in Nature, Art and Science

Edited by
Marjolijn Bol
and E. C. Spary

BRILL

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VOLUME 7

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We would like to acknowledge the generous financial support of the Dutch Research Council (NWO) and the Centre for Research in the Arts, Social Sciences and Humanities, Cambridge (CRASSH), which was instrumental for this book project coming into being. This publication is part of the project Deceiving stuff: histories, functions, techniques, and effects of material mimesis (with project number 275-54-001) which is financed by the Dutch Research Council (NWO). We would like to thank Liesbeth Hugenholtz, Ann-Sophie Lehmann, and the SIAM editorial board for their support for this project and the anonymous press reviewer for helpful comments.

The Library of Congress Cataloging-in-Publication Data is available online at https://catalog.loc.gov

Typeface for the Latin, Greek, and Cyrillic scripts: "Brill". See and download: brill.com/brill-typeface.

ISSN 2468-2977
ISBN 978-90-04-39249-6 (hardback)
ISBN 978-90-04-51-541-3 (e-book)

This book is printed on acid-free paper and produced in a sustainable manner.

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FIGURE 0 'Nottingham Dollies'. Dolly the Sheep was the first mammal to be cloned from an adult cell (taken from the mammary gland of a six-year-old Finn Dorset sheep and an egg cell taken from a Scottish Blackface sheep). She was cloned at The Roslin Institute, University of Edinburgh in 1997, by a team led by Professor Sir Ian Wilmut. The image shows four sheep, Debbie, Denise, Dianna and Daisy, made from the same mammary gland cell line that produced Dolly, cloned in 2007 using Somatic Cell Nuclear Transfer (SCNT) by Professor Kevin Sinclair at the University of Nottingham

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Introduction

Marjolijn Bol and E. C. Spary

Oliver: Do you think it's possible substances have their own velocity?
Henry: For instance?
Oliver: Eggs.
Henry: Eggs? … Because it changes form, the egg.
Oliver: Its whole function is to become something else. It keeps disappearing and reappearing as something new. I can't think of anything else in the world with that kind of material altruism.
Henry: Material altruism is moral altruism.
Oliver: Exactly. Funny that the egg should be a symbol for the soul, don't you think?

Elizabeth harvest (2018), directed by SEBASTIÁN GUTIÉRREZ

⁘

This collected volume of essays brings together scholars from the sciences, social sciences, arts and humanities in order to address the various roles played by materials in mimetic practices. Mimesis or imitation comes in many forms, from animal and plant mimicry to artistic copies 'from life'. 'Gucci' watches may be bought for a few dollars by the roadside, while *real* Gucci watches fetch thousands in high-end shops. All of these practices make sense in light of particular sets of standards for material reproduction, defined under very specific local cultural, social, political and intellectual circumstances. Mimesis is a problematic action; it touches on abstractions that have great importance for forging consensus, justifying faith, commanding assent or mobilising further action. Yet these abstractions require continual maintenance and policing if they are to retain their value. What is it that is 'natural' about mimicry? How do artists learn which features of the original are required for a 'good' copy – indeed, what even counts as 'the original'? What role does context play in adjudging the price of two apparently identical watches? Last but not least, who is qualified to answer any of these questions? These are just a few examples of the different valences of 'material mimesis' as a topic, reflected in the terminological richness of the English language when it comes to designating

 | DOI:10.1163/9789004515413_002

the various acts of material mimesis with which we are concerned: copy, replicate, forge, fake, imitate, duplicate, synthesise, counterfeit, simulate, clone.

In antiquity, in one of the first and most influential definitions of the concept, Aristotle explains that 'mimesis' refers to the way in which the arts mirror nature. According to this conception, both form and material define the end result, the mimetic object. In modern scholarship on mimesis, especially in the history of science, art and aesthetics, the role of form has received much attention. The fundamental role of materials in mimetic practices, by contrast, has received far less study.[1] The present volume aims to redress the balance, bringing together scholars from the arts, humanities, social and natural sciences in order to address material practices of mimesis. Its essays encompass a broad set of themes, highlighting stimulating and thought-provoking synergies in scholarship on art, architecture, religion, science, medicine, philosophy, archaeology, museology and conservation (whether of works of art or the environment). Our authors reflect on how, in mimetic practice, materials may be used to produce forms of order and value, or to control time; on the effects of copying as a set of social and material practices on the meaning of objects; and on the embeddedness of material artefacts within human networks of fabrication, exchange, use, knowledge and display.

Materials play a fundamental role in mimetic practice, from the earliest known examples to some of the most recent. Ancient ceramic vessels, for instance, some nearly four millennia old, imitated the visual appearance of other materials like metal or straw; seventeenth-century artisans gave wood the costly appearance of marble (fig. 0.1), or made paper appear to be gilded leather, in what one might term "added-value" mimesis. Chemical innovation, particularly during industrialisation, generated new opportunities for material mimesis, crowned with the invention of plastics, materials which – as their name suggests – can be (trans)formed into almost anything imaginable, from perfumes to prosthetics. Today, computer science allows us to flip pages of digital paper (fig. 0.2) and navigate the visible world in three dimensions, while materials science has invented biomaterials that replace the cells of our bodies, smart materials that can take on the look of their surroundings, and 3D printing technologies that enable the smallest of particles to be replicated with dimensions visible to the human eye, to name but a few. Material mimesis invites creative exploration and material experimentation – a past, present and future world of materials in which artisans and scholars have long played, and continue to play, a conjoint role. Materials are fundamental to mimetic practices, yet – whether in nature or in the arts – they do not passively 'take on' or 'mirror' form. Rather, mimetic practices prompt fundamental questions about the nature, meaning and effects of materials themselves, demanding

FIGURE 0.1 *The Warwick Castle Table*, England (made), *c.*1671. The top of slate decorated with scagliola, the frame of pine and beech faced with scagliola, the legs decorated in imitation of Siena marble
VICTORIA AND ALBERT MUSEUM, LONDON. ©VICTORIA AND ALBERT MUSEUM, LONDON

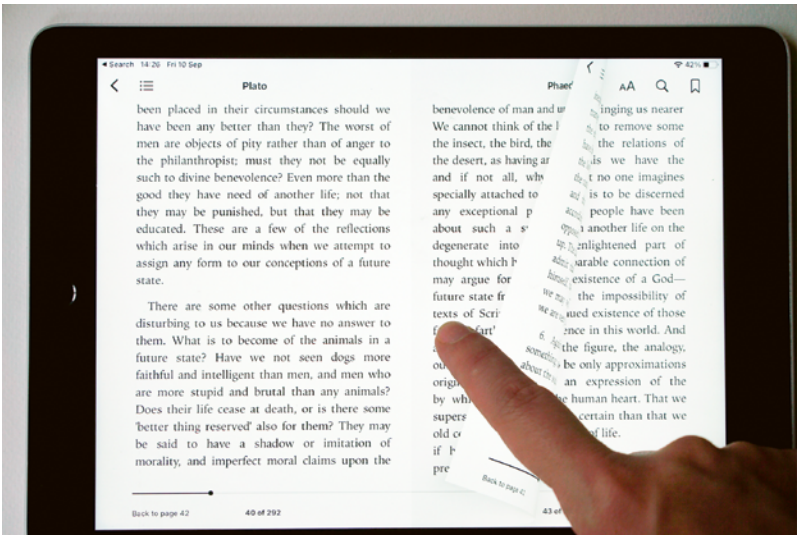

FIGURE 0.2 Turning a digital page of a so-called e-book on a tablet
PHOTO: MARJOLIJN BOL

interaction between materials, makers and users before it can be said exactly what constitutes resemblance, similarity, verisimilitude, representativeness, reproduction, or equivalence.

The replicated thing exists in many guises, from the fake, forgery or copy, through the substitute, ersatz or imitation, to the prosthesis, metonym or metaphor. Even to list these terms is to flag the moral ambivalence that surrounds all copying.[2] The trickster or go-between is the one whose ability to blend in, often by materially refashioning the body so as to control appearance, causes disquiet.[3] Such very human themes of disguise, concealment and protection in turn infiltrate the language with which the coloration of insects in Batesian mimicry, or the ability of the octopus to camouflage itself against its surroundings, are described.[4] There are both positive and negative aspects to virtually all acts of mimesis. Precise copying might be an ideal to which to aspire: conversely, a replacement organ might mean a life saved. On the other hand, many objects are irreplaceable, and attempts to produce substitutes for them create ontological and social havoc of the worst kind. The question of art forgery remains an area of sensational public interest, while counterfeiting banknotes is criminalised worldwide (fig. 0.3). In between these extremes lies a whole array of mimetic practices whose status is prone to shift temporally

FIGURE 0.3 Forged banknote, ostensibly issued by the Banco de Portugal in 1922, overprinted with the word 'duplicado'

or culturally. The copying of a work of art might take place for benign reasons: to satisfy the request of a tasteful patron, for didactic ends, or in the context of ritualistic practice. Even though precious stones, for instance, were often imitated to deceive the innocent buyer, similar imitations – produced using the same materials and methods – were actively commissioned by patrons to decorate the frames of medieval religious paintings and other polychromy.[5] Imitation stones were also used by naturalists to investigate the properties of stones produced by nature. Ornamentation and imitation may thus add value; but they may also be perceived to disguise, and thereby deceive.

At what point do forms of 'benign' copying spill over into artful deceit? Who is 'in the know', and why? As the individual contributions to *The matter of mimesis* show, such judgements are complex ones. Mimetic practices pervade many areas of life: literature, science, medicine, money, food, art, fashion, nature, religion. One of the questions this volume is able to address by bringing together scholars across a range of disciplines is how an examination of materials can indicate what such practices have in common. For example, practices of replication almost all attempt to preserve some quality of the original. Acts of replication thus force makers and critics to articulate what they understand the original to be. Therefore, by looking at mimetic practices, we can reach a deeper understanding of what the original 'is' in its essence for a given culture, as well as how and why it possesses value. Such considerations also allow us to explain why what counts as a faithful copy, a convincing likeness, or even an undetected fake, changes over time and across space. For many centuries, European naturalists kept in their cabinets an object known as the Tartary lamb: an animal in the Far East that supposedly grew from the earth, like a plant (fig. 0.4).[6] How could collectors have believed in the Tartary lamb? This volume suggests that the question, posed in that way, is the wrong question. The Tartary lamb was a legitimate object of scientific enquiry, whose status as a fake had to be created. Only over time did naturalists come to agree that it was impossible for an animal to grow from the earth. Changes in the culture of proof, in the essence of what it meant to be an animal, were what eventually turned the Tartary lamb into a fake. Shifts in mimetic standards thus produce effects close to those accompanying the settlement of scientific controversies, in that they alter the conditions of possibility of knowledge and making. The object, once known to be fake, may come to seem self-evidently "wrong", as Hermens discusses in her chapter; not only is its historical value lost, but our very perception of it *qua* object shifts in irreversible ways. Thus chronological and cultural specificity are intrinsic to fakes; they appear both more local and less universal than "originals" or "the real thing".[7]

FIGURE 0.4 A specimen of the Vegetable Lamb, or Lamb of Tartary, an object crafted from a mixture of natural materials that served as the basis for early modern discussions of nature's power to procreate atypical forms of life: in this case, a being that transcended Aristotelian boundaries between vegetable and animal
1996–231 VEGETABLE LAMB. CREDIT: GARDEN MUSEUM – MALCOLM RUSSELL

Yet it is not necessarily the case that fakes lose all value once their status as mimetic objects is known. The chapters of Pugliano and Rijks show that the fictitious object was an important component of early modern collections at a time when human intervention and artifice were widely viewed as mandated by God in order to perfect flawed, postlapsarian nature. The same concern drove early modern interest in ludic Nature, as Tarp's essay reveals.[8] From the later eighteenth century onwards, material mimesis would become a more contentious practice, as the boundaries between authenticity, honesty, simplicity and "the natural" on the one hand, and duplicity, concealment, secrecy

FIGURE 0.5 Glass beaker from the sale of the Adrian Hope collection (1894). Identified by scholars as one of the rarest and earliest examples of enamelled Venetian glass, but reclassified after 1968 as a fake

and artifice on the other, were redrawn (fig. 0.5).[9] But it is still the case today in spaces such as museums, and even in nature, that many material objects are agreed to require human intervention. Changes in conservation standards, for example, or altered understandings of the 'real' nature of a material object (a glacier, a portrait) constitute normative and prescriptive statements about materiality and ontology, linked to new forms of agreement surrounding the

practices to be used to preserve objects in a particular state of existence, or to restore what is deemed to have been lost. Within their various fields, art historians, environmental historians, ecologists, biologists, materials scientists, historians of science, museologists and museum curators participate in making such decisions about the materials of the artificial and natural world, but their discussions have rarely been brought together.[10] This volume aims to make that conversation possible. It asks how, and under what circumstances, some material practices and interventions come to be seen as appropriate and legitimate, and it takes seriously the injunction of recent work on making, remaking, repair, restoration, recycling and reuse.[11]

Behind our interest in material mimesis as, respectively, an art historian and a historian of science, lies our awareness of the new interest in historical reconstruction that is pervading both of our fields, manifest in projects such as ARTECHNE, overseen by Sven Dupré at Utrecht University, The Netherlands, and the Making and Knowing Project, overseen by Pamela Smith at Columbia University, USA, who addresses these questions in her contribution with Isabella Lores-Chavez to this volume.[12] Attempts to replicate experiments carried out by early modern craftspeople or alchemists, Galileo Galilei (1564–1642) or Isaac Newton (1642–1727), involve the recreation of experimental objects, both instruments and products, where often merely textual and visual traces of these survive. Such reconstructions at the material level are less than straightforward, however. Very often today's experimenters find that replicating the material conditions of the experiment does not produce the same result: the experimenter's skills, the materials used for experimentation, and even the embodied state of the practitioners, may differ so much from those that might have existed in the past as to cast doubt on what 'replication' actually means.[13] When it comes to the manipulation of materials, imitation highlights the elusiveness rather than the stability of materials, and shows that their instability over time, their historical inaccessibility, can be as great as that of past language or texts.

Replication thus raises complex issues surrounding expertise, trust and credit, particularly when it comes to materials prioritised by the culture in question. In triumphalist histories of fakes and deceptions, the figure of the expert usually looms large as the *deus ex machinâ* whose knowledge confronts, confounds and debunks mimetic practices across a spectrum of fields.[14] But such presentations are problematic, for they side with winners in debates over the significance and value of replicated materials. Mimetic materials and practices which are acceptable in one time or place may be beyond the pale of legitimacy elsewhere. Different standards of value prevail in different knowledge cultures, so the expert is only the person who commands locally prevailing

standards. Material expertise thus changes in tandem with definitions of the fake or forgery. Whether for artworks or banknotes, the term 'forgery' is a relativistic one, applying to material objects made using practices that are *agreed to be improper at a particular time and place*. Looking at material mimetic practices such as counterfeiting discloses a technological 'arms race' in which forgers and experts continually strive for the upper hand in knowledge and skill concerning material practices of replication. When experts tie their authority to their analytical power of exposing fakes, the relative value of materials and objects must first have been collectively established before fakes, copies or reproductions can hold any significance whatsoever.[15] This is as true in debates over whether an artist or apothecary uses a substitute material for reasons of availability or for its intrinsic properties, as it is in worries over the fidelity or infidelity of copies to originals in the light of changing prescriptions about faithful copying. Scholars investigating the adulteration of foods, for example, have shown that public standards of adulteration, like public protests against the ersatz, are always dictated by strictly local accounts of bodily needs, historical conventions, and individual or collective rights. An accepted practice of modifying foods may cease to be acceptable; a new food may enter into and upset an existing state of affairs, and its moral, political or legal position then has to be negotiated via a series of steps. Here too experts become involved, often as spokespersons for the natural, but so too do considerations of profit, politics and public health. Such debates go to the heart of the relationship between consumers, producers and governments, and, indeed, both produce and transform that relationship.[16] As the phrase 'a faithful copy' suggests, at the heart of material mimesis is the moral economy. It is not Nature but Society that dictates what kinds of interventions count as 'adulteration', as opposed to 'enhancement' or 'improvement'.

Value, it transpires, thus lies at the heart of many discussions and practices of material mimesis. With this complex set of interrelations at play, it is not surprising that material mimesis affords a wider spectrum of interpretative possibilities than merely deceit or emulation. The historical archaeologist Meghan Howey, for example, interprets the production of miniature ceramic kettles by the indigenous peoples of the Northeast/Great Lakes regions as a way "not to flatter Europeans but to assert control over their colonial encounters with them during the late sixteenth and early seventeenth century".[17] This volume explores plural forms of value generated by material mimetic practice, from the fabrication of synthetic materials as part of industrial capitalism, to the fabrication of artworks out of food.

Material mimesis is not only concerned with the management and distribution of social credit, but also with capital – both symbolic capital, in the

sense of Pierre Bourdieu, but also more literal (and material) manifestations, such as coin.[18] As a material object, a coin mimetically figures value in its most literal form, travelling throughout societies as a medium that allows credit to be exchanged and social hierarchies to be established. The coin is perhaps the ultimate token of material mimesis, often literally bearing a portion of political authority in an impression of the ruler's head. On its travels, it doubles as a material vehicle for the spatial distribution of political authority – the sign of the ruler's presence in everyday transactions of value and wealth. The history of coins as material objects points us to omnipresent concerns about fraudulence, which invariably take on a moral guise: fake coin is bad coin. As Mary Poovey puts it:

> A system of representation is experienced *as* problematic only when it ceases to work – that is, when something in the social context calls attention to the deferral or obfuscation of its authenticating ground [...] When the problematic of representation becomes visible, [...] this can have grave implications for a society's economic and political stability, for it can jeopardize the prevailing model of value, the conventions that facilitate trust, and the signs that convey creditworthiness – monetary, social, legal, and political.[19]

Since the legitimacy of rule is compromised by bad coin, it is hardly surprising that rulers throughout history have sought control, not just over the possession of precious metals as a resource, but also over their working and chemistry. Metalworkers of all kinds were among the earliest kinds of knowledge experts to forge close relationships with rulers, their authority – like that of the ruler's – often literally impressed upon the coin they made.[20]

Hoarding coin has a long history, continuous with the hoards of torcs discussed in Jody Joy's chapter. Well into the early modern period, mercantilists sought to concentrate coin within the realm so as to prevent its loss to foreign states. This agenda of power, however, came to be in tension with the inherent value of the coin *qua* precious metal. It was not until comparatively recently, between the seventeenth and nineteenth centuries, that inherent (material) and ostensible (face) value came to be clearly differentiated, such that the *form* in which wealth circulated was no longer identified with the innate value of the *material*. Over the same period, new forms of mimesis for forging wealth also emerged, involving materials other than metals: paper, ink, and eventually also computers. Changing relations of authority, expertise and hierarchy may have dramatic consequences for the capacity of the material copy to contain value, as historical crises over paper money exemplify.[21] Many of the essays in

this volume reflect upon networks of credit and communication as indispensable aspects of the regulation of flows of value in material form. But managing these flows requires intervention at the material level to prevent a sort of 'value entropy': when too many replicas of it exist, an object's value reduces, but when one original is preserved in a museum while many acknowledged copies of it are circulated, its value is greatly enhanced. Worries about 'replicas' or counterfeits and the ethical anxieties attached to them are worries about the potential for loss or relocation of value that material copies represent, expressed in debates over the morality of widening consumption since ancient times. This dialogue or tension between original and copy is something with which specialists in both the arts and the sciences continually contend, as the essays of Conte and Kromholz particularly underscore.

If we envisage material mimesis as a set of practices concerned with the control of flows of value between individuals, it becomes clear why motifs of preservation, stabilisation, crystallisation and fixing abound in discussions and practices relating to it, from the imitation of stone to the imprint of a body upon it, from the hoarding of treasures to the curation of archives. Material mimesis is a time travel machine. Its practices are about controlling temporality: in museums, material artefacts are carefully restored to 'an earlier time', while only when artefacts or natural history specimens are prevented from deteriorating can they play their role in narratives about abstracts such as 'History' or 'Nature'.[22] Even cosmetics, in their mimicry of youth, are attempts to fix and control time. Regulative practices thus surround all material mimetic enterprises. The made object bonds and re(-)forms individuals. Entanglements between matter, mimesis and trust underpinned a prominent debate in Christian theology that spanned the entire medieval and early modern periods – the question of whether the senses may be trusted, given that material things are transitory, and therefore cannot be relied upon to preserve either value, or even reality.[23] When the Dutch physician Frederik Ruysch used the body parts of still-born or miscarried children to craft anatomical tableaux, he did not do so for what we would understand today to be 'scientific' or 'artistic' ends, but to create a *vanitas* – an object which would, in its very material mimesis, recall the ephemerality of all material life here below for visitors to his Amsterdam collection. Such reflections were to stem from viewers' sense of their own embodied mortality. Knowledge, admiration, wonder and reflexivity united in the act of observing the tableaux that were made out of their own fabric. Ironically, ephemerality was conveyed through successful preservation. A similar dynamic is at play in Kromholz's analysis of far more recent ephemeral artworks in our volume.[24] No wonder then that the process of crafting and even viewing the mimetic object should have transformative effects.

Within the sciences, such questions take on particular ontological charge where reconstruction aims at restoring or enhancing the 'naturalness' of entities. Taxidermy and habitat dioramas are occasions for tacit claims about what 'nature' is to be made explicit. Great effort is put into the preservation of landscape features at risk of disappearance due to environmental change, such as glaciers. At what point in such interventions does a glacier cease to be a 'natural' object? Practices such as palaeontological reconstruction techniques, 3D scientific models, or instruments that 'create' the materiality of viral particles by making them visible to the observer, bring us right up against the limits of the 'real' and 'natural'. Historians and sociologists of knowledge address the plural forms of expertise involved in reaching consensus over such visualised and instrumental materialities, as exemplified in our volume by the contributions of Maerker and Henning.[25]

In order for material mimesis to work as an engine of time and value in these ways, it is necessary to add order and structure to material objects. This is a practice which operates on different scales. In managing big data, such as the Illustris project discussed by Skulberg, Sparre and Veele in our volume, scientists are in the business of inserting order into dark matter. Seventeenth-century scholars, for their part, worried about the fact that microscopic observation disclosed a disconnect between the clumsy hand of the human artist and the perfection of design that Nature *qua* artist brought to the butterfly's wing.[26] Access to different scales of visuality deconstructs mimetic reliability and verisimilitude, hence also the credibility of the artist's mimetic endeavour. Such attempts to regulate and make order in large and small material systems may be redirected outwards, to the regulation of networks of human actors. The effects of a material object cannot be explained independently of these networks, which is why the broader questions addressed by the book relate to audiences, interpretation, appropriation and response.

The expression 'material mimesis' itself is of relatively recent origin, most often applied to problems of new materials and manufactured consumables such as plastics, kettles, paintings. More recently, scholars have come to encompass the 'material' in a wider sense – the body, the natural environment, the theatre, colour – within the study of mimesis. The Swiss historian of art Christine Göttler, one of the first to write about material mimesis, uses the term to designate early modern attempts to represent the soul in wax.[27] Scholarship on reliquaries has shown how virtue could reside in saints' bodies for centuries, even as the 'real' bodily matter was constantly being shed and replaced by artificial means.[28] When we consider exactly what the material serving for mimesis was supposed to replicate in examples such as this – in

FIGURE 0.6 The relic of Santa Vittoria, preserved in the Church of Santa Maria della Vittoria, Rome. Precious stones have been used to replace body parts lost due to wear, deterioration or deliberate removal
PHOTOGRAPH: © FABIAN FRÖHLICH / DIREZIONE CENTRALE DEGLI AFFARI DEI CULTI E PER L'AMMINISTRAZIONE DEL FONDO EDIFICI DI CULTO DEL MINISTERO DELL'INTERNO / © FONDO EDIFICI DI CULTO, MINISTERO DELL'INTERNO, ITALY

one case the soul, in another sanctity – it becomes clear that material mimesis operates upon objects in a more than purely material sense. To use gemstones as the material of choice for replacing the lost body parts of saints was a way to underscore the high value of their bodies' fabric, mirrored in the flourishing trade in relics in the Middle Ages and beyond (fig. 0.6).[29] But even today's supposedly more 'rational' and 'scientific' attempts to replicate body parts suggest a set of expectations of mimetic embodiment that similarly overspills the question of utility. For a glass eye, or a false hand, lacks what might seem, *prima facie*, the essential property of that original – its capacity for seeing or feeling. Prosthetics (in the broadest sense) have a function of enhancing and transforming our relationship to the world and to one another (fig. 0.7).[30] Pushing the limits of material mimesis in this way brings us up against ontological questions: where does matter end, and agency, power, spirit, or however

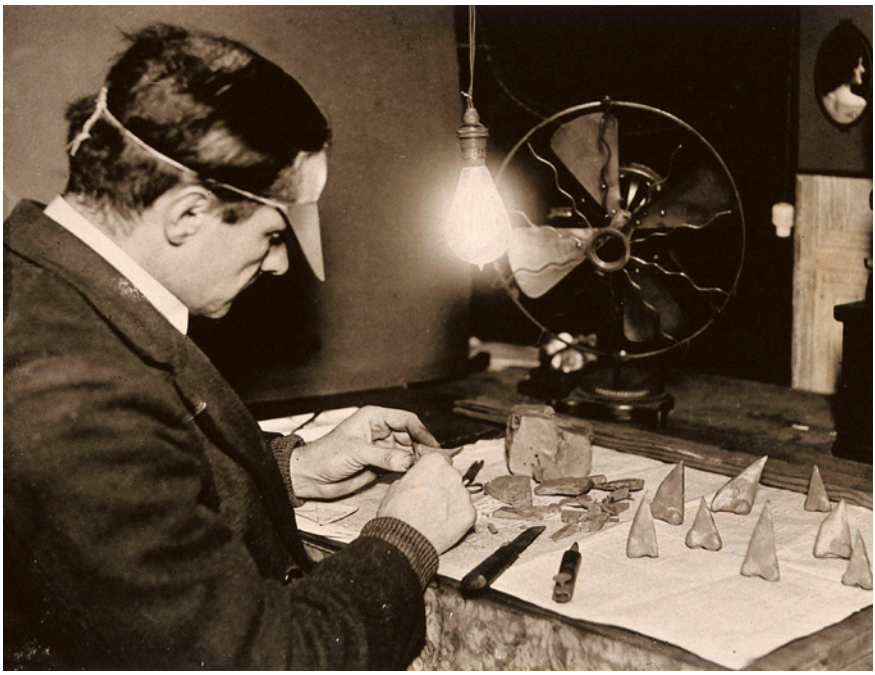

FIGURE 0.7 Artificial noses being made by an artist at work in his studio in Hampstead, London. Photograph, ca. 1921. The manufacture of prosthetic body parts is an ancient practice involving the adaptation of many materials, from bone, wood or metal to grafted flesh, to stand in for the lost original. The disfigurements of World War I led to the development of modern cosmetic surgery. Yet the noses made for injured soldiers by this craftsman would never smell or inhale.
CREDIT: WELLCOME COLLECTION

we designate its opposite, begin? These are, of course, among the oldest scholarly questions in Western culture, with their roots in Christian distinctions between the earthly and material on the one hand and the heavenly, spiritual or ideal on the other. As Bennett and Joyce (2010:21) observe, it is precisely this historically constituted dichotomy that scholars must probe in seeking to explore how materials appear to express power, agency or meaning. When we begin to ask what '*it*' is that is being created or made using mimetic techniques, we are immediately confronted with intangibles that relate to all discussions of representation *per se*, but which resist material reductionism – a problem which archaeologists have faced perhaps sooner and more pressingly than any other discipline, evident both in Bruno Latour's calls for a 'symmetrical archaeology' and in theoretical discussions of materiality by scholars such as Tim Ingold.[31]

Beyond the inherent prestige of the materials they imitated, early modern copies might also represent the skill of the artist, as Dümpelmann and Kinney's essays show. Here, the ownership and display of copies signalled a range of characteristics beyond simple material resemblance, including scholarly status, good taste, and wealth.[32] Conte and Kromholz, for their part, allude to a crucial transition in the valuing of contemporary artworks: a 'hollowing out' of value, such that it is no longer the material of manufacture as such, but rather an indefinable essence of "art *as* art", that confers value on both the original and its copy. Mimetic procedures are increasingly critical in fields such as museum studies, where *what* is reproduced is as important as *how*: museologists, and also archivists, faced with the digitisation of objects and material texts, are currently wrestling with problems of what the conversion of a material object or artwork into an immaterial medium does to its value, meaning and politics.[33] Nowadays, on the fringes of material mimesis, there exists the inverse process whereby the material world is recreated as virtual reality, a theme addressed in the chapter by Skulberg, Sparre and Veele through the case of the cosmological simulation Illustris. Similarly, in Stumpel's chapter, the theme is survival – but, as he points out, the survival of what? Mimesis is central to human efforts at preservation, and studying it causes us to reflect intently, not only upon *what* it is that cultures choose or desire to copy, but also upon *why* they do so.

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Endnotes

1 While not necessarily in the context of mimetic practice, it should be mentioned that the fundamental role of matter and materials in the history of science, art and aesthetics is increasingly recognised. See, e.g., Posman *et al.* 2013; Klein & Spary 2010; Anderson, Dunlop & Smith 2015.

2 Boon 2010.

3 On tricksters and go-betweens, see especially Zemon Davis 2008; Gruzinski 2002; Schaffer *et al.* 2009.

4 As exemplified, for example, in the title of Stevens 2016; see also Harmon 2013.

5 Bol 2014.

6 Dance 1976.

7 Beretta & Conforti 2014; Jones 1990. The literature on controversies is large, but see, for instance, Latour 1999; Rudwick 1985.

8 See especially Findlen 1990.

9 Examples of these opposites are clear in Scott's study (1995) of the fashionability of 'Italianate' interior design, and Martin's account (2009, chap. 4) of the French cosmetics trade and the critique of artificiality in the Old Regime.

10 Although the literature is large, important statements include Ginsberg *et al.* 2014 (biology); Leslie 2005 (chemistry); Lynch 1988 (scientific images); Benson 2020 (ecology); Wonders 1993, Maleuvre 1999 and Brenna *et al.* 2018 (museology); Miodownik 2014 (materials science); Mitchell 1992 (digital images).

11 See, *inter alia*, Bellingradt 2017; Werrett 2019; Warde 2018; Jackson 2014.

12 See, respectively, https://artechne.wp.hum.uu.nl and https://www.makingandknowing.org.

13 For interesting discussions of this, see especially Smith 2004; Principe 2013; Rampling 2020; Dupré *et al.* 2020. Food scholars such as Ivan Day and Ken Albala (https://www.historicfood.com/portal.htm and http://kenalbala.blogspot.com) address related domains of historical reconstruction in their systematic attempts to recreate past recipes, while others have endeavoured to recreate past sensory worlds (e.g. the Odeuropa project, https://odeuropa.eu/mission/, or the 'Historical Soundscapes' site of the European Association for Digital Humanities, https://eadh.org/projects/historical-soundscapes). Most scholars acknowledge, however, that such projects do not afford direct access to 'the past', but rather techniques for creating new sources of historical evidence.

14 Notably in Dance 1976 and Craddock 2009, to take examples from both science and art.

15 See, for example, Lynch 2008.

16 See, for example, Abad 2006; Teuteberg 1994; Cobbold 2020. These issues loomed particularly evident in nineteenth-century chemists' attention to food adulteration, as Stanziani 2007 shows, but also in metallurgy and natural history (see Spary 2003, and the essays of Pugliano and Rijks, this volume).

17 Howey 2011, 329.

18 According to Bourdieu, 'Symbolic capital, together with the forms of profit and power it warrants, exists only in the relationship between distinct and distinctive properties, such as the body proper, language, clothing, interior furnishings [...], and the individuals or groups endowed with schemata of perception and appreciation that predispose them to *recognize* [...] these properties' (Bourdieu & Wacquant 2013).

19 Poovey 2008, 6.

20 Stewart 1992 shows that moneyers' names often appeared on English coins dating from the declining years of the Roman Empire, and then once local coin production began in the 8th century. As Jody Joy's essay, this volume, indicates, metalworking was extremely sophisticated by at least the Iron Age. On the complex sequence of workshops and tests through which metals passed en route to being converted into coin, see, for example, Stahl 2000, chap. 14, and also Hills, this volume. For discussions of assaying, metallurgy and coin, see especially Asmussen 2020; Wennerlind 2003. Oakley 2013 usefully calls for a view of hallmarking as 'a *system*, a social entity created by an assemblage of physical, performative and conceptual elements'.

21 See, e.g., Spang 2015, chaps. 2–3, on the way that the rejection of paper money during the French Revolution also jeopardised central political authority.

22 Hahn 2012, 2017; Wonders 1993.

23 This debate has been the subject of very extensive research which we do not propose to summarise here. For a brief introduction to empiricism and scepticism in medieval scholastic philosophy, see Perler 2015; on the role of the senses in religious discourse, see Chidester 1992 and Schmidt 2000.

24 Bert van de Roemer 2010; Knoeff 2016; Hendriksen 2013.

25 See especially Chadarevian & Hopwood 2004; Bock von Wülfingen 2017.

26 Brooke 1991, 267.

27 Göttler 2002.

28 See, for example, Hahn 2012, 2017; Bagnoli 2011; Koudounaris 2016; Warner 2012, chap. 3.

29 Geary 1978; Walsham 2010; Hahn 2018; Wiedenheft 2018; Pazos 2020.

30 Work by Hellmann (1999), Rublack (2010), Entwistle (2015) and Steele (2001) has pointed, for example, to the prosthetic use of furniture and fashions as adjuncts to the body.

31 Latour 1991. See, in particular, Tim Ingold's call (2007) for scholars to recognise that 'the properties of materials [...] are not fixed attributes of matter but are processual and relational'; also Joyce & Bennett 2010, 27–30.

32 On the use of images to represent natural objects in early modern collections, see Felfe 2018.

33 On this, see especially Geismar 2018; Alberti 2011; Ferber & Wilde 2016.

PART I

Substitution

∴

FIGURE P1 Emeralds and reconstructions of their imitations, made according to ancient recipes. The photo shows, from left to right, a translucent green glaze over gold leaf made with verdigris (a green copper-based pigment) ground with oil; a raw, unpolished emerald; three quench-cracked crystals dyed with verdigris dissolved in hot oleoresin in imitation of natural emerald
PHOTO: MARJOLIJN BOL

Introduction

This section enquires into the cultural conditions that enable or stimulate the emulation of material substances. Several art forms have come into being as a direct result of attempts to imitate other materials (Bol 2023). Glass-making practices, for instance, were stimulated by the desire to imitate gemstones, while new ceramic glazes were developed to imitate metals. Sometimes imitation produced a chain of new practices: after painters north of the Alps started using oil paint to imitate the visible world, fifteenth-century Italian tempera painters began to use egg to imitate the visual appearance of oil paintings from the North, while sixteenth-century tapestry weavers invented and adopted new dyestuffs to imitate oil paintings more successfully. Similarly, research on eighteenth-century consumption has revealed the proliferation of inexpensive replicas of luxury items that was made possible by the rise of mechanised production, and that brought many less affluent consumers into an industrialised world (Berg 2002). Even in the realm of the senses, the question of producing a substitute material to replace a substance valued for its fragrance or flavour raises problematic questions about identity and difference, as well as the ethics and politics of substitution, and even about the conditions of possibility for trusting the senses. This is particularly evident in debates over the ersatz, commonly associated with wartime shortages, and over the adulteration of foods, medicaments and toiletries.

The common denominator between the different papers in this section is that they all focus on issues of substitution and material mimesis in art by studying its epistemic impact. Ajmar, for instance, argues that a culture of material mimesis is the emergent, dynamic context against which we should measure many practices of Italian Renaissance artisanal emulation. She explores the case of Renaissance wood intarsia to capture how Renaissance artistic practices operated through continuous processes of mutual 'trans-material' emulation, whereby an art strove to *look* and *be* like another, in a flow of constant transformation. Ajmar shows that this phenomenon should be understood as an active component of wider processes of artisanal epistemology, wherein approximating another material might be a form of experimentation, or knowing by making. Smith and Lores-Chavez likewise focus on how the mimesis of natural materials served the epistemic aim of investigating nature in the making of art. Their study of a late sixteenth-century manuscript reveals that the experiments by its anonymous author with the imitation of natural substances, such as gemstones and animals cast from life, were simultaneously an

aesthetic quest and a probing of the relationship between nature and art. In her study of fifteenth-century porphyry imitations by the della Robbia family, Zarnecka shows that in some cases it was the *lack* of knowledge of the natural material, including how to work it, that instigated its imitation through visual substitution. She shows that artistic imitation of the durable purple colour of porphyry by glazing clay was taken to display the mastery of nature's secrets in the arts by means of human skill. Such practices imbued the newly invented material, and the sculptures made from it, with a similar symbolic and religious value to that of the scarce and valuable porphyry produced by nature.

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CHAPTER 1

Counterfeiting Materials, Imitating Nature

Pamela H. Smith and Isabella Lores-Chavez

The remarkable ceramic vessels crafted by Bernard Palissy (1510–1590) and the cast-from-life tableware of Wenzel Jamnitzer (1507/08–1585) testify to a fascination with nature's creations and its generative processes among sixteenth-century artists (figs. 1.1, 1.2). Filled with animals, shells, and plants molded from actual specimens, these objects mimicked the diversity of nature. From Palissy's writings it is clear that such objects were meant not just as a mimesis of the form of natural things, however, but also as an assertion of his ability, through imitation, to gain knowledge of nature.[1] In 'The art of the earth', a section of his *Discours admirables* (1580), Palissy (1957, 188–203) asserts that knowledge of nature can only come by means of 'art', a direct engagement with the materials of nature involving great bodily labor and suffering. Because

FIGURE 1.1 Bernard Palissy, dish with rustic 'figulines', second half of the sixteenth century. Lead-glazed clay, 76.1 cm × 45.4 cm. Musée des Beaux Arts, Lyon
© LYON MBA. PHOTO: COURTESY OF MUSÉE DES BEAUX-ARTS, LYON

 | DOI:10.1163/9789004515413_004

FIGURE 1.2 Wenzel Jamnitzer, tablepiece, 1549. Silver, 99.8 cm × 46.0 cm RIJKSMUSEUM, AMSTERDAM. PHOTO: RIJKSMUSEUM. PUBLIC DOMAIN

knowledge of nature only emerges from direct and repeated experience of the things of nature, all those who practise an art learn thereby the principles and causes of natural phenomena. Even a 'laborer without knowledge of languages, except the one your mother taught you' can be said, according to Palissy (1957, 113–114), to have a philosophy of nature. To explicate and prove his knowledge about how natural substances come into being and are transformed, Palissy's writings on natural subjects explored the formation and generation of natural phenomena based on direct observation. Moreover, he put objects on display in a museum in Paris to accompany the lectures he said he provided to the curious there.[2] Palissy's actions make clear that his mimesis of natural things, in its direct engagement with the materials of nature, had an epistemic aim of extracting natural knowledge from his making procedures.

A remarkable anonymous manuscript contemporaneous with Palissy and Jamnitzer, which contains the most detailed extant instructions for casting from life, sheds further light on the practice of imitating nature in an artisanal workshop. It reveals that the making of quotidian objects in itself formed a fundamental investigation into nature and natural materials, even when it was not accompanied by the kind of written claims that Palissy makes. The author of the manuscript Ms. Fr. 640, now in the Bibliothèque nationale de France, experimented with the imitation of nature on multiple levels, from detailed techniques for life casting to methods for fabricating gemstones. The manuscript comprises 170 folios of closely-written observations, notes, and recipe-like instructions set down in late sixteenth-century France by an anonymous person whom we refer to as the author-practitioner. This individual does not appear to have had ambitions to make explicit epistemic claims to knowledge of nature; however, his efforts to make objects that mimicked natural things – his quotidian testing and trying of materials – demonstrate the ways in which the workshop's everyday mode of working and producing could constitute investigating and philosophising about nature. This is especially evident in Ms. Fr. 640's entries that aim to produce imitations of natural substances, ranging from fabricated gemstones to animals cast from life. The endeavor to create such man-made equivalents prompts the artisan to examine closely the peculiarities of raw materials and to seek practicable techniques that can match (without supplanting) nature's generative forces. In his attention to the colour and surface effects of the natural substances to be reproduced, the author-practitioner describes precisely the phenomenon that Marjolijn Bol (n.d.) calls material mimesis, in which one material imitates the visual properties of another. This material mimesis is thus based on first-hand experiment with, and hypothesizing about, raw substances and their properties.

Our essay closely reads and reconstructs the manuscript's recipe for *Jaspe contrefaict* (counterfeit jasper) in order to understand the author-practitioner's interest in and practice of imitation. Although physical likeness was seemingly the primary objective, our reconstructions suggest that the process of imitating or reproducing a raw material might also have helped the author-practitioner understand both the material and the forces behind its generation in nature.[3] We find connections between the author-practitioner's modes of inquiry into the physical properties of materials and important sixteenth-century epistemic projects, including the *Kunstkammer* and contemporaneous natural philosophical writings on the genesis of stones. As we explore what constituted a convincing imitation of *naturalia* prized by early modern collectors, thinkers, and artisans, we consider the status and epistemic aims of these products within collections of the time.[4]

1 Making and Knowing

Our investigation of imitation jasper was carried out in the framework of the Making and Knowing Project (www.makingandknowing.org), a collaborative project dedicated to exploring artisanal and experiential knowledge, which has produced a digital critical edition and translation of Ms. Fr. 640. This manuscript comprises an extraordinarily detailed first-hand account of practical techniques for making objects typically found in an early modern *Kunstkammer* collection. It contains recipes for a huge variety of techniques, with almost half of the over 900 entries devoted to casting and metalworking methods, and includes in-depth entries on arms and armor, and observations on a multitude of other processes and practices from painting to plant cultivation. The Project's digital edition of this manuscript, *Secrets of craft and nature* (published 2020), contains a full transcription, English translation, and critical commentary on many of the entries. This commentary was created by students in a 'laboratory seminar' at Columbia University, in which hands-on reconstructions of techniques and objects in the manuscript are carried out.

The more the Project has learned about Ms. Fr. 640 through these reconstructions, the clearer it has become that the anonymous author-practitioner was preoccupied with imitating nature in a diversity of forms. His instructions for life casting are by far the most detailed written accounts of this technique, and include, for example, casting the multiple petals of a rose, and clever 'secrets' for a method to produce an exact imitation in concave of a portrait

relief medal in convex – called 'incuse reverse casting' today. He was also interested in sleight-of-hand tricks, a type of deceptive trickery that forms the other side of the coin of perfect imitation, encapsulated in terms such as 'crafty', 'cunning', or 'artifice' (and today's 'artificial'), which ultimately refer to the power – for both good and evil – of the work of the human hand. As is well known, the German term *Kunst*, meaning art, derives from *können*, or 'to be able to do' – in other words, 'skill'. Some of the very first written recipes for dyes and pigments contained in the so-called Leiden and Stockholm papyri (*c.* 2nd century CE) include just such ambiguous processes of imitation, for colouring and dyeing are natural stages of material transformation, but are also capable of deceiving through their perfect imitation of more precious substances, such as gold or gemstones. As this essay will show, however, imitation in the making of art is much more than representation – or deception – of form, and this more significant, indeed epistemic, mode of imitation pervades Ms. Fr. 640's recipes.

2 Imitating and Counterfeiting

Ms. Fr. 640 contains a rich array of terms used by the author-practitioner for imitative practices. A search of the manuscript for words or roots potentially associated with mimesis yields *natur-*, *contref-* (from *contrefaire*, or 'to counterfeit'), *imit-*, *selon*, *vray*, *aproch-*, *artific-*, and *effect*. Several noteworthy points emerged: first, the author-practitioner employs the term *le naturel* – appearing thirty-seven times – to refer to the natural state of a thing. This term – literally, 'the natural' – suggests a concept in which the natural properties of a material or creature exist as a kind of independent component within it. By contrast, the use of *nature* with a possessive – 'its nature' – occurs infrequently. For example, in fol. 105v, the author-practitioner describes methods for catching nightingales and emphasises that 'you must observe their nature' [*naturel*], attributing *le naturel*, or 'the natural', to the creatures themselves.[5] In other words, the behaviours of physical beings or materials are not described by reference to natural tendencies but rather by an acknowledgement of *the* natural that resides within them. In sixteenth-century France, this notion of the innate character of a thing or person was used to translate the Latin term *ingenium*, making native traits central to the early modern understanding of 'ingenuity'.[6] The author-practitioner's interest in observing how *le naturel* manifests itself is made clear by his pairing of the term with *selon* ('according to') or, relatedly, *comme* ('as').[7] When describing the casting of a rose on fol. 155v, the

author-practitioner insists on the importance of painting it *selon le naturel*, imparting to 'the natural' an individual authority from which the maker takes his cue to produce his artifice.

Consistently, *le naturel* appears in recipes that deal with tips for either visual representation or physical manipulation; some indicate what to expect when handling a particular substance or how it behaves as it undergoes an unfamiliar process. The fifty-nine occurrences of terms related to the word 'nature' attest to the author-practitioner's preoccupation with understanding the raw materials with which he claims to work. Notably, the author-practitioner does not have an equivalent for our modern term 'naturalistic'. Rather, his terms related to nature predominantly address the physical properties of things and emphasise the value of the object as the starting point for faithful representation. The author-practitioner also uses the term *le naturel* to refer to the natural object itself, often to insist on it as the unmatched source of visual information that guides the artisan's work. His marginal note on fol. 141v about painting moulded crayfishes to augment their lifelikeness recommends: 'As in this & all other things, have always the natural one in front of you to imitate it'.[8]

The most suggestive insight into his conception of mimesis emerges from a comparison of his use of *imiter* ('imitate') and *contrefaire* ('counterfeit'). *Imiter* and its variants appear twelve times in the manuscript, in the context of both two- and three-dimensional representations. *Contrefaire*, on the other hand, appears seven times, exclusively in recipes that deal with producing doubles for raw materials. Given how apparently intentional his use of these terms is, *contrefaire* may specifically denote material mimesis in the manuscript. This becomes particularly clear in the recipe on fol. 10r for *Jaspe contrefaict*. He uses *contrefaire* as an adjective modifying jasper in the recipe title, and then again as a verb in the long marginal note, 'To better counterfeit mottled jasper'.[9] This is in contrast to the meaning of *imiter* within the same recipe, which he uses in an inventive aside about imitating a rose with the scrapings produced in thinning the horn with a plane for the jasper.[10] 'You can imitate roses' delights in the possibility of visually representing a rose by arranging the horn scrapings according to their natural curl (fig. 1.3).[11] This, too, is material mimesis, which is perhaps why the author-practitioner goes on, in another recipe on 10r entitled 'Roses', to say that these are 'counterfeited' by dyeing the scrapings of horn or parchment. The contrast between *contrefaire* for jasper and *imiter* for roses in a single recipe, however, alerts us to a distinction that the author-practitioner appears to make between a visual effect of verisimilitude and a feasible visual substitution for the raw material. If we are to take him at his word, *jaspe*

FIGURE 1.3 Imitation rose, made from shavings of painted bovine horn, from first trial of imitation jasper, following instructions in Ms. Fr. 640
PHOTO: ANA ESTRADES & WENRUI ZHAO, THE MAKING AND KNOWING PROJECT

contrefaict is so materially close to the original stone that it could stand in for it, rather than merely appearing like it.

3 Portrait and Counterfeit

In the early modern period, the term *contrafactum* and its vernacular cognates emerged as a powerful way to convey authenticity and 'fact' by means of the visual. As the art historian Peter Parshall (1993, 555–556) has shown, this term served as a label 'most often employed within the emerging genres of portraiture and topography, for images reporting specific events, and for portrayals of both natural and preternatural phenomena'. To characterise an image as a counterfeit possessed almost the opposite sense of its meaning today, describing not a mode of deception, but rather an attempt to communicate firsthand

or eyewitness evidence. That it was most often applied to portraits reveals that the term could convey both the image-maker's personal contact with the 'original' and also the effectiveness of the representation itself. An *imago contrafacta* stood in for the real person, event, or object it described, but not in order to deceive. The term *contrafactum* could support 'subjects that for one reason or another seemed to ask for a special order of legitimacy' (Parshall 1993, 564) precisely because they inspired wonder and disbelief. The media revolution of widely circulating prints helped disseminate and bolster the use of the term. The increasingly active 'rhetoric of verifiability and actuality' in the early modern period 'granted images so described a certain truth value, one not always in sync with the reality effect of the image itself' (Swan 2005, 10). The author-practitioner's use of *contrefaire* in the manuscript appears to be congruent with this usage. Using this term to describe a representation of a natural material, he appears to claim that legitimate knowledge of the original derived from material imitation can be independent from the persuasiveness of the representation. In other words, imitating can lead to knowing, even when the imitation produced is not fully convincing.

Several of the author-practitioner's contemporaries use the term *contrefaire* similarly. Giovanni Villani's *Segreti* (*c*.1300) uses the adjective *contrafatti* in recipes devoted to imitating valuable raw materials, namely amber, ivory, coral, and pearls.[12] The pseudonymous Alessio Piemontese's popular book of secrets (*De Secreti*, 1555), like Ms. Fr. 640, provides recipes for artistic techniques and experiments with material mimesis, and uses *contrafatto* in a recipe for making ebony 'so beautiful as to cause shame to the natural'.[13] Making objects that resembled raw materials seems to have been understood as a process of taking direct cues from nature to approximate the materials' natural state, with the implication that the finished products were visually close enough to the original materials that they could function in their place. The 'counterfeit' could be a visual substitute for the thing itself, much like a portrait – the ultimate *imago contrafacta* – could be valued as a stand-in without being confused for the actual person.[14] If the author-practitioner understood his manufactured jasper to be more *contrafactum* than mere imitation, we may further consider how his *jaspe contrefaict* might function as a representation charged with conveying knowledge of jasper's 'nature' or essence.

4 Jasper

Reconstruction of the fol. 10r recipe for counterfeiting jasper, over the course of three trials, allowed us to investigate the feasibility of the author-practitioner's

proposed material mimesis. The initial reconstruction, 'Jasper imitation on horn', by Ana Estrades and Wenrui Zhao, tested the author-practitioner's suggestion of gathering and painting bovine horn shavings to imitate the appearance and texture of rose petals.[15] The 2016 and 2018 reconstructions of the fol. 10r recipe worked with the same type of water buffalo horn ('horn from which one makes lanterns, quite thin'),[16] planed and sanded until it was thin enough to be translucent (between about 5 and 3 mm), and cut into rectangular pieces about 5 cm long, using a jeweler's saw.[17] To paint the horn in the 2016 reconstruction, Isabella Lores-Chavez and Charles Kang used the green pigment verdigris and red madder lake pigment, each ground with spike lavender varnish ('The colors for this jasper want to have a base with clear turpentine or spike lavender varnish') and, for a more translucent paint, linseed oil ('colors matte in body are not so appropriate here').[18] The reconstruction set out to test the recommendation made in a marginal note that a better 'counterfeit' marbled jasper can be made using 'wool with thick hairs dyed in diverse colors'.[19] This passage is not explicit about how the wool ought to be coloured, nor does it indicate how to adhere it to the painted horn. For the 2016 trial, we dyed two samples of yarn made of 100% sheep's wool in the lab. Because the author-practitioner does not specify any adhesive, we first tried pressing the yarn into the paint to see if it would naturally stick. When the yarn proved too fibrous and bulky for the paint to act as a glue, we tried dipping the yarn in paint and using it to spread paint across the surface of the horn. This resulted in only a slightly marbled, less uniform look to the surface. Finally, we attempted to adhere yarn to the horn by dipping a strand in spike lavender varnish before applying it to the horn. This strand certainly stuck more effectively, but it still did not achieve a marbled effect as suggested by the author-practitioner (fig. 1.4).

For all five samples of painted horn in the 2016 reconstruction, we used a sharp metal tool to scrape lines into the horn, following the recipe instructions: 'After you have layered all the colors, scrape oblique lines on them, then layer gold & silver leaf'.[20] Finally, to half of each painted horn sample we applied transfer gold leaf (thin gold foil adhesible by rubbing onto flat surfaces) and coated the unpainted side with spike lavender oil ('One needs to oil the unpainted reverse with spike lavender oil').[21] These last three steps contributed significantly to the effect: the scratched lines created delicate patterns not unlike those found in real jasper, while the gold backing brightened the colour of the painted horn and highlighted the fine scratched lines further.

In the third trial, in 2018, we revisited the author-practitioner's marginal recommendation to use 'wool with thick hairs' to achieve a more marbled surface effect (fig. 1.5). This time we used unspun wool applied to horn painted

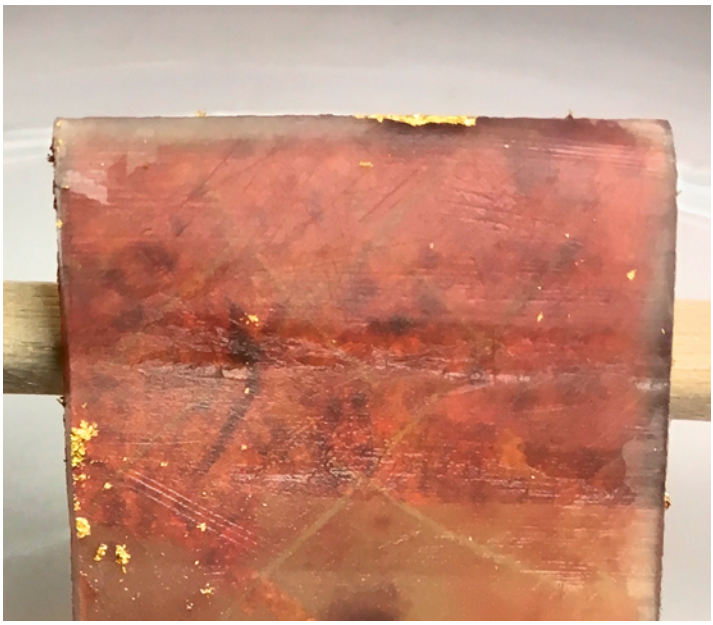

FIGURE 1.4 Imitation jasper from second trial made from bovine horn, red paint (madder and spike lavender varnish), dyed woollen yarn, and transfer gold leaf, oiled with spike lavender oil, following Ms. Fr. 640, fol. 10r
PHOTO: ISABELLA LORES-CHAVEZ, THE MAKING AND KNOWING PROJECT

with coloured varnish, producing a sample of counterfeit jasper that most convincingly resembled the real stone. Oiling the unpainted side with spike lavender oil rendered the horn immediately more translucent, making the painted side more visible while helping the horn retain the fatty lustre that made it the author-practitioner's material of choice ('the horn presents a luster & fatty polish like jasper'.)[22]

5 Reconstruction Insights

Our reconstruction of *Jaspe contrefaict* gave compelling evidence for the author-practitioner's possible sequence of experimentation. The layout of the text on fol. 10r includes a central block of text (the recipe), with a marginal note extending far down the left side of the folio that communicates variations on the process and possible uses of the product (fig. 1.6). This note contains the first piece of advice for making the imitation more convincing: the use

FIGURE 1.5 Top: Native jasper, unpolished. Bottom: Imitation jasper from third trial
PHOTO: PAMELA H. SMITH, THE MAKING AND KNOWING PROJECT

of coloured wool. Its placement in the margin may indicate a second trial of the jasper counterfeit. Directly following this are instructions for scratching oblique lines and for backing with gold leaf, both of which significantly augmented the appearance of the horn as a patterned yet translucent object. The use of wool and the scratching followed by gilding seem to be techniques he employed in later trials, or ideas he wrote down for later testing.

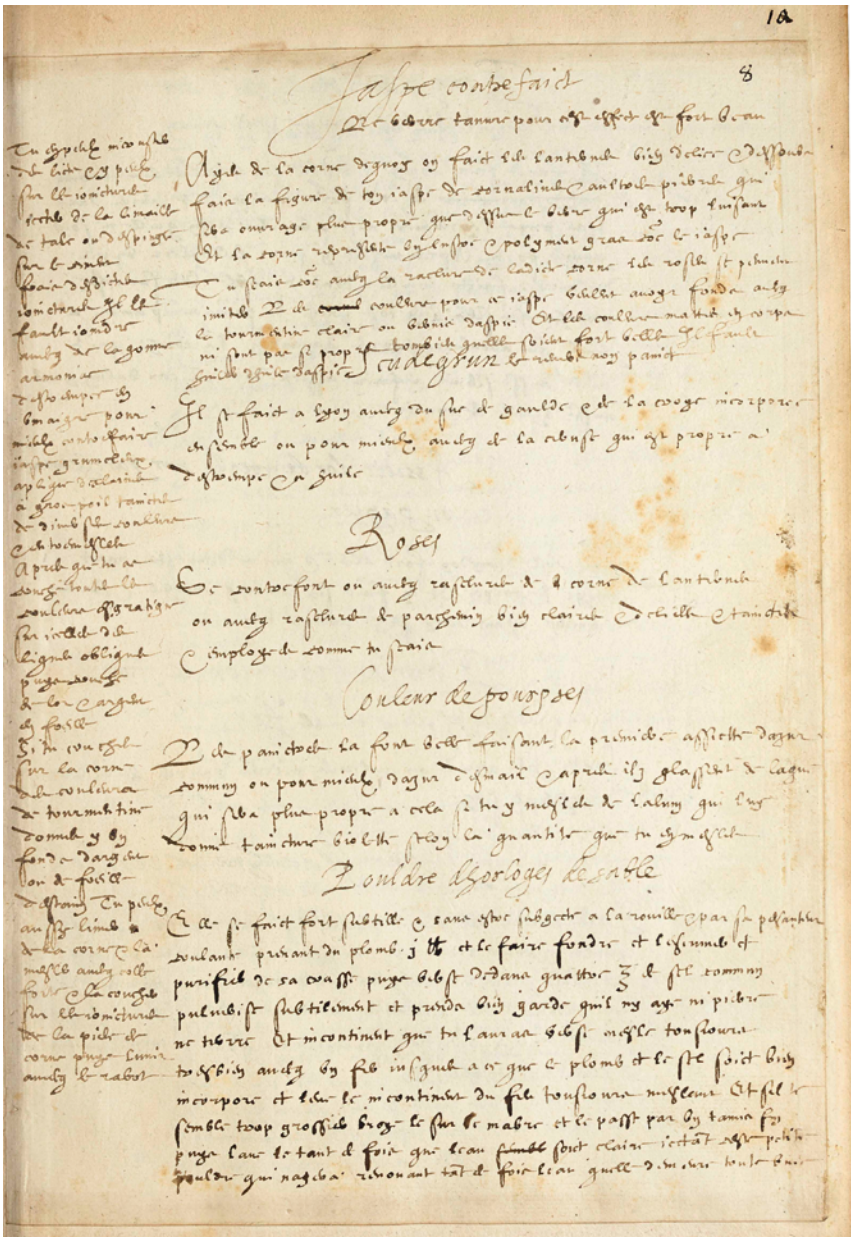

FIGURE 1.6 Folio 10r, Ms. Fr. 640. The recipe for *Jaspe contrefaict* begins at the top of the page and continues with a long marginal note at left. 'Recueil de recettes et secrets concernant l'art du mouleur, de l'artificier et du peintre', BIBLIOTHÈQUE NATIONALE DE FRANCE, DÉPARTEMENT DES MANUSCRITS, MANUSCRIT FRANÇAIS 640. WITH PERMISSION

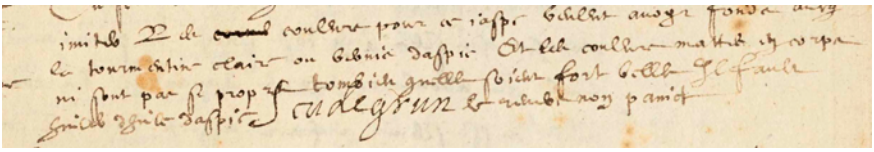

FIGURE 1.7 Detail of folio 10r, Ms. Fr. 640, showing the text at the end of the main recipe squeezed into the little space available above and around the title for the following recipe

In contrast, the final step of oiling the unpainted side, which undoubtedly contributed to the product's verisimilitude, appears urgently squeezed in at the end of the main block of the recipe, on either side of the heading for the following recipe (fig. 1.7). Further modifications were recorded in marginal notes: while the main body of the recipe recommends not using glass, a stray line of text beneath the title states the effectiveness of thin glass, perhaps another indication that the author-practitioner returned to the recipe with alternate steps or materials. Based on our reconstruction, it seems likely that the author-practitioner attempted this recipe multiple times, and in our own trials, multiple iterations produced better counterfeits.

Both the analysis of the author-practitioner's language and our reconstructions make a case for his awareness of the value of his own artifice. He even anticipated a use for his counterfeited stone: the long marginal note squeezed onto fol. 10r begins by stating that the imitation jasper can be used to inlay bed frames (fig. 1.8).[23] This use could potentially augment its verisimilitude: when not the sole focus of the viewer's attention, even modest jasper-like visual qualities could be sufficiently effective.

6 The Place and Purpose of Jasper

The purpose of making counterfeit jasper thus was not to deceive: it may have been to convey the 'essence' of the material, and perhaps even to understand how the real stone came to have that essence and appearance. The creation of a material mimesis could serve not just to stand in place of the real, but also to 'explain the physical problem of the genesis of nature's materials', a process comparable to the belief proclaimed by the thirteenth-century philosopher-theologian Albertus Magnus (*c.*1200–1280) 'that nature could be understood from the direct analogy to its artisanal counterparts' (Bol 2014, 129). To examine whether this applies to the author-practitioner's process of making jasper, we must consider both the function of jasper in the early modern period and the epistemic context for his recipe.

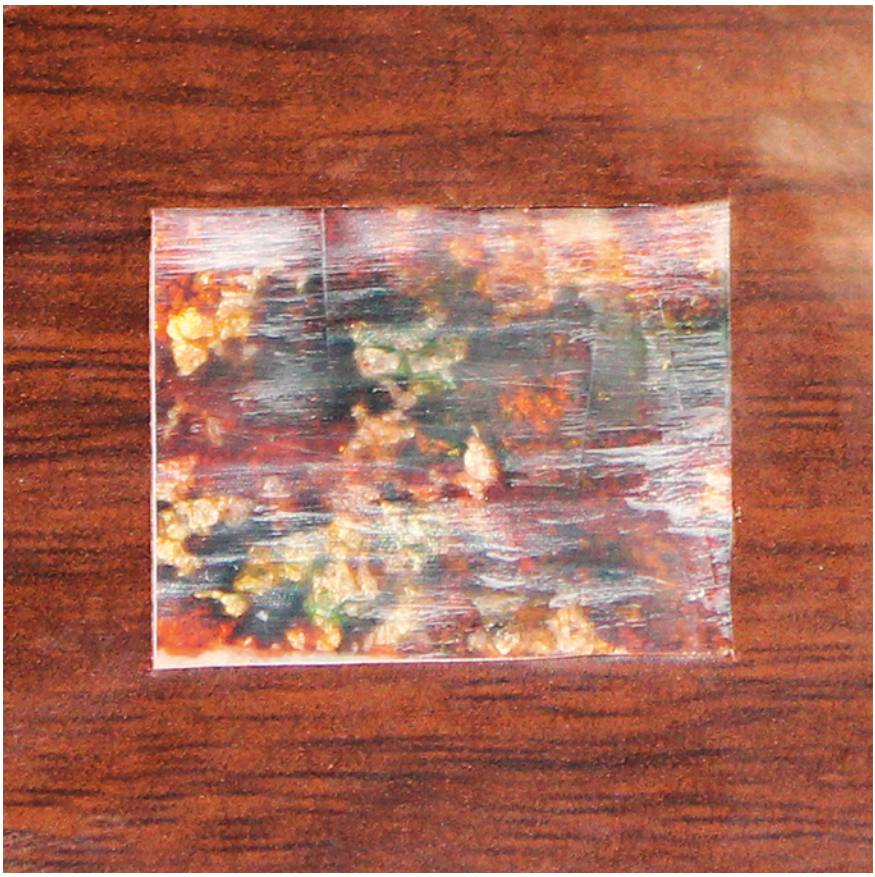

FIGURE 1.8 Imitation jasper from the third trial inlaid into imitation wood frame
PHOTO: TIANNA UCHACZ, THE MAKING AND KNOWING PROJECT

In the sixteenth century, jasper was among several precious stones commonly collected in princely *Kunstkammern* and even in modest collections of *artificialia* and *naturalia*. Already in the medieval period, a taste for jasper existed at the imperial courts of Prague, where precious vessels were carved from locally mined stone.[24] Generations later, Holy Roman Emperor Rudolf II (1552–1612) continued to display goods made of Bohemian jasper in the capacious *theatrum mundi* he had famously amassed. Additionally, he commissioned large tabletops in the *commesso di pietre dure* technique from the stone carver Cosimo Castrucci and his workshop in Prague. Around 1597, the Medici workshops in Prague were making a round table (now lost) of jasper and porphyry for him. These compositions, like their counterparts produced in the grand-ducal workshops in Florence, combine different kinds of stones, including jasper,

FIGURE 1.9 Galleria dei Lavori, Barberini cabinet, *c.*1606–23. Oak and poplar veneered with various exotic hardwoods, with ebony moldings and plaques of marble and slate; pietre dure work consisting of colored marbles, rock crystal, and various hardstones, 59.1 cm × 96.8 cm × 35.9 cm
METROPOLITAN MUSEUM OF ART, NEW YORK. WRIGHTSMAN FUND, 1988, 1988.19

whose individual characteristics here matter less than the surface effects the stone contributes to the whole (fig. 1.9). The work of the artist embellishes the stone's natural preciousness; its value derives from a combination of the raw material and the artist's artifice.[25]

At Schloß Ambras, in the extensive *Kunstkammer* of Archduke Ferdinand II (1529–1595), the son of Holy Roman Emperor Ferdinand I, jasper was among the gemstones and minerals in the archduke's collection of *naturalia* in their raw form, evidently sometimes displayed alongside artistically worked versions of the same materials (Scheicher 1985, 32). In the early modern *Kunstkammer*, jasper was thus appreciated both as a marvellous stone and as a workable raw material. Moreover, jasper could also be admired for receiving representational impressions from nature itself. In *Le parfaict joaillier* (a 1644 translation of the 1609 work *Gemmarum et lapida historia*), Anselm de Boodt (1550–1632), a Flemish mineralogist and humanist, discusses the specific hardness of jasper

and the ways sculptors worked it. Comparing heliotrope to jasper, he remarks that it has 'a greater authority than jasper, unless it is the case that nature has imprinted upon this jasper images and effigies'.[26] De Boodt indicates how figuration naturally occurring in jasper could increase its value, drawing an analogy between the work of nature and the sculptor's carving of images into the stone.

The author-practitioner undoubtedly had opportunities to see jasper, given its availability from European mines. He may also have been familiar with the writings of Bernard Palissy, who made ceramic casts from life using techniques comparable to the author-practitioner's life castings in metal. In 1580, Palissy published his Paris lessons on natural history in *Discours admirables*. Among the many descriptions Palissy provides for the formation and properties of natural materials, there is a long section devoted to stones, which includes detailed explanations for the physical appearance of stones like jasper. He is particularly preoccupied with these stones' colouring:

> As for the colors of figured marbles, jaspers, porphyries, serpentines, and other such kinds, their colors are caused by various drips of water that fall from the surface of the earth to the place where these rocks are formed: the waters coming from many and various places in the earth, in descending bring with them these various colors which are in these stones [...] Other drops will carry other various colors that will cause many patterns on the rocks.[27]

Palissy pictured multiple stages in the formation of rocks deep within the earth, positing that the final colours and textures of jasper were generated by the movement of water.[28] Pairing theory with practice, Palissy also created glazes for his ceramic grottoes in his attempt to 'decipher the causes of colour transformation in nature', using 'human craft to elucidate natural process' (Shell 2004, 22, 27). The author-practitioner's recipe for *jaspe contrefaict* indicates an inquisitiveness about the colouring and patterning of the stone comparable to observations that spurred Palissy's theories about the origins of such stones. The author-practitioner experiments with techniques for materially imitating the appearance of jasper as well as for 'generating' it. He specifically considers how colours ought to be laid down but also disrupted and moved around (with wool or by scraping). The admonition *not* to use opaque colours also suggests a practical knowledge of the relative translucence of some pigments compared to others, as well as a concept of colours first suspended in water and then made solid and visible by their union with a substrate.[29] The author-practitioner's encounter with the real stone could have prompted

FIGURE 1.10 Bernard Palissy, spoon handle in the shape of a woman, *c.*1556–90. Glaze and terracotta, 14.8 cm × 4.2 cm, Musée national de la Renaissance, Ecouen, France. Palissy used colored glaze to imitate jasper

questions about how nature produces such astonishing effects and informed his practical efforts to mimic them (fig. 1.10).

Both in Ms. Fr. 640 and in the *Kunstkammern* of early modern Europe, jasper coexisted with several other materials sought after in their raw form. Coral and multi-coloured woods were essential components of a stock of *naturalia*. Although each of these, too, was incorporated into larger vessels and *artificialia*, their natural appearance was itself a source of fascination for collectors and artisans alike. Ms. Fr. 640 contains numerous recipes for making coloured wood, among them the general 'Recipe for colouring all wood' (fol. 75v–76r), as well as instructions for colouring it green, red, and purple (fol. 76r). Wood of diverse colours was produced in Europe and imported from overseas, essential in techniques like *intarsia*, as used in the *studiolo* of the Duke of Urbino Federico da Montefeltro (1422–1482), designed by Francesco di Giorgio Martini (1439–1501) between 1478 and 1482 (Wilmering 1999). The author-practitioner's inclusion of methods for dyeing wood accords with his general interest in the manuscript in decorative practices involving painted and dyed materials, including horn. Judging from his comments about the potential uses of the *jaspe contrefaict*, it is likely that he had in mind multiple uses of coloured wood – itself a possible material mimesis of finer woods or rarer substances like ebony – when he included these recipes in the manuscript, attentive to the natural aesthetic qualities as well as decorative applications of both the raw material and its imitation.

As with jasper, the author-practitioner provides instructions for making coral on fol. 3r, using the designation *coral contrefaict*. This recipe suggests a material mimesis so successful that it could substitute for the precious original; even the marginal note reiterates the verb *contrefaire* rather than using *imiter*.[30] Coral was a favorite collector's item in early modern *Kunstkammern* for its visual appeal, its restorative medical properties, and its suitability for carving. Ferdinand II included it in his Schloß Ambras collection, both in its native form and as a decorative addition to mounts for exotica such as ostrich eggs. The author-practitioner's recipe produces a version close to natural coral; the reconstruction made by the Making and Knowing team with Dr. Elisabeth Berry Drago attests to the convincing appearance of the imitation. For some collectors, coral's visual appeal coincided with a pursuit of the knowledge that close inspection could yield. Ferrante Imperato (*c*.1525–*c*.1615), the Neapolitan apothecary, relied on direct observation of 'the materials in his collections to describe anew the contours of the natural world' while preparing his 1599 *Dell'historia naturale* (Findlen 1994, 32, 42). Here he discusses the physical properties of coral, and explains how he believes it is formed in nature, based on his firsthand examination of actual specimens. He stated that coral grew over

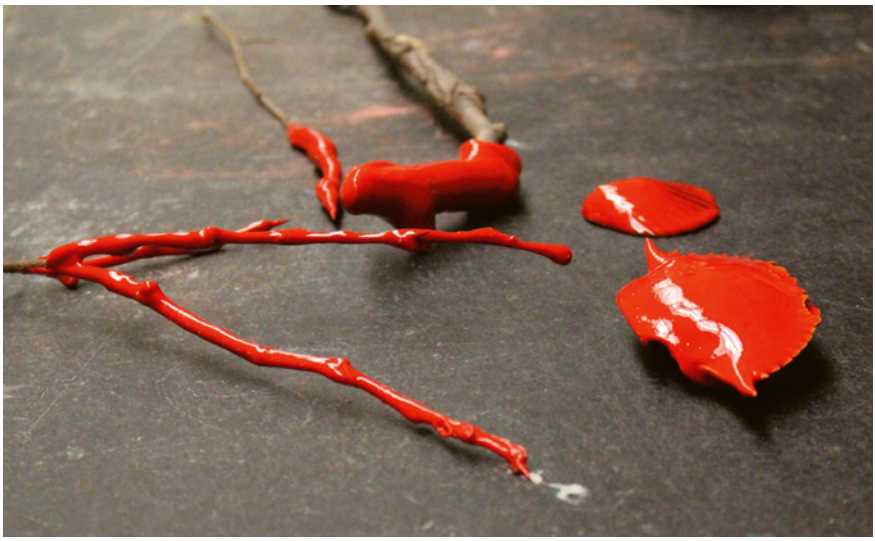

FIGURE 1.11 Imitation coral, reconstructed following Ms. Fr. 640, fol. 3r
PHOTO: PAMELA H. SMITH, THE MAKING AND KNOWING PROJECT

branches, encasing them completely, giving as proof that, when broken open, coral specimens exposed wood cores (fig. 1.11).[31] Unbeknownst to Imperato, he was probably looking at a piece of imitation coral made according to the technique described in Ms. Fr. 640.

The 1565 treatise of Samuel Quiccheberg (1529–1567), *Inscriptiones tituli theatri amplissimi*, sheds light on the conceptual frameworks that informed the diversity of jasper, wood, and coral in early modern collections. These raw materials belong to what Quiccheberg (2013, 81) calls 'the universal class [...] compri[sing] natural things and the entirety of natural matter'. In Quiccheberg's system for organising objects in a collection, *naturalia* belonged to the third of five classes, within which there were eleven 'inscriptions' or subcategories. Remarkably, several inscriptions in the third class encourage the possession of materials taken directly from nature *or* 'imitated by artifice'. Within the same inscription, Quiccheberg includes 'herbs, flowers, small branches, boughs, pieces of bark, wood, roots, and the like', as well as versions of these 'either cast from metal of some kind, woven from silk, or depicted by some new art'. Furthermore, the 'earthen materials and liquids' in the eleventh inscription can be 'both naturally produced and manufactured'. In Quiccheberg's conception of a collection of *naturalia*, the imitation appears to be the material equivalent of the raw substance: it is a counterfeit that can stand in for its *naturel*.[32] By including human-made objects created by techniques unknown

to him within the same inscription as natural specimens, Quiccheberg's treatise demonstrates that imitations were not considered degraded products but ingenious counterfeits of raw materials, able to stand in for the real thing. In the *Kunstkammer*, in the workshop, and in the theoretical texts that sometimes linked them, a 'counterfeit' manifested a response to a natural wonder, without the modern connotations of deceptiveness and superficiality.

Quiccheberg's *Inscriptiones* seems to make room, in a complete *theatrum mundi*, for precisely the kind of imitative techniques contained in Ms. Fr. 640. The enthusiasm on the part of intellectuals like Quiccheberg for nature 'depicted by some new art' surely spurred artisanal practices of imitation. 'Reproduction was an achievement in itself', presented as a welcome opportunity to compare natural artifice to human artistry (Pilaski Kaliardos 2013, 149). The intermingling of *naturalia* with *artificialia* posing as *naturalia* serves as a reminder that, in imitating the artifice of nature, artisans had the paradoxical task of effacing traces of their creative processes, without making the imitation so convincing as to completely conceal the ingenuity of its maker. Ultimately, these inventive artisanal techniques could have epistemic reaches, constituting a valuable mode of creating knowledge about nature. The resemblance between the raw material and the *imago contrefacta* (whether an image or an object) could promote an understanding of the organic processes that engendered such visually impressive substances in the first place. These projects in material mimesis were artful endeavors *and* investigations of nature. Possessing both the imitation and the natural material, a collector might have considered 'that art could, by virtue of the knowledge about natural processes on the part of the artist, produce things that were "virtually" natural' (Pilaski Kaliardos 2013, 163). The artisan, meanwhile, moved from a close examination of the raw material to its re-creation in the workshop, using familiar tools and techniques to make objects that could rival nature's impressive artifice (Pilaski Kaliardos 2013, 149).

7 Making and Owning

If the products of experimentation with imitation could serve as substitutes for the original raw material, could deception in the sense of a modern forgery have been one motivation for making them?[33] Given the commercial success of exotica and *naturalia* as sought-after objects for *Kunstkammern*, charlatans abounded, 'not aspir[ing] to interpret nature, but to sell nature to those who created knowledge out of the raw ingredients of the marketplace' (Findlen 2002, 302). Despite its rich use of imitation terms, the recipe on fol. 10r deals

with the practical, not the commercial, aspects of the making and the product itself. The author-practitioner's *jaspe contrefaict* was not destined to garner a high price and enter a princely *Kunstkammer*, but it could serve to ornament a bed frame in a more modest setting.

In his imitation recipes, the author-practitioner articulates a practice undertaken on a daily basis in the artisan's workshop: through physical manipulation, certain materials could be pushed to undergo transformations to resemble another material. Subjected to a non-natural transformation, one material could take on the visual appearance – and even the physical properties – of another. The distinction the author-practitioner seems to make between *imiter* and *contrefaire* indicates his subtle understanding of how workshop versions of coveted raw materials could be the compelling, if not perfectly convincing, simulacra resulting from such processes. The endeavor to create a human-made equivalent for raw natural substances provided an opportunity to learn more about them and to seek practicable techniques that could match (without supplanting) nature's creative forces.

Stones such as jasper sustained both visual and scientific appeal in the early modern period; they showed distinctive patterning, but no two specimens were ever quite the same. For the author-practitioner, examining this kind of object up close seems to have raised questions about its material peculiarities and about how nature generates them. Those irregularities guided inquiries, as much for the author-practitioner as for his naturalist contemporaries. In the catalogue of his own *Kunstkammer*, Ferrante Imperato, according to Paula Findlen (1994, 227), 'argued that nature's causes did not exceed the powers of ordinary observers' and 'underscored nature as a knowable entity, full of ordinary rather than magical wonder'. Discovering how ordinary materials can produce the verisimilitude of exceptional materials is central to the author-practitioner's endeavors. His ingenious attempt to 'turn' bovine horn into jasper is a far cry from Bernard Palissy's description of water slipping colour onto primordial clay before it congeals to form patterned stones like jasper.[34] Yet, in a similar fashion, the recipe communicates a curiosity about the ways that nature creates and astonishes, engendering improbable transformations through which water can become colour and soft earth durable stone.

The author-practitioner's own processes begin in readily accessible workshop materials, manipulated in pursuit of his fascination with transforming one material so that it resembles another (both mimetically and in some of its physical properties). We can see his trials as a result of curiosity about the workings of nature, but they are also simply a fundamental and everyday response to the challenges that arise in the working of natural materials, a part of the exploring, testing, and trying by which practitioners come to understand the

constitution and behaviour of their materials. The author-practitioner's efforts to overcome and transform horn, pigment, wool, and varnish into *jaspe contrefaict* were simultaneously an aesthetic quest and a probing of the relationship between nature and art. The author-practitioner's iterative practice, borne out of the need to test working hypotheses about his materials, resulted in multiple versions of the 'counterfeit' as he adapted his techniques and materials to try to capture the state of the native stone. The iterative experimentation in creating the material mimesis reveals the artisan learning about the natural world in reproducing its hidden ('secret') processes of making. The imitation of jasper with horn, pigment, wool, and gold leaf presented an opportunity both for working and thinking through the properties of materials, and for investigating the processes by which precious and epistemic objects could be produced and reproduced.

Acknowledgements

We thank Charles Kang wholeheartedly for his creative input and invaluable help during the second reconstruction trial. Charles was indispensable to our investigation of the recipe in 2016. Research for this article has been supported by NSF Grants #1430843 and #1734596.

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Endnotes

1 Smith 2004. Casting or moulding from life constituted an imitation of nature on multiple levels: see Smith 2014. For more on lifecasting techniques, see Smith & Beentjes 2010.

2 Palissy 1957, 27: 'As anyone can see and hear in less than two hours, providing he will take the trouble to come and see my cabinet, in which will be seen marvelous things which are placed there as witness and proof of my writings, arranged in order on shelves, with labels below them: in order that one may learn by himself'; Palissy 1957, 233: 'Copy of the Labels: Placed under the marvelous things which the author of this book has prepared and arranged in order in his cabinet, to prove all things contained in this book'. See also Amico 1996, and Kemp 1999.

3 We use the term 'raw material' here to designate naturally occurring substances that have not undergone any kind of intervention or transformation by human hands or tools.

4 We limit our focus here to jasper (and similar stones), coral, and wood. On gemstones, also subject to imitation, in Ms. Fr. 640, see Kremnitzer *et al.*, 2020.

5 Ms. Fr. 640, fol. 105v: 'Il faut observer leur naturel'; Making and Knowing Project *et al.* 2020, online: https://edition640.makingandknowing.org/#/folios/105v/f/105v/tl.

6 We thank Richard Oosterhoff for his insights into *naturel*. For the Latin *ingenium* in sixteenth-century France, see Marr *et al.* 2018.

7 Of the thirty-seven times *le naturel* is used, it appears after *selon* or *comme* a total of twelve times.

8 Ms. Fr. 640, fol. 141v: 'Et en cecy & toutes aultres choses ayes tousjours le naturel devant toy pour limiter'; Making and Knowing Project *et al.* 2020, online: https://edition640.makingandknowing.org/#/folios/141v/f/141v/tl.

9 Ms. Fr. 640, fol. 10r: 'Pour mieulx contrefaire jaspe grumeleux'; Making and Knowing Project *et al.* 2020, online: https://edition640.makingandknowing.org/#/folios/10r/f/10r/tl.

10 Ms. Fr. 640, fol. 10r: 'Les roses se peuvent imiter'. For this part of the recipe, see Estrades 2020.

11 Ms. Fr. 640, fol. 10r, Making and Knowing Project *et al.* 2020, online: https://edition640.makingandknowing.org/#/folios/10r/f/10r/tl.

12 Villani n.d. See recipes numbered 469, 470, 1058, 1059.

13 Piemontese 1555, 166: 'A far ebeno contrafatto tanto bello che fa vergogna al naturale'. The recipe for imitation pearls in the later French edition is labeled 'Pour contrefaire perles lesquelles seront forts belles comme naturelles' (Piemontese 1627, 798).

14 In contrast, consider the author-practitioner's use of the word *faire* for the imitation of emeralds and rubies on fol. 100v: 'en ceste sort le vulgaire faict des esmerauldes', 'pour

fayre rubis'; Making and Knowing Project *et al.* 2020, online: https://edition640.makingandknowing.org/#/folios/100v/f/100v/tl. Rather than using *contrefaire*, the author-practitioner suggests the possibility of virtually generating the thing itself, rather than its visually convincing substitute.

15 Estrades 2020 reviews the use of horn in early modern Europe, particularly the tradition of making lanterns with it.

16 Ms. Fr. 640, fol. 10r: 'La corne dequoy on faict les lanternes bien deliée', Making and Knowing Project *et al.* 2020, online: https://edition640.makingandknowing.org/#/folios/10r/f/10r/tl.

17 For a full account of the 2016 trial, see Lores-Chavez 2020. We thank Charles Kang for his essential input and insights during the reconstructions.

18 Ms. Fr. 640, fol. 10r: 'Les couleurs pour ce jaspe veulent avoyr fonds avecq la tourmentine Claire ou vernis daspic'; 'Et les couleurs mattes en corps ni sont pas si propres'; Making and Knowing Project *et al.* 2020, online: https://edition640.makingandknowing.org/#/folios/10r/f/10r/tl. Spike lavender varnish is a thick substance resembling turpentine varnish, made by heating spike lavender oil and stirring a powdered gum resin into it when it simmers, as described by the author-practitioner on fol. 4r.

19 Ms. Fr. 640, fol. 10r: 'Laines à gros poils tainctes de diverses couleurs'; Making and Knowing Project *et al.* 2020, online: https://edition640.makingandknowing.org/#/folios/10r/f/10r/tl.

20 Ms. Fr. 640, fol. 10r: 'Après que tu as couché toutes les couleurs, esgratigne sur icelles des lignes obliques, puys couche de l'or & argent en foeille'; Making and Knowing Project *et al.* 2020, online: https://edition640.makingandknowing.org/#/folios/10r/f/10r/tl.

21 Ms. Fr. 640, fol. 10r: 'Il faut huiler d'huile d'aspic le revers non painct'; Making and Knowing Project *et al.* 2020, online: https://edition640.makingandknowing.org/#/folios/10r/f/10r/tl.

22 Ms. Fr. 640, fol. 10r: 'La corne represente un lustre & polyment gras co[mm]e le jaspe'; Making and Knowing Project *et al.* 2020, online: https://edition640.makingandknowing.org/#/folios/10r/f/10r/tl.

23 Ms. Fr. 640, fol. 10r: 'Tu en peulx incruster des licts'; Making and Knowing Project *et al.* 2020, online: https://edition640.makingandknowing.org/#/folios/10r/f/10r/tl. For more information on early modern use of jasper and imitation jasper – including for tarsia, *pietre dure* inlay, and marquetry – see Estrades 2020.

24 Cat. New York 2005, 167–168.

25 Marshall 2006, 77; Bukovinksá 2005, 222; Langedijk 1998, 358–382.

26 De Boodt 1644, 329: 'une plus grande auctorité que le iaspe, si ce n'est qu'à ce iaspe la nature ayt imprimée des images & effigies'.

27 Palissy 1957, 174.

28 Palissy 1988, 116. Like Paracelsus and Agricola, Palissy developed innovative aqueous mineral theories based on direct observation of mines and mineral matter (Norris 2007, 69–86).

29 Samuel Quiccheberg (1529–1567) drew such analogies, for example between the creation of objects like life casts and the generation of natural materials like stones that originated in the 'juices of the earth.' See Smith 2014, 57–58.

30 Ms. Fr. 640, fol. 3r, Making and Knowing Project et al, 2020, online: https://edition640.makingandknowing.org/#/folios/3r/f/3r/tl. For an investigation into the uses and understanding of coral in the early modern period, see Chessa 2020.

31 For Imperato's encounter with coral, see Chessa 2020. For the process of making imitation coral from Ms. Fr. 640, see online: https://player.vimeo.com/video/129811219.
32 Quiccheberg 2013, 66–67; Felfe 2018.
33 For further discussion of deception and imitation, see Kremnitzer *et al.* 2020.
34 Palissy 1957, 174.

CHAPTER 2

Looking into Renaissance Wood Intarsia

Marta Ajmar

> And in general the bodies of trees, as of other living beings, have in them skin, blood, flesh, sinews, veins, bones and marrow.[1]

In Book 16 of his *Historia naturalis*, Pliny the Elder foregrounds an almost anatomical approach to trees and the idea of a deep structural and physiological homology between the vegetable, animal and human worlds, whereby the body of the tree and of man/woman are essentially the same, linked through a bond of embodied design that can become manifest. This fundamental consonance is the guiding principle of Pliny's extended discussion around the nature of vegetation, which is treated throughout the treatise as a living being, carrier of vital spirit or *anima*.[2] This chapter builds on this analogical approach to take a fresh look at the Renaissance blossoming of wood inlay or *intarsia*, a technology involved in an animated conversation with nature through the medium of wood. I will explore *intarsia* through material mimesis, a concept that evokes processes of active correspondence. I will argue that *intarsia* reveals a deep affinity and interconnectedness between the human and non-human natural domains (fig. 2.1). With *intarsia*, art and nature intertwine, becoming indistinguishable (Ingold 2013, 91–108).

1 Defining Material Mimesis

Coming to terms with mimesis, even just linguistically, is no simple task (Ajmar 2016). Although the term generally used in fifteenth- and sixteenth-century Italy to refer to mimesis is *imitazione*, the Renaissance meaning of the word goes well beyond that of imitation, which for us today is mostly a derogatory notion, conjuring up concepts of mindless copying and tainted replication. Mimesis not only encompasses the pursuit of naturalism in art, but might

FIGURE 2.1 Giovanni da Verona, pheasant and liturgical objects, *c.*1502. Wood intarsia. Monte Oliveto Maggiore, choir, detail of intarsia panel

even extend to endowing representational art with the power to transcend the empirical domain and open the door to 'the spiritual substructure of reality' (Halliwell 2002, 350). Renaissance *imitazione* is closer to the wider, far more fertile, ancient notion of mimesis (from the classical Greek *μίμησις*) meaning imitation as *re-presentation* and even *correspondence*, rather than mere copying. It comprises, for example, many ideas of *lusus naturae* or 'jokes of nature', whereby images of people or animals might appear within plants, or of plants within rocks. It also encompasses mirror images, tied together by a magical bond.[3] This concept resonates with fifteenth-century humanists like Leon Battista Alberti. Referring to Pliny, in *De pictura* Alberti points out how 'nature herself seems to delight in painting, for in the cut faces of marble she often paints centaurs and faces of bearded and curly-headed kings'.[4] Mimesis thus evokes a notion of nature as deeply interconnected, a universal productive force underpinning the animal, vegetable and mineral kingdoms, drawing them together through an incessant activity that reveals the hidden mimetic correspondences between them.

We can see this approach to mimesis underpinning Renaissance natural philosophical writings echoing Pliny's, for example in *Dell' Historia Naturale*, authored by the apothecary and collector Ferrante Imperato and first published in Naples in 1599. Written in the vernacular, richly illustrated and carrying an extensive index for easy consultation, the treatise showcases how pervasively mimesis occurs in nature. Dendrite stones – from *δένδρον*, the Greek word for tree – are a case in point: as agates that carry within themselves tree-like inclusions of iron or manganese, they are described by Imperato as stones 'naturally designed with images of woods' (fig. 2.2). The appearance of these natural forms within a stone is seen by Imperato as the work of nature as a maker able to conjure up mimetically forest-like structures within the mineral specimen. This effort in discovering hidden designs within nature is not just the job of the natural philosopher or of the nature-friendly artisan, but also a Christian duty, whereby revealing 'sacred patterns' is a way of celebrating the work of God (Edgerton 1991, 14).

This Renaissance worldview, where nature is believed to operate through mimesis, is ably illustrated through the contemporary debate about fossils, which are frequently brought forward as eloquent exemplars of this phenomenon. Fossils are often explained not as the mineralised remains of living organisms, but as petrified juices generated by the earth's natural ability to imitate living creatures, following an interpretive model based on mimetic principles.[5] In a famous passage of his *Musaeum Metallicum* (completed by 1599 and published post-mortem in 1648), a friend of Imperato, the Bolognese natural philosopher and physician Ulisse Aldrovandi, aligns himself with this position.

FIGURE 2.2 Stone naturally designed with images of woods, engraving from Ferrante Imperato, Dell'Historia Naturale, Venice, 1672 (1599)

Responding to the presence within fossils of what appear like depictions of natural forms, he suggests that 'we really must admire the wonderful spectacle of Nature, which traces these images so perfectly that they look as if they have been painted with a brush'.[6] The *Helix coquina*, a fossil specimen featured in his collection, where, in Aldrovandi's eyes, nature has recreated the appearance of a shell, provides a tangible example of the artistry of nature (Sarti 2003). This idea of nature as a maker of images is, however, complicated by an alternative outlook postulating instead processes of subterraneous metamorphosis, whereby living organisms mutate into fossilised forms over time under the influence of particular agents, such as underground moisture and fluids or 'humours'. Imperato advocates for both understandings somehow working in unison. In his explanation of some 'figurative or inscribed marbles', he suggests that 'their figuration is the result of earlier forms transformed through the intervention of the stone-like humour, so that what was earlier a batch of seeds or hay has been changed into stone over time' (fig. 2.3).[7] While apparently in disagreement with each other, both interpretative frameworks assume that nature's transformative and generative powers can operate mimetically across different domains, allowing for something to reveal itself in or through something else.

I propose to define material mimesis as a concept bringing together the notion of natural mimesis outlined above with a phenomenon that manifests itself within the many Renaissance arts engaged mimetically with nature and/or other arts, not just visually and at surface level, but also *materially* and *technologically* (Ajmar 2016). I want to suggest that material mimesis is an active component of wider processes of artisanal epistemology whereby

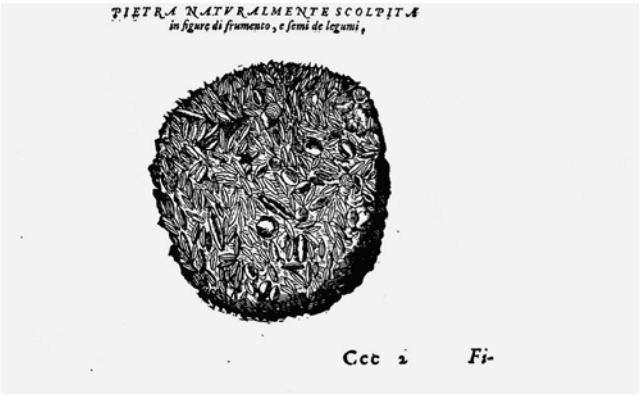

FIGURE 2.3 Stone naturally carved with images of wheat, seeds and legumes, engraving from Ferrante Imperato, Dell'Historia Naturale, Venice 1672 (1599)

approximating another material – natural or man-made – not only embodies an artistic and technological aspiration, but also an intention to connect human making with nature's generative power at a deep level (Smith 2004, 2014). To make *with* nature: this lies at the heart of Renaissance views of nature as being in permanent transformation, and of matter as fundamentally animated.[8] Between the late fourteenth and the early seventeenth centuries, a wide array of mimetic productions, including ceramics, glass, stucco, stone and wood, flourished on the Italian peninsula, sharing a common purpose: looking – and to some extent being – like something other than themselves. Exploiting the intrinsic animacy of the material, these artefacts defy comfortable and fixed systems of classification, as they embrace complexity, ambiguity and openness, and foreground the fluid, dynamic, alive nature of matter.

The practices at the heart of material mimesis somehow carry within themselves an ability to challenge the boundaries between the natural kingdoms, between the natural and the man-made, and between different artificial materials, through artefacts that often embody a status in between the solid and the liquid, a sort of *mezza natura*, as in the case of the 'half mineral'.[9] One of the most explicit cases of material mimesis bringing together art and nature is so-called *vetro calcedonio* or chalcedony glass, a fifteenth-century Venetian production capable of trans-materially taking on the appearance of a natural material, such as the semi-precious mineral agate (fig. 2.4).

Made by adding metal oxides to the glass formula, *vetro calcedonio* might be seen as a physical embodiment of the Renaissance understanding of materials, whereby glass is classified as a 'half-mineral' (*mezzo minerale*), by virtue of

FIGURE 2.4 Artist unknown, bottle, 1500–1525. Chalcedony glass, Venice

being a substance suspended between mineral and metal, fluid and solid, natural and man-made.[10] The vigorous waves of glass that make up these artefacts are a powerful metaphor of the Aristotelian epistemological model whereby minerals are understood as juices solidified within the earth.[11] Above all, they evoke a connected genesis and shared ontology between the semi-precious stone and the glass object – the result of a close collaboration between art and nature. In this chapter I will argue that these emergent mimetic technologies contributed significantly to expanding the boundaries of artisanal knowledge, while also providing the material evidence of that expanded know-how. As they encouraged the development of novel ways of understanding and re-producing materiality, they led to a fuller exploitation of the potential intrinsic within the material itself.

The in-between status of the mimetic arts might also be seen to extend to time and space. Suspended between different media and stretching the boundaries of contemporary technology, these artefacts might also be seen to oscillate between different *temporal* and *geographical* frameworks, evoking both recent and distant antiquities.

From ancient Greco-Roman to more recent non-European objects, mimetic artefacts often appear to engage in vertiginous processes of multiple quotation and reference across distant domains. Eloquent examples include the tin-glazed earthenware *tazza*, possibly made in Tuscany, shown in fig. 2.5, whose dark manganese spotted glaze resembles the chromatic effects of chalcedony, thus suggesting a response to late classical agate vessels such as the famous *Tazza Farnese*, held in the Medici collections since the fifteenth century.[12] The *tazza* also connects Italian pottery to other materials, such as the natural shell of the tortoise, as well as to earlier ceramics such as Egyptian marbled ceramics (fifteenth century CE) or Chinese 'tortoise-shell' stoneware (twelfth to thirteenth century CE).[13] The reverse, which appears to be a variation on the theme of the Buddhist double-lotus shape commonly found in Chinese ceramics, sculpture and lacquer, further amplifies the temporally and geographically multilayered nature of the object.

I propose that one of the factors underlying the emergence of the mimetic arts in the Renaissance is the arrival or the surfacing on the Italian peninsula of non-European and Greco-Roman artefacts predicated on the appearance and innate properties of the *material*. Chinese ceramics, Indian tortoiseshell and Asian lacquer all belong to this wide category of objects, emphatically asserting their intrinsic materiality, and offering in some way an alternative system of value to the many *painted* artefacts that continued to develop over

FIGURE 2.5 Artist unknown, tazza, 1580–1600. Earthenware with manganese and tin glaze intended to imitate tortoiseshell, Italy

the course of the Renaissance – from polychrome sculpture to pictorial furniture. This non-European ware *of substance* reached European shores through multiple channels, often as diplomatic gifts or as prestigious trade goods, and is documented within Italian collections from the late Middle Ages onwards.[14] At the same time, growing awareness of and contact with Classical, Hellenistic and Byzantine artefacts – ranging from ancient agateware to alabaster vessels, from coloured marble sculpture to marbled ceramics – would have expanded the familiar material realm and helped to ignite interest in the intrinsic material qualities of objects.[15] Both phenomena must be seen as playing a central role in the development in Italy of indigenous mimetic arts at this time.

The mimetic arts have been marginalised from the art-theoretical narrative because of the predominance of a discourse foregrounding *disegno* as the principle and foundation of art. The definition of *disegno* as a process pertaining to *figurative* representation, and therefore not central to arts predicated essentially on materiality, has contributed to this relegation of the mimetic arts. The concept of material mimesis helps establish a more balanced perspective, bringing into the foreground the many Renaissance non-figurative – or non-exclusively figurative – artistic practices where a more holistic, beneath-the-surface idea of imitation predicated on material and technological interconnectedness is pursued. Though it should be seen in a continuum with *visual* mimesis – as for example in painting's long-standing attempt to represent and replicate materials such as marble through abstract pictorial effects – it will be suggested that what distinguishes material mimesis is the ability to also engage with the deep, physical and almost visceral material nature of the medium in question, and thus with its *ontology*. Where likeness is not achieved merely through figurative mimesis, but through practices more closely involved in interrogating, reproducing and revealing the genesis and nature of the material. These practices serve to make explicit the complexity of the making processes: the places where design becomes *embodied*. To explore these questions in greater depth, I will now turn to wood inlay or *intarsia*, a technology that over the course of the Renaissance developed a distinctive new vocabulary of material mimesis.

2 Material Mimesis in Wood Intarsia

Intarsia provides a fertile ground for exploring the way in which material mimesis participated in Renaissance artisanal practices of material exploration and knowledge making. A productive starting point for investigating how is Renaissance *intarsia* understood at the time as an artistic practice and process involving embodied design consists in looking at the language used

to describe it. Two different standpoints emerge clearly: that of the humanist scholar encountering this new technology and that of the artisan making it. The metaphors employed by these two groups operate on a wide semantic spectrum. Some humanist scholars use 'painting in wood' (*legno pinger*), to refer to this technique, highlighting its ability to make an image out of wood. Some artisans articulate *intarsia*-making in a more physical and exploratory way, such as 'extracting with the chisel', which can also be interpreted as 'scrutinising', the wooden matter.[16] Here we can see both an understanding of *intarsia* as a visual practice brought forward in partnership with the material, and an approach suggesting a more embodied sequence of actions that entailed carving out the material first and then examining it closely, almost anatomically, in order to achieve the desired effect. Although different, these practices and ways of seeing converge in the creation of *intarsia* work, where image and matter are intimately connected and where mimesis affects both the surface and the depth of matter.

The view of *intarsia* as predominantly a visual technique involving wood emerges in an early account of the impression it made upon a fifteenth century beholder. This compelling *ekphrasis* was written by the Sicilian monk Mattheus Colatius in response to his encounter with a recently completed cycle in the *sacrestia* of the Paduan church of St. Antonio in around 1475:[17]

> It all looks true. I cannot believe that these [panels] are a fiction. I get closer and slide my hand across all of them. Then I step back, and slowly walk around, looking in depth into each of them. [...] I see various buildings: houses, bell towers, churches, [...] steps, arches, windows, with projected shadows, doors left ajar, revealing inner spaces.[18]

The detailed description, panel by panel, fulfils the *topoi* of the genre, as Colatius marvels not just at the visual accomplishment brought about by the panels, but also at the mimetic power of the thin slivers of wood making up the inlays, inherently depicting a figure, an object or a scene, and displaying an in-depth knowledge of nature. Significantly, the emphasis on the visual power of *intarsia* is combined with a material eulogy of this technology: what emerges is not just an optical response to the mimetic qualities of wood inlay, and a need to *look into it* (*intuens*, from *intueor*, means to examine intently, and suggests close observation), but also a haptic one, where he explores it dynamically by walking in close proximity to it and sliding a hand over it. Perception by touch and physical engagement are equally important cognitive tools, pointing towards an enhanced process of material, embodied knowing. In his closing words, Colatius remarks: 'What can scarcely be painted in colours, you

have painted *in* wood' – *ligno pinxistis* – acknowledging *intarsia* as a fully animated manifestation of material mimesis.[19]

Intarsia reached Italy mostly via Northern Africa and Andalusia, where its largely non-figurative character, generally attuned to Islamic principles of representation, allowed for the power of the material to manifest itself (Wilmering 1999, 65–68). As it arrived on Italian shores, *intarsia* acquired a distinctly figurative idiom. It continued, however, to carry an emphasis on materiality as well, eventually leading to a distinctively new language of inlay, where wood is deployed as an art material capable of exposing its own animate nature while also re-presenting mimetically other substances. We see this enacted in the mimetic *intarsia* panel by Giovanni da Verona (fig. 2.1), where the wood tesserae display wood's anatomy – the 'skin, blood, flesh, sinews, veins, bones and marrow', to use Pliny's phrase, that make it alive as a material – in different parts of the composition, from the dado squares and the building blocks of the fictional arch to the areas where the wood imitates different media, from marble to gold, linen to feathers.

This emphasis on the materiality of wood and its expressive power is a useful point of departure for suggesting that, between the late fifteenth and early sixteenth centuries, *intarsia* developed a distinctively new wood-based lexicon. *Intarsia* makers contributed to this phenomenon by moving gradually away from the drawn, graphic *intarsia* of the earlier period and embracing instead a materially generated form of inlay.

If we place Matteo di Nanni's *Justice* panel (*c*.1430) (fig. 2.6) side by side with the figure of St. Jerome (fig. 2.7) by Cristoforo Canozi (*c*.1471), we see a significant shift in the way in which the materiality of form is expressed. When comparing the locks of hair of the figure of Justice with St. Jerome's strands of beard, we notice that while the former is obtained by inserting thin slivers of wood next to each other to create an almost graphic impact, the latter is achieved by identifying a wood fragment which already contains within itself the desired structure and visual effect and placing it in the right position within the wooden mosaic. This involves selecting a fragment that does not just depict, but *materially embodies* the parallel strands of a well-groomed beard, where the design is *intrinsic* to the material, as opposed to imposed on, or drawn over, it, and thus where artisan and nature operate as co-workers.

3 Designing in Wood

With *intarsia*, designing can occur *in* rather than *on* the material and often involves extracting an image rather than applying it. For this reason, *intarsia*

FIGURE 2.6 Matteo di Nanni, *Justice*, *c.*1430. Wood intarsia, Siena

lends itself well to the notion of embodied design, whereas *disegno* is something intrinsic to making and to the materiality of the artefact as opposed to something imposed over it, a process of continuous correspondence between maker, material and environment.[20] From the discerning selection of materials to the ingenious composition of the wood tesserae, where the shape, colour and figuration, texture and luminosity of the individual wooden piece are

FIGURE 2.7 Cristoforo Canozi, St. Jerome, *c.*1471. Wood intarsia, Modena, Duomo, choir, detail of intarsia panel

put in a material relationship with the rest of the ensemble in the physical making of the *intarsia* panel, all aspects of this technology are *designed in*. The design process involved in making *intarsia* is highly distinctive, though it often involves *design as drawing* in the conventional sense too. Some design drawings made by *intarsia* makers have survived, and documentary sources have occasionally captured their authorship of sketches and preparatory drawings.[21] Moreover, panels that survive in a damaged state often reveal the rigorous armature of perspectival drawing incisions that preceded the application of the wooden tesserae (fig. 2.8) – most likely executed with the help of a design drawing or cartoon applied to the matrix, with the design being destroyed in the process of transposing the image.[22] However, this emphasis on design drawings and their translation onto the *intarsia* panels is quite misleading, as it fails to capture the fact that *intarsia* design is a much more intrinsic and materially engaged activity than drawing on paper. *Intarsia* design goes beyond the surface, as it cuts through and into the flesh and bone of wood, enacting Pliny's paradigm for understanding wood as a complex, multilayered body.

This dissecting process, bringing *intarsia* close to another *arte* engaged with the depth of matter, anatomy, is achieved with the help of a tool unique to this

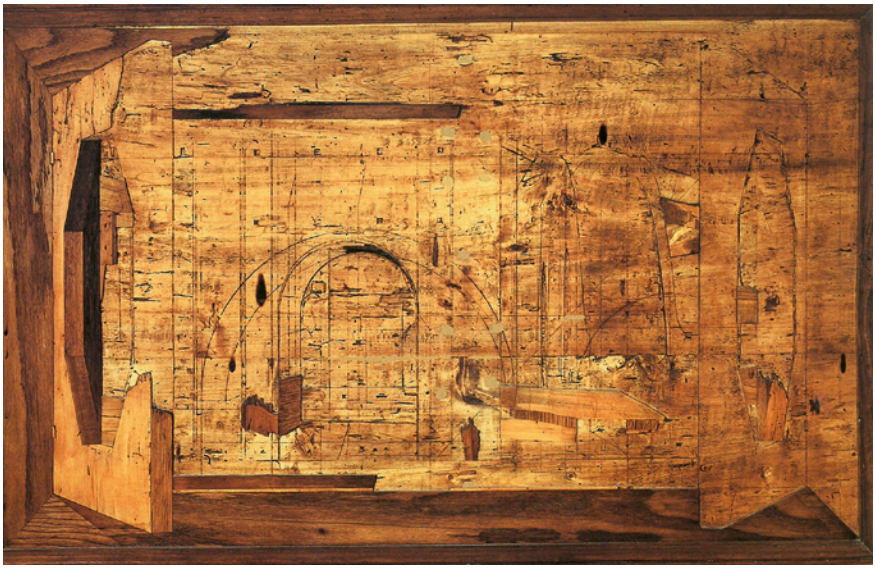

FIGURE 2.8 Cristoforo and Bernardino Canozi, damaged sacristy panel showing design marks, *c.*1487–1490. Wood intarsia, Parma, Duomo, sacristy, detail of intarsia panel

technology: the shoulder knife (*scarpello a tiro*).[23] Intarsia makers are aware of the distinctive, precise and laborious physicality of this process and of the specific role of this tool, as vocally stated in an *intarsia* panel by the Sienese master Antonio Barili (fig. 2.9). Architect, engineer, sculptor in wood as well as *intarsia* maker, Barili operated within humanistic circles and was a close friend of the architect and theorist Francesco di Giorgio Martini.[24] The panel, now lost, was once part of an *intarsia* cycle made by Barili between 1483 and 1504 for the chapel of St. John the Baptist in the Duomo of Siena.[25] A highly self-reflexive self-portrait, it represents Antonio in the act of incising with a shoulder knife

SELF-PORTRAIT IN TARSIA OF ANTONIO BARILI. ITALIAN. 1502.
Museum of Art and Industry, Vienna.

FIGURE 2.9
Antonio Barili, self-portrait, 1502. Wood intarsia, originally in Siena, Duomo, Chapel of St. John the Baptist, later held in the Staatliches Kunstgewerbemuseum, Vienna, lost in World War II
© MARTA AJMAR (PHOTO IN AUTHOR'S POSSESSION)

an inscription on a plaque that simultaneously proclaims his authorship of the artwork and underlines its arduous physicality. The inscription reads 'HOC EGO ANTONIVS BARILIS OPVS COELO NON PENICELLO EXCVSSI AN DN MCCCCCII', 'I, Antonio Barili, have extracted this work with the knife/chisel, not the little brush, AD 1502'. Celebrating an energetic relationship with matter and the role of wood inlay's most distinctive tool, the panel sets a *paragone* between *intarsia* and painting possibly intended also as a sexual innuendo, where the sizeable ingenuity of the shoulder knife – *coelum* is both 'chisel' and 'vault of the sky' – is set against the limpness of the small brush – *penicellum*/*penicillum* meaning both 'little brush' and 'little penis'.[26] It is certainly not accidental that the shoulder knife gets pride of place in several contemporary *intarsia* panels, as it is the technological *pièce de résistance* in the arsenal of the *intarsia* maker, manifesting the uniqueness of his skill in its engagement with wood *as a material substance* to be cut into, where the design is carefully excavated from the material, rather than imposed over it. The body of the artisan is central to this process of close and continuous correspondence with the material, and the resulting *intarsia* an example of embodied design manifesting a process of working with nature.

4 Embodied Knowing through Reconstruction

To gain a deeper understanding of the process of designing-in, and the language of embodied wood design, I recently engaged in the first stages of reconstruction of a late fifteenth-century Italian wood *intarsia*, under the guidance of a distinguished cabinet-maker and furniture conservator based in Florence, Simone Chiarugi.

The *intarsia* panel selected for the reconstruction is part of the backrest of a choir stall and survives in situ in the Duomo at Parma, Northern Italy (figs. 2.10, 2.11).[27] Designed and executed by Cristoforo and Bernardino Canozi between 1487 and 1490, the cycle stands out for the way in which the materiality and inner design of the wood are exploited to create an ensemble of extraordinary naturalism. The panel (fig. 2.11), which we chose because of its relative simplicity of design that lends itself well to a partial reconstruction, represents an alcove with open doors revealing a cavity occupied by a footed vessel filled with candles. The design uses at least four different woods: bog oak (*quercia affogata*) for the near-black background; red cherry (*ciliegio*) for the outer frame and the vessel; curly maple (*acero riccio*) for the blonde, wavy parts of the closet doors; and oak (*quercia*) for the dark brown components of the door.

FIGURE 2.10
Cristoforo and Bernardino Canozi, Banco dei celebranti, 1487–1490. Wood intarsia, Parma, Duomo

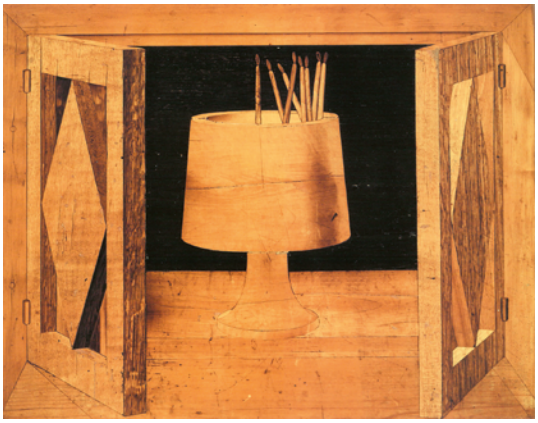

FIGURE 2.11
Cristoforo and Bernardino Canozi, Footed vessel filled with candles, 1487–1490. *Banco dei celebranti*, detail of intarsia panel. Wood intarsia, Parma, Duomo, choir

As an improvised intarsia apprentice only beginning to engage with *chaîne opératoire* methodologies, I became involved in the process of partially reconstructing this composition in the full awareness that many of the methods and tools employed were inaccurate, anachronistic and significantly distant from those that would have been utilised in a Renaissance workshop (figs. 2.12, 2.13).[28] The drawing has been extracted from a photograph of the intarsia panel and transferred directly onto the wooden support to guide the reconstruction (fig. 2.14). From lacking historical tools, such as the shoulder knife, to the use of electric saws and planes, I embarked upon this undertaking conscious that authenticity was not the objective. I would argue, however, that even this process of flagrant historical approximation is valuable when it comes to attempting to capture salient aspects of bodily engagement with

FIGURE 2.12
Simone Chiarugi in his laboratory sawing a plank of wood
© MARTA AJMAR

FIGURE 2.13
My workstation and tools in Simone Chiarugi's laboratory
© MARTA AJMAR

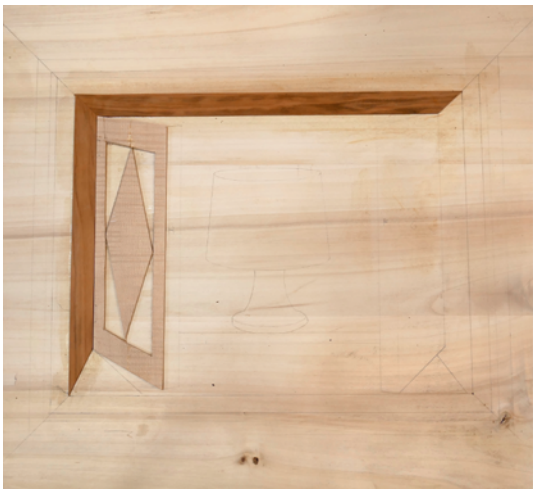

FIGURE 2.14
Reconstructing the alcove door with cherry and curly maple wood tesserae

materials, tools and the unfolding of design. For example, the selection, cutting and planing down of the different woods to make the thin intarsia tesserae brought me into very close contact with the physical properties of each wood. Though the term tessera is useful because of its immediate association with mosaic, the intarsia technique is significantly different. While in mosaic the individual tessera is a largely standardised unit, within intarsia each wooden piece must be cut with the utmost precision to fit together perfectly through shape and coloration within a specific location. In this way, each wooden tile embodies a different part of the design (fig. 2.14).

In other words, unlike in a mosaic, my reconstructive efforts have not involved assembling regular fragments of wood to fill in a predetermined composition, but rather generating the design from within the depth of the selected pieces and cutting them in such a way as to maintain the integrity of each part. Once cut to measure, each fragment is then assembled on the wooden support, gradually making the design. Because the design is extracted from within the wood, however, choosing the right type and piece of wood is of vital significance. In a similar way the Renaissance *intarsia* maker, while often using a pre-existing design drawing, would have played a key role in identifying the inner figuration, the image within the wood that best approximated the intended design. The significance of this process of intimate material engagement is highlighted by evidence suggesting that the Canozi brothers travelled to the various locations where they had been commissioned to make intarsia cycles on their own cart laden with wooden fragments, including woods that would have easily been sourced in any given location (Bagatin 1990).

FIGURE 2.15
Oak wood fragment infested with woodworm
© MARTA AJMAR

As I learnt to cut the piece at the correct 'anatomical' angle to expose a particular *facies* or coloration of the wood, so I also began to *look into* it. Selecting the pieces of wood with the right texture, and with patterns of light and shade able to let the design emerge from within, created a new visual, haptic and olfactory proximity with the material, allowing me to develop a more embodied understanding of and empathy with the wood. Finding my way around fragments of oak heavily infested with woodworm (fig. 2.15), ideally suited to design-in part of the *intarsia* alcove because their state of relative decay has produced a darker hue in the wood, made me think anew about these parasites, no longer freeloaders but in some way co-workers, thus opening a window into the biological and environmental circumstances in which wood grows and decays, where its life cycle is embodied and traceable in the material.

A significant part of my panel reconstruction involved manipulating *acero riccio* or curly maple, a blonde wood widely utilised by Renaissance *intarsia* makers for its embodied image potential, emerging from the depth of the material through a pattern of almost parallel, gently oscillating, lustrous waves. Curly maple was often used within *intarsia* to imitate materials embodying these luminous, vibrating visual qualities, such as silk, marble and reed. Its visual softness and aliveness disguise, however, a surprising hardness and brittleness. The 'resistance of material and technique' eloquently described by Juhani Pallasmaa in *The thinking hand* (2009, chap. 2) manifested themselves to me clearly, through the wood's recalcitrance to my hand's clumsy attempts to manipulate it.

As I worked my way through the sawing and chiseling of the curly maple door, my lack of skill made itself manifest in multiple ways. Soon my untrained hand began to leave permanent, irreversible scars on the panel (fig. 2.16). As

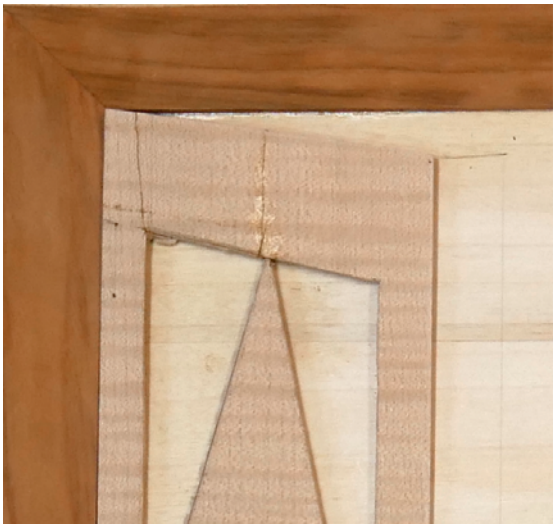

FIGURE 2.16
Reconstruction of curly maple wood door showing various points of fracture
© MARTA AJMAR

the wooden door started to break in several places because of the flawed and unsustainable pressure I involuntarily applied to it in the cutting process, I came to recognise the extent to which embodied ways on knowing demand a continuous process of correspondence. Antonio Barili's boastful statement proclaiming that he had extracted the work with the chisel, not the brush, while holding a vigorous shoulder knife and carrying out extremely fine work made me painfully aware of my lack of proficiency. As I recollected Pliny's analogy between the anatomy of a man and that of a tree, I identified as a surgeon botching up her incision and started to experience new levels of anxiety and a sudden urge to flee … It's a long road to embodied ways of knowing.

5 Looking into Wood: Renaissance Intarsia Makers as Material Knowers

Between the late fifteenth- and the early sixteenth-century, the technology of *intarsia* produced a new ability to look at its material with fresh eyes and *see into it*. Designing-in wood went hand in hand with a new way of *looking into* this material. Renaissance *intarsia* embraced wood's materiality to new creative effects, revealing an epistemological approach where making and material knowledge are in symbiosis. This novel material outlook fostered the deployment of wood that would have normally been rejected in the production process of furniture: whose irregularities, abnormalities or undesirable structure, due to a variety of factors – from parasites to unusual patterns of growth or

cutting and carving processes – would usually have led the piece to be discarded. Instead, what we see at play is a skill known to sixteenth-century natural philosophers as discernment (*discernimento*), whereby the *intarsia* master understood the material at a deeper level, and developed a distinctive ability for sourcing, selecting, preparing and applying the very particular wood fragments demanded in each design.[29] Through the possession of such skills, the *intarsia* master revealed himself as an active knower and manipulator of matter, fruitfully engaged in material mimesis.

One of the strategies adopted by *intarsia* makers for designing in and engaging mimetically with materials involved exploiting the peculiar variations in colour and texture of the wood itself. Some woods lent themselves to this particularly well. Walnut or *noce*, a wood displaying a great variety of veins, flesh and bones, especially within its roots, became a material of choice for many *intarsia* makers (Wilmering 1999, 9). Echoing Alberti, agronomic treatises remark how walnut wood contained naturally generated images of 'mountains, houses, villages, heads of men, animals […] and other similar things pleasing to the eye'.[30] This potential is exploited in the panel shown in fig. 2.17, portraying the *studiolo* of Federico da Montefeltro in Urbino. Here, the variation in luminosity between the sapwood and the outer parts of the wood in walnut is utilised trans-materially to evoke the armour's individual metal components' propensity to reflect light differently. The sharpness of the helmet, the roundness of the gauntlet, the intricate pattern of the knitted chain mail under the armour and even the broken surface texture of leather straps are conjured up in wood.

Intarsia makers' strategic use of woods implies a direct engagement with wood's materiality and biology, where the conventionally perceived weakness of particular aspects of the tree's anatomy and physiology is turned into an expressive mimetic tool. These irregular features in wood – what Pliny refers to as a 'fault of timber […] called cross-grain, when the veins and knots have grown twisted' – can be put to work. As Pliny remarks 'in some trees are found centres like those of marble, that is hard pieces like a nail, unkind to the saw', but that material hardness can be exploited to evoke an affinity across natural domains between wood and stone.[31] Giovanni da Verona's *intarsia* cycle at Monteoliveto (fig. 2.1) makes active use of these parts of the wood carrying marble-like patterns, obtained from the branches of climbing plants or from the roots of trees: these wooden pieces are used purposefully in parts of the composition where we would expect to find variegated marble. They feature prominently in the dado panels of the lower register of Giovanni's composition, where architectural conventions would have dictated the use of coloured and veined marble. While fulfilling the rules of architectural decorum, these components, where

FIGURE 2.17 Attributed to Baccio Pontelli, ducal armour, 1470s. Wood intarsia, Urbino, Palazzo Ducale, Studiolo of Federico da Montefeltro, detail of intarsia panel

the wood somehow transcends itself, affirming a deep bond between the vegetable and the mineral domains, are also powerful agents of material mimesis, ultimately proclaiming that these materials are deeply connected.

This mimetic correspondence across natural domains is further explored in a new way of imitating trans-materially, or rather 'counterfeiting' other materials, which emerges in *intarsia* from the early sixteenth century: what is

known today as *legno composito* or 'composite wood', a man-made wood that might be seen as an ancestor of particle board or chipboard. Resulting from the waste (*brucioli*, literally 'crumbs') of woodcarving, *composito* is made by assembling and gluing together different kinds of wood shavings, some artificially coloured, to make a compact cake that is later sliced into tesserae, producing new composite effects resembling other materials, such as variegated marble. This novel invention was widely used by *intarsia* makers, possibly starting with Antonio Barili, who gives it pride of place in his *intarsia* self-portrait (fig. 2.9), where *composito* lines almost the entirety of the inner walls of the fictional window (Wilmering 1999, 22). This use of *composito* would continue to appear in many architectural details where a marble incrustation would be expected (fig. 2.18).

FIGURE 2.18
Antonio Barili, self-portrait, 1502. Wood intarsia, originally in Siena, Duomo, chapel of St. John the Baptist, later held in the Staatliches Kunstgewerbemuseum, Vienna, lost in World War II. Detail of intarsia panel with composito
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Imitating variegated marble not just visually – at surface-level – *composito* also aims to approximate it structurally, in its heterogenous composition, making apparent veins, speckles and different kinds of grains. What is enacted is a process of material mimesis, where this wood-substitute is used to embody a different material structurally, revealing its inner makeup. We can discern in it tiny chips of different thickness, colour and reflectivity, and their layered structure, leading the eye into the depth of this material, and by implication opening questions about its composition and origin. With mimetic *intarsia* we see in action the artisan's ability both to reveal the processes of natural transformation in new and unexpected ways, and to reinvent matter through ingenuity, where human creative power operates in conjunction with the *vis generativa*, the generative force of nature (Morel 1998).

When we look at the attributes assigned to many *intarsia* makers in their contracts, disseminated through Italian archives, an interesting pattern emerges: they appear under a range of different titles. The expression *magistri perspective*, masters of perspective, is often found, in line with the contemporary classification of some *intarsia* panels as perspectives (*prospettive*) on the strength of their spatial, geometrical framework. It is also common, however, to find attributes that foreground an identity bound to the materials and technological processes involved, where they appear as manipulators of wood: they are listed as *magistri a lignamine*, masters of wood; *incisores lignaminis*, wood-cutters or surgeons; *maestri intagliaduri*, woodcarvers or engravers; and *maestri intarsiadori, intarsia* masters, the last term suggesting a considerable level of independence and self-assurance within this *arte*, which is named as such (Bagatin 1990, 204).

This overt engagement, even at the level of trade taxonomies, with the physical processes of *intarsia* making, leads us to propose an approach that would see it as a distinctive form of artisanal epistemology, combining visual *and* material knowledge in unique ways. Much scholarly attention has been paid to *intarsia* as perspective.[32] It is undeniably striking how deeply this technology embraced the pictorial and geometrical opportunities and challenges offered by an engagement with *prospettiva* and its corollary effects of illusion and lifelikeness. Through perspective, wood could aspire to a *figurative* imitation of nature. The precision in the replication of reality, and the ability to generate accurate geometric designs brought about by the practice of perspective in art, must be singled out as having a significant effect on all the mimetic arts in the drive for close surface approximation. The intimate engagement with the 'surface characteristics of the phenomenal world as they are optically transmitted point by point into the human eye by the reflected ambient light array'

engendered by perspective would also have helped to instigate curiosity about the physical structure of the natural world, and prompt an investigation into matter beneath the surface (Edgerton 1991, 10). After all, *perspectiva* – from the Latin *perspicere* – means 'to look deeply into'.[33] However, the radical conceptual, perceptual and epistemological transformation brought about by perspective, with its heightened visual sensitivity and inquisitive outlook, did not operate in isolation. As we saw with *intarsia*, it went hand in hand with artisans' new emphasis on material mimesis, and *together* they gave rise to new visually and materially driven artistic productions predicated on exploring and revealing the inner structure of things.

6 Revealing the Inner Workings of Things

'[I have not written] anything that I have not seen with my eyes, and touched with my hands, and that I have not explored anatomically, both in its exterior and interior parts'.[34] Aldrovandi's declaration in his *Discorso Naturale* (1565) of how his anatomical knowledge of nature was acquired through direct surface and in-depth visual and haptic investigation summarises an approach shared across different artisanal productions, as this chapter has explored in the case of *intarsia*. This quasi-anatomical approach to material production developed over the course of the Renaissance, bringing artisanal practices closer to an outlook generally associated with natural philosophy and medicine. From the second half of the fifteenth century onwards, a new interest in revealing the inner workings of things emerged in different domains of learning. This phenomenon has been associated with the rise of pictorial perspective, and more generally with technological and scientific attitudes that manifest themselves, for example, in new visual approaches offering peeled-off and transparent views as well as cross-sections. We see this concern appearing in manuscript and printed treatises ranging from engineering, architecture and pottery to human anatomy (Long 2011, chap. 2). In the peeled-off view of the skull shown in fig. 2.19, for example, the anatomist Andreas Vesalius represents the different layers making up the human head, revealing a complex structure involving skin, flesh, sinews, veins and bones.

This scrutiny into the inner mechanisms of things has been highlighted as a momentous pan-European phenomenon, underpinning wider processes of 'rational' knowledge construction, communication and exchange to which many early modern artisanal practices contributed (Long 2011, chap. 2). In the Italian sixteenth-century pottery manuscript shown in fig. 2.20, a diagram and

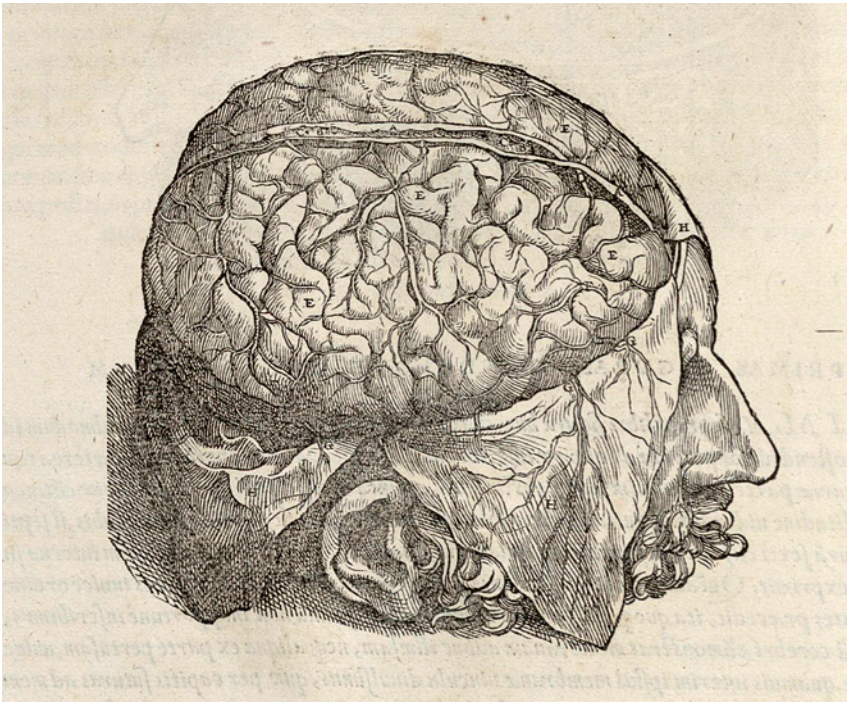

FIGURE 2.19 Peeled-off view of human skull. Engraving from Andreas Vesalius, *De Humani Corporis Fabrica* (Basel, 1543)

transparent view of a new vessel design are offered to show how the water would fill it from below, through a hidden mechanism embedded in the deep structure of the ewer (fig. 2.20).

This novel approach, proposing a distinctive way of understanding an object or a material by looking into and through it, brings us back to Ferrante Imperato's *Dell' Historia Naturale*. The treatise foregrounds an encyclopaedic engagement with all kinds of materials, from the fossil earths discussed above to non-European novelties such as Chinese porcelain. In an extended section devoted to earth-based productions, Imperato offers a significant mention of Chinese porcelain that expands on this materially focused *looking into* approach, where the inner structure and deep materiality of artefacts are closely examined:

> brought to us from the Levant [...] they are made of matter like no other, white, hard and subtle: so that when they are placed between the eye and the light, they can be seen in some degree of transparency.[35]

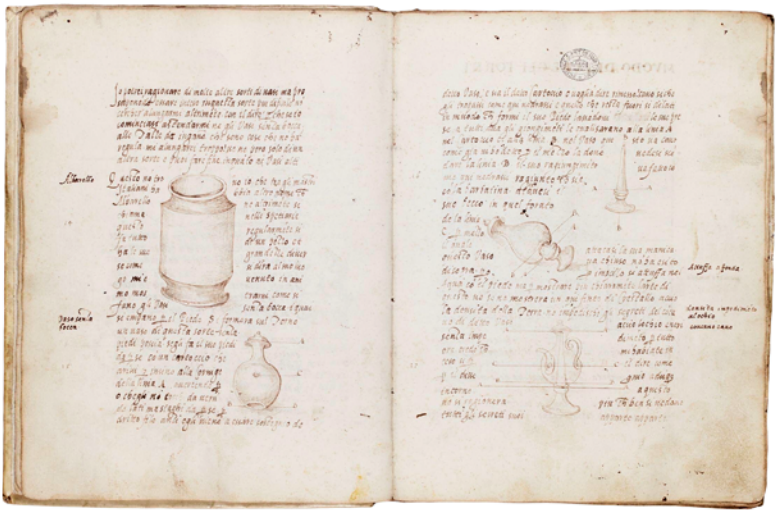

FIGURE 2.20 Cipriano Piccolpasso, transparent view of an ewer, *Li Tre Libri dell'Arte del Vasaio*, *c.*1557, fol. 15. Illustrated manuscript

In later pages, Imperato goes beyond the surface of porcelain and interrogates it structurally. His discerning eye dissects porcelain almost anatomically, emphasising the layers of glazes and pigments and the underlying body of the pot, pointing to an understanding of artefacts through their intrinsic, below-the-surface, deep materiality:

> the excellence of porcelain resides as much in the body as in the glaze. In them, the whiteness of the one [body] is so similar to the whiteness of the other [glaze] that those who are not familiar with this matter think that they are looking at one substance alone.[36]

Thus, artefacts and materials are seen to participate in the broader phenomenon discussed above of apprehending things below the surface, interrogating their materiality in terms of substance, structure, stratification and depth, where the eye is not only *looking at*, but *looking into*. This approach, merging an external and internal, optical and haptic scrutiny, may be seen as the first step in wider processes of material knowing.

7 Conclusion

In this chapter I have sought to define material mimesis as a form of artistic and technological imitation able to reveal deep correspondences connecting the human and natural domains, and fostering ways of *making with nature*. I have showed how this largely non-figurative, beneath-the-surface understanding of imitation helped Renaissance artistic productions new to Europe make manifest the design embodied within the material, showing the continuity between the generative power of art and of nature and promoting artisan and nature as co-workers. Locating the discussion in the context of wood intarsia, a technology that tends to be side-lined by conventional accounts of Renaissance art, it is suggested that intarsia makers should be seen as discerning material knowers. After engaging in partial reconstruction to develop a more embodied understanding of this technology, I propose that intarsia makers display a distinctive ability and willingness to *look into* the depth of the wooden matter. This engagement with the inner workings of things aligns their approach with that of other contexts of Renaissance knowledge production – from anatomy to natural philosophy to pottery – ultimately reclaiming a more central place for intarsia makers within the wider techno-artistic ecosystem of the time.

Acknowledgements

I am very grateful to Emma Spary and Marjolijn Bol for inviting me to present at the 'Matter of mimesis' conference and for their generous and inspiring feedback as editors. This chapter stems from research carried out for my forthcoming monograph exploring material mimesis in Italian Renaissance artefacts by examining cross-culturally practices of material imitation and reinvention and the role of artisans as material knowers. I am greatly indebted to the Leverhulme Trust for the Research Fellowship 'Material mimesis: Local and global connections in the arts of the Italian Renaissance', which enabled me to undertake extended research in Italy, Japan, China and Taiwan. I am also very thankful for the support offered by the V&A Research Institute and the Andrew W. Mellon Foundation. I would like to thank Simone Chiarugi for giving me the opportunity to engage in intarsia reconstruction under his expert guidance. The time spent in his workshop in Florence has been a truly transformative learning experience. Warmest thanks to the friends who have shared ideas and offered very valuable comments and suggestions, in particular Richard Checketts, Christine Göttler, Christine Guth, Alex Marr, Liz Miller, Ulinka Rublack, Pamela Smith, Paul Taylor and Simona Valeriani.

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Endnotes

1 Pliny 1945, vol. 4, 504: 'Atque in totum corpori arborum ut reliquorum animalium cutis, sanguis, caro, nervi, venae, ossa, medullae.' For other classical and medieval references revealing an understanding of wood as operating like a body, see Neilson 2014, 225–226.

2 Pliny 1945, vol. 4, 2: 'Restat ut – neque ipsa anima carentia, quandoquidem nihil sine ea vivit – terra edita aut inde eruta dicantur ac nullum sileatur rerum naturae opus'. 'It remains to describe the things produced by the earth or dug up from it – these also not being devoid of vital spirit, since nothing lives without it – and not to pass over in silence any of the works of nature'.

3 Halliwell 2002, 13–16 and 344–357; Findlen 1990, 292–331; see also Gebauer & Wulf 1995, 64–75.

4 Alberti 1540, 52: 'Ipsam denique naturam pingendo delectari manifestum est. Videmus enim naturam, ut saepe in marmoribus Hippocentauros regumque barbatas facies effigiet'. For the translation, see Grayson 1972, 64–65.

5 An extensive account of the Renaissance debate on diagenesis, morphogenesis and natural generation can be found in Morel 1998.

6 Aldrovandi 1648, 101: 'Verum debemus admirari pulchrum naturae ludentis in his lapidibus spectaculum, dum in his variorum animantium icones adeo accurate effigiat, ut penicillo delineare esse videantur'.

7 Imperato 1599, 603 [with regard to *marmi lineati* or *scritti*]: 'i suoi figuramenti sono da forme vere precedenti già trasmutate dalla humorosità petrigna sopravenuta percioche il precedente cumolo de semi, e pagliuole nel successo di tempo si è trasmutato in pietra'.

8 Findlen 1990; Smith 2014; Klein & Spary 2009.

9 Biringuccio 1559, 98–103.

10 Biringuccio 1559, 98–103.

11 Aristotle, *Metereologica*, 1: 111, 6.

12 Ajmar 2016; Fusco & Corti 2006.

13 Ajmar 2016.

14 Jackson & Jaffer 2004; Spallanzani 1994, 2006; Ajmar & Molà 2011; Gerritsen & Riello 2016; Juneja & Grasskamp 2018.

15 Christian 2010; Favaretto 1988; Fusco & Corti 2006.

16 The verb used is *excutere*, from *excutio*, suggesting an action of extraction combined with a process of examination.

17 The inlay still survives, in part, after extensive work and a catastrophic nineteenth-century restoration. See Bagatin 1990.

18 Colatius 1486, fols. 328v–329v: 'Videntur illa mihi vera omnia. Non possum cito credere ficta esse. Accedo propius, duco per omnia manum. Regressus deinde circueo gradatim intuens diligentissime singula. […] Aedes, templa, cum campanis turres, fornicum fenestrarumque umbris, testudinis, surgentibus item gradibus cum etiam inclinatis foribus vacua videri.' See Manni 71–72.

19 Colatius 1486, fol. 330v: 'quo vix pingi colore potest, vos ligno pinxistis'.

20 Ingold 2002, part III.

21 See for example Bagatin 1990, 190.

22 See for example Manni 2002, 402.

23 See Wilmering 1999, 57; I would like to thank Lydia Goodson for making me aware of the use of the term 'scarpello a tiro' in Renaissance Umbria.

24 For a biography of Antonio Barili, see Lenzini Moriondo 1964.

25 The group, which originally included nineteen panels, was dismantled in 1663 and transferred in 1749 to the Coro of the Collegiata dei Santi Quirico e Giulitta in San Quirico d'Orcia, near Siena, where seven panels still survive. The panel discussed here was removed from the Collegiata to be sold to the Museum für angewandte Kunst in Vienna and later lost during World War II. See Lenzini Moriondo 1964.

26 Diminutive of the Latin word *penis*, meaning tail, brush and penis.

27 For this Canozi cycle, see Bagatin 1990 and Manni 2002.

28 For an overview of re-enactment methodologies, see Agnew, Lamb & Tomann 2019. For an explanation of how embodied reconstruction can be used to gain insights into past cultures, see Tiballi 2008. A useful introduction to *chaîne opératoire* is provided by Coupaye 2015. *See* Marchand 2010 for knowledge creation and apprenticeship.

29 Dupré & Göttler 2017, 15–27. Imperato (1599) speaks of 'discernimento'.

30 Tanara 1661, 514: 'Monti, Case, Paesi, Capi d'Huomini, Animali, […] e simili di vista dilettevole'.

31 Pliny 1945, vol. 4, 516: 'publicum omnium vitium vocant spiras, ubi convolvere se venae atque nodi. Inveniuntur in quibusdam sicut in marmore centra, id est duritia clavo similis, inimica serris'.

32 See, for example, Manni 2002.

33 Edgerton 1991, 43, 115 and 117–139.

34 Aldrovandi 1565, fol. 1565, fols. 39–42: 'non iscrivendo cosa alcuna che co' proprij occhi io non habbi veduto, et con le mani mie toccato, et fattone l'Anatomia, così delle parti esteriori, come interiori'. See also Tugnoli Pattaro, 1977.

35 Imperato 1599, 30: 'Portate dal Levante […] sono fatte di materia diversa da ogni altra, bianca, dura e sottile: cosicché quando sono poste tra l'occhio e la luce si possono vedere in qualche misura di trasparenza'.

36 Imperato 1599, 30: 'L'eccellenza della porcellana risiede sia nel corpo che nello smalto. In essa il bianco dell'uno è cosí simile al bianco dell'atra che coloro che non conoscono bene questo materiale credono di vedere una sola sostanza'.

CHAPTER 3

Firing Porphyry in the Italian Renaissance Kiln

Zuzanna Sarnecka

In the second half of the sixteenth century a Neapolitan architect and painter, Pirro Ligorio (1510–1583), wrote a recipe for painted porphyry. As he explained, 'when we want to imitate porphyry with paint, we make a plane of purple colour or *lionato rossetto*, but with some darker parts, and then, using flesh colour, we cast some small dots across the surface with a brush'.[1] Here Ligorio was eloquently codifying knowledge which by then was already widespread. The time of experimentation, and of the pursuit of suitable tools and methods for carving porphyry, had already passed. This chapter will focus on an earlier era, that of the mimetic venture of the Della Robbia family of artists, who strove to produce a porphyry-like material in the ceramics kiln. The Della Robbia did not merely paint the surface of their sculptures to imitate the visual properties of the rock, as described by Ligorio, but rather, by means of a laborious and quasi-magical process of firing porphyry in the kiln, they participated in a dialogue between the artificial and the natural, between representation and actual substance.

Luca della Robbia's (1399/1400–1482) experiments with tin-lead glaze, applied to the surface of biscuit-fired earthenware and refired, constituted a distinctive Italian Renaissance project, which seems to have been inspired, at least in part, by ceramics imported from Asia, North Africa and Spain.[2] Luca began glazing the surfaces of his terracotta sculptures in around the mid-fifteenth century, a technical innovation which could be seen as based upon the imitation of nature. This was an argument first advanced by Giorgio Vasari (1511–1574), a sixteenth-century artist and historiographer from Arezzo in Tuscany, who claimed (1986, 32) that Luca's product was a cheaper alternative to natural marble. Using specific examples, I will suggest that, in fact, the three generations of the Della Robbia artists conspicuously used their technique to imitate porphyry, not only to hint at the visual properties of the natural rock, but also to add spiritual importance to their work. I will discuss various factors that might have informed Luca's interest in the artistic and spiritual properties of porphyry, and that subsequently spurred systematic imitation of the material in the medium of glazed terracotta by his nephew Andrea (1435–1525). Then I will move on to the analysis of technical aspects involved in this process of substitution. Lastly, I will comment on the wide

variety of compositions and artistic uses of porphyry-like glazes in the Della Robbia sculptures, assessing the effectiveness of their attempt to mimic this rare and costly natural substance with man-made materials.

The characteristic visual qualities of porphyry depend on two stages of crystallisation. One takes place in the magmatic chamber, when some of the crystals, predominantly feldspar, are formed; the second occurs during volcanic eruptions, and corresponds to the rapid cooling of the lava. The name of the rock seems related to this process of formation, for the word 'porphyry' evokes both fire and incandescence (*pur* / *phur*), surely for the purposes of emphasis (Malgouyres 2003, 11; Del Bufalo 2012, 12). The link between heat and porphyry was explored by Dante in his *Purgatorio*, where he described the third step to the doors of Purgatory as made of porphyry 'as fiery as the blood that spurts from veins'.[3] The porphyry step represented the third and ultimate stage of penitence, and the material was used to capture the burning love of God and others, which motivated the sinner to renounce the earlier sinful life. Luca della Robbia read Dante's texts, and may have been interested in this passage and the connection between porphyry and heat, since the first step, described earlier in the *canto*, was made of marble, pure white and so brilliant that 'one could see one's reflection in its surface'.[4]

This passage from Dante's *Purgatorio*, aside from evoking the heat of seemingly burning porphyry, also reflects the link between porphyry and blood. This association may have been reinforced by the knowledge that a deep purple dye, as intense in colour as that of porphyry, could be produced from the blood of certain molluscs, now identified as *Hexaplex trunculus* (Minelli 1998, 70). Porphyry signified sacrificial blood in particular, meaning that the rock was associated with the Eucharist and symbolised the blood shed for the salvation of mankind, as described in Matthew 26:28: 'This is my blood of the Covenant, which is poured out for many for the forgiveness of sins'.[5] Consequently, porphyry became an important component of celebrating the liturgy in unconsecrated spaces. Only certain stones were considered appropriate for use as altar-stones: the most common choices were marble, porphyry, jasper, alabaster, onyx and serpentine (Favreau 2003, 327–352). The eleventh-century portable altarpiece commissioned by Countess Gertrude, now at the Cleveland Museum of Art, is one of the finest examples of spiritual links between porphyry and the Passion. Gertrude belonged to a noble German family with clear imperial aspirations, as can be inferred from her marriage with Count Liudolf of Brunswick, half-brother of the emperor Henry III, and from the presence of the relics of St. Adelaide, the wife of Otto I, preserved in the altar. To emphasise the connection between porphyry and Christ's blood, on one side of Gertrude's altarpiece there is a cross flanked by St. Constantine and his

mother St. Helen. Helen, who famously discovered the relics of the True Cross, was buried in a sarcophagus carved in porphyry, and Gertrude might have selected this stone as a top for her portable altar not only to highlight the link between the rock and Christ's sacrifice, but also in order to establish dynastic alignment.[6] Through its seemingly impressionistic arrangement of white and pinkish dots on a deep purplish background, porphyry could capture the spilled blood, as in Stefano Lunetti's (*c.*1495–1564) illumination showing the Circumcision in a manuscript at the British Library.[7] The porphyry decorates the pavement of the temple around the altar, on which the standing and blessing Christ Child is being circumcised. This and similar depictions might have informed a statuette of the Christ Child (*c.*1490–1510) from the workshop of Andrea della Robbia, in which the luminous, white figure stands majestically on a porphyry base (fig. 3.1), which perhaps evokes the blood shed during the Circumcision and foreshadows the suffering of Christ during the Flagellation and Crucifixion. In the Christian context, the rock became a powerful visualisation of Christ's blood spilled for the salvation of mankind, and of the bloody sacrifice made by the martyrs (Filoramo 1998, 238). In Florentine art, the connection between porphyry and martyrdom was explored by the members of the Medici family. The rock was used in several monuments to highlight the links between St. Lawrence and Lorenzo il Magnifico, the *de facto* head of the Florentine Republic in the second half of the fifteenth century and an important patron of the arts (Butters 1996, 49–50).

Porphyry was also associated with brilliance and lustre. In his *Zibaldone* (1457), Giovanni Rucellai (1403–1481) wrote that 'many wonderful slabs of porphyry [...] were shiny as a mirror'.[8] This quality of brilliance was difficult to capture, for instance in fresco painting, as remarked by Georges Didi-Huberman, (1995, 30), in his description of the fictive marbles painted by Fra Angelico at San Marco in Florence. Oil glazes in panel paintings and enamels allowed superior effects to frescoes, in terms of the vividness of the purple colour and imitation of the rock's brilliance, but only enamel could compete with glazed terracotta in terms of the durability of these material and visual properties (Gavel 1979, 77–78). The Della Robbia strove to ensure the high brilliance of their reliefs by increasing the quantity of the tin oxide in their glazes (*c.*20% versus *c.*7% discovered in glazes from Casteldurante).[9] This formula created high tension on the surface, especially if the sculpture in its biscuit-fired state was not cleaned and dusted properly. Moreover, because of the high proportion of tin oxide used, the Della Robbias' glazed sculptures had to be fired at a higher temperature than other glazed earthenware, because the reduced level of lead decreased the glaze's potential for melting. Thus, including porphyry in their compositions might have been linked to the Della Robbia ambition to

FIGURE 3.1 Andrea della Robbia workshop, *Christ Child*, *c.*1490–1510, glazed terracotta LONDON, VICTORIA AND ALBERT MUSEUM. PHOTO: VICTORIA AND ALBERT MUSEUM, LONDON

show the brilliant surfaces characteristic of the polished rock but successfully mimicked in glazed terracotta.

As one of the hardest stones known, and because of its deep purple colour, porphyry was associated with empire and rulership. Apart from imperial sarcophagi, it was also used in statues commemorating the deeds of various rulers.[10] One example of this practice is the group of *The four tetrarchs* in Venice, which at times was believed to have apotropaic powers, because of the agency of porphyry (Tronzo 2012, 49). The skilful modelling of the figures seems miraculous, especially if we consider that the smoothing of one square meter of porphyry required 150 working hours, compared to the 5 or 6 hours required for its equivalent in Carrara marble.[11] Furthermore, Vasari's famous description of Leon Battista Alberti's struggle to incise the patron's name on the porphyry doorstep to the entrance of the church of Santa Maria Novella in Florence reveals that the skill and tools necessary for carving the rock were long lost by the early fifteenth century: 'In our days, the mastery of working this kind of rock is unavailable, since our artisans have lost the skill of sharpening the iron, and thus the tools to carve the material'.[12]

Because of its hardness, porphyry was also employed in artists' workshops for grinding pigments, as described in several instances by Cennino Cennini (1370–1440): 'take a slab of pink porphyry, which is a strong and resistant stone. For there are several kinds of stones for grinding colours, like porphyry, serpentine and marble [...] but porphyry is superior to them all. And if you take one of the very, very bright ones it is better, one of the ones that is not completely polished [...] Then take a stone to hold in your hand, also of porphyry, flat at the bottom and cupped at the top, shaped like a bowl [...] so that your hand should be able to draw and guide it here and there as it pleases'.[13] It was no accident that Pier Maria Serbaldi da Pescia (*c.*1455–after 1522), credited with recovering the art of carving porphyry in the early sixteenth century, was a gem-cutter used to working with hard and precious materials.[14] However, even after the rediscovery of suitable tools and techniques, the material's relative hardness meant that carving and polishing large-scale porphyry figures was a long and painstaking process (Bol 2018, 223–257). The most celebrated Renaissance sculptor in porphyry, Francesco Ferrucci del Tadda, dedicated his whole career to this single material, as it took him and his sons about twelve years to carve one full-figure statue of Justice (Butters 1996, 294).

In the early fifteenth century, humanists in Florence gained greater access to Ptolemy's *Geographia*, thanks to a Latin translation of the Greek text by Jacopo Angeli da Scarperia (Hawkins 2003, 457–468). Luca della Robbia's contacts with Florentine scholars meant that the processes underlying the production

of the stone could have been familiar to the Della Robbia artists.[15] Our appreciation of porphyry has changed over time, with increased awareness of its material properties and the rediscovery of the quarries from which the rock was extracted. Mons Porphyrites, modern Gebel Abu Dukhan, located in Egypt close to Hurghada, remained a mystery from antiquity until the 1820s. The mining of porphyry was notoriously laborious. Probably because of this, its quarries were abandoned in the fifth century AD (Ward-Perkins 1971, 141–149). This meant that rocks that had already been extracted were reused over time in different contexts, and it was this recycled porphyry, taken predominantly from antique architecture, that was admired and used in Europe between the sixth and eighteenth centuries.

During the fifteenth and early sixteenth centuries, the process of making glazed terracotta was not widely understood, and family recipes were strictly guarded. This secrecy went hand in hand with the unfamiliarity of the material properties of actual porphyry. Whilst members of the Della Robbia workshop clearly benefited from the knowledge and practical know-how of the ceramics industry, its limited influence in the late fifteenth century on the art of maiolica might be linked to the importance placed on secrecy in the artistic world and the limited circulation of knowledge (Sarnecka 2021). The possible exchange of technical know-how between artists' workshops, which was characteristic of Florence and Italy in general in the fifteenth century, apparently did not extend to the realm of glazed terracotta sculpture (Marini 2009, 59). As we learn from Luca's will, drafted in 1472, he left his art to just one person, his highly-skilled nephew Andrea. Unlike Theophilus in the twelfth century or later writers such as Vannoccio Biringuccio (*c.*1480–*c.*1539) or Cipriano Piccolpasso (1524–1579), Luca did not promote openness of knowledge and the free circulation of available glazing methods. Piccolpasso, for instance, openly criticised people who shared the secrets of their arts on their deathbeds and only with their oldest sons.[16] Rather, Luca followed the artisanal strategy of limiting access in order to ensure stable financial profits. The art of glazing had a monetary value: in Luca's will, the secret is mentioned as a transmissible property after a reference to a sum of money given to the Opera del Duomo, and before the section dealing with his house.[17] It was not so much the immaterial knowledge that Andrea was to inherit after Luca's death, but rather the financial gain associated with secrecy and exclusive access to the recipe. Imitating porphyry in this medium added another layer to the perceived artistic supremacy of the Della Robbia production.

It is possible that the Della Robbias' imitation might have been informed to an extent by certain doubts about the material properties of porphyry which persisted through the fifteenth century. Ruy González de Clavijo, who travelled

to Constantinople in 1406, made notes on what he believed was the way of making porphyry. In his description of the interior of Hagia Sophia, de Clavijo (1859, 37) wrote about the arches underneath a dome as being decorated by 'four very large slabs, two on the right hand and two on the left, which are coloured with a substance made from a powder, artificially, and called porphyry'. This account is important, since it reveals the confusion between the natural rocks and man-made materials obtained artificially from coloured dust. De Clavijo used the word *pílfido*, a variation deriving from the Greek word meaning 'of purple colour'. This Greek word was later adopted into Italian, and was heard in this form by Pedro Tafur, who travelled to Italy.[18] In 1450, Giovanni Rucellai (1960, 69, 72, 74) used the word *porfido* in various descriptions of interiors, such as the eight columns in the Sistine Baptistery or the pavement of the choir in the old church of San Giorgio in Venice. However, the term itself did not circulate widely in the first decade of the fifteenth century. It is therefore possible that de Clavijo heard it in Constantinople, and, not being familiar with the material properties of the natural porphyry, thought that it was an artificial material. Suzanne Butters, discussing this same quote (1996, 43), has assumed that de Clavijo was looking at a fictive porphyry, rather than thinking that porphyry slabs had to be made by artificial means. To support her interpretation, Butters cites a recipe book from the late sixteenth to early seventeenth century, by which date the material properties of porphyry were widely recognised, as were the imitations of this rock in other materials such as wood or indeed glazed terracotta.[19] However, in the early fifteenth century, the lack of understanding of the process of formation of porphyry, and the inaccessibility of the quarries where it was to be found, encouraged a general scholarly audience, including travellers such as de Clavijo, to question the rock's natural character.

Various observers and chroniclers suggested that porphyry was fabricated from water and purple dye. Towards the end of the fifteenth century, an anonymous Ottoman writer disputed the common belief that porphyry was a frozen, water-based dye. He noted that:

> since no person has seen the marble quarry, certain people say that the [stone] called porphyry is artificially made. They say that, during ancient times, according to the quantity of columns required, they made moulds and channelled water into them. Afterwards they added the desired colour to the water, and then they had a plant, and they also added this plant to the water and the water solidified and became marble, it is said [...] Moreover, if it applied to a single colour, one might find grounds for believing it. But since there exist marbles of three or four colours, it is

> impossible to add one colour to water and obtain three or four colours and veining; reason cannot accept such a thing.[20]

The application onto one surface of three colours and stippling was possible, however, through the medium of glazed terracotta. The lack of understanding of the Della Robbia technique by their contemporaries only added to the material mystery of the imitation of porphyry with glazes, and contributed to the creation of the artistic myth. A similar material mythology was established in relation to bronze, as discussed by Frits Scholten (2005, 20–35), who stresses that dependence on an unknown outcome ensured the quasi-magical effect of the final artistic product. This uncertainty was linked to the difficulty of obtaining accurate temperatures in the kiln, to ensure a successful cast in the case of bronze, and in the case of glazed terracotta to ensure a lack of air bubbles and to prevent glazes from running. That spiritually engaged activities took place in the workshop on Via Guelfa can be inferred from Piccolpasso's *Three books of the potter's art* (*c*.1557). Piccolpasso stressed the importance of offering prayers to God for the successful firing of the clay: 'When you have finished all this, direct your prayers to God with all your heart, thanking Him for all that you receive'.[21] In a different passage, Piccolpasso encouraged further praise of God's name: 'Always remember to do all your activities in the name of Jesus Christ, with that in mind light the fire'.[22] The document confirms that the difficult process of controlling the temperature in the kiln and the successful firing of meticulously prepared terracotta ware were placed in God's hands, in the belief that the outcome relied on His grace. We find similar links between skill and devotion in Cennino Cennini's account of drawing on gilded glass, when he recommends: 'Tie a needle to a little stick as if it were a little hairbrush, and it should be really fine at the tip and, invoking God's name, begin drawing the figure that you want to do lightly with this needle'.[23] Similarly, Theophilus stressed in his treatise that all knowledge was given to men through the grace of the Holy Spirit and the sevenfold gifts. Wisdom is necessary 'to know that all created things proceed from God, and without Him nothing is', while the fear of the Lord ensures that 'you remember that you can do nothing of yourself; you reflect that you have or intend nothing, unless accorded by God'.[24] Both medieval and Renaissance writers on the arts clearly linked craft to piety.[25]

We may assume that Luca was intimately aware of, and wished to imitate in his sculpture, the material importance, spiritual significance and quasi-magical properties of porphyry, not least because of his friendship with many Florentine humanists. In 1433, Luca's close friend Niccolò Niccoli received a letter from Ambrogio Traversari, in which he discussed the beauty of a porphyry vase from Santa Maria in Porto in Ravenna. He wrote that: 'the simpler

friars think it is one of the water jars in which the Evangelist attests that water was changed into wine'. In the letter, the vase is described as: 'made of porphyry, beautiful and sculpted (*tornatile*)'.[26] *Tornatile*, derived from the Latin *tornatilis*, emphasises the importance of craftsmanship, as it implies that the vase was beautifully finished and worked, and that it was not just a piece of quarried porphyry, precious in itself, but was carved by the equally miraculous work of the artist who gave the material its specific form. Being both a devout man and a supreme artist, Della Robbia might have considered the spiritual significance of the miraculous transformation of matter. The first miracle performed by Christ was to change water into wine during the Wedding at Cana (John 2:1–11): through experiments with glazes, Luca could have transformed a liquid substance into something that visually resembled one of the hardest and most valuable of stones.[27] The technical challenges posed by imitating the colour and texture of porphyry in other media might also have prompted Luca's interest in the rock. In his natural history, well-known to Renaissance readers, Pliny the Elder reported (1855, book 35, chap. 31) that *purpurissum* belonged to the category of pigments which cannot be applied onto the fresh *intonaco*, and therefore could not be used in painting in the technique of *buon fresco*. For this reason, and because of the expensive nature of the pigment, the colour was recommended to be used very sparingly and rarely in wall painting, only in the most important commissions, and by highly-qualified workshops (Salvadori 1988, 206). Indeed, instances of fresco-painted illusionistic porphyry are relatively rare, and artists who wished to imitate this rock, such as Pietro Lorenzetti in painting the scene of the *Resurrection* in the Lower Church at Assisi, used the more widely available hematite, which was an iron oxide stone of a dark red hue (Malgouyres 2003, 13). Imitating porphyry on the verso of painted portraits was more common, both in Italy and in Northern Europe.[28] However, even if a deep purple was used in frescoes or panel paintings to imitate porphyry, it lacked the texture of the actual stone. This was a quality that could be imitated with greater success through the use of tin glazes on the biscuit-fired surface of terracotta.

The extensive use of the widely available manganese purple in the art of ceramics may have been another technical aspect that informed the imitation of porphyry in the Della Robbia workshop. As described by Cipriano Piccolpasso in his treatise on the potter's art, manganese was to be found in abundance in different places throughout Tuscany.[29] Moreover, during the fifteenth and sixteenth centuries, vividly red fired glazes were notoriously difficult to obtain. As lamented by Piccolpasso (1980, 104), red was unreliable, and he had seen the colour fired successfully only once in a workshop of Vergiliotto in Faenza, who used levigated Armenian bole (material widely used by painters

FIGURE 3.2 Anonymous artist (Faenza?), *Adoration of the Magi*, *c.*1490, glazed terracotta LONDON, VICTORIA AND ALBERT MUSEUM. PHOTO: VICTORIA AND ALBERT MUSEUM, LONDON

as a preparatory layer underneath a gold leaf in paintings and polychromy). Manganese purple was the closest colour to red that one could use in decorating ceramics. The glazed terracotta relief showing the *Adoration of the Magi*, by an anonymous artist probably from Faenza, exhibits a variety of elements, including lips, garments and shoes, painted using manganese purple, which at times seems very close to the purplish colour used by the Della Robbia to imitate porphyry (fig. 3.2).

Apart from these technical considerations that might have motivated Luca and subsequent members of his family to engage with the imitation of porphyry, there may also have been a sense of familial interest in the material. As observed by Giancarlo Gentilini (1992, 11), the family name derives from a plant called *robbia*, from the root of which was obtained a dye of intense red colour. In his *De architectura* (7, 14, 2), Vitruvius wrote of the imitation of purple colours – *purpurei colores* – that they could also be obtained by applying the root of this plant to clay, or by dyeing clay with *hysignum*. Gentilini suggests that the wealth of the Della Robbia family, from the early fourteenth century onwards, may have come from trade in this dye, which they either produced in Tuscany, or imported, principally from the Levant.[30]

Taking these factors into account, it should be emphasised that Luca's sculptures were not celebrated for their mimetic qualities. In fact, he is most renowned for his unparalleled and otherworldly white surfaces on reliefs of the Virgin and Child. Early in his glazed terracotta production, Luca was urged by his patrons to imitate the actual colours of things represented using his glazes, as in the case of the second lunette for the doors to the Old Sacristy of the Florentine Duomo (Planiscig 1948, 30). In the first lunette for the Sacrestia delle Messe, showing the *Resurrection of Christ* (1442–1444), Luca exclusively used white glazes for all figures, foliage and other elements of the composition, set against a blue background. He made no attempt at naturalistic imitation of the visual properties of any material, including porphyry on the opened sarcophagus, as subsequently done in numerous representations of the same iconography executed by Andrea. In the *Ascension* lunette (1446–1451) designed for the space above the doors to the Old Sacristy, the trees and rocks are in their natural colour. This was a direct consequence of the contract, which asked Luca to take into account the true appearances of things and to try to imitate them in his work.[31] What seems important is that the lack of a porphyry-like glaze on the lunette showing the *Resurrection* cannot be explained by technical shortcomings, nor by the restrictions of Luca's palette, for he used purplish glazes to decorate the *Peretola tabernacle*, completed in 1442, before he received the commission for the first lunette (fig. 3.3).[32] The colour was used to paint one putto in the centre of the architrave of the architectural frame. The manganese

FIGURE 3.3 Luca della Robbia, *The Peretola tabernacle*, *c*.1441–1442, glazed terracotta, bronze, marble
PERETOLA, CHURCH OF SANTA MARIA. PHOTO: FEDERICA CARTA

FIGURE 3.4
Luca and Andrea della Robbia, Stemma of Jacopo Pazzi, *c.*1460–1465, glazed terracotta
FLORENCE, PALAZZO SERRISTORI. PHOTO: RENZODIONIGI, FLICKR

purple, when mixed with white, gave a very opaque glaze with the colour of a blueberry milkshake, admittedly very unlike the appearance of porphyry.

Luca's interest in imitating porphyry came later. The first occasion on which he sought to evoke the rock with his glazes was in the Pazzi coat of arms (Italian *stemma*) (*c.*1461), on the interior of the dome of the family chapel in the chapter house of Santa Croce in Florence. Given the commemorative character of the commission, it was highly appropriate to imitate the purple and durable porphyry. Undoubtedly, a family of such lofty aspirations as the Pazzi would have appreciated the long-standing associations of the material with power and rule. However, only in the purple shell which decorates Jacopo Pazzi's stemma (dated to 1460–1465), which was jointly executed by Luca and Andrea, can we observe significant technical progress in mimicking the visual properties of porphyry (fig. 3.4). This time there are clear white and black dots, to suggest that it is not just any purple, an artistic choice of the colour, but a conscious, deliberate attempt to imitate porphyry.

Apart from the use of porphyry-like glazes for stemmi and decorations of commemorative spaces, the Della Robbia workshop imitated elements that could have been carved from the actual rock, such as pilasters, tombstones, or the thrones on which the Virgin was seated with her divine Son. In the Basilica at La Verna, Andrea della Robbia's *Assumption of the Virgin* includes a detailed porphyry sarcophagus (fig. 3.5). Through the deliberately uneven application

FIGURE 3.5 Andrea della Robbia, *The Assumption of the Virgin*, 1488 (detail), glazed terracotta
LA VERNA, SANTA MARIA DEGLI ANGELI. PHOTO: ZUZANNA SARNECKA

of the manganese glaze, Andrea conveyed the actual characteristics of the porphyry, taking into account the fact that its crystals, depending on the type of porphyry used, could be white or, as in this case, slightly pinkish. Moreover, in this composition Andrea also juxtaposed purple porphyry with the green variant, also seen as a powerful religious symbol, and famously used in the thirteenth century for the tomb of St. Anthony in Padua (Lorenzoni 2000, 129). He clearly wanted to establish this symbolic connection and show the variety of materials obtainable through the glazing of terracotta. He repeated this juxtaposition of purple and green porphyry in other works, including the *Lamentation over the dead Christ* in the Old Cathedral at Marseilles, now in the sacristy of the new Cathedral.

Certainly, Andrea was much more interested in imitating the actual properties of porphyry than his uncle, and it is in his works that we can find the best examples of mimesis of the material. In Luca's *Madonna del Roseto*, dated to 1460–1470, now in the Bargello, we see a uniform, darker, porphyry-like glaze used in the throne. Andrea's treatment of the same element in the *Annunciation* panel, held at the Bode Museum, captures the actual texture and visual properties of porphyry. In both instances, the material of the Virgin's throne is bound to establish the connection between porphyry and rulership. Close-ups of the two reliefs reveal the dramatic difference in treatment of the same rock using the medium of glazed terracotta (figs. 3.6–3.7). The relief by Andrea, which might have been a part of a base of an altarpiece or a predella, as in another work by him designed for the Baglioni Chapel at Assisi and now held at the Museo della Porziuncola, includes white crystals and pinkish dots on the surface of the throne, combined with black short smudges to suggest the stippling typical of porphyry.[33]

In the scenes of the *Assumption*, Andrea also used porphyry-like glazes to adorn the Virgin's sarcophagus. In the *Madonna della Cintola with saints* of *c*.1502, from the Collegiata of S. Martino e S. Leonardo at Foiano (fig. 3.8), we see the sarcophagus with three panels imitating red porphyry below the figure of the Virgin.[34] On a different altarpiece in Frankfurt, there is a sarcophagus that only has two panels, showing the green and red porphyry. Andrea also included porphyry slabs in various predella panels – sometimes in rectangular or circular form. The latter was introduced in a laurel wreath in the altarpiece showing *St. George fighting the dragon*, at Pieve di S. Maria e S. Giorgio at Brancoli, dated *c*.1490–1500.[35]

Andrea's sons echoed some of this ambition to imitate porphyry in their own work. Towards the end of the fifteenth century, Giovanni della Robbia (1469–1529) displayed this material in the architectural frame for the *Lavabo*, in

FIGURE 3.6 Luca della Robbia, *Madonna del Roseto*, *c*.1460–1470 (detail), glazed terracotta
FLORENCE, BARGELLO MUSEUM. PHOTO: ZUZANNA SARNECKA

the sacristy of Santa Maria Novella in Florence (fig. 3.9). Similarly, in a ciborio for the sacred host at the Barga Cathedral, the artists of the Della Robbia workshop depicted porphyry on the bases of two angels bearing candelabras, dated *c*.1490–1500.[36] Another ciborio for the sacred host, held at Isabella Stewart Gardner Museum in Boston, has spandrels with disks that juxtapose red porphyry against a green background on the right-hand side, and serpentine against a porphyry background on the left.[37] The use of porphyry-like glazes in the context of a ciborio could have been stimulated by the artists' ambition to evoke in their sculptures the links between porphyry and the sacrifice of

FIGURE 3.7 Andrea della Robbia, *The Annunciation*, 1490 (detail), glazed terracotta BERLIN, BODE MUSEUM. PHOTO: ZUZANNA SARNECKA

FIGURE 3.8 Andrea della Robbia, *Madonna della Cintola*, 1502, (detail), glazed terracotta
FOIANO DELLA CHIANA, COLLEGIATA. PHOTO: ZUZANNA SARNECKA

FIGURE 3.9 Giovanni della Robbia, Frame for the marble lavabo, *c.*1498 (detail), glazed terracotta
FLORENCE, SACRISTY OF SANTA MARIA NOVELLA. PHOTO: ZUZANNA SARNECKA

Christ which allowed His body and blood to be transformed into bread and wine during the Eucharist.

It should be emphasised that the imitation of porphyry in glazed terracotta was not limited to flat surfaces, but also included moulded elements. An altarpiece of the *Assumption of the Virgin*, attributed to the artist-friar Fra Ambrogio della Robbia (1477–1528), now in the Palazzo Comunale in Pergola, but originally in the Hermitage of the Minori Osservanti di San Giorgio at Monterubbio, has a frame decorated with porphyry vases in the form typical of the Della Robbia workshop (fig. 3.10).[38] Ambrogio's brother, Fra Mattia (1468–after 1532), addressed the needs of the Franciscan community by firing figures entirely in white, such as in *The Annunciation*, now in the Church of Santa Maria del Soccorso in Arcevia. This work is important for our understanding of

FIGURE 3.10 Fra Ambrogio della Robbia, *Pala di Pergola*, *c.*1520 (detail), glazed terracotta PERGOLA, PALAZZO COMUNALE. PHOTO: ZUZANNA SARNECKA

the persistence of this signature colour in the Della Robbia shop in the Marche and the devotional connotations of this colour outside Florence, but it also includes a mimetic representation of porphyry in the spandrels of the Virgin's bedchamber, thus confirming an interest in showing the material outside Tuscany as well.

Over time, less attention was paid to material mimesis among the artists from the Della Robbia workshop. Girolamo della Robbia (1488–1566), when decorating the base of the statue of St. Francis, now in the Museo Bandini, applied the dark manganese-purple glaze unevenly onto the light surface of the fired terracotta, which in various areas comes through the glaze and creates a rather poor representation of the white crystals that are characteristic of porphyry (fig. 3.11). Moreover, the white glaze, which ran during the firing, splits the base through the middle and spoils the illusion, reminding the viewer that he or she is not actually looking at a piece of porphyry but at a piece of glazed terracotta. Imitating porphyry in glazes was not an easy or straightforward task, and clearly the Buglioni, the successors of the Della Robbia artists, had trouble in obtaining good effects when mimicking this material. As remarked by Allan Marquand, a sarcophagus in the scene of the *Assumption of the Virgin*

FIGURE 3.11 Girolamo della Robbia, *San Francesco*, *c.*1510–1515, (detail), glazed terracotta FIESOLE, MUSEO BANDINI, FIESOLE. PHOTO: ZUZANNA SARNECKA

by Benedetto Buglioni (1459/1460–1521) from the church of Santa Maria a Casavecchia was merely a 'mottled violet in imitation of porphyry or marble'.[39]

Through their use of porphyry-like glazes, members of the three generations of the Della Robbia family established the spiritual connotations with blood and rulership, as well as evoking the hardness of the material transformed by heat in a little-known process. They imitated the aesthetic properties of porphyry in three major respects: the rock's deep purple colour, its texture, which included stippling, and its lustre. The exercise of imitating porphyry shows that Luca and later Andrea della Robbia were truly in the vanguard of the Florentine era of experimentation. In Florence under Medici patronage, over the course of the sixteenth century, it became increasingly popular to imitate porphyry in paint. Without true knowledge of the origin of porphyry or the tools to shape it, the Della Robbias' glazed terracotta was the best available substitute for the actual stone, becoming porphyry in every aspect but its chemical composition. Secrecy and lack of knowledge of the material were key to creating a mythology for both glazed terracotta and porphyry. Cultural, artistic and social factors meant that the Della Robbia family's interest in porphyry occupied a unique place in their practice. Man-made porphyry, created in the new, quasi-magical medium, added symbolic and religious value to the Della Robbia sculptures. Luca and Andrea – like Christ during the Wedding at Cana – transformed liquid matter into something else, even if in their case the result was not wine, but hard and precious porphyry.

Acknowledgements

I am very grateful to Professor Deborah Howard, my colleagues from the University of Warsaw and the editors for their most helpful comments on the earlier versions of this chapter. The final stage of my research was generously supported by the National Science Centre, Poland (Project no. 2018/29/B/HS2/00575).

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Endnotes

1 Pirro Ligorio, 'Delle antichità di Roma', Libro XXXVI, 'varij Marmi e Colori di quelli', Oxford, Bodleian Library, Ms. Canonici Ital. 38, ff. 108r/v: 'Il Porphirite […] quando il volemo contrafare in pittura noi facemo un campo di color tarrè [*sic*] òver lionato rossetto, ma che habbi del scuretto, et dopo con color di carne li buttamo sopra certi punti minuti col pennello'.

2 Gentilini 1992, 12; Del Bravo 1973, 1–34.

3 Aligheri 1949, Canto IX, 101–102, 389: 'porfido mi parea sí fiammeggiante / come sangue che fuor di vena spiccia'.

4 Aligheri 1949, Canto IX, 95–96, 389: 'marmo bianco era, sí pulito e terso ch'io mi specchiai in esso qual io paio'. For the significance of Dante's writings for Luca's sculptures, see Sarnecka 2016, 291–301.

5 New International Version.

6 Cat. London 2011, no. 42.

7 Ms. Thompson 30, f. 37; Garzelli 1985, 663, fig. 1059.

8 Rucellai 1960, 74: 'molte belle tavole di porfido et maxime sotto il pergamo, rilucenti come uno specchio, delle più belle che sieno in Roma'.

9 Barbour & Olson 2011, 56–61, tab. 2b.

10 Barry 2011, 67; Raff 2008, 134–142.

11 Delbrück 1932, xix, 2, 31, 134.

12 Vasari 1973, 109–111: 'A' dì nostri non s'é mai condotto pietre di questa sorte a perfezione alcuna, per avere gli artefici nostri perduto il modo del temperare i ferri, e così gli altri strumenti da condurle'.
13 Cennini 2015, chap. XXXVI.
14 Barry 2011, 497; Butters 1996, 171, 334–335.
15 Pope-Hennessy 1980, 15–16; Del Bravo 1973, 1–34.
16 Long 2001. On openness in Theophilus's practice, see 85–88; for Biringuccio, 178–179; for Piccolpasso, 234–235. On artisanal secrecy in the early modern period, see Eamon 1994; Newman 1997; Smith 2004.
17 Pope-Hennessy 1980, Appendix II, 91–93.
18 De Clavijo 1999, 130 and note 109: 'E entre ellos avia cuatro màrmoles muy grandes, las dos, a la una parte derecha, e las otras dos a la otra parte siniestra, que eran coloradas de una cosa que es fecha de polvos arteficialmente e llámanlo pílfido'.
19 Butters 1996, 43. Her interpretation is the more striking in that she included in her Appendix V and VI, 398–403, a range of documents showing that in the mid-sixteenth century there was still no understanding of how columns could have been carved in porphyry, and that the tools to work the rock were rediscovered only in the second half of the sixteenth century.
20 Barry 2011, 288.
21 Piccolpasso 1980, *c*.64r: 'Fatto tutto questo porgonsi preghi a Dio con tutto il core ringratiandolo sempre di tutto cio chegli ci da'.
22 Piccolpasso 1980, *c*.64v: 'Racordandosi far sempre tutte le cose col nome di Jesu Cristo acceso il fuoco'.
23 Cennini 2015, chap. CLXXII.
24 Theophilus 1961, preface to the third book, 62.
25 In the Middle Ages, similar links were drawn between rhetoric and piety (Carruthers 1998, 9).
26 Baxandall 1971, 152–154: 'porphyreticum pulchrum, et tornatile'.
27 New International Version. There are other instances of porphyry vases preserved in churches across Europe that were believed to have been those in which Christ transformed water into wine at the Wedding at Cana; for a famous example at St. Denis, see Conway 1915, 103–158.
28 Mundy 1988, 37–43. Sarah K. Kozlowski is currently working on a group of portable, multi-part panel paintings from Angevin Naples, painted on their exteriors to resemble porphyry.
29 Piccolpasso 1980, *c*.26r: 'Il manganese se ne trova abondante mentre per questo felicissimo stato et in diversi luoghi per la Toscana questo e notissimo per tutto Italia et operarsi per tutto ove si lavora di vetro'.
30 Gentilini 1992, 11. On the trade in the dye see Renna 1998, 133.
31 Poggi 1988, 21, doc. no. 1563: 'quod mons sit sui coloris arbores etiam sui coloris'.
32 Gentilini 1992, 94.
33 Marquand 1922, cat. no. 69, 102, fig. 72.
34 Marquand 1922, cat. no. 354, 199–201, fig. 259.
35 Marquand 1922, cat. no. 252, 125–127, fig. 209.
36 Marquand 1972, cat. no. 213, 88–89, fig. 184.
37 Marquand 1972, cat. no. 218, 91–92, fig. 186.
38 Bellandi 2004, 123–126.
39 Marquand 1972, cat. no. 114, 102–103, fig. 78.

PART II

Added-Value

∵

FIGURE P2 Using sandpaper to imitate the look of aged jeans
PHOTO: MARJOLIJN BOL

Introduction

Many mimetic practices are undertaken to add value to existing materials. Their study can thus shed light on the conventions of beauty, authenticity and value operating in particular cultures, and how these change over time or within and between cultures. Such practices cause us to reflect on the relationship between modes of production and consumption, and the role of makers and experts in mediating it. In several arts, especially architecture, materials are often purposefully given a treatment to make them seem rougher than they really are. Renaissance architects, for instance, in imitation of the Romans, carefully worked stones to give them a 'natural' appearance. In the early modern period, 'quality' was often defined by precisely those characteristics of regularity, reliability and replicability that were hard to achieve without mechanisation. Yet, since full industrialisation, such practices have been castigated for producing an impersonal world of object-human relations, shedding the essentially 'natural' characteristic of diversity and individuality in favour of commodification. The 'handmade' has thus acquired a new moral purpose as the regulator of human-material relationships in a world of mechanically produced commodities. Practices serving to conceal the mechanical origins of material objects are widespread. Yet even the rustic could be commodified, as for example in practices of deliberately distressing, staining or ripping fabric to create new fashion garments.

Mimetic techniques are also crucial to both the forgery and the restoration of works of art. The 'antiquing' of products, for example, adds value and the appearance of rarity by concealing the recent origins of a material object. Forgers (and restorers) have to become increasingly expert in order to produce a trustworthy replica, one which will withstand close scrutiny. As standards of authenticity transform, so too the qualities that an object needs to possess in order to be a successful forgery change. This results in situations in which there is no reliable way of establishing authenticity. The chapters in this section focus on these issues by addressing practices of imitating silver and gold, the materiality of silver, and the impact of ideas about authenticity on mimetic practice. In his contribution, Joy shows how an iconic artefact of the European Iron Age, neckrings – also known as torcs because of their twisted form – transformed the personal appearance and social identity of their wearers. The surfaces of these torcs, made from a base metal, were deliberately manipulated to look like gold and silver. Joy argues that this surface enrichment helped create new value systems, giving similarly shaped torcs the capacity to have distinct social significance by virtue of their different colours.

In her essay, Hills explores the often hidden values that underlie the use of silver to make altars in baroque Naples. Through the case of silver, she considers how artworks operate materially *beyond* the materials and methods from which they were made, and the local meanings attributed to them. In Hill's essay, silver is not discussed as a passive substance, therefore, but as a material with its own story: the materiality of silver is implicated in, and a product of, the ruthless plunder of European colonialism, the degradation of indigenous workers, and ecological ruination. Hermens, in turn, investigates how ideas about the authentic artwork in all its material manifestations have deeply influenced practices in the replication, forging and conservation of works of art. Her chapter addresses the various drivers of the mimicking of material authenticity, and the incentives that urged the development of new and interesting methods for doing just that. Hermens discusses how, in the past, precious metals, pigments, and gems were imitated to create ingenious high-quality artefacts, seemingly including true precious materials, as well as more modern methods of mimesis to fake art. Her essay also explores less sophisticated methods, such as the artificial ageing of fakes, as well as conservation treatments that were used to mimic age.

CHAPTER 4

More (or Less) Than Meets the Eye? Torcs of the European Iron Age

Jody Joy

Neck-rings known as torcs are an iconic artefact of the European Iron Age (*c*.800 BCE–43 CE in Britain) (fig. 4.1). Comprising twisted wires, and often with decorative terminals, many torcs were made of precious metals. Although rare, Iron Age representations of humans or deities show individuals wearing torcs. Torcs can also be seen on classical statues depicting Iron Age peoples (Joy 2015). They were therefore clearly an important artefact type, and may have been status symbols, or markers of authority and communal wealth.

FIGURE 4.1 The so-called 'Great Torc', from Snettisham (BEP 1951,0402.2)

 | DOI:10.1163/9789004515413_008

This chapter draws on scientific examination of torcs dating from the second and first centuries BCE, found at Snettisham, Norfolk, UK (Joy & Farley forthcoming). Metal analysis shows the surface of the torcs was deliberately manipulated using various processes, including surface enrichment and mercury gilding. These techniques are highly unusual and peculiar to torcs (Meeks *et al.* 2014). The overall result was to privilege gold or silver at the surface, leaving a copper-rich core. One of the effects could have been to deceive the viewer into believing the metal torcs were made from contained far more precious metals than they actually do. But there is significant variety in terms of the range of surface colours produced, so there may also have been other motivations.

In this chapter, I investigate this material mimesis, concentrating on surface enrichment. Why did torc makers develop surface enrichment techniques? What properties of gold and silver were valued by Iron Age people? Were they esteemed for their colour, shininess, or even malleability? As surface enrichment techniques were not generally applied to other types of artefact during the Iron Age in Britain, why were they developed specifically for torcs? To help answer these questions, I draw on Taussig's (1993, 21, 47) observation concerning the 'two-layered' character of mimesis: the processes of copying and the extent to which the copy shares or acquires properties of the original. On the one hand, surface enrichment could deceive the viewer into believing torcs are made primarily of gold and silver: through its enriched surface the torc takes on the material properties and values of 'pure' metal in the eyes of the viewer. The variety of colours produced through surface enrichment may also have been highly valued. On the other, surface enrichment is a result of the manufacturing process, a way of making neck-ring wires that was repeated many times. Was it therefore the intentional outcome of an innovative manufacturing technique, or just a happy outcome associated with a particular tradition of making metal wires? Taking Iron Age torcs as our case study, how can we reconcile intentionality and habit in mimetic processes? Thinking more broadly, the dual drive in torc manufacture – aesthetics on the one hand, and practical limitations on the other – is central to many branches of the arts, as is the question of how far 'happy accidents' influence design.

1 A Pain in the Neck? What Is a Torc, How Were They Worn and Who Wore Them?

The word 'torc' or 'torque' comes from the Latin '*torques*', a term attributed to the objects because many are formed of twisted wires. Following the

generally-understood archaeological definition, the label is used here to describe ornaments formed of a neck-ring with protruding terminals (Eluère 1987, 22). Torcs were worn around the neck with the terminals at the front. Patterns of wear show that some were regularly removed and put back on again. Depending on the intensity of usage, they could therefore have been worn daily or less regularly over a longer period of time.

Although rarely recovered in huge numbers, torcs are found across a wide area of Europe from the Czech Republic across to Germany and France, and as far west as the British Isles, Ireland and the Iberian Peninsula (Hautenauve 2005). They are made of precious metals, copper alloy, and iron and date from between the sixth century BCE and the first century CE. There is significant regional variation, and torc terminals can often be highly decorative. Torcs are sophisticated objects, and considerable effort and time was invested in their manufacture. In addition to the objects themselves, as already mentioned in the introduction, when Iron Age people chose to depict images in human form, many show people wearing torcs (Eluère 1987, 2). Similarly, representations of Iron Age peoples in the Classical World, particularly warriors such as the well-known Dying Gaul, often portray torc-wearers. Torcs therefore appear to have been a significant artefact form tied to specific identities. This is reflected in the contexts in which they are discovered. On the Continent, torcs are often found in graves, worn by the grave occupant. Owing to torcs' scarcity and sophisticated manufacture, often in precious metals, archaeologists have most often interpreted torcs from graves as valuable objects, representing the status of the individual they are buried with: a sign of social and/or religious authority, with its identity tied to that of the deceased. In Britain, torcs instead appear in special deposits known as hoards. Hoards are collections of objects buried together at the same time (Bradley 2013, 122). It is a tradition which lasts for 5,000 years or so, from the last hunter-gatherers to the early modern period. Interpretations of hoards vary widely, depending on period and context. Some are thought to have been objects buried for safekeeping, but for some reason never retrieved. Iron Age hoards have often been interpreted as votive deposits, offerings to the gods. This is because patterns can be seen in the location of the deposition of hoards, often close to springs or on hilltops: locations which may have had religious importance (Fitzpatrick 1992). The sheer quantity of hoards (thousands are known from later prehistory) has also been used as an argument against so many being the result of accidental loss. Finally, many hoards were carefully arranged in the ground, suggesting that they had not been rapidly buried for safekeeping (Bradley 2013). The Snettisham hoards fit this pattern. The presence of a later Roman temple close to where the hoards were discovered supports the idea that it was also a place of religious importance

in the preceding Iron Age period. As we will see, many of the hoards were carefully ordered as they were put in the ground. These factors have led to the Snettisham torcs from hoards being interpreted as a form of wealth linked to tribal groups (Stead 1991) and communal offerings (Fitzpatrick 1992).

2 An Embarrassment of Riches? The Torcs from Snettisham, Norfolk

The torcs examined in this study were all found on a single wooded hillside, known as Ken Hill, located just outside the modern village of Snettisham, Norfolk. During the past 70 years, around 60 complete torcs and a total of at least 150 (including fragments) have been recovered from over a dozen hoards. The hoards are quite diverse, but can be categorised broadly into two main types: tightly packed groups or 'nests' of torcs, and hoards made up mostly of fragments (Figs. 4.2 and 4.3). They also vary in the number of objects deposited. For example, Hoard E (fig. 4.4) contained only four objects, whereas Hoard F comprised over 600 artefacts. In addition to torcs, many hoards contain coins, which is useful for dating. The earliest coins date to the late second century BCE. Crucially, no coins of a type known as Gallo-Belgic E have been found, providing a *terminus ante quem* of 60 BCE. This is significant because it coincides with a time when the first coins were minted in the region (Chadburn 2006). Radiocarbon dating of organic cores dates the manufacture of some torcs to the third or early second century BCE (Garrow *et al.* 2009). This means they were at least 50 years old when they were put in the ground. Some were even older; the aptly named Grotesque torc, extremely worn and much repaired, has terminals decorated in a style of art in vogue over 100 years before it was deposited (fig. 4.5). It is clear therefore, that in addition to representing some form of offering, the Snettisham hoards also marked the end of a long-standing tradition of wearing torcs in the region, which was replaced by the use of coins (Garrow and Gosden 2012).

The Snettisham torcs come in various sizes, ranging from the equivalent of a size 18 collar to much smaller examples likely to have been worn as bracelets or armlets. Given the range of sizes, they were probably worn by both sexes and possibly even children. They comprise a neck-ring of twisted ropes, made of wires which were hand-hammered, with two terminals. The neck-rings are all very different. Wires of various thicknesses and combinations and patterns of twists were used, ranging from simple forms made by twisting two thick wires to twisted ropes made of multiple twisted wires. Some neck-rings were even hollow, created by coiling wires around a former such as a metal rod or a thin length of wood (Cartwright *et al.* 2012). Most terminals were cast, but a

FIGURE 4.2 Hoard L during excavation, showing the tightly packed 'nest' of torcs

FIGURE 4.3 A sample of the artefacts from the fragmentary Hoard F

FIGURE 4.4 Hoard E (which includes the Great Torc), as it was found

FIGURE 4.5 The so-called 'Grotesque Torc' from Hoard L (BEP 1991,0407.37)

small number are made from sheet metal (cf. Machling and Williamson 2018). Many torcs are exquisitely manufactured and elaborately decorated (Megaw & Megaw 2001; Garrow & Gosden 2012). For example, the eight ropes, each formed of eight twisted wires, making up the neck-ring of the so-called 'Great Torc' were carefully twisted (fig. 4.1). Despite being hand-hammered, the diameter of each of the wires is nearly identical, meaning that there was no deviation when the wires were twisted together, creating a perfectly formed neck-ring. The decoration on its terminals has raised edges and hatching worked using fine tools. The different surface textures of the design catch the eye from a distance by breaking up the surface of the gold, but the complicated design can only be fully appreciated when viewed close-up (Joy 2015). It is truly a magnificent object.

To put the Snettisham discoveries into context, only around 50 other torcs are known from the rest of Britain, and only 250 or so precious metal torcs from continental Europe (Hautenauve 2005). It has been suggested that at the end of their lives, torcs were most often melted down and recycled (Joy 2016). It certainly seems that, at that time in Norfolk when the Snettisham hoards were deposited, many were melted down to make coins, but for some reason the Snettisham torcs were not; instead, they were carefully placed in hoards. Snettisham is therefore clearly an exceptional site, and must have been a highly significant place for Iron Age people. It may not be coincidence that several centuries later the Romans built a temple on the hill (Hutcheson 2011).

3 Manipulating Surfaces

Recent research on the Snettisham torcs by scientists at the British Museum has revealed the extent to which torc neck-ring wires were manipulated to alter their colour and surface appearance. Incomplete objects and fragments provided the opportunity to view the metal wires in cross-section and undertake a full examination and microanalysis of the metal (Meeks *et al.* 2014). The manufacturing history of artefacts can be read from the microstructures of the metal, revealing technical choices which may express social values, as well as technical requirements dictated by the physical and mechanical properties of the metal (Hosler 1994, 3). Investigation revealed that torc wires were made of three main alloys: high gold-silver with low copper, silver-gold-copper and silver-high copper with low gold. When the 150 or so torcs and torc fragments from the site were compared side by side, the range of different surface colours observed was far greater than the restricted number of alloys would suggest (fig. 4.6). This represented a bit of a mystery until the wires were examined in

FIGURE 4.6 Collection of torc fragments looped onto a silver-alloy bracelet from Hoard F

cross-section, when it was found that most have a gold- and silver-enriched surface and a copper-rich core. The composition of the wires was therefore deliberately altered with significant surface enrichment of precious metals and depletion of base-metal copper, resulting in a different surface colour and composition from the core. Given the limited number of alloys, the great variety of surface colours observed is explained by variations in the degree of surface enrichment. The greatest differences between the surface and the core occur on wires made from the silver-high copper with low gold alloy, where the surface appears as a silvery or pale gold colour compared to the coppery-coloured core (Meeks *et al.* 2014, 142). In addition to surface enrichment, some copper-alloy torcs were also gilded. This was achieved by coating the torc in an amalgam of gold and mercury. Boiling off the mercury left behind a thin coating of gold on the surface of the copper-alloy. Both surface enrichment and gilding are metalworking techniques that are rarely seen before the Roman period, and seem to have been specifically developed for the manufacture of torcs.

It is thought that surface enrichment was achieved through a combination of hammering, heating and pickling (in mild acid such as vinegar), a process that was repeated several times.[1] It is worth describing torc wire manufacture in detail, in order to understand the embedded nature of surface enrichment

in the manufacturing process. The following is a summary of a more extensive account by Meeks *et al.* (2014). A metal rod or bar was first cast, then hammered in order to thin, shape and lengthen the wire. Although torc wires are circular in cross-section, it is easier to maintain a square cross-section when working, so it is thought torc makers first worked the wire in a square cross-section before final shaping. This hypothesis is supported by the presence of characteristic facets seen on torc wires, which are a by-product of wire primarily being worked with a square cross-section. The wire was periodically heated to around 600° C between hammering sequences. This process, known as annealing, was essential to soften the metal and help prevent cracking during the elongation of the wire. A consequence of annealing is that any copper in the surface layer is oxidised. The copper oxide, which appears as a thin black layer resembling soot, was removed from the wire surface by pickling it in a mild acid (probably vinegar), directly after annealing. Episodes of hammering, annealing and pickling were repeated until the wire was the desired thickness. In addition to producing torc wire, this process resulted in a progressively enriched gold and/or silver surface, producing wires ranging in colour from pale silver to a rich gold. Multiple wires were made in this way, in what must have been a time-consuming process. The wires were then twisted together in different combinations to form torc neck-rings. Some terminals were made separately before being joined onto the neck-ring, others were formed by looping the wires at each end.

In sum, torc wires were made in different colours by a process of surface enrichment, which itself was a result of the repeated episodes of hammering, annealing and pickling necessary to make wires of the required form, length and diameter. Intentionality is difficult to assess, but torc makers did not seek alternative methods of producing wires. Metalworkers were at the time well able to achieve a consistent colour through close control of alloys, when making other objects such as coins (Cowell 1992) and torc terminals, many of which were made by casting, which is an entirely different manufacturing technique. Alternative methods of manufacture which would not have affected the surface colour of the wires were also not sought. For example, wire could have been thinned by 'drawing' it through draw-plates of progressively smaller diameters. Whether intentional or side-effect, the surface colours resulting from producing torc wires in this way were evidently desirable.

4 Gold in Prehistoric Britain

In southern Britain, artefacts made of gold, especially personal ornaments, but also ridged cups and even a cape, are well-known from the Bronze Age period

(Needham 2000), but there is an intriguing absence of gold artefacts between 800 BCE and about 250 BCE (La Niece *et al.* 2018; Northover 1995). This hiatus in the production of gold objects is difficult to explain. On the Continent, gold objects appear in rich graves (*c.*600–400 BCE). A small number of gold neck-rings were also made in Scotland and Ireland, produced between 300 and 50 BCE (Hunter 2018). Instead, the dominant metal used for making high-status objects in southern Britain, such as decorated sword scabbards, display shields and mirrors, was bronze. The composition of the bronze, containing roughly 10% tin, was remarkably consistent throughout much of the Iron Age, giving the metal a distinctive yellow colour. It is thought that the gold used to make artefacts in the Bronze Age came from sources in Britain and Ireland (Northover 1995). Perhaps the hiatus in the manufacture of gold artefacts during much of the Iron Age can be explained by a breakdown in exchange links to sources of gold (La Niece *et al.* 2018). Alternatively, gold artefacts may simply have stopped being culturally desirable after 800 BCE, with status objects instead manufactured from bronze.

Gold reappears again in the archaeological record during the third century BCE, when torcs were first made (La Niece *et al.* 2018). Gold in the form of scrap items, and later coinage, was possibly imported from continental Europe at around this time, and coins were first minted in southern Britain sometime in the early second century BCE. Analysis of the alloys suggests the torcs were made from recycled gold primarily sourced from the Continent, rather than from locally extracted gold (La Niece *et al.* 2018, 419). During the period from the third to the mid-first centuries BC, there was a preference for yellow-coloured alloys for both coins and other precious metal objects, although, as we have seen in the case of the Snettisham torcs, the colour range was quite diverse, varying from a pale silvery gold to rich golden hues. Preferences changed around 50 BCE, with a shift to a reddish gold colour containing more copper (Farley 2012). This is in contrast to bronze manufacture, which was conservative. The same tin bronze composition was maintained for much of the Iron Age, with little experimentation in the use of alloys until the very end of the Iron Age period, when zinc was combined with copper to make brass. At this time, objects requiring strength and hardness, such as tools and weapons, were made of iron. Bronze was reserved for items of dress such as pins and brooches, as well as highly decorated objects like mirrors and display shields. Perhaps bronze was valued because of its workability, or possibly even its colour.

5 The 'Value' of Precious Metals

Regarding the two-layered properties of mimesis, is it possible to differentiate between design decisions which result from social choices and those which are dictated by the constraints of the materials (Hosler 1994, 5)? We have seen how the requirement to produce torc wires of even diameters brought about surface enrichment through the necessity of periodic annealing to prevent wires from cracking. We can also surmise that surface enrichment was socially desirable, since it was a process that was repeated. But what could the motivations be for altering the surface colour of torcs? Was it simply a question of aesthetics, because a range of different hues of silver and gold was prized, or were other values ascribed to precious metals in society at this time?

Gold and silver are valued by many cultures. In Europe, as the moniker suggests, *precious* metals have long been tied to monetary value, the material therefore has a worth beyond aesthetic qualities or the form and function of the artefact. This is evidenced by the practice of hallmarking, a guarantee of the quality of the metal, which has been in place in England since a statute was issued by Edward I in 1300 (Oakley 2013, 66). Discussing medieval gold from England, Peter Oakley (2013) argued that even when it is formed into objects, it can still be recognised as a substance, and that, unlike objects, substances can be reconstituted repeatedly and still retain their identity. It is worth quoting him at length:

> Gold and silver share the specific tendencies of workability and recombination. Not only can they be divided, they can be recombined, holding the potential for an infinite number and range of future amalgamations that undermines the stability of any current object; any existing gold or silver object can all too easily be perceived as a mass of raw material for the manufacture of the future object-in-waiting. Consequently, keeping any gold or silver object in its current form (both conceptually and physically) requires continual and concerted social effort.[2]

In this sense the material is important, rather than the form of the material, which is transitory. But we must also beware of overly Eurocentric views of the inherent value of precious metals, which are not universal. For example, during much of African history, the metal selected to fashion socially significant artefacts such as bracelets, staffs, vessels, masks and statues, objects which were

used for exchange, placed in graves and shrines and offered as bridewealth, was copper and its alloys, not gold, even though the latter was a material for which the continent later became well-known to European explorers and colonial powers. The reason for this was the value placed on the red colour of copper, which carried considerable symbolic capital in Africa (Herbert 1984). Even where precious metals are highly valued, it is not always because of their qualities as a form of money or exchange. In West Mexico, during the period 1200–1300 CE, metalworkers used a wide variety of different copper, silver and gold alloys, as well as surface enrichment to manipulate the colour of artefacts. Metal was valued for its colour and shine, which were seen to bestow divine qualities on artefacts (Hosler 1994).

In sum, the hiatus in gold manufacture in southern Britain from 800 to 250 BCE may have been because of the social values ascribed to the colour of bronze, rather than solely because of a lack of gold to continue making gold artefacts. The conservative tradition of bronze usage, wherein there was very little experimentation with the use of alloys, could therefore be explained by social conventions regarding the 'correct' colour and surface properties of bronze. If this is the case, the question we should probably ask is not 'why are there no precious metal artefacts for much of the Iron Age in southern Britain?', but rather 'why did they start making precious metal objects again after 250 BCE?'

6 Material Properties. Opportunities to Show Off and Innovate

If we turn again to the material properties of the alloys used to make torcs, perhaps the choice of these alloys had important practical considerations (Meeks *et al.* 2014, 153). For example, silver-high copper, low gold and gold-silver-copper, all have low melting points, requiring less heat and less fuel to make artefacts. They can also be easily worked and re-worked through heating and hammering. But bronze is also relatively easy to work and its melting point is actually lower than pure gold. We therefore need to seek alternative motivations for the ready adoption of these metals in the third century BCE. In this section we focus on one uniting factor contributing to the adoption and working of these new alloys: that they are *not* bronze. It will be argued that the adoption of these new materials created space for invention and innovation.

Focusing on the physical qualities of the alloys, we have already seen how it was possible for Iron Age metalsmiths to manipulate the surface colour of gold and silver alloys using new techniques, in a way that was not attempted with copper alloys prior to the use of zinc to create brass artefacts during the

first century CE. It has already been mentioned that the existence of different coloured torcs indicates that the ability to manipulate surface colour was socially desirable, but one further strand of evidence which underlines this hypothesis is the way in which torcs of different colours were treated in deposition. As already stated, the Snettisham hoards can be broadly grouped into two groups: hoards primarily comprising fragments of torcs, and so-called 'nests' of whole torcs. In both instances, care was taken over collecting torcs of various colours. Hoards containing torc nests, such as Hoard L (fig. 4.5), were ordered according to colour, with silvery torcs positioned towards the top and gold-coloured artefacts at the bottom (so deposited first) (cf. Stead 1991; Hutcheson 2004; Joy 2016). These patterns were maintained across a number of the hoards. It is possible that torcs of a particular colour conferred a certain status or identity, an order of 'seniority' maintained in deposition. Whatever the motivation for this ordering, it is clear from the presentation of the artefacts in deposition that their colour was important. Similarly, in fragmentary hoards, such as Hoard F, collections of artefacts can be noted within the wider hoard. Fig. 4.6 shows a silver ring with fragments of artefacts of various colours looped onto it. There are around 20 such collections of artefacts among the 600 or so artefacts placed in Hoard F. Again, because objects of different colours have been grouped together, these collections of objects act to emphasise the colour differences of the precious metal torcs and torc fragments at Snettisham (Joy 2016).

The hiatus in gold-working lasted over five centuries, meaning that many of the complicated skills required to make torcs were new (La Niece *et al.* 2018, 421). Casting and sheet metalworking were both employed to manufacture bronze objects as well, but wire production and surface enrichment are peculiar to torcs, and must have involved an extended process of innovation and experimentation, as well as perhaps borrowing and learning techniques used elsewhere in Europe. It has been suggested that other torcs in Britain were made using techniques more commonly used elsewhere at the time, particularly the Mediterranean (Hill *et al.* 2004; Hunter 2018). New materials could have been adopted, therefore, because they allowed metalworkers to break free from the constraints of bronzeworking. We should also not underestimate the influence of 'happy accidents' in the manufacture and design of ancient artefacts. Making wires in a particular way brought about surface enrichment and a new ability to manipulate the surface colour of gold wires. Knowledge and skill transfer, as well as command of metalworkers with access to these innovative new technologies, could all have been important factors (La Niece *et al.* 2018, 421). The use of new materials, likely sourced through complicated exchange networks, may also have been important, with social significance

perhaps attributed to their 'exotic' origins. The second and first centuries BCE was a time of social change in East Anglia (cf. Davies 1996). Perhaps political power was linked to personal or communal connections and the wider exchange networks necessary to obtain these new materials (La Niece *et al.* 2018, 421). Making highly visible artefacts from them would have also emphasised the prestige of the wearer and their community.

In sum, when thinking about why people started to make precious metal objects again (particularly torcs) after 250 BCE, I suggest here that it is because newly available precious metal alloys, probably imported from Europe, created space for innovation. The fact that these alloys were not bronze meant that metalworkers were not constrained by the relatively conservative tradition of bronzeworking previously used to make prestige objects. The properties of these metals also meant that metalworkers were able to manipulate the colour of artefacts in new ways, which, judging by the variety of the Snettisham torcs, was evidently desirable. Thirdly, the new materials created opportunities for control, both over the acquisition of new metalworking skills, but also over a new exotic material sourced from far away. It is interesting that this new wire-making technology was also extended to make bronze torcs, but that people also adopted another innovation – gilding – to alter the colour of bronze torcs.

7 Material Mimesis – Two Faces?

Returning to the subject of mimesis, the material mimesis observed in the case of the Snettisham torcs is difficult to classify. It is not a classic case of *substitution*: replacing one substance with another. One result of the new techniques developed to make the surface of torcs was that mixed alloys were made to resemble pure gold or silver, but surface enrichment techniques also resulted in artefacts of many different colours. Similarly, this is not a classic case of *forgery* or *disguise*. Through scientific examination of the artefacts and careful consideration of the historical context, it does not appear that the sole intention of the artisans who made torcs was to deceive torc users deliberately. Neck-ring wires were all made in the same way, so such a claim would imply that *every* torc was a 'forgery', that *all* producers were 'in' on the scam and that *all* consumers were duped by it. Following this line of reasoning, it is actually a torc made of pure gold or silver that would constitute a 'forgery', rather than the torcs made using the techniques in question. It therefore appears that torcs were valued for their colour and the quality of their manufacture, not solely because of the proportion of precious metals they contained. Finally,

preservation, or the imitation of the materials and technology of artefacts made by previous generations of artisans, can also be viewed as a form of mimesis, whereby certain material attributes are maintained and change is actively discouraged. We can see this in the preservation of the properties of the bronze used to make prestige objects throughout much of the Iron Age. In contrast, torc making appears to be partly a reaction to this conservative bronzeworking tradition. By adopting new materials, metalworkers were able to break free from the constraints imposed by the traditions of bronzeworking, experimenting with new techniques, particularly surface enrichment. *Change* is one of the outcomes of torc making therefore, not preservation.

In the introduction to this essay, following Taussig (1993), it was suggested that material mimesis can be two-tiered, linked to replicating or copying and the processes involved in replication. From this viewpoint, it is difficult to avoid a 'chicken and egg' question: which came first, the desire to make different coloured torcs, or surface enrichment? Reconstructions of torc-wire manufacture have shown how embedded surface enrichment was in the production process. Perhaps, when metalworkers were experimenting in the manufacture of torc wires, they noted the colour change and then developed methods to enhance and manipulate it. This 'happy accident' would have resulted in the production of objects of various colours which, because of their variety and the different treatment of artefacts of different colours in deposition, must have carried social significance. Rather than representing a deliberate attempt at disguise, deception or even preservation, surface enrichment was embraced for its dual abilities to represent change and variety in a manner that was socially acceptable, in contrast to the conservative tradition of bronzeworking. In other words, social value was created through the manipulation of colour and materials. Torcs of similar form but different colours could have had separate social significance. In this sense, by maintaining a specific production technique but slightly altering the composition of alloys and the duration of wire-working (thereby promoting higher proportions of precious metal on the surface), change and variety was promoted through preservation. Material mimesis in the production of torcs counterintuitively promoted variety in the surface appearance of artefacts. The production of prestige objects, using exotic new materials sourced from far away and innovative production techniques, presented in a range of colours not previously seen, provided new social opportunities. Individuals and groups could demonstrate their prestige through connections to widespread networks of knowledge and exchange. Craftspeople could show off their skills and knowledge in new and exciting ways. Both the torcs themselves and the torc-wearers also became symbols of these networks of knowledge, prestige and exchange.

Acknowledgements

I would like to thank the editors and the anonymous reviewer for their useful comments on previous drafts. I would also like to thank Julia Farley, with whom I am co-writing a book on the Snettisham hoards, for her constant encouragement and support, as well as for her help sourcing images and image rights for this chapter.

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Endnotes

1 This is supported by a modern-day smith working with these alloys who was able to replicate the same kinds of microscopic and aesthetic effects revealed on the ancient artefacts through scientific investigation (Meeks *et al.* 2014, 149).

2 Oakley 2013, 64.

CHAPTER 5

Nomadic Silver: Refinement, Transaction, Transformation

Helen Hills

Silver was the most nomadic material of the early modern Spanish empire. It traversed continents from the Andes to Europe to China. Raw ore was refined and worked into ornate silver objects; in turn, those objects were frequently melted down and the silver re-used. Violently extracted from the earth in the Andes, it became the dazzling marker of social, political and, above all, spiritual refinement in Europe. Silver opens a special triple optic – at once political, natural, and divine – and brings the divine, nature and politics into relation materially through its time-warping, boundary-crossing capacities. It offers at once a vantage point on the flow of capital and imperial power, a window on the production of nature, and a superficial contact with the divine. Thus silver's nomadism lay beyond the movement of individual silver objects from one place to another: it was a slippery and *immanent* aspect of silver's capacity to add shine and substance to the lack-lustre. Key commodity of exchange, silver was nomadic in its very silveriness.

Current scholarship bifurcates silver geographically and temporally. On the one hand, silver's extraction in the so-called 'New World' is interpreted in political, ecological and sociological terms, in relation to its role in world trade, deforestation, the rise of capitalism and displaced labour. From that point of view, silver is measured in thousands of kilograms transported across the globe and in terms of currency, trade and capitalism. On the other, silver in Europe is treated as elegant objects to be appreciated, a 'reflection' of the wealth and refinement of their possessors. Thus, in travelling from Potosí across the Atlantic Ocean to Europe, silver changes appearance, language, and disciplinary field – in short, it changes epistemologically – and the *affect* and *politics* of silver fall out of the picture in an inert 'finished' object. These scholarly effects are interrelated, and are political in their denial of a politics. An analogy with the smartphone in contemporary culture is useful. Indium oxide, from which soft screens are fashioned, is mined in some of the world's poorest countries by some of its poorest people, leaving a wake of poverty and ecological devastation. Despite this, the purchase and possession of a smartphone bear no stigma, even in well-educated circles. To caress it in a relation of seductive intimacy is a

sign of supposed sophistication and 'connectedness'. There was something akin to this in upper-class relationships with silver in early modern Europe: associations of refinement, connectivity, superiority, even intimacy. This chapter asks how silver might be investigated as more than means or measure of empire, on one hand, and more than mere object of luxury, on the other, to ask how these two stories – these two sides, as it were, to the same coin – might be brought together. How might we think them in relation? How might silver's nomadism, its capacity to traverse territories and switch registers be thought in relation to silver objects? In what ways does such an approach shed new light on silver in Naples?

The silver reliquaries of Naples' many protector saints, conserved in the Treasury Chapel of San Gennaro (fig. 5.1) in Naples cathedral, flaunt a form of 'naturalism' that gestures to another realm entirely, and demand a consideration of silver in these terms. They are approached here in light of silver's convulsant transformations from the Viceroyalty of Peru to Naples, part of Spain's empire within Europe, and are treated as sites where the particularly charged interrelationships amongst colonialism, sanctity and locality took place and were reformed.[1] The chapel, building from 1608, was overwhelmingly metallic at a time when polished marble was the preferred material for churches and chapels. In this chapel crucial relationships between Naples and the heavenly court are forged, take place and are elaborated by means of silver. The Greek term *μεταλλάω*, or 'seeking after other things', suggests that metal is particularly suitable for a reliquary chapel, but why was *silver* the preferred metal for the reliquaries of Naples' protectors? The silver in this chapel conjoins two different sorts of colonialism, Spanish rule in the so-called New World, whence came the silver, and Spanish rule in the Kingdom of Naples. Hence I investigate the ways in which colonialism, silver, and sanctity intersected with particular redolence in this chapel through movement, exchange and transformation.

Rather than think of silver reliquaries as inert and finished, they are explored here in relation to silver's materiality, its processes and potential for transformation. Under examination is not the simple transfer of a stable object from one place to another, nor the impress of 'idea' or 'form' onto silver conceived as inert matter, but instead the pro-duction, the *bringing forth*, a perpetual becoming of *silver in movement*, part of the production and bringing forth of those who extract it, refine it, bear it, wear it, or whose eye is caught by its gleam and blinded by its beam.[2]

Gold was more highly valued than silver, but the massive quantities of silver that inundated Europe (and beyond) after 1545 ensured that it was silver that became refinement's *leit motif*. The silver hilt of a sword or tip of the cane marked a gentleman out from the sixteenth to the eighteenth centuries; silver

FIGURE 5.1 Naples, Treasury Chapel of San Gennaro, Naples Cathedral
PHOTO: MASSIMO VELO

lamellated thread rendered aristocratic dress dazzling. It was silver, above all that was used for chalice, pyx, and paten, and liturgical vessels of all kinds.[3] And it was silver that conveyed the divine to humankind in the Mass, and that was thus implicated in transubstantiation. But even as silver threaded its ways into European elegance and rites of redemption, it also marked the most ruthless plunder of European colonialism, the degradation of native workers, and ecological ruination.[4] Nevertheless, scholarship on and museum displays of European silver artefacts remain resolutely technical, connoisseurial and taxonomical, insisting on the place where artefacts were fashioned, rather than the story of the metal: silver teapots made in London, exquisite eighteenth-century epergnes, splendid Neapolitan chocolate pots (fig. 5.2). It is as if something were being held under control, anxiously kept in place.

Silver was a key component in Spanish imperialism on both sides of the Atlantic and an engine of the commodity frontier of the Spanish empire. But only the Latin American side of the story has been interpreted in relation to coloniality.[5] Further, while colonialism's cultural implications have been studied in nineteenth-century extra-European empires, this aspect of Spain's

FIGURE 5.2 Silver Gallery, Victoria & Albert Museum, London
BY PERMISSION OF VICTORIA & ALBERT MUSEUM, LONDON

early modern colonial project within Europe has been ignored. The principle enunciated by the Castilian jurist Juan de Solórzano Pereira's *Politica Indiana* (Madrid 1648) was that each kingdom under Spain was to be ruled *aeque principaliter*, 'as if the king who holds them all together were king only of each one of them' (Elliott 1992, 52–53). By contrast, the kingdoms of Mexico and Peru were subordinate to, and incorporated within the kingdom of Castile alone. Nevertheless, formal independence was more complex in practice. For all its significance as key staging post for Spanish colonialism in Europe and despite the presence there of the viceroy and his pompous court, Naples was a junior partner to the monarchy to which it belonged. The transport of silver from Spain's colonies in the New World across the Atlantic to Spanish dominions

in Europe provides more than mere material connection between different forms of colonialism. The working of Spanish silver in Spanish-ruled Naples was a crucial part of the Spanish colonial project. The complex ways in which processes and products of fashioning silver from church plate and reliquaries to furniture, dress, and jewels for Grand Tourists were intimately implicated in processes of governance and to discourses of political and spiritual dominion and salvation urgently require investigation.

The lavishness of Neapolitan silver was notorious. Abbot Giovanni Battista Pacichelli (1703, 62–63) remarked in *Memoirs of Journeys through Christian Europe* (Naples 1685) on its superabundance. The quantities of church silver astonished northern visitors, including Gilbert Burnet in 1686:

> The wealth that one sees in the City of Naples alone, passeth imagination [...] The Plate that is in [...] the Dome, (which is but a mean building because it is ancient, but hath a Noble Chappel, and a vast Treasury) and in a great many other Churches are so prodigious, that upon a modest estimate, the Plate of the churchs of Naples amounts to Eight Millions of Crowns.[6]

Neapolitans, too, were alive to these extraordinary riches. Carlo Celano, canon and historian, remarks in his 1692 guidebook on a ravishing silver colossus by Cosimo Fanzago and Gennaro Monte in the Annunziata, which comprised altar, altar furnishings and architecture, all of silver, and cost over 35,000 *scudi*:

> A pyx entirely of silver, enriched with well conceived statues [...] which cost, both for the silver and for its working, 17,000 *scudi*. Also to be seen there are two life-sized angels of silver, each holding a torch [...]; and 10,000 *scudi* were spent on this work. The lateral doors, through which one access the choir, are similarly of silver, well worked with famous figures, and on them were spent 8000 *scudi*.[7]

Significantly, Carlo Celano (1692) characterises the silver of San Gregorio Armeno in terms of 'excess':

> The silverwork is present in excess, in quantity, in weight, and in its working, and particularly those objects that are used to adorn the main altar on feast days, such that greater than these are not to be seen in other monasteries. There are candlesticks, vases, flowers, crosses, mass cards, all of silver to adorn all the chapels of the church, and for the most part they were paid for by individual nuns.[8]

The lavish use of silver in this female convent is tellingly deemed 'excessive' in quantity, weight and elaboration.

Pacichelli in 1685 implies a parallel between the silver in Naples' churches and monasteries and the stupendous silver deposits in its public banks:

> If, however, I wanted to enumerate and distinguish between all the churches and monasteries, I would be spread too thin, since there are more than three hundred: the precious furnishings, the silverwork, which in the opinion of experts, exceed the rest of Italy, including those of private individuals, and the almost unbelievable pledges or deposits (*pegni*) of the eight public banks.[9]

Thus baroque Naples was tarnished with a reputation for excess, in which silver played a crucial part. For Gilbert Burnet in 1685, such silver splendour was associated with corruption and amounted to profligate waste:

> Every year there is a new Governor of the Annunciata, who perhaps puts in his own Pocket twenty thousand Crowns; and to make some compensation when he goeth out of Office, he giveth a vast Piece of Plate to the house, a Statue or a Saint in Silver, or some Coloss of a Candlestick; for several of those pieces of plate are said to be worth ten thousand Crowns; and thus all the Silver of Naples becomes dead and useless.[10]

That 'excessive' ecclesiastical silver was part of the mortmain of the Spanish church, a prodigious resource that was gathering dust rather than fighting wars or generating interest. For Burnet, 'the vast and dead Wealth that is in the hands of the Churchmen, is another Cause of their Misery'.[11] Indeed, the Treasury Chapel, like any church treasury, was seen as an immobilisation of capital (fig. 5.1). It was a sign of surplus, of dead capital in the eyes of Protestants, but a capital that for Catholics could circulate in peculiar ways and return its profits in eternity.

However, while many commented on the astonishing quantities of silver in Naples, few reflected on its presence in relation to the Spanish empire and, indeed, insisted that silver was found locally. Campania, claimed Pacichelli, 'is fertile in metals, of gold, silver, mercury, lead, tin, bronze, iron'.[12] Antonio Serra, however, in 1613 recognised the absence of local silver and gold deposits (Reinert 2016, 117). Indeed, most silver came to Naples, via Seville and later Cadiz, from the Spanish 'New World', transatlantic counterpart of the Kingdom.

1 Silver as Lifeblood of the Spanish Empire

Spain's imperial ambitions fed on American silver. The New World accounted for almost three-quarters of the world's silver production in the sixteenth century.[13] So abundant were precious metals in Hispanic America that El Inca Garcilaso de la Vega (1539–1616) claimed in 1609, 'the mines offer such riches that after a few years of working, iron will be worth more than silver'.[14] Spain was able to import vast quantities of grain from as far afield as the Ukrainian steppe by the 1590s and gargantuan quantities of Baltic timber, because it could pay for them in silver. 'At every turn', claims Jason Moore (2010a, 36), 'land (forests, silver veins, fertile soil) was organized by empires [...] as a force of production in servitude to the commodity form, as a mechanism for maximizing the productivity of labour'. These flows of materials across the world depended on silver, on a world ecology and a world economy that fuelled the rise of capitalism and that was the ruthless logic of the commodity frontier.[15] 'The spectrum of vital food, labor and resource sectors – comprising the production and extraction of sugar, silver, forest products, iron, copper, fish, flax, grain, slaves, and livestock – was characterized by a profoundly restless historical geography', writes Moore (2010b, 60–61). New commodity sectors moved to regions where the commodification of land and labour was low, and where indigenous capacities for effective resistance were minimal.

Most silver came from Potosí, home of the fabulous silver mountain discovered by the Spanish in 1545. Emblazoned on Potosí's coat of arms, King Philip II's motto read, 'For the wise king this lofty mountain of silver could conquer the whole world'. In his 'Historia de la Villa Imperial de Potosí' (*c.*1706–1736), Bartolomé de Arzáns de Orsuá y Vela describes Potosí in terms that unite heaven and earth: 'body of land and soul of silver [...], a trumpet that resounds throughout the globe [...], magnet of all desires [...], money enough to buy the heavens'.[16]

By the 1570s the Cerro Rico ('Rich Mountain') was the epicentre of a commodity revolution that subordinated the Andean peoples and landscapes to serve capitalism and empire. Base silver, found in abundance, had to be refined. It was the most fuel hungry of smelted metals. When viceregal attempts to reorganise mining in Peru failed to address declining output, smelting gave way to mercury amalgamation, a technique that pulverised ore with mercury to extract silver, while control of production was wrested from Indians to Europeans in the *mitayo*, perhaps even more deadly than slavery in its forced labour drafts.[17] After 1566, when mercury was discovered in the

Huancavelica mines, silver production increased in volume and speed. Viceroy Pedro de Toledo y Leiva referred to the Potosí-Huancavelica combination as 'the two axes on which run the wheels of this entire Kingdom [of Peru) and the wealth which your Majesty possesses'.[18] But the ore that these methods made available was exhausted by the 1670s. More and deeper tunnels were dug; accidents, fatalities, disease, misery soared. Mercury poisoning, the dreadful effects of which were recorded long before by Georgius Agricola, massively aggravated human suffering and landscape poisoning.[19]

The Spanish crown reaped huge wealth from its control and taxation (direct and indirect) of 'New World' mines, since it controlled the mining and minting of silver (Graulau 2011, 30–43). Incentives encouraged bullion owners to take their treasure to Spanish mints, where it accrued additional value, while Spain collected seigniorage. The Spanish monarchy minted about 4.55 million kilograms of silver and 2,800 kilograms of gold in the years between 1600 and 1639.[20] Viceregal American silver required four marks, including the tax mark known as the '*quinto*': one-fifth of an object's value was due to the royal treasury.[21] More gold and silver was produced by mints owned by the Spanish Monarchy in the seventeenth century than in the later sixteenth century, and far more than by its English and French rivals (Motomura 1997, 332). Massive amounts of silver from Andean mines traversed the Atlantic, forming a world trade system involving Asia, including China.[22]

Prodigious profits from the globalised silver industry largely financed the sprawling Habsburg empire, of which Naples was a crucial part.[23] A key site to global exchange between northern and southern Europe, the eastern Mediterranean, Africa, Asia and beyond, Naples was part of the interrelationality of these worlds, place of intersection and exchange. The richness of early modern Naples is precisely its hinge-like character, meeting place and exchange point of real and imagined spatial and political networks – interlocking Madrid and the Habsburg Empire, Rome, Asia and the New World.

While the Spanish government deployed its court in Naples to dramatise its power on a wider European stage, as part of its strategy to legitimate Spanish power in Italy, the effects on the city were local, specific, and profound.[24] Spanish silver freely entered Naples as part of the Spanish empire and its working there informed that nexus; economically, politically and materially. As many as 350 workshops of silversmiths were concentrated in the Orefici quarter of the city, in each of which worked family groups of various size, repositories of astonishing technical and artistic skills.[25]

Wrested from the earth by the blood of conquest and the savagery of colonial mining, refined Spanish silver was beaten into beneficence (fig. 5.3). Wrought, chased, engraved, repoussaged, damascened, and embossed, silver

FIGURE 5.3 Silver reliquary of St Clare, Treasury Chapel of San Gennaro, Naples
PHOTO: © MARINA COTUGNO-PANCAKE-PRODUZIONI

metal was transformed into accoutrements of political distinction, niceties of social refinement, and necessities of spiritual communion. Neapolitan silversmithing was particularly prized.

Noble Neapolitans boasted lustrous silver collections; silver sculptures adorned silver furniture reflected in silvered mirrors.[26] The silver collections of the prince of Avellino, the marchese di Campolattaro, the duke of Atripalda and others were sought out on the aristocratic circuits. Entire generations of

FIGURE 5.4 Madonnas dressed in silk and silver thread, 18th-century Neapolitan work
PHOTO: LUCIANO PEDICINI. © ARCHIVIO DELL'ARTE, PEDICINI FOTOGRAFI

silversmiths, including the family workshops of Buonacquisto, Pisa, Porzio, Maiorino and Lanzetti supplied splendid silver to the residences of rich merchants and aristocrats (Catello & Catello 1972, 39). Fashionable dress, enlivened by silver thread to denote nobility, lent shine to aristocratic beauty and accelerated erotic attraction. Silver thread was used, too, to dress dolls and Madonnas, like those from the aristocratic female convent of San Gregorio Armeno, daintily dressed in pink silk, with embroidery in spun silver, silk, taffetas of ivory silk and lamellated silver (fig. 5.4). All were enmeshed in the thread of the silver trade (D'Arbitrio 2013, 225–236).

Smooth, shiny, gorgeous and valuable, silver was above all a material of reuse and retransformation, a highly energetic solvent. Malleable, soft, ready to be

of service, the substance from which other objects had already been made; already passed on, refashioned, reformed, and melted into liquid, it was the preferred medium of valuation and exchange. The value of coins lay in their metal, not in the mint; silver could be assayed for purity, while copper could not. Price was set in silver (Flynn & Giráldez 1995, 207–208). Spanish *Reales* bore the heads of the Spanish monarchy and the emblems of empire (the Columns of Hercules) as far as they circulated (Yriarte 1955, 2–12). Reproductive, metamorphic, a material that denoted value itself in coins, silver was profit, the gain of flesh through the material that it imitates, the most mobile of currencies. It encapsulated the ability to shift one material into another, to cross continents and traverse cultures, to slip from one form to another, to exchange earth for heaven, and back again.

Silver is slippery: at once material and colour, substance and surface; an internal quality of the element, a secret but precise quality that directly links density to surface and that produces its sheen. Silver effortlessly crossed the boundary between the secular and the sacred, the human and the divine. It was particularly implicated in discourses of the sacred, of assaying, of testing, of purification, and of authenticity and sanctity through the discourse of light, *lux* and *lumen*, and its capacity to reflect light.[27] Silver was the material *par excellence* for chalices, pyx and plate, for *carte di gloria* and sacred and liturgical objects including patens, cruets, ciboria, monstrances, crosses, candlesticks, croziers, thuribles, and paxes (fig. 5.5).

Imbricated with the spiritual and material transformations of transubstantiation in the Mass, silver sacramental vessels bore those miraculous particles between altar and priest, priest and communicant. In the sacrament silver bridges the gap between man and God, doctrine and desire, sin and grace: 'This cup is that new testament in my blood, which is shed for you' (Luke 22, 20). As the priest drinks the blood of Christ, it is silver that transfers God to man, that transfers His *incorporation*. It is silver that communicates between the holy and the material and that permits their exchange.

In the form of *ex-voti*, silver made promises and affirmed beliefs (See fig. 5.6). Mountains of silver *ex-voti* accumulated on saints' tombs before being melted down and re-used, in a process described by Georges Didi-Huberman (2006, 84) as '(the *ex-voto*) enter(ing) into civilization [or circulation], in some way, acceding to the status of an object both substitutable and mobile'.

The *ex-voto*'s promise to the saint was part of the currency of sanctity, most evident in Naples' cult of relics. Relics, as bones of saints, since *The martyrdom of Polycarp*, were thought of as 'more precious than rare gems and purer than fine gold' (*Martyrdom of Polycarp* 18, 2). Relics were 'treasures' stored in treasuries adorned with treasure. Gennaro Luongo (2013, 238) writes of the

FIGURE 5.5 Silver-gilt chalice, made in Naples, *c.*1700. V&A Museum, London: M.42-1951
BY PERMISSION OF VICTORIA & ALBERT MUSEUM, LONDON

'*tesaurizzazione*' of relics in Naples.[28] More than that, the city of Naples was 'treasurised', refashioned in terms of relics-saints-silver at once economy and currency, material and divine. Reliquaries were overwhelmingly fashioned from silver.[29] Silver attracts and reflects light, constantly bringing to life and setting the relics apart from the everyday world. Precious silver declares the preciousness of the relics inside. Silver, like sanctity, is put to the test, assayed, and sustains its virtue. Silver unites reliquary and relic, permits transference of

FIGURE 5.6 Silver *ex-voto* from Naples.
PRIVATE COLLECTION. PHOTO: HELEN HILLS

the translateable, and allows *virtus* to be its own reward. Yet all the while silver was imbricated in the violence of Spanish colonialism.[30]

Naples needed its saints. Excessively afflicted by nature's excesses, crowded into a pestiferous port, perched on seismic land, overshadowed by Vesuvius, Naples was visibly threatened and during Spanish rule for political reasons

Naples was depicted as under continuous threat, exposed to annihilation at any moment. In response to those threats, Naples generated an extraordinary number of patron saints through the seventeenth and first half of the eighteenth centuries until it boasted more protectors than anywhere else. The Treasury Chapel of San Gennaro minted Naples' swarm – an astonishing thirty-two protectors by 1731; today fifty-one (fig. 5.1).

Thus the Treasury Chapel was superabundantly inhabited by relics and saints and, by extension, by external institutions, churches and monastic institutions, which were invested in the chapel through their silver saints. The effect was not of simple population, but of *over-population*, a synthesis of heterogeneity, of saintly reproduction and overflow. Thus the Spanish monarchy's 'silverising' extended beyond the economic sphere, with which it has predominantly been associated, to the farthest reaches of religious aspiration. The silver saints of the Treasury Chapel were part of that complex nexus whose interjunctions defined 'Naples'. With the exception of the reliquary bust of San Gennaro, the Treasury's reliquaries are made of silver (fig. 5.3). It is silver that bestows their disturbing shifting quality. During festive processions, reliquaries became part of the world, mobile and fluid, animating not just the chapel, but a flow of silver into the street back to their churches of provenance (fig 5.7).

Silver reliquaries extended the action of the chapel, the involvement of the worshipper, as a 'mechanosphere', a shifting assemblage which cut across institutions and categories, holy and secular, biological and architectural, social, economic, ecclesiastical and lay.[31] Thus the saints produced a chapel with increasing spiritual reach, that consisted of traces which spill over its boundaries.[32] The currency of reliquaries *in circulation* made *virtus* present and thus the chapel became a theatre of virtue – an exemplary world.

Relics alter place. They were not simply moved from one point to another (translation); in that movement they transformed and *became* (variation). And, on assuming residence in the chapel, each new reliquary statue altered it, acquiring a power superior to human nature. Their movement was change of space, rather than simply a shift across it or from one space to another. It was analogous to the flow of refined silver – altering Naples and altering its relation with the divine. Silver is a good analogical material for the currency of relics: a metal that seeks after other things, apparent guarantor of value located elsewhere, yet always available through exchange. Saints' relics embody the promise of God's power to remake the human body at the resurrection. Just as the relic is the promise of a future integration of flesh and spirit, so silver, as smooth surface replacing skin and flesh, operates to convey this material analogy. In the reliquary busts silver is incarnate, surface, skin and substance, and

FIGURE 5.7 Amassed silver reliquaries ready for procession during the feast of San Gennaro, 2013
PHOTO: HELEN HILLS

assumes the place of flesh and skin, resplendent with the bones that it covers. Surface and contents, remnant and redemption are interfused, an anagogic metaphor. The reliquary busts are thus more than sculptural busts of saints. They are heavily contaminated by contact: contact with the relics they contain and, through them, with Heaven (the saint in glory) and divine will. The palpable and material do not fuse with the spiritual and glorified, but work in parallel analogously.

According to Christian theology of glorified bodies, the chains that bind matter and human bodies to the corrosive effects of time are shed through activation of a human potentiality, imagined as dormant but within the material world and an integral part of it. The question of identity was at the heart of the belief in resurrection, since it depends on the same human being rising again. 'Not a hair on your head shall perish' (Luke 21.18). What constituted the body's entirety, given its changing form? What of me must rise in order for the body to be me? Body becomes question. The matter touches the bone. No wonder, then, that the body-part reliquaries continue to disturb. Here it is

silver that emerges as an autonomous force of miraculous materiality, the reliquary as more than a voice in a prosopopoeia. The silver reliquary busts figure anticipation incarnate, the glory of the saint's body transfigured for eternity, reunited with its happy soul, on earth and in heaven. They show us what will have been. More than mere representations of saints, the reliquaries offer a textural connivance between silver and flesh, between matter and salvation, between fragment and whole. *Virtus*, the attribute of relics, permeates the silver flesh of the virtuoso reliquary. Silver draws together, reflecting faces in saint's skin, fusing surfaces, crossing worshipper and reliquary in a form of animated prosthesis or cyborgian divinity (fig. 5.3).[33] The reliquaries and relics are fugitive: what arrives, leaves; in leaving, remains absent, remains outside its own arrival. Sharp light, glancing off the busts, conveys something that is immediately stolen away, whose truth consists in vanishing. The bones that can literally be seen facilitate the mediation of the saint: they both are and are not the saint, now in the presence of the glory of the Lord.

2 Conclusion

As a treasury of silver from the viceroyalty of Peru, the Treasury Chapel bears the stamp of Spanish imperial ambition. It celebrates Spain's conquest of the New World, its command of the silver trade, and the wonderful transformation of conquest into bullion and bullion into salvation. The chance to turn base metals into silver and gold pushed alchemists to frenzy. But the ensilvering of flesh was more than a dream. It was also a nightmare. The capacity to transform what he touched to gold first thrilled King Midas, and then, as he turned food, wine, and his beloved daughter into lifeless metal, poisoned him. For if silver was the lifeblood of the Spanish Empire, it was also its death rattle.[34] The Spanish monarchy was so indebted that, on arrival at Cadíz, the silver was already bound to the stock exchanges across Europe. Spain's permanent war strategy accelerated its own demise, fuelled the rise to world power of its chief rival, the United Provinces, and intensified the extension of commodity production and exchange throughout the Northern Atlantic.[35] It effected a dynamic decisive to the development of industry, banking systems, colonial trading companies with wars and slave ships, and the agricultural industry, and the expulsion and impoverishment of people rendering them available as labourers. 'Hurling' people onto the labour market took place at the same time in Europe as in the colonies.

There was a lot wrong with silver in baroque Naples. It was a matter particularly subject to abuse. Its very purity corrupted. Coins were clipped, silver

accumulated and pointlessly hoarded, and it represented, far from a fountain of life, the great deadening hand of the Church itself. Silver had a particularly concentrated effect on Naples, because Naples' monetary economy was not bimetallic as almost everywhere else. Naples' monometallism made it particularly vulnerable to clipping. Gilbert Burnet reported in 1686:

> As for the Coin, it, as all the other Spanish Mony (*sic*), is so subject to Clipping, that the whole money of Naples is now light, & far below the true value [...] He hath laid some Taxes on the whole Kingdon, & hath got a great many to bring in some Plate to be coined: and when he hath thus prepared a quantity, as may serve for the Circulation that is necessary, he intends to call in all the old Money, & to give out new Money for it.[36]

Silver seemed to offer the imperial Spanish what they most desired: a (reducible) meaning and a means to substantialise every relation, even the relationship with the divine. But while silver might work to exchange and transform, it was also always at risk of simply *transacting*, a gleaming threat barely veiled, that traduced potentiality and reduced the possibility of salvation into shrivelled bones and lumps of metal.

The reliquary sought to domesticate the relic, but in the reliquary busts, a whole army of saints was set in motion.[37] Silver passed along, sliding through social relations without substantialising them. In its trail, it left mayhem, devastation, and despair. Yet silver slipped through, passed this by, as innocent and pure as can be. The saints guaranteed the silver, just as it guaranteed them. Silver, as an object of desire, was that into which dross might be turned, whose relation with matter depended on extraction, transportation across the known world, refinement, assaying and working, on betrayal and disguise. Just as the saints required their work to be done in silver, so it was silver, with its long and bloody trail of expropriation, exploitation and destruction, that required the saints. In the saints, silver became fully nomadic, just as in silver the saints assumed their capacity for the nomadic transformation of the soul.

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Endnotes

1 How place *takes place* is at issue here.

2 On the distinction between matter, materials and materiality, see Benjamin 2007, 13–28.

3 See Braun 1932. For a general discussion of church silver, see Hernmarck 1977, 305–357.

4 For silverwork in 'viceregal America', see Esteras Martín 2006, 178–227.

5 Not to be confused with colonialism, which refers to specific historical periods of imperial domination, coloniality refers to the logical structure of colonial domination (Mignolo 2007, 6–8).

6 Burnet 1686, 192–193.

7 Celano 2000, 847: 'una custodia tutta di argento, ricca di ben considerate statue [...]; ed in queste vi spese, e nell'argento, e ne' lavori 17 mila scudi. Vi si vedono ancora due grandi Angioli d'argento quanto al naturale, ogni uno de' quali tiene un torciere [...]; ed in quest'opera vi è spesa 10 mila scudi. Le porte laterali, per le quali si va al coro, sono similmente d'argento ben lavorato con famose figure, e vi è di spesa da 8000 scudi'.

8 Celano 1970, 927–933: 'Gli argenti danno in eccessi, e nella quantità, e nel peso, e nei lavori, e particolarmente quelli, che servono per adornare ne' giorni festivi il maggiore Altare, in modocchè maggiori di questi non se ne vedono in altri Monisteri. Vi sono candelieri, vasi, fiori, Croci, e Carte di Glorie, tutti di argento per adornare tutte le Cappelle della Chiesa, e questi la maggior parte sono stati fatti a spese delle monache particolari'.

9 Pacichelli 1685, 50.

10 Burnet 1686, 192–193.

11 Burnet 1686, 192.

12 Pacichelli 1703, 5: 'È fertile di Metalli, sian pure, d'Oro, Argento, Mercurio, Piombo, Stagno, Bronzo, Ferro'.

13 Across the Viceroyalty of New Spain, silver mines at Zacatecas, Guanajuato, Taxco, Pachuca, Real del Monte, and San Luis Potosí (all in present-day Mexico) became famous (Esteras Martín 2006, 180).

14 Garcilaso de la Vega, *Primera parte de los Commentarios Reales de los Incas* (1609), cited in Esteras Martín 2006, 180.

15 Relative, not absolute, exhaustion was what mattered, and it was produced by the contradictory relations of markets, states, and social classes in Central Europe and the capitalist world-ecology (Moore 2010a, 35; 2010b, 61).

16 Quoted in Esteras Martín 2006, 180.

17 Recent scholarship recovers some aspects of the indigenous Andean Indians knowledge of silver extraction that contributed to colonial techniques (Bigelow 2016, 117–123).

18 Pedro de Toledo y Leiva, *Memorias de los virreyes del Perú* (1648), quoted in Lohmann 1997, 29.

19 Agricola (1657, 344) refers to mercury's noxiousness for health: 'Argenti vivi fumus dentibus noxius'.

20 The Spanish Monarchy decreed that private bullion, mined in its territories, be taken to an authorised mint in America or Castile (Motomura 1997, 333).

21 Viceregal authorities were less concerned with legal silver standards than in collecting the *quinto* (Esteras Martín 2006, 181).

22 Europeans were intermediaries in trade between the New World and China (Flynn & Giráldez 1995, 201–221).

23 The financial foundation of the Spanish empire was based on resources from outside the Iberian peninsula (Flynn & Giráldez 1995, 201–211).

24 The Viceroys' growing involvement in the cultural life of Naples was part of that strategy, and included the feasts of San Gennaro, Corpus Domini and San Giovanni a Mare in Naples (Carrió-Invernizzi 2007, 392–393).

25 Catello & Catello 2000, 28–57; Catello 1998, 307; Luizzi 2008, 69.

26 Catello 1998, 307. For the history of silversmithing in Naples, see Catello & Catello 1975; Catello & Catello 1972, esp. 35–50.

27 On 'lux' and 'lumen' and art, see Bouvrande 2015, 1–10.

28 Luongo 2013, 238.

29 Neapolitan silver furnishings, including altar frontals, hangings, and furniture, suffered various dispersions over the centuries, culminating in the late eighteenth-century Bourbon requisitions of sacred silver from places of worship. The disproportionate survival of reliquaries cannot be simply attributed to their sacred contents, but is due to the fusibility of silver in relic-reliquary.

30 A reader has asked whether this violence is particularly European. It was a central aspect of the production and fashioning of imperialism and colonialism. My point is that this extended on both sides of the Atlantic, and that although elegant refinement in European courts might seem a world away from the brutal extraction of silver in the Andes and Mexico, the two settings were far more intimately connected than has been recognised. The examination of that apparent gap should be part of any examination of materiality; it indicates the consequential transformations in which discourses of matter and materiality are deeply implicated – and indeed how they come to matter beneath the apparent surface of things.

31 For 'mechanosphere', see Deleuze & Guattari 1988, 71, 74.

32 Lefebvre (1991, 83–85, 96, 98, 278, 281) pointed out that bounded spaces are spaces of transit, taking as his example the modern house whose boundaries are crossed by electrical wiring, water and gas pipes, sewage systems, and radio waves.

33 See Lury 2013, 5–20; Haraway 1991, 7–21.

34 'Early capitalism developed rapidly because it generated successive local ecological crises, not in spite of them' (Moore 2010a, 40). The enormous silver flows enabled the Crown to pursue its permanent war strategy while dispensing with the restructuring of state machinery and ecological regime that was urgently required.

35 On this cycle, see Stein and Stein 2000.

36 Burnet 1686, 190–191.

37 'To sanctify excess is a form of domestication; in the institutionalisation of a saint there frequently lies the attempt to neutralize [...] or to otherwise bring under the rule' (Meltzer & Elsner 2009, 378).

CHAPTER 6

Restoring, Patinating, Copying, Faking Material Authenticity

Erma Hermens

> I buy seven Tang bowls for $5 each. They have been properly aged. This is skill, another skill. I watch as a man dips a fat old brush in red clay slip and washes it over the basis of his olive green jars until it gathers and encrusts in the hot air into that crumbly just dug up way. A few shops down there is a haphazard pile of cups and jars – sixteenth-century porcelains from last week – over which a man is splashing an acid solution. It bites into the glaze and abrades it in a usefully random way. This level of authenticity – the grasses matted to the insides of my bowls, the cloacal dirt deep in the seams of these gorgeous celadons that I am coveting and wondering how to get home – is a fabulous flowering of how the market works. We can do authenticity if authenticity is what you want.[1]

In his search for the origin of white porcelain, the artist Edmund de Waal (b. 1964) visits Jingdezhen in China, where one can buy imitations of seventh-century Tang porcelain encrusted with clay to mimic a crumbly dug up state, as well as 'sixteenth-century' porcelain 'from last week' abraded with acid to imitate old age (fig. 6.1). Ageing the porcelain answers to the demands of a market which craves a certain aura of authenticity. Hence the material state of these imitation Tang bowls, as defined some thirteen centuries ago and carefully reproduced, is manipulated to achieve an aged appearance. Yet, as De Waal recounts in *The white road* (2015, 68), 'No one is here for aesthetics. They are here to make a living, walking skilfully along the pathway between reproduction and – what is the correct word – fraud? Fakes? Well neither of those. This could not be more complex in a country where copying is a valued pathway of respect, a way of learning "skills"'. Michael Taussig (1993, xiii) (1993) describes how 'the wonder of mimesis lies in the copy drawing on the character and power

FIGURE 6.1 Porcelain production at Jingdhezen
PHOTO: JOHN WARBURTON-LEE PHOTOGRAPHY / ALAMY STOCK PHOTO

of the original, to the point whereby the representation may even assume that character and that "power". In Jingdezhen, character and power is gauged not just from using the same material of Tang bowls – white porcelain – but also through the mimicked patina of the object's long life, as seen in the 'cloacal dirt deep in the seams of these gorgeous celadons', or the imposed abraded effect apparently acquired through use and time. Although there was no doubt in De Waal's mind that he was buying a modern reproduction, the aesthetic value of the imitated authentic state, including its traces of age and the impact on the viewer's experience, cannot be denied. For such modern objects made for the trade, the fictive narrative of the object's history or biography presented by a patina – dirt, dust, corrosion, abrasion, human impact – denotes age and origin. Material mimesis, and the mimetic methods used in art production, replication and conservation, can be approached in a variety of ways; the material mimesis involved is influenced by ever-changing concepts of authenticity, perception, expectations and evolving scientific methods, as well as transformations in taste, patterns of collecting and the commerce of the art world.

When considering authentic artworks, we need to look at the objects' material histories or biographies, as artefacts were appropriated and changed, stimulated by, for example, a new taste or fashion, the art market's demands, a change of status, perhaps even political revolutions, or ever-advancing

approaches to restoration. Some of these changes may be considered historical, belonging to the life of the artefact, and may thus become part of an authentic and sometimes material narrative. Others may be unintentional or actual falsifications, the latter possessing their own materials and contexts. In a radio discussion on authenticity in art, Xavier Bray, the chief curator of the Dulwich Picture Gallery, explains why he inserted a Chinese replica of Jean-Honoré Fragonard's *Young Woman*, ordered on the internet and costing $120 (including postage), into an Old Masters exhibition ('Start of the Week', BBC Radio 4, 2015). When it arrived, Bray states, it looked rather fresh, and he was tempted to 'put a bag of tea to it'. Placed next to the original, however, the differences are striking: there is no 'soul', Bray states. The project, the brainchild of the American artist Doug Fishbone, challenged the visitor to look closely at the paintings and then vote on which work in the exhibition was the fake. Only 300 out of 3000 who voted picked the fake Fragonard. The British artist Grayson Perry, speaking on the same programme, clarifies how craftsmen would have had the eye, hand and brain of the era they lived in, something which is impossible to replicate in a modern copy or version. Perry explains to the other interviewee in the programme, Patrick Mark, maker of a film on the history and revival of the famous Fabergé company, which today produces replicas of Fabergé's original designs, that such replicas or versions – which in many cases use modern materials and methods to mimick the original matter – would look physically similar, but would lack the 'spirit of the craftsman'.

The production of replicas or copies that mimic historical processes, skills and materials should be situated in the context and time in or for which these were made. Edmund de Waal describes how, in the case of the Tang bowls, their reproductions are not just commercial products in China. Rather, copying such historical objects is also a 'valued pathway of respect, a way of learning skills'. Similarly, in late sixteenth- and early seventeenth century Italy, a copy after a Raphael painting was a highly-desired possession, with art historical documentary value, and an accepted inclusion in a comprehensive, high-quality art collection. However, a century later, in the changed context of eighteenth-century Europe, due to a new moral emphasis on originality and authorship, those esteemed copies were discarded, and, for example, sold off to art academies to serve as educational models for copying, both in painting and print, and thus for learning skills (Black *et al.* 2012). The Foulis Academy in Glasgow, established in 1753 by Robert Foulis, a printer and book dealer, is a case in point. Foulis travelled to Continental Europe to obtain works for his business, but also to buy paintings for the study collection of the Academy. He also had copies made by students for private clients. For example, in October 1767, the banker James Coutts paid £50 for a copy of the Duke

FIGURE 6.2 David Allan, the interior of the Foulis Academy of Fine Arts, Glasgow. Engraving, 23 cm × 29 cm

of Hamilton's monumental Rubens, *Daniel in the lions' den*. Such copies were also shown in exhibitions (fig. 6.2), and used as training materials for students who made drawings, prints and paintings after them (fig. 6.3).[2] Today, most of these paintings, often good-quality copies, live in storage rooms.

This chapter will focus on those aspects of mimicking material authenticity introduced here: historical restoration, as well as replication for various reasons and at different times and places, demonstrating the fluidity of the concepts of material authenticity and the importance of context for interpretation.

1 Restoration

The significance of the aura of authenticity has fluctuated over the centuries. One of the earliest examples of restoration practices with an interesting history of value added by mimetic means is the early modern practice of restoring antique sculptures. At that time, collectors of antiquities desired complete

FIGURE 6.3 David Allan, exhibition of the Foulis Academy's paintings in the inner court of the University of Glasgow. Engraving, 23.5 cm × 28.5 cm

sculptures, and hence many fragments were completed by the addition of their missing parts, newly made and sometimes aesthetically enhanced. The Italian painter, architect and writer Giorgio Vasari comments, in his *Lives of the most excellent painters, sculptors, and architects* (1550), on this type of 'restoration': 'antiquities thus restored surely have more grace and life than those mutilated trunks', thus indicating the contemporary penchant for the complete.[3] Many anecdotes as well as documentary evidence demonstrate the widespread nature of this practice, and illustrate that methods of restoration sometimes coupled an original 'mutilated trunk' with precious and exotic materials that were not necessarily 'truthful', but rather followed the collector's taste or interpretation. For example, the French sculptor Nicolas Cordier (1567–1612), working in Rome, restored yet simultaneously embellished many Roman sculptures for the collection of the cardinal, art collector and arts patron Scipione Borghese (1577–1633), by adding different coloured marbles, or even restituting missing parts with bronze casts. The famous *Zinghara Borghese* for example

(marble and bronze, 1.58 m, Louvre, Paris), recorded in 1556 as without a head and in a Roman collection, was completed – most likely by Cordier – with a head, arms and feet cast in bronze, in a largely interpretative manner, as there was no documentation of the original, and following Borghese's taste for the exotic (Haskell & Penny 1981, 339–341). Cordier was aiming for completion, in the spirit of Vasari, as well as seeking to impart a certain aura of authenticity. Yet he added a seventeenth-century twist based on the dominant taste of the collector and the market. The *Zinghara* certainly attracted a lot of attention.[4]

One might argue that these additions followed the contemporary interpretation of antique sculpture by 'enquiring minds', as explained by the sculptor Orfeo Boselli (1597–1667) in a dedicated section of his treatise *Oservationi della Scultura Antica* (1650), where he discusses the process of restoring antique sculptures and reliefs in great detail:

> It is not something for an indifferent intellect as others believe, but rather for an enquiring mind, so varied and sublime that it entices the greatest in art. One must attempt to recognise the antique statue, which Virtue or God or character it represents, to be able to follow its bearing, and give it the required attributes to hold, then to give it its due proportions, and most importantly to follow the antique style, if anyone can attempt so much.[5]

Boselli argues that a thorough knowledge of classical sculpture is crucial for a sculptor's education. He declares that the replacement of missing body parts was *necessarissimo*: crucial to the public appreciation of antique sculptures, as most would be placed in gardens and galleries. Restorations executed by Gian Lorenzo Bernini (1598–1690) and François Duquesnoy (1597–1643), among others, are praised: 'I cannot omit the figure of a jumping faun owned by the Signori Rondinini, for which the compensation was done by Francesco du Quesnoy of Flanders, for which he remade the thighs, legs, arm and head, marvellously accompanying the antique manner'. However, Boselli feels that many collectors have no esteem for good restorations, lamenting that the work was not well paid, and that it was, 'to tell the truth, for the most part best left undone'.[6]

Documentary evidence from the well-preserved archives of the Medici Guardaroba in Florence provides some further insights into the materials used for such restorations. In these documents, which concern the manufacture of many artefacts at workshops established at the Uffizi in 1588, we find quite detailed descriptions of restorations of the *antiquaglie* in the Medicis' collection. For example, there is a payment to the sculptor Chiarisimo d'Antonio

Fancelli (1588–1632) for the 'restoration of the head of an antique marble putto, remaking the nose and shoulders, one all of alabaster, the other of white marble, and of the same alabaster counterfeiting a garment for an emperor […]'. The sculptors working at the court were asked to add noses, ears and limbs, but also embellished the statues with curly hair, detailing on garments and more, based on their own interpretation of other known examples and descriptions, yet sometimes fashioned to current preferences. The Medici ledgers show that materials such as marble were ordered in large quantities, and selected based on their similarity with the originals, to mimic certain qualities of colour, transparency and opaqueness: coloured marbles, semi-precious stones, granite, transparent alabaster, and so on. Extensive accounts list waxes, oils and resins that were used to add patina to the *antiquaglie*, so as to unify and harmonise the aged original parts of the sculpture with new additions.[7] All this brings an Aristotelian interpretation of mimesis to mind. Here mimesis added the value of completeness to the damaged and truncated monstrosities, as Vasari calls them, that survived from antiquity; but it also emulated them, through stylistic adaptations and unusual combinations of precious and exotic materials that were not necessarily "truthful", but rather answered the expectations of patrons and the market. The material likeness between the original and the additions was further improved by polishing the whole sculpture to a uniform smoothness.

In the early nineteenth century, these acts of completion were increasingly critiqued, and guided by the opinion of antiquarians (fig. 6.4). An interesting case of completion followed by de-restoration concerns the *Leaning satyr*, a sculpture in the collection of classical antiquities in Berlin, which was acquired from the Roman sculptor Bartolomeo Cavaceppi (1716–1799) in 1776 for the royal Prussian collection.[8] Cavaceppi was a much-lauded restorer of antiquities. His methods diverged from earlier interventions, as he would leave the original in its sometimes rough state, allowing a surface texture that was different from that of the additions (Conti 2007, 227–229). The British Museum holds a Roman bust which was restored by Cavaceppi (fig. 6.5). The base and bust are indeed modern, and the face shows traces of a red pigment which was removed by Cavaceppi, 'an ignorant Sculptor, [who] used every means to expunge the red colour by the spirit of salt and acquafortis', thus removing that part which would in fact identify it as an original.[9]

In the *Leaning satyr*, Cavaceppi completed the original fragment, just a torso, by adding a head and right hand with a flute, the missing left arm, the lower part of the legs, and the plinth and part of the tree trunk upon which the Satyr leans, all executed in marble in an early neoclassical style. As the

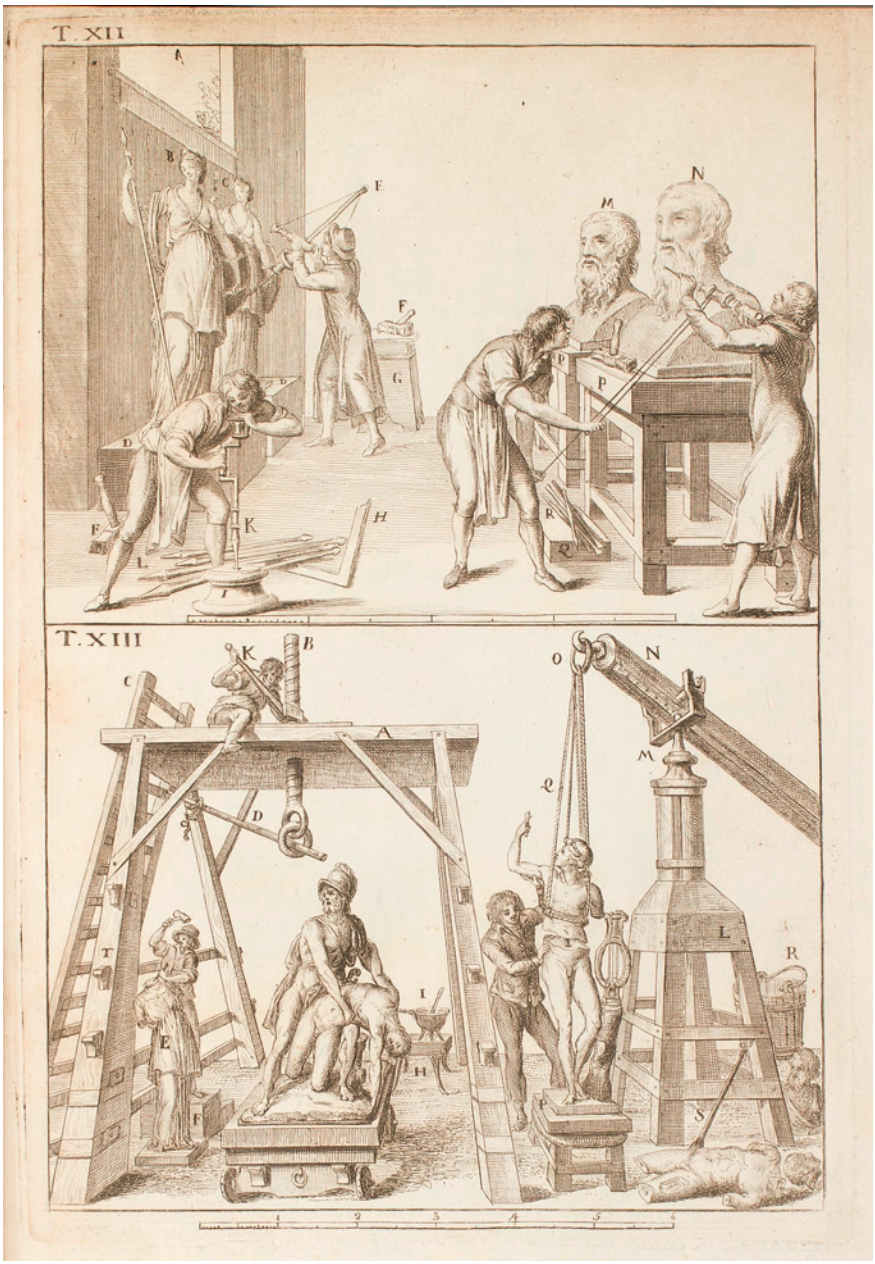

FIGURE 6.4 Carlo Lasinio, *The execution and restoration of sculpture*. Etching, 26.2 cm × 18.4 cm
FROM FRANCESCO CARRADORI, *ISTRUZIONE ELEMENTARE DELLA SCULTURA* (FIRENZE 1802)

FIGURE 6.5 Marble head from a statue of Jupiter Serapis, wearing a kalathos (a basket used in religious processions), and decorated with olive branches. The bust is modern. The face was originally coloured red. Roman, 2nd century CE. Marble, 59 cm × 31 cm × 33 cm

(1805,0703.51)

statue was displayed in the park of Sanssouci in Potsdam, it suffered severe weathering, so the sculptor Christian Daniel Rauch (1777–1857) was commissioned to treat it in 1825. Rauch accepted some of Cavaceppi's additions, but replaced the Satyr's head and the right hand holding the flute. He confirmed his intervention by inserting a piece of paper into the statue's head, stating that he, Rauch, had modelled it. Rauch chose to de- and reconstruct the sculpture's most important features based on other replicas of similar types, and indeed on the opinion of antiquarians (Fendt 2009, 41–49).

Such informed interpretative restorations evoke Eugène-Emmanuel Viollet-le Duc's (1814–1874) statement in *On restoration* (1875, 4) that 'To restore an edifice means neither to maintain it, nor to repair it, nor to rebuild it; it means to re-establish it in a completed state, which may in fact never have actually existed at any given time'. For the architect, '[i]n such circumstances, the best plan is to suppose oneself in the position of the original architect, and to imagine what he would do if he came back to the world and had the programme with which we have to deal laid before him'. Viollet-le-Duc implicitly points at the necessitous attempt to restore and encapsulate the spirit of the original. To imagine what the completed state of the sculpture would have been was not just to maintain or repair it, but to re-establish it, for which purpose the sculptor-restorer would need to a be true and skilled artist, and possess the 'enquiring mind' mentioned by Orfeo Boselli.

By the late nineteenth century, the "correct" treatment of antique statues entailed removing all added parts, and acknowledging only the remaining ancient core. Alois Riegl's *The modern cult of monuments* (1903), written over a century ago, but still relevant today, coins the term 'age value' to capture the reasons underlying this shift: 'From the standpoint of age value, one thing is to be avoided at all costs: arbitrary human interference with the state in which the monument has developed [...] Therefore, the cult of age value works directly against the preservation of monuments'.[10] The removal of added body parts, and indeed of arbitrary human interventions, is indicative of this approach.

2 Harmonising Traces of Time

Although added body parts were removed from antique sculptures, traces of ageing, such as surface patina or yellowed varnishes, were expected by a public which, during an encounter with objects in a museum, interpreted them as evidence of the artworks' long life. Nineteenth-century controversies, and even those of today, were often incited when such traces were removed. Increasingly, interference with artworks in public collections, and especially

the aesthetic impact of some restoration treatments, attracted public comments and even provoked sarcasm. A case in point concerns the Elgin marbles. When these precious fragments were cleaned, a letter by the anonymous 'Marmor' published in *The times* newspaper for 18 June 1858 represents the emotional reaction of the public:

> Sir – I have seen with amazement and indignation the Colosseum – that mighty record of imperial Rome's magnificence – "restored" in part by the descendants of Goths in Italy, its crevices plastered up and the rich, varied, golden hue, the result of nearly 2,000 Italian summers, obliterated by a monotonous coating of filthy colour. I have seen with like feelings some of our masterpieces in the National Gallery destroyed in order to give a wretched "restorer" a job, and on walking through the Elgin room at the British Museum to-day I witnessed proceedings which in absurdity and atrocity may vie with both those I have named. Sir, they are scrubbing the Elgin Marbles! Will their next act be to fill up their abrasions and have them neatly mended? Now, Sir, I am no worshipper of dirt, but I do say that the tone given by time to antique sculpture [...] is absolutely essential to the harmony of its effect.[11]

The 'tone given by time' to antique sculpture, or indeed any artwork, perceived as harmonising in the Romantic Victorian era, adds to the aura of age and authenticity. As David Bomford succinctly describes: 'It was an age in which prevailing ideas of taste toned down, covered up, disguised and altered paintings in ways that could be trivial or fantastic. The famous golden glow of toned gallery varnish went hand-in-hand with over-restoration and outrageous invention' (figs. 6.6a, b).[12] Matthew Hayes (2021, 130) explains: 'As objects of their era, paintings were required to illustrate not only authorship but also the Renaissance qualities of beauty, monumentality, harmony and perfection'. This is an approach reminiscent of the idealisation of antique sculptures, which resulted in the addition of missing parts.

Alessandro Conti (2012, 279) cites one of the few manuals on nineteenth-century restoration practice, *De la restauration des tableaux*, written by the restorer Giovanni Bedotti and published in Paris in 1837, which sets out some of those rather interpretative approaches. For example, Bedotti (1837, 44–46) deemed it 'necessary therefore to retouch and remake only certain inaccuracies, certain distractions of the artist, which one sometimes encounters in well-designed paintings'. Although he warns against 'extensive' corrections, he emphasises that 'sometimes it happens that even the most skilful painters

FIGURES 6.6A & 6.6B Michiel van Musscher, *Portrait of Nicholaes Witsen (1641–1717)*, 1688. Oil on canvas, 54 cm × 48 cm. Before and after cleaning, showing the huge tonal difference when many layers of discoloured varnish are removed
© RIJKSMUSEUM AMSTERDAM (SK-A-5016)

make overly gross and visible errors', which needed to be remedied.[13] Bedotti also advised preserving the patina on paintings by leaving some of the discoloured varnish or dirt, and covering damaged areas with paints 'soluble in spirits of turpentine, and then patinated with a mixture of soot and ash'.

Patination to mimic the effect of time, using coloured varnishes – perhaps often romantically assumed to have been used by earlier painters – was mentioned in my earlier quote by 'Marmor', who suggested that the removal of the toned varnishes known as 'gallery varnishes' had destroyed some of the masterpieces held at the National Gallery in London (Anderson 1990, 3–8). Such worries most likely stemmed from the well-known Cleaning Controversy of the late 1840s. In 1848, Charles Eastlake (1793–1865), the then Keeper of the National Gallery, himself a painter and a scholar of technique, commissioned the cleaning of a large number of Old Masters. Over the years, the Gallery's first Keeper, William Sequier (1771–1843), and later his brother John, the Gallery's restorer, applied a gallery varnish to the paintings: a brownish solution of mastic in boiled linseed oil that mimicked the supposed golden glow of paintings by the Old Masters. Seguier also oiled the paintings regularly with linseed oil to resaturate them. This latter action caused the paintings to become tacky, and

attract dirt and pollution from the London smog. However, as Eastlake stated: 'that harmonious effect [of the gallery varnish], I scruple not to say, may sometimes be assisted even by a film of dirt [...]'.[14] By 1844, the date when Eastlake became Keeper, most paintings already showed a dark brownish patina.

Varnishing paintings was not an isolated practice, as the testimony of the Dutch restorer Jan van Dijk (*c.*1690–1769) demonstrates in his description of the state of Rembrandt's *Nightwatch* (1642), which he had been assigned to clean:

> As a result of the many layers of boiled oil and varnish that have been applied from time to time, one can no longer see what Company [of officers] it depicts, let alone who are the Chief Officers, for it was thought that it had become tarred over [...][15]

In the late nineteenth century, there was a taste for 'brown pictures', according to Arthur F.E. van Schendel (1910–1979), director of the Rijksmuseum from 1959–1975, who recalls how one Ruheman (1891–1973), at that time restorer at the National Gallery London, told him that when he started working at the Kaiser Friedrich Museum in 1929, he found a large amount of ochre pigment in the painting conservation studio that was used to colour varnish (Van Schendel & Mertens 1947, 2).

When the National Gallery pictures were exhibited in 1846, after the removal of this 'golden tone', members of the public reacted in force, writing rather acerbic letters to the Times. Even John Ruskin got involved. For Rubens' *War and peace*, he argued in 1846, the darkened varnish provided: 'the most advantageous condition under which a work of Rubens can be seen; mellowed by time into more perfect harmony than when it left the easel'. In Ruskin's view, the execution of the master is always so bold and frank' that the painting would be easier on the eye 'under circumstances of obscurity, which would be injurious to pictures of greater refinement'.[16] To this, Eastlake responded, when questioned by the Select Committee in an 1853 inquiry into the Cleaning Controversy, that:

> The Rubens may be said to have been long buried under repeated coats of yellowed and soiled varnish. It was found that these could be removed with perfect safety as the surface of the picture had that extreme hardness which the works of this master, above all others, often possess.[17]

Clearly, Rubens was not Ruskin's favourite artist; but others were equally appalled by the bright colours and unexpectedly strong contrasts in the cleaned pictures.

In these same years, Frédéric Villot (1809–1875), curator of paintings at the Louvre in Paris, started a programme to remove the 'brown soup', or 'museum gravy' from items in the collection, to similar public outrage (fig. 6.7). He had restored paintings himself, and was an artist and pupil of Delacroix. He worked with several restorers who, not surprisingly, were also vilified. To the many public protests from connoisseurs, artists and the general public, Villot responded with the defence that the cleaning of a painting was restricted to only the most necessary acts. Concerning the cleaning of paintings by Rubens in the Medici Gallery, he argued that it had produced a large number of:

> conversions among the most fanatic partisans of yellow and brown [...] there are those who cannot appreciate paintings until they no longer resemble what they were when the artist finished them [...] let such people provide themselves with glasses tinted according to their taste.[18]

However, Villot was heavily criticised, and his actions were clearly viewed as conflicting with contemporary taste. Overcome by all the vitriol aimed at him, the curator ultimately resigned.

Such controversies are directly connected with perceptions, or rather expectations, of the appearance of Old Masters. The fact that paintings do change over time through ageing, restoration and other factors, phenomena not necessarily all understood by the public, created a certain image, an added age value: the romantic myth of the Old Master. For a long time, it was assumed that such toned varnishes were applied by the artists themselves in order to unify and harmonise the colours. Yet William Hogarth's illustration and text from his *Analysis of beauty* (1753), showing Father Time sitting on a big pot of varnish, blowing smoke from his pipe onto a canvas, and holding a scythe which cuts through the picture (fig. 6.8), already gestures towards such expectations well before these nineteenth-century controversies. The caricature mocked the ignorance of most viewers and even artists themselves, concerning the changes wrought by time that were intrinsic to the materials being used in their manufacture: 'Notwithstanding the deep-rooted notion, even amongst the majority of painters themselves, that time is a great improver of good pictures, I will undertake to shew, that nothing can be more absurd'. The changing materials, including the darkening of oil and varnish: 'disunites, untunes, blackens, and by degrees destroys even the best preserved pictures'.

FIGURE 6.7 Henri Fuseli, *Two men smoking a picture*. Drawing from the Roman Album, 1774. Pen and grey ink with grey wash over graphite

FIGURE 6.8 William Hogarth, time as an old winged man sitting on a broken statue, blowing pipe smoke at a dark landscape painting which he has pierced with his scythe; to left, a large jar labelled 'Varnish', 1761. Receipt burnished out and sheet trimmed. Etching, engraving and mezzotint

Hogarth (1912, vol. 2, 113) goes on to describe the bright colours used for a still life of flowers, and how they will suffer:

> Shall we wish to see them fall still lower, more faint, sullied, and dirtied by the hand of time, and then admire them as having gained an additional beauty, and call them mended and heightened, rather than fouled, and in a manner destroyed; how absurd! instead of mellow and softened therefore, always read yellow and sullied, for this is doing time the destroyer, but common justice.

No wonder that this illustration was used on the cover of the catalogue of the 1947 *Exhibition of cleaned pictures* which returned to the Gallery from safe storage after World War II. By this date, the presentation of cleaned paintings was once again the topic of fierce public debate. It provoked a discussion concerning patina in the pages of *The Burlington magazine*. To prevent a revival of controversy, Sir Philip Hendy (1900–1980), director of the Gallery at the time, provided an extensive explanation of the cleaning treatments, so as to manage expectations (Hendy 1947). He also points at how perceptions of the cleaned works are impacted by the way the paintings were presented to the public during the nineteenth-century controversy, where they were displayed alongside uncleaned paintings:

> The problem of cleaning pictures is bound up with the problem of exhibiting them. No picture can ever be considered entirely by itself. Even if it is presented alone, on an easel, our understanding depends to a great extent upon what we have been used to seeing and what we have been led by past experience to expect. When pictures are presented together hung in rows, room after room, any one that is exceptional in tone or degree of individual expression is almost bound to shock.

The introduction to the exhibition catalogue appropriately quotes Milton (1644): 'If it come to prohibiting, there is aught more likely to be prohibited than truth itself, whose first appearance to our eyes bleared and dimmed with prejudice and custom, is more unsightly and unplausible than many errors'. The prejudiced viewer also surfaces in other controversies, such as the cleaning of Michelangelo's fresco in the Sistine Chapel, where the age value or aura of history was, according to some critics and the public, compromised. Their removal thwarted expectations, even for twentieth-century 'eyes bleared and dimmed with prejudice and custom'. One might say that, as far as the

public were concerned, the cleaning almost *de-mimicked* material authenticity (fig. 6.8).

3 Copying

Material mimesis runs through the history of copies, fakes, versions and replicas, all of which entail an element of material imitation. The sheer abundance of copies and fakes is connected to demand. As Mark Jones (2003, 92–98) states: 'Each generation, each society fakes the things it covets most', for political, religious, artistic, or financial reasons. The appreciation of such imitations fluctuates over time. As mentioned above, in sixteenth-century Italy, a desire for original paintings by Raphael stimulated a market for high-quality copies, which were displayed amongst original works by other artists. Many patrons ordered their ambassadors to gain access to major collections to send their court painters to copy famous pieces to complement their own. The practice is described by the Roman collector and personal physician of Pope Urban VIII, Giulio Mancini (1559–1630), in his *Considerationi della Pittura* (1619–1621), in a discussion of a prince who, when confronted with both original and copy, was unable to distinguish them. He expressed greater appreciation for the copy, since 'in copies, when they are well made, one possesses two artefacts: the work made first, and a secondary work which imitates it'.[19] Here Mancini was most likely referring to Vasari's description of a copy of Raphael's portrait of Pope Leo II (1519) by Andrea del Sarto. After the Pope's death, Federico II Gonzaga, Duke of Mantua, admiring the portrait in the Medici collection in Florence, asked for the portrait as a gift. His request was mediated by the new Pope, which made it hard for Ottaviano De Medici to refuse, for reasons of diplomacy. However, Ottaviano secretly commissioned Andrea del Sarto to make a copy: 'when it was finished, even Messer Ottaviano, for all his understanding in matters of art, could not tell the one from the other, nor distinguish the real and true picture from the copy; especially as Andrea had counterfeited even the spots of dirt exactly as they were in the original'. The counterfeiter aimed at a certain material mimesis of the aged original, not only by choosing an exactly similar panel, but also by applying the spots of dirt. The copy was so perfect that a mark was added to the back of the panel so as to be able to discern it from the original. Upon being informed that the portrait was a copy, Federico gracefully accepted it, stating that: 'I value it no less than if it were by the hand of [Raphael] – nay, even more, for it is something out of the course of nature that a man of excellence should imitate the manner of another so

well, and should make a copy so like. It is enough that it should be known that Andrea's genius was as valiant in double harness as in "single"'.[20]

The value of copies also as a record of the artist's genius was corroborated by Cardinal Federico Borromeo (1564–1631) in his treatise *Musæum* (1625), in a discussion of the didactical and art historical value of his own art collection, which he donated to the Ambrosiana Gallery in Milan. With reference to Pliny's writings, Borromeo notes how words saved many works from antiquity that would otherwise have been lost: 'Writers have been so successful at restoring individual features and brush strokes that they have, in effect, brought about a remarkable contest between the pen and the paintbrush (or chisel)'. However, Borromeo does not represent himself as retrieving lost works, like Pliny, but rather as directly reporting on works in his collection, including his copies of well-known paintings: 'Thus people of all kinds might wish that, just as transcribed copies of ancient books have survived up to the present day, so too, copies of famous paintings might have been made and survived, so that the hard work of earlier men could have benefited subsequent generations'.[21] Interestingly, Borromeo gives priority to the copying of masterpieces that are in a poor state through over-restoration.

The mimetic approach to physical composition of these painted copies adapted to contemporary practice. Very little research exists on the practice of copying from a technical point of view, nor were comments made on it in written treatises, which focus more on the value of copies as both record and educational tool. One case study may shed a little light on this. A full-scale copy of Raphael's *Entombment of Christ* (*c*.1608–1609), in the collection of the Hunterian Art Gallery (University of Glasgow, oil on canvas, 174.6 cm × 170 cm), provides an interesting technical comparison with the original, and allows an assessment of the mimetic intentions of the copyist. The original painting has an interesting history. It was taken – or rather kidnapped by night – from Perugia by Cardinal Scipione Borghese (1577–1633), who sought to add the precious work to his collection. When its abstraction was discovered, the Perugians rebelled, and Pope Paul V ordered Scipione to send a full-scale, high-quality copy back to Perugia to replace the original, which hung in a publicly accessible chapel. From the documents, it appears that two copies were made, but today, a copy by Cavaliere d' Arpino is the only one held in Perugia's collections. Although over twelve further copies exist of *The Entombment*, the Hunterian version is the only one besides d' Arpino's which is full scale. Scipione Borghese also commissioned a copy from Giovanni Lanfranco (1582–1647) in 1608. While it is uncertain that the Hunterian picture is this Lanfranco copy, technical research has shown that it was most likely painted in Rome around that time, using techniques far removed from Raphael's, who painted on panel

using a light-coloured ground (Black *et al.* 2012). By contrast, the Hunterian copy is painted on canvas, and here we have found a warm reddish-brown ground layer and a paint layer build-up from dark to light, rather than light to dark as in Raphael's version. The painter copied by following his personal oil-painting practice, not unlike the addition of body parts to antiquities by baroque sculptors using their own materials and techniques. The intention in this case was not to create a falsification. Yet a high level of similitude was required to obtain acceptance from the people of Perugia, and hence a certain level of intended 'deception' may have been involved, to appease the Perugians' resistance against the original's confiscation.

Such copies produce an interesting history of mimesis and contextual impact. Even today, and especially within continuously changing artistic practice, as contemporary artists work with editions, reinstallations, remakings, replications, and copies, the production of copies for display, with the originals kept in storage, continues to be a subject for discussion in contemporary restoration and museum practice. Thus material mimesis of the original iteration – whatever the intention – remains an interesting and important discussion topic in this field.

The shark used by Damien Hirst for his work *The physical impossibility of death in the mind of someone living* (1991) decayed quite soon after being made. In 1993, the shark's skin was stretched over a framework. Recalling this treatment, Hirst comments in an interview: 'It didn't look as frightening. You could tell it wasn't real. It had no weight' (Vogel 2006). Still further decay led the artist to replace the empty shell of the original shark with a new one in 2006, after the work had been sold to a new owner by the Saatchi collection. This time, appropriate preservation techniques were used, guaranteeing longevity. Of art historical opinion concerning the replacement, Hirst states:

> It's a big dilemma [...] Artists and conservators have different opinions about what's important: the original artwork or the original intention. I come from a Conceptual art background, so I think it should be the intention. It's the same piece. But the jury will be out for a long time to come.

Petra Lange-Berndt (2007), among others, critiques Hirst's view. In her opinion:

> The concept of originality as something singular has become obsolete [...] The substitution of the [shark] should thus not be rated as a surrogate of an original but as a remake. The original frame and concept and a similar shark – these do guarantee not authenticity but rather a continuity of the performance.

The careful use of the best preservation techniques by Hirst's team of scientists suggests that material mimesis plays a key role in the underlying intention of the remake: after all, a new real shark, similar in size and appearance, was used. This seems to be the ultimate material mimesis, pursued by a team of specialists led by the original artist during his lifetime, and safeguarding both the material and conceptual aspects of the work. In fact, Hirst now offers to remake any of his works that contain real animal material every ten years. Yet this practice does draw the work into the realm of temporality of a repeat performance, as Lange-Berndt proposes, and hence its material authenticity becomes rather ambiguous.

4 Faking

Deception really comes into play in cases of intentional mimicry of an original or a style without acknowledgement of authorship. The history of fakes is extensive and increasingly complex. Material mimetic practice by forgers embraces straightforward copying, not necessarily with any thorough understanding of historical techniques, up as well as highly sophisticated forgeries, as seen in some more recently uncovered fakes. A case in point is Han van Meegeren, the famous Dutch painter who had to demonstrate before a court of law that he was indeed capable of making a fake Vermeer painting, in order to prove that the Vermeer he had sold to the Nazi leader Hermann Goering was a fake. Technical research has shown that in *Christ and the pilgrims at Emmaus*, instead of using the traditional linseed oil as a binding medium, van Meegeren used phenol formaldehyde, better known as Bakelite. On heating the painting to 120° Celsius, the Bakelite hardens into a solid film. Cracks were formed by manipulating the canvas, which were filled with black ink to simulate soiling, producing the aged appearance of an Old Master painting. If, after rubbing the surface with alcohol, a hot needle could penetrate the paint, it indicated that the paint was too soft to be old. The Bakelite, hard and solid, could pass this test. Modern technical analysis, however, has identified the unusual binder, as well as the presence of cobalt blue, a pigment not in existence in Vermeer's time. To our modern eyes, equipped with more extensive art historical knowledge of Vermeer, it is hard to understand how the van Meegeren paintings – and *Christ and the pilgrims at Emmaus* in particular – could have been prized by connoisseurs. Their desire to discover such works and their expectations concerning the artist were carefully manipulated by van Meegeren, and this may have coloured their perception and judgement of the fakes.

Although van Meegeren's case is much discussed, the increase in value of artworks has led to the appearance of many sophisticated forgeries, some of which have been acquired by well-known museums. In 1997, the Art Institute of Chicago bought the small statue of *The faun* as a work by Paul Gauguin, which, according to the Museum's press statement, turned out to be: 'a creative, well-researched forgery of a lost work by the artist produced by the recently sentenced Greenhalgh family from Bolton, England'.

Mimicking material authenticity and making the perfect fake is no longer achieved by replicating an artwork's visible appearance using modern materials. Nowadays it entails a knowledge of historical pigments, paint handling and ageing processes, on which there is a rapidly growing body of published work. To use Prussian Blue, a pigment introduced to the palette around 1709, in a seventeenth-century 'original' – once an indicator of forgery – can be considered foolhardy in the twenty-first century, and any forger might easily know this. Technical analysis is also an increasingly integral part of connoisseurship. Artificial ageing to create a patina and an aura of authenticity, using abrasion with acid or by means of coloured varnishes and soot, may still be practised, but hardly plays any role in the modern art forgeries flooding the market. For example, the recent case of the Italian-French art collector Giuliano Ruffini, who tried to sell several Old Masters, including a *Portrait of a man*, allegedly by the Dutch painter Frans Hals (1582–1666), in 2008, required thorough scientific analysis. The portrait's authenticity is now largely doubted, but was initially accepted by the Louvre, which tried to raise the funds to buy it. The affair shows the ingenuity of the forger's methods and the role of the network of art dealers involved. This, and of course the financial implications of such cases for well-respected auctioneers, led Sotheby's to establish their own scientific laboratory in 2016, equipped to conduct imaging and scientific analyses to establish authenticity.

Although some forgers, once exposed, become the subject of books, films and television programmes on techniques of fakery, the discovery that a painting is forged also immediately changes our perception of it. As Mark Jones (1990, 15) so aptly observes:

> When a "Monet" turns out not to be, it may not change its appearance, but it loses its value as a relic. It no longer provides a direct link with the hand of a painter of genius, and it ceases to promise either spiritual refreshment to its viewer or status to its owner. And even though the work in question remains physically unaltered, our aesthetic response to it is profoundly changed.

5 Conclusion

As we have seen, the notion of material authenticity is configured around certain concepts, which in turn depend on ever-changing contexts. Restorations carried out in the eighteenth and nineteenth centuries often concerned replication, copying or even emulation using similar materials, or sometimes different ones that fitted contemporary tastes. The twenty-first-century conservator, however, would tend to seek a thorough understanding of the physical object and its condition, based first and foremost on scientific analysis that allows identification of the historical methods and materials used, and informed by (art) historical contextual research. The concept of a more scientific connoisseurship is developing rapidly, guided by this new model of conservation.

One could write a similar history of the copy, its status at the time of making, and its function as an art historical document, as indicated by Borromeo, but still relevant now. Here material mimesis did not necessarily need to follow an exact replication of historical processes and materials, as the copy after Raphael's *Entombment* demonstrates, but was achieved through contemporary practice and materials, much along the conceptual lines of the restoration of antiquities executed by early modern sculptors. Using copies in contemporary art provides a whole new set of parameters which make for interesting reflections upon historical replication practices. Forgers, however, are increasingly aware of the importance of material mimesis down to pigment particle level, as sophisticated analytical methods can quickly identify any mistakes they make. Bakelite would no longer deceive the critical viewer or forensic investigator now, unlike the connoisseurs of the 1940s who were deceived by the aura of authenticity cleverly put together by dealer and forger, led by a self-evident desire to identify an Old Master as rare as a Vermeer.

In the passage with which this chapter begins, Edmund de Waal points to the technical ingenuity of the potters in Jingdezhen, not just in making copies, but also in adding the patina of age: 'They have been properly aged. This is skill, another skill'. Skill is crucial, and emerges as the red thread running through this paper: the artistic skill required to restore 'mutilated trunks', the skill of accurately imitating age, the skill needed to fake and deceive. The impact of changing tastes and of course market pressures, leading to an increased number of forged modern artworks that are harder to detect and that fetch high prices, or to the mass production of copies of seventh-century Tang porcelain, are issues that run through most of this narrative as well. After all, as the Chinese craftsmen in Jingdezhen said: 'We can do authenticity if authenticity is what you want'.

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Endnotes

1 De Waal 2015, 682
2 Foulis 1776, vol. 1, 93–143.
3 Vasari 20094.
4 Haskell & Penny 1981, 339-341; on the restoration of antiquities, see Conti 2017, 114–120.
5 Boselli 1978, 86.
6 Dent Weil 1967, 84.
7 Barocchi & Gaeta Bertelà 2002, vol. 2, 644. The quote is from a document in this volume dated 31 October 1617.
8 On Cavaceppi and his *Raccolta d'antiche statue*, see Meyer & Piva 2011.
9 Cook 1958, 22, 24, British Museum number 1805,0703.51, online: https://www.britishmuseum.org/collection/object/G_1805-0703-51 [accessed 25 May 2020].
10 Riegl 1996, 6.
11 Jenkins 2001.
12 Bomford 1994, 3513.
13 Quoted in Hayes 2021, 101–102.
14 Hayes 2017, 107, n. 57.
15 Te Marvelde 2013. This volume contains further relevant papers on the history of conservation.
16 Anderson 1990, 3–7; Keck 1984, 73–87.
17 Anderson 1990, 4.
18 For a succinct report on the cleaning controversies in London and Paris, see Keck 1984, 73–87, with quote at 79.
19 Mancini 1956–1957, 327.
20 Vasari 2009, 83–121.
21 Borromeo 2010, 19–21.

PART III

Materialising the Impossible

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FIGURE P3 Gian Lorenzo Bernini, *Rape of Proserpina* (detail), 1621–1622. Marble
BORGHESE GALLERY, ROME. CC BY-SA 4.0

Introduction

The desire to imitate the impossible, to make a delicate feather out of dense ivory or give paper the appearance of a block of heavy marble, is manifest in works of art from different periods of human history. Instead of representing the modernist idea of 'truth to material', this particular variation of mimesis exhibits the artisan's attempt to show off the material contrary to its own nature. Such transformations, and the ingenuity needed to accomplish them, stimulated early modern scientific discussion of the nature of materials, as well as of the materials used by nature to accomplish certain goals such as spontaneous generation. To what extent was nature herself an artisan, and how far was the relationship between God and nature reiterated in the relations between human ingenuity and craft, mind and hand, science and *techne*? How have changing accounts of the relationship between divine, natural and human creativity in turn altered standards of perfection and quality? Many branches of scientific knowledge depend upon material manipulations to make visible the unseen or indeed unseeable. 'Nature' can be reified in museums through habitat dioramas and other arrangements of specimens; or, as Bruno Latour (1988) has argued, the reality of microbes can be inscribed on paper. Ironically, claims about 'nature' can only be made by series of artificial manipulations of matter, whose truth depends on securing community assent to the 'lifelikeness' of these forms of material representation, that is, the extent to which the material object can successfully function as a metonym of the whole, whether it be the lifelike specimen that represents the species, or the model that purports to represent the whole natural world. Material technologies such as the specimen or the collection could be described as mimetic arguments or material rhetorics. How was agreement about the conventions of mimesis secured in particular cultures?

The essays in this section discuss a variety of ways in which artisans and makers transformed wood into the appearance of bronze, made bronze or wax look like human flesh, or used material imitations of the human body to help understand its anatomy. In her chapter, Dümpelmann argues how, once sculptors abandoned colour towards the end of the fifteenth century, artists began to explore material mimesis in order to create what she terms 'material fictions'. Transforming sandstone and clay into marble and alabaster, or wood into stone and bronze, Renaissance sculptors used their medium's material and the traces of their tools to define a new language for sculpture. In this way, Dümpelmann argues, they introduced 'fictitiousness' as a concept in art theory. In her chapter, Kinney shows that by the end of the seventeenth century

such ideas had firmly taken hold. Drawing on the correspondence about three related commissions for bronze copies of ancient marble sculptures given to the Florentine sculptors Massimiliano Soldani Benzi and Pietro Cipriani between 1695 and 1721, Kinney investigates how the mimetic potential of the material practices of moulding, casting, and finishing was described at this time. She shows that appreciation of the abilities of Benzi and Cipriani was not only based on the mould, but, crucially, on the fact that the material they used for their sculptures – bronze – was more 'like flesh' than marble, thanks to their mastery of the techniques of finishing.

In the context of nineteenth-century anatomical representations, Maerker focuses on the imitation of flesh and the human body from yet another perspective. Her chapter focuses on the material nature of representational strategies in the making of anatomical models. From secret modelling pastes involving paper, glue and minerals to wax and plaster casts, Maerker shows how makers perceived, articulated and defined the mimetic success of anatomical representations, depending on their intended users. Moving from the mimetic potential of wax in the history of anatomical representation, Conte's essay deals with the appreciation of wax in hyperrealist art. Within the frame of traditional normative aesthetics, his chapter offers an historical-theoretical account that shows why hyperrealism is often equated with the passive, mechanical duplication of reality. The negative valuation of wax as a mimetic material, Conte argues, might in fact be closely intertwined with its long history of use in the making of anatomical preparations. By introducing the possibility of a seemingly paradoxical 'original copy', Conte offers a way to escape such criticism of hyperrealism *qua* art form, thus introducing a new way of appreciating hyperrealist art.

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CHAPTER 7

Fictitiousness in Non-Polychrome Renaissance Sculpture

Britta Dümpelmann

Since antiquity, the use of a restricted colour palette has counted as proof of great artistic mastery in painting. Among the best-known examples are Pliny's (23/24–79 CE) praise of Apelles for his use of the four-colour palette, as well as Zeuxis (late 5th–4th century BC), who painted all in white ('*pinxit et monochromata ex albo*').[1] In the same vein as this antique tradition, Erasmus (1466–1536), writing in his *De recta Latini Graecique sermonis pronuntiatione*, 1528, praised Albrecht Dürer's (1471–1528) outstanding achievements in black-and-white printmaking:

> What does he not express in monochrome, that is by black lines? Shade, light, radiance, projections, depressions [...] He even depicts what cannot be depicted: fire; rays of light; thunderstorms; sheet lightning; thunderbolts; or even, as the phrase goes, the clouds upon a wall; characters and emotions – in fine, the whole mind of man as it shines forth from the appearance of the body, and almost the very voice. These things he places before our eyes by the most felicitous lines, black ones at that, in such a manner that, were you to spread on pigments, you would injure the work. And is it not more wonderful to accomplish without the blandishment of colours what Apelles accomplished only with their aid?[2]

The more minimal the artistic means, the greater the artist's effort, and the more elaborate the artwork becomes. While the artist's primary aim was a mimesis of life and nature that looked deceptively real, restricting the use of colour introduced what I shall call a 'mimetic gap'.[3] This mimetic gap was a necessary condition for marking out the result as a highly sophisticated, artificially created – and hence fictitious – artwork. Hence, the reduction of colour, slightly but significantly, shifts the focus: from a deceptive mimesis, trying to reveal its creative process, to a concept of mimesis unveiling, while demonstrating itself as an artistic creation instead.[4] However, this formal principle applies rather more in painting and the graphic arts than it does in sculpture, whose three-dimensional materiality, demanding less intellectual effort,

approximates it closer to nature. As Kathleen Weil-Garris (1982, 66) puts it, 'another antique-derived concept [is] that sculpture and, *a forteriori*, sculptors, were inferior intellectually and socially because their art inherently depends on materials and on manual labor.' The medium's immediacy has historically been emphasised by the use of polychromy. Up to the fifteenth century, colours were normally added to sculpture. As Cecilie Brøns of the Tracking Colour Project frames it:

> White marble has generally been considered a typical image of antiquity. However, the lack of colour has no relation to ancient aesthetics. In fact, antiquity cultivated a veritable wealth of colours, but after centuries of deterioration, very little paint remains on the artefacts, giving rise to the mistaken notion of white marble as a classical ideal.[5]

Three-dimensional, lifelike, polychrome sculptures were not only close to nature, but also to life: iconoclasts feared the conflation of sacred archetypes with their sculptural representations, while in the famous *paragone* debates over the relative standing of painting and sculpture, the latter was often seen as inferior on account of the supposedly lower intellectual effort it demanded.[6]

In what follows, I want to focus on the late fifteenth century as a turning point when sculptors reduced or abandoned colour, and the medium's material and traces of the artist's tools came to be considered the genuine language of sculpture.[7] The restriction of colours in painting and graphic arts inevitably produced a degree of material abstraction which identified the painted or drawn product as a fictional one. Doing the same in sculpture usually revealed the material's natural colour, and the viewer's eye is inevitably drawn to the artistically worked material as well as the traces of artistic labour inscribed on it. The emphasis on artistic work as a fictitious product achieved in this way could be further increased when artists veiled the material being used by evoking different chromatic qualities on its surface. In many cases, a wide range of pigments and dyes was added to the varnish covering sculptures, so as to produce a delicate, unifying coat.[8] Artists discovered the possibilities of adjusting the material's chromatic values, either by intensifying its natural colour and language, or by seemingly transforming it into an entirely different material: sandstone and clay into marble and alabaster, wood into stone and bronze. Instead of neglecting sculpture's materials, these techniques of apparent material transformation closely corresponded to the medium's genuine language, that is its materiality (Dümpelmann 2018, esp. 322–328). As palpable as these material allusions may have been, a certain mimetic gap was always necessary for any artist who wanted his work to be understood not as

an imitation of nature, but primarily as an artistic product, consciously displaying the skills and means that had brought it into being. Instead of aiming at a material mimesis in the sense of an equivalent substitute, artists therefore created material fictions. These fictitious results left the beholder suspended between matter and representation. Between two realities, artworks created a specific reality of their own. Did these forms of colour limitation in sculpture translate the formal principle of reduced artistic means, already articulated in monochrome and restricted colour painting, into the vernacular practice of sculptors? Lastly, did this move introduce intellectual effort and fictitiousness into the domain of sculpture, so often neglected in written art theory?

1 The Appreciation of Non-Polychrome Sculpture in Early Modern Art Theory

From the early sixteenth century onwards, numerous records attest to a growing appreciation for the qualities of the material used in sculpture, as the use of what had been an indispensable coating of colour came to be reduced or abandoned. One of the most important of such discussions is Giorgio Vasari's (1511–1574) chapter on woodcarving from his *Introduzione alle tre arti del disegno dell architettura, della scultura e della pittura* ('Introduction to the three arts of design, architecture, sculpture, and painting'), first published in 1550. In the first part, Vasari, an architect, painter, and art historian, surveys the material and techniques used in woodcarving. In the second, he focuses on the famous sculpture of St. Roch (fig. 7.1), carved around 1520 for the Florentine church SS. Annunziata by the South German woodcarver and stone sculptor Veit Stoss (*c.*1447–1533), analysing the artistic criteria that the sculpture fulfilled, and accounting for its advanced state of perfection and refinement.[9] Deeming it no less than a *miracolo di legno* (miracle in wood), Vasari uses the figure of St. Roch – the only wooden sculpture produced north of the Alps to be mentioned in his *Vite* or lives of artists – as a perfect exemplar to demonstrate 'How figures in Wood are executed and […] what sort of Wood is best for the purpose'.[10] Writing of one of the material's main characteristics, Vasari emphasises that wood could never adopt the 'flesh-like appearance and softness […] that can be given to metal and to marble, and to the sculptured objects that we see in stucco, wax or clay'. In consequence, he advises the use of limewood, which was relatively soft compared to other sorts of wood used for sculpture, such as oak. Limewood was easier for the sculptor to handle, and, according to Vasari, it more 'readily obeys the rasp and chisel'.[11] A few lines later, we read how 'With exquisite carving he [Veit Stoss] fashioned the soft and undercut

FIGURE 7.1 Veit Stoss, *St. Roch*, limewood, *c.*1520, height: 180 cm.
SS ANNUNZIATA, FLORENCE

draperies that clothe it, cut almost to the thinness of paper and with a beautiful flow in the order of the folds, so that one cannot see anything more marvellous.'[12] Veit Stoss's ability to bring the appearance of softness into being in his St. Roch (and to do so with such refinement) is to count as proof that he had accomplished what had earlier been assumed to be impossible, and such levels of skill are here held up as a principal criterion of perfect woodcarving. Vasari concludes – wrongly attributing the sculpture of St. Roch to the 'Frenchman, Maestro Janni' – that 'in order that the excellence of the artist may be seen in all its parts, the figure has been preserved up to our time in the church of the Annunziata at Florence, beneath the pulpit, free from any covering of colour or painting, in its own natural colour of wood and with only the finish and perfection that Maestro Janni gave it, beautiful beyond all other figures carved in wood.'[13] In a similar manner, Vincenzo Borghini (1515–1580), who supposedly suggested the choice of St. Roch as a perfect exemplar to Vasari for his introduction, stated in his 1564 *Selva di notizie* that the whole power and strength of a sculpture is bestowed by the carving knife, and if any clumsy fellow were to use colour just anyhow, he would betray the very nature of the art of sculpture.[14]

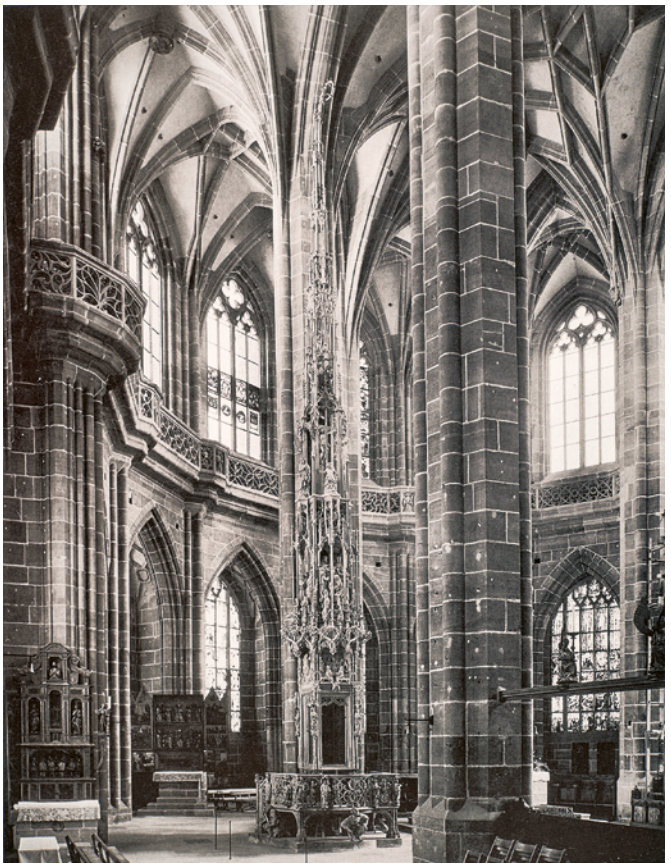
Slightly earlier records from Northern Europe convey a similar appreciation for non-polychrome sculpture. One example is a 1525 entry in the yearbook of Nürnberg's Carmelite monastery (begun in 1520), referring to the so-called Bamberg altarpiece (fig. 7.2) recorded by the commissioner, the Prior of the monastery and Andreas Stoss (*c.*1477–1540), Veit Stoss's son. This passage

FIGURE 7.2 Veit Stoss, so-called Bamberg altarpiece, limewood *c.*1520–1523, 355 cm × 292 cm
FORMERLY CARMELITE CHURCH, NÜRNBERG, NOW IN BAMBERG CATHEDRAL

justifies the explicit prohibition of polychrome painting in succinct terms: every art connoisseur would know why colour was not used on carved wooden sculpture.

> Let no Prior lightly have it painted with colours: every master skilled in the art will tell him why. Note: the altarpiece is to be opened only on at the festivals of the Nativity, Easter, Pentecost and the two days following. Ascension, Trinity, All Saints, Epiphany, Corpus Christi, the Dedication of the Convent's Church, and all festivals of the Blessed Virgin Mary. On the day of a festival it is to be closed straight after second Vespers. Twice every year it is to be cleaned. And there are not to be large lights on the altar, on account of the smoke: two small wax candles are enough, and any others should be placed away from the altar.[15]

In 1532, the humanist Helius Eobanus Hessus (1488–1540) described the ambry carved by the Nürnberg sculptor and master-builder Adam Kraft (*c.*1455–1509) for the church of St. Lorenz in Nürnberg (fig. 7.3, a & b) in keeping with the impression of softness described by Vasari, marvelling: '[It seems as if] it would be easy to cast it, model it or flex it this way or that – so isn't it even more admirable that it should actually be hard to break the marble / since it appears as if one should be able to bend it by hand?'[16] Within the seeming softness of the stone that so obediently followed Adam Kraft's hands, this piece of art gives the impression that the laws of nature might be disregarded. The abandonment of colour appears to be a precondition for rendering the carving tools' traces perceptible on the sculpture's surface. In conjunction with this, both Vasari and Eobanus Hessus use a metaphorical language – alluding to paper, flesh, or alien media and techniques – to describe the realisation of artistic ideas that seemingly contradict the material's true physical laws. The evocation of softness is considered a proof of artistic virtuosity, this highly skilled transformation of nature staging the artist's effort as mastery of the material. Where art theory used this metaphorical language as a kind of tool, to describe something that tends to escape description, artists at that time were in fact effecting what appeared to be material transformations – practices that might be understood as sculpted art theory. These forms of designated fictitiousness in sculpture can widely be observed north of the Alps as well, and allowed sandstone or clay and wood to appear as alabaster and marble, or wood to appear as bronze. These transformations have in common that a seemingly poorer, cheaper material is transformed (and hence sublimed?) into a more precious one. Perhaps this material transformation might therefore be characterised,



FIGURES 7.3A & 7.3B Adam Kraft, ambry, sandstone, iron framework, glue-bonded rock flour, limewood, 1493–1496, height: 2000 cm
NÜRNBERG, ST. LORENZ

as postulated by Alberti, Vasari and Pomponius Gauricus (*c*.1482–1528/1530), in terms of a hierarchy of materials, within which bronze and marble ranked above the popular materials of wood and terracotta.[17] At the same time, different materials possessed their own associations with particular artistic traditions. Weil-Garris points out that, '[S]ince surviving ancient statues were marble, not bronze, marble itself became a metaphor of the antique', while the German-speaking lands were a centre of excellent woodcarving at this time, and the use of (lime)wood 'has been taken to distinguish German renaissance sculpture.'[18] Against the background of these national connotations and traditions associated with Renaissance sculptor's materials and techniques, one of the central questions to be examined is whether the materials applied or evoked by the artists can be associated with these values – or if the main concern lay elsewhere.

2 'Woe to the Ancients' – Fictitious Marble Monuments South of the Alps

South of the Alps, one of the first known examples of apparently transformed sandstone is the 'Cavalcanti Annunciation' (figs. 7.4, a & b) by the Florentine Renaissance sculptor Donatello (*c*.1386–1466), commissioned by the Cavalcanti family for the Florentine church of Santa Croce, and dated around 1435.[19] It is made of local grey sandstone, *pietra serena*, with the angels at the summit modelled in terracotta. Partial gilding of the garments, the hair, the angel's wings, and the architectural decor adds highlights that may seem unusual in conjunction with the *pietra serena*'s greyish surface. This rather soft, slightly glittering sandstone, 'which was widely used in Florentine architecture in the Renaissance, was an unusual choice for a monument of this kind, during a period when white marble was regarded as the ideal material because of its intrinsic value, its aesthetic beauty, its echoes of works from classical antiquity and, not least, its availability' (Vaccari 2003, 21). When referring to the work, Vasari applied the term *pietra di macigno*, a name in common use for *pietra serena* at that time: 'but what made [Donatello] known for who he was and what gave him a name was an Annunciation in grey stone, which was placed close to the altar of the Chapel of the Cavalcanti, in the Church of S. Croce in Florence'.[20] The choice of this unusual, to some extent humble and unworthy, material actually in use for architecture, and its decorative elements, stands 'in clear contrast with the tension inherent in this work, the idealised beauty of which comes so close to classical sculptural prototypes and which therefore should have demanded nothing less than the use of brilliant white marble'

FIGURES 7.4A & 7.4B
Donatello,
Cavalcanti-Annunciation, *pietra serena* (Florentine grey sandstone) and terracotta, partly gilded,
*c.*1434, 218 cm × 168 cm
FLORENCE, S. CROCE

(Vaccari 2003, 22). Vasari must have been aware of this tension, even though the effect was softened by adding white covering to the stone's surface; as analysis has shown,

> the tabernacle of Santa Croce was glazed from the beginning in white with gold highlights. This is further demonstrated by the fact that no traces of atmospheric residue were found on the stone, indicating a long time between the completion of the work and its colouring. Moreover, the exact consistency between the results of stratigraphic analysis of the parts in stone and those in terracotta make it clear that all parts of the tabernacle received the same treatment through the centuries. It is now fairly clear that the intention was to harmonise two different materials, both humble.[21]

One of Donatello's intentions was certainly to harmonise terracotta and *pietra serena*. However, the reason why he did not execute the Cavalcanti Annunciation in marble – as contemporary beholders would have expected for such an ambitious assignment – but intentionally chose inferior material has not yet been satisfactorily answered by art historians.[22] Taking a closer look at the 'classical sculptural prototypes' to which Donatello was alluding, Ulrich Pfisterer has pointed out that Donatello's Mary clearly references the antique model of a *Venus pudica*, both in posture and gesture.[23] The fact that Donatello did not depict a particular moment of the events, but rather tried to evoke both beginning and end of the story through the bearing of the angel and Mary, is a striking testimony to the fact that sculpture is able to *visibile parlare*, to stage the depicted scene as a visible speech. With this, Donatello not only transformed a pagan antique prototype, dressed in antique style, into Christian fifteenth century art, but also reflected – and strengthened – this process of transformation in respect of materiality. Making the *pietra serena* obviously look like marble, while definitely not working *in* marble, allowed Donatello to make it unmistakably clear that his aim was in no sense to imitate or copy antiquity, but rather to transform it into his own specific language: to give an *idea* of the antique model to which he was alluding. He achieved this by following the concept of reduced artistic means, itself derived from antiquity, that is, by working in a humble, inferior material. The painted stone and terracotta needed to remain visible to a certain extent underneath the white coat, as a necessary condition for making the fictitiousness perceptible in and of itself, perfectly articulating that notion of transformation as an artistic idea, an artistic fiction that was realised in sculpture. In an apparent parallel to Alberti's instruction not to paint gold with gold, but rather to create the effect of gold

with colours, Donatello *evoked* all the qualities and effects of an antique marble monument in his sculpture, without its *being* either antique or sculpted of marble.[24] By this means, he presented himself as a true master sculptor of transformation, inviting the beholder not to marvel at the sculptures' precious material, but rather at the sculptor's exquisite skill in sculpting.[25] It is worth recalling that the depicted scene's content *per se* is also one of transformation: it concerns the transformation of God's word into flesh, incorporating both the human and divine nature of God.[26] Against this background, the mutual correspondences between subject, style, and material could hardly be more dense and prolific.

Donatello's fictitious marble monument is to be understood as embedded in 'a series of works produced in Tuscany and Emilia-Romagna between the third and fourth decade of the fifteenth century, in which a use of the restricted range of colours – white, blue, gold – seems mutually complementary to stone, terracotta or marble sculpture' (Vaccari 2003, 27). In the next century, Antonio Begarelli (*c*.1499–1565), from a family of potters, would become one of the leading artists in expressive Emilian tableau sculpture – 'staged arrangements of veristically painted life-sized figures, done in terracotta or in mixed "non-precious" materials of other kinds'. He has been depicted by Kathleen Weil-Garris (1982, 62–71) as vindicating this popular tradition and preventing it from being banished from high sculpture. Based on the false belief that ancient sculpture was white, Michelangelo (1475–1564) and others of his close circle reinforced the aforementioned hierarchy of materials, focusing especially on marble as a metaphor for the antique. This was one possible answer to the dominant vision at that time of Cinquecento art as pictorial rather than sculptural, invoking the inferior position of sculptors and their manual labour mentioned above. Another answer was to make tableau sculpture 'pictorial' in a new sense, and this was the answer articulated in Begarelli's terracotta work (fig. 7.5) – praised by none other than Michelangelo himself, who, according to Vasari (1550), proclaimed: 'were this clay to become marble, woe to the ancients!' It was not only for the articulation of exalted pathos in group sculpture, but especially for the characteristic white coat of colour on Begarelli's terracotta sculpture, that Michelangelo celebrated Begarelli's modelled pictorial fictions.[27] From his first documented work onwards, the so-called *Madonna di piazza* (fig. 7.6), executed in 1522 for a niche in the facade of the Palazzo Communale in Modena, Begarelli made use of this unifying white coat of colour.[28] The community of Modena had launched an open competition for a sculpture, preferably carved from Carrara marble, because, as two counsellors explained, terracotta, although cheaper, would be less durable and more in need of repair.[29] The young and still unknown Begarelli (*quidam adulescens*

FIGURE 7.5 Antonio Begarelli, *Bust of Christ*, terracotta, *c.*1530, 52 cm × 52 cm
BERLIN, BODE-MUSEUM

de domo) did not respond by producing a conventional *bozzetto* (a small-scale model), but with a finished, larger-than-life Madonna, measuring 190 cm in height, modelled in clay. This Madonna, praised as most beautiful, good (*pulcherrima, bona*), and far less costly (*multo minor impensa*), was chosen by the committee. In light of the original commission and the prominence of the setting, Begarelli was instructed to make it look like marble (*et eam faciet que de marmore videbitur esse*) and to guarantee its protection from wind and water for two years.[30] The fact that the community of Modena had originally besought a marble sculpture, but then opted for Begarelli's Madonna modelled in clay, could hardly be a better demonstration of the great success that the artist's characteristically whitened terracotta sculpture had right from the start. Just like Donatello, Begarelli seemingly transformed a humble, inferior material – here clay – into marble as superior substance; and just like Donatello, Begarelli applied it in conjunction with a specific stylistic mode: in his case an emphasised pathos, to prove sculpture's ability to depict *historiae*, an ability which was traditionally restricted to painting. Taken in tandem with the Cavalcanti Annunciation, one might wonder whether this material transformation should be understood as an attempt to compensate for clay's inferior position

FIGURE 7.6 Antonio Begarelli, so-called *Madonna di piazza*, terracotta, 1522, height: 190 cm
MODENA, MUSEO CIVICO D'ARTE

in tableau sculpture as a material 'reserved for the plebs'. Begarelli's modelled pictorial fictions certainly strengthened the position of Emilian tableau sculpture. The primary function of his material transformation was not to upgrade the material itself, but rather to emphasise the artist's work. The reduction of artistic means was a necessary condition for leading the beholder to worship the artistic *opus*, not its *materia*. As Kathleen Weil-Garris (1982, 66–69) has pointed out, this shift of emphasis may be considered as effected 'under the aegis of Raphael's school', when 'the artistic idea became paramount and the preciousness of material was no longer essential to sculpture.'

Both Donatello and Begarelli benefited from their local origins and traditions: Donatello increased the value of the local Florentine material *pietra serena*, and Begarelli, due to his family background, possessed the necessary skills that enabled him to elevate modelled clay to the same level as sculpted marble. Still, their developed forms of material mimesis do not primarily focus on material values, but rather demonstrate a gradual shift of attention from the applied material to the represented idea. A glance at parallel forms of material mimesis north of the Alps may shed light on the techniques developed by Northern sculptors.

3 Marble and Alabaster Evoking Monuments in the North

Adam Kraft's steeply rising ambry for the Nürnberg St. Lorenz church (fig. 7.3, a & b) appears to surmount the church's vaulting; the slender artwork's summit is forced to curl due to its monumental size. Its delicate ornamentation oscillates between architectural and vegetal forms, while it is hard to tell at first glance of what this seemingly organic artwork is made. Even though Eobanus Hessus, praising the ambry in 1532, repeatedly described Adam Kraft's ambry as made of marble ('There it stands in white marble'), it was in fact sculpted of sandstone, its core and the delicate covings supported by an iron framework encased in rock flour bonded with glue.[31] A wooden statue of Christ placed on the ambry's first level was covered by a coat of whitish colour to disguise its actual substance. This so-called unifying stone colour (*Steinfarb*) was applied to the whole object – records indicate that it was renewed during Adam Kraft's lifetime, since his wife received a sum of money for grinding rock flour.[32] Partial polychrome painted faces, and landscape backgrounds made it even more difficult to decipher this oscillating, to some extent supernatural, materiality – whether Eobanus Hessus really believed in its marble substance, whether this is something he wanted to see, or whether referring to this

material was a way for him to praise the artwork's virtuosity, are questions that cannot readily be answered today. Just fifteen years later, we learn in Johann Neudörfer's (1497–1563) *Nachrichten von Künstlern und Werkleuten* (1547) that Adam Kraft 'was famous and skilled at softening and casting hard stones. He would have moulds made in which he mixed lime with small ground stones, then fired it, and painted it with "stone colour"; however, all the twisted curvatures of this workpiece are hollow on the inside, and supported by iron bars. Otherwise they would not stay as they are'.[33] When Neudörfer first attributes quasi-alchemical knowledge to Kraft, as a master skilled at softening and casting hard stones, and then rather pragmatically unveils the construction methods of this supernatural artwork, his words seem to reflect the fact that, technical knowledge notwithstanding, the impression of this supernatural artwork leaves the beholder suspended between its actual composition and its appearance (Oellermann 2002, 132). Eobanus Hessus expressed this by referring to Kraft's ambry as a living organism: 'One believes the master himself could have animated the stones'.[34] Despite everything, the very essence of this delicate artwork cannot be translated into spoken language. Hessus concludes: 'All that remains concerning this work, it is impossible for me to report; for the muse, in admiring the splendour of this work, has forsaken me.'[35]

The Creglingen altarpiece (fig. 7.7) by the woodcarver and stone sculptor Tilman Riemenschneider (ca. 1460–1531) kept scholars busy with the eye-catching whiteness of its limewood, which contrasted with the framework's reddish fir.[36] It may count as one of his most delicate works, in view of the highly elaborate surface, richly adorned with decorative elements. However, the question as to whether the altarpiece was originally polychrome, or at least intended to be polychrome, remains anything but resolved. Two serious paint strippings, one to remove a dark monochrome, oil emulsion varnish, the second to remove a white coat of paint, were often referred to as a reason for this open question.[37] Discussing the Münnerstadt altarpiece, Eike Oellermann (2008, 216–218) states that even repeated treatments with acid would not have completely destroyed the original traces of colour, and concludes that, in a technical sense, there is nothing to support the surface of the Creglingen altarpiece originally having been painted. Referring to the restless, broken patterns of the carved drapery, which turn in upon themselves and out again, Oellermann suggests that polychrome painting would indeed have helped to clarify these artificially complicated forms. Furthermore, in considering some surprisingly "empty" spaces, such as the strangely emphasised gap between the two apostles in the middle scene, or the blank letter presented by the archangel to Virgin Mary, Oellermann sees the punchworks' delicate finish standing

FIGURE 7.7 Tilman Riemenschneider, *Altarpiece with the Assumption of the Virgin*, limewood, *c.*1505–1510, 930 cm × 273 cm
CREGLINGEN, HERRGOTTSKIRCHE

in a curious opposition to these seemingly unfinished parts, which, again, colour would have clarified. Against the technical result, but following the natural logic of the artwork, Oellermann, then, suggests that the sculpted wood was originally polychrome, but does not venture into any details as to what it may have looked like. I suggest, on the contrary, that the Creglingen altarpiece was designed by Riemenschneider without any coating on the whitish limewood apart from partial gilding, with the aim of evoking precious alabaster or marble. Unlike Donatello, Begarelli and Kraft, Riemenschneider may have exposed the bareness of the wood itself in order to bring this material mimesis into being – which may be considered to be an even stronger statement of a woodcarver self-confidently unfolding the qualities of his genuine material, rather than disguising it with a pigmented glaze. The fact that Riemenschneider tied his partly gilded annunciation groups made of alabaster (fig. 7.8) to the tradition of depicting the Virgin and Mother Mary in precious white marble or ivory reinforces still further this reading of the Creglingen altarpiece as a monumental showpiece of partly gilded alabaster.[38]

Two wooden sculptures – St. Lorenz and St. Stephan (figs. 7.9 a & b) – probably carved by a student or follower of Veit Stoss, illustrate that Riemenschneider was not the only sculptor to think of stone while carving in limewood, with the difference, however, that these two figures are wearing a coat of colour that evokes stone. Kept in Nürnberg's St. Lorenz church, the two limewood sculptures are conserved in their original polychromy: mostly covered in a colour imitating greyish stone, with only the hair and parts of the garments gilded. Their current appearance, much closer to bronze than stone, is related to significant darkening of the varnish – restorers described the much better conserved traces of colour on their back as exhibiting a range of dull greys, imitating limestone.[39] It may have been the original appearance of the Volckamer monument, executed by Veit Stoss as one of his first assignments back in Nürnberg, that inspired the artist to apply this coat of colour in imitation of stone. The huge relief was embellished with scenes from the Passion of Christ in limestone, flanked, on the upper level, by two lifesize figures of the Man of Sorrows and the *Mater dolorosa* executed in oak. While the dark oak tree seems to create a disharmonious contrast with the spongy limestone, we may suppose that it too was originally painted in a unifying greyish colour.[40]

That painting techniques alluding to the material qualities of alabaster (and other precious stones) were common in the North is further supported by a most interesting record in the Prague guild book of painters (1490–1582):

> Let the journeyman carver or [master] carve an image of the Virgin Mary out of wood. Then let the image be carved in a masterly fashion both

FIGURE 7.8 Tilman Riemenschneider, *Virgin Annunciate*, alabaster, *c.*1500, height: 54 cm
MUSÉE DU LOUVRE, PARIS

FIGURES 7.9A & 7.9B Veit Stoss (pupil or follower), *St. Stephan* (top) and *St. Laurent* (bottom), limewood, painted in grey, partly gilded, ca. 1520, height: 149 cm and 144 cm
NÜRNBERG, ST. LORENZ

> before and behind, and polished smooth yet without colours, being neither painted nor limned [...] beforehand, let the journeyman have a painting made for himself [...] let him then ornament the frame around this picture after his fashion and skill [...] yet let a smooth white work be executed upon it, akin to alabaster, but with a little silver added for the shine, as gilding, so as to turn it a golden colour and dye it, so to speak.[41]

Painting techniques in sculpture which imitated marble or alabaster may thus be considered widespread both in Italy and in Northern Europe throughout the fifteenth and sixteenth centuries. Both practices placed high value upon artistic invention. Although the attempted material mimesis always proceeds from a seemingly inferior material ("simple" stone, terracotta, or wood) to one that was considered superior (marble and alabaster), none of the examples discussed above seems to be principally concerned with *material* value, even though the emulated material is more costly. Rather, in line with the antique tradition of reduced artistic means as a proof of skilful mastery, each work in its specific historical context seems to be focusing on the articulation of ingeniously created artistic ideas, exposing the artist's work, not the preciousness of the applied material. The use of humble material can therefore be read as an invitation for the beholder to focus on the quality of the finished artwork as a product of artistic labour, and the use of a humble material be considered a logical condition of bringing this into being. Artists were not constrained to use the humbler materials for reasons of cost, but rather chose to use them, as intentionally applied artistic principle, to designate their material mimesis. To some extent, these highly-elaborated forms of material fictitiousness can be considered an immediate result of a daily workshop practice where limewood and sandstone were both in use – just like Riemenschneider's figure of St. Matthias, which the artist repeated in stone after having sculpted it in limewood a few years earlier.[42]

4 Fictitiousness as a Paramount Criterion of Material Mimesis in Colour-Reduced Renaissance Sculpture

A brief comparative look at how woodcarvers treated the surface of their artistic medium indicates that the works that could rightly be described as *holzsichtig* (allowing the wood to be seen), in the true sense of the word, are much less common than one might expect. Far more common were slightly pigmented glazes, which went beyond the mere function of protecting the

FIGURE 7.10 Tilman Riemenschneider, *Adam*, nutwood, 1495–1505, height: 24 cm
WIEN, KUNSTHISTORISCHES MUSEUM, KUNSTKAMMER (FORMERLY CONSIDERED TO BE A FORGERY, EXPOSED IN 1975 AS A WORK BY TILMAN RIEMENSCHNEIDER)

wood to adjust and unify the genuine colour that it possessed in its natural substance.[43] Tilman Riemenschneider's slender 'Adam' (fig. 7.10), acquired in 1866 from the Böhm collection by the Kunsthistorisches Museum Vienna, and then housed in Ambras castle until 1875, is one of the few works that demonstrably exposes the completely untreated texture of the nutwood from which it is carved.[44] In fact, this figure of Adam was formerly covered with a toned glaze, giving a bronze effect. As chemical analyses have shown, this coating was not original, and it was removed in 2008.[45] Nowadays, the exposed bare wooden texture planned by Riemenschneider lends the seemingly dancing figure a vital epidermis. Quite a few small-scale wooden sculptures created for, and collected in, the context of the *Kunstkammer* display elaborate treatment of their wooden surface in conjunction with additional pigments and dyes, which together evoke the quality of cast bronze sculpture. It is the appearance of such objects that may have inspired a former owner of Riemenschneider's 'Adam' to dress the sculpture in a shiny coat of bronze; an effect Vasari too described in 1568, especially in connection with walnut: 'There are also most praiseworthy works in boxwood to be seen done by workmen in this trade, and very beautiful ornaments in walnut, which, when they are of good black walnut, almost appear to be of bronze.'[46] Other examples, including carved altarpieces and crucifixes, such as the so-called del Maino altarpiece, or Veit Stoss's Bamberg altarpiece and his crucifix in St. Lorenz, Nürnberg, illustrate that these forms of material mimesis were by no means restricted to *Kunstkammer* contexts. As I have shown in detail elsewhere (Dümpelmann 2022), these phenomena can be closely linked to the daily workshop practice of making wooden models for cast bronze sculptures, in the course of which woodcarvers evoked the effect of bronze in wood. While aiming at the invention and creation of material aesthetics in model-making for cast bronze sculptures, woodcarvers founded a rich experimental field, leading them to highly-skilled and self-reflective results that gradually developed from anticipatory models into independent artworks. In analogy to the works evoking marble and alabaster discussed above, the artists did not primarily focus on material values, but rather grasped and staged the artistic idea as an immediate result of model-making in their daily workshop practice. Despite the predominant role of the German-speaking lands in high quality woodcarving at this time, as mentioned above, the usual designation of wood as a typical "German" material does not seem appropriate for this period. Examples like the del Maino altarpiece, or Vasari's praise of St. Roch, seem rather to illustrate that wooden sculpture was also highly appreciated south of the Alps, while the fact that Vasari considered St. Roch to be a French-Italian product – being completely unaware of its actual origin

FIGURE 7.11 Daniel Mauch, *Madonna on the Crescent Moon* (the so-called Berselius-Madonna), 1529–1535, height (including base): 74.5 cm
GRAND CURTIUS, LIÈGE, DEPOSIT BY ST. PANCRACE, DALHEM

in Southern Germany – suggests that such issues of origin were hardly of paramount importance for him. Within the evocation of bronze as an important antique material second to marble, these works implicitly allude to antiquity, an allusion explicitly staged by Daniel Mauch's small-scale Madonna on a crescent moon, carved from lime between 1529 and 1535 (fig. 12). The sculpture's base, painted with a fictitious marble polychromy, contrasts ingeniously with the skin of the infant Christ and Virgin, which originally showed bright, completely untreated limewood.[47] The correspondence of the bare exposed wood with the purity of Christ's and Mary's flesh, juxtaposed with the fictive marble painting on the base, could hardly provide a clearer appreciation of the material and its highly-skilled mastery by Mauch (*c.*1477/1479–1540). This aspect is emphasised through a pronounced, self-conscious signature on the base, proclaiming Mauch as the artwork's author, stating that the carving belonged to Berselius (Pascal Bierset, 1480–1535), a Benedictine monk from the abbey of St. Laurent in Liège, and, lastly, explicitly competing with antiquity. On the front are the following words: 'What do you, antiquity, marvel at your Myrons! Desist from it! The time-honoured centuries hand the palm to the New'. Similarly, the words on the reverse read: 'Antiquity's famous artworks may bid farewell / they are all nothing compared to Daniel's work'.[48] In this particular case, the fictitiousness of the sculpture's polychrome, 'false' base appears inferior to the unveiled, 'true' incarnate substance of the Virgin and the infant Christ. We might perhaps read this as a gesture of humility on the part of Daniel Mauch; certainly these confident words of praise for him as the work's author – probably bestowed by Berselius, its commissioner – show no other signs of modesty.

Given traditional views of marble as *the* antique material, it may seem surprising to find a woodcarver competing with antiquity through his mastery of a seemingly inferior material. The fact that the woodcarver and stone sculptor Daniel Mauch did so in the face of this tradition further underscores both his own self-confidence and the increased artistic value of woodcarving. Even wooden sculpture could engage with antiquity, but, as has been pointed out for the objects which evoked marble or alabaster, the crucial point of reference is not to be found in the mere allusion to antique materials as such. In fact, the forms of material mimesis discussed here, both those alluding to marble and alabaster and those alluding to bronze, took a concept of reduced artistic means, itself derived from antiquity and traditionally related to painting, and applied it to sculpture, transforming the art in keeping with the genuine material language of the media it used. In so doing, Renaissance sculpture both north and south of the Alps introduced fictitiousness as a theoretical

concept, closely developed from, and articulated in, artistic practice. Instead of the value of materials, the artist's work and the artistic idea, as articulated through highly elaborate forms of material mimesis, are paramount criteria for evaluating these specimens of Renaissance sculpture.

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Endnotes

1 Pliny 1952, 298–299, 308–309.

2 Quoted in Białostocki 1986, 31; see also Grebe 2015, 174.

3 I owe this expression to Ann-Sophie Lehmann, who introduced it at the conference 'The matter of mimesis. Studies on mimesis and materials in nature, art and science', Cambridge, 17–18 December 2015.

4 Chantal Conneller (2013, 90) introduced the distinction between 'deceptive' and 'honest/creative' in order to characterise two different types of skeuomorphs.

5 http://www.trackingcolour.com/ [accessed 1 February 2019], with extensive bibliography; see also http://www.stiftung-archaeologie.de/publicationsen.html [accessed 1 February 2019] with reference to cat. San Francisco 2017.

6 See Hinz 1989; Rosenfeld 1990; Hoeps 1999; Wenderholm 2006, 74–78; Fricke 2007; Fehrenbach 2011, 47; Dümpelmann 2012, 20 ff.

7 Kahsnitz 2005, 39; Gasparotto 2014, 88–103, at 95; and Dümpelmann 2018, esp. 317–320.

8 Oellermann 2004, 113; Oellermann 2008, 213–214; Marincola 1999, esp. 108–112. Current research has repeatedly presented the field of furniture manufacturing as an important source of knowledge and experience in the matter of wooden surface treatments; see Rommé & Westhoff 2009, 100, with reference to Michaelsen 2002; Koller 2008, 214–215, and recently Habenicht 2016, 22 ff, 30 ff and 59.

9 Vasari 1960, 173–176; also Vasari 1966–1997, vol. 1, 108–110.

10 Vasari 1960, 173; Vasari 1966–1997, vol. 1, 108: 'Come si conducono le figure di legno e che legno sia buono a farle', title of his chapter on woodcarving.

11 Vasari 1960, 173; Vasari 1966–1997, vol. 1, 109: 'ubbidisce più agevolmente alla lima et allo scarpello'.

12 Vasari 1960, 174; Vasari 1966–1997, vol. 1, 110: 'e condusse con sottilissimo intaglio tanto morbidi e traforati i panni che la vestono et in modo carnosi e con bello andar l'ordine delle pieghe, che non si può veder cosa più maravigliosa'.

13 Vasari 1960, 174–175; Vasari 1966–1997, vol. 1, 110: 'acciò si veggia in tutte le sue parti l'eccellenza dell'artefice, è stata conservata insino a oggi questa figura nella Nunziata di Firenze sotto il pergamo, senza alcuna coperta di colori o di pitture, nello stesso color del legname e con la sola pulitezza e perfezzione che maestro Ianni le diede, bellissima sopra tutte l'altre che si veggia intagliata in legno'. The passage with the wrong attribution reads thus: 'by the hand of the Frenchman, Maestro Janni, who living in the city of Florence which he had chosen for his country […]' (see Vasari 1960, 174).

14 Varchi & Borghini 1998, 115: 'E perch'i' ho detto ch'e colori non sono [de] gli scultori, no vo dire che non le possin colorite le loro figure, se le vogliano, come fanno i ceraiuoli o quei che fanno ritratti di gesso; […] la forza dello sculture e la virtù consiste ne dintorni dati dallo scarpello, e se qualche goffo ne l'arte sua usa i colori, esce della natura di quell'arte et il lor medesimi se ne ridono et appena gl'accettano fra loro'.

15 Quoted after Baxandall 1980, 48. Original Latin text from the 'Anniversarium' of the Carmelite Church held in Nürnberg, Stadtbibliothek: 'Nullus prior faciat eam coloribus pingere faciliter. Causam sibi narrabunt omnes arteficiosi magistri in illa arte. Nota: aperiatur tabula solum in festo nativitatis domini, pasche, penthecostes et duobus diebus sequrntibus, ascensionis, trinitatis, omnium sanctorum, epiphanie domini, corporis Christi, dedicationis ecclesei ac in omnibus festiviatibus beatae Mariae virginis. Eo die mox finitis vespersi secundis claudatur. Et omni anno binies mundetur. Et ne magna lumina super altare propter fumam. Sufficiunt due pave candele de cera. Alie vero extra altare locentur', quoted in Schaffer 1928, 362, note 3; more recently, see Habenicht 2016, 182, note 182. On the Bamberg altarpiece, see Kahsnitz 2005, 39, 402–410.

16 Verein zur Erhaltung der Lorenzkirche 1996, 45: 'Gießen ja ließ sie sich leicht, modellieren und hin und her biegen – Ist drum nicht mehr zu bewundern, daß brechen sich lässet der Marmor / Eben noch hart, daß es scheint, man könne mit Händen ihn biegen?'

17 Weil-Garris 1982, esp. 62–63, 72–73, note 7; Gasparotto 2014, 95.

18 Weil-Garris 1982, 66; Dacosta Kaufmann 2004, 344 (reference to Baxandall 1980 at 257, note 20); see also Gasparotto 2014, 95.

19 Rosenauer 1993, 153–157, cat. 35; Pfisterer 2002, 232–268, esp. 233; Fehrenbach 2011, 47–48; Fehrenbach 2010, 37–38; Vaccari, 2003, 19–37.

20 Vasari, 1912–1914, vol. 2, 239; Vasari 1966–1997, vol. 2, 203: 'Ma quello che gli diede nome e lo fece per quello che egli conoscere, fu una Nunziata di pietra di macigno, che in Santa Croce di Fiorenza fu posta all'altare e cappella de' Cavalcanti'.

21 Vaccari 2003, 27.

22 To some extent, this is due to the fact that in 2002, the original appearance of the artwork's surface had not yet been examined (Pfisterer 2002, 233; Harris 2010, 3).

23 Pfisterer 2002, 239–241; on the artist's reception of antiquity, see also Trudzinsky 1986, esp. 47–95.

24 Alberti 2011, 'On painting' (1435), 45, 72.

25 See Claussen 1996, 47, note 13, for additional references.

26 See Arasse 1999 and 2003; Kruse 2000, 2003, 175–224; Drummond 2018.

27 Weil-Garris 1982, p. 67; on the white monochrome glaze, see also Ferrari 1986, and Bonsanti 1992.

28 Cat. Modena 2009, 214–217, cat. 55.

29 Bonsanti 1992, 123, 249.

30 Bonsanti 1992, 122–130, 249; Bonsanti 2009, 49.

31 Verein zur Erhaltung der Lorenzkirche 1996, 42: 'Weiß steht es da von Marmor'; Schleif 1996, 17; Oellermann 2002, 132 ff.

32 Schleif 1996, 24; Oellermann 2002, 142–144.

33 Neudörfer 1547, 11: 'Er habe Formen gemacht, darein Leimen mit kleinen gestossen Steinlein vermischt, den darauf gebrennt und mit Steinfarb angestrichen, es sind aber an solchem Werkstück alle krummen Bogen inwendig hohl und mit eisernen Stangen eingelegt. Sie könnten sonst nicht so bleiben'; Schleif 1996, 24.

34 Schleif 1996, 45: 'Man glaubt es habe der Meister selber die Steine beseelt'.

35 Schleif 1996, 18: 'Alles, was drüber hinaus noch übrig bleibt, zu verkünden, hat mir die Muse versagt, die den Glanz dieses Werkes bewundert'; Verein zur Erhaltung der Lorenzkirche 1996, 45.

36 Simon 1998, esp. 59–65; Kahsnitz 2005, 238–244, esp. 244; Oellermann 2008. Marincola & Serotta (2022) (323–338), supports 'Eike Oellermann's contention that the Creglingen Assumption Retable is an unfinished work originally intended to be polychromed'.

37 Oellermann 2008, 214; Marincola 2004, 131–147.

38 Cat. National Gallery of Washington/The Metropolitan Museum of Art New York 1999–2000, cat. No. 2, 163–167; cat. No. 3, 168–171; cat. No. 21, 246–249.

39 Oellermann 1976, 180; cat. Nürnberg 1983, 214–218, cat. No. 19, 214.

40 Oellermann 1976, 180, (with reference to Lossnitzer 1912, 193, note 325); Dümpelmann 2012, 184.

41 For the Czech original text, see Chytil 1906, 319–323; compare the German version in Nejedly 1999, 30–39, at 38, n. 30; see also Zindel 2010, 90.

42 Michael Baxandall viewed Riemenschneider's sandstone sculpture as showing characteristics more proper to limewood, and therefore concluded that limewood 'clearly ha[d] priority' for the artist (Baxandall 1980, 182–185; see also Buczynski and Kratz 1981, 335–375; Westhoff 2004, 153–165).

43 Oellermann 2004; Marincola 1999.

44 In his restoration report of 19 December 2008, the Viennese conservator Georg Prast identified the wood as nut, not pear as previously argued. See cat. Washington/New York 1999, No. 20, 242–245; cat. Munich 2006, cat. No. 30, 168 *et seq.* This may support the assumption that Riemenschneider also made use of pure limewood in the Creglingen altarpiece without any additional glaze.

45 Compare, e.g., the description by Timothy B. Husband (written before the removal of the shiny glaze): 'Without the attributes this figure could readily be mistaken for a Northern interpretation of a Renaissance bronze – or a model for one, as the surface is remarkably similar to that of a wax worked up with a tooling knife – and thus may be evidence of Riemenschneider in a rare expression of Renaissance interest'; cat. Washington & New York 1999, 245.

46 Vasari 1966–1997, vol. 1, 109: 'E degli artefici di così fatto mestiero si sono vedute ancora opere di bossolo lodatissime et ornamenti di noce bellissimi, i quali, quando sono di bel noce che sia nero, appariscono quasi di bronzo'.

47 Cat. Ulm 2009, 284–288, entry 39.

48 Cat. Ulm 2009, 285: 'QVID MIRARE TVOS AETAS ANTIQUA MIRONES/ DESINE DANT PALMAM SAECULA PRISCA NOVI // AETATIS VALEANT ILLUSTRA SIGNA VETVSTAE / CVNCTA NIHIL FACIUNT AD DANIELIS OPIS'.

CHAPTER 8

The Fleshiness of Bronze

Hannah Wirta Kinney

In his 1730 *Some observations made in traveling through France, Italy, etc*., the English author and Grand Tourist Edward Wright (1680–1750) concluded his account of the antiquities of the Tribuna of the Grand Duke's Gallery in Florence, Italy, by describing bronze copies of its four most important and famous marble statues: the *Medici Venus*, the *Dancing faun*, the *Wrestlers*, and the *Knife grinder* (fig. 8.1) The four bronze statues that Wright used to illustrate in words the marble originals that were the subject of the passage had been commissioned two decades earlier from the Florentine bronze sculptor Massimiliano Soldani Benzi (1656–1740) by John Churchill, 1st Duke of Marlborough (1650–1722), for his palace, Blenheim, in Oxfordshire, England (fig. 8.2) Visiting Florence in 1721, Wright had assisted the Lord Chancellor Thomas Parker, subsequently Earl of Macclesfield (1667–1732), in purchasing bronze copies of the same famous antiquities for his country seat, Shirburn Castle, also in Oxfordshire. According to Wright's narrative in *Some observations*, the maker of Parker's bronzes, the Florentine sculptor Pietro Cipriani (*c.*1680–*c.*1745), had promised Parker that they would 'at least equal' Massimiliano Soldani Benzi's copies for Marlborough, 'and be the most exact that ever were made'.[1]

That Wright would describe Cipriani's bronze copies of these lauded ancient marbles as 'the most exact that ever were made' is striking, given the blatant material difference between prototype and replica. The "original" first-century BCE Roman marble of the *Medici Venus* – itself a transcription of a Greek bronze prototype, but not known to be Roman in Wright's time – is white, though warmed by a patina of age. Cipriani's *Medici Venus* instead is a brown bronze that was smoothly finished, thus allowing reflected light to accentuate the undulations of the subject's form (figs. 8.3, 8.4) Besides the most striking material differences between the two Venuses, Cipriani also modified the marble's composition in his bronze. He did not include the *putto* riding a dolphin that served as a structural support for the weight of the marble figure in the ancient prototype. The marble base, which included a spurious signature of Clemonenes, son of Apollodorus, has been replaced in the bronze with Cipriani's own name, followed by the Latin terms '*Formavit et Fvdit*', 'moulded and cast' (fig. 8.5).[2] How then could the bronze statue, which only

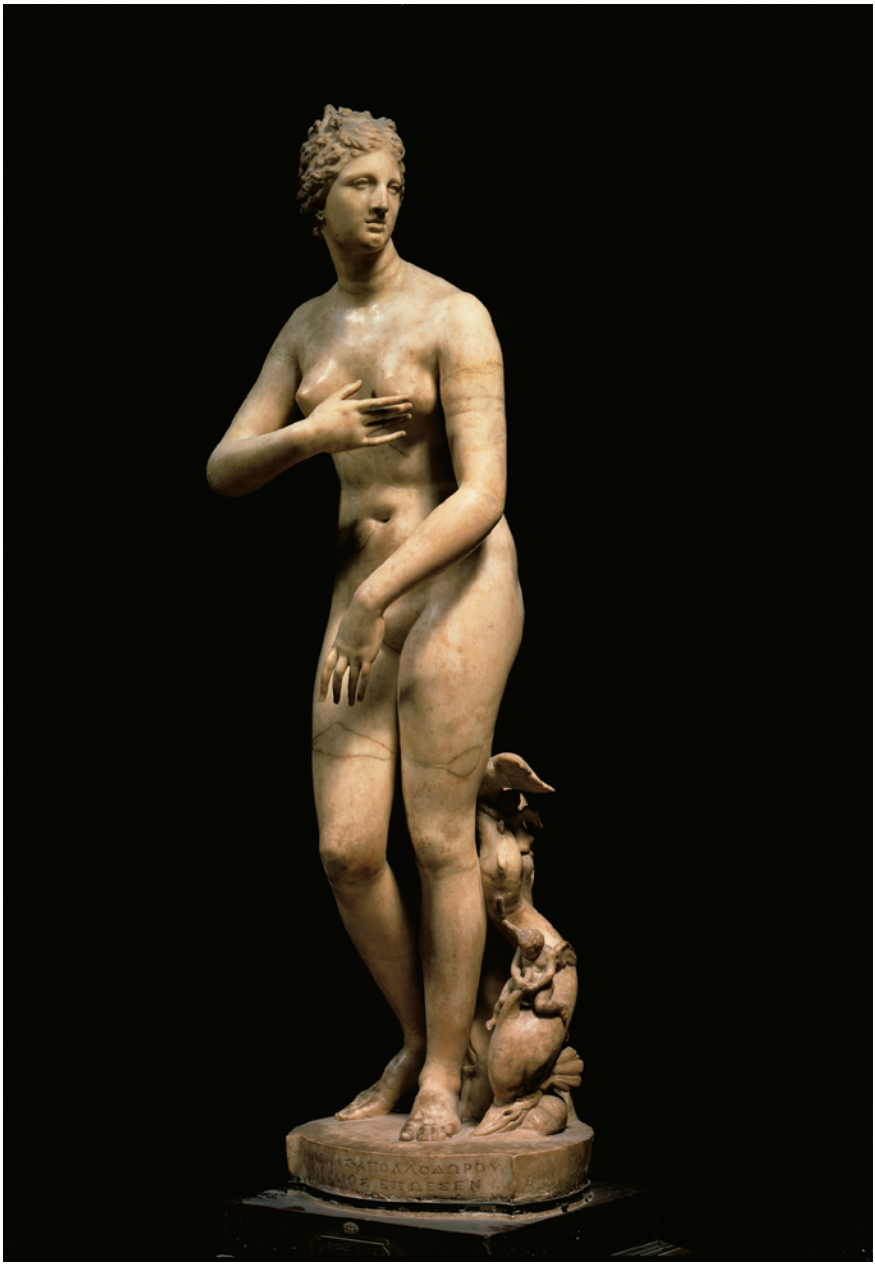

FIGURE 8.1 Hellenistic artist, *Medici Venus*, Late 2nd – early 1st century BCE. Marble, 153 cm
GALLERIA DEGLI UFFIZI, FLORENCE, INV. SCULTURE, 224.
PHOTO: GALLERIE DEGLI UFFIZI – GABINETTO FOTOGRAFICO

FIGURE 8.2 Massimiliano Soldani Benzi, *Medici Venus*, 1710–1711. Bronze. BLENHEIM PALACE, WOODSTOCK, ENGLAND. PHOTO: JULIA CLARE FRANCES HAMILTON

FIGURE 8.3 Pietro Cipriani, *Medici Venus*, 1722–1724. Bronze, 155.3 cm
THE J. PAUL GETTY MUSEUM, LOS ANGELES, 2008.41.1.
PHOTO: GETTY OPEN CONTENT PROGRAM

FIGURE 8.4 Pietro Cipriani, *Medici Venus*, 1722–1724 (detail). Bronze, 155.3 cm
THE J. PAUL GETTY MUSEUM, LOS ANGELES, 2008.41.1.
PHOTO: HANNAH WIRTA KINNEY

FIGURE 8.5 Pietro Cipriani, *Medici Venus*, 1722–1724 (detail). Bronze, 155.3 cm
THE J. PAUL GETTY MUSEUM, LOS ANGELES, 2008.41.1
PHOTO: GETTY OPEN CONTENT PROGRAM

replicated portions of its prototype's content and composition, have been considered the most exact that was ever made?

Answering this question requires returning to correspondence about three related commissions for bronze copies given to Soldani and Cipriani between 1695 and 1721, in order to understand how the mimetic potential of the material practices of making a bronze sculpture – namely moulding, casting, and finishing – was described at the time. The first commission for bronze copies of these marble antiquities came from Prince Johann Adam Andreas of Liechtenstein I (1657–1712) in 1695. This was followed by a commission from the Duke of Marlborough in 1710, and finally by one from Lord Parker, mentioned above, in 1721. Moulds, it will be demonstrated, were described in art treatises of this period as passively imprinting the form of a model, thereby making the mould an 'exact' negative that would subsequently receive and shape the molten bronze cast into it. Part of the social value of the mould was that its required physical closeness to the surface of the original prototype it transcribed also became symbolic of the relationship between the commissioner of the copy and the owner of the original. But, in suggesting that their copies were exact, Soldani and Cipriani did not intend to remove their own "hand" from the resulting works completely. As the correspondence, as well as their prominent signatures on the bronzes, reveals, they instead believed that while the mould could exactly copy the form of the model, their own technical skills (*arte*) played an important role in ensuring that the faithful transcription of the statues' contours – made possible through the mould – would be emphasised in the resulting bronze. Their ability to imitate was therefore

based upon their mastery of the techniques of manipulating bronze with their own hands. The sculptors' goal, then, was not to make a materially similar copy, but instead a copy that emphasised the qualities of the prototypes that their contemporary viewers most admired: how the ancient marble depicted the corporality of the human form.

This was an especially important aspect of the lauded *Medici Venus*, which portrayed a fleshy and alluring goddess, described in the period as being particularly lifelike. In Soldani's correspondence with Liechtenstein during the 1690s, the sculptor even claimed that his techniques for finishing the bronze would produce a surface on his *Medici Venus* that would appear 'soft and delicate, as if it were flesh'.[3] Due to the multiple mimetic references that 'exact' bronze copies of the *Medici Venus* contain, these statues will be the primary subjects of the pages that follow.

1 The *Medici Venus*'s Allure

Understanding Liechtenstein, Marlborough and Parker's motivations for acquiring copies of the *Medici Venus*, one of the most highly-regarded ancient sculptures in early eighteenth-century Italy, requires investigating its early modern reception. The *Medici Venus*, along with two other ancient statues, was brought to Florence from the Medici Villa at Trinità dei Monti, Rome, in 1677. While archival sources published by Edward Goldberg demonstrate that the relocation was tied to a prescription by the Tuscan Grand Duke Cosimo III's doctor recommending that the corpulent ruler begin walking in his galleries to improve his health, contemporary published accounts present a different narrative, one that reveals some of the *Medici Venus*'s fame in this period.[4] In 1681, the art historian Filippo Baldinucci suggested that the reason for the relocation of the three sculptures was the *Medici Venus* 'herself'. As he recounted, the *Medici Venus* had often been 'abused by the most inappropriate words and gestures' by those who had come to study the sculpture in the Medici's Roman villa. These acts had convinced Cosimo III (1642–1723) to bring the *Medici Venus* to Florence in order to protect it from such insults.[5] Writing nearly a century after Baldinucci, the Florentine historian and antiquarian Giuseppe Bencivenni went further, insinuating the sexual nature of these 'inappropriate words and gestures' by equating them with the story of the young Athenian who 'fell in love with the simulacrum of Gnido' or Praxiteles' statue of Aphrodite at Cnidus.[6] The *Amores*, a text probably of the third century CE and attributed to Lucian, recounted this story of a young Athenian who fell so much in love with the statue that he locked himself in the sanctuary where it stood for a

night, leaving a 'blemish' on the marble figure's thigh that future viewers would interpret as proof of 'what she'd suffered'.[7] Bencivenni's reference to this story, and his use of the word *simulacro* instead of *statua* (statue), *figura* (figure), or even *Venere* (Venus) is illustrative of the double function of the marble: to serve simultaneously as a surrogate for the goddess, and as a 'real woman' for its viewers. Grand Tourists' descriptions of the *Medici Venus* – like the ancient ones concerning the *Cnidian Venus* – convey the experience of seeing the marble as being similar to seeing a nude woman herself. In *Some observations*, Wright even composed a poem describing the *Medici Venus*'s beauty in lines that expressed the marble's lifelike qualities:

> The gentle Risings of the Skin
> Seem push'd by Muscles mov'd within:
> The swelling Breast, with Graces fill'd
> Seem easy, to the Touch to yield.[8]

2 The Lineage of the Commissions

In 1684, not long after the *Medici Venus* and the other marbles had arrived in Florence from Rome, the first Florentine copies of them were executed. Giovanni Battista Foggini (1652–1725), Medici grand-ducal sculptor and Soldani's rival, made gesso copies of two ancient marbles that were displayed with the *Medici Venus* in the Tribuna of the Grand Duke's Gallery, the *Dancing faun* and *Knife grinder*, for the newly-formed French Academy in Rome. In 1687, using gesso copies as models, Foggini then produced marble versions of the same statues, as well as Michelangelo's *Bacchus*, for Versailles.[9]

The first commission for bronze copies of the *Medici Venus* and other antiquities from the Tribuna was given to Soldani by Prince Johann Adam Andreas I of Liechtenstein in the 1690s. The Prince was not initially interested in acquiring full-length copies after the antique, but instead bronze busts of the heads of Michelangelo's figures from the New Sacristy of San Lorenzo Church, Florence, as well as a series of bronze busts after ancient marble prototypes displayed in the Grand Duke's Gallery. He additionally hoped to purchase bronze copies of statues by François Duquesnoy and Alessandro Algardi. After several months of correspondence, Liechtenstein finally engaged Soldani to make bronze copies of the *Medici Venus* and *Dancing faun*. On Soldani's advice, Liechtenstein then added to this group a full-length copy of Michelangelo's *Bacchus*, instead of busts after statues in the New Sacristy, which Soldani advised at several points would not be easily translated from full-length figures

into busts.[10] Liechtenstein specified that he wanted the *Medici Venus, Dancing faun*, and *Bacchus* in 'the same proportions (*grandezza*) as the Original'.[11] Soldani accepted the commission, with the caveat that it might be difficult to obtain the license from the Grand Duke to take moulds of the statues, and in particular the *Medici Venus*. A month later, however, the license was granted and he set to work.[12]

The Duke of Marlborough's preliminary intention in 1709 was, similarly, not to purchase bronze copies of antiquities, but instead marble mythological figures by the seventeenth-century sculptor Pietro Francavilla. Marlborough was later advised by two English court delegates living in Tuscany that, while the pieces were 'very good Italian Statuary', the current owners, the Bracci family, were asking a price above their just value.[13] Within the letter dissuading Marlborough from purchasing the Bracci collection, its author, Christopher Crowe, the English consul in Livorno, enclosed a note from Soldani in which the sculptor proposed to make bronze copies of 'the six famous and singular marble statues that are in the Tribuna of the *Galleria* of his Royal Highness the Grand Duke of Tuscany'. Soldani counseled Marlborough that the statues were lifesize, and that 'wanting them made in bronze in the same proportions (*grandezza*) required moulding (*formare*) them in order to have them come out correctly (*giuste*)'.[14] Though further deliberation ensued, in January 1710, Marlborough finally commissioned Soldani to copy four of the six statues of the Tribuna in bronze: the *Medici Venus*, the *Dancing faun*, the *Knife grinder* and the *Wrestlers*. The commission had been agreed in the faith that Cosimo III would grant the necessary permission for the copies to be made.[15]

As the Marlborough commission was being negotiated, Foggini produced a new set of gesso casts of the statues for the Elector Palatine Johann Wilhelm, the husband of Cosimo III's daughter Anna Maria, for his palace in Düsseldorf.[16] In April of 1710, John Vanbrugh, Marlborough's architect, informed his patron that 'there have been moulds newly taken for the Elector Palatine', and that in order to speed up the production of Marlborough's bronzes, permission had been given for the bronzes to be 'formed upon those moulds'.[17] What this letter indicates, then, is that although Soldani stressed the importance of personally moulding the statues in order to have them come out correctly in his letter to Marlborough, in the end he used Foggini's moulds – with Cosimo III's permission – to cast his bronze copies.

The Marlborough commission inspired two other English patrons to acquire similar copies after the Tribuna marbles. The first was Thomas Wentworth, 3rd Baron Raby, later Earl of Strafford, who commissioned Foggini in 1714 for a set of copies, which are lost.[18] The subsequent commission was from

Lord Chancellor Thomas Parker, whose son George arrived in Florence with his tutor Edward Wright in 1721. As was previously mentioned, in Wright's 1730 publication, compiled from letters from his travels, he described Soldani's bronzes for Marlborough as a way to discuss the marble originals on display in the Tribuna. Wright then went on to recount that, while in Florence, George Parker had commissioned bronze copies of the *Medici Venus* and the *Dancing faun* from 'Signor Pietro Cipriani, an excellent Artist, and formerly a Scholar of Soldani, and his Assistant in casting those Statues for the Duke of Marlborough'.[19]

Early in January of 1722, George Parker wrote to his father to explain that Cosimo III would not allow new moulds to be made from the original marbles, suggesting that both Parker and his father had wanted their bronzes to be cast from freshly-made moulds. Confronted by this impediment, the younger Parker and Wright were endeavoring 'to get casts made from the best moulds we could find ready made'.[20] They eventually did gain access to moulds – though it is not entirely clear if they were Foggini's or Soldani's – and Cipriani completed the copies in 1722.[21]

From this complicated lineage, a few important conclusions may be drawn. First, the Medici court used a system of licenses to closely regulate the production of copies. These licenses controlled not only who could own a copy, but also which of the court artists could actually form a mould over the prized marble originals. The full political implications of this system lie beyond the scope of the current argument, but it is essential to underline how it operated, because it was a major reason why both Soldani and Cipriani insisted upon the mimetic potential of the process of piece-moulding to capturing their subject. Moulds taken directly from these statues were extremely rare, because they required the artist to have direct access to the surface of the original marble, a privilege granted to few. Therefore, claiming to possess these moulds served as proof that the sculptor had actually formed his copy *from* the original, thus giving it a greater sense of authenticity.

An unpublished receipt for payment for a collection of sixteen gesso busts and statues, signed by Cipriani and annotated by his patron Roger Newdigate in 1739, illustrates how this concept of authenticity continued to operate two decades later, even after the Medici family no longer ruled Florence and its art collections. Next to Cipriani's description of the subject of each of the gessoes, Newdigate indicated the number of copies cast from each mould, even specifying that the *Medici Venus* was 'cast from the mould which was made upon the original statue'.[22] Exactness, in the eyes of the patron, therefore resided in the mould, not the maker.

3 *'E così di pezzo in pezzo la figura si forma'*

While Soldani and later Cipriani often wrote about bronze's ability to reproduce marble exemplars exactly, it was actually Liechtenstein who had first acknowledged the superior qualities of bronze over marble in copying originals, in his correspondence with Soldani in the 1690s. Part of his preference for bronze was a practical concern. Due to the material qualities of marble, transporting statues carved from it was very risky. For this reason, Liechtenstein said, it was 'better to have those most beautiful statues that are in the Galleria of His Royal Highness the Grand Duke cast in bronze, because if one makes the mould (*forma*) over the Original itself, the copies come out correct (*giusto*) like the Original'.[23] In his flattering letter of response, Soldani agreed with Liechtenstein's thoughts, both on the risk of transporting marble and on the superiority of bronze for producing copies: 'Your Highness has reflected very well that making marble copies of these statues would not be good, because one [i.e., a sculptor] could never succeed in copying them [the originals] with such softness and grace of the contours as they have in the original'.[24]

It was from Liechtenstein's suggestion that Soldani seems to have developed the marketing scheme for his subsequent bronze copies. Ultimately, he would drop concerns about the fragility of marble in favour of an argument for exactness, based around the claim that the moulds would mediate to give the reproduction the 'softness and grace of the contours as they have in the original'. Just a month later in the correspondence, Soldani repeated the argument about exactness when discussing the copies he was about to make of Michelangelo's *Bacchus*, the *Dancing faun*, and the *Medici Venus*. He noted that the King of France had copies of the same statues, 'but of marble. They are not, and nor could they ever be as correct (*giuste*), as these in bronze will be'.[25]

Soldani's self-serving motivations for such an argument should not be discounted. As mentioned, the first copies of these statues were made in gesso and then in marble by Soldani's rival at the Medici court, Giovanni Battista Foggini. The first, and perhaps most obvious, reason for such a comparison was that Soldani did not work in marble, but instead bronze. In this context, Soldani's comparison between the two materials sought to emphasise that it would be better to commission him than Foggini, since up to that point Foggini had only produced gessoes and ultimately marbles from moulds he had first produced in the 1680s. Notably, this passage of the letter also makes clear that Soldani did not consider the gessoes that Foggini made to be independent finished objects worthy of the Prince's consideration, but instead to be simple workshop models. While only a few decades later Cipriani would actively market gesso copies of antiquities as finished objects to interested English gentry,

at this point gesso was not regarded as a material used for full-scale copies of sculpture displayed by a princely patron.[26] Although by creating a comparison between the mimetic potential of marble and bronze, Soldani was certainly trying to make himself appear to be the better candidate for this commission – his correspondence with the Prince is a continuous plea for additional work – his implied argument about the superiority of bronze over marble as a medium for capturing the 'softness, and grace' of the original's contours exactly aligned with a broader cultural acceptance of the mould as a passive recipient of the model's active form. Making sense of the logic of his argument requires an understanding of the process of piece-moulding and how it was utilised by sculptors working in both marble and bronze.

Since Foggini used gesso copies as his models for the Versailles marbles, the first step in his process would have been similar to what Soldani described time and again as the key to his copies' exactness, that is, directly moulding from the ancient sculpture. The process of taking a piece-mould from a marble statue was a multi-step process, as the 1802 publication *Instruzione elementare per gli studiosi della scultura* by the Florentine Francesco Carradori depicts and illustrates. Before the piece-moulds could be made, the entire surface of the ancient marble had to be covered with a greasy release agent, so that once the mould pieces had cured they would easily pull away from the surface. To capture the intricacies of the original, tiny swathes of gesso were applied to the surface of the marble in order to slowly trace its contours, labeled 'C' in Carradori's illustration, shown in fig. 8.6. The complexity of the carving in the original dictated how many mould pieces were used. These individual mould pieces were then connected to a larger mother-mould, labeled 'B' in Carradori's illustration, from which a new positive could be cast.

In Chapter XI of *On Technique* (1550), which focused on making and casting models in bronze, Giorgio Vasari described the way in which the individual *forme* (mould pieces) came together to produce the negative of the statue's form, or the *cavo*, into which gesso or wax would later be cast.

> Like this, piece by piece, the *figura* forms itself (*si forma*), the head, the arms, the torso, the legs, until the last piece. In this way, the *cavo* of that statue, which is to say the negative of the statue's form (*forma incavata*), becomes imprinted (*improntata*) in the *cavo* with all of its parts and every minute detail of the model.[27]

The magical agency of the mould to replicate the figure is captured in Vasari's phrase *la figura si forma*, the figure forms *itself*. Vasari's wording removes the hand of the maker from this process, thus describing the act of moulding as

FIGURE 8.6 Francesco Carradori, Plate V, 'Nella quale vien dimonstrato il metodo da tenersi per far le Forme di Gesso', from *Istruzione elementare per gli Studiosi della Scultura* (Firenze 1802)
PHOTO: GETTY RESEARCH INSTITUTE

an interaction between the *figura* and *cavo*. The last line of Vasari's description, that all of the minute details of the model – in this case the ancient statue – become *improntata*, impressed, on the *cavo*, is also significant in the way it describes the mould as passive, simply taking the form of the model. Baldinucci too defined the verb *formare* (to mould) as meaning to use gesso to 'make an imprint' (*far presa*) of a model.[28]

While the language in period art manuals used to describe the mould's facture revolved around the passive act of imprinting the form of the model, the actual process of applying and removing the mould was dependent upon the skill of the mould-maker, which was a specialised craft, as well as the qualities of the gesso used to make the mould. The importance of the material qualities of the gesso for the resulting exactness of the imprint is captured in a 1649 contract between Diego Velàzquez, court artist of the Spanish King, Philip IV, and Girolamo Ferreri, a Roman *formatore* (mould-maker), regarding the commission of gesso copies of antiquities for the Royal Alcazar Palace, Madrid. In this contract, Velàzquez specifies that the gesso utilized for the piece-moulds (*tasselli*) and undercuts (*sottosquadri*) that comprised the composite moulds

(*forme*) had to be derived from 'the whitest, blemish-free stone' that, after it was fired and ground, would be sifted 'with a finer sieve than is usually used'. His insistence that this type of very fine gesso be used was meant to guarantee that the impression of the statue's marble surface into the mould would not be obscured by the coarseness of the gesso. The contract further specified that this same fine gesso had to be used to form the first layer of the subsequent gesso positive. In a wash of technical requirements, the description of this task is poetic: the fine gesso should be used for 'the first *skin* (*pelle*) next to the *Flesh* (*Carne*)'.[29]

Soldani's argument about bronze's superior mimetic capacities therefore implied that the molten bronze was cast directly into the mould's exact impression of the model. By this logic, the bronze surface, or *pelle*, seems to have touched the body, *carne*, of the marble directly through the mediation of the mould, which had touched both. While this description would have been especially appealing in symbolising the close relationship between original and copy, it downplayed particularly important stages of the lost-wax casting process.

Once the individual sections of piece-mould were removed from the model and then completely reassembled, they produced the *cavo* or *forma* into which gesso or wax was cast (*gettato* or *buttato*). In the foreground of the Carradori's illustration, a man is pouring gesso or wax into the *forma* labeled 'S', while at 'O' a *forma* of an arm has already been cast. This diagram makes it clear that individual elements of a single statue – usually arms, legs, head, and torso – were cast separately and subsequently assembled. So while the mould was rhetorically described as passively imprinting the negative form of the model, and, once cast, as reproducing 'every minute detail of the model', in reality statues were reproduced in sections and later assembled.

Period patrons were not unaware of this aspect of the process. As Wright noted in relation to the bronzes made for Lord Parker, because full-scale copies were comprised of multiple pieces, putting them together also required an understanding of the original's composition, in order to reproduce the turn of the head or position of the arms correctly. If the maker was unaware of these subtleties of the original form, the pieces could be put together incorrectly, thereby failing to capture the 'Air', as Wright termed it, of the original. For this reason, he claimed, Cipriani had obtained permission from the Grand Duke to study the originals that served as his prototypes in order to facilitate his 'exact putting the parts together'.[30]

It was with the casting of the *cavi* that Soldani and Foggini's processes of creating copies began to diverge. Foggini had cast his *cavi* in gesso. Once cast, the pieces were then assembled into a full-scale model that he, or more

likely his workshop, used as a guide for carving the marble sculpture. Foggini or his workshop probably utilised instruments to transfer the measurements of the model to the marble block mechanically. Soldani instead would have had the *cavi* cast in wax in order for them to be cast in bronze. He did not assemble the individual pieces – legs, arms, head, torso – before investing them and casting them in bronze, as is clear from the subtle yet visible joins on the legs of the Marlborough *Medici Venus* (fig. 8.7).

Early in the correspondence with Liechtenstein, Soldani identified three distinct steps in the process of making that he said were important for the facture of copies. First the moulds would be made 'with every *diligenza*' over (*sopra*) the original marble. The copies would then be 'cast in bronze with

FIGURE 8.7 Massimiliano Soldani Benzi, *Medici Venus*, 1710–1711 (detail) BRONZE, BLENHEIM PALACE, WOODSTOCK, ENGLAND. PHOTO: HANNAH WIRTA KINNEY

great mastery, and finished by my hands (*con le mie mani*)'. Soldani's insistence on the role of finishing *con le mie mani* was a claim of authorship clearly delineating his role within the workshop, which was a nexus of several specialised forms of expertise. Liechtenstein, and patrons like him, were aware that the sculptors they commissioned did not perform all of the tasks required to produce a sculpture themselves, and thus tried to specify the extent of the artist's involvement in the process by requiring his 'hand' at particular points of the process.[31]

Liechtenstein believed, as Soldani would later parrot back to him, that the exactness of copies was initially produced by the moulds made over the original, but also greatly depended upon the precise cold finishing (*rinettare*) that would ensure that the contours of the prototype, which had been exactly reproduced from the original, would not be ruined. As he wrote:

> You Sir [Soldani] must do this work yourself, because the young men in the workshop (*i Giovani*) are not capable of cleaning (*pulire*) the bronze in a way that leaves them looking soft (*morbide*) and without ruining some of the contours.[32]

This passage of the letter reveals Liechtenstein's knowledge of workshop practice, where less accomplished workshop members would do some of the finishing work on the bronze after it had been cast – first removing the refractory material and breaking away the sprues and risers that had been added to facilitate the flow of liquid bronze – before detailed work was executed by skilled craftsmen. Soldani assured the Prince, swearing on his reputation as a gentleman, 'and not a common Master (*Professore*)' that the bronze copies would be finished 'to a level of perfection (*perfezione*) comparable with the originals' and that he would complete the work himself 'with utmost attention'. His own labour would make these sculptures 'the most beautiful and singular works that there are in the world', even though they were copies and, furthermore, not the first copies.[33]

4 Flesh Made Marble Made Bronze

Of the three full-scale bronze copies that Soldani created for Liechtenstein, the *Bacchus* was completed first (fig. 8.8) When it arrived, Liechtenstein found it '*mal disegnata*' (poorly designed) and was shocked that Soldani had selected this 'ordinary' sculpture to copy when the *Galleria* was full of the 'most superb' examples of the art.[34] It is intriguing that Liechtenstein commented upon the

FIGURE 8.8 Massimiliano Soldani-Benzi, after Michelangelo, *Bacchus*, 1699–1703. Bronze with red-brown lacquer patina, 198 cm
LIECHTENSTEIN THE PRINCELY COLLECTIONS VIENNA-VADUZ, INV.-NO. SK573
PHOTO: LIECHTENSTEIN THE PRINCELY COLLECTIONS VIENNA-VADUZ / SCALA, FLORENCE

design of this figure, which would have been Michelangelo's, while Soldani's art of bronze was not critiqued. Soldani's failure, it seems, lay in selecting a model not worth copying. Soldani replied expressing his disappointment that Liechtenstein had found almost all parts of the statue flawed. He explained he had chosen to copy the *Bacchus* because he knew how much Liechtenstein had wanted a piece by Michelangelo. He had selected it in particular, because it was a well-regarded work that had been copied along with the *Medici Venus* ever since the first casts were made by Foggini, thereby suggesting that Soldani might have also been reusing moulds to produce these copies. Although the Prince was disappointed with the *Bacchus*, Soldani hoped that he would be pleased when he saw the *Medici Venus*, for he promised that it was 'delicate and soft, as if it were flesh'.[35] (Fig. 8.9)

Throughout the correspondence with Liechtenstein, Soldani continuously returned to bronze's ability to capture the appearance of flesh. This was not just a quality whose importance he emphasised in his copy of the *Medici Venus* – which, as previously mentioned, was particularly known for its fleshiness – but also in the full-length figures he proposed to make after the New Sacristy figures. He promised to finish the brawny Michelangelo bodies with all of his *diligenza*, specifically in order 'not to lose the muscles'.[36] Soldani's concentrated and precise level of finishing, which he called *diligenza*, required him to work the bronze surface of his figures extensively. He forewarned Liechtenstein that this finishing initially made the bronze shine, but that, as the lustre faded, his patron 'would discover all of the tenderness' that there was in the *Medici Venus*.[37] When the statue finally did arrive, late in 1706, Liechtenstein was content, even if the shine of the finishing was still obscuring the promised 'softness'. 'This will pass', he wrote, 'as we have seen in the statue of the Faun'.[38] (Fig. 8.10)

At several points in his correspondence with Liechtenstein, Soldani described how well he had imitated (*immitato*) the originals that served as his prototype through his *diligenza*, or the high level of attention that he gave to finishing.[39] To Soldani, imitation was not a mental process tied to *disegno*, but one materialised through his own hands. This is revealing of his conception of his own authorship, both within the workshop and in relation to his model. Often a sculptor's 'hand' was expected to create the original design model, which would later be executed by his workshop; but in case of copies – especially those made through moulds – the models already existed. The sculptor's role, then, was effectively to recreate this model through his own technical skill (*arte*). The flesh that Soldani was trying to imitate – or make even more perfect – was not flesh itself, but rather flesh that had already been mimetically formed by the ancient artist who carved the marble *Medici Venus*.

FIGURE 8.9 Massimiliano Soldani-Benzi, *Medici Venus*, 1699–1702. Bronze with red-brown lacquer patina, 158 cm
LIECHTENSTEIN THE PRINCELY COLLECTIONS VIENNA-VADUZ.
INV.-NO. SK537
PHOTO: LIECHTENSTEIN THE PRINCELY COLLECTIONS VIENNA-VADUZ / SCALA, FLORENCE

FIGURE 8.10 Massimiliano Soldani-Benzi, *Dancing faun*, 1695–1697. Bronze with red-brown lacquer patina, 138.5 cm
LIECHTENSTEIN THE PRINCELY COLLECTIONS VIENNA-VADUZ.
INV.-NO. SK541
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While there are many resonances between Soldani's description of the fleshiness of bronze with the Pygmalion myth, whereby the sculptor with 'miraculous art' (*mira feliciter arte*) carved a beautiful woman in ivory that, thanks to the intercession of the goddess Venus, became true flesh, the object of Liechtenstein's desire that was to be materialised through Soldani's mediation was not a woman, but a statue. Soldani was not meant to make his sculpture come alive as a woman, but to make his bronze come alive as the marble in all of its fleshiness.

Acknowledgements

Much of the archival research for this essay was conducted while I was a Samuel H. Kress Fellow at the Medici Archive Project in Florence, Italy under the generous mentorship of Sheila Barker and Alessio Assonitis. Additional archival and collections-based research outside Italy was supported by grants from the American Friends of Christ Church and the History of Art Department, both of the University of Oxford. I also am grateful to Geraldine A. Johnson for the many conversations we shared that allowed my ideas on this topic to mature.

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Endnotes

1 Wright 1730, 412. For the Parker commission, see Connor 1998, 2005; Zikos 2005a. Correspondence regarding the commission can be found in British Library, Stowe Ms 750, and Archivio di Stato of Florence, Carte Gallieli v, inserto 1. The archival sources complicate Wright's narrative about the commission contained in *Some observations*. For these inconsistencies, see Kinney 2017, 111–116. For the Marlborough commission, see Avery 2003, 430–436, 443–451; Avery 2005, 11–15, Ciechanowiecki & Seagrim 1973.

2 For a history of the marble *Medici Venus* and some of its reproductions, see Haskell & Penny 1981, cat. 88, 325–328.

3 Soldani to Liechtenstein, 20 April 1703, in: Lankheit 1962, doc. 674, 335: 'delicata, e morbida come fusse carne'. On the Liechtenstein commission, see Lankheit 1962, 139–148, and the transcribed correspondence on 326–338; Zikos 1996, 2005b; Götz-Mohr & Schulze 1986.

4 On the transport, see Boyer 1932, Haskell & Penny 1981, 55–56, and for a discussion of the political negotiations that enabled it, see Goldberg 1983, 227–251.

5 Baldinucci 1847, 384: 'a cagione dell'infinito numero di giovani studiosi dell'arti nostre, che e di quella patria e forestieri, del continovo vi concorreva per disegnarle, modellarle, e più di ogni altra la Venere, la cui rara bellezza esposta quivi benignamente ad utilità de'professori, era bene spesso con parole, e con gesti, da'più scorretti abusata, deliberò di torla via da quel luogo, ed a Firenze insieme coll'altre farla portare'.

6 Bencivenni 1779, note CXXXIII, 206–207: 'Una motivo di pietà concorse a far prendere a *Cosimo III* la risoluzione di ordinare che fosse condotta a *Firenze* la *Venere*, scrivendo il *Baldinucci*, che il medesimo si determinasse a torla dal luogo ove era, perchè la medesima da quei che andavano a studiarla era *ben spesso con parole, e con gesti da più scorretti abusata*. Parebbe che si fosse rinnovata sopra questa statua il fatto del giovane Ateniese, che s'innamorò del simulacro di *Gnido*'. The *Cnidian Venus* is in fact the Greek model that inspired the Roman marbles of which the *Medici Venus* is a later version (Elsner & Sharrock 1991, 155).

7 *Amores*, 15–16, translated by MacLeod.

8 Wright 1730, 407–408. On the lifelike as well as sexually enticing qualities of the sculpture as described by Grand Tourists, see Hale 1976, 47–50. For a broader overview of Grand Tourists' responses to looking at nude sculpture, see Chard 1995. On the slippage between the sculpture and the real in ancient texts about the *Cnidian Venus*, see Elsner & Sharrock 1991, 155–157.

9 A gesso and marble copy of the *Wild boar* were also made with this group (Penny & Haskell 1981, 161–163). For correspondence related to the French commission, see Alazard 1924, 134–135, 140.

10 The busts are discussed in Soldani to Liechtenstein, 11 December 1694, in: Lankheit 1962, doc. 635, 326. Later, Soldani responded to Liechtenstein concerning the effort he had expended in order to find some putti by either Algardi or the 'Fiammingo', François Duquesnoy, indicating that the Prince had requested them before the date of writing (Soldani to Liechtenstein, 22 March 1694/1695, in: Lankheit 1962, doc. 637, 327). For Soldani's descriptions of why the New Sacristy figures would not easily be translated into busts, see, for example, Soldani to Liechtenstein, 11 December 1694, in: Lankheit 1962, doc. 635, 326–327; Soldani to Liechtenstein, 31 May 1695, in: Lankheit 1962, doc. 641, 328; Soldani to Liechtenstein, 5 October 1700, in: Lankheit 1962, doc. 663, 333.

11 Liechtenstein to Soldani, 18 June 1695, in: Lankheit 1962, doc. 643, 328: 'in grandezza come si ritrova il Originale'.

12 Soldani to Liechtenstein, 9 July 1695, in: Lankheit 1962, doc. 645, 329: 'Credo bene che si troverà qualche durezza in ottener la licenza di formar dette statue, in particolare la Venere, poi che quando il Ser.mo Gran Duca la fece levar di Roma, ebbe concetto di farne far una di metallo, per collocarla dove era questa, ma fin ora non è seguito'. Confirmation of the license appears in Soldani to Liechtenstein, 30 August 1695, in: Lankheit 1962, doc. 647, 329–330.

13 Christopher Crowe to Duke of Marlborough, Livorno, 1 July 1709, BL, Add MS 61523, fols 246–247. A transcription of this letter appears in Avery 2005, 11 and Avery 2003, 435–436. The Bracci collection is also discussed in Avery 2003, 431.

14 Christopher Crowe to Duke of Marlborough, Livorno, 1 July 1709, enclosure in BL, Add MS 61523, fol. 251: 'le sei statue di marmo famose e singolari, che si ritrovano nella Tribuna della Galleria dell' A. R. del Granduca di Toscana […] le quali sono tutte alte al naturale, e volendole far di bronzo dell'istessa grandezza, bisogna formare le med[issi]me perche venghino giuste (transcr. and trans. in Avery 2003, 445–446; orig. Italian text in n. 30; see also Avery 2005, 12).

15 Jacopo Giraldi to Cosimo III, 24 January 1710, London, ASF, MdP 4234, fol. 206, first cited by Ciechanowiecki & Seagrim 1973, 180, n.5 (transcr. Avery 2003, 447–448; orig. Italian in n. 35).

16 The shipment is confirmed in a letter from Cosimo III to Elector Johann Wilhelm, 14 July 1710, in: Lankheit 1962, doc. 280, 272.

17 Vanbrugh to Marlborough, 28 April 1710, in: Lankheit 1962, doc. 339, 281.

18 The Strafford commission is discussed briefly in Avery 2005, 15 and Zikos 2005a, 27, 2005b, 173. Soldani's surprise that he had not been given the commission is expressed in an enclosure in Christopher Crowe to Lord Strafford, 14 January 1715 (transcr. Lankheit 1962, doc. 341, 282, now in in BL, Add MS 22223, fol. 11).

19 Wright 1730, 412. For the practice of composing books from letters, see Connor 1998, 27.

20 BL, Stowe MS 750, fols 395–396, George Parker to Thomas Parker, 17/6 January 1721/1722, partially transcr. Connor 1998, 26.

21 Zikos 2005a has suggested that Cipriani gained access to the moulds of the *Venus* and *Faun* as well as a set of gesso busts commissioned for Parker from Soldani. But Cipriani could also have gained access to the moulds through Foggini, worked on another set of bronzes of the 'famous Greek Statues of the Tribuna' in 1716, which ultimately ended up in the *Galleria* (F. S. Baldinucci, 'Life of G. B. Foggini', Biblioteca Nazionale di Firenze, MS. Pal. 565, CC. 164R–171V, transcr. Lankheit 1962, doc. 48, 236).

22 Warwickshire Country Record Office, CR136/B3520.

23 Liechtenstein to Soldani, 18 June 1695, in: Lankheit 1962, doc. 643, 328: 'perchè la Condotta è anche molto pericolosa, e stimiamo meglio di far fare cose buttate di Bronzo dietro di quelle cose bellissime che se ne trovano nella Galleria dell S.r. Gran Duca, perchè in questo modo le Copie vengono giusto com l'Originale, se si fa la forma sopra l'Originale stessa ma poi consiste tutto nell rinettare, e V. S. deverebbe stesso pigliarsi questa faticha, perchè i Giovani non sono Capaci di pulire in un modo, che le cose restino morbide, a che non si guasti qualche contorno'. On the difficulties of transporting sculpture in the early modern period, see also Di Dio 2005.

24 Soldani to Liechtenstein, 5 July 1695, in Lankheit 1962, doc. 644, 328–329: 'V. A. veramente a benissimo considerato, che a far le copie di marmo di queste statue, non sia bene, perchè non si può mai arrivare a copiarle con quella tenerezza, e grazia di contorni come

elle sono, e difficilissime di transporle per il pericolo di romperle; Ma formate con ogni diligenza sopra li medesimi originali, e getta di bronzo con somma maestria, e rinettate con le mie mani, crederei che V. A. S. dovesse restar contenta, e che fussero opere degne della sua Galleria'.

25 Soldani to Liechtenstein, 30 August 1695, in: Lankheit 1962, doc. 647, 329–330: 'il Bacco, il Fauno, e la Venere, cose che nel mondo sono singulari, non avendo che il Re di Francia le copie delle medesimo, ma però di Marmo, le quali non sono nè possono mai esser così giuste, come saranno queste di bronzo'.

26 Marchand's research on the history of gesso casts of sculpture reaches a similar conclusion that the most elite patrons only wanted to have full-scale copies made in bronze and not gesso (Marchand 2007). One exception is a series of gessoes made for Mary of Hungary, discussed by Cupperi 2010, 2004.

27 Vasari 1966, 97: 'e così di pezzo in pezzo la figura si forma, e la testa, le braccia, il torso e le gambe per fin all'ultima cosa, di maniera che il cavo di quella statua, cioè la forma incavata, viene improntata nel cavo con tutte le parti et ogni minima cosa che è nel modello'.

28 Definition of *formare*: 'Far forme; ed è proprio de' nostri Artefici: e fassi pigliando gesso da far presa, e ponendolo sopra alcuna cosa d'intero, o non intero rilievo, acciochè rimanga impressa la cosa formata nel medesimo gesto: e questo poi chiamano forma, o cavo; perchè le parti rilevate della cosa formata, vengono nel gesso incavate; onde ponendo in esso cavo altro gesso, o cera liquefatta (dopo avere con mistura d'olio, e sapone il detto cavo per tutto bene untato) fannosi poi altre cose simili, a quelle che si son formate' (Baldinucci 1681, 63).

29 ASR, 30 Notai Capitolini, Ufficio 32, vol. 155, *c*.6r–v: 'Convenedo che d(ett)o Girolamo sia ob(liga)to di fare la Capata del gesso p[er] d[ett]o effetto della pietra più bianca, e senza machie, e che si cocia, separatatm(en)te, e pesta che sarà si sedaccia Con un sedaccio più fino del solito, e questo gesso che sarà e più fino e più bianco debbia servire p[er] far tasselli, o sottosquadri di d[ett]e forme et anco le prime pelle vicine alla Carne' (author's trans.; transcr. Parisi 2007, doc. 2, 352–353; see also Solís *et al.*, 2007, 387–388).

30 Wright 1730, 412. For a discussion of how this contributed to Wright's description of the exactness of Cipriani's copies, see Kinney 2017, 111–116.

31 For the text of Soldani's letter, see above, n.24. On the various meanings of the expression 'di sua mano', see Spear 2002, Montagu 1989, 99–103, O'Malley 2005, 90–96. Seymore 1968 argued that, in relation to Renaissance sculpture it should be interpreted as 'cause to be done', or workshop oversight.

32 Liechtenstein to Soldani, 18 June 1695, in: Lankheit 1962, doc. 643, 328: 'ma poi consiste tutto nell rinettare, e V. S. deverebbe stesso pigliarsi questa faticha, perchè i Giovani non sono Capaci di pulire in un modo, che le cose restino morbide, a che non si guasti qualche contorno'. On 17th-century sculpture workshops, see Montagu 1989.

33 Soldani to Liechtenstein, 9 July 1695, in: Lankheit 1962, doc. 645, 329: 'assicurandola che opererò per mia reputatazione, e da Gentiluomo, e non da comun Professore [...] che io farò a perfezione come gl'originali, e saranno da me condotte alla fine con ogni attenzione, e V. A. si potrebbe pregiare d'avere le più belle e singolari opere che sieno al mondo'. Soldani was from a noble family from Montevarchi, which explains why he insisted upon his status as a gentleman; for the history of his family, see ASF, Ceramelli Papiani, fasc. 4434.

34 Liechtenstein to Soldani, 4 April 1703, in: Lankheit 1962, doc. 673, 335: 'La statua di Baccho è arrivata, ma vien iudicata tanto delli pittori come scultori per una cosa mal dissegnata, e veramenta troviamo l'istesso, che habbia un'attitudine cativa, idea pessima, e seccha,

che non potiamo maravigliarci a bastanza, che V. S., che ha così buon gusto, ha scielto di fare questa cosa tanto Ordinaria, dove nella Galleria se ne trovano altre Superbissime […] habbiamo un disapiacere, che lei non ha impiegato in una cosa meliore la Sua virtù'.

35 Soldani to Liechtenstein, 20 April 1703, in: Lankheit 1962, doc. 674, 335: 'Spero dunque che quando vedrà la Venere abbi da restare l'A.V. contenta, per esser delicata, e morbida, come fusse carne'.

36 Soldani to Liechtenstein, 20 November 1700, in: Lankheit 1962, doc. 664, 333: 'io ne sarei contento, e mi affaticherei a rinettarle con tutta la mia diligenza, per non perdere i muscoli'.

37 Soldani to Liechtenstein, 5 February 1707, in: Lankheit 1962, doc. 686, 337: 'Godo che la Venere sia stata di sua sodisfazione, e ben presto lascierà il lustro, et allora si scoprirà tutte le tenerezze che vi sono'.

38 Liechtenstein to Soldani, 4 January 1707, in Lankheit 1962, doc. 685, 337: 'siamo ben contenti, vero è, che per il gran Lustro non par tanto morbido. Ma questo passerà come ha visto nella Statua del Fauno'.

39 Soldani to Liechtenstein, 21 January 1695/6, in: Lankheit 1962, doc. 650, 330: 'Spero che V.A. sia per gradire il lavoro delle Teste […] le quali mi paiono pulite a quel segno che può arrivare l'arte, non avendo auto riguardo alcuno nè a tempo, nè a spesa per bene immitare gli originali'. Soldani to Liechtenstein, 26 November 1697, in: Lankheit 1962, doc. 656, 331: 'ho terminato la statua di bronzo del Fauno, avendo con tutta la diligenza immitato l'originale'. On the importance of *diligentia* for *mimesis* in ancient Roman art criticism, see Perry 2000.

CHAPTER 9

Anatomical Preparations and Mimetic Expertise

Anna Maerker

Modern Western medicine takes it for granted that we need to investigate the interior of the body to understand it, and that this knowledge is necessary for medicine to provide successful treatments. This focus on the body's interior raises a number of significant problems, both ethical and epistemological. Given the body's association with personhood, whose bodies should be made available for medical study, and on whose authority? What can dead bodies teach us about the living; what can animal bodies teach us about human ones? In early modern Europe, dead bodies of saints and sovereigns were imbued with power, and played a part in public processions, celebrations, and devotional practice. At the same time, the bodies of executed criminals were made available to physicians and surgeons for dissection; this privileged access distinguished the members of prestigious medical organisations. While used by medics as signs of privilege, the practice of dissection also prompted (often violent) dissent among publics, who resented the dismemberment of their loved ones. Public resistance notwithstanding, anatomists sought access to bodies in ever larger numbers, following the anatomist Andreas Vesalius's exhortation to his fellow medics that the study of anatomy was indispensable for true knowledge of the body, and that this study needed to be hands-on (fig. 9.1). In Britain, numerous private anatomy schools were founded in the second half of the eighteenth century to offer medical students opportunities for practical study with corpses. As the number of executed criminals did not satisfy demand, anatomists increasingly took to less salubrious methods for obtaining dead bodies. Body snatchers, the so-called 'resurrectionists', stole the bodies of the recently deceased, a practice which scandalised the public and led to the development of technologies such as the 'mortsafe' to keep deceased friends and family safe from dissection (fig. 9.2). To combat public anxieties while ensuring the supply of bodies for medical teaching, in 1832 the British government introduced the Anatomy Act, which permitted the use of unclaimed bodies for dissection.

But even a supply of corpses by such means did not entirely solve the practical and epistemological problems of medical education. Anatomy schools could not guarantee that the bodies obtained would match the current

 | DOI:10.1163/9789004515413_014

FIGURE 9.1 Andreas Vesalius, *De humani corporis fabrica* (1643): frontispiece
CREDIT: WELLCOME COLLECTION. PUBLIC DOMAIN MARK

FIGURE 9.2 Iron mortsafe to protect the coffin from bodysnatchers, early nineteenth century
CREDIT: SCIENCE MUSEUM, LONDON. CC BY

curriculum; pregnant women, for instance, were always highly sought after. Not every dead body was suitable to stand in for "the human body" in general, and sceptics of dissection argued that the practice of operating on dead bodies did not help budding surgeons when faced with the living. Teachers at private anatomy schools, universities and hospitals used a wide range of objects and representational techniques, ranging from blackboard drawings and illustrated textbooks to three-dimensional models, skeletons, and dry and wet preparations of body parts.[1] However, no single medium could ever fully bridge the gap between original and representation: neither images, models or preparations are ever completely identical to the thing they represent. Medical artists, modellers and anatomical preparators have to make choices about what features of the body to preserve. Wax models, for instance, are well suited to reproducing the dimensions and colours of the body, but they lack the haptic qualities of real flesh, as well as its odours. Such choices are influenced by a number of factors, from the availability and cost of materials and artisanal skills to the intended uses of the representation (e.g. visual inspection or hands-on training) and the intended audience (e.g. medical students or lay publics). The non-identity of the representation to its subject is frequently desirable – models, for instance, were often hailed as useful tools for public anatomy education because they lacked the stench of real corpses, and were thus deemed suitable to encourage lay engagement with the body. This non-identity is salient not only for models, but for preparations as well. While the use of the body itself as the basic mimetic material supports claims to authenticity, it requires much (often invisible) labour to keep the body looking like itself.[2] Some of its features are inevitably changed through the process of preservation: tissues are softened or hardened through immersion in a preservative, colours fade, shapes distort. Modern 'plastinates', preparations of human bodies made by the anatomist Gunther von Hagens since the 1970s, are marketed as embodying 'the fascination of the real', but they prioritise visual appearance, and feel more like plastic than flesh.

Both modellers and preparators, then, have to determine priorities regarding matters from coloration and haptic qualities to the expense and danger of materials (e.g. the flammability or toxicity of preservation fluids), to intended interactions (e.g. vision or touch) and audiences. Such decision-making processes may be informed by an image of the "ideal user", and ideal forms of use, which are specific to the circumstances of the modelling or preparation project – its institutional, disciplinary, or political context. However, there is a second set of problems which vexes anatomical representation: the phenomenon of users' interpretive flexibility. Anatomical representations may try to

incorporate an 'ideal user' by exhibiting features deemed particularly suitable for the intended audience, and by attempting to prescribe specific ways of interacting with the representation, e.g. labelling to facilitate memorising the names of anatomical details, or easily-opened jars to encourage physical interaction with a wet specimen.[3] Even where such choices are taken by the producers of the representation, however, users may reinterpret models and preparations in their own way, for instance by using teaching objects for decorative purposes.

This essay investigates two influential makers and users of anatomical preparations and models from the 1820s to 1840s, the brothers Robert and Frederick Knox, to investigate the practical and epistemological problems inherent in anatomical mimesis, and especially the phenomenon of interpretive flexibility. The collections created by the Knox brothers, especially their wet and dry preparations of body parts for use by medical students and medical practitioners, were celebrated as outstanding achievements in three-dimensional anatomical representation by their contemporaries. In their teaching, the Knoxes were frequently confronted with the problem of users' interpretive flexibility. They were certainly not alone in this; curators have long been aware of audiences' divergent interpretations of collections.[4] However, the case of the Knox brothers is particularly illuminating because they made explicit responses to the problem of interpretive flexibility, and paid attention to models and specimens. In cases where representations failed, in particular, it was the Knoxes who defined what counted as mimetic success, and whose expertise was necessary to achieve and attest to this success. Thus, their activities offer useful material for outlining fundamental structural features of makers' mimetic expertise with regard to the question of interpretive flexibility and the agency of users. In particular, the case illustrates that, in principle, makers could respond to mimetic failure in two different ways: by creating better representations, or better users. This chapter does not conceive of these two responses as an absolute dichotomy: arguably, measures to ensure "proper" use of anatomical representations could be framed either as an attempt to improve representations or as an attempt to improve users. The question, then, is why some practitioners chose to frame mimetic failure as either a problem of faulty representations or one of incompetent users. What does this tell us about contexts of making and use, and about the relationship between the maker and user of anatomical representations? These strategies, the chapter further argues, contribute to makers' circular articulations of professional identity: mimetic success was a sign of professional expertise, but simultaneously this expertise was necessary to determine what counted as successful mimesis. This chapter

asks how makers accounted for discrepancies between intended and actual use, how they framed solutions to this problem, and how they ascribed agency to makers and users in determining what counted as mimetic success.

1 The Knoxes: Models and Preparations in Early Nineteenth-Century Britain

The brothers Robert and Frederick Knox were well aware of the fundamental problems of anatomical representation; both engaged in the production and use of anatomical preparations and models for use in professional medical training. Today, the elder brother, Robert Knox (1791–1862), is best known for his involvement with the murdering body snatchers Burke and Hare, Knox's suppliers, who bypassed the laborious process of disinterring the dead by murdering suitable dissection subjects.[5] However, to his contemporaries, Robert (fig. 9.3) was one of the most celebrated anatomists of his day. He obtained his medical degree from the University of Edinburgh and pursued further study of anatomy in Paris. After his training, Knox the elder taught at a private anatomy school in Edinburgh, where he also built up the Museum of Comparative Anatomy for the Royal College of Surgeons. The Burke and Hare murders were only one of many controversial episodes in the life of Robert Knox, who clashed with the authorities and the medical profession over issues such as his refusal to follow the prescriptions of the Anatomy Act and his unlicensed teaching. After repeated disagreements with the medical establishment at the University of Edinburgh and facing declining student numbers at his private school, Robert left for London in 1840, where he embarked on a new career as a prolific medical writer.

The best thing about Robert Knox, contemporaries agreed, was his younger brother Frederick. Even the *Medical times*, a journal which continued to support Robert's career in the 1840s and 50s by publishing many of his articles, admitted as much in a portrait of the irascible anatomist.

> But, verily, we are oblivious – we had well nigh forgotten another pleasing feature in the character of our hero. Pardon us, Brother F, thou part and parcel of our friend Robert – we proclaim to the world thy unrivalled excellence in putting up preparations, and the tranquil amiability of thy nature.[6]

Frederick (1794–1873) had trained as a surgeon, and became his brother's assistant in 1824. In this position, he prepared human and animal specimens for the

FIGURE 9.3 Robert Knox
CREDIT: WELLCOME COLLECTION. PUBLIC DOMAIN MARK

Royal College's Museum.[7] In 1831 Frederick obtained a license for surgical practice, and in 1836 he published his only monograph, *The anatomist's instructor*. Four years later, when Robert moved to London, Frederick and his wife and children emigrated to New Zealand, where Frederick became the first public librarian in the country. In the Antipodes, he did not practise surgery, but continued to engage in anatomical and zoological research at the Wellington Philosophical Society, the Mechanics' Institute and the New Zealand Institute.

In the 1820s to 1840s, the Knox brothers produced and evaluated anatomical models and specimens for medical students and practitioners; their peers and competitors were anatomists and pathologists in the context of the flourishing medical schools of early-nineteenth-century Britain. They had to take care to distinguish themselves from contemporaneous popular shows which sensationalised the display of human bodies, both real and artificial.[8] The brothers responded to recent developments in medical research, especially the rising importance of pathological anatomy which aimed to locate disease in anatomical lesions.[9] While contemporaries perceived Frederick to be 'part and parcel' of his notorious brother, it would be misleading to assume that the siblings' position on anatomical representation was interchangeable. Robert and Frederick developed different responses to the problems of anatomical representation: improving representations or improving users. These responses also, more or less explicitly, entailed different articulations of professional expertise through mimetic success.

2 Frederick Knox and the Making of the Competent User

Frederick Knox publicised his 'unrivalled excellence' as a preparator in his only book, *The anatomist's instructor, and museum companion; being practical directions for the formation and subsequent management of anatomical museums* of 1836.[10] In the book, Knox introduced himself as 'surgeon, conservator of the Museum in Old Surgeons' Hall'; he stressed his experience with anatomical preparations, having 'dissected and displayed […] from two to three hundred preparations annually'. Frederick accorded great importance to anatomical museums for medical education: 'Without museums the profession would be in the state of man without a language'. However, he considered that at present, this language of anatomy was rather foreign to museum visitors: 'In visiting museums […] the student has hitherto derived little or no advantage; to him they are […] sealed books'.[11] Students could neither understand anatomical preparations, nor handle them properly. This incompetence was, in his

view, also common to many medical professionals. Thus he criticised an anonymous lecturer who had returned one of his wet specimens covered in dust and hairs, because 'it had been removed from the jar, handed about the class on a dirty trencher, wiped by the common door-keeper, with the cloth with which the seats of the classroom had been carefully cleaned for the preceding week! I refused to receive the preparation into the collection'. He singled out the German anatomist Friedrich Tiedemann (1781–1861) as an ideal user on account of his 'power of touch', 'the soundness and clearness of his judgment', and not least, his ability to handle the collection 'without any thing sustaining the slightest injury'.[12]

Despite these problems, Frederick considered that museums offered great potential advantages for medical research and teaching. How, then, could collections be made useful? Frederick's strategy was twofold: to prepare able makers of anatomical collections, and to prepare able users. Good practitioners of anatomical preparation, in his opinion, required both manual and intellectual skills.

> Most professions admit of being divided into what is merely mechanical and what is strictly speaking scientific; but [...] this distinction can scarcely be made in anatomy [...] Unless the conservator of a museum can himself perform every little manipulation, in addition to that which is purely scientific, the work of the museum will never thrive in his hands [...] The best directors in any undertaking [...] will be those who are themselves thoroughly acquainted with all the minutiae.[13]

For Frederick, the celebrated surgeon and anatomist John Hunter (1728–1793) was the ideal embodiment of this combination of skills, a model expert who 'injected, dissected, and finally prepared most things with his own hands' (F. Knox 1836, 6).

Despite his insistence on the importance of the curator's own manual skills, Frederick was far less dismissive of the work of 'invisible technicians' than many of his contemporaries. While he conceded that fine artists were of no use to anatomists, he suggested that stuccateurs (plasterers specialising in the sculpting of architectural ornaments) had valuable skills. He admitted that drawings had some advantages for anatomical research and teaching: they allowed the results of anatomical research to be recorded and communicated, and anatomical details to be memorised through the act of drawing. However, even the best drawings 'can never supersede the necessity of actual personal investigation'. As, in his view, 'the most useful kind of drawing to the anatomist

is the power of giving the simple but correct outline', drawings were better done by anatomists themselves, as professional artists were too concerned with 'effect' to make useful anatomical drawings.[14] However, Frederick Knox was prepared to acknowledge that artisans could be helpful to anatomical endeavours, citing his own collaborative efforts to produce plaster casts:

> Modelling with Plaster-of-Paris is very useful, [...] a great variety of objects for the museum can be represented well with this substance, and its use is very easily acquired [...] The art of modelling trenches upon that of the artist [...] I recommend the anatomist to do as I did, viz. visit the studio of the artificer in stucco.[15]

However, the utility of an anatomical collection was not based solely on the perfection of individual preparations. Frederick also highlighted the importance of collection users and the intellectual and manual skills they brought to the learning process. For him, mimetic success was a social achievement which required users' participation and communal agreement, much as elite audiences of works of art brought connoisseurship of materials to their appreciation of the mimetic success of antique sculptures.[16] In order to make museum visitors competent users of anatomical collections, they had to be educated in the techniques and problems of anatomical preparations. 'What we do not understand we take little or no interest in' – and therefore students had to learn about practices of preparation and conservation (F. Knox 1836, vi). Once a visitor was aware of the inevitable distortions introduced by different techniques, he could competently subtract these distortions to arrive at a truthful mental image of the anatomical detail in question.[17]

> My observations will [...] enable the student at once to perceive whether the preparations have really had labour bestowed on them, or are merely preserved from decomposition; and will at all times put him on his guard with respect to the inevitable changes on the colour and delicate textures caused by the modes adopted for preservation.[18]

Problems with preparations were numerous.[19] Frederick pointed out that both dry and wet preparations distorted in shape (fig. 9.4); that varnish gathered dust and prevented the turpentine saturation necessary for a specimen's protection from pests; and that wet preparations in particular suffered from discoloration, due to the extraction of blood, and the effect of alcohol on tissue. This was especially damaging in the case of early stages of inflammation, which became invisible in wet preparations. While body parts of afflicted patients

FIGURE 9.4 Robert Knox Collection, preparation of a ruptured uterus, described as 'dried and therefore considerably contracted'
CREDIT: SURGEONS' HALL MUSEUMS, THE ROYAL COLLEGE OF SURGEONS OF EDINBURGH

provided 'authentic' evidence, pathological phenomena such as inflammation were highly ephemeral and required a great deal of artifice to be preserved.

Practical considerations in the making of anatomical preparations meant that Frederick adopted different practices to respond to the particular characteristics of the material to be preserved. Throughout the *Anatomist's instructor*, Frederick was careful to highlight (F. Knox 1836, viii) that the suitability of different preparation techniques depended strongly on the type of tissue, organ or lesion to be represented, and on the intended use of the preparation. Not all 'textures admit[ted] of being preserved'. Vascular dried preparations, for instance, should only be used to show spatial relationships for surgical anatomy, and only if of high quality rather than 'an ill-prepared mummy'. Nerves should not be preserved as dried preparations at all, as 'they shrink much, and dry of a blackish colour, requiring paint, the most objectionable process which can well be devised'. True knowledge of nerves could only be obtained through dissection and 'accurate engravings' (F. Knox 1836, 38, 39). Frederick Knox's repeated insistence on the inappropriateness of paint in the preparation of nerves may well have been a dig at rival preparators who used coloured wax injections and paint to highlight details on their teaching preparations. He thus used the choice of "inappropriate" materials for the representation of the body to demarcate who counted as a knowledgeable expert.[20]

A few anatomical details however lent themselves well to preparation, as long as users understood preparation practice: 'The transition from the skin to the mucous membranes forms a most happy arrangement; and a glance at a series of well prepared preparations (*provided the knowledge of the student is of a practical nature*), is superior to all the read lectures or lengthened printed descriptions in the world'.[21] While Frederick frequently denounced the use of paint in anatomical preparation as misleading, he reckoned that artificial materials could be superior to natural ones, depending on the intended use of the preparation and the structures to be displayed. In the articulation of skeletons, for instance, natural cartilage had a tendency to shrink, and Frederick advised that it should therefore be replaced by artificial materials.

Frederick Knox repeatedly invoked the language of danger and risk to support his claims to expertise and the central role of his mimetic expertise for the success of medical teaching, and ultimately for medical/surgical practice. Manipulating dead tissue to resemble the living body entailed a great degree of knowledge and skill, and was fraught with risks. The preparator repeatedly cautioned his readers that the wrong choice of technique could have grave results in every sense. Many preparation techniques, he warned, gave false impressions of anatomical details. Such was the case for instance with injected

blood vessels: 'the enormously dilated red trunks of arteries which you see in most injected preparations are very serious objections to their use', due to the discrepancies between the living body undergoing surgery and the injected specimen; for 'the arteries, when seen in the course of operation, are of a white colour, having in general rather a collapsed appearance' (F. Knox 1836, 31). The dead body could never fully represent the living. Misleading preparations could cause serious surgical errors by giving budding practitioners a false impression of the size or coloration of the anatomical structure to be operated on and thus inviting mis-identification:

> The use of any thing requiring paint must for ever render it a most dangerous and improper material for anatomical purposes [...] its introduction into museums would very soon render all vascular preparations [...] most dangerous objects for the study of the beginner. I reckon it quite impossible that the surgeon, removed from hospitals, and, consequently, the means of practical instruction, can by any means keep up his knowledge of the anatomy of the body, and the attempt to do it by means of a few dried mummies is truly [...] laughable [...] Instead of assisting the mind, such preparations must tend to destroy the surgeon, as it is probable he will remain satisfied with their inspection; and when called upon to tie the humeral artery, for instance, which he may have punctured in phlebotomy, he will think of his preparation at home where the artery is distended to twice its natural size, and *painted*! of a bright shining vermilion colour, and with this phantom flitting before him, I could almost imagine his putting a ligature on the humerus instead of the humeral artery.[22]

At the level of anatomical research, inappropriate technique could be equally damaging, as problems with preparations could lead the practitioner to misleading observations. Frederick cited the case of apparent connections between small vessels which were in fact artefacts produced by the use of heavy mercury in injections:

> When numerous vessels are filled with the mercury [...] the weight becomes considerable, and the tunics of the vessel are ruptured: in injecting the lacteals in the mesentery, this fact has in all probability given rise to the supposition that these vessels communicate directly with veins; the mercury having been [...] found in the veins in various attempts to inject the lacteals.[23]

Thus, for Frederick Knox, anatomical representation should not follow a single method, but should respond flexibly to the characteristics of the materials and structures to be preserved. Knox acknowledged the impossibility of perfect representation, and accorded agency to the user: it was the user's task to bridge the inevitable gap between representation and object. A successful encounter between representation and user required both a suitable representation and a well-informed user, aware of the advantages and limitations of the techniques employed.

3 New Anatomical Models: Auzoux and Thibert

Around the time of the publication of Frederick Knox's *Instructor*, two influential new types of models were developed in France: the papier-mâché models of normal human anatomy by Dr Louis-Thomas-Jérôme Auzoux (1797–1880), and the casts of pathological lesions by Dr Félix Thibert (*c.*1800–*c.*1848). These new models prompted Frederick's brother Robert to articulate his position on anatomical representation as well.

Around 1820, as a medical student in Paris, Auzoux had begun to experiment with various modelling materials, and eventually developed a secret modelling paste, a mixture of paper, glue, cork and minerals which was more robust than traditional waxes, and enabled Auzoux to construct lifesize models of the human body which could be "dissected" into pieces (fig. 9.5).[24] The new models were extensively labelled, both to help users identify body parts and to guide them as to the order in which the model should be dismantled. The colour scheme adopted a compromise between naturalistic and schematic colourings; different strands of adjoining muscles, for instance, were painted in brighter and darker shades of red to facilitate their visual distinction. The new material also enabled serial production using moulds, which made the papier-mâché models considerably cheaper than waxes. Auzoux founded a factory in his home town in Normandy, and over the course of the nineteenth century he established a global customer base, exporting his models as far as Brazil, Russia, and India. At an early stage in the development of his enterprise, Auzoux took his models to Britain, which, at the height at the bodysnatching debate, seemed a likely market for anatomical models. In 1831, the French doctor travelled to London to demonstrate his models to British physicians, arguing that his products were the ideal substitute for real corpses. He received 'the most flattering marks of approbation', as well as royal approval when the King himself purchased one of the models for the recently-founded King's College London.[25]

FIGURE 9.5 Dr. Auzoux, model of the human eye
CREDIT: SCIENCE MUSEUM, LONDON. ATTRIBUTION 4.0 INTERNATIONAL (CC BY 4.0)

Auzoux's positive reception in England may have prompted his fellow model-maker Dr Félix Thibert to follow suit and display his own casts in London in the 1840s. Like Auzoux, Thibert had studied medicine in Paris. He was working as preparator for the Paris Faculty of Medicine when he began to develop models that were designed to overcome some of the fundamental problems of pathological collections, such as the fragility and mutability of specimens, and the impossibility of reproducing them for wider distribution. Perhaps inspired by Auzoux's serial productions, Thibert developed a technique which allowed him to take casts of pathological lesions, which could then be reproduced in large numbers.[26] These reliefs were cast in a paste made from a secret recipe; the colourless casts were painted and stored in book-like boxes, together with a brief case description (fig. 9.6). Thibert made use of the emerging fashion for medical encyclopaedias. His models were highly specialised products for medical professionals rather than for introductory education.[27] Copies of each lesion could be distributed and collected as a 'living encyclopaedia' (*encyclopédie vivante*) at provincial hospitals and medical schools. A commission of the

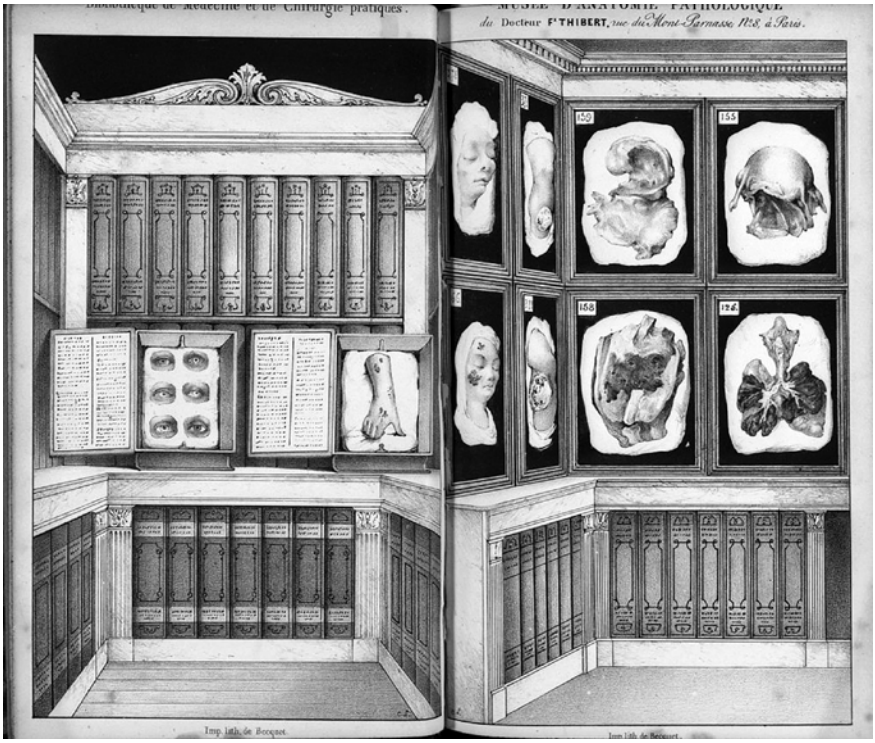

FIGURE 9.6 Félix Thibert, *Musée d'anatomie pathologique* (1844)
CREDIT: UNIVERSITY OF OXFORD. CC BY

Royal Academy of Medicine reported how Thibert's models allowed pathologists to preserve the fleeting appearance of instructive and rare pathological lesions; according to the commissioners, they combined the fidelity and accuracy of the visual appearance of wax models with the robustness and durability of stone.[28] Like Auzoux, Thibert received positive feedback from academicians and medical professionals for his new type of model, and won a prestigious Prix Monthyon from the French Academy of Sciences for his invention.[29]

4 Robert Knox and the Making of the Perfect Collection

In 1845, Felix Thibert opened a showroom of his new pathological models at the Cosmorama in Regent Street, later moving to South London's Bridge House Place (Bates 2010, 117–118). Robert Knox probably first saw his casts in London, and again on a trip to Paris in late 1845. The *encyclopédie vivante* met with his approval, and Knox wrote a report in favour of Thibert's pathological casts which the latter included in his English catalogue alongside positive reports by French academicians. In December 1845, Robert Knox attended a meeting of the Birmingham Pathological Society, where he praised the utility of Felix Thibert's anatomical relief models.[30] The following year, Thibert employed Knox to demonstrate his models to the London public. Robert Knox also expounded the merits of Thibert's models compared with other kinds of anatomical representation, especially specimens and other models, in print. In addition to a report for Thibert's English catalog, he published a two-part article in the *Medical times*. Ostensibly concerned with the state of anatomical museums and collections, the article extolled the virtues of Thibert's casts.[31]

Like his brother Frederick, Robert Knox used the language of risk and danger to heighten the stakes of mimetic success. He opened his article with his customary dramatic flourish, stressing medicine's 'unutterable importance to individual life'. Medicine was the only weapon against the old enemy disease – 'a game of chance, in which most of the human race are at one time or another engaged. The stake is not unfrequently life'. His statements, both in the article for the *Medical times* and in his report for Thibert's catalogue, were occasionally contradictory – he at once praised and denied the utility of anatomical collections; he claimed that anatomical preparations were useless, and yet he considered some structures suitable for preservation. In general, Robert shared many of his brother Frederick's opinions. Like Frederick, Robert observed that students and practitioners did not know how to use anatomical collections: 'Tables were covered with preparations, yet nothing was to be seen – if seen, nothing was understood'. However, Robert as good as admitted that such

collections might be useful under certain circumstances, for they formed 'the only certain and safe records of our science and art'. Pathological specimens were especially important for such collections, if medicine wanted to develop beyond 'mere empiricism' and conjecture. However, where Frederick had proposed that the way to make museums useful was to support both able makers and able users of preparations, Robert framed his strategy differently: he proposed a strict separation between collections according to their intended use, coupled with the creation of better anatomical representations which depended solely on the maker's own expertise.[32]

While Robert joined his brother in highlighting the many 'invisible labours' involved in anatomical preparation, for him these labours were largely wasted. This was particularly true of pathological preparations, due to their inevitable deterioration:

> Unhappily for the utility of anatomical museums, and [...] for the progress of medicine and of surgery, it has been found, after a long, painful, and expensive experience, that animal structures cannot be preserved for any length of time, retaining their original colour and general appearance, without which it is manifest that they cannot serve as records of disease.[33]

Beyond the specific problems of morbid anatomy, he listed numerous general problems with anatomical collections and specimens: distortions due to the preservation method or the optical properties of the container, fragility, and expense. The 'hardening, softening, corrugation' of wet preparations left them 'scarcely recognisable' within a few months, Robert argued (1846, 327), and 'the form of the phial distorts the structures, giving rise sometimes to ridiculous mistakes'. These mimetic problems were compounded by the damage sustained by preparations through frequent handling, the 'oppressive' expense of their maintenance, and the fact that these records of 'valuable facts' could not be circulated widely. Where models were developed to solve the problems of preservation, he argued, they only served to introduce severe problems of their own, which were strongly to be condemned. The new 'dissectible' Auzoux models, in particular, met his disapproval, 'those frightful things, called "papier mache" machines for teaching elementary human anatomy'. The 'imposture [was] so manifest', Robert asserted (1846, 307–308), that such models immediately disqualified their user as 'a monstrous quack [...] a person whose education and manners fitted solely for the pork-butcher trade; and from whom every gentleman and honest man must shrink'. In elementary anatomy collections,

bones should be the only permissible specimens. 'All other preparations are not only useless, but positively injurious' as they 'encourage indolence, and do not even show what they are intended to display', 'add to the expense of anatomical establishments, encumber the shelves of a museum, and mislead and misdirect the student'.

In his dismissal of anatomical preparations and models, Robert Knox, like his brother, differentiated between the various uses of such objects. To improve medical education and research, he suggested that anatomical collections should be strictly separated into three categories of 'elementary human anatomy and physiology', 'scientific or comparative anatomy and physiology' and 'pathological or morbid anatomy'. Each of those collections should only contain those types of objects most useful in their specific educational context. Thus, collections of normal human anatomy for elementary anatomical education in medical schools should only contain 'a few human skeletons, separate bones, sections of crania, some artery or two [...] so traced as merely to show them more distinctly, the pelvis and cranium of both sexes and all forms, the foetal skeleton at all ages, the pelvic organs and their products, a few preparations of the organs of sense'. Scientific collections of no use to practitioners, such as Daubenton's at the Paris Museum of Natural History, or John Hunter's museum, should focus exclusively on comparative anatomy, while museums of pathological anatomy for use by practitioners 'of a practical nature, [...] should be placed in hospitals as books of reference, and entrusted to the hands of practical professional men'. Like Frederick, Robert singled out John Hunter as a model practitioner, albeit for his clear demarcation of 'scientific' from teaching collections, rather than for his combination of practical and intellectual skills.[34]

Having established these general demarcations, Knox sketched his view of a good pathological representation. Such representations should be 'sufficiently exact to recal (*sic*) to the mind of the physician diseased alterations of the organs he had already seen, and exhibit to the as yet uninstructed student appearances not calculated to create false impressions' (R. Knox 1846, 307). Thus, in addition to a strict separation of normal, comparative and pathological collections, Robert Knox advocated another strategy for improving anatomical collections: the development of better anatomical representations whose accuracy would not mislead students and practitioners (this despite the fact that he had just roundly dismissed all previous efforts, including the 'failed' plaster casts made by his brother.)

In his efforts to overcome those difficulties, Robert Knox (like his brother) was perfectly happy to resort to the use of artificial materials. Wax, Robert

admitted, went some way towards representing pathological structures, but suffered from discolouration and fragility which rendered wax models 'mere toys', vulnerable to heat and dust, as well as being very expensive and impossible to replicate easily. All of these difficulties were of course overcome by the models which Knox was hired to praise: the plaster casts by Felix Thibert.

> Besides representing every form of disease, internal and external, so as greatly to resemble life, these plaster painted models are of a hard and firm material unalterable by dust or handling, or by exposure to climate. The models of Dr. Thibert are not delicate toys requiring to be sealed up under glass, and shown occasionally as varieties never to be handled. The colours are indelible [...] The expense, compared with any other mode of forming a museum, is absolutely trifling. They may be multiplied indefinitely, and thus the improvement of an art, depending most frequently on pathological discoveries, will no longer remain shut up in the museums or cabinets of the mere anatomist, or buried in the metropolis, but be extended rapidly over Britain.[35]

It would be easy to dismiss Robert's discussion of anatomical collections as an advertisement for his employer Thibert. It is surely no coincidence that his article opened with the threat of deadly diseases and closed with praise for the perfection and utility of Felix Thibert's casts of pathological lesions. However, both Robert's and Frederick's discussions were based on long practical experience with the production and use of anatomical representations, and their expertise was recognised by the medical community. The brothers shared some important positions: both acknowledged the labour and complexity in making and using anatomical representations, especially those in three dimensions. Both provided insights into the many problems of anatomical representations, from the loss of colour and shape to the distortions introduced by glass vessels and even the threat of pests and incompetent users. Both contended that the choice of appropriate methods and materials were the markers of true mimetic expertise. But on one crucial point Frederick and Robert diverged: in the way they framed their responses to the impossibility of perfect anatomical representation. Frederick resorted to educating and disciplining both users and makers, making the skill of the preparator visible in order to enable preparation users mentally to subtract distortions caused by preservation. Thus, he accorded crucial agency to the users of models and specimens: they had to bridge the inevitable gap between original and representation. No amount of expertise on the part of the maker alone could ensure mimetic success. Robert, on the other hand, searched for an answer to the problem not with users, but

with the objects themselves, and continued the quest for better representations. For him, the expertise of the maker alone was paramount for making anatomical representations useful.

5 Conclusion

A wide range of factors determined what counted as mimetic success in anatomy and pathology. Makers of three-dimensional representations, whether models or preparations, had to make choices concerning the objects' features and modes of display. These choices were shaped by visual conventions, intended uses and visions of the 'ideal user', but also, crucially, by the material features of models and specimens. The difference between original and representation could be both an advantage and a disadvantage – wax models, for instance, lacked the smell of the corpse, but also its haptic qualities. Techniques had to be tailored to the qualities of different tissues. The materiality of models and preparations also raised pragmatic concerns, such as the expense of production and maintenance, and the availability of local artisanal skills.

No representation was fully determined by makers' choices, however. The teaching practices of the Knox brothers were confronted with (potentially fatal) misinterpretations of preparations by medical students and practitioners. Actors framed their responses to this problem either as attempts to improve users or to improve representations. Frederick Knox framed his response to the problematic use of anatomical representations as a question of improving both makers' and users' skills. His solution to the problem of inevitable distortions in the process of preservation was to make visible the craft of preservation in order to allow visitors mentally to subtract the distortions introduced by the process of preservation and preparation. Thus he imagined the expert anatomist as a person who combined intellectual and manual skills, and the ideal user as a person who at least to some degree shared the same skills and had a measure of agency. By contrast, Robert Knox claimed that the utility of anatomical collections was based on improving representations. For him, however, criteria of perfection were dependent on the context of the collection as a whole. Here he distinguished three different contexts of use: normal anatomy, comparative anatomy and pathology, and he advocated different mimetic techniques and materials for each of them. Robert claimed that expert judgement was necessary in order to achieve the correct and clear separation of the three kinds of collections, and he did not consider it necessary to make this judgement visible to users. Yet he did not endorse complete autodidacticism.

In elementary anatomical education, a teacher's demonstrations of the dead body were indispensable. Even if Thibert's pathological models achieved a high degree of perfection, they were only useful to trained practitioners. For both Knoxes, mimetic success was a context-dependent, historically contingent, and communal accomplishment. Where they differed was over the question of who was accorded mimetic expertise, and how.

Learning with anatomical representations was fundamentally an interaction between the object and the user, and thus interpretive flexibility could be framed as either a problem with the object, or a problem with the user. This does not imply that historical responses to problems of interpretive flexibility should be categorically divided into improving users or improving representations. Measures taken to ensure appropriate reception and use of anatomical representations can be interpreted either way. For instance, the addition of labels to models could be understood either as an attempt to improve the models, or as an attempt to discipline users. The question for the historian, then, is not merely to ask whether makers aimed to make better users or better representations. Rather, the question is: What sort of work does it do for makers to frame their representational strategies as an improvement of users or representations? Why do historical actors make this distinction, and what are the potential consequences for their articulation of their own role, and their relationship to users? How do makers perceive and articulate the materiality of anatomical representations, how do they understand the role of materials for making models work? These larger issues – materiality, interpretive flexibility, and the relationship between makers and users – offer overarching analytical foci to establish broader accounts of the history of three-dimensional anatomical representations.

Acknowledgements

I am grateful to the editors, Liz Hallam, Mechthild Fend, Sam Alberti, and Simon Werrett for their thoughtful feedback and suggestions.

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Endnotes

1 On the visual culture of 19th-century medical and biological education, see, e.g., Alberti 2011, Berkowitz 2011, Anderson & Dietrich 2012.

2 Rheinberger 2010, especially chap. 12.

3 Knoeff *et al.* 2013; Huistra 2019.

4 See e.g. Alberti 2007.

5 For the life of Robert Knox see most recently Bates 2010; also Lonsdale 1870 and Rae 1964.

6 Anonymous 1840, 225.

7 Little is known about the life of Frederick Knox. The present brief account is based on Beasley 2001 and Kaufman 2001. On the material culture of Edinburgh anatomy, see Kemp & Patrizio 2006.

8 Altick 1978; Lightman 2007.

9 On the rise of pathological anatomy, see Maulitz 2002.

10 F. Knox 1836. Positive reviews of the book appeared quickly, e.g. in *Medico-chirurgical review*, vol. 25 (1836), 408–427; *London medical gazette* 18 (1836), 738–739.

11 F. Knox 1836, frontispiece, v, vii, 2, 3.

12 F. Knox 1836, 13, 137.

13 F. Knox 1836, vii.

14 F. Knox 1836, 133, see also 136.

15 F. Knox 1836, 138.

16 See Kinney in this volume.

17 Similarly, 19th-century astronomers developed 'personal equations' to subtract systematic errors from their observations. See Schaffer 1988; Hoffmann 2007.

18 F. Knox 1836, viii.

19 For similar technical problems of preservation in fish, see the contribution by Rijks in this volume.
20 For this work of demarcation, see also Spary 2003.
21 F. Knox 1836, 112 (author's emphasis).
22 F. Knox 1836, 40–41.
23 F. Knox 1836, 32.
24 Auzoux 1858, v. For Auzoux's models, see, e.g., Olszewski 2009.
25 Anonymous 1832a, anonymous 1832b.
26 On the concept of 'mechanical objectivity', see Daston & Galison 2007 and the contribution by Henning, this volume.
27 For the use of three-dimensional models to capture new research findings as a form of 'plastic publishing', see Hopwood 2004.
28 *Rapport* of 1839, reproduced in Thibert n.d., 289.
29 Thibert n.d.
30 Lonsdale 1870, 341–342.
31 Thibert n.d., 26–43; R. Knox 1846.
32 R. Knox 1846, 307–309.
33 R. Knox 1846, 307.
34 R. Knox 1846, 307.
35 R. Knox 1846, 328.

CHAPTER 10

The Fleshiness of Wax

Pietro Conte

This essay deals with hyperrealism and its materials from the perspective of aesthetics, meant both as the philosophy of perception and as the theory of art. It unfolds in four sections. First, I introduce the theoretical reasons lying behind the age-old banishment of hyperrealistic pictures from the realm of so-called "high" art. Adopting a phenomenological approach, I investigate why hyperrealism has been (and quite often still is) considered as *a priori* non-artistic. In the second part, I focus instead on Edgar Degas's *Little dancer aged fourteen* (1878–1881) in order to show how hyperrealism (or, more precisely, a certain kind of hyperrealism) could and should be regarded as a fully legitimate form of art. Finally, in the third and fourth sections, I provide two paradigmatic examples of the use of hyperrealistic sculptures in contemporary art, so as to address the question of why they have been granted access to museums and art galleries all over the world, whereas ordinary wax figures *à la* Madame Tussaud's – although materially indistinguishable from their much more appreciated counterparts – have not. The overarching goal of the essay is, therefore, twofold: to offer a historical-theoretical account of the equating, within the frame of traditional normative aesthetics, of hyperrealism with a merely passive, mechanical duplication of reality; and to provide a way to escape criticism of hyperrealism *qua* art form, by admitting the possibility of a seemingly paradoxical "original copy".

1 The Phenomenologist at the Wax Museum

In his 1911 *History of portraiture in wax*, which should still be considered as the standard work on hyperrealism (that is, a kind of art which tends towards a perfect overlapping between images and reality), the Austrian art historian Julius von Schlosser (1866–1938) predicted that the invention of photography would rapidly extinguish 'the last flickering pulse' of the centuries-old tradition of ceroplastics. Schlosser's requiem was based on the conviction that the need for a 'faithful,' 'living' and 'true' picture of the subjects portrayed was satisfied better by photographs than by the old-fashioned, far more expensive,

and hard-to-accomplish wax sculptures.[1] However, Schlosser's assumption has proven historically wrong. In point of fact, not only are traditional cabinets of wax figures still very popular, but recent decades have also witnessed an ever-growing production and circulation of fine art hyperrealistic sculptures all over the world, from the United States to Europe, China, Japan and Australia. Artists such as Paul Thek, Bruce Nauman, and, more recently, Vanessa Beecroft, Maurizio Cattelan, Ron Mueck, John De Andrea, Duane Hanson, and Peng Yu have taken advantage of the physical properties of some particular materials (from traditional wax to the more "technological" silicone, fiberglass, and polyester resin) to create images which so closely resemble their models that they can easily be mistaken for the models themselves. Yet a crucial question remains as to whether (and how) hyperrealistic images can access the realm of art, and this is not a historical and empirical, but rather a theoretical question – one concerning the *principles* by which an object should be regarded and defined as a work of art.

This question was repeatedly addressed by the German philosopher Edmund Husserl (1859–1938). In the very same period in which Schlosser was working on his masterpiece, the founder of the phenomenological movement delivered a series of academic lectures on hyperrealism and the possibility it held out of being deceived by pictures resembling real things or persons to the point that it becomes (almost) impossible to discern them from the originals. Although both scholars shared a common theme, their vantage points were quite different. Schlosser's purpose was to offer an *historical* survey of the evolution of hyperrealistic wax sculpture over the centuries, whereas Husserl's main interest lay in sketching out a *theoretical* model for understanding hyperrealism *tout court* from the perspective of philosophical aesthetics: his research focussed primarily on philosophy of perception, and only secondarily on art issues.

Husserl explored the case of wax figures as a classic example of the extremely problematic distinction between perception (*Wahrnehmung*) and pictorial consciousness (*Bildbewusstsein*). He began by recalling a day at the end of the 1870s when, while still a student, he went to visit Castan's Panopticon, one of the most famous wax museums of the time: 'I remember the scene at the waxworks in Berlin: How startled I was when the all-too-amiable "lady" on the staircase beckoned to me. But how, after somewhat regaining my composure, I suddenly recognized that this was a mannequin calculated to deceive me'.[2]

This anecdote should not be underestimated, for it constantly recurs as a veritable *leitmotif* of Husserl's works, both published and unpublished.[3] To summarise some salient points of Husserl's argument in brief, perception is

an act in which something objective appears as present (*gegenwärtig*) and is taken to be actual (*wirklich*): the perceived object appears 'so to say in person, as present in itself.'[4] By contrast, in pictorial consciousness 'although the object itself appears, [...] it does not appear as present. It is only presentified (*vergegenwärtigt*)': it is *as if* it were there, but only as if, for it appears not immediately in itself, but only indirectly through a medium, that is, through the mediation of an image. Husserl provides the following example: 'A photograph lies before us, representing a child. How does it do so? In the first instance, by sketching a picture that resembles the child overall, but that differs from it very markedly in respect of the child's apparent height, colouring and so on (Husserl 1904–1905, 18, 20).

Pictorial consciousness – that is, the consciousness of being confronted with a picture – can only arise if we are able to distinguish between what Husserl (1904–1905, 22) calls the 'pictorial object' (the *representing* object: the depicted child) on the one side, and the 'picture subject' (the *represented* object: the child in flesh and blood) on the other side. The differences between the picture and its referent may certainly vary a great deal, but they must always be noticeable, however small they may be: 'an awareness of difference must exist [...] The object that appears does not stand in its own right, but as a representative of another object which is identical or similar to it'. It is a matter of similarity: pictorial consciousness involves representation by means of resemblance – it is a consciousness of resemblance, not of identity. This means that the picture has to be immediately perceived *as a picture*, that is to say, as a picture-of something else which, instead, is not a picture but a real thing or person. Husserl's position (1904–1904, 32) is unequivocal: 'If a conscious relationship with the depicted thing is not present in a picture, then it is not even a picture'. In this sentence, one must emphasise that '*conscious* relation': we must always be clearly aware that what is at stake is a relationship of similarity, not of identity.

Yet what happens if a picture does not allow the beholder to distinguish clearly between representing object and represented subject? In other words: what about hyperrealistic images? Back to the "lady" of Castan's Panopticon: when looking at a wax figure, it is hard to realise, at least at first glance, that it is not a real human being. Phenomenologically, as long as we take it for an individual in flesh and blood, we have a fully ordinary perception, furnished with normal belief, even if it subsequently proves to be mistaken. When we suddenly become aware of having been deceived, pictorial consciousness arises, and we look at the wax figure as what it ontologically is, namely, a puppet. Even then, however, pictorial consciousness does not succeed in lasting, for a wax figure so closely resembles the real human being that perceptual consciousness momentarily prevails again and again:

> Wax figures [...] present perceptual appearances of people so well cloaked by representation that the instances of difference are unable to generate a clean and clear awareness of difference, that is, a secure pictorial consciousness. Pictorial consciousness, however, is the essential foundation for the possibility of aesthetic feeling in fine art. No picture, no fine art. And the picture must be *clearly* distinct from reality; that is, distinct in a purely intuitive way, without the aid of indirect thoughts. We are to be lifted up, away from empirical reality and into the equally intuitive world of representativeness (*Bildlichkeit*). Aesthetic semblance (*Schein*) is not the deception of the senses (*Sinnentrug*). [...] Aesthetic enjoyment is founded on a peaceful and clear awareness of representativeness. Aesthetic effects are not fairground effects.[5]

Here is where the phenomenological analysis of deception proves to be crucial for aesthetics not only as the theory of perception, but also as the theory of art. Husserl provides one of the clearest explanations ever given of the theoretical reasons underlying the long-established relegation of illusionistic likenesses (and their materials, too) outside the domain of "high" art, into the "lower" sphere of crafts and merely technical virtuosity. The course of argument seems faultless: on the most basic level, talking about art means talking about pictures; pictures must clearly exhibit their representational character; hyperrealistic pictures do not, so they are not, properly speaking, pictures, and therefore they cannot even be considered art. Any excessive similarity between the world of the image and the real world seems to obscure the 'unreality' of the image itself: as Husserl clearly states, in front of a wax figure 'we indeed *know* that it is a semblance but we cannot help ourselves – we *see* a human being'.[6]

Husserl was far from being alone in regarding hyperrealism as incompatible with art. Trying to explain why extremely lifelike pictures violate any aesthetic requirements and cannot be considered genuine works of art, Arthur Schopenhauer (1788–1860) had already argued that they produce 'the illusion of having before us the thing itself':

> Instead of having the true work of art that leads us away from what exists only once and never again, i.e. the individual, to what always exists an infinite number of times, in an infinite number of individuals, i.e. the mere form or Idea, we have the wax figure giving us apparently the individual himself and hence that which exists only once and never again, yet without that which lends value to such a fleeting existence, that is, without life. Therefore the wax figure causes us to shudder, since its effect is like that of a stiff corpse.[7]

Mutatis mutandis, this is the same position held by Immanuel Kant (1724–1804) in his *Critique of Judgement*. After entitling the 45th paragraph 'Fine art is an art, so far as it has at the same time the appearance of being nature', he took care immediately to clarify this statement – which could be read as a defence (or even a praise) of hyperrealism – by pointing out that art must appear as nature *only to a certain point*: 'Art can only be termed beautiful where we are *conscious* of its being art, while yet it has the appearance of nature. We must be able to look upon fine art as nature, although we recognize it to be art'.[8] Once again, the emphasis is on the fact that the beholders must be able to recognise the image *as an image*: they must be fully aware of the pictorial nature of what they are looking at.

To sum up: following Kant's, Schopenhauer's, and Husserl's arguments, one might conclude that 'hyperrealistic art' is no more than an oxymoron, for hyperrealism and art simply do not mix. There is a 'but', however. Husserl visited Castan's Panopticon at the end of the 1870s. Just a few years later, in 1881, Edgar Degas presented his famous *Little dancer aged fourteen* at the sixth Impressionist exhibition in Paris. Dressed in a real bodice, tutu, and ballet slippers, and fitted out with genuine hair, this hyperrealistic sculpture was fated to overturn the traditional idea of art.

2 'But for Heaven's Sake – Not Inside a Museum of Art!'

While Degas created many sculptures during his lifetime, *Little dancer* was the only one he ever exhibited. It is universally regarded as one of the most complete manifestations of nineteenth-century theories of realism, which demanded that art should faithfully depict modern life in all its multifarious aspects, including those generally considered ugly, obscene, or simply unaesthetic. Yet far less attention has been paid to two facts.

First, *Little dancer* was made out of wax, the material of hyperrealism *par excellence*. Many bronze casts made from it are exhibited in different museums all around the world, but the original, which can still be admired at the Washington National Gallery, where it forms part of the Mellon collection, is indeed a wax figure. Making a sculpture out of stone, wood, or metal idealises the subject portrayed, leaving no doubt as to the iconic nature of the depiction. By contrast, making a sculpture out of wax is more disturbingly naturalistic, as it forces an encounter with an organic material strictly related to flesh and blood.[9] In *Rhapsody, or additions to the Letter on sentiments* (1761), Moses Mendelssohn (1729–1786) for instance explicitly maintained that 'the

difference between the material of the imitation and the material of nature, the marble and the canvas are the most obvious sensed features which, without damaging the art, call the attention back from the illusion whenever necessary. Because of this, one also sees why the closer that painted statues come to nature, the more unpleasant they are. [...] Life-size and fully clothed wax figures leave an impression that is quite disgusting'.[10]

It is therefore hardly surprising that, when Degas first exhibited his sculpture, some critics argued that it reminded them, simply and vulgarly, of the uncanny practices of taxidermy: as Henri Trianon put it harshly, one should 'bring it into a museum of zoology, anthropology, or even physiology, but for Heaven's sake – not inside a museum of art!'[11] The reasons behind this and other similar polemical attacks can be traced back to the centuries-old connection between wax and the tradition of anatomical modelling.[12] In the eighteenth and nineteenth centuries – the golden age of wax medical anatomies – wax was mainly regarded as the quintessential stand-in for human flesh. From the famous, highly idealised 'Venuses' and *écorchés* to the far more individualised *moulages*, wax had become the material for a very specific genre of lifelikeness, aimed at mechanical fidelity to reality and 'noninterventionist objectivity' (Daston & Galison 2007, 123–187). Regardless of whether they were actually cast from life or not, hyperrealistic figures in general were immediately associated with mechanical processes that seem to invalidate *a priori* any aesthetic claim. The detractors of hyperrealism could ceaselessly refer, as a paradigmatic example, to the criticism formulated by Denis Diderot:

> I have been told about a sculptors' trick. Do you know what they do? They take plaster moulds of a model's feet, hands, and shoulders. By filling these moulds, casts are made that they subsequently use in their compositions just as they are. This is an easy way to approach the truth of nature; yet it must no longer be regarded as the merit of a skilful sculptor, but rather of an ordinary smelter.[13]

However, despite all the above criticisms, the fact remains that Degas's *Little dancer* was shown in an *art* exhibition, and that it is still regarded as one of the most radical innovations in the whole history of sculpture. It opened a new way of looking at artistic practices, a way in which hyperrealism and art are not (or at least not necessarily) opposites. The second point one should focus on leads in the very same direction. The fact, which is definitely not as well known as it deserves to be, is that the story of the exhibition of *Little dancer* is quite an enigmatic one. The sculpture was already largely finished by the end

of March 1880, and Degas had announced it for the fifth Impressionist exhibition of that year. Yet the show opened without it. A glass case was placed in one of the museum halls, as if the sculpture's arrival were imminent; but then the show closed with that case still empty. A year later, in 1881, history seemed to be repeating itself. *Little dancer* was announced for the sixth Impressionist exhibition, the empty case was set up again, and again it remained empty, even if this time only for a while. Although it was not immediately exhibited, the wax sculpture did finally arrive to fill that showcase, but it only did so several days after the exhibition's opening.

Why Degas decided to wait for so long before unveiling his work is still (and, presumably, will remain) a matter of debate, but one should assume that there were not so much *technical* as *theoretical* reasons. In fact, even if the sculpture, as is well known, was clearly inspired by the physical appearance of the young dancer Marie-Geneviève van Goethem, Degas's work cannot be regarded – and this is crucial – as a mere replica of its model. As many critics pointed out, Degas did not intend to create a copy of the real-life ballerina: on the contrary, he meant to transfigure her symbolically into what Paul Mantz called a 'flower of precocious depravity', with a face 'marked by the promise of every vice' and bearing the signs of alleged 'atavistic criminal tendencies'.[14] At that time in Paris, dancers had a bad reputation, and their profession was all but risk-free: recruited from the humblest classes, those very young artists were often engaged as escorts prepared (or rather forced) to give themselves to wealthy clients as soon as the shows were over. It is thus no coincidence that Degas exhibited his *Little dancer* next to two pastels sharing the title *Criminal physiognomy* (*Physionomie de criminels*): the 'natural born prostitute' was the perfect complement to those 'natural born killers' who would shortly afterwards be at the core of Cesare Lombroso's notorious study of physiognomic attributes.[15] In 1892 – just one year after the public exhibition of *Little dancer* – Lombroso (1835–1909) opened the Museum of Criminal Anthropology in Turin, where he collected, among other specimens, hyperrealistic wax replicas of the heads of 'madmen and criminals'. Lombroso's biological determinism was based on the presumption that criminality was an inherited trait, revealing itself in a person's visible features. By seeking to isolate the 'natural born criminal' as a deviant type of human being, the founder of the Italian school of anthropological and positivist criminology focussed on the face as a tell-tale mirror of the self, convinced as he was that the physical features could provide access to personality traits and, therefore, indicate whether an individual was prone to crime or madness. Through comparison of many facial characteristics, Lombroso meant to reveal the criminal types underlying them. Thus, the wax heads hosted in his museum are to be regarded as a hybrid form of anatomical modelling: on the one side, they strove (like *moulages*) for maximum

adherence to the strictly individual physiognomies, while on the other side they were supposed to be (like wax "Venuses") representatives of general human categories. Paradoxically enough, in Lombroso's museum individuals turned into types.

In addition to all this, it should be pointed out that *Little dancer* raised not only moral and social, but also and foremost *aesthetic* issues. Degas took advantage of hyperrealism to make the boundaries between reality and image blur dangerously, yet without prejudicing the artistic value of his "creature". On the contrary, it was precisely that provocative blurring which ultimately gave *Little dancer* its artistic status. Under the (dis)guise of an extremely realistic work, Degas's wax figure led to a deep resemanticisation of realism itself, thus confirming once more that, for art to be art, it must not aim at mere imitation, even if it seems to aspire to nothing more than the maximum degree of lifelikeness and mimetic adherence to reality.

When framed in this context – a context in which hyperrealism *can* indeed be considered as a legitimate form of art – even the empty showcase proves to be significant. Far from being just an expedient to create suspense, it marked an astonishing turning point in the history of art, a change which at that time remained essentially unappreciated, but was nevertheless fated to make history. For the very first time, that empty glass case suggested that whatever were put inside it – no matter *what kind* of object it turned out to be – was to be regarded as art, just because the artist chose to put it there. Duchamp and his *Fountain* were still a long way off, but what Degas did with the showcase of *Little dancer* can be interpreted, from this perspective, as a starting point for ontological discussions on the nature and definition of the work of art that would come to be at the core of readymade theories such as the one elaborated by Arthur Danto (1981).

Thus, among its many merits, Degas's *Little dancer* had one in particular, namely that of legitimising hyperrealism as a form of art. Not hyperrealism *tout court*, though: not Madame Tussaud's hyperrealism, but a kind of hyperrealism which does not aim at the trivial reproduction of reality. Since Degas, the fundamental question has no longer been whether or not there could be such a thing as hyperrealistic art, but rather how artistic hyperrealism is to be distinguished from non-artistic hyperrealism. Let's take a couple of examples from contemporary art.

3 Lynching in the City Centre

Milan, 6 May 2004. It is a nice breezy spring evening in Piazza XXIV maggio. The sun has already gone down, but one person is not yet asleep. A middle-aged

man armed with a ladder and a cutter draws near to the centuries-old oak that stands out in the middle of the urban landscape. He stops at the foot of the tree, glances up and sees them: three children, hanging, a slipknot around their necks, eyes wide open, and a fixed, empty gaze. Heedless of the guards watching over the horrific scene, he climbs up and calmly, methodically, begins to release those lifeless bodies by cutting the ropes that keep them hanging. Down comes the first child, down the second, but the third is out of reach, so that he needs to proceed cautiously. Suddenly the branch flexes, unexpectedly bends, and breaks; the man falls down and lies hurt upon the ground, surrounded by a curious crowd growing larger and larger until the ambulance rushes him to the emergency room (fig. 10.1).

This is the story of a bricklayer and an artwork by Maurizio Cattelan. Not real children, but simple dummies dressed in jeans and T-shirts, with bare and soiled feet. Cattelan's installation immediately raises a great clamour, eliciting contrasting reactions: to those thinking that it is just a provocative, grim marketing strategy, primarily conceived for maximum exposure, others immediately reply that art is art, and it neither can nor should be afraid of appearing unseemly, scandalous, or even degenerate. Asked for his own view, Cattelan declares that his purpose was to focus on childhood, and on the violence to which too many children are exposed worldwide. Indeed, the work stages a radical and extremely problematic reversal of the ordinary power relations between adults and children, making the kids, for once, look down on the adults, not only from a physical but also from a moral point of view:

> They look like real children watching down on us, like three judges or prophets. There's something judgemental in their gaze. This is a condition which we have forced children to be in, and now, from that position, children look at us and tell us what we are doing to ourselves, to our future, to our vision of tomorrow. My artwork is about the way we are handling our dreams.[16]

Above and beyond any discussion of the different interpretations of the art installation offered by the artist, critics, or simple passersby, what truly stuns is that apparently trivial statement: 'They look like real children'. This is the key point from which one must start in order first to approach, and then to acclaim, contest, or just ignore Cattelan's artwork. This was perfectly understood by Franco De Benedetto himself, the "saviour" of the puppets, who after recovering declared: 'I did not expect all this clamour about my action, I definitely did not do it for glory. You haven't been there, under those children's gaze. It hurt you, it looked so real'.[17] By making the beholder doubt the possibility of

FIGURE 10.1 Maurizio Cattelan, *Untitled* (2004). Resin, fiberglass, synthetic hair, clothing and rope
MILAN, PIAZZA XXIV MAGGIO
PHOTO: ATTILIO MARANZANO
COURTESY MAURIZIO CATTELAN'S ARCHIVE

finding any difference whatsoever between appearance and reality, Cattelan's hyperrealistic dummies undermined the idea of 'representation' itself, suggesting that those puppets were not "just puppets", that is to say mere objects: what was really at stake were the originals, the models themselves – the children of flesh and blood.

We are dealing here with the 'indecisive nature of the boundaries between the artistic and the living' discussed by José Ortega y Gasset (1883–1955), and it is no coincidence that Stefano Civardi, the public attorney assigned to prosecute De Benedetto for aggravated damage, felt the urge to ask for an expert appraisal, so as to ascertain whether or not the three puppets could be numbered among the 'things of historic and artistic interest' protected by the Italian penal code.[18] The outcome of the evaluation was fairly predictable: the experts declared that the installation, however disturbing, must be considered genuine art. In fact, a few months later, one of Cattelan's children reappeared – this time hanging from a flagpole – in Seville's Biennial of Contemporary Art, before eventually being sold by Christie's for £900,000.

Yet these pieces of evidence were not enough. Some continued to argue that provocativeness was not sufficient to turn simple objects into works of art. As Carla De Albertis, a member of the former Italian conservative party 'Alleanza Nazionale,' summed up during an intervention at the town council meeting of 10 May 2004, 'no clue was given about these puppets being virtual, so that you would think they were real people. There was no information about the purpose of the installation, not the least bit, and this is unfair and inappropriate'.[19] Besides the ethical-axiological judgement about the alleged 'unfairness' and 'inappropriateness' of hanging those children in the city centre, the theoretical core of this kind of criticism once again concerns the lack of clearness about the artistic nature of Cattelan's work. If the artwork mingles with a real object, the risk of being unable to distinguish its fictional nature becomes too high. Of course, Duchamp's *Fountain* was nothing but a trivial daily object, but what made it unique was its decontextualisation: placing it inside a museum was an operation of physical as well as semantic transfer – a *trans-fert*, a metaphor. But it is quite a different matter with Cattelan's children: they were hanging in the middle of the street, forcing all passers-by (including real children) to an unavoidable and therefore violent exercise of voyeurism.

Here is one of the main arguments deployed by the critics of the installation, starting with De Benedetto himself: 'Instead of putting those puppets in a public square for everyone to see, Cattelan could have displayed them in a museum. There you pay to get inside, you *choose* to go'.[20] Equally important, however, was the artist's reply during an interview for the *Guardian*. After admitting that he was purposely trying to elicit strong responses, Cattelan

pointed out that 'it was very important that this work was exhibited outside. But that is why people found it so unbearable. Safely inside a museum, it would have been a huge success'.[21] Only located in an incongruous place not specifically intended to host works of art could those hanging dummies accomplish their task:

> I was aware that someone could be offended by my artwork. The audience is made of several stories, every single person carries his own. This morning I was listening to the passers-by's remarks: someone was arguing that the installation was 'a work against war,' someone else that it was made to symbolise the need 'to protect the trees.' There were also those who, outraged, shouted out: 'We support life, not death!' If I could gather these comments all together, I would say *they* are the artwork.[22]

This is a crucial statement, for it clarifies that Cattelan's work consists not only of the installation itself, but also and foremost of the reactions elicited in the beholders – in *any* beholder, from connoisseur to unaware passer-by. Those children can affect or shock us, make us pensive or simply irritate us, but one thing holds certainly true: they question us, they concern us, they provoke us, thus demonstrating that images possess the power to make us act and react. Surfing the internet, one can find comments such as this:

> Cattelan's work is definitively a successful experiment. That is what happens when children's terror comes right to your doorstep, instead of remaining confined to Uganda or Sudan, Iraq or Palestine. However, those children hanging from the tree were nothing but puppets. It is sad to think that, for so many real children living in the very same condition, there are so few people willing to climb on the tree and cut the rope.[23]

Everything correct, everything embraceable, except for one small detail: those children *were* certainly 'nothing but puppets', but they were nevertheless *perceived* as if they were real human beings. And this mismatch between ontology and phenomenology, between 'being' and 'perception', changed the whole game.

Finally, what is the difference between this work and a figure in an ordinary wax museum? From a material and technical point of view, the answer is quite simple: nothing at all. *Nothing* differentiates them: the same ability to imitate, the same skill in rendering the details, the same power in recreating the flesh. On the contrary, if we look at the semantic level of hyperrealistic works of art, we have to admit that we are faced with something very different

from Madame Tussaud's wax figures. The statues in a wax museum aim only at imitating a real person, object, or scene as closely as possible: theirs is a *superficial* task. By contrast, in order to make art, technical ability is not enough. One could say that, among the many different meanings that could be attributed to the three hanging children, there was also an ironic, yet no less crucial, questioning of the relationship between Tussaud's realism on the one hand, and artistic realism on the other. Cattelan's work was first and foremost aimed at finding a way to make copies (even in the humblest sense of the word, as mechanical, almost automatic reproductions) original and artistic. His dummies challenged the beholder to find the difference between image and reality on the one hand, and between craft and "high" art on the other. In conclusion, one could say that Cattelan's artwork was transgressive in the most literal sense of the word: it aimed at *trans-gredi*, that is, at 'over-stepping' the traditionally well-established boundaries separating art from non-art, reality from image, illusion from perception. And it is precisely this transgression which makes his wax figures far more significant than those of Tussaud's.

4 Who Is He Really?

A second, paradigmatic example of how it is possible to take advantage of hyperrealism to produce genuine works of art has been provided by Gavin Turk's *Che*, a lifesize sculpture in multicolored wax, which makes lifelikeness its most flagrant feature (fig. 10.2). It is tempting to consider this sculpture, hardly distinguishable from an ordinary wax figure such as one might expect to find in a Panopticon, as the all-too-jaded repetition of Duchampian readymades. Should we really regard *Che* as a work of art simply because it has been placed on a pedestal inside a glass case inside a museum?

Let us look more closely. At first glance, the face seems nothing more than a three-dimensional transposition of the well-known photograph taken by Alberto Korda in 1960, which went viral in the stylised version adapted in 1967 by Irish artist Jim Fitzpatrick, and shortly thereafter was celebrated in a 1968 painting attributed to Andy Warhol.[24] Upon closer inspection, however, we find a self-portrait of Turk himself. And what of that curious cowboy pose? This too seems familiar, as if we had already seen it countless times; and indeed, such is the case, for it explicitly calls to mind Elvis Presley starring in Don Siegel's movie *Flaming star*, which has been immortalised – once again – by Warhol's silkscreens (fig. 10.3). Quoting the quote of a quote, thus, or copying the copy of a copy.

FIGURE 10.2 Gavin Turk, *Che* (1999). Waxwork in vitrine, 115 × 279 × 115 cm
COURTESY: LIVE STOCK MARKET, GAVIN TURK

But there is more: the icon of revolutionary dreams and ideals of freedom and justice (Che Guevara) mingles with the rock icon (Elvis Presley) while hinting at the same time at the American artist (Warhol) who transformed both of those icons into ambiguous simulacra. The uniqueness, and even the identity,

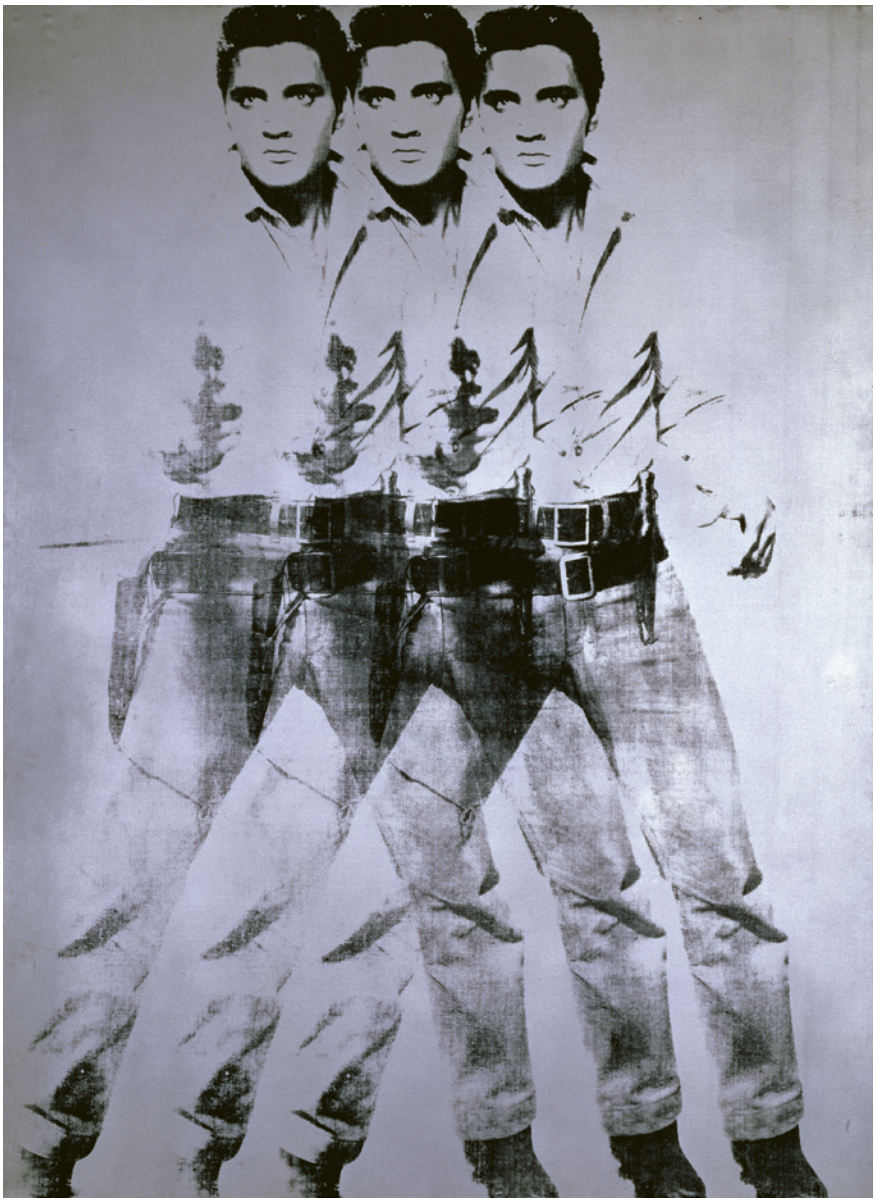

FIGURE 10.3 Andy Warhol, *Triple Elvis* (1963)

of the figures involved is jeopardised by the potentially infinite reproducibility of their images. Beyond these three, however, Turk's work has a fourth protagonist, that is, Turk himself: by borrowing and reproducing again, for the umpteenth time, those two twentieth-century icons, the artist radicalises Warhol's artistic strategy in a twofold sense. Firstly: who is the *subject* portrayed? Che Guevara, Elvis Presley, Andy Warhol, or Gavin Turk? Or maybe it is all four? Or none of them? Secondly: who is the *author* of the work? Who holds copyright? Korda, Siegel, Warhol, or Turk? It is impossible to say. Therefore, what is questioned is not only the status of art in the age of its technical reproducibility, but also that of the artist and, more generally, of individuality itself: at stake is the ambiguous relationship between being and appearing, between a real body and its substitute, between personal identity and mythical identification.[25]

Here, once again, is the difference with Tussaud's hyperrealism. Despite any apparent similarity between Turk's *Che* and ordinary wax figures, the differences cannot be overlooked. Madame Tussaud's statues only aim at perfectly (and superficially) mimicking their models in the flesh, whereas Turk's work makes its originality out of mimicry, quotation, borrowing, and even plagiarism – and it is precisely this paradox of an *original copy* that makes it a work of art. From this perspective, the choice of material is also explained: wax has always been used to guarantee the immediate recognisability of the subjects portrayed, but it is here employed to certify the (postmodern) impossibility of any identification, while its innate vocation of reproducing surfaces and appearances is now exploited to stress the need to look beyond the façade.

5 Conclusion

This chapter has a twofold purpose. First, it has aimed to shed light on the *theoretical* reasons behind criticisms of hyperrealism as a possible art form. This objective was met through an analysis of the long-established assimilation of hyperrealism to merely mechanical (hence, in principle, non-artistic) reproduction. By taking a phenomenological approach, I showed that the age-old exclusion of hyperrealism from the realm of so-called "high" art was primarily due to the almost automatic equating of wax sculpture with the objective, 'noninterventionist' duplication of reality. The reasoning can be syllogistically summed up as follows: if fine art is traditionally defined as the art of genius; if genius presupposes originality, that is, a more or less radical *deviation* from actual reality; then hyperrealism, aimed as it is at faithfully adhering to reality, cannot properly be regarded as a genuine art form. The whole argument

is based on the assumption that hyperrealism *necessarily* goes hand in hand with the mechanical copy, fake, forgery, and hence with an absolute lack of originality.

The second objective of this chapter was to prove that this assumption is both historically and theoretically wrong. Many artistic practices have showed that hyperrealism does not (necessarily) have to be reduced to the counterfeiting of actual reality. On the contrary, it can best be employed to create artefacts which, at first, may perhaps appear to be nothing but duplicates of reality, but on closer inspection turn out instead to be highly original – and this not *despite*, but rather *thanks to* their (apparent) adherence to physical reality. The seemingly paradoxical concept of an 'original copy' is thus achieved, and, with it, an explanation of the difference between artistic and non-artistic hyperrealism.

A final remark needs to be made concerning the perspective from which I have tackled the issue of (purported) excessive similarity in this essay. Wax is the material of hyperrealism *par excellence*, and it also plays a prominent role in the history of philosophical reflection, being frequently evoked by authors and in contexts that may at first seem to have little to do with each other, but that are in fact unpredictably interwoven. My choice to focus on such a particular material has therefore been determined by the fact that, over the centuries, waxworks have come to represent a veritable 'cultural obsession' (Bloom 2003) permeating both philosophical and artistic reflection from antiquity to the present day.

To be sure, this focus on wax only covers one single aspect of the far broader thematic spectrum of hyperrealism; yet it is, indeed, a *paradigmatic* aspect. This means that theoretical reflection on the many issues raised by wax figures can be applied successfully not only to other different *materials* (such as, for instance, silicone, fiberglass, and polyester resin, which are ever more frequently used in contemporary art), but also to other different scientific *fields*. Indeed, even outside the arts, it seems as if we are living in the age of hyperrealism: think of computer graphics, image metrics techniques, or the stunning evolution of immersive and interactive environments, virtual and augmented reality, or robotics and android science. In all these domains, as in the artistic field, hyperrealism is used to blur the threshold between the world of the image and the real world drastically. And this was precisely the overarching objective of this essay: to provide a starting point for an in-deep analysis of the multifarious strategies for producing pictures that elicit in the observer (or rather the *experiencer*) an unprecedented 'reality effect' – a topic that has become more of a priority than ever before.

Acknowledgements

This essay was written in the framework of the research project "AN-ICON. An-Iconology: History, Theory, and Practices of Environmental Images". The project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement No. 834033 AN-ICON).

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Endnotes

1 Schlosser 1911, 287.
2 Husserl 1912, 497.
3 See for instance Husserl 1900–1901, vol. 2, 137–138; 1904–1905, 42–44; 1918–1926, 72–79; 1939, 92.
4 Husserl 1904–1905, 18.
5 Husserl 1904–1905, 44.
6 Husserl 1904–1905, 43–44. On the phenomenological concept of 'unreality' see Fink 1930.
7 Schopenhauer 1851, 421–422.
8 Kant 1790, 135.
9 In *Art and illusion* (1960, 60), Ernst H. Gombrich emphasised the different effects elicited by a marble or a bronze bust in comparison with a wax head. On the use of different materials in relation to resemblance especially meant as lifelikeness, see this volume, in particular the essays of Kinney and Sarnecka. More specifically on wax, cf. Panzanelli 2008 and Conte 2014.
10 Mendelssohn 1761, 139.
11 Trianon 1881, in Berson 1996, 368.
12 There is a vast literature discussing the diverse aspects and the multifarious functions of anatomical modelling. In relation to some of the main issues considered in this chapter, see Lemire 1990; Didi-Huberman 1999; Ullrich 2003; Schnalke 2004; Ballestriero 2010; Märker 2011 and her chapter in this volume.
13 Diderot 1763, vol. 1, 247–248.
14 Mantz 1881, in Berson 1996, 1, 358; Onuki 1999, 69.
15 On the emergence and rise of French criminology in these years, see, among others: Nye 1984; Pick 1989; Borlandi *et al.* 2000; Hagins 2013; Regener 2003.
16 Cattelan & Cirillo 2004. On the same occasion, the artist describes his artwork this way: 'The way the artwork is sculpted, the fact that the knot is loose around the necks, and the children's facial expression, almost one of angelic resignation: those bodies seem to rise and to levitate from the ground more than hang. It is an almost angelic image.'
17 De Benedetto *et al.* 2004.
18 Ortega y Gasset 1921, 188; Berizzi & Fazzo 2004, Guastalla 2006.
19 The official report is still available on the website: web http://www.dealbertis.it/Interventi/10-5-04_bambini.pdf.
20 De Benedetto *et al.* 2004.
21 Cattelan & Arie 2004. Similar statements can be found in the recently released autobiographical interview with Catherine Grenier, in which Cattelan reiterates how people remained shocked because the work 'was not protected within the boundaries of a museum or a gallery, being exhibited in a public space, in the middle of the street, where nobody expected to find it' (Cattelan & Grenier 2011, 76).
22 Cattelan & Cirillo 2004 (author's emphasis).
23 Oddone 2004.
24 The work was later revealed as a forgery created by Warhol's assistant Gerard Malanga, who sold it to a gallery in Rome. When Warhol learned of the fake, he chose to "authenticate" it as if it actually were one of his paintings, provided that all the money from its sale was redirected to himself.
25 For more on similar issues, see also Henning's chapter in this book.

PART IV

Preservation

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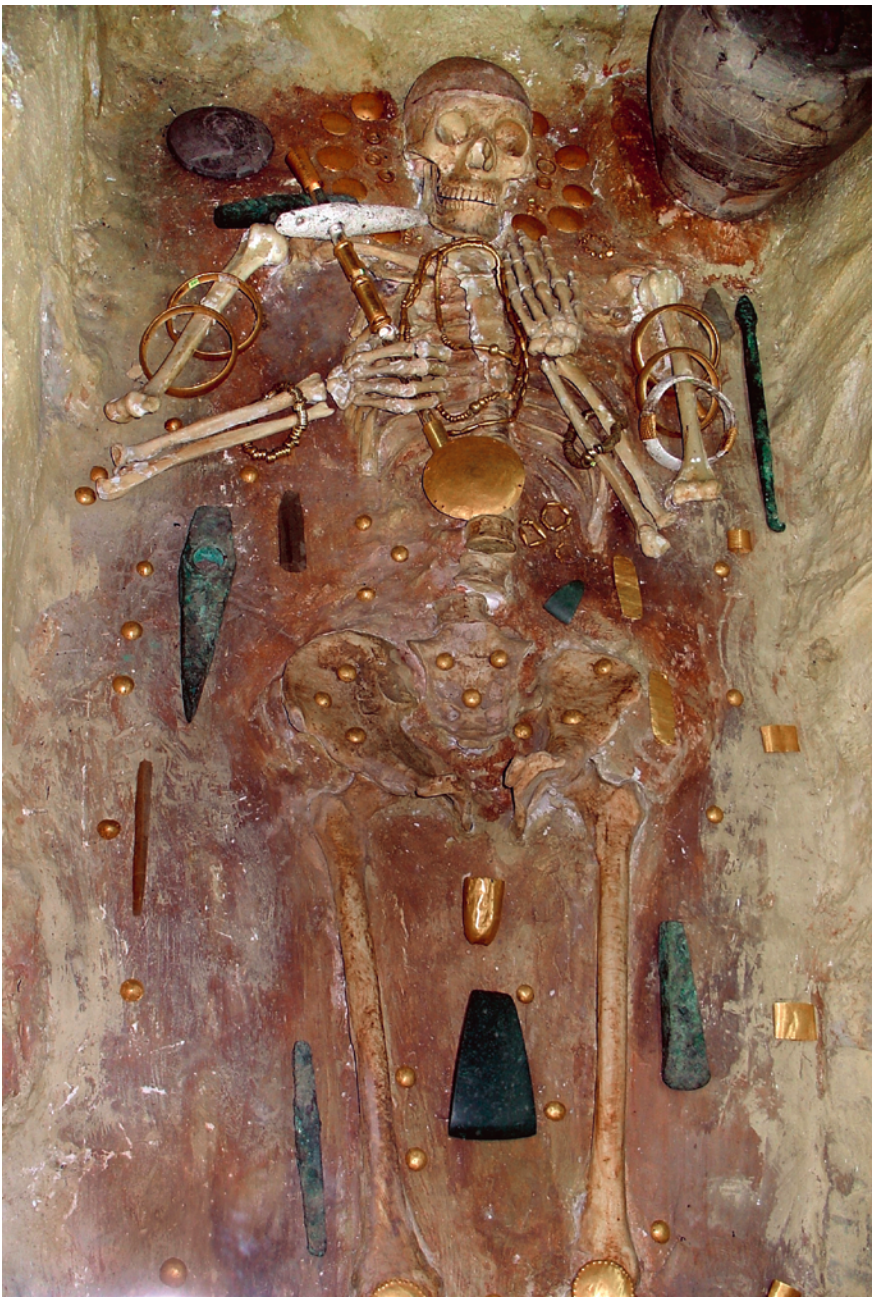

FIGURE P4 A tomb from the Varna Necropolis, Bulgaria (*c.*4600 BCE) with the world's oldest processed gold, preserved by virtue of ancient funerary practice

Introduction

From embalming and taxidermy to gold coins, human cultures have invested huge resources in preservation as a practice of the stabilisation of value, whether of individual bodies or exchanges of capital. Money could be considered a material mimesis of credit, as Marx understood. The preservation of precious bodies by means of effigies, relics or even statues has played a key role in many, if not most, religions. Nature could be captured within cabinets and museums through the successful dramatisation of 'scenes from life', which reconstructed dead animal bodies and posed them as spectacle (Poliquin 2012). The investment of dead bodies, through preservation practices, with renewed life and efficacy points to the way in which mimesis permits the reification or materialisation of esoteric domains not otherwise accessible to the senses. Yet the status of such objects was always at risk, whether from charges of idolatry, theft, decay or merely loss of significance. Mimesis has also often been employed to eternalise a material considered less durable. Durability is a less objective quality of materials than might seem at first sight. In fact, at different times and under different social circumstances, the durability of materials has actually meant that they become subject to continuous flux. Gold is one of the most durable precious metals, because it does not tarnish; this very quality also means that its value endures. Because it can easily be melted down for reuse, an artefact made from it may have a shorter lifespan than a fragile ceramic bowl made in imitation of its precious golden counterpart. Ranging from ritual practice and burial rites to social distinction, the reasons for the transformations of a given material into a more durable mimesis of it are also interesting to consider.

Questions of mimesis in relation to the preservation of works of art lie at the heart of Stumpel's contribution to this volume. He takes a *longue durée* approach to study how mimesis contributes to material survival in the history of art. As with fossils, there is a certain bias in the historical record of surviving art objects. Imitation plays an important role: often the material mimetic object has come down to us, but the original object it imitated did not survive the test of time. Stumpel argues that art historians could gain insights from the field of taphonomy – the branch of palaeontology that deals with the processes of fossilisation – to understand the art historical corpus as a form of cultural sedimentation, in other words, to explore why some objects survive while others do not.

In her chapter, Rijks continues the theme of preservation, discussing attempts to preserve, collect and display aquatic fauna in seventeenth-century

Antwerp. She argues that fascination with the materiality, outer appearance and surface texture – scales, skins, and carapaces – of aquatic animals was common to both collectors and artists, and extended from the collection of natural specimens to the production of works of art and other *artificialia*. Painters and naturalists developed a great variety of mimetic practices in the effort to capture these varied textures for posterity. The manner of rendering these qualities, Rijks argues, was what determined perceptions of the representations' "naturalness".

But what happens when, instead of attempting to stop time and decay, mimetic practices aim to preserve these processes? If the art of photography is typically portrayed as enabling greater 'realism' or 'naturalism', Henning argues in her chapter that, during its early years, photography may have been valued precisely for its ability to *reveal* the ravages of time and decay. She explores contemporary ideas about the mimetic realism of the daguerreotype and plaster cast in the context of an early-nineteenth-century, and specifically Scottish, interest in signs of nature's transience. Her chapter draws on the writings of Naomi Schor and Donna Haraway to build a feminist reading of the mimetic realism of daguerreotype and plaster cast, and situates Sir John Robison's attention to detail within a larger set of discourses on the detail and on decay.

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CHAPTER 11

Scales, Skins, and Carapaces in Antwerp Collections

Marlise Rijks

Aquatic animals were prized collectables in seventeenth-century Antwerp. At least, that is the impression you get when you look at the set of paintings labelled as 'gallery pictures' or '*constcamer* paintings' by the Antwerp artist Frans Francken the Younger (1581–1642). In Francken's gallery pictures, you find seahorses, blowfish, sawfish, horseshoe crabs, and dolphin skulls, to name just a few (e.g. figs. 11.1 & 11.2). This chapter discusses the interest in aquatic fauna in seventeenth-century Antwerp in relation to mimetic practices: how were these natural objects preserved and displayed, and how were they related to the man-made images of the same animals? As with images of nature, we can ask how far modes of representation of natural objects themselves constituted artistic interventions. These fish out of water are part of the early modern turn towards nature in the circles of painters and collectors, but also reveal how radically different their notions of what is natural are from ours today.

Francken was a key player in the rise of the genre of the gallery picture, which was developed in Antwerp in the first decades of the seventeenth century.[1] As a glimpse into the early modern culture of collecting, these paintings offer beautiful arrangements of paintings, drawings, statuettes, coins, books, as well as shells, corals, and (parts of) other aquatic animals. Francken's gallery pictures depict a combination of the natural and the man-made, of *naturalia* and *artificialia*. They let the viewer reflect upon the making of nature and the making of mankind. But upon closer inspection, we may also wonder whether we can draw such an easy distinction between art and nature. For instance, a dried sea horse is obviously a preserved *naturalium*, but without human intervention the object would never have existed: it had to be selected, captured, dried, transported, sold and bought, and put on display. Even such preserved specimens are representations, although one might argue that they come as close to the living 'actual' thing as one could imagine. Early modern collectors were aware of this, and there were debates about the value of different types of representations (in particular specimens versus pictures) during the sixteenth and seventeenth centuries (Margócsy 2014). Furthermore, the dried aquatic animals in Francken's gallery paintings are, of course, images in oil paint of the specimens – adding a second layer of representation.

FIGURE 11.1 Frans Francken II, *Collector's cabinet with Abraham Ortelius and Justus Lipsius*, 1617. Oil on canvas transferred from panel, 52.5 cm × 73.5 cm
LOCATION UNKNOWN (FORMERLY HABOLDT & CO., AUCTIONED 2011)

FIGURE 11.2 Frans Francken II, *Interior of an art cabinet with 'ânes iconoclastes'*, 1620 or 1626. Oil on panel, 101 cm × 143 cm
QUADRERIA DELLA SOCIETÀ ECONOMICA DI CHIAVARI

Preservation was a way of stabilising the value of a natural specimen and creating a lasting representation of a once living animal. Images too provided stable representations of animals, whether dead or alive. In early modern collections, preserved specimens and animal images were often kept together. Collectors at this time were mostly interested in *naturalia* that were particularly curious, rare or exotic. The goal was not so much to collect (or investigate) large samples of "common" nature, as to gain admiration for the atypical.[2] The preserved aquatic animals in Antwerp collections seem to comply with these standards of curiosity, rarity or exoticism, even though very practical reasons deriving from the ease or difficulty of preservation also played a role.

This chapter argues that fascination with the material, outward appearance or surface texture – the scales, skins, and carapaces – of aquatic animals was an important factor in their appeal to collectors. It could determine whether an object was indeed considered worthy of display and how to position it within a collection. Mimesis, in the sense of a proper imitation or representation (which was one of the meanings of this ubiquitous concept) was an important issue: the materials defining surface textures needed to be preserved by means of different techniques. The mimesis of surface texture was also a central issue for painters – in particular, one might argue, in the Netherlandish tradition.[3] One thinks here of depictions of the sheen of fish scales, the toughness of the carapace of a crustacean, or the spiky excrescences of seahorses and blowfish. This interest in textures was shared by Antwerp collectors and artists, and extended from the collecting of natural specimens to the production of works of art and other *artificialia*. The objects discussed in this chapter brokered the connection between the scholarly world, the culture of collecting, and the world of artisanal and artistic making. Crucial in this context was the generous overlap between the preservation of natural specimens and more thorough artistic interventions, from the creation of monsters from real fish, to the depiction of real fish or the pictorial invention of fictitious fish. This led to the existence of a broad spectrum of different levels of mimetic practices.

1 Representation and Texture

Seventeenth-century Antwerp knew a lively collecting culture. The city's numerous successful artists and artisans were able to put their stamp on the culture of collecting, both through their networks and the products made in their workshops (which were in high demand), but also because many of them were themselves collectors.[4] Peter Paul Rubens (1577–1640) was the most famous artist-collector, but many followed his example, from painters

or engravers to apothecaries and gold- or silversmiths.[5] Some of these guild masters were extremely wealthy, belonging to the city's economic elite, while others belonged to middling groups. Often, there was an overlap between their places of making and collecting, the workshop and the cabinet. Their collecting practices could impact the products they made, most notably in the invention of the genre of the gallery picture. Collections also enhanced artists' social status and placed them in contact with other Antwerp collectors. This in turn helped to promote their products further, and to enhance the status of their workmanship. The close relationship between Antwerp's most successful artists and artisans and the city's collectorly élite is one factor that explains the increasing appreciation for artistic and artisanal products and processes. Elsewhere, I have named this new sensibility 'process appreciation', to denote an appreciation not just for the end product, but for the making process in general.[6]

The crafting of precious or exotic materials held an exemplary status within this collecting culture, for example in ornamented nautilus shells or the many objects made with tortoiseshell. Many materials served to decorate the wooden cabinets that held collections – paintings, mirrors, ivory, and tortoiseshell come to mind; silver cutlery was adorned with mother-of-pearl, ivory saltcellars decorated with shells, pearls, and coral.[7] Antwerp painters experimented with different kinds of support, such as marble or metallic surfaces (silver, copper, tin, and other metals). Their paintings and other made objects could thus become part of a display in which different materials were to be compared, such as marble statuettes, paintings on marble, and the depiction of marble in oil paint. Such displays were not just typical of collectors' cabinets, but could also figure in other settings, such as the Baroque interior of the Jesuit Church of Antwerp (St. Carolus Borromeuskerk).[8]

The comparison of materials and surface textures was part of the appeal of such displays. This was related to the issue of the maker of the material: nature or mankind. Such works of art or displays juxtaposed, as it were, the skills of nature with the skills of mankind. For this reason, objects falling *between* art and nature were particularly appealing to collectors, and a similar interest underpinned attention to imitation materials such as counterfeited coral, pearl, marble, or gemstones. From inventories we know that these imitations were both made and collected in Antwerp. Collectors knew about the non-authenticity of these materials, which demonstrate that imitations had a value in their own right. Sometimes imitations were displayed next to the real materials, so the two could be compared (Rijks 2018). Successful imitations captured the colour, shine, or lustre of gems, the same qualities of surface

texture that artists tried to capture in their paintings. Both commercial interest and intellectual interest played a part. Imitations could be a cheaper alternative to the real thing, but it would be a mistake to imagine that counterfeiting processes were always cheap. Intellectual pursuits were also important: many contemporaries argued for analogies between the making processes of art and the natural origins of gemstones, for instance.[9]

Natural history appealed to collectors and artists partly for the same reasons: nature as a maker of a magnificent number of stones, plants, and animals, with a rich variety of forms, colours, and textures. The allegorical paintings typical of Antwerp output (invented by Jan Brueghel the Elder (1568–1625), but emulated by many Antwerp painters), with their abundance of objects, plants, and animals, can be placed in this tradition. The spatial division of such paintings was often based upon the division of the natural world into the elements of earth, water, air and fire, for instance in *Landscape with allegories of the four elements* by Jan Brueghel the Younger (1601–1678) and Francken, now in the Getty Museum (fig. 11.4). Animals were commonly grouped in four kingdoms, quadrupeds, birds, fish, and insects (often these animal kingdoms were, in turn, linked to the elements: quadrupeds to earth, birds to air, and fish to water).[10] Such ordering also took place in collectors' cabinets. The category of fish included sea mammals, crustaceans, and amphibians, and basically referred to the entirety of aquatic fauna.

Another way of ordering was on the basis of similarities in surface texture or material. This sometimes produced results that might seem odd to the modern naturalist, as Florike Egmond (2017) has demonstrated. Emperor Rudolf II, one of Europe's most important collectors, owned albums groups, for example, that combined animals together with stones on the basis of shared characteristics – a hard skin and spiky excrescences. This classificatory move entailed the bringing together of reptiles, lizards, an American armadillo, a tortoise, corals, stones, the skin and teeth of a hippo, shellfish, blowfish, swordfish and sturgeons. A similar interest in scales, skins, and carapaces is visible in Francken's *Collector's cabinet with Abraham Ortelius and Justus Lipsius* (1617, fig. 11.1), where the painter likewise combines coral with a horseshoe crab, a fish with a sort of horn similar to the horseshoe crab (probably a species of triggerfish), a blowfish, a crab, a pair of tusks and a swordfish.[11] All fit into the category of the aquatic, as well as the category of spiky excrescences. Unless the historian approaches ordering criteria from the vantage point of the early modern collector, the logic of the collection cannot be grasped.

Although all sorts of *naturalia* were widely collected in Antwerp, there were no truly specialised collections of *naturalia*, let alone of aquatic fauna. Aquatic

FIGURE 11.3 Frans Francken II, *The world honours Apollo*, 1629. Oil on panel, 64.5 cm × 104 cm
LANDESMUSEUM FÜR KUNST UND KULTURGESCHICHTE OLDENBURG. PHOTO: SVEN ADELAIDE, LMO 15.612

FIGURE 11.4 Jan Brueghel II and Frans Francken II, *Landscape with allegories of the four elements*, *c.*1635. Oil on panel, 53 cm × 81 cm
GETTY MUSEUM, LOS ANGELES. PHOTO: DIGITAL IMAGE COURTESY OF THE GETTY'S OPEN CONTENT PROGRAM

animals in Antwerp were part of collections in which man-made objects, particularly paintings, predominated. The lack of specialisation supports the argument that Antwerp collectors were not so much interested in natural history *per se*, but rather saw their *naturalia* as part of a broader connoisseurship in which art and nature were understood in relation to one other. The dried aquatic animals depicted on Francken's gallery pictures, for instance, seem to question the extent to which such specimens were also artistic interventions. These paintings thus effectively showcase several different levels of artistic interventions upon natural bodies: showing preserved *naturalia*, decorated *naturalia*, and drawings and paintings of plants and animals. In fact, these paintings have been called 'self-aware', in that they reflect upon the medium of painting.[12] I would add that this self-awareness extended from the domain of painting into the broader domain of artistic intervention or making.

This question of artistic intervention was even more compelling in the case of monsters and mythical creatures kept as specimens in early modern Antwerp cabinets. Monsters long remained an integral part of natural history and of the visual vocabulary of artists. As we will see, they were depicted in natural history books and print series alongside other, common species, a practice that continued well into the seventeenth century. Furthermore, the practice of fabricating monsters out of (parts of) real animals was widespread, as Pugliano argues in this volume. Such activities, again, may seem odd to the modern eye, but was entirely appropriate in early modern cabinets, where different levels of artistic interventions or mimetic practices readily overlapped.

2 Scales, Skins, and Carapaces

One of the most curious aquatic animals depicted by Frans Francken the Younger, which may have looked like a monster to those who saw it for the very first time, was the horseshoe crab. This animal, to be found in East Asia and on the Atlantic coast of the United States, only became known in Europe during the sixteenth century. The first images reached Europe in the form of drawings made by travellers to the New World, while Clusius had an engraving made based upon a dried specimen from the East Indies, which was published in his *Exoticorum libri decem* (1605). The horseshoe crab appears in at least four of Francken's paintings: three times in gallery pictures painted in 1617 (e.g. fig. 11. 1) and once in an allegory of 1629 (fig. 11.3).[13] Around 1620, two horseshoe crabs were also depicted by another Antwerp artist, Frans Snyders (1579–1657), on a fish stall.[14] These Antwerp paintings were among the first European depictions of the horseshoe crab and, to the best of my knowledge, the first in the

medium of oil. It is very probable that the crab depicted by Francken was from the collection of his acquaintance, the notary Gilles de Kimpe (d. 1625), one of the city's most avid collectors (Rijks 2019).

De Kimpe had a truly impressive collection of books (of which he owned over 1,000, among the largest libraries in Antwerp at the time), and also owned no less than 144 paintings, drawings and prints running into the hundreds, over 2,000 medals and a variety of *naturalia*.[15] Among the aquatic animals represented in De Kimpe's collection were a *zeeduyff* (blowfish); two mysterious objects described as *zeepeerden tanden* (literally seahorse teeth, perhaps walrus tusks); *eenen schilt van een schiltpadde* (the shell of a turtle); another *schiltpaddeken* (turtle); and a so-called *zeespinnecop* (sea spider), the early modern Dutch name for the horseshoe crab.[16] All the aquatic animals or their parts in De Kimpe's collection would have been considered to be 'fish'. In the early modern period, this category contained virtually all aquatic fauna, including sea mammals, crocodiles, turtles, shrimps and crustaceans. In Latin, a distinction was sometimes made between *pisces*, which included creatures with scales that lived in water, and *aquatilia*, a broader term which included all aquatic animals, also those without scales (Egmond 2017, 60). It is impossible to establish whether someone like De Kimpe was aware of such a distinction, but in general collectors in this period used broad and inclusive categories, rather than narrow ones.

From Antwerp inventories we know that Gillis de Kimpe was not the only Antwerp collector to own dried fish or other aquatic animals. The wealthy merchant Peter Licea (d. 1645), for instance, owned a *zeehaenken* (a lyra).[17] A sales book from 1653, listing objects from the superb collection of Petrus Deams (*c.*1590–1653), former prior of the Carthusian monastery, included three seahorses and a 'dragon', which sold for 3 *gulden* and 5 *stuivers*. In the same sales book we find a *zeespinnecop* (another horseshoe crab), a fish, and an ostrich egg, all of which were sold together to a certain F. de Bie for the total sum of 7 *gulden*.[18] As in other cities, Antwerp surgeons and apothecaries sometimes amassed collections of *naturalia*.[19] Among them were the surgeons Abraham Rombauts (d. 1675), who owned *vier drooge vissen* (four dried fish), and Benedictus van den Walle (d. 1652), who owned a *gedroocht visken* (a small dried fish) as well as a *schelpe van een groote schiltpadde* (the shell of a large turtle) and *een geheel gedroocht lantschildpaddeken* (a whole dried land turtle).[20] In the Antwerp apothecary shop owned by Abraham van Horne (d. 1625), customers could admire a 'dried crocodile hanging on a beam', a 'large dried snake, a large dried turtle' as well as 'a large dried tongue of a fish'.[21] The objects called 'tongue stones' or 'glossopetrae' were, in fact, fossilised sharks' teeth, but this was only suggested later in the seventeenth century. They were on display in

many cabinets and sometimes mounted in gold and silver or used in fantastic artefacts. As early as 1565, Conrad Gessner (1516–1565) had discussed tongue stones and their different names, colours, materials, and where to find them.[22] Gesner also noted that the specimens were believed to work against poison. Furthermore, he summed up the points of debate: some believed these objects to be of purely stony nature, while others thought them to be tongues of fish, tongues of snakes, or even the beaks of births. Then there were specimens that looked very much like shark teeth, for instance one sent to Gessner by the Antwerp apothecary Pieter van Coudenberghe (1517–*c.*1599).[23] As in the case of Gillis de Kimpe, the aquatic animals in Antwerp were often part of impressive art collections. In his 30-room townhouse at the Gildekammerstraat, Van Horne, for instance, also had a number of tapestries and 32 paintings on display, while Van de Walle owned not only 119 paintings (including four by Rubens), but also numerous objects made with tortoiseshell, a human skeleton and a 'flame-shaped dagger', which was probably a much-desired exotic *kris* from Indonesia (Göttler 2016). Van Coudenberghe, moreover, was known for his fantastic botanical garden (Guicciardini 1612).

Almost without exception, these collectors had boxes and drawers filled with large and small shells. Shells were among the collected *naturalia* that were most widely owned and fashionable: every self-respecting collector owned some. In some cases, rare exotic shells were decorated with gold and silver. One very popular example was a decorated nautilus shell, an object accorded pride of place in many collectors' cabinets. Corals too were widely collected, both in their natural state and made into artefacts. In seventeenth-century Antwerp inventories, moreover, we find an abundance of objects decorated with tortoiseshell. Then there are several specimens of whalebone or baleen, in some cases turned into picture frames or other artful objects.[24] They are described as *een walvischgraet* (a whalebone); *elff rondekens lantschap met gedraeyde lystkens van walvischgraet* (eleven round landscapes with turned whalebone frames); *een swert ebbenhollten cruijs met eenen voet van schiltpadde ende walvisgraet* (a black ebony cross with a stand made of tortoiseshell and whalebone); *een schribantien van walvischgraet met schilpat ingeleyt* (a desk of whalebone inlaid with tortoiseshell); *een leijste van walvisgraet* (a frame of whalebone); *twee halffmaentkens van walvisgraet met perelkens daerinne* (two half-moons of whalebone with pearls). Whalebone or baleen could be pressed into all sorts of shapes and was highly decorative. In the course of the seventeenth century, the States General of the Dutch Republic granted several patents for the crafting of whalebone.[25] Apparently, even ordinary fish skins could be made into new objects: in the shop stock of an Antwerp leather-worker we find – among the skins of dogs, cats, otters, beavers, foxes, and rabbits – *tweehondert ende vier*

gewerckte vissen (two hundred and four worked fish) and (the skins of?) *vierendertigh schollen* (thirty-four plaice).[26] It is possible that fish skin was used to decorate objects such as boxes or sword pommels, or converted into gloves or other fabrics.[27] In fact, in an inventory from 1644 in Haarlem, we read of a 'jacket of fish skin' worth 20 *gulden*.[28]

3 Preservation and Commercialisation

These preserved crocodiles, sea horses, turtles, sawfish, blowfish and horseshoe crabs ended up in Antwerp cabinets thanks to extensive trading networks. Even after the Blockade of the Scheldt by the Dutch in 1585, the import of exotic goods into Antwerp never really stopped (Egmond & Dupré 2015, 211). Via land routes and other ports, such as Amsterdam or Seville, objects from all over the world ended up in Antwerp. Sailors coming back from the New World and East Asia brought home *naturalia* in their chests, hoping to make some extra money. Sometimes naturalists gave shopping lists and instructions to surgeons working in the service of the trading companies. But during long sea voyages, a lot could go wrong with frail specimens. Even before setting out on their journeys, the animals first needed to be preserved properly. It was not only rarity or exoticism that determined which *naturalia* ended up in European cabinets; difficulty of preservation and commercial considerations were equally important.

At the turn of the century, the renowned naturalist Carolus Clusius (1526–1609) wrote down instructions 'for the apothecaries and surgeons who will sail with the fleet to the East Indies in the year 1602', with the newly established Dutch East India Company. In this short memorandum, Clusius (n.d.) requests branches and seeds of plants and trees, but also '*diversche soorten vremde visch, wan sij niet groot waeren*' ('diverse kinds of exotic fish, as long as they are not large'). Indeed, size did matter: since transportation was expensive, it was small animals that were most frequently brought back. Clusius does not give instructions on how to bring these exotic fish back to Europe, and as we all know, hardly anything is more perishable than fish. So which preservation techniques were used for fish and other aquatic animals?

The most common method of preserving fish was by drying. Where it was relatively easy to do so, fish could be dried and kept as whole specimens, for instance in the case of trunkfish and blowfish. As we have seen above, the fish in Antwerp inventories were commonly listed as being dried. From a catalogue of the collection at Leiden University, drawn up in the years 1620–1628, we learn that larger dried aquatic animals could be filled with hay.[29]

Another practice was to cut a fish in half, skin it, let it dry, and apply the skin to parchment or paper, the result being very similar to the way plants were preserved in a herbarium (Davis 2018, 151). One such method was developed and described by Johan Frederic Gronovius (1690–1762), a physician and botanist based in Leiden.[30] The practice of preserving fish in pots and jars filled with alcohol also seems to have been gradually increasing during the seventeenth century. In fact, these two techniques for the preservation of fish, drying and pickling them in alcohol, would remain almost unchanged for 300 years (Davis 2018, 151–152).

We do not have a lot of textual evidence for preservation techniques dating from the first half of the seventeenth century or before. One exception is a note by the Bolognese naturalist Ulisse Aldrovandi (1522–1605), who observed how birds and fish were kept '*sotto spirito*' (in alcohol) in Jacopo Ligozzi's painting studio in Florence (Egmond 2017, 94; Tongiorgi Tomasi 2014). Ligozzi preserved animals in order to study them in detail, in preparation for his beautiful depictions. Aldrovandi notes that Ligozzi's patron, Grand Duke Francesco I de' Medici, had been the inventor of the special preservative liquid used, which apparently kept the shine and colour of the animals intact. This is a remarkable observation, since alcohol inevitably makes colours fade. Whatever sort of liquid it may have been that was used in this case, it is obvious that colour was a big issue in the preservation of fish in particular. Coloured pictures had an obvious advantage over preserved specimens, in that the former were stable representations of fish in their original colour.

In contradistinction to the difficulties involved in preserving fish, crustaceans were relatively easy to preserve. With their tough carapaces, they were easy to dry and much less prone to decay, although there were warnings to avoid boiling crabs and lobsters, which could change their original brownish colour to a vibrant red. But even in the case of crustaceans, it was not always easy to preserve and transport specimens without damage being done. For instance, when Clusius (1605, 128–129) saw a horseshoe crab for the first time in his life, he complained that he was unable to make accurate observations, since the dried animal he investigated was in such bad condition. Particularly troubling was the fact that he was unable to tell with certainty how many legs the horseshoe crab had, while he also confused the telson (the posterior element of the body) with a horn on the head.

Practical reasons of preservation and trade often determined which objects became part of collectors' cabinets in Antwerp and beyond. As Dániel Margócsy (2014, 29–73) has recently argued, commercialisation was a crucial factor in the collecting of *naturalia*, and could even impact scientific practices. Illustrated natural histories, which came to be used to ease communication

and as 'mail-order catalogues' for collectors, are exemplary in Margócsy's view. The production of such works allowed the conversion of the comprehensive and philologically oriented Renaissance natural histories written by humanist scholars into concise works of classification. It was no coincidence that this transformation began in places where commercialisation played the biggest role: in the first instance botany, and somewhat later conchology and entomology. The trade in plants, shells, and insects was a flourishing one precisely because these specimens were relatively cheap to transport and easy to preserve. In zoology, transportation and preservation were much more complicated, especially in the case of large quadrupeds, while these animals were also easier to distinguish, which reduced the need for classification.

The case of aquatic animals seems to fall somewhere in between. Crustaceans were relatively easy to preserve, but fish much more problematic. As we have seen, the fish that were easiest to preserve, such as blowfish or sea horses, often ended up in cabinets. The same holds true for parts of aquatic animals, such as the shell of turtles, or the saw of sawfish. Also, it is not insignificant that many aquatic animals were relatively small, which made transportation comparatively cheap. In line with Margócsy's argument, this may be one factor in the rapid rise of ichthyology during the sixteenth century. Before the early modern period, by contrast, interest in and knowledge of aquatic animals had been rather limited. In other areas of zoology, earlier publications (especially from antiquity) to a large extent determined the type of writings that were possible, but in ichthyology there was less of a debt to the ancients to be acknowledged. Free of the ballast of earlier publications, the field of ichthyology quickly achieved lift-off. In the 1550s, within a single decade, fish books were published by Pierre Belon (1551), Guillaume Rondelet (1554), Ippolito Salviani (1554–1558), and Conrad Gessner (1558 and 1560). These heavily-illustrated works offered the first overviews of the endless variety of life in the underwater world. These works fit Margócsy's definition of the comprehensive and philologically oriented Renaissance natural histories on the one hand; on the other hand, they were the avant-garde in zoology, in that they were less dependent upon the ancients, and outdid contemporary publications on other animals in both numbers and volume.

Works of natural history such as Gessner's fish books (*Historia piscium IV*, 1558; *Nomenclator aquatilium animantium*, 1560), also included descriptions of monsters. Most early modern naturalists did not exclude the possibility that monsters existed, and aquatic environments in particular had long been considered as particularly suitable for the formation of monstrosities. Aquatic environments, such as swamps, wells, and stagnant pools, were also thought to be places where spontaneous generation could occur.[31] Moreover, it was

FIGURE 11.5 *Winged snake.* Woodcut from Conrad Gessner, *Nomenclator aquitilium animantium* (Zürich, 1560), 138–139
PHOTO: LEIDEN UNIVERSITY LIBRARY, 665 A 9

fairly common practice to fabricate the most fantastic beasts and monsters from (parts of) animals, as Pugliano argues in this volume. Gessner, for one, included such man-made monsters in his book of 1560, describing how basilisks or winged snakes were made from rays (fig. 11.5). Likewise, Aldrovandi described and depicted several monsters made out of dried rays (fig. 11.6). The aforementioned 'dragon' in the collection of Petrus Daems was probably such a monster made out of ray. Some of these fabrications survive in museums: a dragon made out of ray in Leiden's Naturalis Biodiversity Center looks remarkably close to Aldrovandi's image (fig. 11.7).[32] Monsters were defined as deviations from 'normal' nature, but many exotic animals that first reached Europe in the early modern period were also deemed to be monsters.[33] Sometimes, New World species were considered to be Old World species altered by different (extreme) climates. At stake was the question of naturalness: when *naturalia* entered the European market, it was very difficult to determine whether they were real *naturalia*, as-yet-unknown *naturalia*, or outright fakes. Just as collectors were interested in the boundaries between natural and the

FIGURE 11.6 *Draco ex raia effictus*. Image from Ulisse Aldrovandi, *Opera omnia. X: Serpentum et draconum historiae libri duo* (Bologna 1640), 315
PHOTO: LEIDEN UNIVERSITY LIBRARY, 665 A 12

FIGURE 11.7 *Dragon made of dried ray*, eighteenth century
NATURALIS BIODIVERSITY CENTER, LEIDEN

man-made, they were also fascinated by the boundaries between the natural and deviations from the natural.

As in the case of imitation gemstones, these fantastic fabricated animals were not necessarily considered to be fraud. The "realness" or "naturalness" of dragons made out of ray lay partly in the fact that they were made out of the body of a real animal: the dragon's skin, its surface texture, were natural. Also, it became a sign of connoisseurship to be able to differentiate not only between the hands of different artists, but also between the 'hand' of nature and man, between the real and the imitation. So although Gessner complains that such dragons were on display in cabinets to impress gullible people, he still included them in his works. Dragons and other monsters may also have been described and depicted for reasons of completeness, and because of the long literary, cultural, and scholarly tradition that discussed their existence (Hendrikx 2018c). In light of this, it is telling that the polyglot, geographer, and founder of the Dutch West India Company Johannes de Laet (1581–1649) describes the scales of a certain 'strange' American fish as being 'as similar as can be to a painting of St George's dragon'.[34] In fact, St George's dragon was so well known, thanks to an age-old corpus of authoritative textual and visual sources, that it was to

a certain extent more "real" than a still unknown American fish. In the early modern period, the value of different forms of "proof" (whether in the form of natural specimens, texts or images) was heavily debated.

4 Fish Pictures

To avoid problems of preservation, pictures were a good alternative to dried or wet specimens. Naturalists and artists who aimed to observe fish when still fresh accompanied fishermen on fishing trips or visited fishmarkets. In his autobiography, Aldrovandi writes that it was in the years 1549–1550 that 'I began to be interested in the sensory knowledge of plants, and also of dried animals, particularly the fish that I saw often in the fishmarkets'.[35] Sometimes, the exchange went in the opposite direction. In the case of Adriaen Coenen (1514–1587), a fisherman's son who became a fish merchant and fish auctioneer at Scheveningen and The Hague, the experience gleaned from his trade formed the starting point for his natural investigations, which he recorded in richly illustrated manuscript albums in the 1570s and 1580s (Egmond 2018).

Sometimes pictures were substitutes for specimens that were missing in a collection (Felfe 2018, 200). Albums with watercolours conveyed information, and were arranged and rearranged according to the owner's idea of order. The practice (and flexibility) of ordering seems to have been more important than the observation of any one strict order (Egmond 2017, 58). Painters also made detailed and vivid depictions of fish: think of market scenes, still lifes, allegories, and gallery pictures. However, unlike watercolours and drawings, fish paintings were not substitutes for actual specimen, but rather functioned as conversation pieces, on which the connoisseur could recognise different species and showcase his knowledge of these species, which could include literary and symbolic meanings. The accumulation of objects, plants, or animals – including aquatic animals – is something these paintings have in common with collections, and both functioned in similar ways.

Around the same time as Coenen, Netherlandish painters started to depict fish in more detail and greater numbers than ever before. Whereas depictions of the Biblical stories of the miraculous catch of fish had long been popular, in the second half of the sixteenth century, the market scenes of Pieter Aertsen (*c.*1508–1575) and Joachim Beuckelaer (*c.*1533–1573) marked the beginning of a new type of imagery, in which fish were elevated from *bijwerk* (secondary motifs) to main theme.[36] In some cases, the Biblical story was moved to the

FIGURE 11.8 Joachim Beuckelaer, *Fish market*, 1568. Oil on panel, 128 cm × 174 cm, 1568 METROPOLITAN MUSEUM, NEW YORK

background, while in other cases it was omitted altogether (e.g. fig. 11.8).[37] The oldest dated fish still life is a painting of 1611 now in the Prado, made by the Antwerp artist Clara Peeters (*c*.1587–after 1636).[38] In another fish still life, now in the Rijksmuseum, Peeters has depicted some fashionable and exotic shells, including the *conus marmoreus* (fig. 11.10). During the seventeenth century, fish still lifes became very popular in both the Southern and Northern Netherlands.[39] Of course, in still life painting in particular, the mimesis of surface texture was crucial. Moreover, Frans Snyders' (1579–1657) large fish market scenes were collected by Antwerp's elites (Wyssenbach 2016, 336). In the aforementioned example, now in the Kunsthistorisches Museum, Vienna, Snyders even included two seemingly living horseshoe crabs on his fish stall, where that exotic animal, not really suited for consumption, would probably not have been found in reality.[40] Indeed, his addition of a range of exotic and expensive shells (including a nautilus shell and a *conus marmoreus*) to the scene points to the fact that such paintings were a kind of collection in their own right, rather than realist documentation of a fish stall.[41]

FIGURE 11.9 Nicolaes de Bruyn, *Aquatic animals* (*including fictitious animals*). Engraving from *Libelivs varia Genera piscium complectens*, plate 10, *c.*1594
RIJKSMUSEUM, AMSTERDAM

FIGURE 11.10 Clara Peeters, *Still life with fish, oysters and shrimps, c.*1612–1615. Oil on panel, 25 cm × 35 cm
RIJKSMUSEUM, AMSTERDAM

While collectors appreciated the display and comparison of different materials in their cabinets (or ordered their objects based upon materials or textures), Netherlandish painters were renowned for their imitation of materials, especially precious materials, and of the play of light upon different textures. In fishmarket scenes by Antwerp painters like Snyders, the lustre and shine of the fish scales depicted was an important part of the paintings' attraction for connoisseurs, along with the abundance of species to be recognised. The different material textures were also pronounced in close-up versions of Francken's gallery pictures, part of a subgenre of the so-called *Preziosenwand* (walls of precious things). This subgenre of the gallery picture is characterised by the predominance of still-life components. One example is Francken's *Interior of an art cabinet with 'ânes iconoclastes'* (fig. 11.2). In this painting, we see lustrous shells and mother-of-pearl, glossy Asian lacquer work, a reflective metal ball, a rough and spiky seahorse, and lucent fine coral. Also depicted are the skull and head of a dolphin and a dried fish.

Changing conceptions of the natural world went hand in hand with the emergence of new pictorial genres, such as market scenes and, around the turn of the century, still life paintings. In market scenes and still lifes, local fish were depicted (even if exotic specimens were sometimes added), while, in the gallery pictures by Francken, the emphasis was on the specimens found in cabinets, which were usually rare and exotic. In Antwerp allegories celebrating the abundance and variety of nature, we often find a combination of local and exotic species. In Francken's *The world honours Apollo* (fig. 11.3) for instance, we see common species, but also a horseshoe crab and flying fish (as well as American maize and an armadillo). As mentioned above, what such paintings had in common with collecting trends was an interest in the remarkable variety of nature: its forms, colours and textures. Another aspect these paintings shared with cabinets was that the viewers of allegories were prompted to recognise and compare species. Lastly, allegories could also include mythical creatures: in Francken's *The world honours Apollo*, the god Neptune with his mythical horses and the Nereids are juxtaposed with real species of *naturalia*.

The engraver Nicolaes de Bruyn (1571–1656) depicted a similar combination of real and fictitious creatures in his *Libellius varia genera piscium complectens*. This was probably the first print series specifically devoted to fish, and came off the press in Antwerp in around 1594, some years before Adriaen Collaert's well-known series *Piscium vivae icones*. The fish are depicted clearly and recognisably, which fitted the turn towards nature, and both Dutch and Latin names are given. Next to common fish such as cod, sturgeon, carp, ray, and herring, there were also other aquatic animals such as shrimp, crabs, snakes, frogs, and shells, as well as *fictitij pisces* (fictitious fish) and the *fabulosus*

equus Neptuni – the (mythical) horse of Neptune (fig. 11.9). De Bruyn's horse of Neptune was largely copied from the ones depicted in works by Gessner and Belon (Rikken 2016). Similar images of Neptune's horses were depicted in maps as well as in paintings, including several of Francken's allegories (e.g. fig. 11.3). As in allegories, cabinets and natural history books, the combination of real and mythical creatures fitted early modern conceptions of the natural as a realm where different levels of artistic intervention were permissible and even desirable.

5 Conclusion

The aquatic *naturalia* depicted by Francken in his gallery pictures were indeed collected in Antwerp, as we know from inventories. Many were collected because they were rare, curious or exotic. But very practical reasons also played a part: the ease or difficulty of preservation determined, to some extent, which kinds of objects ended up in cabinets. Blowfish, for example, were relatively easy to preserve compared to other fish, while shells, corals and turtle shells did not need preservation techniques at all. In seventeenth-century Antwerp, these *naturalia* were part of collections that were usually dominated by paintings, and there were no specialised collections devoted specifically to *naturalia*. This is an indication that Antwerp collectors were not necessarily interested in natural history *per se*, but rather viewed natural objects in the same light as man-made artworks. Here was a connoisseurship in which the making of art and nature were tightly linked.

In part, this connoisseurship alluded to mimetic practices – to a spectrum of representations of nature, including preserved aquatic animals, dried or wet; objects made from precious or exotic materials; decorated *naturalia*; monsters made from real fish; and pictures of aquatic animals, both real and fictitious. All of these objects demanded different levels and types of artistic intervention. Real displays and gallery pictures seem to question and compare these different levels of representation. One aspect that determined the 'naturalness' of these representations was surface texture. In the case of aquatic animals, collectors and artists were fascinated by the textures of their scales, skins, and carapaces. The culture of collecting fostered a context in which these materials were used and displayed in a variety of ways. They brokered a connection between making practices and natural knowledge.

Acknowledgements

A generous grant from the Netherlands Organisation for Scientific Research (NWO) for the collaborative project *New history of fishes. A long-term approach to fishes in science and culture, 1550–1800* enabled me to carry out the research that this paper is based upon. Furthermore, I am grateful to the Research Foundation Flanders (FWO) for funding my latest research project, *Printing images in the early modern Low Countries. Patents, copyrights, and the separation of art and technology*. I would also like to thank Florike Egmond, Paul J. Smith, and the editors of this volume for their constructive comments.

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Endnotes

1 Filipczak 1987; Marr 2010; Rijks 2015.

2 This situation only slowly changed in the late 17th century and the 18th century. See MacGregor 2018.

3 Netherlandish painters were renowned for their imitation of materials and the play of light upon different textures, while Netherlandish art theorists from Karel van Mander (*reflexy-const*) to Samuel van Hoogstraten paid attention to optical phenomenon and theories (Weststeijn 2008, 329–347).

4 Rijks 2022.

5 Several authors have argued that the apothecary's shop was an urban hub where natural history was pursued; see for instance De Vivo 2008; Pugliano 2018.

6 The economic concepts of product and process innovation were famously applied to the Dutch art market by John Michael Montias (1990).

7 Such as the saltcellar designed by Rubens for his own collection: Jan Herck and Georg Petel, *Saltcellar with the triumph of Venus*, 1627–1628, 43.8 cm × 12.5 cm, Royal Palace Stockholm.

8 Baadj 2018.

9 Newman 2004; Smith 2016; Bol 2014.

10 Joris Hoefnagel linked insects to fire, but this seems to have been exceptional.

11 Thanks to Floris Bennema for this identification.

12 Stoichita (1997) has argued that, in the context of the image debates during the 16th century, some paintings became self-aware meta-paintings: by taking painting as their theme, these works acquired a new status as 'theoretical objects'.

13 Frans Francken the Younger: 1. *The cabinet of a collector*, 1617 (signed and dated), oil on panel, 77 cm × 119 cm. Royal Collection, RCIN 405781; 2. *Collector's cabinet with Abraham Ortelius and Justus Lipsius*, 1617 (inscribed and dated), oil on canvas transferred from panel, 52.5 cm × 73.5 cm, private collection (formerly Haboldt & Co., auctioned 2011); 3. *A curiosity cabinet*, 1617, oil on panel, 89 cm × 120.5, Collection of the Duke of Northumberland, Alnwick Castle; 4. *The world honours Apollo*, 1629, oil on panel, 64.5 cm × 104 cm, Oldenburg, Landesmuseum für Kunst und Kunstgeschichte (signed right: 1629; left, below: do. ffranck. IN. f.A.). I would like to thank Stephanie Dickey for pointing me to the horseshoe crab in Francken's gallery picture, now in Alnwick Castle.

14 Frans Snyders and possibly Anthony van Dyck, *Fish market*, *c.*1620, oil on canvas, 253 cm × 375 cm, Kunsthistorisches Museum, Vienna, inv. nr. 383. See: www.khm.at/de/object/90599c8fdd/.

15 We know about De Kimpe's collection from a household inventory drawn up after he died in July 1625. Duverger 1984–2009, vol. 11, 399–415; City Archive Antwerp (SAA), Notary J. Plaquet 2867, fols 1r–12r; Rijks 2019.

16 SAA, Notary J. Plaquet 2867, fol. 8v.

17 Duverger 1984–2009, vol. 5, 225–228. Peter Licea (d. 1645) was chapelmaster of Our Lady Chapel at St. Jacob's church, Antwerp. From a series of watercolours of fish now held in Amsterdam University Library, we know that the term 'zeehaenken' was used for the lyra.

18 Duverger 1984–2009, vol. 7, 117–119, 148, 325–342. Petrus II Daems was the son of the rich Antwerp merchant Petrus I Daems (1560–1640) and his wife Isabella de Witte (d. 1635). For biographical details for Petrus I and Petrus II, see Timmermans 2008, 47, 60, 145; Sacré 1991, 171–179.

19 Rijks 2022.

20 On the collections of the surgeons Benedictus van den Walle and Abraham Rombauts, see Duverger 1984–2009, vol. 6, 387–393, vol. 10, 87.

21 SAA, Notary B. Van den Berghe, 3495 (1624–1627).

22 Gessner 1565, 162–163 (chapter 'de lapidus qui aquatilium animantium effigiem referunt'). In *Nomenclator aquatilium animantium* (1560), Gesner had already discussed glossopetrae in the chapter on sharks (Canis Carcharis), 151–153.

23 Gesner 1565, 163: 'In formula C ad numerum primum expressus lapis, similis est caeteris, substantia, duritie & splendore: sed auis alicuius, Mercule ferè, rostri superiorem partem prae se fert, minor caeteris, & vero Lamiae aut Carchaie denti (qualem Petrus Coldenbergus pharmacopoeus Antuerpia ad me misit) simillimum'.

24 In the inventories of Sebastiaan Daems, Elizabeth Sophie, the pastor Arnoldus van den Hove, Jan Lindemans, Johannes van Beverts, and Jeremias van Pelleken (Duverger 1984–2009, vols. 1–12).

25 Doorman 1940, 138, 144–145, 163, 208, 291.

26 Inventory of Clara Adriaenssens: Duverger 1984–2009, vol. 11, 203–205.

27 It is known that the skins of cusk, cod, eels and flatfish were used to produce objects such as gloves. Also, interest in shagreen, leather made from shark or rayskin, remained steady over the period from 1600 to 1800. Stevenson 1902, 382; Gluth 2016.

28 In the inventory of Marijcken van Steenkiste (6 January 1644). See Biesboer 2001, 90.

29 There was a 'manati ofte See Kalf. Es met hoi ghevolt' (a manatee or sea cow. It is filled with hay) and 'een klein Bruynvisken, met hoi ghevolt' (a small porpoise, filled with hay) in the inventory drawn up by Otto Heurnius in the years 1620–1628. See Barge 1934, 39.

30 Gronovius described his method in a letter to Peter Collinson, who published it in the *Philosophical transactions* (Barlow Robles 2017; Striekwold & Van Trijp 2017; Gronovius 1742).

31 Shell 2010, 61–62; Hendrikx 2018b, 2018c.

32 Such a dragon also exists in the in the Utrecht University Museum (https://www.universiteitsmuseum.nl/Collectie/Detail/UZ-4914). Sophia Hendrikx (2018a) and Robbert Striekwold achieved a similar result in a historical reconstruction in 2018, based upon Gessner's description of how to make a ray into a dragon.

33 Lawrence 2018, 95. See also the chapters by Tarp, Smith & Lores-Chavez, and Ajmar in this volume.

34 De Laet 1630, 118: 'Maer de vreemste visch, is een kleyn vischken, zo ghelijck, als kan wesen, de schilderije van S. Joris Draeck'. On De Laet, see also Jorink 2006, 307.

35 Findlen 1994, 75–177, with quote at 175.

36 Meijer 2004, 18–19. As Meijer notes, Aertsen's *Market scene* (*c.*1560, now in the Wallraf-Richartz-Museum in Cologne) with a number of detailed fish is unique for this painter, while Beuckelaer produced many paintings with fish.

37 Compare Beuckelaer's *Miraculous draught of fishes* (1563) now in the Getty (110.5 cm × 210.8 cm) with *The element of water* (1569) now in the National Gallery (158.5 cm × 215 cm). The latter painting is a new type of market scene, in which fish take up the at least half of the canvas, while in the background (in a vista through a gate) Beuckelaer has depicted the scene of the miraculous draught of fish very small.

38 Clara Peeters, *Still life with fish, a candle, artichokes, crab and prawns*, 1611, oil on panel, 50 cm × 72 cm, Museo Nacional del Prado, Madrid. On Clara Peeters, see Vergara 2016.

39 Duverger 1984–2009; Montias n.d.; Meijer 2004.

40 Frans Snyders and possibly Anthony van Dyck, *Fish market*, *c.*1620, oil on canvas, 253 cm × 375 cm, Kunsthistorisches Museum, Vienna, inv. nr. 383. See www.khm.at/de/object/90599c8fdd/. See also Rijks 2019.

41 Göttler 2013, 93–94; Koslow 2006, 140–141.

CHAPTER 12

'Some Slight Eruptive Disease': Victorian Verisimilitude in Photography and Plastercasting

Michelle Henning

In 1839, a Scotsman named Sir John Robison wrote of the daguerreotypes he had seen on a visit to Paris, comparing Louis Daguerre's invention to Hippolyte Vincent's novel plaster casting method, both techniques which had attained an extraordinary level of mimesis. Robison's report reveals that, although casting predates photography, a new realism emerged in casting at the same time that photography made its first appearance. Mechanisation and industrialisation had enabled both photography and plaster casting to arrive at a new mimetic fidelity. These technologies extended and developed what Walter Benjamin, writing in the 1920s and '30s, called the mimetic faculty, a human capacity especially evident in childhood. Photography and casting were 'mimetic' in the broad sense of imitating aspects of nature, but like childhood mimicry, and as Benjamin noted, the process of copying also yielded new perceptions of the world.[1] In Robison's descriptions of daguerreotypes and plaster casts, it is the imperfections in the original that reveal the perfection of the copy. The image or cast drew attention to tiny, seemingly irrelevant details, which were highly valued in scientific study, though abhorred in aesthetics. This chapter argues that daguerreotype and plaster cast hold a joint attraction in the context of an early- nineteenth-century, and specifically Scottish, interest in signs of nature's transience, informed by certain religious and scientific ideas about decay and waste.

As feminist writers Naomi Schor and Donna Haraway have shown, ideas about realism, mimesis and the detail are historically related to anxieties about the feminine, decadence and decay. Both writers have addressed the intersections of aesthetics and science, and how gender and race hierarchies are produced through concepts of nature and through specific mimetic material practices. Following aspects of Schor and Haraway's work, the present chapter sets out a feminist reading of the significance of the mimetic realism of daguerreotype and plaster cast. It situates Robison's attention to detail within a larger set of discourses on the detail and on decay, suggesting that it may have been overdetermined by older anxieties amongst the Edinburgh élite

regarding social upheaval and revolution, in particular a certain 'patriarchal paranoia' (Taylor 2014, 300). Recent photography history and theory suggests that the invention of photography is dependent on a historically-specific photographic desire, rather than solely the availability of materials and the appropriate social conditions (Batchen 1997). While this chapter agrees with the view that photography's invention was dependent on certain historical notions about nature, perception and realism (among other things), it also emphasises the historical specificity of various photographic processes, in particular the increasing dependence of photographic mimesis on nineteenth-century industrial byproducts. Against the tendency to see photography as a means to *arrest* time and therefore decay, the chapter suggests that photography may also have been valued for its ability to *reveal* the ravages of time and decay.

1 The Faithful Daguerreotype

In 1839, on first seeing a daguerreotype, a number of writers expressed their astonishment at the minute detail contained within this exquisite and magical 'mirror with a memory' (Holmes 2013, 69). In a characteristically showmanlike gesture, Daguerre handed a magnifying glass to the first visitors to his Paris studio, encouraging them to examine the first samples thoroughly. One of these early visitors was Sir John Robison (1778–1843), Secretary to the Royal Society of Edinburgh. Robison reported on his visit before the Society of Arts and, in a paper published in the *Edinburgh new philosophical journal* in July 1839, he explained that the daguerreotype, when examined at a level 'not perceivable to the naked eye in the original objects', remained perfectly faithful to reality. Here, 'a crack in the plaster', there 'a withered leaf lying on a projecting cornice', there an 'accumulation of dust in a hollow moulding of a distant building'.[2]

It is, in Robison's account, the tiniest imperfections that most profoundly express the perfection of the daguerreotype. They are also, in a sense, interlopers: elements that were not intended to be recorded, that made their way into the image unnoticed. Perhaps Robison meant to suggest, as other early commentators on photography did, that these details are imperceptible, not necessarily because they are miniscule or far away, but because our attention neglects them. We might assume that such detritus was usually less the object of attention of the gentleman scientist than of female cleaners and manual workers. However, Robison's list also evokes a sense of gradual, imperceptible ruination. Cracks in plasterwork, withered leaves, gathering dust: these describe moments in a process of gradual deformation, accumulation,

corrosion or perishing. In a painting, such things might act as *memento mori*, reminders of death and of our own materiality. In the context of the daguerrotype, they point to its ability to capture a moment in time, but also to catch material substance in flux.

To understand the significance of Robison's observations, we need to know something about the meaning of withered leaves, cracks and dust, and the smallest imperfections or blemishes, both for him and for the Edinburgh audiences to whom he presented his account. One of the two vice-presidents of the Royal Society of Edinburgh in 1839 was the Rev. Thomas Chalmers (1780–1847), a preacher who would become the founder and leader of the Free Church of Scotland in 1843, famously photographed by David Octavius Hill and Robert Adamson using the calotype process (fig. 12.1). Chalmers had been a student of Robison's father, also named John Robison (1739–1805), whose teaching as Professor in Natural Philosophy at the University of Edinburgh had helped shape Chalmers' particular brand of natural theology. Unlike some other advocates of natural theology, the evangelist Chalmers' vision was not one of a benevolent God and a harmonious nature. Rather, he emphasised the corruption of nature, 'an utter derangement into which nature has been thrown – so that all her elements are impregnated with disease', and the inevitability of decay and degeneration, such that 'even the mute and inanimate things are subject to the power of a decay'.[3]

The association with Chalmers suggests that Robison's observation of the minute details in the daguerreotype may have been led partly by such interests, cultivated in a milieu in which signs of decay and transience meant something quite different to what they signify to a contemporary reader. Religion, the arts, the sciences and social theory were closely bound in early nineteenth-century Edinburgh, when the borders between specialist academic disciplines were only beginning to harden, and where the legacy of the Scottish Enlightenment was embodied in a plethora of learned societies, well informed about the latest developments in continental science and eager to learn about Daguerre's new invention. The Edinburgh intelligentsia had a particular interest in questions of modern progress, and an equal interest in notions of the decay of matter and the decline of civilisations. As this chapter will show, since the late eighteenth century, Scottish natural history and natural philosophy had become increasingly concerned with the transience of matter. Social theory also addressed questions of social decline and degeneracy. The lack of sharp separation between the disciplines meant that new theories in science, political economy, and aesthetics shared models of decadence, decay and transience. Aesthetic questions were closely bound up with questions of morality, and treatises on

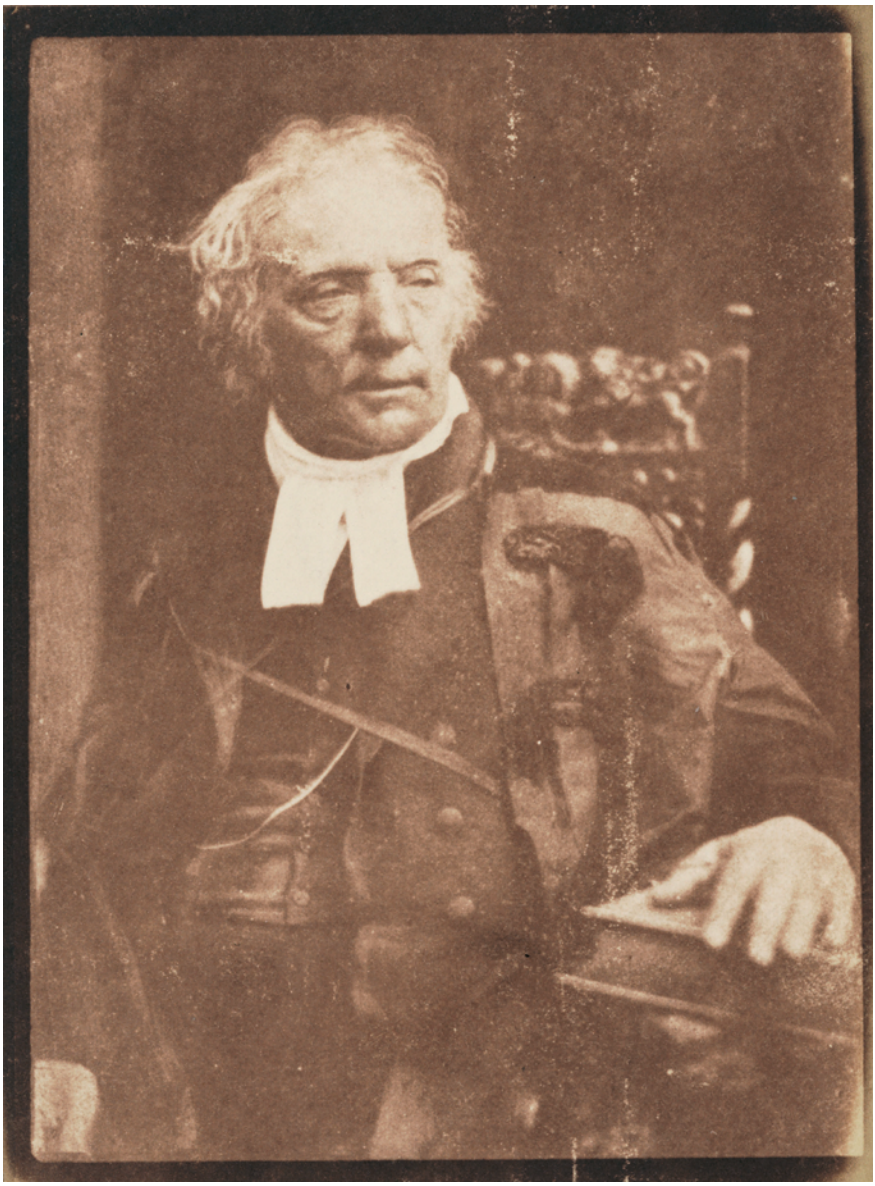

FIGURE 12.1 David Octavius Hill and Robert Adamson, *Portrait of Thomas Chalmers*, *c.*1843–1847, salted paper print from paper negative
COLLECTION OF THE METROPOLITAN MUSEUM OF ART, HARRIS BRISBANE DICK FUND, 1937. © NATIONAL PORTRAIT GALLERY, LONDON. PUBLIC DOMAIN

taste were careful to warn about the threat of decadence, effeminacy and corruption consequent upon too much refinement or too much luxury.

Robison tied his observations about the realism of the daguerreotype to observations about another technical development which also promised an astonishing verisimilitude, Hippolyte Vincent's new method of plaster casting:

> It is a curious circumstance that, at the same time that M. Daguerre has made this beautiful and useful discovery in the art of delineation, another Parisian artist [Vincent] has discovered a process by which he makes solid casts in plaster of small animals or other objects, without seams or repairs, and without destroying the model [...] I am in possession of several specimens of his work, among which are casts of the hand of an infant of six months, so delicately executed, that the skin shows evident marks of being affected by some slight eruptive disease.[4]

As in the daguerreotype, mimetic perfection is expressed through imperfection, here blemishes on the skin. Imperfections underscored the realism of the copy: where once both scientists and artists leaned toward ideal types, in the second part of the nineteenth century, new concepts of realism and truth to nature began to require an increasing attentiveness to particularity. Photography appeared at a transition point: it nourished the new aesthetics of realism and the scientific commitment of truth to nature, but violated the first principles of the neoclassical aesthetics that dominated the late eighteenth and early nineteenth centuries. According to the Englishman Sir Joshua Reynolds' *Discourses on Art* (1790), an over-attention to detail marked an inability to deal with the general, the ideal, or the spiritual; it was a threat to the virility of art, a marker of the decline of civilisation, symptom of a slide into decadence and effeminacy. Mimetic practices which faithfully recorded the most arbitrary, contingent detail were dismissed as 'detailism', understood as a particularly feminine error (Schor 2007, 3–19).

Plaster casting also leaned toward the particular rather than the ideal, yet it was simultaneously the principal means for the dissemination of the classical ideal through the reproduction of Greek and Roman sculpture. As Hannah Kinney's chapter in this volume shows, in the early eighteenth century, the Medici court had exercised control over copies of classical statuary, limiting the taking of moulds from the sculptures in its possession. The demand for new classical copies was such that, as Marden Nichols (2006, 117) writes, 'Reproduction kept pace with excavation', meaning that as soon as an ancient sculpture was unearthed, copies began to circulate. For example, the Venus

FIGURE 12.2 Louis Jacques Mandé Daguerre, *Still-life with plaster casts or L'Atelier de l'artiste* (1837). Daguerreotype, 16.5 cm × 21.5 cm
COLLECTION OF THE SOCIÉTÉ FRANÇAISE DE PHOTOGRAPHIE, PARIS.
PUBLIC DOMAIN

de Milo, discovered in 1820, was immediately cast. A full-size cast appeared in the Louvre in 1821, and miniatures, made using Achille Collas' sculptural copying machine (introduced *c*.1836), were mass-produced in 1839. The first photographs were populated with such classical casts: Daguerre's 1837 *Still life* is the earliest example, and probably one of the ones that Robison saw on his visit.[5] The first daguerreotype of a miniature Venus de Milo was also produced in 1839. This use of plaster existed alongside techniques of casting 'from life' such as Vincent's, and the use of plaster in the production of death masks and medical *moulages*.

While early photographers often described themselves as little more than mechanical operators, and their photographs as produced by the sun, or nature 'herself', at the same time they staked a claim to art not only by adopting the genres of painting, but also, Geoffrey Batchen suggests, through the depiction of plaster casts (fig. 12.2). In this way they encoded in the daguerreotype or calotype the ideals of liberty and democracy associated with classical sculpture, immediately situating the daguerreotype in artistic tradition. In

Daguerre's compositions with plaster casts, Batchen (2004) identifies both a display of technical, reproductive virtuosity, and a potential address to 'artistic power brokers'. The depicted cast worked both for and against the photograph's cultural status. It invoked classical ideals while at the same time it implied an analogy between one copying technique and another. Yet, to the extent that the photograph was a detailed and faithful copy, it would struggle to be recognised as an artwork.

2 The Mutant Detail

From the moment the daguerreotype was made public, photography's reputation for non-selectivity began to be cemented. Unable to distinguish between the relevant and the irrelevant detail, the camera recorded everything. Photographs recalled seventeenth-century Dutch art, sometimes positively, as in the *Art-union*'s 1846 description of photographs as 'triumphs of the Dutch school', but often not, since Dutch painting had long been criticised for a 'drudging' mimesis, with a combination of 'low and confined' subject matter and an emphasis on the particular over the general or the ideal.[6] The neo-classicist aesthetics of Reynolds and others was premised on a notion that detail detracted from the sublime grandeur of an overarching whole.[7] Dutch genre painting did have its defenders in the late eighteenth and early nineteenth centuries, who valued its technical craft and its attentiveness to the 'humble'. By the 1830s, they increasingly associated it with Dutch political liberties, with Protestantism and republicanism (Demetz 1963, 102–112). But it could only be defended if distanced from a too-faithful mimesis, for realism's privileging of detail remained contentious.

In her book *Reading in detail: Aesthetics and the feminine* (2007, 46), Naomi Schor traces the association of the detail with the feminine and the decadent across aesthetic theory. She shows how some of the same nineteenth-century French critics who celebrated Dutch painting participated in 'a remarkably coherent discourse on the detail', which she characterises succinctly as follows:

> the totalizing ambitions of realism that claims to account for the entire domain of the visible are deplored; the privilege accorded the horrible detail is decried; the loss of difference between the insignificant and the significant [...] is lamented; the possibility of reconciling the respect for the whole of classicism with the attention to minutiae which characterises realism is duly debated; and finally the invasion of the arts by an

> anarchic mass of details is pronounced the unmistakeable sign of cultural dissolution.

As Schor points out (2007, 100 and 9–11), 'a long critical tradition condemns the superfluous detail as symptomatic of decadence', and associates it with the feminine, in line with the Western philosophical tendency to identify maleness with form and the female with matter. In this long tradition, women are seen as unable to transcend the concrete and the particular, incapable of abstraction and 'by nature mimetic'. Reynolds viewed excessive detail as turning art away from the ideal and toward matter and the contingent, and as undermining the (masculine) sublime. He described how a painter's eye, attuned to laborious visual study, ought to see 'blemishes and defects' if only to eliminate them; the practitioner of a 'naive mimeticism' will 'pollute his canvas with *deformity*'.[8]

The term 'deformity' suggests a larger anxiety about the detail in aesthetic theory: Schor traces the obsession with imperfections of skin and flesh in G.W. F. Hegel's *Aesthetics:* '*little hairs, pores, little scars, warts*' and further on '*folds of skin* [...] *freckles, pimples, pock-marks, warts etc*'. Here detail becomes pathological, flesh 'in constant danger of a morbid mutation'.[9] Such a focus on aberrations of skin was not confined to philosophical aesthetics: from the eighteenth century, as a number of writers have argued, smooth skin becomes associated with a healthy body and an emergent modern sense of individual personal identity. On this basis Jonathan Reinarz and Kevin Siena, for example, speculate (2013, 2–3) that 'damage to skin took on greater psychic and cultural weight as the nineteenth century dawned'.

No wonder then that the results of photographic portraiture were initially met with horror. In the 1840s, articles about photographic portraiture warned potential sitters, especially women, of the new technology's unflattering nature (see for example Winter 1846). Yet Robison's discussion of the 'eruptive disease' visible in the plaster cast is not concerned with flattery. Plaster casting and photography appear, in Robison's account, as technologies able to extend the human power of vision, to reveal the traces of the past but also to anticipate the future as decay or eruption. Compare Hermann Vogel's 1875 description of the taking of a portrait in Berlin using the dry-plate process, which revealed specks on the subject's face: 'A day later the lady sickened of the small-pox, and the specks, at first invisible to the eye, became then quite apparent. Photography in this case had detected, before the human eye, the pock-marks, very feebly tinged yellow'.[10] It was the spectral range of the photographic emulsion that enabled it to register this faint yellow as dark marks, and Vogel's example emphasises its diagnostic potential. The example had added

resonance in the second half of the nineteenth century, after smallpox vaccination became widespread and scarring from the pox more stigmatised.[11]

Deformity and mutation could appear as positive aspects of photography and plaster casting only to the extent that these were reproductive practices outside the purview of neoclassical aesthetics. The mechanical recording of minute and imperceptible detail may corrupt and pollute the ideal and the sublime, but is invaluable in scientific study. Indeed, as Mieneke te Hennepe has shown, dermatology as a distinct science grew in the 1840s and '50s, and made early use of photography, with dermatological atlases deploying photographs from 1865 onwards.[12] While manual techniques such as drawing and painting had been deployed for both scientific and artistic purposes, the non-selectivity of new techniques of plaster casting and photography suited them to scientific recording rather than to aesthetic expressions of the sublime or the ideal. If plaster casting was the principal means of reproduction of classical sculpture, and thus of an idealised aesthetics, it also increasingly lent itself to extreme mimesis of the kind Vincent pioneered, in the form of casts 'from life' ('*moulages sur nature*'). Meanwhile in the art market, as Patrizia Di Bello says in her book *Sculptural photographs* (2018, 35), 'Photographers, reducing-machine workers, or cast-makers were not fine-artists but mechanical workers'.

Robison's comparison suggests that he understood photography principally as a reproductive technology. The photograph was frequently compared to the cast: the French painter Jean-François Millet, for example, reportedly stated that 'photographs are like casts from nature, which can never be equal to a good statue. No mechanism can be a substitute for genius. But photographs used as we use casts may be of the greatest service'.[13] Photography was also compared to sculpture copying machines, used to reproduce and miniaturise classical statuary, busts and medallions. Di Bello points to how contemporary accounts linked daguerreotype to Achille Collas's machine for reproducing medallions, and she cites David Brewster, the other vice-president of the Royal Society of Edinburgh, who in 1843 compared photography to James Watt's 1814 prototype for a sculpture copying machine. This device was refined and built by Benjamin Cheverton. Di Bello (2018, 23–25) writes that by 1843, several such machines were already in use, their products frequently exhibited alongside calotypes and daguerreotypes.

By the mid-1860s, faithful and detailed imitation of reality was a common yardstick by which to measure the quality of a photograph. For example, Julia Margaret Cameron, though widely admired in art circles, was snarkily dismissed in photographic journals, with one writer of 1865 arguing that she managed to produce 'photographs in which almost all that constitutes the charm

of a photograph, faultlessly minute detail and truth, are carefully eliminated'.[14] Though some critics advised against too much precision and suggested mimicking the softening techniques of Rubens and Titian, in the mid-nineteenth century haziness was generally seen as a flaw – it was only towards the turn of the twentieth century that art photographers ('pictorialists') turned increasingly to artisanal techniques that simulated the limitations of human vision with blurs, atmospheric effects and distortions.[15]

If the claim to art of the photograph was doubted, its ability to record the detail and especially signs of ruination and the passage of time, was not, and in this respect it leaned towards a Romantic aesthetic. In 1845 John Ruskin declared of his daguerreotypes of Venetian palaces that 'It is very nearly the same thing as carrying off the palace itself – every chip of stone & stain is there'.[16] Photography had the edge over other reproductive techniques in its ability to document the signs of damage and ageing in artworks. Revealing the decaying state of frescoes and paintings, 'all accidental flaws, scratches, breaks and proppings-up' as well as 'the misdeeds of Cleaners and "Restorers", photography seemed not only to record the traces and testimony of the past, and to appeal to the Romantic love of the ruin, but also, in line with natural theology, to expose both human corruption and the inevitable decline of civilisation.[17]

3 Decay, Decadence and Waste

The culture that shaped Robison's reception of photography was preoccupied with natural decay, economic disaster, revolution, and cultural and social decadence. These threats were rooted in events and ideas dating from half a century before Robison's encounter with the daguerreotype: in anxieties provoked by the French Revolution and its aftermath; in environmental changes produced by the Industrial Revolution; in attempts to contain the insurgent potential of women, the working classes and colonised peoples; in concerns regarding the instability of the free market and growing secularisation.[18] The assertion here that this culture is characterised by a fear and fascination with decay is not premised on a general diagnosis of patriarchal capitalist society, but relates to specific religious, scientific and cultural theories that tempered cultural optimism and the belief in progress with an emphasis on downfall, withering or decline. To some extent, these views are native to Scotland and to the evangelical Presbyterian narrative promoted in Chalmers' natural theology, which used Robison senior's natural philosophy to stress the transitoriness of the visible world. They can also be traced back to the political climate of the

end of the eighteenth century, a time when the prevailing atmosphere was, as Jack Morrell (1971, 46) puts it, one of 'pervasive prejudice, intolerance and uneasiness'.

The Scottish Tories in this period repeatedly denounced popular institutions, reformers and Whigs as Jacobin and treacherous. The elder Robison himself was instrumental in stoking this atmosphere, via his book *Proofs of a Conspiracy against All the Religions and Governments of Europe, Carried On in the Secret Meetings of Free Masons, Illuminati, and Reading Societies* (1797), which attributed the French revolution to an international plot, aimed at universal revolution and led by a secret society called the Illuminati. It went through four editions in just over a year. Michael Taylor has argued that this book was highly influential among conservatives between 1797 and 1802, and that the theory was inserted into the ongoing debate on the role of women in British society and the reaction to the 1798 rebellion in Ireland, as well as into an attack on continental philosophy. Robison gave a specific role to women in the Illuminati conspiracy, just at the point when feminist voices such as Mary Wollstonecraft's were beginning to be heard. According to Taylor, 'British patriarchs were already on their guard against the danger of female subversion'.[19] Robison's conspiracy theory attributed the corruption of women to the Illuminati, thus implicating the nascent feminist movement in a conspiracy against nation and state.

It is clear that the French revolution and its aftermath, as well as events in Ireland, entrenched the patriarchal paranoia embodied in Robison's conspiracy theory. The Scottish intelligentsia of the late eighteenth and early nineteenth centuries were a patriarchal elite, steeped in Calvinism, committed to modernisation but doubtful about progress and fearful of losing their position. John Playfair, Robison's colleague, wrote an obituary for Robison in which he noted that his conspiracy theory was a response (though a disproportionate, 'indiscriminate' one) to the astonishing rate of change of post-revolutionary France, the 'extraordinary spectacle' in which 'in a few months one might behold more old institutions destroyed, and more new ones projected or begun, than in all the ten centuries which had elapsed between Charlemagne and the last of his successors'.[20]

The spectacle of French institutions ground to dust fed into a much more longstanding set of narratives concerning the rise and fall of civilisations. These also shaped aesthetic theories: for example, Hegel, in his *Aesthetics*, uses the classical organic model of artistic development in which each style and culture has periods of growth, flowering and withering. In late-eighteenth and early-nineteenth-century Scotland, ideas of aesthetic decadence were

tied to wealth. Moral corruption could result from luxury, opulence and over-refinement (faults associated with the otherwise admired Dutch). One symptom, or consequence, was effeminacy and loss of manhood, thus eighteenth-century treatises on taste were careful to distinguish a gentlemanly taste associated with masculine virtues of discipline and morality (Hemingway 1989, 14–21).

This was a culture in which the material and the moral were deeply entangled. Several historians now view it as anachronistic to speak of 'economy' in relation to the long eighteenth century, since the term actually denotes a modern sphere of practice and discourse concerned with the production, distribution and management of resources and with monetary exchange. Lissa Roberts and Simon Werrett argue that the period under consideration instead practised 'oeconomy', the Greek origins of which imply 'bringing order to the domestic sphere'. This was not simply an early form of economy, but a distinct sphere of material and moral imperatives, guiding and regulating the stewardship of land and natural resources, including the reuse of waste materials, according to 'the virtues of order, prudence and moral responsibility'.[21]

In the decades preceding 1839, notions of balance and equilibrium associated with mechanics increasingly underpinned political (o)economy as well as the natural sciences. Playfair himself understood the French revolution in these terms, as the result of France's unbalanced political institutions.[22] This metaphor of the balance was challenged in the 1830s. One of the influential figures in this was the conservative Englishman William Whewell. In his Bridgewater treatise, Whewell (1833, 202–203), like Chalmers, advocated a natural theology, emphasising the finite nature of a universe in which 'it now appears that the courses of the heavens themselves are not exempt from the universal law of decay; not only the rocks and the mountains, but the sun and the moon have the sentence "to end" stamped upon their foreheads'. The mechanistic equilibrium model suggested the universe could persist eternally, but, as M. Norton Wise (1989, 399–404) shows, the 'universal law of decay' enabled Whewell to posit an end to the universe and therefore a beginning – a creation. Against the idea of balanced tendencies, Whewell posited that the natural tendency toward dissipation and decay could only be countered by moral force. It was during the 1830s that Chalmers, too, arrived at an emphasis on the instability of nature, partly through his reading of Whewell. For Chalmers, the transitory character of nature, its tendency toward decay, supported an idea of moral intervention and Christian conversion. Decay and dissolution were built into nature, a consequence of original sin.

Whewell conceived of waste in terms of his 'universal law of decay', and avoidance of waste as an oeconomic imperative (Wise 1989, 423). Although

this kind of moral concern with waste was present in the eighteenth century, as part of oeconomic discourse and practice, ideas about waste changed in the 1830s as (according to Wise) the steam engine metaphor replaced the mechanical balance. One representative of the growing tendency to justify avoidance of waste not in moral terms but in terms of efficiency was Charles Babbage, who defined the task of engineering as the effort to increase efficiency by overcoming waste, understood as a 'waste of materials, waste of time, waste of power, waste of skill, and waste (wear) of machines'.[23] Nevertheless, waste, putrefaction and decay were still often conceived in moral and religious terms, as perversion of nature or part of God's plan.

By the 1860s, at least, the coal reserves that had fuelled Britain's early Industrial Revolution were understood to be exhaustible. In his 1795 publication *The Theory of the Earth*, the Scots geologist James Hutton had described coal as a key part of the dynamic cycles of nature, reinforcing the need, as Lissa Roberts and Joppe van Driel summarise (2008, 63), for 'human stewardship of a global system whose ongoing fertility depended on maintaining its dynamic balance'. Hutton's theory of geological time famously suggested that the world was much more ancient than previously thought, yet rapid industrialisation seemed to be changing it irrevocably. It was in this context of anxieties about progress and environmental degradation, as well as concerns about cultural and revolutionary decadence, that notions of photographic realism were shaped.

4 Reality Effects

A similar constellation centred around the 'fear of decay', though in a different time and place, is suggested by Haraway in her article 'Teddy bear patriarchy. Taxidermy in the garden of Eden, New York City, 1908–1936' (1984). Haraway argues that realism became a means by which early-twentieth-century American monopoly capitalists armed themselves against decadence. She describes the American Kodak magnate George Eastman as 'an object lesson in the monopoly capitalist's greater fear of decadence than death'. Haraway's argument is that scientific knowledge, far from being a neutral pursuit, is caught up in the larger culture and aesthetics of patriarchal white monopoly capitalism. In the late 1920s, men like Eastman and Carl Akeley, the taxidermist-hunter for the American Museum of Natural History (AMNH) in New York, worked actively to produce knowledge in ways that harnessed the mimesis of photography and taxidermy, producing a realism that might 'bridge the yawning gaps in the endangered self', and 'ensure against disappearance'. This sense of endangerment came from several directions, from anxieties about decadence,

race and sex. In particular, Haraway reads photography and taxidermy in this period as part of larger eugenic meaning-making technologies intended to intervene in 'a potentially fatal organic sickness of the individual and collective'. The AMNH saw its educational task in terms of the promotion of public health; its public activities were designed 'to arrest decay [...], assure racial purity [...], preserve resources', and 'arm the culture against decadence'.[24]

It is striking how the cultural climate in which photography was received in mid-nineteenth-century Scotland similarly linked concerns about cultural and social decline with ideas of nature and decay. However, Haraway is talking about eugenics, a concept unknown to Robison and his colleagues in 1839 – though they would have been familiar with practices of selective breeding of livestock and Malthusian arguments about population. Unlike their nineteenth-century predecessors, Akeley and Eastman were concerned with perfection. Ideas about truth, perfection, and racial and gender purity underpinned their commitment to new standards of realism in both taxidermy and photography. Their 'realism' actually implies the neoclassical, organicist notion of verisimilitude. For instance, Haraway (1984, 36) emphasises Akeley's commitment to 'truth' and to the ideal and perfect specimen: on a giraffe hunt, 'several animals were passed over because they were too small or not colored beautifully enough'.

This notion of realism as organic perfection and as insurance *against* decay contrasts sharply with the kind of realism associated with photography in the mid-nineteenth century, with its emphasis on the superfluous detail, its non-selectivity that encompassed the aberrant alongside the beautiful. Nineteenth-century commentaries on the photograph's capacity to preserve the past perfectly, to halt the passage of time, or to diagnose disease or error, also drew attention to how it lingered on the flaw, how it brought out the signs of the erosion of monuments and the everyday deterioration that had previously been glossed over.

After 1848, photography's influence began to register in literary fiction, and here it seemed to threaten the organic unity that would later be so prized by Akeley. Increasingly, photography became the means by which the 'real' was defined in literature (Armstrong 1999). Contemporary reviewers repeatedly compared realist writing to the daguerreotype for its lack of compositional unity and emphasis on irrelevant detail. Both photograph and realist novel seemed to make the detail a means to destroy hierarchy, losing any sense of an overall structure or coherent form. In France, Flaubert, Balzac and Champfleury's writing was compared to the daguerreotype in order to denigrate it: literary realism seemed to violate the principle that art required choices to be made, hierarchies to be established (Kelly 1991, 201–202). Against an organicist model

of the artwork as a whole (in which no detail can be inessential), the inessential detail is, in Roland Barthes' words (1982, 11), 'scandalous', 'profligate', a 'narrative *luxury*'.

Barthes (1982, 15–16) named as 'reality effects' those tiny details that do not contribute to the plot or have any meaning in themselves except to give a sense of the real. Writing in the late 1960s, he saw them as part of a larger development across a number of disciplines and media in the late nineteenth century. The reality effects of realist literature underwrite the realism of the text, rather than contribute to the depth of its meaning, but they are nevertheless meaningful even if they say 'only this: *we are the real*'. Later, in *Camera lucida*, Barthes (1984, 4) suggested that the contingent details of the photograph do not do this. Rather than signify, the accumulated details of the photograph *designate* the real, the photograph 'points a finger', says 'that'. However, for Robison and others, skin eruptions, pock-marks, withered leaves and cracked plaster did more than designate the real, or even say 'this is the real'; instead they became reality effects with a specific significance – they said: 'this is how the real is': transient and inexorably decaying.

5 Rendition and Material Copies

Photography came to Edinburgh in a period in which science, industry, politics and aesthetics were all understood through a religious and patriarchal framework that articulated threats to the social and moral order in terms of decadence, feminisation, and decay. Yet decay was also understood, in British natural theology, as evidence of God's creation and design. Mimetic technologies such as those of photography and plaster casting were valued for their capacity to directly reproduce the minutiae of transience and ruination; this gave them scientific, but also moral value.

The copy is a rendition, a version of something other than itself. The term originates in the French verb '*rendre*', now used predominantly in the sense of 'to return' but originating in the sense of 'to deliver' or 'to yield'. In the contemporary use of rendition in the phrase 'extraordinary rendition', the connection to 'surrender' or 'yield' is evident; it refers to the illegal abduction and delivering-up of a subject by the United States government for torture in another country. But, as Nicole Shukin explains, rendering also refers to the processing of animal remains, as in the rendering of bones to produce gelatine. The suspect is yielded up for torture, an animal's body is melted down to yield its constituent parts, an object yields its copy. She uses 'rendering' as a key conceit in her 2009 book *Animal capital* to talk about the relationship

between the mimetic function of (cinematic, photographic) film and the processing of animal remains on which this mimesis relies (in the form of gelatine emulsions). In particular, she discusses Eastman Kodak's 1930 acquisition of a Massachusetts glue company, intended to ensure control over their gelatine supplies and remove their dependence on Germany. Shukin's aim, in evoking the multiple meanings of 'rendering', is to draw attention to film's materiality and link cinema to 'resources economies trafficking in animal remains'.[25] In another instance of its taxidermic realism, film represents animals at the same time as being literally constituted by them.

Rendition offers one way to articulate the continuum between the industrial materiality of photography, its mimetic capacity and moral concerns about waste. Although early processes such as the daguerreotype and William Henry Fox Talbot's calotype were not gelatine-based, the industrialisation of photography in the last quarter of the nineteenth century was premised on gelatine, which made it possible to mass-produce pre-prepared light-sensitive materials (dry plates), and also unexpectedly increased light sensitivity. Plaster casting came to gelatine earlier. It was Hippolyte Vincent's innovative use of gelatine moulds that facilitated the new, exquisite realism so valued by Robison. Élisabeth Lebon writes that Vincent began to study the possible use of gelatine as early as 1833, exhibiting his innovation at the *Exposition des produits de l'industrie* in 1834, and receiving a silver medal at the 1844 *Exposition*. As Robison suggests, Vincent's process required fewer seams, and therefore fewer repairs, in each cast produced. Lebon writes that the process was promoted as having the advantage of rapidity, economy and reproduction, since it was possible to take ten to twelve casts from one mould.[26] It was a difficult process, but when done well, even the finest and most fragile details could be copied with the utmost fidelity and minimum manual intervention. It was this fidelity to the fragile and the momentary that particularly struck Robison.

In both cases, gelatine improves fine detail and mass-reproducibility. While *gelée* or jelly was an animal product long used in art and in cuisine, gelatine was a specifically industrial product, the consequence of new techniques in rendering developed in the late eighteenth and early nineteenth centuries.[27] In 1814, the industrialist Jean-Pierre-Joseph d'Arcet patented a technique 'for the manufacture of glue or broth by a new procedure by means of which one converts into glue or broth all the gelatine and cartilage contained in the bones of animals' – a rendering process.[28] Gelatine rendering techniques were developed from experiments in the 1790s, notably by d'Arcet's own father (Jean Darcet) in order to produce cheap foodstuffs amid post-revolutionary deprivation in Paris, but d'Arcet's process was also used for the manufacture of *colle-forte*, the strong glue used in in manufacturing and the arts. As this

product became available, other competing manufacturers sprang up on the basis of similar patents, and its uses multiplied. In the 1840s, the juries of the 1844 and 1849 Industrial Expositions recognised the new glues as having reached a pinnacle of quality (Lieffroy 2007, 45–47).

Increased gelatine production was one means by which the growing chemical industry harnessed urban waste – at the start of the century, Céline Lieffroy (2007, 37) recounts, there were at least 20 tons of bones produced daily by Parisian butchers and by the knackers' yards. E.C. Spary (2014, 214, 233) writes of how Jean Darcet presented his experiments 'as a demonstration of the material benefits of rational economic knowledge' which showed 'how much could be made out of little'. The process developed by his son, d'Arcet, appeared as a 'chemical sleight of hand', magically transforming 'the inedible into the edible'. Vincent's gelatinous plaster casting technique was also a quasi-magical process, harnessing a waste product for immaculate renditions or copies.

The drive to reduce waste also drove the development of photography even prior to its adoption of gelatine. Iodine, a crucial component in the production of the daguerreotype, was discovered in 1811 during saltpetre manufacture; waste coal tar was found to be useful for producing dyes, leading to new sensitisers for photographic emulsions; gelatine was the medium that facilitated dry plates and emulsions. This practical, industrial impulse was linked to the older oeconomy which lent the reuse of waste a virtuous edge, and would counter and compensate for the tendency of nature to decay. Looked at this way, photography was a unique accomplishment: a copying process that might yield up (render) the whole of reality and that was able both to render the imperceptible signs of decay visible and to transform waste products into the practically invisible supports for this rendition.

At the same time, copies were duplicitous, since their realism depended on them downplaying their own material qualities. Thus the successful plaster cast mimics marble or human flesh, and the photograph invites us to look through it to what is represented, rather than lingering on the surface. Mimesis yields copies that are not only seen as inferior to artistic renditions and the originals in nature, but threaten to replace art or nature altogether. Techniques of artificial reproduction could inflame or assuage patriarchal anxieties regarding the breakdown of gender, class and racial hierarchies. In late eighteenth-century Britain and during the nineteenth century, as Harriet Guest argues, sexual difference was thought to be key to civilised society, and threatened by a growing commercial culture. She identifies as a 'leitmotif of later eighteenth-century theories of civilization' the notion that how women were treated and educated could upset the fine balance between 'corruption and refinement, degeneration and progress', and notes that even Wollstonecraft warned of a corrupt

and affected femininity, of a certain kind of woman enthralled by the superficial and the artificial.[29] By the 1840s, feminine dissimulation and deception could be contrasted with the camera's unsparing vision. The daguerreotype in particular seemed simultaneously to appeal to feminine vanity, as it was rapidly adopted for portraiture, and to frustrate women's attempts at fakery – in revealing 'warts and all' it might disclose a corruption beneath the feminine surface.

Anxieties about the collapse of hierarchy are predicated on the unacknowledged belief that the hierarchy is not inevitable and never-ending, but must always be propped up. Photography could appear both reassuring and threatening on this count. It would counter waste through the repurposing of industrial byproducts, yet as it rapidly industrialised, it became a major producer of waste and pollutants; and as it became reproducible, its proliferation of copies seemed to undermine aesthetic, moral and social hierarchies.[30] In its early manifestation as the daguerreotype, its ability to arrest decay (and thereby preserve the past) was perhaps less significant than its ability to reveal the inexorable decay and dissolution of nature.

Acknowledgements

Thanks to E.C. Spary and Marjolijn Bol for their thoughtful and helpful feedback on the drafts of this chapter, and to Rowan Lear for sharing my interest in the materiality of photography and helping to renew my interest in feminist theory.

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Endnotes

1 On Benjamin's theory of mimesis, see Buck-Morss 1989, 263–267. On technical reproduction, see Benjamin 20022.

2 Robison 1839, 155–156.

3 Chalmers, cited in Smith 1979, 62.

4 Robison 1839, 1575.

5 Robison (1839, 156) mentions that he saw still life compositions of 'various groups made up of plaster-casts and other works of art'.

6 *Art-union*, June 1846, cited in Fawcett 1986, 187; Richardson and Reynolds, cited in Demetz, 100.

7 Schor 2007, 182. Peter Demetz (1963, 99) writes that in the 18th-century European art academies the 'imitation of nature' signified a perfected version, what nature intended, 'had not destructive time and the deficiencies of the material interfered'.

8 Reynolds, cited in Schor 2007, 9. Reynolds does recognise 'the uses of particularity', but Schor focuses on his persistent anti-detailism.

9 Hegel, cited in Schor 2007, 22–24.

10 Vogel 1875, 65. From 1873, Vogel had pioneered new photosensitive emulsions that extended the limited spectral range of early dry plates, producing greater sensitivity to yellows.

11 Newsom Kerr (2013) suggests that 18th-century inoculation practices domesticated the pock-mark, but by the turn of the 19th century, early vaccinators encouraged an increasing idealisation of the unblemished face.

12 Te Hennepe 2007, 125–151. Schnalke (1995, 83) writes that the plaster and wax moulage process was only institutionalised in dermatological hospitals from the 1860s onwards, beginning at the Hôpital St Louis in Paris.

13 Millet, cited in Roxana *et al.* 2010, 26, n. 11. See also Di Bello 2018, ch. 1. The analogy persists into the 20th century in the comparison between photograph and death mask; see Henning 2017.

14 Anon. 1865.

15 Poivert 2009; Martin 2010.

16 Shapiro 1972, 220.

17 Athenaeum 1855 and Charles Heath Wilson 1874, both cited in Fawcett 1986, 191, 205.

18 See Hemingway 1989; Morell 1971; Smith 1969.

19 Taylor 2014, 294–301. On the relationship of the Illuminati theory to the British use of 'Illumination' to describe the Enlightenment, see Schmidt 2003.

20 Playfair 1815, 523

21 Roberts 2014, 134 and Roberts & Werrett 2018, 6.

22 Playfair 1815, 530–531. Playfair's politics could not be further from the elder Robison's, whose conspiracy theory he described (1815, 527) as the result of lamentable 'prejudices which had taken possession of an understanding in other matters so acute and penetrating'.

23 Wise 1989, 420; see also Werrett 2018, 54.

24 Haraway 1984, 63, n. 97, 42, 53, 57.

25 Shukin 2009, 21. For the discussion of the glue company acquisition, see Shukin 2009, 106, 112.

26 Lebon 2012, 86. Vincent's life and work are not well documented, although some French histories of plaster casting mention him, including Lebon 2012 and Rionnet 1996. According to Rionnet (1996, n. p.), gelatine was used for plaster casting in public ateliers in Paris from the middle of the 19th century. Vincent's process was perfected by Roubier-Paillard and Opigez in collaboration with the Louvre atelier.

27 As Spary writes, 'The invention of gelatine created a space for the exercise of chemical expertise which was separate from the everyday world of cooking and eating' (2014, 216).

28 From Darcet's patent, cited in Lieffroy 2007, 40 (author's translation). See also Spary 2014, 223–224.

29 Guest 2000, 23, 158, 276–277.

30 Benjamin 2002, 106.

CHAPTER 13

Time and Its Teeth: On Art, Survival and Material

Jeroen Stumpel

This essay will explore the different roles of material when it comes to the survival and transmission of works of art.[1] By what pathways are concrete objects like sculptures or paintings able to survive?

In the last lines of his *Metamorphoses* (8 CE), Ovid meditates on fame and survival. He is referring to the durability of words, rather than of works of art, in proudly telling us how he completed a work which '[neither] fire, nor sword, nor the gnawing tooth of time shall ever be able to undo'.[2] He shows immense faith in the continued transmission of his text over countless generations, and his words have been more than vindicated in the twenty centuries since his death in year 20 of our common era. A contemporary and colleague spoke in a similar vein about his own poetic *oeuvre*, words which proved to be equally justified. Neither rain nor wind, Horace wrote, nor years, nor the flight of time, would be able to destroy his verses: 'I have built a monument which will last for more years than bronze'.[3]

Some of the strange power of these words resides in the incongruent comparison between the immateriality of verses and the solidity of a material like bronze. Horace describes his monument as standing even higher, '*altius*', than pyramids, even though no such concrete measurement could ever be given to a collection of poems. He also claims that the endurance of his poetry will somehow prolong his very life: '*non omnis moriar*' – I will not die completely, he movingly wrote.

Clearly, the material survival of objects differs from the transmission of texts. Whilst a chain of copies is sufficient for a text, for an artefact to become immortal, a significant part of its very material as well as its form must reach later generations. Copying doesn't usually count as survival here.[4] Of course, in the case of texts too, eternity might be aimed for in the choice of material used to support the encoded information, as we often see in antiquity in the case of written laws, for example the stone tablets of Biblical lore that bore the Ten Commandments, the Mesopotamian law codes inscribed on high basalt steles, or the bronze plaques used in Roman times to announce laws and regulations (fig. 13.1). But it seems almost superfluous to observe that while Moses' tablets did not survive, his Commandments have. Likewise, our vast knowledge of

FIGURE 13.1 Artist unknown. Stele with law texts of King Hammurabi of Babylon, Diorite or basalt, *c.*1755–1750 BCE
LOUVRE, PARIS

Roman law is not based upon texts on bronze – of which in fact only a minute number have reached posterity (as Horace somehow foresaw). Obviously, the survival of texts may transcend the durability of their material support. The process is, one might say, of a meta-material nature.

This is different in the case of works of art, whose very nature, value, and identity is intrinsically related to their material. Material may not only determine the size and other visual features of the object, but also its survival over generations. The term 'survival' used here to refer to the duration of an artwork's existence is quite common in discourse about artefacts. A vase may not survive a fall, just as Bellini's cycle of important paintings has not survived a 1577 fire in the Doge's palace in Venice. But pots, pans and paintings are dead to begin with: so what does survival mean in those cases? What does it entail for an artwork to survive, and to what extent can one compare this to the life and survival of organisms? Both 'death' and 'destruction' are antonyms of survival, but there is an asymmetry here: we are happy to refer to the endurance of, say, a painting as survival, but its loss is not referred to as 'death'. I have never heard anyone say that Bellini's paintings died during the Venetian fire. In other words, although every death is a definite form of destruction, not every definite destruction is a form of death.

It may be argued that works of art begin to die when they come to be deprived of their original social functions and meanings. Consider Navajo sand paintings: elaborate patterns shaped as part, and even centrepiece, of cleansing ceremonies, only to be destroyed after the ritual. The destruction is, in a sense, an actual part of the ritual. During the twentieth century, some of these paintings have been photographed, and their shape thus preserved (Parezo 1983). There are even sand paintings that have been fixed by ethnographers and are still on display. To what extent is this a form of survival? Are these zombie works, like the living dead? For some critics the numerous altarpieces in collections all over the world are dead in this sense, generally divorced not just from their original frames, but from their altar and cult as well. But one could also hold a less dramatic view, and maintain that they have changed rather than died, transformed into an artwork, a gallery object, wall decoration, or historic document. They may not so much have died, as started a new life. In any case, such transformed artworks are less dead than their unfortunate fellows that burned to ashes, for instance, and disappeared altogether. At least parts of their material and form have been preserved.

Survival in these and other matters is determined by a combination of the properties of the material, and those of their surrounding culture. To begin with the former, works of art made of brittle and ephemeral material obviously

have a smaller chance of survival than things made of more solid stuff. We know that Albrecht Dürer meant for his painted altarpiece for Heller to survive 'for more than five hundred years', as he himself wrote, and he recommended a varnish of his own making to enhance the longevity of the work even beyond this already impressive stretch of time. Dürer emphasised that he had chosen procedures and materials that would enhance the durability of his work. In one passage, he even suggests that the actual practices of the cult going on around the altarpiece, rather than promoting its survival, could threaten it: 'Make sure it is kept clean, and is not fingered, and doesn't have holy water splashed on it'.[5]

Unfortunately, the Heller altarpiece was lost – ('it did not survive') meaning that it was destroyed by fire at the end of the eighteenth century. And yet, to quote Horace again, 'it did not die completely', because, about a hundred years after Dürer had painted his original, a competent copy was made to the same size. This copy is now in a museum in Frankfurt, where it is shown as part of a didactic presentation about banking and money in sixteenth-century Frankfurt, since the patron who commissioned it was a local man of means. The original painting had been deprived of its cultural context much earlier, first with the arrival of the Reformation in Frankfurt, and later when it entered the collection of Maximilian I, Elector Archduke of Bavaria, in Munich. In this case, we might speak of a "material transmission": the transmission of unencoded material like images and shapes through a process of copying. This preserves some features of the object by partial replication, sometimes even in other materials – from bronze, say, into marble, or from oil paint into watercolour.

How do we look upon examples such as the sculptures of Praxiteles, ones that did not actually survive, but nonetheless enjoyed great reproductive success? These are not just philosophical questions. Ways and modes of survival are very important for understanding art history. When the house of Hokusai the elder burnt down in a fire which both he and his artist daughter only just escaped, all his painting materials, patterns, sketches, and documents were lost, and lost forever (Baatsch 2016). Hokusai doubtless had memories of this material, but it was no longer accessible to other artists, whether of his own generation or any other. This certainly affected not just Hokusai's *oeuvre*, but that of many other artists as well – in other words, it influenced art history.

Obviously, the history of art is determined by survival in many different ways. But as far as I know, to date there has been no systematic analysis of survival and material transmission in art. We have numerous studies of iconoclasm, the wilful destruction of images, but much less on other forms of disappearance of art.[6] It is known, for instance, that in Italian castles and country houses of the thirteenth to fifteenth centuries, there must have been many

decorative paintings depicting fake hangings and festoons, scenes of court life or the different faces of the seasons. Very, very little of this work has survived (Dunlop 2009). The famous fifteenth-century Schifanoia cycle of frescoes in Ferrara, for instance, was only discovered under layers of plaster during the nineteenth century, as were Pisano's Arthurian knight scenes in Mantua, where one almost complete and famous example has been preserved – Mantegna's *Camera picta*.[7] But these represent less than the tip of an iceberg of art that was never a target of iconoclasm, but rather a victim of wars, fashions or economic necessity.

We could say comparable things about the famous *dipinti* or *panni fiaminghi* that arrived in Italy by the shipload during the Quattrocento. These glue paintings on linen are a rarity nowadays, and among the flood of Flemish *panni dipinti* there are few survivors indeed.[8] One could also refer to an example concerning very precious art of the same period – artworks more prestigious, in fact, than painting or even tapestry. In a wonderful study, Van der Velden (2000) has reconstructed the oeuvre of Gerard Loyet, a goldsmith working for Charles the Bold. This gifted artist made, among other things, a considerable number of golden votive images that became important miracle-working images in the sacred places of Europe. None of them have survived: of the entire production by Gerard Loyet that is known from the archives, just a single work exists – a splendid miniature votive gift, showing Charles with the patron saint St. George (fig. 13.2). All these forms of disappearance are different both from iconoclasm (image-focused destruction), and from incidental loss (accidents like Hokusai's fire). They were neither intended nor fortuitous, but somewhere in between, and structural factors may have been involved. One might ask whether it would be worthwhile to study such factors more systematically – to pursue the analysis, not just of what has disappeared (something fairly rare within the historiography of art), but of possible patterns, or recurring mechanisms, in the survival of art works over a long period of time.

In a seventeenth-century print, we can see Time gnawing at works of art, already having half-devoured the Belvedere Torso, which is thus enduring a fate that Horace boasted his verses would be spared (fig. 13.3).[9] Is the consumption by Time a random process, a blind procedure? Or are there patterns in his taste for art, systems in his mad appetite? This question has been posed quite explicitly in a different field of historical enquiry, namely palaeontology, where this type of analysis goes under the name of 'taphonomy'. Taphonomy is the analysis of how organisms become fossilised, if indeed they do. The term was coined in 1940 by the Russian scientist Ivan Efremov. He intended to study the conditions that allowed (the remains of) organisms to become fossils: the transition 'from the biosphere to the lithosphere'. He took the name from the

FIGURE 13.2 Gerard Loyet, *St. George with donor image of Charles the Bold*, 1467–1471, encrusted enamel, gold and silver-gilt, height 53 cm CATHEDRAL OF ST PAUL, LIÈGE. PHOTO: JEROEN STUMPEL

Ancient Greek τάφος, for 'grave'. Taphonomy is, in other words, a systematic study of that which has become buried, and may be found in the ground. It studies the chances of survival, not of living organisms, but of objects that are transformations of once living organisms, ones that have 'not died completely' but have been transmitted in material form over periods longer than Horace could even have imagined. One motivation behind taphonomy is to understand biases of the fossil record better. The omnipresence of certain fossils like

FIGURE 13.3 Cornelis van Dalen II, *Time gnawing at the torso of the Apollo Belvedere*, engraving by Cornelis van Dalen, title page to François Perrier, *Eigentlyke afbeeldinge van 100 der aldervermaerdste statuen of antique-beelden* (Amsterdam 1702)
RIJKSPRENTENKABINET, AMSTERDAM, INV. NR. RP-P-OB-50.015

shells in a particular stratification can easily create the impression that one is dealing with a particularly dominant, successful species at the time. But it might also be a mere by product of the fossilisation process itself; other life forms may simply not have fossilised in such quantity. 'Hard parts' like shells, so taphonomy tells us, are more likely than 'soft parts' like worms to be represented in geological strata, regardless of the size and spread of their populations in the period when they were alive. This kind of enquiry is a far cry from art history, but I believe the field could gain from some of the insights of taphonomy, which seem to have validity beyond the mere world of fossils.[10] After all, comparable biases plague the preserved art historical corpus. In overviews of art history, the *panni dipinti*, or the lost works of Loyet and his colleagues, are hardly mentioned, if indeed they are mentioned at all. This creates a distorted view of the history of art, one determined more by the various possible routes for survival than by actual production. That goes not only for groups of works that have practically vanished altogether, but also for the appearance even of large groups of works that have in some form or other have come down to us.

1 Survival and the Rule of Skin

Taphonomy tells us, as we have seen, that 'hard parts' have more chance of becoming fossilised than 'soft parts'. We know much about the shape of dinosaurs, but far less about their skin, colours or surface patterns. In dealing with works of art from the past, there are close taphonomic parallels. In fact, we must always, and by definition, distrust the outer ring of an art object that has survived, and this includes its skin as well as possible accoutrements such as frames, pedestals and other objects attached to it. Would some *kouroi* have been adorned with sashes or other textiles, like statues of the Buddha in many temples in Thailand or Cambodia today (fig. 13.4)?[11] After all, we know that wooden cult images in Classical Greece could indeed have textile adornments. Most famous is the woollen *peplos* on the ancient statue of Athena Polías on the Acropolis, which was annually renewed in a grand ceremony. If so, nothing of such organic additions would have been preserved. Likewise, the stark and barren monument of Stonehenge may well have been clad with festoons of leaves or branches – but again, if this was so, the chance of their survival would be nil (fig. 13.5). These are guesses, shots in the dark, mentioned merely to underline the extent of our ignorance about the original exterior of many monuments.

FIGURE 13.4 Artist unknown, Wat Chang Lom temple, thirteenth century, Si Satchanalai, Thailand
PHOTO: © CORBIS

FIGURE 13.5 Artist unknown, monument of Stonehenge, *c.*2900 BCE
PHOTO: CODY LOGAN, OPEN SOURCE

There are famous cases, however, where we do know with certainty of additions that were lost. The Great Pyramid at Giza originally shone, thanks to a white surface of polished blocks of limestone all over its exterior. This heavy outer skin is now almost entirely lost, resulting in a severe distortion of the intended appearance of the pyramid.[12] A comparable case are the great obelisks founded under the female pharaoh Hatshepsut, made of reddish granitc.Both the obelisks and their pedestals bear texts expressing great pride in their construction and expected longevity. 'Truly my heart turns this way and that', so the queen states on one of them, 'when I think of people who will see my monument years later, who will speak of what I have made'.[13] Elsewhere, Hatshepsut states that the obelisks were made 'in order that my name may exist, established and enduring in eternity'. Unlike Horace, Hatshepsut put her trust in the material strength of the impressive constructions: 'They were of one piece of strong granite, without a join or mend in them'. And indeed, one of them still stands, with inscription and all (fig. 13.6). The quarrying and working of granite of such enormous size is an astonishing engineering feat. But remarkably, Hatshepsut spent more proud words on the skin of the huge needles than on the granite itself: 'My heart led me to make obelisks of electrum', we read, and this term refers to a naturally occurring, very precious alloy of silver and gold, that covered most of the outside of the stone needles. She 'put on them the best electrum. I have weighed the electrum by the satchel like grain'. Elsewhere the obelisks are repeatedly described as 'made of great amounts of electrum'. Apparently, the gilding was more important than the entire shaft of granite. And indeed, the effect of the electrum layers would have been striking, causing a spectacular reflection of sunlight. She even refers to them as 'mountains of gold'. A contemporary description confirms that not just the pyramidal top, but at least half of the needles were coated in this wondrous yellow white metal. But here, as so often, this 'soft part', this very skin so essential to the patron, has all but disappeared.

Vanished skin or disappeared accoutrements can be suspected not just on the basis of descriptions, but also of material traces, however vague, of their former presence. An interesting case is presented by Donatello's *Saint George*, made for the façade of the Orsanmichele church in Florence (fig. 13.7). Marks on the marble head reveal that he once wore a helmet or wreath, while in his open hand he must have held a blade or lance. Such additions would strongly affect the overall impression of the marble statue. Interestingly, recent investigations during a restoration have shown that the actual skin of the stone was different too. It has always been known that within the series for which it was designed, in which different guilds acted as patrons for different sculptures, *Saint George* numbered among the less costly of the sculptures in material terms. The most

FIGURE 13.6 Artist unknown, Obelisk of Queen Hatshepsut, at Karnak, Egypt. Granite, *c.*1455 BCE

prestigious sculptures on the façade were made in bronze, while marble could be almost ten times cheaper. It now appears that the marble had some form of coloration on its surface, a paint which in fact had a bronze colour. The outer layer is of uncertain date, perhaps even seventeenth-century; but this form of material mimesis which converted marble into faux bronze would have changed the sculpture even more than the attached objects mentioned earlier. Thinking back to the earlier examples in Egypt, one surmises that, there too, material mimesis played a central role in some way – the intention perhaps

FIGURE 13.7 Donatello, *Saint George*, 1417, marble
BARGELLO MUSEUM, FLORENCE (ORIGINALLY ON THE FAÇADE OF THE OR SAN MICHELE COMPLEX), FLORENCE
PHOTO: OPEN SOURCE

being to build mountains of solid silver and gold. As material mimesis is mostly a matter of surface imitation, its manifestations are particularly subject to the taphonomic rule that outer skins have diminished chances of proper survival, something that can also be seen, for instance, in the many altarpieces in Trecento, Tuscany, which have lost much of the original splendour of their gilding. This vulnerability of material mimesis has caused a bias in our artistic corpus, and has contributed greatly to the relative neglect of this phenomenon in art historical studies.

If we now go from the skin to the core, one might suppose that the taphonomic changes of survival would simply be proportional to the robustness of the material itself. We know, for instance, with precision that on 20 January of the year 1494, Piero di Lorenzo de' Medici ordered a large piece of sculpture from Michelangelo. He duly finished the work, but not a trace of it remains. It was made of snow, during an unusually cold Florentine winter. It is obvious that a snowman must be ephemeral in mild climates, so its non-survival seems trivial – like sculptures made out of sand, or temporary decorations in papier-mâché. But in cultural taphonomy, the relation between the durability of a material and the long-term survival of the object is not always that straightforward. Individuals and institutions may take measures to freeze and fix works in brittle material – as we have seen in the ethnographic attempts to preserve Navajo sand painting. But such practices may also be seen in museums and collections of modern art, where a sculpted self-portrait by Marc Quinn (*Self*, 1991–2017), made of the artist's own frozen blood, is kept in freezing conditions.[14] Nowadays, any museum would doubtless have done the same with Michelangelo's snowman. In such cases, the life of very vulnerable works is directly tied to the life of the institution that keeps them. Their cultural environment may form a corridor for survival that is quite unexpected, considering the nature of their material.

2 The Risk of Recycling

Above it was said that survival in art objects 'is determined by a combination of the properties of the material, and those of the surrounding culture'. With surviving works of brittle stuff, we have seen that the cultural surroundings, rather than the material itself, are in question. But this also goes for works made from more durable, sometimes extremely durable, material, which may paradoxically attract rather than avert destruction initiated by the cultural world around it. The splendid outer casing of the Giza pyramids once suffered damage from natural causes during an earthquake, but its near disappearance

is mostly down to culture: the building activities of a sultan in the fourteenth century, and a pasha in the nineteenth, who redeployed them for the building of various mosques and a fortress. It is hazardous for a monument to be of a material that might invite reuse – especially a rare and precious one. From the historiography of European tapestry, we learn that a great number of medieval tapestries were destroyed during the eighteenth century, not just as victims of fashion and taste (the fate suffered by their artistic fellows, painted adornments of castles), but because they were burnt in heaps, and from their ashes was harvested the gold that had been used for the wonderful, gilded threads of their weave.[15] Some of the painted decorations could be recovered from under the layers applied on them, but these tapestries paid more dearly for their very material splendour and are irredeemably lost.

As Horace wrote, bronze is a durable material. It survives easily because it is only mildly subject to corrosion. But it is expensive and eminently recyclable, and so products made of this metal are in definite taphonomic danger. In 1506, Pope Julius II commissioned a large piece of sculpture from Michelangelo.[16] It was to be a monumental bronze sculpture, more than 10 feet high, of the seated pope, to be erected in Bologna, a city that Julius' troops had recently conquered. To furnish the required amount of bronze, the pope had the town's church bells melted down. Two years later, the huge statue was finished, but a further three years on, the bronze was melted down again, this time to turn it into a heavy cannon (baptised '*La Giulia*') aimed at the armies of the same pope by his opponents. Bronze is tougher than snow, but in this case, and many others, artefacts made of it may prove to be almost as ephemeral.

Looking at the history of sculpture in Greece according to written sources that have come down to us, bronze was the eminent material in which the best sculptors produced their masterpieces. But the half-dozen or so actually surviving works are a tiny number. Of this handful, the majority are marine finds accidentally lost in shipwrecks and protected by the sea. Think of the Getty's *Victorious youth*, the *Marathon youth*, the *Artemision bronze*, the *Piraeus Apollo* or the two *Riace bronzes*. The one striking example preserved in non-aquatic circumstances is the wonderful *Charioteer* of Delphi, from the fifth century BCE. In Delphi alone, many tens, maybe hundreds of bronze sculptures used to surround the sanctuary of Apollo, but in the long run all of these were used for scrap, recycled into swords, shields or other bronze implements (fig. 13.8). The *Charioteer* only managed to escape – albeit without his horses – thanks to a landslide that kept it hidden from the fourth century BCE until 1896, the year of its rediscovery. By coincidence, this bias in the artistic record – the near absence of classical Greek bronzes – has been mitigated by material transmission. I refer to the reproduction of copies of Greek bronzes in marble that

FIGURE 13.8 Artist unknown, *Charioteer* (detail), bronze, *c.*470 BCE
DELPHI ARCHAEOLOGICAL MUSEUM, DELPHI, GREECE.
PHOTO: VICENÇ VALCÁRCEL PÉREZ, OPEN SOURCE

occurred in Roman times. By means of this process, the form of the *Discus thrower*, for instance, was materially transmitted to post-classical times. This channel of transmission also had its own strong effect upon the aesthetic appreciation of marble as a material for sculpture in later periods. But could it be ('never trust the skin') that some Roman copies were coloured bronze, imitating their metal models in this respect as well?

The taphonomic risks of bronze were well known during the Renaissance. There is the interesting case of Isabella D'Este of Mantua, who desired to erect a statue of Virgil, a native of Mantua. It was to be designed by Andrea Mantegna (who actually produced a drawing) and executed by a master sculptor. Isabella discussed the matter with her learned court advisers, and wrote in a letter: 'We proceeded to discuss the question of whether the poet's statue should be made of bronze or marble, and agreed that although bronze is certainly the nobler material, yet, since there is always a risk that it may be melted down to make guns or bells, we should prefer a fine marble statue, placed on a noble pedestal in some honourable place'.[17] This shying away from a more noble and durable material, a kind of proleptic taphonomy, occurred not only in the case of bronze, but also in the cases of gold and silver. In Vasari (1550), for instance, we read about Antonio del Pollaiuolo, a gifted and well-trained goldsmith. He made various works all over the city of Florence. But, as Vasari says, most of them 'have been destroyed and melted in the fire, because of the city's needs in time of war'. So Antonio realised that his craft 'did not produce long-lasting results from the labours from those who practised it'. He decided to abandon it in favour of painting, a profession new to him, 'because of his desire to be remembered for a longer time'. Apparently, again according to Vasari, Antonio considered painted panels more durable than gold (in inverse relation to the material durability of this metal versus wood), and indeed his Capponi altarpiece figures in every overview of Western art history (fig. 13.9).[18] We don't know whether Antonio, like Horace, was actually driven by a desire 'not to die completely', nor whether such a desire made him turn to painting.[19] But the story itself unambiguously shows how Renaissance figures could consider artworks in gold a liability, if longevity was on their mind.

An astonishingly close view of the destruction of sophisticated works in gold is given by the goldsmith Benvenuto Cellini, who describes in his diary his time with Pope Clement VII during the siege of Rome in 1527.[20] The pope had withdrawn into the castle of Sant'Angelo, surrounded by enemy troops. Cellini himself assisted in the defence of the castle, firing guns and cannons, but the pope interrupted such martial activities with a special request. With the possibility of an escape in mind (there were secret corridors), Clement demanded that Cellini extract all the jewels from the beautiful papal tiaras,

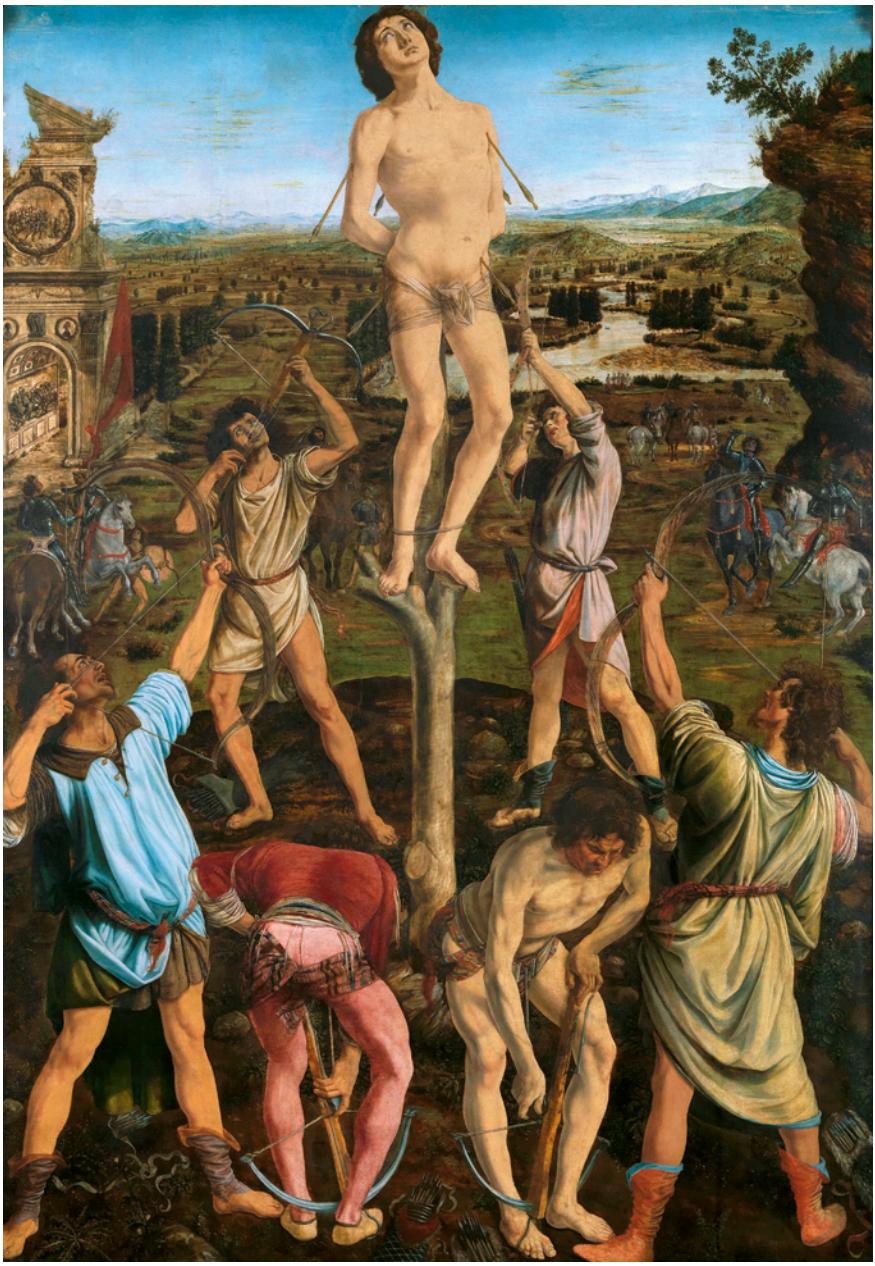

FIGURE 13.9 Antonio del Pollaiuolo, *Martyrdom of Saint Sebastian*, 1475. Oil, tempera on panel, 291.5 cm × 202.6 cm
NATIONAL GALLERY, LONDON

rings and other exquisite works, and have them sewn into the pope's mantle, while the gold was melted in an improvised oven of bricks and converted into transportable bullion – all this to allow the pope to escape with cash. Yet in the end these actions proved unnecessary: the castle was not taken. Obviously, not every artwork made of gold met with a fate such as this. Such works have their own corridors of survival, via the relative safety of treasure-chambers, for instance in royal houses, temples or churches with long-term historical continuity. Works of Antonio del Pollaiuolo in silver and gold have come down to us in the heritage of the Florentine Duomo, while Cellini's splendid *Salt cellar*, the only work in precious metal that can be reliably attributed to him, survived in the French royal collection, and from there entered the Habsburg treasury as a gift (fig. 13.10). After the fall of the Habsburgs, the treasury became part of the Kunsthistorisches Museum in Vienna – and

FIGURE 13.10 Benvenuto Cellini, *Salt cellar*, 1540–1543, gold, enamel, ebony, and ivory, 28.5 cm × 21.5 cm × 26.3 cm
KUNSTHISTORISCHES MUSEUM, VIENNA
PHOTO: KHM, VIENNA

museums of course are meant to be corridors *par excellence* of survival above the ground.

3 Burial and Distortion

If we look to earlier periods, however, where the unbroken chains provided by such institutions are lacking, it is geological protection that offers almost the only route for survival. We have already spoken of protection by water, such as in shipwrecks, but caves are even more important, as also burial in the ground. The term 'taphos' in taphonomy means, as we have seen, 'grave' or 'burial'. In the study of fossils, it is essential to understand the shapes of organisms that were once part of the biosphere, and which after their death became part of the lithosphere through a process of diagenesis – in other words conversion into geological sediments. We could metaphorically speak of sedimentation in the case of artefacts as well. There are various forms of such sedimentation. First of all, we have the unintentional variant, the chance burial of artefacts by natural causes. We have seen this in the landslide protecting the *Charioteer* of Delphi, but the most famous case, and well-nigh unique, is the concealment of Herculaneum and Pompeii by a huge, dense blanket of volcanic ash. Another phenomenon is semi-intentional sedimentation. This comes in distinct categories. The first is where artefacts were buried purposely, but not with the intention of safeguarding them as integral works of art; the second is when things are indeed buried for protection, but not with the intention that they would stay there.

There are numerous examples of the burial of (fragments of) works of art for purposes entirely other than preservation. Such is the case for a sculptural ensemble of reliefs dating from the sixteenth century, discovered in a church near Utrecht. Thanks to various waves of iconoclasm, sculpture of the early sixteenth century is a very rare commodity in the Northern Low Countries. In the small town of Doorn, the pieces of this large, damaged group were used as foundations for a new section of the church (Van Wezel & Van den Akker 2013). By this unexpected means they came to be preserved, albeit in deplorable condition (fig. 13.11). Far more spectacular is the group of monuments in the town of Dura Europos, also preserved by semi-intentional sedimentation. Here, the finds concerned very rare works of art and architecture: not only a sanctuary of Mithras, but also the earliest Christian place of worship to have survived in Asia (and perhaps indeed elsewhere). On top of this, an even rarer monument was revealed: the painted decorative ensemble of a synagogue. This recovered

FIGURE 13.11 Artist unknown, *Kiss of Judas*, relief in French chalkstone, with polychromy, *c.*1530
CHURCH OF ST. MAARTEN, DOORN, THE NETHERLANDS

art of the synagogue now figures in every overview of art history. Dura Europos has been called 'the Pompeii of Asia Minor'. The title may be justified to a certain extent by the richness and importance of the find, or by the fact that it concerned an entire section of the town, hidden under rubble. But the causes of this burial were very different from those acting in the case of Pompeii, and rather than being the blind work of nature, they sprang from human action. In around 256 CE, Dura was under Roman control, and an important strategic stronghold. The town came under attack from Sassanid Persian troops. Feared for their cunning approaches to fortified places, the troops' tactics included the ingenious use of tunnels and underground gangways that passed beneath a town's protecting walls. In order to counter such strategies, it was decided to have the grounds surrounding parts of the walls covered by huge piles of rock and sand. As it happened, this was the area where marginal religions had their sanctuaries, and so they came to be buried, along with the rest of the dwellings adjacent to the wall. The attacks on the small town proved successful in the long run, but later it was abandoned, leaving other important archaeological findings, while synagogue, church and temple slumbered beneath the man-made land slide.

Another very special case of semi-intentional sedimentation is presented by the example of a subway station in New York. It was part of a pioneering attempt to establish an underground transport system based on pneumatic engineering. As early as 1870, a station was fully equipped, but the undertaking proved unprofitable. The structure was abandoned, falling into complete oblivion. Many decades later, it was hit upon during tunnel-building for a new line of the electric subway. Parts of the station were found intact, including a piano left in the waiting room and a complete carriage (figs. 13.12a, 13.12b). The underground positioning was intentional, but not determined by respect for the artefacts. The remains had been surprisingly well kept, but were simply forgotten, while the rediscovery of the material was never intended. This latter factor creates an important difference from a second form of semi-intentional sedimentation. In this variant, the burial is intentional, but also intended to safeguard the artefacts, although they were not meant to remain in their hidden condition. Such items are known as hoards: stocks of valued objects, temporarily put in safe condition in the ground or in caves. Often finds of hoards concern coins, but there are spectacular and important cases involving works of art, such as the Cuerdale Hoard from the Viking period, or the much earlier Mildenhall Treasure, containing more than 30 pieces of very rare Roman silver platters, dishes and bowls. Perhaps the best-known find from this category of semi-intentional burial is the case of the Dead Sea Scrolls. These large texts on papyrus, dating from the fourth century BCE to the first century CE, were discovered in the caves of Qumran, near the Dead Sea, in the late 1940s and early 1950s. They were probably put there for safekeeping during wars, in Roman times. The brittle papyri bear texts dating from around the time of Horace and earlier – they reached modern times not by transmission but materially, by surviving undisturbed in desert caves which not only kept them hidden from view, but also naturally preserved them in ideal climatological conditions. After concealment, the collection was forgotten. The Dead Sea Scrolls contain some the oldest surviving parts of Biblical texts.

From semi-intentional sedimentation we now turn to the most important category: intentional sedimentation. This is where artefacts are put into the ground intentionally for the long term, or even in perpetuity. Perhaps the best example of the former is the curious phenomenon of the time capsule, such as the once-famous Westinghouse time capsule produced for the New York World Fair of 1939 (fig. 13.13a).[21] The idea was to bring different typical products of the age to later generations – people living 5000 years later, in fact, as the capsule is be opened no earlier than the year 6939. Apart from texts on microfilm (Horace's verses were not included) and a small microfilm reader, the metal capsule measuring about 2 metres in length contains some thirty-seven

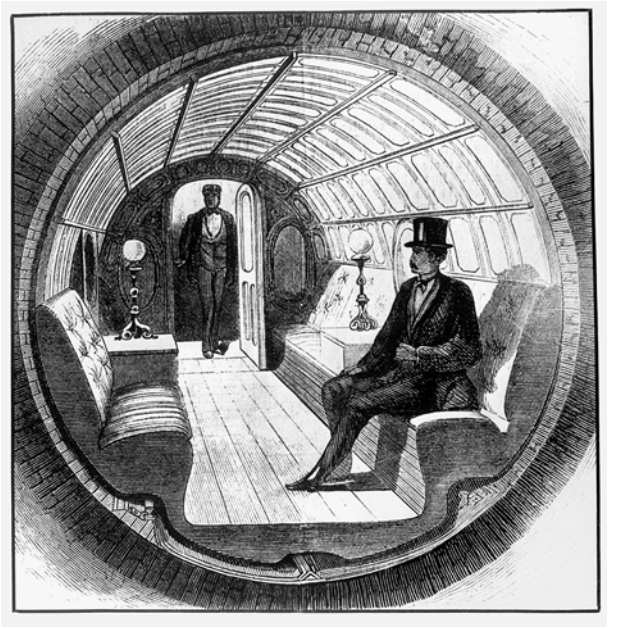

FIGURE 13.12A Artist unknown, *Images of the Beach Pneumatic Transit project*, *c.*1870. Wood engraving

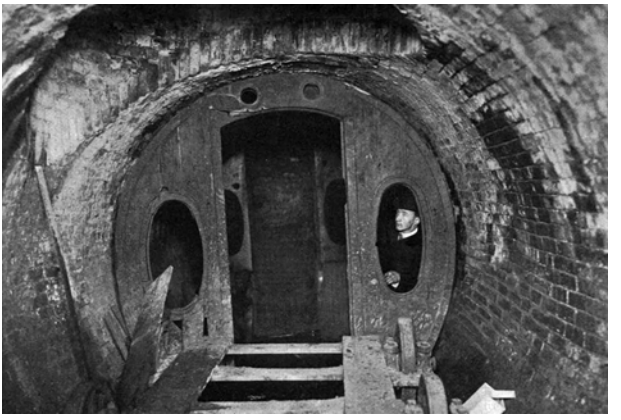

FIGURE 13.12B Beach Pneumatic Transit project, retrieved wagon, *c.*1912
PHOTO: UNKNOWN

FIGURE 13.13A
Westinghouse Time Capsule
PHOTO: DOUG COLDWELL/CC BY-SA 3.0

FIGURE 13.13B
A Kodak Bantam F/4.5 camera, the model placed in the Westinghouse Time Capsule in 1939 (see fig. 13.13.a)
PHOTO: PUBLIC DOMAIN

objects, including a fashionable hat for ladies, a fountain pen, a slide ruler, and a photographic camera (fig. 13.13.b). In order to make sure that the items were materially preserved, a specific alloy had to be developed. The organisers decided 'that the best possible material is a metallic alloy of high corrosion resistance & considerable hardness, of nonferrous nature, and preferably containing a high percentage of copper. Of all the tools used by ancient peoples, those of stone and copper have come down to us from farthest in the past'. This led to the choice of 'Cupaloy': an alloy of copper with 0.5% chromium and 0.1% silver.

Time capsules were organised in various forms and degrees of sophistication all through the twentieth century. The craze was very much stimulated by the find of a much older example of intentional sedimentation: the spectacular discovery of the tomb of Tutankhamen by the Carter expedition in 1922. This was of course an obvious form of intentional sedimentation – the objects were placed where they were for funerary reasons. For our knowledge of artefacts from a deep past, burial is likely the most important category of survival by far.

The situation of tombs or protected funerary casings might seem much like that of the time capsule. In both there is, of course, biased selection – in the case of the Westinghouse capsule, clearly determined by an idealised

self-image of the decade, in keeping with the agenda of the World Fair; in the case of tombs, all kinds of psychological, social, religious and ritualistic forms of selection are at work.

From a taphonomic perspective, however, there is an important difference between the tomb and the time capsule. The capsules aim to deliver to the future real stuff – actual objects that, in principle, could return to daily practice once removed from their enclosure. This is often not at all the case with grave goods, which might just as easily be copies or tokens of artefacts as the real thing. There are ancient Chinese texts that give a particularly sharp insight into the peculiar character that funerary goods may have. One, dating from the second century BCE, but revisiting notions formulated much earlier, puts it thus:

> Confucius said: in dealing with the dead, if we treat them as if they were entirely dead, that would show a want of affection, and should not be done; or if we treat them as if they were entirely alive, that would show a want of intelligence and should not be done.

This is very different from the intended audience of time capsules.[22] In the following lines of the same text, we read: 'On this account, the vessels of bamboo (used for burials) are not fit for actual use; those of ceramic cannot be used to wash in'. The author goes on to mention many more examples of such gifts deliberately made of the wrong material or lacking essential parts; offerings which 'are called spirit vessels, that is, the dead are thus treated as if they were spiritual intelligences. The term 'spirit vessels' is a translation of the words 'Ming qi', which perhaps could also be translated as 'would-be ware'. The text has a prescriptive tone, but at the same time it is descriptive; it describes what people may do when bestowing funerary gifts, and in fact points at a transcultural phenomenon, I believe. To illustrate this, I shall turn to an incident reported in a Dutch national newspaper decades ago. It showed a photograph of members of a family surrounding a recent grave (fig. 13.14). They are described as 'defeated, full of incomprehension. The grave has been broken open'. A hole had been made in the coffin just below the head of the buried man, strongly suggesting that some evil doers had been after the golden chain the dead man was well known to wear continually. A sad case of modern grave robbery, but, as we learn from the final paragraph, 'the widow had substituted the heavy chain for a much less valuable one when the dead man had been placed on a bier. So the perpetrators dug two meters down, all for nothing'. The

FIGURE 13.14 From the front page of the *Telegraaf*, a national Dutch newspaper

gold chain was in fact a case of material transmission, 'would-be ware', rather than being actually present.

Such tactics are known for many graves and tombs. In Etruscan graves, such as the *Tomba dei rilievi* in Cerveteri, dating from about 550 BCE, the many grave goods, from shields to swords, are made of stucco, including a mirror which, to quote Confucius again, was 'not fit for actual use' (fig. 13.15). This may also be the case when actual material is used. The so-called Rudham Dirk, dating from 1500 BCE, is a bronze dagger, buried in the ground for ritualistic reasons, that had been deliberately folded and thus rendered completely unusable (fig. 13.16).

FIGURE 13.15 Artist unknown, *Tomba dei rilievi*, Necropolis of Banditaccia (Cerveteri), *c.*550 BCE
PHOTO: ROBERTO FERRARI, OPEN SOURCE

A very important and complex example from a funerary context is presented by some pottery dating from the Greek classical age. A few decades ago, Michael Vickers and David Gill proposed one of the most innovative of theories concerning Greek art, in their book *Artful crafts: Ancient Greek silverware and pottery* (1994). They challenged established views of Greek pottery vases as objects of great aesthetic value in antiquity. In line with older ideas from the so-called Oxford school, beginning with Arthur Evans, they considered these objects to have been cheaper, ceramic versions of vessels made in silver and gold (figs. 13.17a, 13.17b). If so, they would be both skeuomorphs ('a physical ornament or design of an object made to resemble another material or technique'), as well as examples of material mimesis. The black of Greek pottery was, in the view of Vickers and Gill, a form of imitation of corroded silver (which can indeed be black), while the red and yellow colours imitated the glow of different variants of gold or copper. Even the signatures that are sometimes found on such pottery they believed to be signatures of renowned goldsmiths, rather than those of the potters – comparable to Dutch biscuit tins bearing reproductions in relief of the *Nightwatch* that have the name 'Rembrandt' upon them. The views of Vickers and Gill were slow to become commonly known, let alone

FIGURE 13.16 Artist unknown, Rudham Dirk, bronze, 1500 BCE
NORWICH CASTLE MUSEUM AND ART GALLERY. PHOTO: JEROEN STUMPEL

FIGURE 13.17A
Artist unknown, Silver kantharos with *The abduction of Helen*, *c.*420–410 BCE
PART OF THE VASSIL BOJKOV COLLECTION, SOFIA, BULGARIA

FIGURE 13.17B
Shuvalov Painter?, *Kantaros with image of Eros*, 420–410 BCE
LOUVRE, PARIS

accepted. The reasons for this delay are both institutional and aesthetic. There is a feeling of unease about the material mimesis they detected. In a fine scholarly and scientific study from the Getty Foundation, *The colors of clay: Special techniques in Athenian vases* (2006), their thesis was conveniently ignored. Instead, both the shape and colouring of such Greek pottery are described as the products of sophisticated aesthetical considerations peculiar to pottery at the time. This approach met with counter-reactions. A particularly strongly-worded response came from Vickers himself (2007), who expressed his disappointment that nowhere in the book nor in the exhibition that it accompanied was any reference made to 'the arguments that have been put forward to read them (the colours) as attempts by the decorators of pots to evoke the appearance of silver, gold, ivory and copper', nor to the fact that the pots owed their very shape to work in other materials that stood very much higher in the hierarchy of substances. They were cheap substitutes, and Vickers even referred to them as kitsch, rather than art.

The reader may well ask what this discussion has to do with funerals and intentional sedimentation. Well, it is a strange and disturbing fact that the large corpus of this type of Athenian pottery was almost exclusively found in Etruscan graves and tombs. In his review, Vickers (2007) ascribes this to the supposed astuteness of the Etruscans, who 'as notorious pirates, knew a thing or two about material values'. Whether this is typical of an Etruscan pirate mentality, I wouldn't know – most likely such astuteness can be found anywhere. But the remark may imply that both Athenians and Etruscans were using such clay imitations for their symposia, or at the least that they were household goods which, like modern kitsch, were an *Abklatsch* of wares used in the highest social circles. But to what extent were these funeral finds actually representative of Greek material culture, as opposed to would-be ware, belonging to burial cults? Elsewhere, Gill and Vickers (1995) have clearly argued for the latter.

Here we are presented with a true taphonomic problem. On the one hand we could be dealing with a biased corpus, due to the vicissitudes of material survival which distorts the view of the actual production and use of these objects, creating the false impression that their habitat was exclusively funerary and Etruscan, whereas their presence was in fact much more widespread. Or should we, rather, heed the alternative taphonomic rule that grave goods are likely to be products of material mimesis, rather than being actual objects that were in daily use? So the basic question is whether we are dealing with material survival in tomb conditions that were particularly favourable, or with a form of material transmission created by funerary rites. As things stand, I tend to opt for the second possibility – after all, so many grave goods are tokens

or models of objects: miniature horses from the Tang period in China, model boats in Egypt, golden shields of no martial value in some Mediterranean tombs, and so on. I believe the Etruscans, like so many cultures, had their own 'Ming qi'. Such terms as kitsch would not be applicable, then, in the same way that the fake paper money of Chinese burial rites ('hell banknotes') would not be considered counterfeit. In some Chinese funerary rituals, actually damaging or even destroying grave goods is part of the ritual itself; 'hell money', for instance, is burnt, in a situation vaguely comparable to Navajo sand paintings mentioned earlier.

And even if one holds on to the more orthodox view (for instance on the basis of the relatively rare finds of figured pottery outside of a clear funerary context, both in Athens and Italy) that such ceramic ware was generally used in symposia, there are still strong indications that many examples were made with a burial ritual in view.[23] This not only applies to iconography, where the choice of morbid scenes to decorate this ware hard to associate with an atmosphere of festive drinking and banqueting, but also to some inscriptions, such as the use of word 'śuthina', generally translated as 'for the tomb', directly designating the goods as funerary ware.[24] The same term is found on bronze mirrors excavated as grave goods, thus marking the difference between actual implements and ones destined for the grave. It is the difference between the time capsule and the tomb again: a real mirror would belong in the former, a transformed one in the latter.

As an amateur student of Greek red figure pottery in various collections from Amsterdam to the Louvre, and from Cambridge to Leiden, I was also struck by the fact that the overwhelming majority of the pottery had once been broken, only to have been carefully restored by the museum or dealers, such that the breakage was often scarcely noticeable. This ubiquitous damage may of course have been caused by natural causes during the pottery's long interment. But the conditions in the Etruscan tombs and *necropoleis* could have preserved numerous examples intact as well. Is it possible that the neglect or even breaking of the goods was somehow part of the funerary rites themselves?

It seems, indeed, that ritual breaking did occur among the Etruscans.[25] If this mere guess again holds water, then museums, as corridors of survival, would in fact be distorting an important aspect of the artefacts with their devoted and admirable acts of restoration.[26]

4 Conclusion

In this essay I have tried to explore some of the many aspects of material survival in the history of art. Of course, the parade of examples I have offered

cannot do full justice to this intriguing and complex phenomenon, but hopefully at least some patterns have emerged: for example, that some lacunae in our heritage of art and artefacts are not just the result of chance, but rather recur with structural regularity. As the survival of art is generally considered a matter of surviving materials, it can be stated, for instance, that the outer surface or skin is always likely to have been changed, degraded or destroyed. Clearly, some materials are more vulnerable than others under certain conditions, but robustness itself does not guarantee survival. In fact, robust and rare materials are very likely to invite recycling, and thus the destruction of art. Furthermore, art that has been safeguarded underground for burial purposes often constitutes a material transformation of a class of artefacts, rather than the actual survival of the type of object it purports to be. At the least, I hope, I have made it clear that the huge and ubiquitous gaps in our artistic heritage deserve a great deal more attention than they are usually granted in overviews and discussions of art history.

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Endnotes

1 Earlier versions of most of this essay were presented at the conference 'The matter of mimesis: Studies on mimesis and materials in nature, art and science' at Cambridge, and at a conference on technical art history in Vienna.

2 Ovid 1984, 426–427: 'Iamque opus exegi, quod nec Iovis ira nec ignis/nec poterit ferrum, nec edax abolere vetustas'.

3 Horace 1919: 'Exegi monumentum aere perennius / Regalique situ pyramidum altius, / Quod non imber edax, non Aquilo impotens / Possit diruere aut innumerabilis / Annorum series et fuga temporum. / Non omnis moriar […]'.

4 Copying might include gradual replacement here. In antiquity, the case of the so-called 'ship of Theseus' was sometimes discussed. Say the ship of the great hero Theseus had been preserved in Athens's harbour. As it deteriorated over the centuries, the Athenians repaired it plank by plank, nail by nail. At what juncture, if ever, did it cease to be the ship of Theseus? By the time every material of the original had been replaced, the ship of Theseus would be an artefact that functioned as a relic, rather than an original work of art. But it seems that in the tradition of Western ideas about authenticity and conservation, the notion of the relic partly overlaps with the notion of the artwork. For a discussion of such questions with regard to the replacement of a modernist work, see, for instance, Hosey 2018.

5 For the translation of the letters by Dürer with commentary, see Ashcroft 2017, Vol. 1, section 47, 'Albrecht Dürer, nine letters to Jakob Heller', 224–225.

6 On iconoclasm, see for instance Freedberg 1985 and Gamboni 1997.

7 On this 'camera picta' or 'camera degli sposi' see, for instance, Lightbown 1986.

8 See, for instance, Nuttal 2000.

9 Perrier 1702, title page by Cornelis van Dalen II.

10 Taphonomy has established itself as a discipline of its own, with many publications in the field, and the establishment of at least one academic journal devoted to it, the *Journal of Taphonomy*. In this essay I use the concept as a model and a metaphor for cultural history, not as a method. It seems that a method transfer has been attempted in (palaeo-)archeological studies, not without discussion and criticism. See for instance Lyman 2008.

11 A *kouros* was an ancient Greek statue of a naked young man.

12 See, for instance, Arnold 2003.

13 For a recent translation and discussion of the texts, see Niedziólka 2000.

14 The situation of Quinn's *Self* is even more complicated, as the work is renewed every 7 years, a rhythm comparable with the regeneration cycle of cells in our body. This will come to an end at the time when the artist dies.
15 Campbell *et al.* 2002, 6–9.
16 See, for instance, Hughes 1997, 114–117.
17 Lightbown 1986, 189, 463–464; for the letter, see Cartwright 1907, vol. 2, 21–23.
18 For an illuminating discussion of the effects of time on paintings, see Taylor 2015.
19 For a short discussion of Vasari's statement and the survival of Pollaiuolo's work in precious metal, see Wright 2005.
20 In: Cellini 1984, 72–74 ('La vita di Benevenuto di M. Giovanni Cellini Fiorentino scritta per lui medesimo in Firenze'book 1, ¶ 39).
21 On time capsules, see Jarvis 2003; Clark 2010.
22 For further references and discussion, see Stumpel 1996, 120–121.
23 For a detailed and clear defence of the view that ceramic vessels were generally used outside in symposia outside of a funeral context, see for instance Steiner 2007, 231–238. Also, more recently, Bundrick 2019, for instance 51–73.
24 Bundrick 2019, 71–73.
25 Ritual breakage is mentioned, for instance, in Bundrick 2019, 71.
26 See Bentz & Kästner 2007.

PART V

Making Material Knowledge

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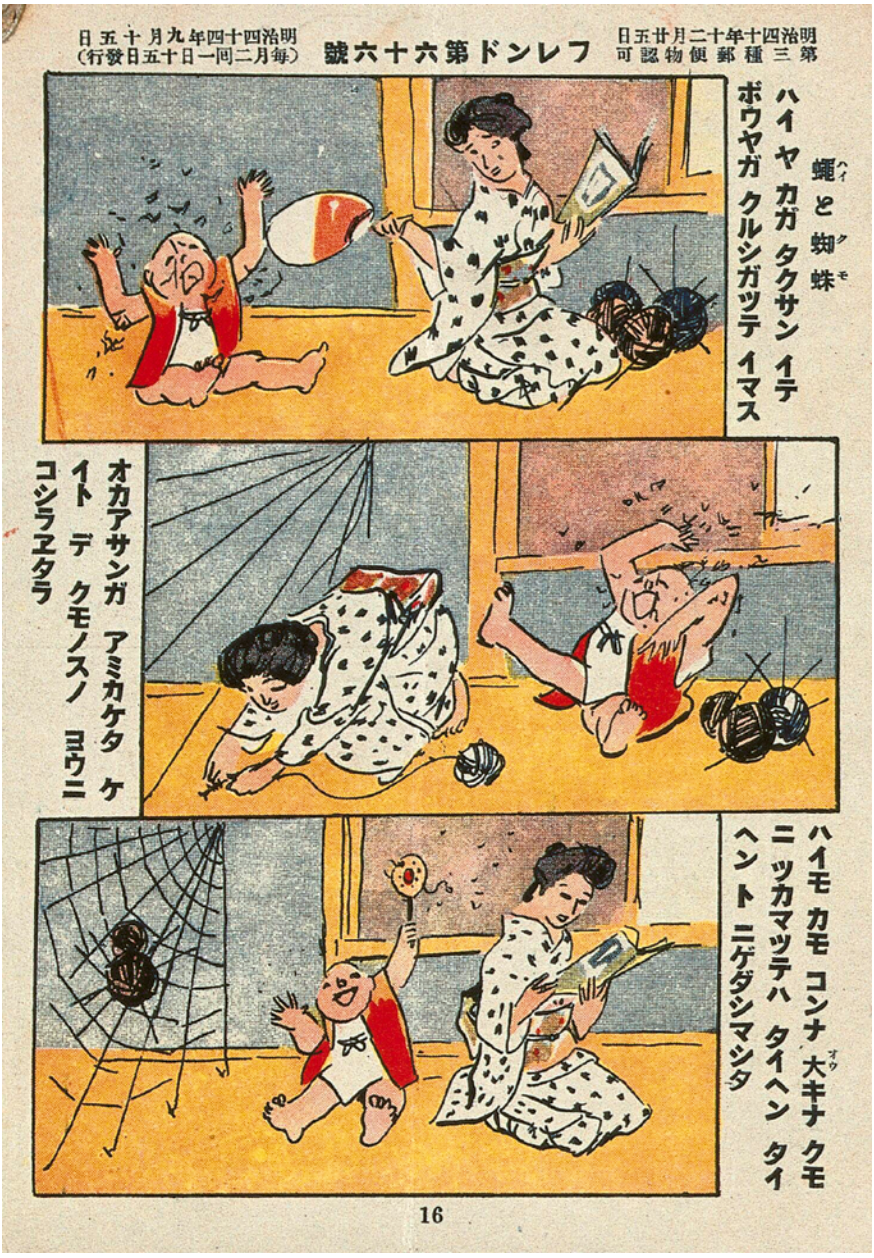

FIGURE P5 A mother stops flies from pestering her young son by constructing a fake spider's web out of wool. Colour process print, 1909

CREDIT: WELLCOME COLLECTION. PUBLIC DOMAIN MARK

Introduction

What is at stake in attempts to replicate material substances in order to gain better understanding of the past? Attempts to imitate past cuisine, chemistry, weapons, furniture, textiles and other objects have been carried out in an effort to settle debates over past production methods, shed more light upon 'lived experience', or revive lost skills. It is well established within the history of the sciences that 'tacit knowledge' is an essential part of past making practices (Olesko 1993, Sibum 1995). Instructions, rules and recipes never contain sufficient information to allow materials to be replicated unproblematically. Replication becomes still more complex for fields such as alchemy, where making processes were shrouded in complex layers of secrecy and mystical language (Rampling 2020, Smith 2004). Recent scholarship has eroded older oppositions between form and matter. The act of making and coexisting with materials, and the ways in which we think through processes of making, take centre stage, and use-relations may be constructed through material manipulation. Thus, practices of imitation or replication produce new versions of how humans deploy the material world to construct the social world, as well as vice versa.

From toads with tails to legless birds of paradise, Pugliano addresses some of these issues via the act of making and circulating credible fakes, imitation specimens and fabled creatures in the Renaissance 'theatre of nature'. She argues that the circulation of fakes was accompanied, in both natural historical and medical circles, by a renewed concern with the identity and reliability of the materials of nature. For scholars and collectors, fascination with the capacity of certain materials to replicate the appearance of others (and the skill required to make them do so) was complemented by vivid anxiety over the adulteration of substances, and the fear of exposing one's own gullibility. Lastly, the collection of fakes was also a pedagogical tool, serving to warn collectors about the frauds awaiting them in the marketplace.

Moving away from intentionally manufactured specimens, Tarp's chapter concerns the early modern history of another important question: can materials also perform mimetic acts *without* a human agent? Studying the writings and collection of the Danish doctor, polymath, and collector Ole Worm (1588–1654), Tarp investigates the latter's ideas and theories about the possible "agency of matter". Worm fervently collected natural specimens that displayed artistic patterns not created by human artisanship. According to Tarp, Worm theorised nature's creation of these images by drawing on accounts of

petrifaction, alluding to the trope of nature's playfulness, and discussing his own encounters with natural phenomena. Her chapter shows that, in the early modern period, pictorial activity discovered in natural matters was, like the relation between matter and form, held to be a key to understanding the workings of nature.

Rietveld's contribution returns to the role of the human actor in processes of making, but this time from the perspective of philosophy. Zooming out from material mimesis, Rietveld offers a philosophical framework for studying the skilled and embodied engagement of makers with materials. He argues that this conceptual framework helps connect insights on material engagement with the state-of-the-art in the philosophy of embodied cognitive science. To illustrate the potential of the concept of skilled intentionality for understanding embodied making, Rietveld discusses several aspects of skilled material engagement at RAAAF (Rietveld Architecture-Art-Affordances]), a multidisciplinary studio which works at the intersection between visual art, architecture, and philosophy.

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CHAPTER 14

Fake Specimens in the Renaissance

Valentina Pugliano

> From your [letter], I see that Your Excellency wants to make me a cinnamon from a bramble, a whale from a sardine, and an elephant from a fly.
>
> LEONE TARTAGLINI TO ULISSE ALDROVANDI, 22 December 1571[1]

⁂

The rise of natural history in sixteenth-century Europe was accompanied by the feverish creation of hundreds of collections designed to showcase the materials of nature. Their creators, ranging from erudite physicians to modest apothecaries and priests, often shared a university affiliation and a medical background alongside a desire to use their collections actively to explore the truths of the physical world. Unlike aristocratic *Kunst- und Wunderkammern*, it was not just the exceptional or rare that found representation in their *theatrum rerum naturalium* (theatre of natural things), but also the commonplace and the useful – an elegant cauliflower grown in the kitchen garden, or the skin of a hare hunted in the woods nearby. The manufactured quality of these Renaissance museums has been examined so far in relation to their few ethnographic exotica and collections of drawings, often the contribution of renowned artists.[2] The fabricated quality of their organic specimens, however, has yet to receive due attention.

Most sixteenth-century cabinets of *naturalia* sported instances of highly manipulated natural items. At a basic level, before their insertion in a collection, plants, animals and minerals had to be prepared for display and conservation – cleaned, pared down, dried, lightly seasoned with spices or fully gutted and stuffed. But the fabrication did not end there. Collections regularly featured credible fakes, ersatz or imitation specimens and mythological creatures. These included dragons and sea monsters '[as described by] the Ancients'; multi-headed hydras – a gift for kings, feared for their gaze and poisonous breath – with miniature bodies combining the features of lion and eagle; and misshapen beasts like the two-headed calf, which

natural philosophers, following Aristotle, considered preternatural creatures produced accidentally by excess or lack of matter, or by the mother's imagination affecting the womb.[3] There were anthropomorphised mandrakes, and toads with a snake's tail artificially attached – the Bolognese polymath Ulisse Aldrovandi (1522–1605) owned two, distinguished by the fact that one toad had teeth and the other did not (fig. 14.1). A must-have was the bird of paradise or *manucodiatum* – peculiar because it was said to live airborne without ever resting, after it began arriving from the Moluccas with its feet cut off (fig. 14.2).[4] Not all "false" specimens were frauds or monsters. Naturalists sometimes resorted to artificial compositions to make their collectables more lifelike and better entertain their genteel audience. The Leiden apothecary Christiaen Porret (1554–1627), for example, owned a bird's nest which he adorned 'with five or six little birds, very beautifully constructed of feathers in all colours'.[5] Nor were all such fakes put together by hand. Several were natural materials which, whether by misidentification or fraudulent mis-selling, had taken on the identity of fabled materials prized for their healing, symbolic and magical properties, such as the unicorn horn (a narwhal tusk), the griffin's claw (an ox's horn), and the adder's tongue (a shark's tooth) (fig. 14.3).

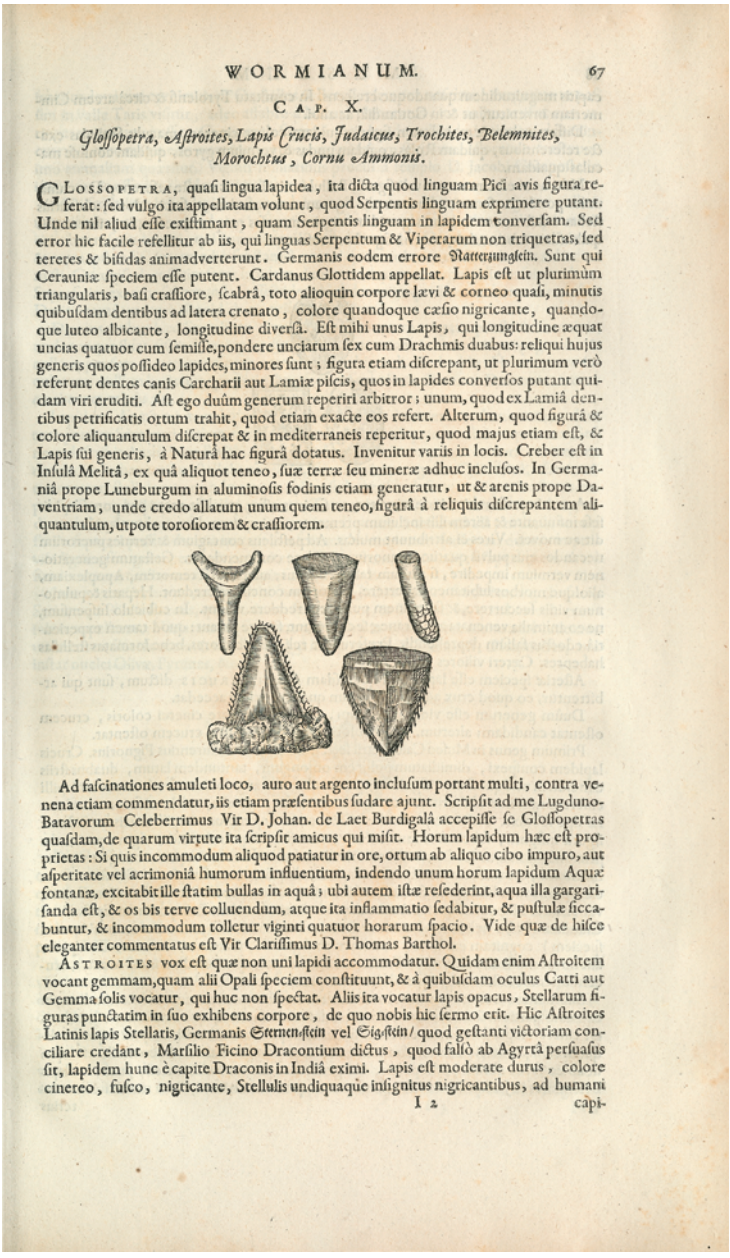
Although some of these items were reputed genuine, by the second half of the sixteenth century growing numbers of naturalists were ready to admit that fantastical creatures like the hydra, and more plausible exotica like the *manucodiata*, were either handmade or had been tweaked to suit an enduring fable. In their new compendia of flora and fauna, Pietro Andrea Mattioli (1501–1577), Guillaume Rondelet (1507–1566), Conrad Gessner (1516–1565) and Aldrovandi began to expose such specimens as clever tricks by sailors, apothecaries and especially charlatans (*circulatores*, *ciarlatani*), those monster-mongers and peddlers of miraculous remedies for which Italian cities like Venice were famous. And yet they continued to collect fakes and ersatz with relish, and to recommend to their readers those observed in other notable collections. Identifying something as fake did not make it less worthy of collecting. Indeed, these doctored specimens remained central to natural historical cabinets until the mid-eighteenth century (fig. 14.4).[6]

While the early modern enjoyment of mirabilia and wonders is well documented, the practice of assembling counterfeit *naturalia* in collections designed to teach about nature with new accuracy is, at the very least, intriguing. This is especially so when we consider that this surge in counterfeit specimens coincided with the wider humanist project of eliminating all forgeries of content and authorship, a project embraced by subsequent generations of jurists, theologians, and physicians, the professions to which most naturalists belonged. What, then, was these objects' appeal? If authenticity was not at

FIGURE 14.1 'Bufo mostrificus cauda anguina'. One of the two monstrous toads with a tail owned by Aldrovandi. Engraving from Ulisse Aldrovandi, *Serpentum et draconum historiæ* (Bononiæ 1640), book 1, 61
COURTESY OF THE SMITHSONIAN LIBRARIES AND ARCHIVES, WASHINGTON, DC

FIGURE 14.2 Over the years Aldrovandi collected watercolours for several kinds of bird of paradise. This specimen, however, captured on paper as a lifeless skin waiting to be mounted, offers an interesting contrast to most birds featured in his watercolour collection, which appear in formulaic lifelike poses, either perched on a branch or standing on a stone or amid the grass, sometimes lifting one leg, sometimes clutching some food (BUB, *Fondo Aldrovandi*, Tavole, vol. 2 Animali fol. 67)

COURTESY OF THE BIBLIOTECA UNIVERSITARIA, BOLOGNA



WORMIANUM. 67

CAP. X.

Glossopetra, Astroites, Lapis Crucis, Judaicus, Trochites, Belemnites, Morochtus, Cornu Ammonis.

GLOSSOPETRA, quasi lingua lapidea, ita dicta quod linguam Pici avis figura referat: sed vulgo ita appellatam volunt, quod Serpentis linguam exprimere putant. Unde nil aliud esse existimant, quam Serpentis linguam in lapidem conversam. Sed error hic facile refellitur ab iis, qui linguas Serpentum & Viperarum non triquetras, sed teretes & bisidas animadverterunt. Germanis eodem errore Natterzungstein. Sunt qui Ceraunias speciem esse putent. Cardanus Glottidem appellat. Lapis est ut plurimùm triangularis, basi crassiore, scabrâ, toto alioquin corpore lævi & corneo quasi, minutis quibusdam dentibus ad latera crenato, colore quandoque cæsio nigricante, quandoque luteo albicante, longitudine diversâ. Est mihi unus Lapis, qui longitudine æquat uncias quatuor cum semisse, pondere unciarum sex cum Drachmis duabus: reliqui hujus generis quos possideo lapides, minores sunt; figura etiam discrepant, ut plurimum verò referunt dentes canis Carcharii aut Lamiæ piscis, quos in lapides conversos putant quidam viri eruditi. Ast ego duûm generum reperiri arbitror; unum, quod ex Lamiâ dentibus petrificatis ortum trahit, quod etiam exacte eos refert. Alterum, quod figurâ & colore aliquantulum discrepat & in mediterraneis reperitur, quod majus etiam est, & Lapis sui generis, à Naturâ hac figurâ dotatus. Invenitur variis in locis. Creber est in Insulâ Melitâ, ex quâ aliquot teneo, suæ terræ seu mineræ adhuc inclusos. In Germaniâ prope Luneburgum in aluminosis fodinis etiam generatur, ut & arenis prope Daventriam, unde credo allatum unum quem teneo, figurâ à reliquis discrepantem aliquantulum, utpote torosiorem & crassiorem.

Ad fascinationes amuleti loco, auro aut argento inclusum portant multi, contra venena etiam commendatur, iis etiam præsentibus sudare ajunt. Scripsit ad me Lugduno-Batavorum Celeberrimus Vir D. Johan. de Laet Burdigalâ accepisse se Glossopetras quasdam, de quarum virtute ita scripsit amicus qui misit. Horum lapidum hæc est proprietas: Si quis incommodum aliquod patiatur in ore, ortum ab aliquo cibo impuro, aut asperitate vel acrimoniâ humorum influentium, indendo unum horum lapidum Aquæ fontanæ, excitabit ille statim bullas in aquâ; ubi autem istæ resederint, aqua illa gargarisanda est, & os bis terve colluendum, atque ita inflammatio sedabitur, & pustulæ siccabuntur, & incommodum tolletur viginti quatuor horarum spacio. Vide quæ de hisce eleganter commentatus est Vir Clarissimus D. Thomas Barthol.

ASTROITES vox est quæ non uni lapidi accommodatur. Quidam enim Astroitem vocant gemmam, quam alii Opali speciem constituunt, & à quibusdam oculus Catti aut Gemma solis vocatur, qui huc non spectat. Aliis ita vocatur lapis opacus, Stellarum figuras punctatim in suo exhibens corpore, de quo nobis hic sermo erit. Hic Astroites Latinis lapis Stellaris, Germanis Sternenstein vel Sigstein, quod gestanti victoriam conciliare credant, Marsilio Ficino Dracontium dictus, quod falsò ab Agyrtâ persuasus sit, lapidem hunc è capite Draconis in Indiâ eximi. Lapis est moderate durus, colore cinereo, fusco, nigricante, Stellulis undiquaque insignitus nigricantibus, ad humani

I 2 capi-

FIGURE 14.3 Glossopetrae or 'tongue stones' (shark teeth), believed by many in the early modern period to be of mineral origin. Engraving from O. Worm, *Museum Wormianum* (Leiden 1655), 67
COURTESY OF THE SMITHSONIAN LIBRARIES, WASHINGTON, DC

FIGURE 14.4 Cabinet of the apothecary Ferrante Imperato in Naples, from F. Imperato, *Dell'Historia naturale* (Naples 1672), folded plate. Two separate counterfeit dragons can be spotted in the top left corner and in the top right corner respectively, the latter next to a specimen of *manucodiata*. Misshapen animal specimens are scattered across the ceiling.
AUTHOR'S PRIVATE COLLECTION

stake, what kind of mimicry did they offer and what was its function? But for a handful of celebrated hoaxes exposing the gullibility and vanity of experts, the role of forgery and counterfeiting in natural history, and in the material history of early modern science more generally, remains understudied.[7] If it is true that 'each society, each generation, fakes the thing it covets the most' (Jones 1990, 13), then counterfeits of nature should be considered a response to a specific epistemological juncture and set of desires.

1 The Fake and Different Regimes of Knowledge

Focusing primarily on the monstrous genera of hydras, cockatrices and basilisks that adorned princely collections, so far historians have studied counterfeits of nature at the intersection of two traditions: the learned interest in the marvellous, and the commercialisation of nature that began in response to the rise of natural historical collecting itself. They have documented the fascination of medieval and Renaissance scholars with the literary and mythological

prodigies that populated bestiaries, herbals and lapidaries, as with the more vernacular marvels exhibited in broadsides and at fairs. The German physician Lorenz Hoffman (d. 1630), for instance, owned a dragon in a box, the skeleton of a four-week-old child, and a hen made out of real feathers (Kenseth 1991, 86–87). The collection of such an ensemble could be explained by a complex mix of secular and religious motives. Scholars were led to be ecumenical in their interests both by the quest for encyclopaedic knowledge that characterised humanism, and by the belief that to collect enabled one to know more about God. Alongside preternatural events like earthquakes, floods and comets, misshapen humans and beasts were traditionally considered tokens of God's displeasure at human sin, or 'portents', prophetic signs of fearsome happenings to come, such as war or a royal death. Concurrently, the conviction that nature's error, the oddity embodied by the wonder, would best reveal the true laws of God's creation, became a central tenet of early modern natural philosophy, sparking a vivid interest in teratology. Wonders and portents became collectables like other prized *naturalia*. By the seventeenth century, it was not just that naturalists procured their specimens from the market, but also that merchants and retailers actively responded to the desires of the educated public by opening specialist shops where collectors could find ready-made curios to furnish their cabinets.[8]

Fake specimens cannot be explained by wonder, naïveté or cupidity alone, however. In this chapter, I shall reconsider these objects' association with natural history and with the pharmaceutical and medical culture of Renaissance Italy – whence most manufacturers and consumers of counterfeit *naturalia* came. I will argue that for this audience the fake embodied a particular category of the natural, and that owning a fake was not simply a concession to wonder and a taste for mannerist aesthetics. Rather, it could be conceived as a pedagogical exercise.

For Renaissance naturalists, who approached nature as a problem of description and identification, the fake presented a double jeopardy. Scholars did not know all that was in the world (indeed, Nature was playful, even in known categories, as Lisbet Tarp's essay in this volume shows.) Therefore, asserting that a particular kind could not exist among God's creation was both epistemologically arrogant and theologically problematic. Engendering further humility, the momentous discovery of the New World had deeply confused scholarly knowledge of fauna and flora even as it drastically expanded the range of known entities (Pagden 1993, 17–49). Among this cornucopia of real and imagined forms, the boundary between true and false could be difficult to discern.

It is at this epistemological juncture of deep uncertainty about the limits of the physical world that counterfeit *naturalia* gained their pedagogical appeal.

As they harnessed dreams about new geographies, fakes played on notions of the possible and the exotic. As they created new species from old materials and masqueraded known textures and forms, counterfeit bodies asked naturalists to pay close attention to their specimens' materiality, the outward properties of organic matter, its docility towards preservation, and its afterlife once mounted in a collection.

To explore these issues, I will focus on the zoological craftwork of the medical charlatan Leone Tartaglini da Fogliano (fl. 1550–1576). A native of Tuscany active in Venice, mastro Leone described himself as a herbalist (*herbolajo*) and surgeon (*chiruico*). He sold wonder drugs from a stall in Saint Mark's Square, prepared with herbs sourced from his physic garden on Murano. He was especially famous for a powder against intestinal worms, over which the Venetian Senate granted him a temporary monopoly.[9] Like other professors of secrets, he dabbled in publishing, printing at his own expense a booklet on the nature of sleep which included recipes for some of his preparations against common ailments like warts, mange, and dog bites. His figure, predicting ill health (*mala sorte*) from a stage with a raven perched on his shoulder, is immortalised in a 1585 survey of Renaissance professions by Tommaso Garzoni, who also mocked him for 'receiving his doctorate from Lizzafusina', a fishing settlement on the estuary of the Brenta river, where the barges sailing up from the mainland stopped before delivering their catch to Venice. Indeed, in natural historical circles, Tartaglini acquired a reputation as a supplier of rare marine life from the Adriatic sea, and for his skill in fashioning credible fakes out of fish skins, which were avidly consumed by northern Italian collectors.[10]

Tartaglini excelled in the genre of the basilisk or flying dragon (*draco volans*), and his fame is tied to the specimens he supposedly manufactured in the 1560s and 1570s for the cabinets of Aldrovandi in Bologna and the apothecary Francesco Calzolari (1522–1609) in Verona (fig. 14.5). Calzolari's dragon, most probably inherited by Count Ludovico Moscardo (1611–1681), is still visible in Verona's Museum of Natural History (fig. 14.6), while one of Aldrovandi's specimens may have made its way into the Museum of Natural History of Venice (MSNVE-16722) (figs. 14.7, 14.8).[11] Crucially, unlike the princely hydras, which were usually considered imaginary creatures (an *inventio* according to Aldrovandi), the basilisks produced by Tartaglini and his colleagues were ersatzes, replicas of a species believed to exist in nature in Libya, Egypt and Ethiopia. Part dragon and part serpent, as described in Pliny the Elder's *Naturalis historia* (AD 77, book 8, chap. 33) and corroborated by authoritative travellers to the East like Pierre Belon (1517–1564), the fearsome basilisk had the power to destroy its surroundings with its breath and subjugate all beasts with its gaze.[12]

FIGURE 14.5 The four-footed basilisk belonging to the apothecary Francesco Calzolari. Engraving originally published in B. Ceruti & A. Chiocco, *Musaeum Francisci Calceolari Iunioris Veronensis* (Verona 1622); reprinted in Forti (1928), [249]

I will suggest that, in approaching this mimetic craftwork, naturalists like Aldrovandi made reference to two distinct settings where fraudulence was a concern in material mimetic terms. The first was the world of crafts, and particularly the drug market. Pharmacy exposed naturalists to sophisticated manipulation techniques for *naturalia*, and gave them one way to conceptualise how substitution – the replacement of the prescribed by the adulterated – affected notions of ingredient authenticity and goodness. The second setting was humanism, which had inaugurated the use of artefacts as evidence to support textual analysis as early as the fourteenth century. While the humanist material or "archaelogical" turn greatly influenced sixteenth-century scholarship, it was not without its challenges. As it opened new avenues for corroboration and action, it also made humanist scholars, in the words of Christopher Wood, 'peculiarly prone to credulity' (Wood 2012, 166; also Burnett 1992).

My contention is that in medical and natural historical circles, counterfeit *naturalia* met two new scientific needs tied to the emerging values of observation, empiricism, and *peritia*: the need to examine nature at first hand, and the need of a cautionary tale warning of the difficulty of that labour of interpretation. The body of the fake not only activated the imagination but demanded

FIGURE 14.6 Lodovico Moscardo's flying dragon with ribbon and bulging eyes (possibly the Calzolari original)
COURTESY OF THE MUSEO CIVICO DI STORIA NATURALE, VERONA

FIGURE 14.7 Watercolour of one of the two counterfeit *draco volans* – *'raia exsiccata in formam draconis a circulatoribus efficta'* – in the Aldrovandi collection, obtained as specified by drying a ray (BUB, *Fondo Aldrovandi*, Tavole vols. 4–1, fol. 117r)

FIGURE 14.8 Seventeenth-century *Draco volans* in the Museo di Storia Naturale, Venice; possibly the second specimen owned by Aldrovandi
COURTESY OF THE MUSEO DI STORIA NATURALE, VENICE

a renewed attention, as it tested both the limits of nature and the scholar's knowledge of it.

2 Making the Fake

Sixteenth-century accounts are replete with humorous stories of charlatans employing fake basilisks alongside dried snakes and other venomous creatures as theatrical props to persuade the public to purchase their antidotes (fig. 14.9). The general method to confect a basilisk is outlined by Gessner in the volume *On fish* of his *Historiae animalium* (1558). Tartaglini's colleagues utilised types of saltwater fish with flat, cartilaginous bodies and whip-like tails – stingrays, skates, monkfish and roughsharks, all available in Mediterranean waters – and supplemented them at need with the skins of snakes, rabbits, and rats (fig. 14.10). After the fish was cleaned of its meat, its skin was stretched out, cut, and reshaped through several stages of soaking and drying in smoke or hot ashes. The head was pushed up to create torso and snout, the pectoral fins pushed up to make wings or split to add legs, and the tail either curled or made to shoot up straight in the air. This exoskeleton was then filled with straw or wool, or simply dried until it reached the consistency of thick parchment.[13]

FIGURE 14.9 Giovanni Maria Mitelli, 'Charlatan holding a snake', from *Di Bologna l'Arti per via d'Annibal Carracci* (Rome 1660), plate 39
COURTESY OF THE WELLCOME COLLECTION (CC BY 4.0)

352 DE PISCIBVS

& fœminam ex lacte oüiſque comperi. Oculata aſpera carne eſt dura malique ſucci.

De raia Aſteria aſpera.

CAPVT XII.

IN RAIIS Aſperis numerabitur aſterias alia ad leuis diſcrimen, aſpera nominata, quę à Gallis *raie eſtelée*, ab Italis *rometa* vocatur. Aſterias igitur appellabitur à ſtellulis multis, quas habet in lateribus & caudę principio depictas, aſpera ab aculeis plurimis quibus tota horret. In oculorum interuallo multi ſunt breues, frequentes, peracuti, in medij dorſi linea, alij magni, in cauda tres magnorum ordines, aliis plurimis & minutioribus diſtincti. Infiniti ſunt alij, huc illúcque ſine ordine toti corpori inſperſi. Pro dentibus oſſa dura & aſpera habet. Carne eſt dura ſiccáque. Huius generis ſpecies duę eſſe videntur: vna, quę ſtellulas habet, in medio albas, ſed quas ambit circulus ex nigris punctis conſtans, totúmque corpus aculeis horridum eſt: altera ſtellulas prorſus candidas cum multò paucioribus aculeis.

De Raia

FIGURE 14.10 One type of ray commonly used by charlatans. 'De raia asteria aspera', from Guillaume Rondelet, *Libri de piscibus marinis* (Lyon 1554–1555), 352
COURTESY OF THE SMITHSONIAN LIBRARIES AND ARCHIVES, WASHINGTON, DC

With time the skin turned an ochre or brown colour. Ranging between 10 cm and 30 cm in length and height, these creations were small; yet, mounted with open wings, as if in mid-flight, and a snout filled with sharp teeth, their aspect was intended to be fierce. In the seventeenth century, collectors added more overt decorative touches, sometimes actively modifying earlier specimens. This is particularly visible in Moscardo's (formerly Calzolari's) dragon, which acquired striking glass eyes, and chains and ribbons to suspend it from the ceiling – props that would quickly have betrayed its artificial nature.[14]

In fact, artifice was already common in Renaissance museums. Suspension of disbelief was an operative principle of collecting. Collections worked through synecdoche and metonymy, presenting the viewer with suggestions of objects, fragments that stood in for the whole or for something else – the plant had to be imagined from the leaf, evidence for a unicorn found in a piece of horn. Specimens, moreover, did not arrive directly from nature. Raw materials were turned into objects of study after processes of selection and manipulation that ensured their longevity and their mimicry of a lifelike state that made them better legible to the naturalist (fig. 14.11).[15] Preservation was a major area of intervention. Flora and fauna were treated with substances and techniques borrowed from pharmacy, cookery and hunting, such as exsiccation and immersion in fluids. Plants, for example, were dried by gentle heat, hooked from the rafters above the fireplace. Roots and small animals like lizards and toads were pickled in liquid, while larger animals were either skinned or mounted. If some preservatives came from the kitchen, such as honey and wine, most arrived from the apothecary shop, where salt, vinegar, wormwood leaves, alum, potash and diluted resins were used both to preserve and remove undesirable qualities in medicinal ingredients. Alcohol and spirits did not become common for zoological specimens before the seventeenth century's end, and remained an unstable medium of preservation due to evaporation and the unpleasant downside of turning most specimens a dull grey.[16]

Such methods were still rudimentary, and often failed to halt decay and insects. Mounted specimens were frequently ruined by perishable tissues left inside. In 1622, Francesco Calzolari jr was forced to replace, at great cost, the chamaeleon acquired sixty years earlier by the elder Calzolari from the Venetian patrician Daniele Barbaro, because the animal had rotted away. Nor did naturalists always master basic procedures: they often showed little manual dexterity. Their correspondence records cases of half-baked fish covered in soot, or plants going mouldy because of insufficient wrapping during transport. In consequence, expertise was often contracted out and specimens bought ready cured from professional intermediaries. Among these specialists was Tartaglini, first introduced to Aldrovandi by the apothecary Gianbattista

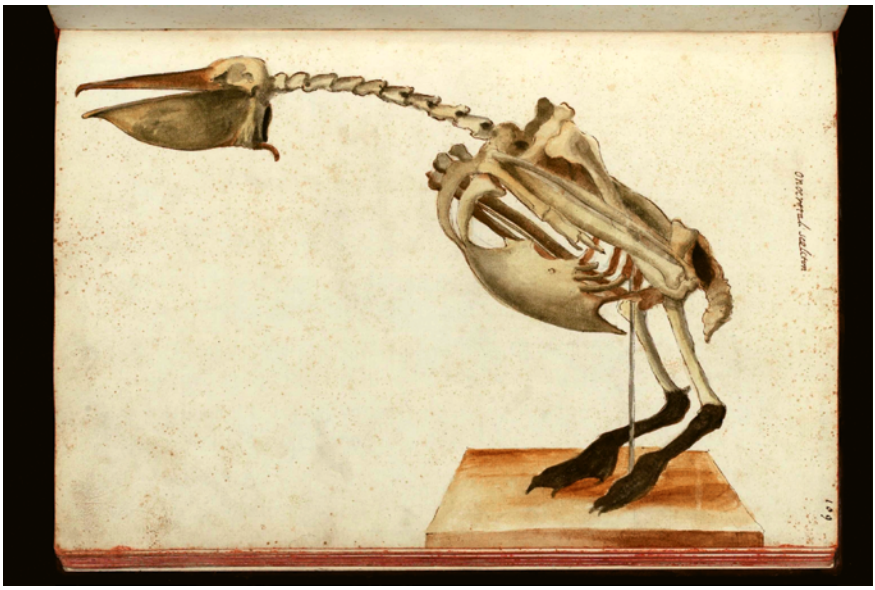


FIGURE 14.11 Mounted pelican from Aldrovandi's museum. BUB, *Fondo Aldrovandi*, Tavole vol. 6, Animali, tomo 2, fol. 109
COURTESY OF THE BIBLIOTECA UNIVERSITARIA, BOLOGNA

Fulcheri as a mountebank who offered a catalogue of Adriatic fish for sale.[17] Of all creatures, fish were the most intractable: their vibrant colours were destined to fade, their soft tissues almost impossible to keep, and their shapes easily distorted. Well into the eighteenth century, the best-preserved fish specimens were those that had been reduced to dry skins and flattened onto a board, like plants in herbaria.[18] The extant sixteenth-century basilisks in north Italian museums are a testament to the charlatans' virtuosity in competently handling such unwieldy matter.

Struggles with preservation – the dark side of Renaissance collecting – left their mark on collections. They affected their content – the average cabinet specialised in plants and minerals, easier to handle and replace, and featured few animal species, generally those smaller and with shells and harder parts that were easier to procure and keep. They also affected the naturalists' intellectual projects, which rarely engaged systematically with zoology before the seventeenth century.[19] The production of hydras, dragons and other counterfeit *naturalia* should be framed within this wider material phenomenon embedded in the birth of early modern museums. Like the mounted pelican or the stuffed blowfish increasingly adorning sixteenth-century cabinets, fake specimens were experiments in embalming and taxidermy, techniques which

were still evolving and which naturalists borrowed directly from artisans who specialised in working with leathers and pelts, from tanners and furriers to fishermen and bird-trappers. It was not uncommon for naturalists to display their counterfeits alongside a dried sample of the fish from which they derived. The fact that scholarly mentions of hydras and dragons featured in specialist herpetologies, ichthyologies, and ornithologies further supports the impression that the interest was at least in part in the tangible properties – the 'affordances' – of the fish and snakes hiding behind the fake.[20] Behind the passion for handcrafted specimens, in other words, lay a fascination with materials and the ways these could be manipulated by a skilled hand.

This was true also of the (fewer) botanical fakes. Beneath Mattioli's scorn at the tricks of charlatans who sold human-shaped mandrake roots to infertile women, claiming they would help with conception, there was a certain admiration. Mattioli had learnt about the method of fashioning mandrakes from a mountebank he treated for syphilis in Rome. First, roots of briony were carved into the desired shape. Then they were punctured with a stylus and replanted with a layer of barley grains covering "sown" in those sections of the where it was desired to grow filaments to mimic human hair and beard. Such deceptions concealed a precise understanding of how certain botanical species germinated, developed, and reacted to soil and additives. These manipulators may have lacked any theoretical and philological lore of the flora they handled; but they were able to harness the very knowledge of how to bring about a transformation in living plants that loftier contemporaries like the Dutch horticulturalist Carolus Clusius were eagerly seeking in their selective breeding of ornamental plants and flower hybrids.[21]

An appreciation for the craftsmanship behind the fake was a strong reason for collecting it. Aldrovandi explicitly praised the 'marvelous artifice [...] of [the] craftsmen of our age who have wished to imitate the Hydra of the ancient poets, concerning which there were so many opinions, some having described it with seven heads, others with five, eight, nine, fifty, ninety and more', and asked his correspondents to refer precisely 'for both your honour and mine, by what material [the hydra] has been counterfeited, and [...] its colours [...] so that I may report it accurately and thus honour the inventor'.[22] These zoological fakes were produced with such '*ingegnum*', such virtuosity and creativity, that their manufacture could be aligned with the artistic reinterpretation of nature visible in the *Kunstkammer*'s *artificialia* – decorative artwork and fantastically shaped ceremonial utensils, obtained precisely by combining different natural materials (such as ivory and silver) and by playing with different material registers (the natural and the wrought).[23] In his *Serpentum et draconum historiae*, Aldrovandi (1640, 313) further linked the counterfeit dragon with

cleverly contrived '*mechanica experimenta*', including an underground spring system built by the Romans, which was able to issue warm water continuously by curling its pipes in the manner of a dragon's tail. The fake, then, was not just an instance of material technology. It embodied one of the driving concepts of Renaissance culture and art, that of ingenuity, and taught observant naturalists to see organic matter as an aesthetic category.[24]

At least in the case of Tartaglini, however, there was no simple dichotomy between artisan producer and learned consumer. While his dragons were certainly produced with a select audience in mind – naturalists, readers of travel narratives, and curiosi attracted by the bizarre in nature – it is not clear how many were sold to private collectors or reached the marketplace, or for what kind of money. For Aldrovandi, who had first seen a dragon in Tartaglini's home in 1571 while touring Veneto collections, the acquisition may not have been a purchase at all. The two exchanged several specimens and watercolours, and the counterfeit may have belonged to this standard circulation of natural historical commodities.[25] Unlike most hired hands contributing to Renaissance museums, moreover, Tartaglini had a documentable interest in the study of nature, as demonstrated by his lost treatise *The herbal* (1558), and his ownership of three volumes of watercolours of fish and plants and a small collection. A partial description of the latter appears in Tartaglini's will of 1576, redacted shortly before he succumbed to one of the worst plague outbreaks to hit the Venetian mainland, which also took his wife Lucia Franco. The will distributed his curiosities among former patrons and acquaintances. The Venetian Senator Simone Zen received the bronze statuette of a lion kept in the charlatan's study, 'my most prized possession'. Fifteen watercolours of rare fruits painted on vellum by a young Jacopo Ligozzi (1547–1627) went to Giovanni Grimani, Patriarch of Aquileia, together with 'the marble hand of a giant'. Three boxes of 'minerals, drugs, and seeds' went to the Venetian apothecary Cechino Martinelli and his brother Alberto. The apothecary Francesco Calzolari received skins of Indian fishes and all of the ostrich 'that could be saved [from decay]'. Calzolari also acquired 'a wooden man' kept in an iron crate with wheels and a cord attached, possibly an automaton, an unusual presence in an artisan's collection, despite the contemporary popularity of mechanical dolls (Brusegan 1996, 24–34; Bredekamp 1995, 2–3). This list of gifts places Tartaglini and his counterfeits in a different light: rather than a mere seller of nature, his artistry with materials was mediated by his membership of the community of north Italian naturalists.

Yet one should note that, even for those craftsmen who remained outside this community, the preparation of this craftwork – were its mimicry to succeed – demanded not only manual dexterity and a feeling for materials,

but also specific knowledge. The charlatan needed the same eye for mimesis and truth-to-life that naturalists asked of their draftsmen and woodcutters. Tartaglini had been responsible for hiring and supervising a Venetian artist for Aldrovandi's collection of watercolours, and himself owned drawings of *naturalia* by Ligozzi which, according to Calzolari, 'can pass for live ones, it's miraculous'.[26] Just as importantly, the charlatan needed an eye for the development of natural history itself, an ability to recognise shifts in the discipline's epistemological and visual sensibilities. I have already mentioned the arrival of exotica. Expertise on nature among the charlatan's educated audience was also growing at a steady pace, bringing with it a reconfiguration of gullibility that inevitably affected the aesthetic parameters and the construction of the counterfeit itself. As Tartaglini put to Aldrovandi: 'my mother experience taught me in this matter [of *naturalia*] that while many things appear similar, they are not, however, the same'.[27]

3 Studying the Fake

What of the conceptual use of fakes and ersatz? Interestingly, confected dragons and misshapen beasts were not the only counterfeits in the *theatrum naturae*. Counterfeit samples of medicinal ingredients and remedies featured in abundance. Aldrovandi's cabinet, for example, displayed several kinds of adulterated *terra sigillata*, a red clay traditionally imported in small tablets from the Levant, and used to stanch wounds and prepare plasters: 'In many pharmacies one finds many red earths used in place of the true *terra lemnia* [...] many display Turkish seals and all are false. Pierre Belon in his History of Greece and Africa [...] mentions 24 varieties, all falsified. All can be seen in my museum' (fig. 14.12). This practice was certainly connected to Aldrovandi's medical training and his appointment as *protomedico* of Bologna in 1578 alongside Antonio Maria Alberghini – a role that took him into the city's pharmacies every three months, to oversee the production of compound remedies and inspect the stock, weeding out defective ingredients and preventing the use of cheaper and less effective substitute drugs.[28]

Indeed, the marketplace, particularly craft production and food services, was the main setting where fraud and authenticity were discussed in the sixteenth century. Both civic authorities and guilds were concerned to define product quality, in order to ensure the dignity and well-being of the *civitas*. Yet definitions of authenticity were never epistemic absolutes. In this institutional context, the master displayed 'sincerity' by not deviating from the prescribed recipe or the set of ingredients, weights and manufacturing techniques

FIGURE 14.12 Three samples of *terra sigillata* from early modern Germany, in the Science Museum, London
COURTESY OF THE WELLCOME COLLECTION (CC BY 4.0)

sanctioned by the guild. Counterfeiting consisted less in outright invention and forgery than in substitution: replacing the licit with the illicit, the optimal with the inferior quality material – older, less durable, local rather than imported. In Padua, for instance, the public was warned about the Lenitive Electuary, which often contained counterfeit tamarinds – in fact a paste combining old cassia and badly preserved dates to create a superficial likeness to the leguminous fruit. While, in the artistic trades, the ability to mimic and deceive (for example by making wood resemble marble) could be a source of aesthetic appreciation and an index of the artist's skill, in most other crafts it was perceived as a threat. Craftsmen were even forbidden from making their wares "look better": fishermen should not freshen up their catch with seaweed, nor ragmen brighten old cloths with sulphate. Infractions were punished with fines and the destruction of merchandise.[29] It was such mimetic tricks that officials like Aldrovandi set out to unmask. They cultivated the skill of detecting deviation from the standard, of recognising when one material dissolved into another and perception was played upon. Sight was only one means of assessment, generally the least reliable. More often, touch, taste and smell served the evaluator better. When assessing a ship's worth, the texture and veneer of birch and oak, their tensile quality, had to be felt. Similarly, sophisticated balsam oil

could only be uncovered by tasting it and suspending it in water, which would separate the wax, myrtle oil and honey it was counterfeited with.[30]

If, for artisans like shipbuilders and tanners, this deception concerned primarily the manipulation of monetary value, in health trades like pharmacy, the implications of fraud could be more sinister. Concerns about drug and foodstuff adulteration had been routine since the medieval period, as apothecaries had no choice but turn to substitutes whenever bad weather or a wayward cargo made standard ingredients unavailable. The sixteenth century, however, witnessed a new anxiety about the identity and reliability of the materials of nature. The rediscovery of Greco-Roman *materia medica* in the fifteenth century, coupled with increased travel both East and West, had greatly expanded the canon of medicinal ingredients. Yet with greater variety came dire problems of identification and nomenclature. What to make of new imports, and how to distinguish the ingredients described by the ancients among all the herbs at the apothecary's disposal? One of the most conspicuous outcomes of this confusion was the development of what I have called elsewhere a 'language of truth'. From the 1540s, pharmacopoeias, botanical treatises and naturalists' letters register a new way of wading through the plenitude of ingredients, by qualifying them according to their proximity to a putative original and its purity. Prestigious remedies inherited from antiquity, such as the famous poison antidote theriac, were now described as containing 'true' cinnamon, 'true' amomum, 'legitimate' cardamom, and being in danger from 'false' hedicroo. 'False', like 'true' and 'legitimate', was a taxonomic category, used to describe *naturalia* approximating, but not quite identical, to the original species described by ancient authors. Thus, false Dictamnus deviated from Dioscorides's True Dictamnus only in its thicker leaves and milder aroma. These predicates were not just a philological or pedagogical exercise, but spoke of a reconfiguration of authenticity and mimesis: to the traditional understanding of 'goodness' and 'sincerity' as the absence of adulteration, sixteenth-century scholars added the aspiration of being truthful to nature, of recovering its original forms as described by the ancients (Pugliano 2017, 255–266).

Collecting became a primary activity through which apothecaries and physicians learnt and honed these distinctions. By displaying correct and incorrect samples of medicinal ingredients side by side, apothecaries could build prepare a catalogue against which to evaluate the appropriateness of their wares. Professors of natural philosophy like Aldrovandi, who regularly lectured on *materia medica* at Bologna using the specimens in his museum (Findlen 1994, 254), could teach his students how to calibrate between deceptively similar *naturalia*, and how to detect common market frauds. In the case of *terra*

sigillata, texture and colour provided the clues: 'there is one kind, very red and powerful which doesn't stain one's hand red as the common one does, which is adulterated and mixed with red soil'. This was valuable preparation for future practising physicians who would eventually prescribe remedies and possibly shoulder the responsibility of the *protomedicato*. The display also acted as a warning to less experienced colleagues who visited the museum.

4 Materials for an Expanded World

Did such pedagogical use of counterfeit medicinal items translate to fake specimens and ersatz exotica? In his popular *De varietate rerum* (1557), the Milanese physician Girolamo Cardano (1501–1576) devoted some pages to describing the natural and artificial content to be found in a *thesaurum*, a princely collection, and how to detect the man-made among those of its *mirabilia* that seemed to stretch the possibilities of nature. Sadly for the neophyte, Cardano asserted that plants could only be exposed with a good knowledge of botany. But for animals there was a way: one must inspect the specimen's external anatomy, paying special attention to joints and sutures which would give away its fabricated nature.[31]

This work of detection is recorded in an interesting set of letters that Aldrovandi exchanged in April 1595 with Luigi Zenobi (1547/1548–1602), a renowned musician at the court of Ferrara, and owner of a seven-headed hydra. Although Zenobi declared up front that his specimen was artificial, the discussion illuminates how a fake could be employed to test one's natural historical acumen. Inspecting a watercolour of the monster, Aldrovandi wrote: 'I cannot understand how [the artisan] was able to reduce a rabbit and the scales of the snake Scorzone to the likeness of a hydra'. The drawing reproduced puzzling 'red and green colours and [...] some lines traversing the body' which Aldrovandi had never witnessed in the said snake. Conversely, the hydra sported bulbous protrusions similar to those he had observed on the back of a chamaeleon arrived from Africa. This prompted him to inquire whether the hydra displayed a third order of protrusions beside the two covering its dorsal spine, and whether the colours used in the drawing truly reproduced those of the 'fake body' (*corpo finto*) or had been added 'to impart some beauty to it'.[32] Aldrovandi viewed colour as one of the most reliable markers of identity both when examining actual specimens, even more so where art in the service of science was concerned. He is also known to have compiled colour lists in which he catalogued hue variations by referencing *naturalia* in his cabinet (Pugliano 2015, 377–383). Yet his concern here was to resurface those traces of

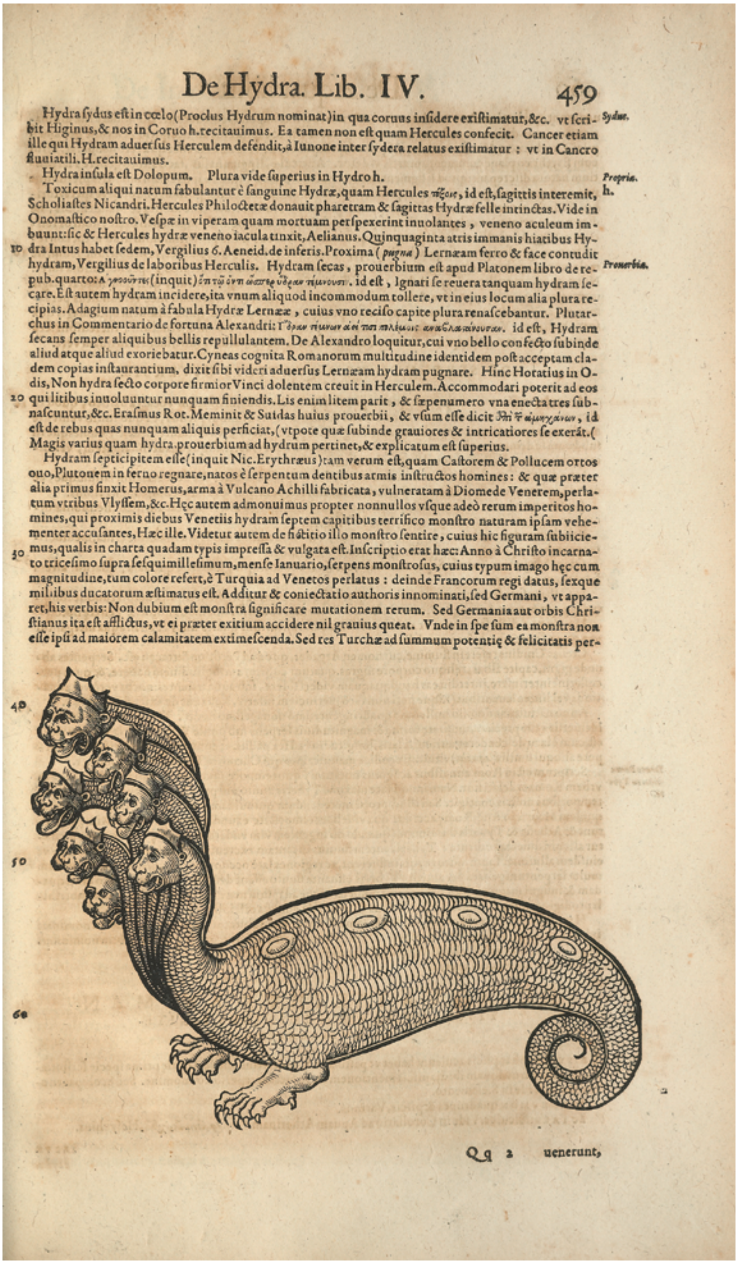
labour that the taxidermic process had actively effaced. At issue for the naturalist was not authenticity, but reconstructing how the process of mimesis had unfolded. Had he been able to view the fake in person, Aldrovandi would likely have handled it to detect qualities indetectible by eye, such as weight and texture. This full sensory engagement with specimens has since been sanitised from our encounters with collections, but was typical of early modern museums, where visitors fully expected to be able to hold and touch the displays, and even to scrape off part of their surface with a knife if the urge took them (Classen 2007). Relying only on second-hand information, Aldrovandi eventually rejected the idea that the hydra was entirely fabricated: 'Truthfully I believe that your Hydra was composed from the body and tail of the real flying dragon born in Arabia and Egypt, to which the heads of other animals were added by art, while the wings, which resemble those of a bat, and the feet were cut off, seeing how the lower part of its body stands empty.'[33]

By participating in the deception while denouncing it, Aldrovandi effectively created a subtle dichotomy between expert and non-expert, particularly important outside the pedagogical context of the university. Mattioli had made much of the foolishness of uneducated women (*donnicciole*). In his *Serpentum et draconum historiae* (1640), Aldrovandi confirmed that it was the populace (*vulgus*) and the inexperienced (*imperitii*) in things natural who would be easily deceived.[34] Yet, even among naturalists, not everyone possessed the expertise to make the right judgment. For example, Friar Gregorio da Reggio (d. 1618), who had alerted Aldrovandi to the Ferrarese hydra, and had 'touched it, and examined it well', avoided drawing conclusions himself: 'if it's artificial, it's a marvel; if it's natural, it's a great wonder'.[35] The worldlier Danish physician and collector Ole Worm (1588–1654), who owned one *manucodiatum* 'with feet', remained convinced that his specimen was a 'lesser variety'.[36] In this shared culture of spectacle and awe, the fake could become an unexpected prop to the scholar's self-fashioning, and a stress test for measuring the knowledge of his guests.

The exercise of collecting and deconstructing counterfeits was pedagogically compelling not simply because uncertainty lingered about the nature of wonders, but also because the standards of evidence applied to artefacts were at this time less stringent than those applied to textual evidence. This was a function of the material or archaeological turn that scholarship underwent in conjunction with humanism. With renewed enthusiasm for the material legacy of antiquity, and its promise of improving upon scarce documentary sources, came some measure of credulity towards material evidence more generally. Almost counterintuitively, according to Christopher Wood, fifteenth- and sixteenth-century scholars, 'presented with a material artifact,

tended to underrate the possibility of an unreliable or wandering transmission and instead to presume a strong connection between the artifact and its referent'. This 'learned credulity' toward objects paved the way for a soaring culture of forgery, which extended to all relics from the ancient world, including statues, medals and coins. It also led scholars into all sorts of errors and misattributions: they misdated often by centuries, seeing the antique in the medieval, taken in by changes in dyes, an old-looking patina, the addition of rust (Wood 2012, 178, 164). Naturalists (many of whom were humanistically trained and cultivated antiquarian interests) shared, at least in part, this good faith in materials, and found it difficult to discount the identity and reliability of the *naturalia* on which they got their hands. The resonance of Pliny in a charlatan's fraud was almost enough to convince its learned viewers that they were seeing the vile monster described by the Roman sage. And, as the example of Aldrovandi judging on the basis of impressionistic drawings reminds us, the difference between copy and original was still being worked out in natural history.

Within sixteenth-century natural history, a skeptical disposition toward material culture was still the domain of the few.[37] This is understandable, as naturalists faced not only the challenge of learning to read objects, but also of coming to terms with a line of plausibility that had been dramatically redrawn by travel and discoveries. Counterfeit *naturalia* brought this into relief. Understanding the fake challenged the viewer's zoological knowledge, because it demanded a mental work of comparison and recombination of traits from different species. Of the seven-headed hydra sold to the King of France (see fig. 14.12), Conrad Gessner commented that 'The ears, tongue, nose, and faces are different from the nature of all species of serpents', adding that, had the maker not been simple-minded, and had he limited himself to using a single species, he would easily have fooled his viewers.[38] Tartaglini's craftwork, in this sense, was even more problematic, as he did not produce abnormally featured monsters meant to shock his audience, but naturalistic representations of plausible animals, probably helped in this by his surgical experience of suturing superficial wounds and setting bones. Despite a seemingly standard morphology, the flying dragon was difficult to categorise correctly because of variations between the individual samples. To render a supposedly single species, craftsmen not only employed the skins of different animals, but also added and subtracted features at will. Some dragons had four feet, while others lacked them altogether; were they exceptions, like the *manucodiata*, or some kind of snake? Some had two feet and a beak rather than a snout; were they ordinary birds? Together with behaviour and habitat, foot typology, the number of limbs and skin texture were key morphological criteria in the zoological



De Hydra. Lib. IV. 459

Hydra sydus est in cœlo (Proclus Hydrum nominat) in qua coruus insidere existimatur, &c. vt scribit Higinus, & nos in Coruo h. recitauimus. Ea tamen non est quam Hercules confecit. Cancer etiam ille qui Hydram aduersus Herculem defendit, à Iunone inter sydera relatus existimatur: vt in Cancro fluuiatili. H. recitauimus. Sydus.

Hydra insula est Dolopum. Plura vide superius in Hydro h. Propria. h.

Toxicum aliqui natum fabulantur è sanguine Hydræ, quam Hercules τόξοις, id est, sagittis interemit, Scholiastes Nicandri. Hercules Philoctetæ donauit pharetram & sagittas Hydræ felle intinctas. Vide in Onomastico nostro. Vespæ in viperam quam mortuam perspexerint inuolantes, veneno aculeum imbuunt: sic & Hercules hydræ veneno iacula tinxit, Aelianus. Quinquaginta atris immanis hiatibus Hydra Intus habet sedem, Vergilius 6. Aeneid. de inferis. Proxima (*pugna*) Lernæam ferro & face contudit hydram, Vergilius de laboribus Herculis. Hydram secas, prouerbium est apud Platonem libro de repub. quarto: ἀγνοοῦντες (inquit) ὅτι τῷ ὄντι ὥσπερ ὕδραν τέμνουσι. id est, Ignari se reuera tanquam hydram secare. Est autem hydram incidere, ita vnum aliquod incommodum tollere, vt in eius locum alia plura recipias. Adagium natum à fabula Hydræ Lernææ, cuius vno reciso capite plura renascebantur. Plutarchus in Commentario de fortuna Alexandri: Ὕδραν τέμνων ἀεὶ τοῖς πολέμοις ἀναβλαστάνουσαν. id est, Hydram secans semper aliquibus bellis repullulantem. De Alexandro loquitur, cui vno bello confecto subinde aliud atque aliud exoriebatur. Cyneas cognita Romanorum multitudine identidem post acceptam cladem copias instaurantium, dixit sibi videri aduersus Lernæam hydram pugnare. Hinc Horatius in Odis, Non hydra secto corpore firmior Vinci dolentem creuit in Herculem. Accommodari poterit ad eos qui litibus inuoluuntur nunquam finiendis. Lis enim litem parit, & sæpenumero vna enecta tres subnascuntur, &c. Erasmus Rot. Meminit & Suidas huius prouerbii, & vsum esse dicit ἐπὶ τῶν ἀμηχάνων, id est de rebus quas nunquam aliquis perficiat, (vtpote quæ subinde grauiores & intricatiores se exerãt.(Magis varius quam hydra, prouerbium ad hydrum pertinet, & explicatum est superius. Prouerbia.

Hydram septicipitem esse (inquit Nic. Erythræus) tam verum est, quam Castorem & Pollucem ortos ouo, Plutonem in ferno regnare, natos è serpentum dentibus armis instructos homines: & quæ præter alia primus finxit Homerus, arma à Vulcano Achilli fabricata, vulneratam à Diomede Venerem, perlatum vtribus Vlyssem, &c. Hęc autem admonuimus propter nonnullos vsque adeò rerum imperitos homines, qui proximis diebus Venetiis hydram septem capitibus terrifico monstro naturam ipsam vehementer accusantes, Hæc ille. Videtur autem de fictitio illo monstro sentire, cuius hic figuram subiiciemus, qualis in charta quadam typis impressa & vulgata est. Inscriptio erat hæc: Anno à Christo incarnato tricesimo supra sesquimillesimum, mense Ianuario, serpens monstrosus, cuius typum imago hęc cum magnitudine, tum colore refert, è Turquia ad Venetos perlatus: deinde Francorum regi datus, sexque millibus ducatorum æstimatus est. Additur & coniectatio authoris innominati, sed Germani, vt apparet, his verbis: Non dubium est monstra significare mutationem rerum. Sed Germania aut orbis Christianus ita est afflictus, vt ei præter exitium accidere nil grauius queat. Vnde in spe sum ea monstra non esse ipsi ad maiorem calamitatem extimescenda. Sed res Turchæ ad summum potentię & felicitatis per-

Qq 2 uenerunt,

FIGURE 14.13 Seven-headed hydra owned by the King of France, from C. Gessner, *Historia animalium*, liber IV: *De piscium et aquatilium* (Zurich 1558), 459

COURTESY OF THE SMITHSONIAN LIBRARIES AND ARCHIVES, WASHINGTON, DC

classifications that naturalists began to devise in the sixteenth and seventeenth centuries – Gessner and Aldrovandi *in primis*.[39] If counterfeit dragons had the uncomfortable ability to call into question the validity of these new taxonomic choices, other fabricated specimens seemed to push the very boundary between the vegetable and animal worlds, or between inanimate and animate – such as the famous Lamb of Tartary (the manipulated rhizome of the fern *Cibotium barometz*), an ovine believed to grow like fruit from a central Asian plant. Attached to it by an umbilical cord, the lamb grazed around until all accessible foliage was gone, whereupon both plant and animal died (Appleby 1997).

The counterfeits' instantiation of fabled creatures afforded a unique sensory experience to the naturalist, who, through his hands, nose and sometimes even tongue, was able to conjecture about the paths that nature could take or could have taken, and test his own theories about generation, genealogy and groupings. The opportunity to witness these creatures first hand in a museum setting was prized by contemporaries. When the Danish anatomist Thomas Bartholin (1616–1680) exposed as a fake the basilisk owned by Frederik II of Denmark, he presented as one of his arguments the fact that he had seen several artificial specimens during his travels on the Continent. Similarly, careful comparison between the mouth of a live pachyderm and his own 'giant's teeth' enabled Nicolas Fabri de Peiresc (1580–1637) to reclassify the latter as elephant teeth (Bondeson 2014, 180; Jaffé 1992, 158). Not simply a good instructional device, the fake, in the words of Mark Jones (1990, 12), could be 'determinant in changing boundaries of belief'.

And it is precisely in relation to the ferment of the American discoveries and increased connections across Eurasia that the study of the fake and its heterogeneity finds its best justification (fig. 14.14). While mythological and Biblical monsters transmitted through texts and sermons were gradually being dismissed in educated circles, the horizon of possibility for what concerned the physical world had expanded rather than shrunk. Faced with an ever-increasing cornucopia of natural forms arriving from afar, wondrous to a European eye used to the morphologies of a temperate climate, the naturalist could not dismiss the unusual *a priori*, but was obliged to consider each case on its own. It is not difficult to see how the ersatz's appearance might find credibility in the new wave of exotica, when we consider how these exotica were supported by often unverifiable travellers' tales, and how they were absorbed epistemologically by painters and writers, namely through a combinatory process (much like that of the fake) that rendered the new by collating parts of the old. Thus, the armadillo, among the most popular Americana

FIGURE 14.14 Seventeenth-century engraving inserting the allegedly real Aethiopian dragon (top left) in an exotic menagerie that includes a camel, a giraffe and a chamaeleon. The dragon's features are lifted wholesale from the much plagiarised sixteenth-century depiction of it given in Pierre Belon's *Les observations des plusieurs singularitez et choses memorables* (Antwerp 1554). Engraving by D. Loggan, 1663, after Wenceslaus Hollar (London 1674) COURTESY OF THE WELLCOME COLLECTION (CC BY 4.0)

featuring in early modern collections, was routinely described as having the head, ears and hooves of a horse, the behaviour and tail of a pig, and a turtle's carapace (Margócsy 2011; Ashworth 1991, 116–117, 121). Hence the slippery ontological nature of Tartaglini's fakes. They are fictitious, but they might instruct by default about something actually out there – especially as his dragons were supposedly replicas of an African species (*draco aethiopicus*) that most naturalists would not have seen.[40] Their mimicry is therefore inherently approximative, mutable, suggestive rather than prescriptive. They reflect the excitement and uncertainty felt by naturalists in the face of an expanded geography.

Like most fakes and ersatzes across time and cultures, from seventeenth-century Dutch imitation porcelain to contemporary Chinese replicas of prêt-à-porter handbags, nature's counterfeits reflected the sense of history of their makers and intended consumers. Their special appeal lay in their ability to make that history more concrete. In this, they again displayed an interesting resemblance to contemporary antiquarian forgeries. According to Wood, antiquarian error, and the ready acceptance of supposedly ancient objects that to

FIGURE 14.15 A second counterfeit dragon from the seventeenth century, once owned by the Veronese herpetologist Edoardo De Betta (1822–1896) and now in Verona's Museo Civico di Storia Naturale.
PHOTO: FORTI (1928), [242]
COURTESY OF THE MUSEO GALILEO, FLORENCE

our eyes seem an improbable pastiche, were not the result of naïveté. More often it was a matter of 'looking through' the artefact's inauthenticity and "recentness" to a referent 'far behind it and so to its true meaning'. Pre-modern scholars understood artefacts and evidence as parts of a chain of substitutions meant to revive and corroborate an evanescent past. The fraudulent document was often introduced to substitute for an original that must have existed and whose "spirit", if not necessarily form, it kept intact. In the process, the distinction between being and replacing became blurred.[41]

I would argue that naturalists too, engaging as they were in a new scholarly field that relied heavily on material evidence, were looking for such tangible immediacy. According to Charles Mitchell, antiquarian scholarship was a matter of fleshing out the bare skeleton of antique remains with interpretive imagination.[42] This the dragons accomplished both materially and conceptually. Part of their persuasive power derived precisely from their corporeality and wholeness, a material state that contrasted with the fragmentary and latent content in most collections of *naturalia* – leaves, teeth, horns, bones. Just as the eighteenth century resuscitated ancient sculptures by turning found fragments into coherent wholes, the basilisk maker created an 'illusion of completeness' (Jones 1990, 14) that enabled the naturalist to see and touch faraway lands. Yet, unlike most medieval and Renaissance antiquarian forgeries, nature's fakes were not connected with recovering and emulating an idealised past, but with present practices and future encounters. If humanist evidence derived its value from "looking old", organic counterfeits were more presentist. The confected dragon stood in for a natural world that the naturalist considered likely to be out there, and only a matter of time before it was found and experienced.

5 Conclusion

Concealed in the extraordinary folds, limbs, and stitching of the fake's body were deeper anxieties and desires concerning the mastery of an enlarged natural world, the probing of materials, and the moral policing of the world of commodities. Depending on the constituency, material mimesis could work as a vector of value, time, or geography. For sixteenth-century healers and naturalists, counterfeit objects gained visibility as protagonists both of ingenious antiquarian frauds and of the wider discussion on substitution, authenticity and fraud in the marketplace. If, in humanist circles, fakes often constituted a reputational downfall, in the practice of pharmacy they were heuristic tools.

Natural history borrowed from both stances. For naturalists, fakes were not just challenges to scholarly reputation, but material and intellectual puzzles. They offered a means to learn about and work with the organic limits of materials, and, with their subtle mimicry, taught scholars to perceive matter as an aesthetic as well as epistemic category.

Fakes also clearly contributed to the development of a critical tradition in the emerging field of natural history. They prompted naturalists – at least the more observant ones – to question their knowledge of the natural world, and offered a tangible immediacy to geographies and pools of *naturalia* that for most European scholars would remain inaccessible until modern times. As mimetic performances of the possible, however, they remained difficult to pin down. It is for this reason that they were such effective instructional devices, and answered a novel scientific need. While they satisfied scholars' desire for new materials of study, counterfeits also acted as a timely warning about the difficulty of interpreting nature and the dangers that a misinterpretation might bring, be it failing health or a reputation for ignorance. Exposing the fake then became a demonstration of connoisseurship and a display of authority.

Mostly untold remains the other side of the story. If fakes 'teach us the fallibility of experts', they can also reveal the expertise of their semi-literate producers and their familiarity with élite cultural vogues. The forger, as Tony Grafton has observed, is often the most accomplished critic (Grafton 1990; Jones 1990, 11).

Acknowledgements

An early version of this chapter, 'Leone Tartaglini's basilisks: fake specimens and explorations in the boundaries of scientific connoisseurship', was presented at the 2nd Watson Seminar in the History of Material and Visual Science, Museo Galileo, Florence, 7 June 2013. I thank the organisers Marco Beretta and Maria Conforti for the opportunity to discuss early ideas on the topic. The commentary then given on my chapter by Alessandro Tosi appeared with revisions as Tosi 2014.

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Endnotes

1 Biblioteca Universitaria Bologna (henceforth BUB), MS Aldrovandi 38/ii–iii, fols. 247r–248v. All translations are mine unless otherwise stated.

2 Olmi 1985; Findlen 1994; Egmond 2010, 2017; Kenseth 1991, cat. nos. 29–39.

3 Pona 1601, sig. B2v; Dance 1976; Findlen 2002; Daston & Park 1981.

4 BUB, Aldrovandi MS 136/xv, fol. 186v. One toad is illustrated in Aldrovandi 1640, book 1, 61 ('Bufo mostrificus cauda anguina'); on the *manucodiata*, Lawrence 2018.

5 Quoted in Swan 2005, 231.

6 Rondelet 1554, 363; Mattioli 1557, 740–741; Gessner 1558, 945; Aldrovandi 1640, 314–320; id. 1599, vol. 2, book 14; id., BUB, MS Aldrovandi 136/xxiv, fols. 105r–109r, 'De ave manucodiata seu Paradisea'. On the longevity of monsters, see George 1985, 183–185; Findlen 2002, 299.

7 See the notorious case of the planted fossils that ruined the reputation of Johann Bartholomeus Adam Beringer, Dean of the Faculty of Medicine at Würzburg University in 1725 (Cooper 2007, 101–109); Beretta & Conforti 2014.

8 Niccoli 1990; Daston & Park 1998; Findlen 2002, 299–304.

9 Archivio di Stato di Venezia, *Provveditori Sanità*, b. 13, fols. 74v, 144r.

10 Brusegan 1996; Garzoni 1587, 746. A list of items traded by Tartaglini features among Aldrovandi's papers (BUB, MS Aldrovandi 136/v, fols. 190v–204r, 'Venetiis, apud Leonem circulatorem de piscibus'). On charlatans and secrets, see Gentilcore 2006, Eamon 1996.

11 These are depicted in Aldrovandi 1640, 315–316 ('Draco ex Raia effictus', 'Draco alter ex Raia exsiccata concinnatus'), and in Ceruti & Chiocco 1656, 234. Aldrovandi's tailed toads had also been supplied by Tartaglini (Forti 1914, 35, n. 2).

12 Pliny 1940, Book 8, chap. 33; Belon 1554, sig. 133r. For a comprehensive discussion of the Plinian basilisk and its Renaissance reception, including theories of its generation and its iconography, see Aldrovandi 1640, 361–376.

13 Katritzky 2007, 93–96; Gessner 1558, 545. While these counterfeits were entirely of animal origin, later specimens often contained supporting wood inserts and limbs made of hardened textiles and paper (see item MSNVE-16723 in Venice's Natural History Museum; Reggiani 2011).

14 Forti 1914, 27–28. Although mounted specimens were becoming common by the 16th century's end, and stuffed birds especially were fashioned in poses suggesting behaviours either observed in life or described by the ancients, the habit of infusing the object with a visible narrative would not become standard before the habitat dioramas of the 18th and 19th centuries, which dramatised nature for a wider lay audience. See Ross 2019; Wonders 1993; Yanni 2000, 27–30.

15 On the legibility of nature, see Daston 2004.

16 Pugliano 2012, 253–264; Larsen 1996, 358, 364. Cheap methylated ethanol, sometimes with added glycerine, is still the most common preservative for wet specimens (Davis 2018, 151; Peck 2003b).

17 Ceruti & Chiocco 1622, 668–669. Before the 18th century, specimens rarely lasted more than a few decades (Peck 2003a). On intermediaries, see Pugliano 2018, 45–49; Schulze-Hagen *et al.* 2003. On Tartaglini, see Fulcheri to Aldrovandi, 28 June 1566, BUB, MS Aldrovandi 38/iii, fol. 100r.

18 This method appears not to have been practised in the sixteenth and seventeenth centuries (Davis 2018, 154). See also Rijks, this volume.

19 According to Wilma George's examination of the perishable zoological content of 17th-century European cabinets, Italian collections contained the fewest animals, generally mammals and fish (George 1985, 180; Peck 2003b, 36–38).

20 Aldrovandi to Luigi Zenobi, 17 April 1595, BUB, MS Aldrovandi 21/iv, fol. 89v. In Aldrovandi's carefully organised collection of watercolours, the main volume devoted to sea creatures and reptiles also includes images for the authentic *draco aethiopicus*, for a charlatan's flying dragon, and for a footed serpent encountered in the Bolognese countryside, which are inserted organically among depictions of rays, skates and roughsharks (see BUB, *Fondo Aldrovandi*, Tavole 4, vol. 1). See also Rietveld's essay, this volume.

21 Mattioli 1557, 501–502; Egmond 2010, 25–44.

22 Aldrovandi to Zenobi, 17 April 1595, BUB, MS Aldrovandi 21/iv, fols. 87v, 89v.

23 Lugli 1990.

24 Welch 2000, 37–38, 79; Rublack 2013, 43. For a similar humanist appreciation of the manufacturing virtuosity and imagination behind antiquarian forgeries, Mitchell 1960, 458–460; Wood 2012, 150–152.

25 Tartaglini to Aldrovandi, 28 November 1571–26 January 1576, BUB, Aldrovandi MS 38/ii–iii, fols. 246r–248r. Tartaglini also exchanged items with Calzolari, and supplied the Venetian garden of Pietrantonio Michiel with plants (Forti 1914, 35, n. 1).

26 Calzolari to Aldrovandi, 16 December 1571, in: Cermenati 1910, 125; Fenari, January to December 1571, BUB, Aldrovandi MS 38/ii–iii, fols. 4r–13r; Olmi 1992; Swan 1995.
27 Tartaglini, 22 December 1571, BUB, Aldrovandi MS 38/ii–iii, fol. 247.
28 BUB, Aldrovandi MS 97, fols. 512v–513r: 'De Terra Lemnia seu terra sigillata'; Belon 1554, Book 1, chs. 22–23, 28. Olmi 1977, 205.
29 Mackenney 1987, 16–18; Pugliano 2017, 255–256. See also Dümpelmann, this volume.
30 On substitution, see Boumediene & Pugliano 2019.
31 Cardano 1663, vol. 3, 340–342.
32 BUB, MS Aldrovandi 21/iv, fols. 87r–v. A rather unhelpful engraving of the Cavalier Del Cornetto's hydra can be found in Aldrovandi 1640, 387.
33 BUB, MS Aldrovandi 21/iv, fol. 89v.
34 Mattioli 1557, 501–502; Aldrovandi 1640, 314.
35 BUB, Aldrovandi MS 136/xxvii, fol. 252v; Olmi 2002.
36 Ashworth 1991, 126. See also Tarp, this volume.
37 Ogilvie 2006, 209–210; Jaffé 1992; id. 1988, 11.
38 Quoted in Findlen 2002, 308.
39 For a gallery of north Italian specimens, see Forti 1928. Aldrovandi, for instance, divided animals into solid-hoofed, cloven-hoofed and clawed. Gessner organised fish according to the order, colour and texture of scales and fins (George 1985, 186; Enenkel & Smith 2014).
40 It was only in 1600 that Aldrovandi himself received a supposedly "true" dragon, mummified, to compare against Belon's description and his own counterfeits (Aldrovandi 1640, 421–422).
41 Jones 1990, 13; Wood 2012, 171, 180–181; Nagel & Wood 2010, 29–34, 251–274.
42 Mitchell 1960, 478, paraphrased in Wood 2012, 157.

CHAPTER 15

Fertile Stones

Lisbet Tarp

This chapter considers one of the most radical aspects of the matter of mimesis: occasions when materials seem to perform mimetic acts without a human agent. The case study under consideration comes from the writings of the Danish collector, physician and scholar Ole Worm (1588–1654), whose curiosity and analytical skills extended to patterns in natural specimens that displayed what appeared to be non-human artisanship. My approach to Worm is prompted by my previous studies of how materials with naturally-occurring images were interpreted and employed in motifs by early modern artists so as to make visual statements on nature's capabilities or limitations as an artist. In early modern art history, non-human image-making has been addressed from various perspectives, for instance, interpretations of images as made by Chance or Fortuna, visual manifestations of artistic and creative power, monstrosities, religious portents, and perceptual tricks in the eye of the beholder. A key to understanding the reception of these images lies in belief (or absence of belief) in a sender, such as God, expressing an intention or message.

In his writings, Worm refers several times to the idea of nature's playfulness in describing naturally-made images as well as elaborate forms and patterns in matters. In an often-cited article on the early modern idea of nature's 'jokes' or 'sports', Paula Findlen (1990, 292) quotes Worm's reference to nature's playfulness in his discussion of 'figured stones': 'Nature has joked (*lusit*) uncommonly in all the outward appearances of natural things […]'. Findlen does not analyse this statement further, leaving Worm to feature as a traditionalist, with a worldview relying on an animated nature, capable of play. While studying his other references to nature's playfulness, however, I wondered whether there was a need for a more varied understanding of his use of this concept. This chapter seeks to clarify his probable reasons for applying the term to specimens. What might a reference to the idea of nature's capacity to make images have entailed at the time?[1]

As a naturalist and physician, Worm's interest in natural phenomena largely involved describing, identifying, and then utilising *naturalia*. Typically for this period, an interest in objects displaying features produced by nature's playfulness formed part of Worm's wider aim of identifying the active force

capable of giving form to matter, most likely in order to replicate the process in his laboratory. In some cases, especially within his collection of stones, it seemed to Worm that a petrifying agent or *succus lapidescens* played a role in the production of these images. The point of departure for this chapter is an analysis of how Worm subcategorised and differentiated types of supposed petrifaction processes, which also embraced the concept of sports of nature, *lusus naturae*, and was supplemented with comparisons to his descriptions of image-containing specimens in both his correspondence and his famous collection catalogue, *Museum Wormianum*. Alongside the analysis of Worm's explanations of the petrifying juice and a discussion of his use of the notion of nature's play, a number of different objects in his collection are presented in this chapter. This broader class of specimens with image-like features includes, but is not restricted to, fossils in the modern sense. The following sections will introduce the context for interpreting natural specimens at the time, as well as Worm and his collection.

1 Nature as Producer of Signs

An underlying assumption about nature's playfulness was a broader understanding of nature as a source and producer of signs. Natural specimens, especially plants, were interpreted as bearing visual resemblances to the human body parts that they could be expected to heal.[2] The rationale behind such uses of nature derived from the doctrine of signatures, and a general theory of the world as tied together in a network of affinities based on analogies and sympathies. In disclosing nature's secrets, special attention was paid to monstrous births, exceptional weather conditions, and spontaneously appearing images in nature. These extraordinary natural phenomena seemed to be particularly loaded with significance, and to display intense powers of production. Some cases were interpreted as portents and warnings from God, illustrating a belief in nature as a means of communication.[3]

Interpretations of nature's pictorial activity are already to be found in antiquity, most famously in the writings of Pliny the Elder (23–79 CE), who was frequently cited, among others by the Italian humanist Leon Battista Alberti (1404–1472), who, in his book *On painting*, reproduced the story of a stone cut in two revealing a portrait, and a gemstone with an image of Apollo and the nine muses.[4] This story, as well as other similar tales of images appearing in unlikely places, were reproduced in later centuries. In the same vein, variations on a view of nature as a goddess and semi-autonomous agent developed

(Economou 1972). Nature imitated the acts of an artist, supposedly making spontaneous images appear for no purpose other than amusement.[5]

In general, visual, textual, and material sources from the sixteenth and seventeenth centuries provide evidence of growing interest in, and artistic use of, nature's pictorial activity, appreciated for its resemblance to works of art. Most likely, this development was connected to the increasing focus on the optical that was encouraged by the invention of instruments like the microscope, and to a growing emphasis on empirical knowledge in general.[6] Over these centuries, natural philosophy, the study of nature, and art theory all developed substantially, eventually also providing theoretical underpinning and physical evidence for the idea of nature's playfulness, even if it was these developments that, at length, also contributed to dismantling the same view (Daston 1998, 242–248). If the idea of nature as sportive and animated would gradually decline in relevance over the early modern period, in Ole Worm's day, the use of the doctrine of signatures, the interpretation of portents in nature, and references to nature as playful, were still common in the study of natural phenomena. It was within this equivocal framework that Worm struggled to explain and define those of his natural specimens having distinctive visual and material features that made them appear like images.

In the Nordic European realm, a general endeavour to identify images and emphasise recognisable *gestalts* or messages in nature was expressed in text and image. One example figures in records of the collection at Gottorf Castle in the duchy of Schleswig, ruled by the Danish king. The so-called *Gottorfer codex*, produced in the years 1649–1659, is a huge catalogue of the contents of the botanical garden.[7] In one of the plates, showing orchids, the flower petals are adjusted in order to enhance the resemblance to naked men, birds, and insects (fig. 15.1).[8] A close-up look at the depicted flowers is required in order to discover the tiny figures, but when detected, they emerge as curious reminders of nature's abilities and agency as sign operator (figs. 15.2a, 15.2b). Furthermore, in the Nordic written sources, there are also reports of extraordinary natural phenomena that were interpreted as portents. For instance, Worm reproduces a story of blue dirt falling from the sky in Scania and staining collars, interpreted as a sign of God's resentment at the luxurious habit of wearing decorative clothing among Worm's contemporaries.[9] Worm taps into the tradition of interpreting unusual natural incidents as a means of communicating a message, in this case about moral habits, but – as will be shown – also about potential medical uses, or offering clues for understanding and imitating natural processes. As will be discussed later in relation to the expression 'nature's play', Worm's commitment to a kind

FIGURE 15.1 Johannes Simon Holtzbecker, *Orchids*, in *Gottorfer Codex* (1649–1659), vol. 1, plate 99, gouache on parchment, 50.5 cm × 38.5 cm
SMK – THE NATIONAL GALLERY OF DENMARK
PHOTO: SMK FOTO

FIGURE 15.2A
Johannes Simon Holtzbecker, *Orchids*, in *Gottorfer Codex* (1649–1659), vol. I, plate 99 (detail), gouache on parchment, 50.5 cm × 38.5 cm
SMK – THE NATIONAL GALLERY OF DENMARK
PHOTO: SMK FOTO

FIGURE 15.2B
Johannes Simon Holtzbecker, *Orchids*, in *Gottorfer Codex* (1649–1659), vol. I, plate 99 (detail), gouache on parchment, 50.5 cm × 38.5 cm
SMK – THE NATIONAL GALLERY OF DENMARK
PHOTO: SMK FOTO

of inventive freedom of nature and nature's ability to communicate messages is, however, less clear.

2 Ole Worm (1588–1654)

Ole Worm, a merchant's son, was born in the Danish city of Aarhus. As a young man, he undertook a Grand Tour in Europe, becoming acquainted with influential scholars and collectors in different countries. Worm established an extensive international network, and in Copenhagen, he gained importance through his three marriages to women from the most important families at the University of Copenhagen. During his lifetime, Worm held several important positions at the university, and played a significant role in supporting young scholars. Furthermore, he was a significant runologist and antiquarian of his time. Both his great project of recording the remains of ancient Nordic culture, and his substantial publications on the subject, were renowned in learned European society.[10] He was well acquainted with the royal family, especially King Frederik III (1609–1670), the first major royal collector in Denmark, who visited Worm's collection, and received his advice both as a physician and as an antiquarian (Schepelern 1971, 15).

Worm obtained a wide variety of objects from his huge network in Denmark and other countries: ethnographic artefacts and antiquities, as well as natural specimens, which became the principal focus of his collection, with paintings, drawings and sculptures playing a lesser role. Worm established his collection in his own home, and used it for teaching activities, as well as for display, attracting local and foreign visitors and earning fame in Europe (Tarp 2018). He spent his final years writing his collection catalogue, *Museum Wormianum*, a work well known in histories of collecting, which was printed posthumously in 1655.[11]

In the historiography, Worm has been given a low priority compared to contemporary scholars deemed to belong to the Danish 'Golden Age' of science, such as the astronomer Tycho Brahe (1546–1601), the anatomist and geologist Niels Stensen (Steno) (1638–1686) – considered as one of the founders of geology – and the astronomer Ole Rømer (1644–1710), famous for his determination of the speed of light.[12] Nevertheless, several studies, primarily in Danish, focus on Worm as a collector, physician, and antiquarian, in addition to the debate over Worm's position on the reception of Paracelsianism and Rosicrucianism in Denmark.[13] The philologist Henrik Ditlev Schepelern has translated Worm's correspondence from Latin into Danish, and has written a dissertation on Worm and the collection catalogue *Museum Wormianum*,

which remains untranslated except for the preface.[14] Even though the ethnologist Camilla Mordhorst has studied the collection catalogue and its famous frontispiece from the perspective of museology and history of ideas, in-depth and detailed analyses of the catalogue text as such, and its later reception and impact on the collection catalogue genre, remain to be done.[15] As an example of the curious early European museum, the frontispiece is often reproduced in secondary scholarship and popular culture today, but considerably less scholarly attention has been devoted to Worm's reception of specific ideas of natural phenomenon, such as the concept of a petrifying agent in nature.

3 The Catalogue Museum Wormianum

The collection catalogue presents Worm's collectibles conventionally, in four main sections probably inspired by foreign collectors and their catalogues: the kingdoms of minerals, plants, animals, and finally artificial things, ordered according to material.[16] The largest section concerns the minerals, and this group of specimens was also the greatest in number (Mordhorst 2009, 43). Many of the individual specimens are meticulously described, some at length, for instance the well-known horse jaw embedded in a tree trunk, an object that still exists today.[17] In general, Worm records the properties of his specimens, such as shape, colour, fragrance, and known medical effects. Besides describing these properties, he also adds the results of observations and tests conducted in order to clarify the origin, ontology, and probable medical uses of his materials. Occasionally, he includes information on the general category to which the object belongs, as well as information concerning its provenance and donor. As was customary, Worm intertwined these observations with references to knowledge obtained through the international learned circles to which he belonged. For instance, on the topic of petrified shark teeth (to which I shall return in what follows), he combined his own investigations of samples with information from his protégé and successor at the university, Thomas Bartholin (1616–1680), and from the Italian naturalist Fabio Colonna (1567–1650).

As expressed in the preface to *Museum Wormianum*, in his studies of nature, Worm placed value on establishing knowledge primarily through first-hand encounters with specimens. This attitude not only aligned him with a general move towards empirical studies at the time, but also reflected the way in which Worm generally concentrated on describing individual natural specimens, adding, discussing, and adjusting information in each case, representing – as he claimed in the preface – only specimens he owned. In this way, his catalogue

is dominated by a wide range of different natural specimens, but which do not represent a rethinking of categories within the four kingdoms as such.

At his death, Worm's collection was integrated into that of King Frederik III. Parts of the descriptions in *Museum Wormianum* accordingly reappear in later royal inventories, for instance in two printed catalogues, both titled *Museum regium*.[18] Over the centuries, several other collections were added to the royal collection, including the collection at Gottorf Castle mentioned in Worm's writings.[19] Only a few of Worm's many exhibits, however, are known today; the main part of the collection was lost to fires, gradual disappearance, or sale at auction during a reorganisation of the royal collection that took place in the decades around 1800 (Mordhorst 2009).

4 Matters of Petrifaction: *Succus lapidescens*

In the history of geology, the discussion and interpretation of fossils in the early modern period is a well-studied subject. The early modern use of the term fossils was attributed to any distinctive object or material 'dug up'.[20] Some of the central questions raised by scholars in relation to stones with innate delineations showing, for instance, a fish, addressed their inorganic or organic origin, the appearance of species not known in living nature, and their tendency to appear, mysteriously, in places far from the sea. Fragments of extinct animals were especially difficult to interpret, due to the lack of a living counterpart to explain them (Rudwick 1985). The subgroup of stones addressed in this chapter was named 'figured stones', stones with pictorial features, some of which would be recognised as fossils today. Early modern ideas of petrifaction applied to a wider range of objects than fossils in the modern sense.[21] Worm's statements on petrifaction were not original, nor did he contribute any new positions to the debate. However, as I will show, he approached the subject of petrifaction from different angles, bringing available theories as well as observation of specimens to bear in explaining their formation.

One widely accepted model of petrifaction rested on the claim that a petrifying juice permeated matter, transforming its nature. This juice, the *succus lapidescens*, and its underlying principle, *spiritus lapidificans*, caused matter to coagulate and transform into stone by penetrating openings in the body of the specimen. Georg Agricola (1494–1555) promoted the idea of *succus lapidescens* in 1546, and it had a great impact throughout Europe (Agricola 1546, 51–57). This juice appears to be related to a general idea on the earth's formative powers, *vis plastica*, supposedly originating with Aristotle (384–322 BC).[22]

Describing an unknown plastic force capable of conferring form upon matter, the concept was part of a larger debate on natural phenomena from Avicenna (*c.*980–1037) to Athanasius Kircher (*c.*1601–1680) and his famous illustrations and interpretations of images in stones.[23] In the *Museum Wormianum*, the chapter on 'figured stones' included different kinds of stones in which an image was visible. Here Worm refers directly to Agricola on the matters of *succus lapidescens*, briefly setting out the latter's argument that the juice is inherent in the earth and capable of transforming natural bodies.[24] Besides the foundational works of Albertus Magnus (1260–1262) and Conrad Gessner (1516–1565), another of Worm's primary sources on the topic of stones and the kingdom of minerals was the lapidary written by the Flemish physician Anselmus Boëtius de Boodt (1550–1632), whom Worm cites, for instance, in relation to the genesis of images in copper schist.[25] The idea of the petrifying juice had been adopted and explained by the Danish doctor and theologian Caspar Bartholin (1585–1629) in his book *Systema physicum* from 1628, which was widely distributed in Denmark.[26] Bartholin was an authority in the Danish academic environment, and furthermore a relative of Ole Worm.

In most cases, when Worm referred to the petrifying juice in his letters and *Museum Wormianum*, he does not explicate the process as such any further.[27] However, in 1646 the director of the Dutch West India Company, Johannes de Laet (*c.*1581–1649), wrote to Worm that he was about to complete a book on 'Gemmis & Lapidibus', in which he planned to include illustrations of petrified mussels he had received from friends in England and France. For this reason, he asked Worm for his view of how the processes of petrifaction occurred, and fortunately, Worm's response survives.[28]

5 Explaining Petrified Things: 'I Believe their Genesis to be Different'[29]

Following a paragraph on a stone closely resembling a honeycomb in appearance, Worm responded to de Laet that he considered there to be three different kinds of petrifaction processes. The first of these seemed to be a sort of natural moulding or imprinting process, where the stone 'takes the shape of a living creature or another part of a natural or artificial thing'.[30] Later in the letter, he then elaborates on this concept, suggesting that these stones which 'emulate other things' might be affected by their place of origin.[31] Here, Worm argues, a 'petrifying juice' causes stones to take on a shape determined by whatever had previously been lying there, for instance 'a foot, a head or the

like'.[32] In this way, the petrifying juice was supposed to contribute in transferring an imprint or shape of a thing to the stone via a process of petrifaction. It is unclear what form such imitation might have taken, and whether it worked in two or three dimensions. However, it is instructive to compare Worm's first type of petrifaction to a plate from the *Lapides* or stones included in Basilius Besler's (1561–1629) catalogue of 1616. Here the different stones may illustrate emulations caused by the juice (fig. 15.3).[33] None of the figurations the stones bear appears to be carved or painted. Nor do the descriptions indicate that any craft was involved in their making. They all seem to be the result of petrifaction, which served to embed the figuration in the stone. However, a few differences do appear. One of the specimens shown on the plate is a stone with a hand imprint, and the caption states: 'ash-coloured stone in which a figure like a hand is imprinted'.[34] Compared to the other stones on the plate, the 'hand' stone is unlike the other samples because it appears as an imprint, the concave shape of a hand carved into the material. The 'marble stone', to the upper left of the image, placed together with the spider, appears as a two-dimensional image, while the different samples with 'snakes' appear as three-dimensional likenesses – figurines rather than 'imprints' like the hand (fig. 15.3).[35] The

FIGURE 15.3 Basilius Besler (author), Peter Isselburg (draughtsman), unknown (engraver), *Lapides: Petrifaction in Fasciculus rariorum et aspectu dignorum varii generis* (Nurnberg 1616), engraving, 157 × 195 mm, Herzog August Bibliothek Wolfenbüttel

PHOTO: HERZOG AUGUST BIBLIOTHEK WOLFENBÜTTEL

differences illustrate variations that may all be subordinated within Worm's first, relatively flexible, category of petrifaction. From this point of view, the hand imprint may be interpreted as an example of how the petrifying juice has modified the stone and fixated the trace of a handprint – or whatever else had previously been lying on the stone. However, the same process might also account for the image of the spider. Even though the spider is reproduced in a different manner from the hand, the depiction of it might be interpreted as a trace of a real spider, fixed by petrifying juice. From this perspective, instances of the first type of petrifaction may be characterised as a kind of indexical image, a sign referencing a physical transaction. It is possible, too, that Worm considered a more radical formative process, wherein the entire stone was reshaped, translating the three-dimensional form of the specimen into stone, as for instance in the 'snakestones' that are also depicted on the plate.[36] It is difficult to gain any better sense of what kind of instances of the first type of petrifaction Worm might have addressed in defining this category. However, Besler's plate may portray a range of possible stones with images that Worm might have had in mind.

In overall terms, Worm's first type of petrifaction is characterised by the fact that the stone does not change substance; rather, a natural process occurs which alters its form. The *succus lapidescens* confers a new shape or pattern upon the stone, mediated by some kind of interaction between the stone itself and another object. The second category of petrifaction is an actual process of transformation. As in the mussels 'that have turned into stone' depicted on Besler's plate, Worm describes this second category of transformation as consisting of cases where the stone was 'a plant, an artificial thing or an animal but then transformed into a stone'.[37] During the petrifaction process, he suggests, 'a salty, petrifying and delicate spirit enters the openings of the body [...]'. When this spirit unites with the inherent moisture in the object, it causes a coagulation and 'transmutes it into stone'.[38] Furthermore, Worm adds, the 'nature of the spirit' has an impact on the quality of the stone, making it 'harder, softer or more brittle'.[39] In this way, the object retained its form, but its substance was thought to be altered by the petrification, which gave it stone-like properties. The most radical of Worm's three definitions of petrifaction, this is also the most mysterious. In another letter to which I will return below, Worm applies this concept of petrifaction to the *glossopetrae*, or petrified shark teeth, a category of collected objects much debated at the time.

The third and final kind of petrified object Worm describes also retains its initial shape in the process of petrifaction. To sum up this category, he argues that the object's petrified state is the result of contact with a liquid containing

cream of tartar, which eventually encrusts it.[40] Consequently, the form of the object is determined by the thing concealed within it. According to Worm (1751, letter 950), this type of petrifaction is superficial. He refers to this process of encrustation in other writings, for instance in a letter to an Icelandic acquaintance in which he defines a stone as a lump of petrified water, and goes on to explain that certain waters from fountains could encrust wool but not actually change it into stone – a process he had observed in Denmark.

All three processes of petrifaction described by Worm may result in objects that look like an image: stones which imitate the forms of other natural and artificial bodies. In other words, these stony materials bore a form which made reference to fish, peas, or the like, but in themselves, they were mere stones, with no, or very few, visible signs of how they received their imitative qualities. However, interpreting Worm's account, the second and third definitions of petrifaction do not reflect an *imitative* act, where the stone is molded by an external force. Instead, they are results of a *change of substance*: either from within, as a process of transformation, or from without, as a process of encrustation. The first kind of petrifaction is more ambiguous, and may illustrate a natural act of copying, in that it involves a transfer from another object to the stone, thus leaving behind a representation. In this respect, Worm's interpretation of specimens had affinities to contemporary theories of artistic production, including debate over how an image was judged to be a successful imitation. In the context of petrifaction, it is interesting that the artists' production of images was framed in terms of the duality between life and death at the time. One of the primary qualities aimed at was for dead material to be given an appearance of lifelikeness, and this quality was constrained by the degree of skill and wit of the artist. Reproducing life convincingly was complemented by the view of the process of making images as an act of petrifaction in which a living body was turned into stone, for instance, through references to the myth of Medusa and her petrifying gaze.[41] Furthermore, the imitation of life was broadly defined in artistic production at the time, and did not only refer to visual likeness. Pursuing his ambition of imitating the 'art of the earth', the potter Bernard Palissy (*c.*1510–*c.*1589) emulated natural processes according to his theories about them, and cast whole natural specimens in order to capture life in clay (Shell 2004). In similar terms, the goldsmith Benvenuto Cellini (1500–1572) describes his casting work using metal as a process of pouring life into the form, imitating life via a process of liquefying and petrifaction (Cole 1999). This aspect of imitating thus entailed copying physical processes like those activities taking place in 'the womb of the earth', linking artistic and alchemical practices. In art theory and the growing artistic aspirations of naturalism, other more common aspects of the concept of imitation were also

explored, for instance by expressing visual or textual relations to antiquity or God's grand work, nature. Exercised in rhetorical theory, imitation was part of an intertextual practice, and this volume on the matter of mimesis testifies to further modes of imitation, including positive and negative valency of the acts. Following this train of thought, one might add that objects with naturally-made images or letters were interpreted in a variety of ways, as entertainment, ill omens, or as an expression of God's support for rulers; thus, their religious significance varied very widely.

Even though the sources for Worm's ideas on imitation and his use of '*imitatio*' and related terms, like '*efficio*', '*refero*', and '*aemulatio*', still need closer examination, the examples above show that in his study of nature, Worm worked within this realm of speculation about how nature or the human maker transferred the image to matter.[42] As has been shown, he was implicitly working with different concepts of imitation, and identifying several probable transformative interactions between matter and form.

In a letter of 1647, Johannes de Laet responded to Worm's letter on the three types of petrifaction, merely stating without further explanation that he agreed with Worm on the subject (Worm 1751, letter 793). This statement confirms that Worm's interpretation of petrifaction already conformed to well-established knowledge in the field, rather than proposing a break with such views. However, more work remains to be done to clarify how Worm interwove his sources of information. In what follows, I will offer further examples of how Worm applied his views of petrifaction to the interpretation of stones resembling other things.

6 Sharks' Teeth, Bread, and Honeycomb. Petrifying Juice in Action

Petrified sharks' teeth were a popular collectible and subject of study. One of Worm's letters was addressed to his friend Henrik Fuiren (1614–1659), who had requested an explanation of this topic. Here Worm expresses agreement with Fabio Colonna concerning the claim that the so-called tongue stones originate from shark teeth. He then modifies his expression of support, adding that he had only heard Colonna's claim, but did not know the supporting argument or its foundation. Subsequently, Worm refers to a sample of earth from Malta that he had received, containing 'this kind of teeth and similar things', which 'supports Colonna, and clearly teaches us that in some places there is a petrifying juice, or rather an exhalation, capable of entering bones and transforming their nature'.[43]

Worm goes on to explain his reasons for doubting that all stones that resembled them were actually petrified sharks' teeth. Firstly, he presents the common objection to any connection between actual teeth and their petrified counterpart: the teeth were often found at places far from the sea, where maritime animals could not exist, although without confronting the commonly advanced argument that the Great Flood was responsible for the dispersal of remains from the sea as far as high, remote places on land. He adds that he observes fundamental differences between actual sharks' teeth and their supposed petrified counterpart, explaining and exemplifying differences in size, shape, and colour. The size of a tongue stone which Worm had inspected made him doubt that these objects were indeed sharks' teeth. Based on the number of teeth in the preserved shark specimen in his collection, Worm estimates that a shark that could have contained some two hundred teeth of this size would be too large to exist. In consequence of this argument, he then suggests different causal processes for the tongue stones and petrified teeth. One kind of stones with the shape of sharks' teeth is created by 'mire' that contained the petrifying powers, and the other one is created by the 'wit' or 'play' of nature, *ludentem naturam*, and has nothing to do with a real shark.[44]

This division between the object produced by a petrifying mire and the products of nature's imaginative play is central to Worm's investigation. Both kinds of petrified teeth, in his view, originate in nature, but one is an actual tooth with a transformed substance, and the other one is a kind of imitation of a tooth, made by nature. In both cases, the petrifying juice plays a central role, because, as Worm writes in the letter, nature 'makes use of the petrifying juice in her sportive actions'.[45] In other words, in Worm's reception of it, the juice is both a general natural power, and a tool used in specific cases where nature acts as an artist. In this way, Worm's explanation of the petrifying juice appears as aligned to the concurrent idea of *vis plastica* mentioned above. One of the interesting things is that Worm attempted to differentiate real transformed sharks' teeth from replicas. Rephrased, he considered the result of sports of nature to be a kind of fake or representation, just as one might judge a model crafted by a human being, since no real sharks' teeth had been involved in the process, regardless of whether the process was considered natural or artificial.

Ending his section on petrified sharks' teeth, Worm lists figured stones held in his museum. The list is interesting in this context, because it exemplifies the scope and variety of stony materials that an investigation of image-making powers could entail at this time. The list included 'a flint stone that looks like a human torso, another one that exactly resembles a left foot, there is one representing a bird, human bones, *osteocolla*, a horn and a petrified unicorn, [and] drops of Carlsbad water that look like peas'.[46] Considering Worm's differentiation of tooth-like stones in the first part of the letter, these samples were most

likely understood as outcomes of nature's playfulness. They bore naturally created images, whose genesis was not revealed by either material or form. In addition, *Museum Wormianum* contains other references to similar 'petrified' objects, for instance stones in the shape of a Norwegian hat, a nutmeg, and the heart of an ox.[47] In *Museum Wormianum*, Worm's descriptions also addressed petrified bread, as well as the honeycomb stone mentioned above.[48] He inserted his account of his pieces of petrified bread into the section of the catalogue describing figured stones, right after the description of a stone which naturally imitated both the male and female genitalia.

The petrified bread represented a nexus of meanings at the time. Besides the specimen's curious resemblance to specific types of bread, and the mysterious transformation of matter involved, the petrifaction of bread was connected to a folklore narrative with a moral message dating back to at least the sixteenth century in Denmark.[49] Stories described bread turning to stone in punishment for sinful behaviours like miserliness or vanity, and sometimes petrified bread was exhibited in churches as a warning (Worm 1655, 84). With the king's support and the assistance of the local clergy, Worm was mobilising local communities to record and gather Nordic antiquities in Denmark, and in all, he received many different kinds of objects. There is very little evidence as to Worm's religious behaviour in general, and most likely, Worm did not promote his petrified bread specimen in order to moralise or intervene in any kind of religious practice (Fink-Jensen 2004). Probably, his intention was rather to gather information and share knowledge with his target audience (potentially university students, colleagues, visitors to his collection, and the readers of his catalogue and letters), who might be interested in the strange occurrence of petrified bread. In the final part of Worm's paragraph, the determining question seems to be whether the bread-like stone was an actual loaf of bread converted into stone, or rather a product of *lusus naturae*.[50] The honeycomb made of stone is also an interesting example, because Worm describes it in detail, exhibiting fascination with its qualities as an imitation. He writes: 'All in all: at first sight, you would judge that it was a honeycomb made of bright, untouched beeswax, mounted on a base of stone, despite the fact that the entire piece is as hard as flint'.[51] This description, as well as many others, foregrounded the pleasure of experiencing the natural imitation at first hand.[52]

7 Extracting Petrifying Powers

A desire to unveil causes and explain physical processes in nature is evident in Worm's letter to the Darmstadt physician Johann Georg Horst (1616–1685). It is interesting that Worm expresses a wish to locate and extract the operative

agent in the petrifaction process.[53] The subject of discussion is a stone Horst had sent him which was supposedly shaped like a mussel, generated by petrifying powers. Worm guesses that the stone was influenced by the mire in which it was found, and he wonders 'whether the dirt on the stone would possess the same powers and properties, if it were cleansed, washed, and cut into pieces?'[54] In another letter, this time to the Icelandic clergyman Einar Arnfinsson (*c.*1608–1688), Worm again mentions petrifying powers supposedly transmissible from one material to another, or eventually to a living being like the human body, where it could stimulate contraction or coagulation. Interpreting a stone Arnfinsson had sent him, Worm (1751, letter 977) argues that it was a so-called stalagmite, common in certain places on the Norwegian coast. He explains that it was condensed from sea foam, under the influence of a petrifying power, and concludes by predicting that the petrifying powers had been transferred to the stone, making it a potentially useful medicament against dysentery. In this way, Worm approached the subject of petrifaction with utilitarian aims, potentially involving chemical experiments. My question is, then, how this experimental approach sits alongside Worm's references to nature's playfulness and its capacity to create images.

In what follows, I will look into how and why Worm used the concept of sports of nature. My intention here is to argue that even though Worm accepted a category of objects ascribed to nature's playfulness, he also approached the phenomenon more as an undefined natural formative power than as a semi-autonomous agent mirroring the concept of an artist.

8 Praising Sports of Nature?

In an article on *lusus naturae*, Helge Kragh offers an introduction to the use of the term in the early modern Danish scholarly milieu. Considering Worm, Kragh states (2006, 20): 'although Worm did not accept uncritically all stories of nature's marvels, he had no doubt about the general idea of *lusis naturae*'. I agree that Worm applied the term to selected specimens without reservations, but how did he use the term and what did it signify?

First of all, Worm uses variations of the term *lusus naturae* in connection with 'exorbitant forms' of both plants and animals, for instance, in the section on 'monstrous eggs' or wood.[55] In these instances, it seems, Worm refers to intensive cases of form-making in nature which did not subscribe to the usual generative system, and it appears that he is referring to a particularly striking quality in characteristics such as colouring, complex patterns, or unusual

shapes.[56] More specifically, it seems that Worm uses the reference to the category of 'sports of nature' as a convenient shorthand to describe the 'look' of a particular specimen or group of specimens. In the paragraph mentioned above on monstrous eggs as *lusus naturae*, Worm specifically remarks that it would be too 'circumstantial' (*operosum*) to describe them all individually.[57] Apparently, the term thus functioned as a collective designation, saving the trouble of writing individual descriptions. Similarly, in a section of the catalogue devoted to marble balls, when Worm notes that the results of nature's playfulness may be observed, he uses the term to designate a complex pattern and coloration, but without detailing the appearance of each individual exemplar.[58] In this way, Worm resorts to a conventional description, usable across a wide variety of specimens.

Worm also lauds nature's wondrous sport in more general terms, for instance, in the introduction to the chapter on stones, 'in which nature's playfulness can be admired', as well as in he sentence mentioned above, in which he claimed that nature 'has joked uncommonly [...]'.[59] These references to nature's playfulness may have functioned as embellishment, in line with a tradition of writing on nature's wondrous abilities, her ingenuity and wealth of vital formative powers as a model the artist should imitate and surpass. In this literature, nature was praised for artful inventions, while the artist was applauded for copying nature convincingly, maybe even improving upon natural creations. The trope of the common ability of nature and artist to create images had visual counterparts, especially in the gardens, grottoes, and motifs of grotesques that prevailed as decoration in the sixteenth and seventeenth centuries (Fabricius Hansen 2018). In this vein, Worm also praises nature's artfulness in one particular object in his collection, a little globe of Florentine marble (fig. 15.4). In the catalogue, Worm recalls nature's abilities to imitate by describing the sphere as a natural depiction of 'the lands of the earth'.[60] This example of sports of nature is one case where the product of playful agency also assumes the status of a depiction. Even though this collected object received a longer description and is mentioned twice in the catalogue – both as *naturalium* and as *artificialium* – it does not seem to be of any experimental interest; rather, equipped with a pedestal, it appears to have functioned as a showpiece for discussion, perhaps with scholars or nobles visiting his collection.[61] The properties of the marble were well known, and did not betray any indications of its genesis, but the depiction of the earth on the globe's superficies remained a curious phenomenon. In another instance, Worm describes a sample of 'Islebian fish-stones' that reproduces the fish in more elaborate detail than any artist could accomplish, and he concludes with the platitude: 'Virtuous nature

FIGURE 15.4 Unknown artisan, Sphere of Florentine marble, origin unknown. Florentine marble, diam. 7.4 cm, no. 5.325, Rosenborg Castle
PHOTO: LISBET TARP

hides in her womb many things that no one will ever be able to explain'.[62] The paragraph on the honeycomb mentioned above shows how sports of nature stimulated both pleasure in the experience and critical evaluation of the quality of the imitation. Nevertheless, this oft-cited phrase concerning the limits of understanding of natural phenomena can also be interpreted as an expression of both unsatisfied curiosity and a bit of frustration.

These longer-term appraisals of nature's abilities differ from Worm's typical practice of breaking things down into subtypes based on observation, for

instance the kinds of petrified specimens described above, or else his discussion of whether a perfect or imperfect nature had produced the lines on petrified sea urchins, examined by art historian Robert Felfe.[63] However, it is noteworthy that, in his inspections, Worm sought naturalistic explanations other than nature's playfulness, and narrowed down the number of specimens he was prepared to include in this category.[64] In some cases, the fact that such specimens carried unexplained visual features is emphasised by Worm's use of platitudes concerning nature's capabilities, perhaps in order to embellish – or even just indicate – the fact that their genesis was unknown, a secret of nature that remained obscure. Paula Findlen has pointed out that 'lusus was frequently used as an *anti-definition* – a means of explaining something that otherwise would have been without explanation', an aspect of the concept further elaborated by Marie-Theres Federhofer.[65] From this point of view, references to *lusus naturae* seem to function, for Worm, as a kind of placeholder for phenomena not yet subjected to a satisfactory explanation. In this way, the objects represented dead ends for scholarly research into nature, or at least that is how they appear in Worm's investigations. The use of the term as a denominator for elaborate and potentially beautiful appearances in nature, described above, offers a more positive sense of Worm's understanding of the idea of nature's playfulness.

Even though Worm personified nature in his writings, for instance in the use of petrifying juice, his references to nature's playfulness thus seem to be rhetorical, rather than reflecting any deeper commitment to the idea of an animated nature. From a more general point of view, Kragh (2006, 16) has described the reference to *lusus naturae* as follows: 'To characterize an object as *lusus* was not intended as an explanation, but rather as a means of emphasizing nature's endless plasticity and unrestrained creativity'. This way of defining how the reference to nature's playfulness could be applied in the early modern period weakens its dependency on the idea of an animated nature. From this perspective, its applicability may have been limited to indicating a broadly defined category of activity in nature, or more specifically, as indicated above, to describing certain operations of the *vis plastica*.[66]

In sum, I argue in this chapter that Worm employs the concept of sports of nature in describing his specimens because it was, firstly, a rhetorical device in learned society more generally; secondly, a conventional designation of a type of curious and visual feature found in nature, and thus a shortcut for conveying the appearance of a specimen to readers; and thirdly, because the phrase denoted visual attributes whose causes were still unexplained and were secrets of nature. These three aspects of Worm's use of the phrase *lusus naturae* are

not mutually exclusive, but elucidate different (and sometimes co-existing) aspects of what it meant for him and his contemporaries.

9 Fertile Matters

If the idea of a petrifying juice did not lead to any breakthrough in explaining the origins of figured stones, or why stones could take on the form of honeycombs or bread, Worm's study reveals that he tried to identify a natural power operating in the process of giving matter shape. In this sense, his interests are in keeping with today's drive to find new ways of co-creating with nature in the execution of technical and utilitarian but also artistic processes. As presented in this chapter, pictorial activity discovered in natural matters was in the early modern period held, like the relation between matter and form, to be a key to understanding the workings of nature. Such objects stimulated erudite discussion and experimentation. At the same time, the staged rivalry between nature and artist reflected the growing awareness and establishment of a new identity for artists, one in which the source and validation of artistic quality played a central role. The popularity of incorporating nature's images in works of art culminated during the sixteenth and early seventeenth centuries, thereafter declining in tandem with concepts like nature's playfulness. Instead, personified versions of nature – Mother Earth, Gaia, Venus or Diana of Ephesus – came to be much used in illustrations across all media, from jewellery and painting to sculpture and the graphic arts.[67] The popularity of female personifications of nature contrasted with the diminishing authority of ideas about an animated earth in the center of the cosmos. Eventually, the naturally-made image came to be conceived of as accidental, rudimentary, and with no embedded intentionality or message.

Recognising gestalts in nature is an entertainment pursued to this day. The ambition to create works of art in which part of the creative process does not involve human hands has recurred on different occasions, for instance in relation to the new art form of photography in the nineteenth century.[68] Western notions of an animated nature have been replaced by an idea of nature conceived as passive and mechanical, reserving the pursuit of images, symbols, and omens in nature for the realms of art, fantasy and superstition. Nevertheless, copying nature or even co-creating with nature is a growing field of research in many different disciplines. The agency of matter, and the potential for initiating and utilising natural structures and processes, are still topics of study in art and science today. In the research fields of the humanities, the focus on our entanglement with objects brought about by the material as well

as theoretical turns has served to reinvigorate discussion of our relation to, and interaction with, our environment. Supported by technological development, mimetic processes drawing upon natural and human activities may prove to be a gateway for rethinking the making of new materials, thus acknowledging shared agency. For instance, one aim is to produce self-generating building materials that repair damage to their form. Artificially made natural bones are 'grown', and programmable camouflage material inspired by the abilities of octopus skin has been made.[69] These bio-inspired approaches to production point out new interpretations of nature's agency, where another kind of intentionality than the one connected to the human subject today maybe needs to be defined.

Acknowledgements

Thanks to the research group 'Images of Nature' at Hamburg University for comments on a paper related to this article. Thanks to Anna-Marie Roos for references and discussion.

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Endnotes

1 On the concept of *lusus naturae*, see also Kragh 2006.

2 Ohly 1999; Foucault 1970; Lohff 2015, 159.

3 McCall, Roberts & Fiorenza 2013; Leong & Rankin 2011; Daston & Park 2001; Hsia 2004; Knoppers & Landes 2004.

4 Cited by Janson 1961, 255, and Felfe 2015, 129. Scholarship on the topic of spontaneous images in nature includes, among many others, Lohff 2015; Felfe 2015; Lohff 2015; Adamowsky, Böhme & Felfe 2010; Blümle 2006; Kemp 1995.

5 Findlen 1990, 325; Daston & Park 2001, 296, 209–210. Another aspect of *lusus naturae* was *fortuna* or chance; see Janson 1961. Worm (1655, 82) concludes the section on figured stones by arguing that they were either made artificially, by chance, or naturally: 'Vel naturales, vel fortuitæ, vel artificiales'.

6 Felfe 2015; Lohff 2015; Kemp 1995; Egmond 2017; Freedberg 2002.

7 Pedersen & Kolind Poulsen 2013; Baumann 2014.

8 Cuveland 1989. Findlen (1990, 313) cites Gaspar Schott (1608–1660), who responds to the experience of an anthropomorphic orchid by relating the human figure or signature to jokes of nature.

9 Worm 1655, 17; Garboe 1959, 28–29; Schepelern 1971, 146; Worm 1751, letter 785. For other examples of portents in Worm's writings, see Schepelern 1971, 186.

10 Worm 1642–1651; Grambye forthcoming. For a full list of Worm's publications, see Schepelern 1971, 398–399.

11 Impey & MacGregor 1985; Bering Liisberg 1897; Whitaker 1996.

12 Kragh *et al.* 2008; Shackelford 1999. On Niels Steensen, see the work of Troels Kardel.

13 Skydsgaard & Teglhus 2006; Tarp 2013; Hovesen 1987; Grell 2007; Shackelford 1999, 2003; Grambye forthcoming. Further bibliographical information on Worm can be found in these publications and in *Dansk biografisk leksikon*.

14 Schepelern 1971; Worm 1965–68. The preface is translated into Danish in Schepelern 1971, 213–217. The greater part of the letters have survived in an 18th-century transcription (see Worm 1751).

15 Mordhorst 2009; Funder 2020.

16 As models, Schepelern (1971, 212) mentions Ferrante Imperato's and Francesco Calceolari's collections. For a short translation of the section on the artificial holdings, see Schepelern 1971, 330–366.

17 The object is at the National History Museum of Denmark (Mordhorst 2009, 164).

18 Jacobæus 1696, Laverentzen 1710.

19 In his will, Worm had mentioned Gottorf Castle as second choice to receive his collection if the King rejected it (Spielmann & Drees 1997).

20 Rudwick 1985; Rossi 1997; Garboe 1959; Porter 1977.

21 According to the *Cambridge Dictionary* (online: https://dictionary.cambridge.org/dictionary/english/fossil [accessed 7 July, 2021]), fossils denote 'the shape of a bone, a shell, or a plant or animal that has been preserved in rock for a very long period'. This means that a preserved footprint is also a fossil. In brief, in some types of fossils, the remains have gone through permineralisation, where the tissues have been dissolved and replaced by minerals through the pores. This simplistic definition resembles Worm's second type of petrifaction.

22 Gould 2004; Alfonso-Goldfarb & Ferraz 2012; Holländer 2011; Beringer 1963.

23 Findlen 2004; Holländer 2011. Worm knew writings of Kircher, for instance, his dissertation *Magnes, sive de arte magnetica* from 1641 (Schepelern 1971, 239).

24 Worm 1655, 81. See Garboe 1959, 28, on fossils as *lapides figurati*.

25 Worm 1655, 38; Garboe 1959, 30; Bycroft 2019; Schepelern 1971, 220.

26 At the end of the section on the petrifying juice, Bartholin (1628, 377–384) refers to several authors also mentioned by Worm in his correspondence and his museum catalogue (Kragh 2006, 17).

27 Worm 1655, 48, 51, 81, 89, and 99. Worm explains the petrifying juice on page 36.

28 Worm 1751, letters 790 and 791.

29 Worm 1751, letter 791.

30 Worm 1751, letter 791: 'Unum, qvod, cum lapis sit naturalis, figuram tamen obtinet aut animalis aut partis alicujus alterius rei naturalis aut artificialis'.

31 Worm 1751, letter 791: 'Sed figura res alias æmulantur'.

32 Worm 1751, letter 791: 'Si enim succus lapidescens in locum, in qvo antea pes, caput aut simile qvid jacuit, inciderit, condensatus eandem res fert figuram, qvam locus, in qvo res, qvam exprimit, delituit'. Schepelern translates this as 'if the petrifying juice drips onto the site' (Worm 1968, 219).

33 Besler 1616; Felfe 2015, 125.

34 'Aschenfarber Stein / in dem ein figur einer hand gedruckt' (fig. 3) (Besler 1616).

35 'Conchæ terrestres in lapides conversæ' (fig. 3) (Besler 1616).

36 Here, it is important to note that Worm examined and interpreted a 'snakestone' and did not consider it a snake, concluding that it reminded him more of a nautilus (Garboe 1959, 30; Worm 1655, 86).

37 Worm 1751, letter 791: 'Alterum, qvod ante fuit vegetabile, artificiale aut animale, in lapidem demum conversum'.

38 Worm 1751, letter 791: 'Existimo, spiritum qvendam salinum lapidificum subtilem sese corporis poris insinuare'.

39 Worm 1751, letter 791: 'Et qvia hic spiritus lapidificus non semper ejusdem est naturæ, hinc sit, ut talium lapidum duriores qvidam, qvidam molliores & friabiliores reddantur'.

40 Worm mentions the hot springs in Karlsbad, Germany (1751, letter 791; see also Worm 1655, 51).

41 Eck 2015; Jacobs 2005.

42 The related research field of terminology of contemporary art theory is comprehensive, for a short introduction; see Kemp 1977.

43 Worm 1751, letter 567: 'Qvæ omnia pro Columna facere mihi videntur, ac evidenter docere, in istis locis succum, aut spiritum potius, esse lapidificum, qvi hæc præstare sufficiens sit, ossea corpora penetrando, & in sui naturam convertendo'.

44 Worm 1751, letter 567: 'Suspicor itaqve, in locis maritimis, præsertim ubi & piscis hujus copia, & limus vi lapidifica præditus, dentes mortuorum piscium in lapides converti, & alibi in mediterraneis ludentem naturam lapides ejusdem figuræ fingere'. The term *lusus naturae* and its variations have been translated in various ways: as play, jokes or the wit of nature.

45 Worm 1751, letter 567: 'Mire ludit natura, ubi ministerio succi aut spiritus lapidifici utitur'.

46 Worm 1751, letter 567: 'In Museo silicem hominem diaphragmate tenus æmulantem, ostento; pedem sinistrum exacte refert alius; est, qvui avem referat, ossa hominum, osteocolla, cornu, & unicornu fossile; pisa æmulantur guttæ Thermarum Carolinarum'. I rely on Schepelern's translation of the verbs: see Worm 1968, 36–38.

47 Worm 1655, 82–83; Schepelern 1971, 183–186.

48 Worm 1751, letter 297; Worm 1655, 84–85, 87.

49 Galster 1941. Denmark was affected by witch-hunting in the 17th century; see Kallestrup 2019. The oral folklore stories were collected and published in the 19th century by Evald Tang Kristensen. A small part of the huge source collection has been translated and digitised: 'WitchHunter & Trollfinder: Mapping Evald Tang Kristensen Collection', http://etkspace.scandinavian.ucla.edu/maps/witchhunter.html [accessed 16 June 2018].

50 Worm 1655, 85: 'Vel quòd panes hi nunquam very fuerint panes, sed lusus naturæ in genere lapidum [...]'.

51 Worm 1751, letter 791: 'Summa: primo aspectu jurares favum, ex candida cera virginea factum, lapideæ basi insistere, cum tamen totum corpus siliceæ sit duritiei'. See also id. 1655, 77.

52 See also Worm's descriptions of a stone imitating both male and female genitals, *hysterolithos* (Worm 1655, 83–84; id. 1751, letter 1005).

53 Worm 1751, letter 1004. On wider interest in locating and extracting a *succus* or *gur*, see Alfonso-Goldfarb & Ferraz 2012.

54 Worm 1751, letter 1004: 'Et quis scit, annon terra, huic lapidi adnata, si purificetur, lavetur, & in orbes redigatur, easdem possideat vires & proprietates?'

55 Worm 1655, 174, 312. On Worm's references to 'nature's play' in the section of animals and plants, see Mordhorst 2009, 158. In the part concerning the mineral kingdom, the

expression 'nature's play' is more frequently used (Worm 1655, 36, 45, 69, 76, 80, 85, 116). The indirect ways of referencing 'nature's play', such as to 'emulate' or 'draw', demand further study.

56 Findlen 1990; Daston & Park 2001.

57 Worm 1655, 312; Mordhorst 2009, 145.

58 Worm 1655, 40. See Worm's description of the agate and its playfulness (Worm 1655, 96).

59 Worm 1655, 36: 'Cum mirè in iis ludat Natura'; ibid., 81: 'Mire ludit Natura in omnibus rerum naturalium speciebus'. Also quoted in Findlen 1990, 292; Garboe 1959, 30; Kragh 2006, 20.

60 For a study of this case, see Tarp 2013 and Mordhorst 2009, 169–171.

61 There is no evidence in the written sources that Worm showed this marble piece to an audience; by contrast, he is known to have presented a piece of rock crystal bearing a crucifix to a group of travellers (Tarp 2018; Schepelern 1971, 158).

62 Worm 1655, 38: 'Cogimur igitur fateri, Naturam polydædalam, multa sinu suo sovere, quorum rationem nemo unquam investigabit.' I rely on Axel Garboe's translation (1959, 30). Also cited in a letter by Edward Lhwyd; see Beringer 1963, 146; Roos 2011, 187–188.

63 Worm 1655, 76; Felfe 2015, 128.

64 Felfe 2015, 128; Schepelern 1971.

65 Findlen 1990, 293; Federhofer 2006.

66 Gould 2004, 216–2017; Richet 2007, 101.

67 Sass and Wenderholm 2017; Porter 1972; Janson 1952.

68 Henning, this volume.

69 For research projects inspired by the functionalities of octopus skin, see the Eugene Bell Center for Regenerative Biology and Tissue Engineering at the University of Chicago.

CHAPTER 16

Embodied Making

Erik Rietveld

Perception is often understood as an individual's mirroring of the objects in the world 'out there'. The influential ecological psychologist James Gibson (1904–1979) wanted to avoid such a division between subject and object. He developed a new account of the perception of the environment that breaks with the idea of static mirroring and rather makes activity central. According to Gibson, daily life entails moving around, engaging with and enacting the 'action possibilities' of the environment, which he calls *affordances*.[1] Affordances are possibilities for action offered by the environment – an environment which, in the case of humans, is to a large extent *man-made*. The action possibilities people have, do not only depend on the way our environment has been formed materially by earlier activities, but also on people's *abilities* and thus on the patterns of activity that have been cultivated by socio-cultural practices.[2] The affordance of sitting on a wooden chair created by a carpenter, for instance, exists only against a wider background of socio-cultural practices of sitting on chairs, rather than say sitting on the floor or perhaps living in a non-sedentary way altogether.[3]

Making can transform the meaning of materials. Once the carpenter has transformed a heap of wood into a chair, this new constellation of wood can be experienced by a person as offering an attractive possibility to sit. Integrating the concept of affordances, the increasingly influential paradigm of embodied/enactive cognition has changed the way science understands the relationship between people and their social and material surroundings (Chemero 2009; Di Paolo *et al.* 2010; Thompson 2007; Rietveld 2008a; Noë 2012; Malafouris 2013; Varela *et al.* 1991; Dreyfus 1972). Embodied/enactive cognition takes seriously the fact that people come to acquire skills and abilities by actively engaging in socio-cultural practices. Such embodied skills in turn structure the way they engage with or 'enact' the *action possibilities* offered by the socio-material environment.

The implications of this new paradigm in cognitive science for making meaningful art and architecture are under-explored. In this chapter, we will show how it can offer a *philosophical framework* for understanding the process of making that takes affordances as well as the embodiment and experience of

skilled makers seriously. This means that this chapter zooms out from (material) mimesis to get a somewhat more general phenomenon in view, namely the skilled embodied engagement of makers with materials. We are aware that in what follows the philosophical background necessary for this may sound quite abstract to non-philosophers, but the advantage of developing this conceptual framework is that we can connect insights on material engagement with the state-of-the-art in the philosophy of embodied cognitive science. Below we will make the abstract concrete by means of examples of skilled material engagement from an actual practice of making.

1 Selectivity in Making

In her work on material engagement, Ann-Sophie Lehmann (2015) has suggested that the material turn in art history 'is still in need of a coherent theoretical framework in order to analyse how concrete materials and techniques make and achieve meaning'. In our attempts to do justice to the contributions of materials, we should not forget the situatedness of the maker in socio-cultural practices if we want to understand both the 'why' and the 'how' of material engagement (see also Smith 2004, 240). One way to improve our insight in material engagement is by focusing on the skilled maker's *selectivity* in dealing with materials. In earlier work (Rietveld & Brouwers 2016; Rietveld 2012a, Rietveld 2008) we have shown that the relation between skilled makers their materials can be characterised as skilled intentionality and can be understood in terms of selective engagement with 'affordances'. (See Figure 16.1 and Text box) More precisely, skilled intentionality is defined as coordinating with several affordances simultaneously (Bruineberg & Rietveld 2014).

To illustrate concretely the potential of the concept of skilled intentionality for understanding embodied making, we will discuss several aspects of skilled material engagement at RAAAF (Rietveld Architecture–Art–Affordances). RAAAF is a multidisciplinary studio working at the intersection between visual art, architecture, and philosophy. It was founded by the architect Ronald Rietveld and philosopher Erik Rietveld, the two partners leading the practice. What interests the makers at RAAAF, to use the words of the late Lebbeus Woods (1940–2012), is 'what the world would be like if we were free from conventional limits [...] what could happen if we lived by a different set of rules'.[4] Showing these visions is the aim of each of RAAAF's art installations and interventions.[5]

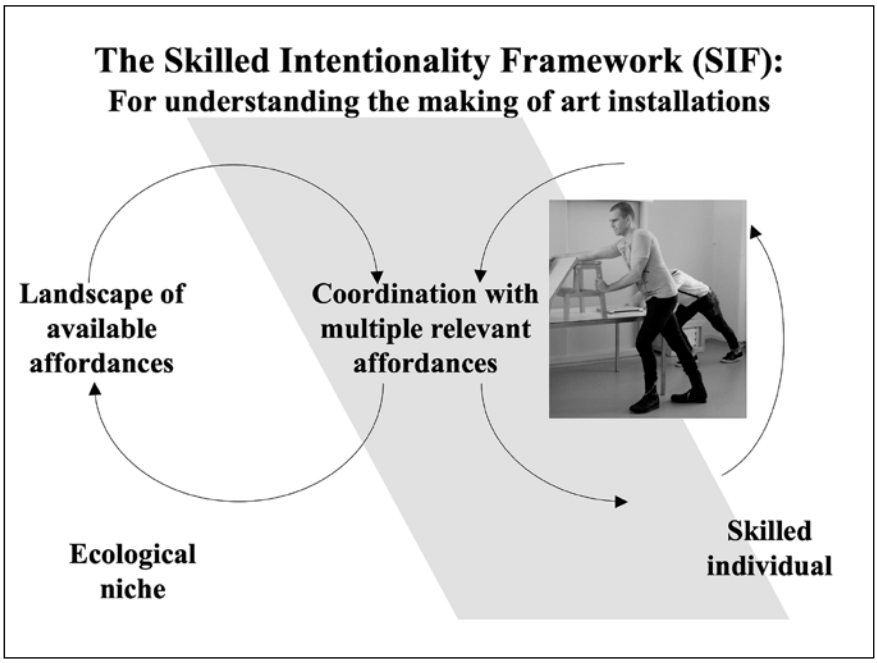

FIGURE 16.1 *The Skilled Intentionality Framework* (*SIF*), adapted from Bruineberg & Rietveld (2014, fig. 1)
PHOTO: BARBARA VISSER

2 Affordances and the Skilled Intentionality Framework

Via the notion of *affordances* (Gibson 1979), Lambros Malafouris's (2014, 2013) work on creativity in material engagement (e.g. in making pottery) may be linked to work on embodied/enactive cognitive science (Rietveld *et al.* 2017). He notes that 'to understand the dynamics of making, we need to rethink what happens in the brain when people are acting creatively in terms of the radical embodied cognitive science that aims to integrate *the whole system* "*brain – body – landscape of affordances*" (Bruineberg & Rietveld 2014; Rietveld & Kiverstein 2014)' (Malafouris 2014, 147, my italics). Once we understand concrete situations of material engagement as a kind of skilled action (Rietveld 2008), this opens up the perspective of using a proven conceptual framework from the philosophy of embodied/enactive cognitive science: The Skilled Intentionality Framework

(henceforth SIF) (fig. 16.1; Rietveld *et al.* 2018). The SIF opens up a new perspective on all kinds of cognition (broadly understood, so including creativity, making and reflecting) by making the individual's (self-organised) engagement with affordances central. Using this, we can understand the selectivity of material engagement theoretically as an aspect of *skilled intentionality* (Rietveld & Kiverstein 2014; Bruineberg & Rietveld 2014, fig. 1; Rietveld & Brouwers 2016; Rietveld *et al.* 2018; Malafouris 2014). Skilled Intentionality is coordination with several affordances simultaneously. In practice, a situated and embodied maker responds in an integrated way to various affordances. The SIF provides a very simple yet elegant understanding of situational context as the multiple relevant affordances that are in play, and of context-sensitivity as selective openness to a multiplicity of relevant affordances simultaneously. So, in the SIF, context turns out to be 'just more affordances' (Rietveld 2012a).

This does not mean that 'affordances' is just another term for 'context'. Whereas context is broadly understood as the 'external circumstances' – in a social, cultural, economic, physical, historical, environmental, or any other sense – for someone or something, affordances are a primarily *relational* concept. We have defined them precisely as relations between aspects of the socio-material environment and abilities available in an ecological niche. So the available affordances for humans are dependent on both the environment *and* many abilities available, which enriches the concept (Rietveld & Kiverstein 2014). Any given person is necessarily only open to a small number of all the affordances that are available in the rich landscape of affordances, a phenomenon that we have called *selective openness* to relevant affordances (Rietveld 2012a; Bruineberg & Rietveld 2014). Selective openness to affordances is dependent on the individual's exercise of abilities and skills (for engaging with or 'enacting' these affordances), and thus limited, fragile and fallible. The relevant 'context' for a particular individual in a particular situation we call the dynamically changing *field of relevant affordances*.

Humans and non-human animals alike restructure their shared material environment to create ecological niches, which in turn shape the affordances and behaviour of the other animals in these niches. Architects are niche creators by profession; what they build tends to contribute for long periods of time (typically decades) to the structure of the human ecological niche.

3 Skilled Intentionality and Creativity in Making

Before we turn to the practice of making, first a few words on (skilled) intentionality to avoid misunderstanding. For philosophers, intentionality is the technical term characterising the *relation* between person and world. However for art historians, as Kitty Zijlmans (2018, chap. 4) notes, intentionality is a word that easily creates the wrong associations, since the meaning of artworks has often been reduced in the past to the artist's intention as reconstructed, for example, from what the artist has said about the work and/or their biography. This conflicts with a relational approach to the meaning of artworks that allows for a given work of art to possess a multiplicity of meanings, depending on observers and their particular situation. In SIF, the meaning of the world for the person is also understood relationally and seen as having multiple sources, because the *relevance* of affordances to which the individual is selectively open can be influenced by:

– bodily processes that might make certain aspects of the environment relevant (think for example of how hunger can make food attractive);
– other things the person cares about; and
– the person's abilities, acquired through sociocultural practices.

Relevant affordances are lived as invitations to act; their significance has an affective dimension. Sociocultural practices are a source of meaning because in practice we develop our abilities, and learn to distinguish better from worse in a way that takes the point of the given practice seriously (Rietveld 2008). For example, in current academic practice, publishing is valued more than study solely for the sake of the acquisition of personal knowledge.

Another traditional reason why historians interested in the history of materials and techniques might be suspicious of intentionality has to do with the mind's intentions being presupposed as the source of creativity. The intention in the head of the artist-maker is then seen as the source of creativity, which instructs the artist's ("mechanical") body to shape materials in a novel way according to this prior creative idea (Ingold 2013).[6] As Withagen & Van der Kamp (2018) have noted, the artwork is then supposedly finished when the material form matches the prior intention. Interestingly, we encounter a philosophical notion of mimesis here: the resulting materialised artwork "mirrors" the prior intention of the artist. Withagen & Van der Kamp describe how popular this problematic idea still is in current mainstream (i.e., cognitivist and intellectualistic) work on creativity:

> Although cognitive theories of creativity can be rather diverse, they share, arguably by definition, the assumption that creativity resides in the mental realm – the formation of novel ideas occurs in the head. And when the idea concerns a novel object or product, the idea can (or cannot) be materialized through a process of making, but this latter process is not considered to be constitutive of the creativity. Indeed, the idea emerged prior to the construction of the product, the latter being a mere materialization of the mental idea.[7]

This mainstream cognitivist perspective has rightly been criticised by others as well, such as Tim Ingold (2013) and Lambros Malafouris (2014). For readers with a justified suspicion of the terms 'intentions' and 'intentionality', we want to make explicit that not all forms of intentionality embrace or presuppose a notion of (mental or prior) intentions. The notion of intentionality that we build upon in this paper does not depend on such 'intentions' or 'ideas', but rather develops a relational, wholly dynamic and material notion of intentionality: skilled intentionality.

As we have argued elsewhere, the fact that makers often "represent" a design by means of drawings and other visualisations should be understood as part and parcel of the process of making, rather than *preceding* its execution:

> Trying to express the "image", by drawing on a piece of paper, by writing or sketching, contributes to the process [of making], which is determined further yet again. Thus, these explicating activities, themselves invited by the pieces of paper and people encountered in the unfolding process, are not merely about the process, but they are *of* the process – enabling it to continue by contributing new affordances ready to be enacted [...].[8]

In skilled intentionality, the maker "joins forces" with affordances in flux which are offered by the sociomaterial environment (Ingold 2013, Van Dijk & Rietveld 2018). So skilled intentionality (and creativity and material engagement as particular kinds of skilled intentionality) is not something pre-planned or in the head, but evolves in the agent-environment system as a whole during the *process of making*.

4 Aspects of Embodied Making at RAAAF

Starting from skilled intentionality in concrete situations of skilled material engagement at RAAAF will help us to avoid creating a new dichotomy between

form and material in practices of making. Ethnography conducted at RAAAF (Rietveld & Brouwers 2016; Van Dijk & Rietveld 2018; Bruineberg *et al.* 2018) clearly shows that both matter in the actual process of skilled creation.

Affordance-based

RAAAF actively *experiments* by making material models and mock-ups scaled to the body, in order to explore the affordances of their art installations under construction freely, and to foreground unorthodox action possibilities.[9] The work of RAAAF is centred around engagement with affordances. In 2010, RAAAF's founding partners were responsible for *Vacant NL*, the Dutch contribution to the Venice Architecture Biennale. The art installation called attention to the enormous potential of temporarily reusing the 10,000 public and government buildings standing vacant in The Netherlands.

Traditionally, affordances are understood as possibilities for motor behaviours like grasping something or sitting on a chair. Our enriched concept of affordances starts from a much larger set of skills than motor skills, because people have developed many different *abilities* (e.g. for surgery, for cooking, for imagination, for language use, for long-term planning, for reflection, for learning about cultural history, for social interaction, etc.) in many different practices (Rietveld & Kiverstein 2014). Moreover, it takes seriously the enormous variety people encounter in their (socio)material environment: a savannah, a study room, or a back alley in a large city, to name just some random examples, all have wildly different *aspects* particular to those surroundings. Given this variety of abilities and environmental aspects, it follows from our definition of affordances (see Section 2) that the variety of affordances available in the human ecological niche is staggering, forming an incredibly rich "landscape of affordances" (Rietveld & Kiverstein 2014; Van Dijk & Rietveld 2017 and 2018; Bruineberg *et al.* 2018). Crucially, artistic makers have the ability to create new affordances by transforming the local sociomaterial environments in which people are situated (Van Dijk & Rietveld 2017; Rietveld & Kiverstein 2014, 2022). Above, the importance of understanding the selectivity in material engagement was mentioned. The person's selective openness makes certain affordances stand out as relevant and affectively solicit action, thereby rendering them especially inviting to the particular individual according to their current needs or concerns (Rietveld 2008; Rietveld & Kiverstein 2014; Dreyfus & Kelly 2007; Withagen *et al.* 2012). People's *experience* of their situations thus always already has an affective dimension, related to the *multiple* relevant affordances they care about in their situation. Architects and other artists can disclose qualities that are already present in the world and open these up to people. These qualities can be present, for example, in the

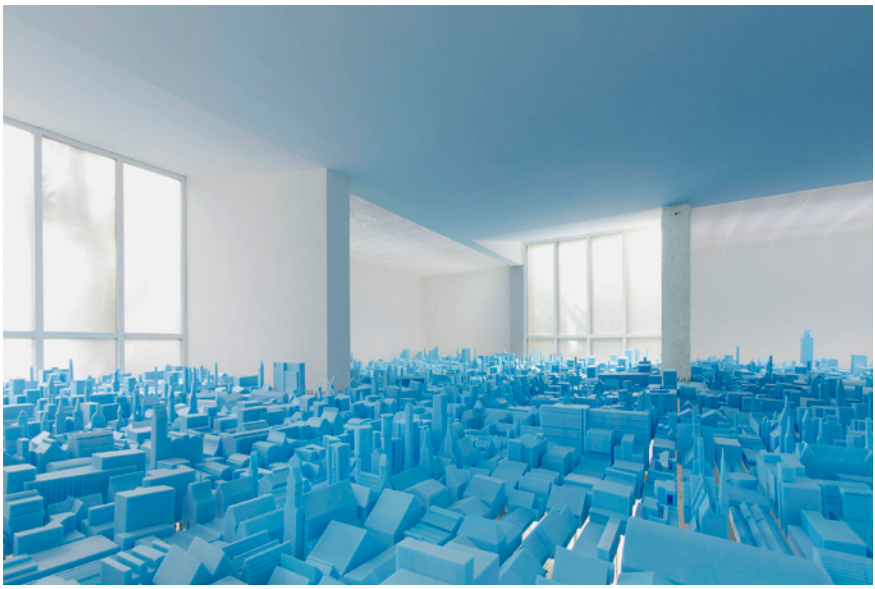

FIGURE 16.2 RAAAF, *Vacant NL*, 2010. Dutch contribution to the Venice Architecture Biennale 2010
PHOTO: ROB 'T HART

(built) environment, in 'underground' or remote socio-cultural practices, or in largely forgotten historic practices. At the Venice Biennale 2010, RAAAF's *Vacant NL* exhibition (fig. 16.2) had the aim of increasing temporary access to 10,000 unused (vacant) public and government buildings. This art installation disclosed the potential of vacant buildings, and the blue foam from which it was made highlighted an experiential quality of the Dutch pavilion designed by Gerrit Rietveld in Venice: its beautiful light. The exhibition is also an example of how RAAAF does not work against the dynamics of the world, but rather joins forces with these dynamics. In the Venice case, this joining of forces was understood as opening up possibilities for physically accessing and "surfing" the existing "sea of vacancy", by calling on the government to allow temporary reuse of their empty buildings (Rietveld *et al.* 2014).

More generally, RAAAF's experimental explorations of the world of affordances translate its philosophical worldview into art installations, and these artworks in turn inspire the reflections of visitors. The makers' experiments explore the potential of sometimes surprising possibilities for action (Rietveld & Brouwers 2016; Van Dijk & Rietveld 2018). An example of this is the

FIGURE 16.3 RAAAF | Barbara Visser, *The end of sitting*, 2014
PHOTO: RICKY RIJKENBERG

installation *The end of sitting* by RAAAF | Barbara Visser (figs. 16.3, 16.4). This installation presented a vision for the office landscape of the future, of 2025. This is a world without chairs or tables, in which many different affordances for supported standing and leaning were incorporated. It invited people to move around more and explore a variety of healthier working positions (Rietveld *et al.* 2015; Rietveld 2016). It also made people aware of their taken-for-granted sitting habits, and invited reflection on how the material environment could help them to break these.

The Role of the Body

The body is a multifaceted aspect of the world: it is skilful yet limited, a locus of lived experience, a physical body of flesh and blood with a certain size and age, a body marked by certain abilities (including language and imagination) and inabilities, an encultured and gendered body. Embodied individuals are characterised by variety and diversity in all these dimensions (Mol 2002). RAAAF's approach to making art installations starts by taking seriously the diversity of what bodies can do and experience. It strives to offer a wide variety of affordances that do not merely cater for a stereotypical "human" or "user",

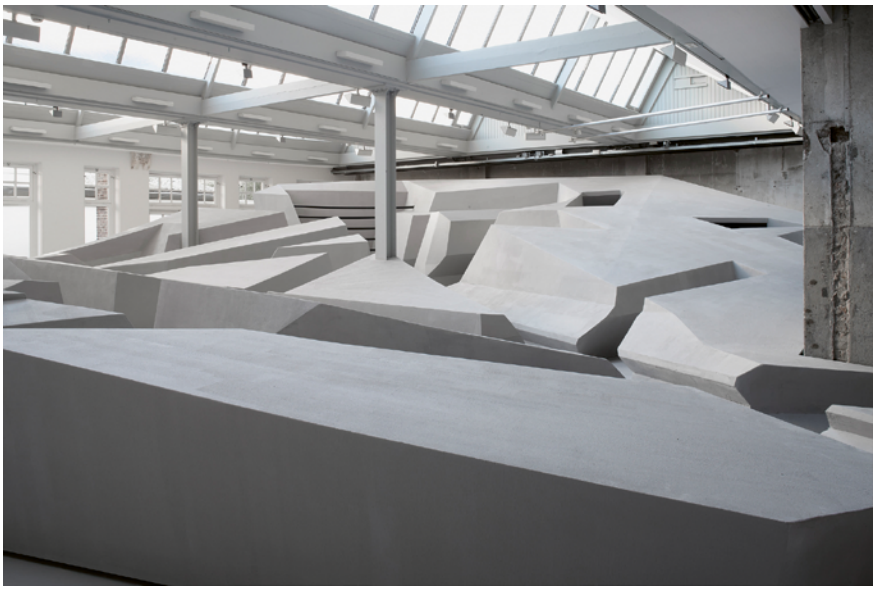

FIGURE 16.4 RAAAF | Barbara Visser, *The end of sitting*, 2014
PHOTO: JAN KEMPENAERS

but rather create a landscape of possibilities for a multiplicity of bodies with a wide range of abilities.

One central ability people have is that of *experiencing* the world, the self and others. In the process of making, it is crucial to anticipate how different people might experience the site-specific installation, and might be invited to experience various "layers" of the intervention over time. *The end of sitting* (figs. 16.3, 16.4) materialises a philosophical worldview: the idea that people are *embodied minds situated in a landscape of affordances* (Rietveld 2016). This vision of the office of 2025 makes people aware of the way their bodies normally take certain environmental regularities for granted. By radically doing away with all chairs, it also creates a lack of grip and related experienced tension (discussed in more detail below, in the section *Tendency towards grip*) that motivates self-reflection and discussion. For example, the installation's peculiar tilted floor, optimised not for walking but for foot support while standing, has a perturbing effect on embodied experience, and foregrounds the way the environment normally supports the body by means of horizontal floors and chairs (Novak 2010; Van Oosterwyck 2018). The installation allows people actively to *explore* alternatives to the physical supports they normally take for granted. The supported standing positions offered by the installation are meant to be only *temporarily comfortable*, in order to increase the likelihood

that people will move around and explore other possibilities. The material structure of *The end of sitting* (which rises from a relatively low height at one end to a 2.5 metre-high enclosure on the other) can match a variety of different body lengths, and invites people to use existing bodily abilities for standing, leaning and reclining in a context of work where these abilities are normally not used, because office workers spend most of their working lives seated.

Embodied cognition emphasises the importance of skills, situatedness, and lived experience for making in practice. Makers are always engaging with their situation on the basis of skills they have acquired by engaging in activities in sociocultural practices, such as the practice of visual art or the practice of architecture. By means of a history of interactions with the given practice, the maker's body has been transformed. According to embodied cognitive science (Thompson 2007), makers do not need to mirror or represent the world in their head, because they are situated in the world itself. Over time, activities by other people and ourselves have transformed these environments in which we are situated into places that provide most of the things we care about. What the embodied individual cares about in a given situation determines to a large extent which action possibilities show up as inviting or soliciting to him or her (see Section 2). Care shapes selective openness and makes an important difference in how situations are lived. The body of the maker is not just a system of possible actions, but a *concernful* system of possible actions.[10]

In the practice of making *The end of sitting*, the makers at RAAAF use their own body continuously to *feel* whether the structures they are designing can work as affordances for supported standing (fig. 16.5). One of the best ways to appreciate in a bodily sense (or 'through the body') what they are about to build is by working with adjustable mock-ups the same size as the body itself, i.e. on a scale of 1:1. Often these are made of wood, because the skilled carpenter would be able to make immediate adjustments on the spot, like a tailor, on the basis of feedback received, but working with wood around the feeling bodies of the architects. At many moments in the process, such bodily experiences were used to give direction to – i.e., constrain – the process of improvement of the installation, and they thus contributed to improving the artists' and architects' grip on the design.

Interestingly, these materialised mock-ups literally provided a common ground for the collaborative making by the different specialists involved. Experiencing supported standing in such a wooden mock-up together allowed them to discuss how this felt, and – using the affordances offered by language – share in an explicit way what potential problems might occur once the mock-up was integrated in the large installation (e.g., whether people would be able to step inside, whether they would be able to pass other people also within it, whether

FIGURE 16.5
RAAAF, Mock-up used for experimentation in the process of making *The end of sitting* (figs. 16.3–16.4)
PHOTO: MAARTEN COOLS

elderly people would be able to access it, etc.). The test models were also used to seek feedback from external specialists with different backgrounds (e.g. experts in interior architecture).

Situatedness and Sensitivity to Context

Cognition and action are not free-flowing or unconstrained, but situated: an individual is situated in a certain way at a certain place, in the wider socio-material environment, and within a certain ecological niche. Affordances are aspects of this niche. Moreover, affordances are typically "nested". A building, for example, offers certain possibilities for action as a place (e.g. in its function as a restaurant or library), but within this building many other affordances are nested (e.g. of floors, rooms, daylight, chairs, books, coffee, etc.).

Behaviour and cognition of humans and other animals should be understood as an aspect of an integrated individual-environment system, or better still, using the phrase introduced above, as a *complex system 'brain-body-landscape of affordances*' (Rietveld *et al.* 2018; Bruineberg & Rietveld 2014; Malafouris

2014). Cognition is not something that takes place purely in our heads, but is rather an aspect of this complex dynamical system. Both behaviour and cognition are therefore inherently context-sensitive. Cognition – and action more generally – are made possible and supported by the affordances available in a certain form of life.

An example of a context-sensitive approach to material interventions is the employment of the possibilities offered by cultural heritage, not only to preserve objects, but also to invite people to disclose histories relating to specific objects and places (including the more troublesome histories of cultural heritage, such as those related to the slave trade, Nazi structures like the Atlantic Wall, vacant nuclear power plants, apartheid, weapon industry, etc.) Precisely chosen interventions (Rietveld *et al.* 2014, chap. 3) can invite people to experience cultural heritage that might otherwise be taken for granted and go unnoticed, by presenting these objects in a certain artful manner. RAAAF's Hardcore Heritage approach does exactly that by means of so-called built manifestos; it makes heritage something that people can experience, and that triggers the imagination. Examples of this include RAAAF projects such as *Bunker 599* and *Deltawerk //*.

It takes one month to cut through meters of reinforced concrete. Bunkers are a synonym for indestructability. *Bunker 599* (fig. 16.6) affords surprise, satisfying one's curiosity and experiencing the cramped insides of normally inaccessible bunkers (by walking through one). It also draws attention to the historical defense mechanism of inundation (by adding water behind it and allowing people to walk over shallow water).[11] Taken together, these aspects allow people to experience the intervention's context – the history of the New Dutch Waterline and the Second World War – in a unique way. *Bunker 599* affords thinking with the installation, imagining, and a sense of contact with history, thereby ensuring that people won't forget. Note that it is thanks to our rich notion of affordances (see Section 2) that we can say that the artwork affords, for example, engaging in reflection on the history of the New Dutch Waterline and World War II.

Monuments are typically regarded as immutable and untouchable, but as a result they sometimes fade from public imagination and memory (Rietveld & Rietveld 2017). In these cases, merely preserving works does not create sufficient engagement, which will in the end undermine their meaning. It is through deliberate destruction, radical changes in context, and seemingly contradictory additions that a new field of tension between present, past and future can then be realised, as *Bunker 599* shows.

FIGURE 16.6 RAAAF | Atelier de Lyon, *Bunker 599*, 2013
PHOTO: ALLARD BOVENBERG

Anticipation

In embodied making 'action' should be understood in a very broad sense: moving, reflecting, perceiving, imagining, and using language, are all forms of action. Crucially, we act by being responsive to relevant possibilities for action (i.e., affordances) offered by the situation, which can include possibilities for imagining, for thinking, for self-reflection, for perceiving, for feeling, for talking, for changing the environment, etc. (Rietveld *et al.* 2018). One single art installation can offer multiple affordances, and thus generate multiple anticipatory states of readiness for doing things. It is this multiplicity of states of action-readiness that contributes to the richness or depth of a person's experience of a strategic intervention. The cut-through *Bunker 599* (fig. 16.6) for example, can, at one and the same time, give a visitor a sense of awe, invite tactile responses to its materiality, afford insight into various similar bunkers as well as Dutch military history at large, and make them become aware of the landscape surrounding the object, all through just one precise and carefully executed intervention.

Being skilled in a certain practice (for example the practice of architecture), allows a maker to *anticipate* the unfolding process of making on multiple timescales, including relatively long ones. In the case of the eight-month-long

process of realising the art installation *Breaking habits* (fig. 16.8) (Van Dijk & Rietveld 2018), as soon as RAAAF's chief architect was asked if he could make an art installation based on an earlier work in the waiting room of the Dutch Mondriaan Fund for Visual Art, he immediately responded to this action possibility affirmatively. Embracing that large-scale action possibility makes smaller scale affordances become inviting (e.g., possibilities for selecting the right location, finding the right materials, etc.). Engaging with these smaller-scale affordances, on the other hand, concretises the larger-scale affordances of making the art installation over time. In this unfolding process, affordances invite skilled participants at RAAAF to act further. Affordances that matter more to the artists will invite engagement and thereby the continuation of certain courses of further action, and affordances that mean less to them may become ignored. Via these invitations, one situation develops into another. In the process, affordances thus *set up the conditions for their own continuation* by inviting participation. Situated anticipation, at any temporal scale, is then part and parcel of keeping attuned to the movement of the different unfolding affordances to which the maker contributes, by sensing how engaging with one affordance also enacts the others, and vice versa (Van Dijk & Rietveld 2018).

The Tendency Towards Grip

The way in which the process of making unfolds, from the affective point of view of the architects, can be understood as a *tendency towards an optimal grip* on the situation. Ethnographic studies into the practice of making at RAAAF (Rietveld & Brouwers 2016) have shown how a tendency towards grip plays a role in many concrete episodes of material engagement. During the design of the moving sculpture *Secret operation 610* (fig. 16.7) for the former Soesterberg air base, two collaborating architects at RAAAF were under pressure to finalise a design element for which several options were available. Experiencing discontent (or its inverse, satisfaction), they experimented on how to advance the design by exploring multiple ways in which the sculpture's wheel could be made. In order to get more grip on the situation, they took a multiplicity of perspectives on what they would actually be making if they were to build it by making many different kinds of visualisations: sketches, cardboard models, drawings, 3D computer drawings, collages, etc.

In an anticipatory sense, the possibilities for action introduced by visualisations were also appreciated in the context of the future real-world settings: how press photographers, researchers working in the object, or people moving around the airbase and observing it would engage with the mobile sculpture. The artists achieved harmony with the situation when, considered from the

FIGURE 16.7 RAAAF | Studio Frank Havermans, *Secret operation 610*, 2013
PHOTO: RAYMOND RUTTING

multiplicity of perspectives they cared about, the design of a given aspect, such as a wheel, was collectively experienced by them as "right" in its context: a kind of satisfactory grip achieved by materially exploring future possible scenarios through experimenting with possibly relevant affordances. The architects moved towards an optimal grip on their design step by step (Rietveld & Brouwers 2016, 557). For dealing with interventions situated in complex real-life settings, this method of iterative improvement by tinkering with various aspects is a typical way of dealing with complexity (*cf.* Knorr 1979).

More generally, the kind of tension experienced when a person's grip is insufficient can be understood as a sub-optimality in the 'person-landscape of affordances' relation. In various ways, the affective tension that fuels a self-organising tendency towards grip is also encountered in complex processes of making. A disattunement in the relation between individual and world – i.e. a situation of insufficient grip – can be affectively perturbing and, crucially, make one *selectively open* to affordances that can reduce such a disequilibrium. The phenomenon and concept of the tendency towards improved grip allows us to avoid presupposing an 'idea' or 'intention' or 'goal' in advance of the process of making. It emphasises how skilled intentionality is about self-organised responsiveness to multiple relevant affordances.

Strategic Interventions

When engaging urgent and complex societal issues such as climate change, flood risks, public health, or social cohesion, RAAAF strives for *strategic interventions*: precisely chosen and well-crafted interventions that can set developments

that the architects desire in motion. (Rietveld *et al.* 2014, chap. 3). They give the architects a grip on the world's complexity. Strategic interventions start from the makers' own concerns and fascinations to inspire others and contribute to realising effective change in a world of complexity. By inviting participation, they set up conditions for their own continuation (Van Dijk & Rietveld 2018). The *Vacant NL* contribution to the Venice Biennale, for example, set a desired development in motion: it made people aware of the enormous amount and potential of vacant cultural heritage in The Netherlands. Within a few years after RAAAF first raised this issue in Venice, it had become a top priority of the Chief Government Architect of The Netherlands, who invited RAAAF to visualise potential imaginative ways of dealing with vacancy.

When planning strategic interventions, it is helpful to distinguish between phenomena at different spatial and temporal scales. On the largest scale of an animal's existence we find its ecological niche. The human ecological niche consists of many different sociomaterial practices. When we zoom in on these practices, we find individuals engaged in situations in a given practice (Van Dijk & Rietveld 2017). Similarly, we can distinguish between the landscape of affordances that we find on the scale of the ecological niche of a kind of animal, and the engagement with a field of relevant affordances on the scale of a single individual. This means that the maker should be aware of the fact that an intervention can correspondingly be analyzed on different scales: on the local scale one can focus on the details of the work, or on its relation to buildings around it, but an intervention might also have meaning on a regional or national scale.

The aforementioned *Bunker 599*, for example, can be seen, entered and touched, but it also makes a statement about the larger New Dutch Waterline (which, at 80 kilometres long, is on a regional scale). The national and worldwide meanings of *Bunker 599* have to do with the way it provokes national and UNESCO policies on monuments, which, unlike *Bunker 599*, tend to focus purely on preservation, rather than imagination and meaning as experienced by people. Art, architecture and other kinds of making can focus on transforming a local environment, but they can also try to be an exemplar for changing an entire practice (like *The end of sitting*, which tries to change the practice of sitting to one of supported standing). In the process of making it is always important to reflect on the way different scales are connected, and the meanings an intervention has on different scales (as we saw in the case of the processes of making *Breaking habits* and *Secret operation* above).

By means of imaginative exploration in the process of material engagement, one can radically innovate, and stretch the borders of an entire field like (interior) architecture, installation art, or cultural heritage preservation. In making something, experimentation and skill are key to achieving a strategic

intervention. Skill-based intuition overcomes the limitations of propositional deliberation in the process of making, because the skills of the maker can be simultaneously responsive to a multiplicity of affordances (including those on different spatial and temporal scales) so that the maker is moved to improve by the solicitations of the material/work under construction. Still, reflection is crucial along the way to explore different perspectives and open up to hitherto neglected affordances.

The makers at RAAAF refrain from pre-programming or prescribing specific forms of use. By creating installations that offer a large variety of affordances they strive to leave room for spontaneous and playful ways of acting (Rietveld & Rietveld 2011; Rietveld, 2016). Not only does this approach to making try to do justice to the immense heterogeneity of the social world by leaving space for spontaneity and improvisation, it also effectively employs the insight that the rich landscape of affordances itself is a place of variety that offers many different affordances to many different individuals.

5 Mimesis in Context

The tendency towards grip on several affordances simultaneously provides a general characterisation of the skilled intentionality of all kinds of making, including material mimesis, but importantly it also encompasses other types of mimesis, material engagement in craftmanship, and skilled activity more generally. As we have seen above, when things are not going well, a skilled maker will experience disattunement and develop a selective openness to possibilities that might improve the situation. At RAAAF there was a sequence of mimesis of supporting standing in the process of creating *Breaking habits* (fig. 16.8). Whereas *The end of sitting* was created in wood, its follow-up *Breaking habits* was made to support standing by means of similar positions created with carpet. However, the aim was not so much to imitate the earlier positions but to *improve* the overall art installation in some dimension (the flexibility of carpet allows the material to move more with the different bodies standing in it) and in a different context: whereas *The end of sitting* was a vision of the office of 2025, *Breaking habits* was a vision of the living room of the future.

In the case of the carpet in *Breaking habits*, some of the qualities of the particular carpet used were valued by the makers (its softness to the touch, its "homely" feel, its cleanability, the fact that it showed marks of movement, its adaptation to the shape of the body), whereas other aspects of it (its tendency to tear easily, the way it folded) were less appreciated, and had to be adapted.

Earlier tests had shown that the carpet could tear if too many people were straining it without spreading the stress over larger surfaces. A first solution was to make the most successful positions for supported standing – built in wood in the earlier *The end of sitting* – in a material that had the required strength: black rubber. The carpet would then be glued onto a basic rubber structure to give it the living-room feel that the makers appreciated in the carpet. However, this solution had some disadvantages. Rubber is quite an expensive and heavy material, and more importantly, the smell of rubber, though liked by the artists, interfered with their concept of the 'living room of the future', which can be understood as a constraint on this process of making. In the end, after testing different options, the artists were attracted by the possibilities offered by another material: the required structural integrity was attained by a combination of lining the carpet with dense felt (which looks just like the reverse side of the carpet itself), and installing metal bars and thin steel cables that together ensured that, as far as possible, the stress was spread over the width of the carpet.

As we have explained above, a maker's skilled practice – including practices of material mimesis – should always be understood as situated. This means that what he or she cares about might sometimes happen to be improved by material mimesis, but is also dependent on many other factors such as socio cultural practices and physical constraints. From *Breaking habits*, for example, it becomes clear that the material that might be seen as mimetic (the felt looking like the reverse side of the carpet) can only be understood in the wider context of the relative unfamiliarity of people with the reverse sides of carpet, and the way the artists expect that people will engage with it. Had people been more familiar with the reverse side of carpets (which typically are not made of felt), then they would have noticed the "unexpected" felt-like properties of *Breaking habit*'s carpet, which would likely have changed their engagement with the installation (e.g. drawn their attention to the process of making, distracting them from reflections on the challenge of transforming the sitting society). The artists' anticipations in turn are partly based on their earlier experiences with the wooden construction, but also by the wider materiality of the installation as a whole (thin steel cables, stainless steel rods, and an additional wooden floor that allows the carpet and cables to be secured to it), the site where it was to be installed and situated, as well as, crucially, the makers' own fascinations and aesthetic preferences. We see them tending towards a grip *on the situation as a whole*, which goes much further than just imitating some material.

FIGURE 16.8 RAAAF, *Breaking habits*, 2017. A site-specific artwork commissioned by the Mondriaan Fund for Visual Arts
PHOTO: JOHANNES SCHWARZ

6 Conclusion

This account of Embodied Making allows one to move from a conceptual framework that sees the created work of art as imitating some intention in the head of the artist, to a situated perspective on the process of making artworks in which coordination with the affordances offered by the socio-material environment is central. Affordances are the possibilities for action provided to us by the environment (Gibson 1979). The selectivity that is characteristic for material engagement, including the realisation of mimesis, can be understood as a selective openness to the relevant affordances for the maker. Recent work on creativity and material engagement (Malafouris 2014; Lehmann 2014) can, via the notion of affordances, be linked to state-of-the art work in ecological psychology and embodied/enactive cognitive science.

The intentionality of skilled makers – skilled intentionality – can be understood in terms of engagement with several affordances simultaneously. If we understand concrete situations of material engagement as a kind of skilled action (Rietveld 2008), this opens up the perspective of using a proven conceptual framework from the philosophy of embodied/enactive cognitive science:

the Skilled Intentionality Framework (SIF). Using SIF, we can understand the intentionality of material engagement, including material mimesis, theoretically as a form of skilled intentionality. The concept of skilled intentionality helps us to move beyond the problematic divisions between mind and matter, individual and social, because skilled intentionality is always situated in (and attuned to) sociomaterial practice. In skilled intentionality, the maker 'joins forces' (Ingold 2013) with the affordances in flux offered by the sociomaterial environment (Van Dijk & Rietveld 2018). So skilled intentionality (and creativity as a particular kind of skilled intentionality) is not something pre-planned or in the head, but evolves in the agent-environment system as a whole during the process of making.

Any given person is necessarily only open to a small number of all the affordances that are available in this rich landscape, a phenomenon that we have called *selective openness* (Rietveld 2012a; Bruineberg & Rietveld 2014). Selective openness to these affordances is dependent on what the maker cares about and the exercise of abilities, habits and skills. More and more work within radical embodied cognitive (neuro)science emphasises the fact that bodies are anticipating, i.e., continuously preparing themselves for what is relevant next: for multiple action possibilities (Bruineberg & Rietveld 2014; Van Dijk &

FIGURE 16.9 RAAAF, *Pretty vacant*, 2013, A vertical equivalent of the Dutch contribution to the Venice Architecture Biennale 2010 (fig. 16.2), a site-specific artwork commissioned by the Centraal Museum, Utrecht
PHOTO: ROB 'T HART

Rietveld 2018; Rietveld *et al.* 2018). Being skilled in a certain practice of making can allow one to *anticipate* the unfolding process of making on longer timescales of many months.

Acknowledgements

Thanks to Janno Martens, Julian Kiverstein, Ludger van Dijk, Ronald Rietveld, David Habets, Maarten van Westen, and Twan Kieboom for feedback on an earlier version of this text. Special thanks to Emma Spary and Marjolijn Bol for their many helpful comments and suggestions. I would also like to thank Bella Gonshorovitz, Stephanie Schuitemaker and Yashka Moore for discussions on the affordances of fashion. Moreover, I would like to acknowledge the research funding awarded by the European Research Council in the form of ERC Starting Grant 679190 (EU Horizon 2020) for my project AFFORDS–HIGHER, and by NWO, Netherlands Organisation for Scientific Research in the form of a VICI Grant.

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Endnotes

1 Gibson 1979; Rietveld & Kiverstein 2014.

2 Abilities are the capabilities that allow one to the get a grip on one's situation (*cf.* Noë 2012), or in the words of Tim Ingold (2011, 5), 'the capabilities of action and perception of the whole organic being (indissolubly mind and body) situated in a richly structured environment'.

3 There is a reciprocal relationship between affordances and sociocultural practices. On the one hand, affordances enable and constrain the patterns of behavior that make up practices, but, on the other, the abilities on which affordances depend are maintained, formed and transformed by the activities of people who make up sociocultural practices.

4 Quoted in Ouroussof 2008.

5 There is a tradition in design theory (e.g. Norman 1988) that emphasises the importance of creating unambiguous affordances, so that it is clear how something should be used. This is different from the artworks by RAAAF, which embrace ambiguity and typically generate an entire landscape of multiple possibilities for action, so that individuals have the freedom to engage with the affordances that matter to them.

6 To use Ingold's words: 'This is to start with an idea in mind, of what we want to achieve, and with a supply of the raw material needed to achieve it. And it is to finish at the moment when the material has taken on the intended form' (Ingold 2013, 20).

7 Withagen & Van der Kamp 2018, 2.

8 Van Dijk & Rietveld 2018, 19.

9 Note that other works of art offer affordances as well: 'An artwork offers several affordances. This multiplicity contributes to the depth of a person's overall experience of the artwork, which may even be a "total experience" of its many layers. We use the term "total experience" to refer to the person's rich experience of this entire situation. Crucially, a person engages with an artwork by being open to the relevant affordances it offers, like possibilities for imagining, touching, conversing, feeling, and for reflecting on what is taken for granted' (Rietveld & Rietveld 2021, 8; Rietveld & Kiverstein 2022).

10 For my discussion of 'concernful', see Rietveld 2008b.

11 Flooding (i.e. inundating) areas of land in order to render them inaccessible is a Dutch military defence practice dating back to the 17th century. Various structures – forts, shelters, bunkers, etc. – ensured that strategic inundation locations could be properly operated and defended.

PART VI

Mimesis Beyond 'Matter'?

∵

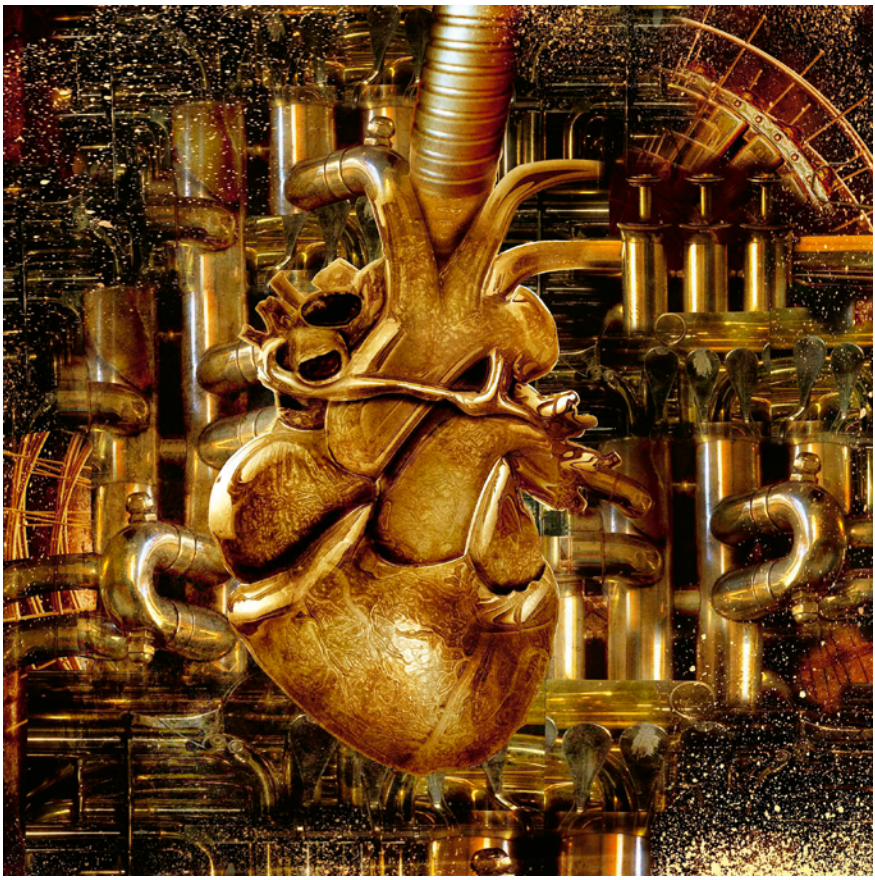

FIGURE P6 The heart as an ornate machine, with valves created from photographs of brass instruments digitally collaged. Although generated on a computer, the image also plays off the prosthetic organ known in common parlance as a 'mechanical lung'. It thus performs a triple mimesis, operating between real, digital and metaphorical scales of representation

Introduction

Thus far the volume has mostly addressed the mimesis of visible materials. But how does one imitate materials that cannot – or can no longer – be observed by the human eye? While this is an epistemological problem besetting forms of mediated replication and modelling over a long period, particularly in the natural sciences, new forms of replication accompanying the digital age throw out new kinds of questions about the consequences of digitisation for both *what* and *how* we know, and these profoundly affect both the power relations governing access to 'knowledge', and understandings of the self. Indeed, digitisation goes beyond this to disturb settled boundaries between the material and the ideal, the object and its replication: it can reshape the form of knowledge and the manner of production of knowledge objects such as images or books (e.g. Sassoon 2004; Owen 2006; Thylstrup 2018; Walther 2019).Traffic to and fro between the virtual and material worlds seems to blur the distinction between fact and fiction, reality and artifice, in new and often troubling ways, but it also offers new prospects for material replication. One of the greatest challenges for material mimesis lies in visualising the quantities, characters, or symbols stored in and transmitted by computers: data. Data can be visualized through material mimetic practices for all kinds of applications and on many different scales. To assist with heart surgery, for instance, surgeons sometimes use imaging data to 3D–print exact replicas of the organ that is to be repaired. To be able to study the heart and its defect through an exact replica before the surgery takes place helps to orient the surgeon during the procedure. But while the defective heart requires imitation because it is hidden inside the human body, in other instances, it is the scale of the materials or matter we seek to imitate that poses special challenges. On the smallest of scales, synthetic drugs mimic the chemical structure of natural neurotransmitters in the body, while is biomimetic nanoparticles mimic some of the membrane functions of the cells of our bodies to help treat certain conditions, including cancer. Such attempts at replication on the molecular scale are central to CADD (Computer Aided Drug Design), a set of techniques involving computerised extrapolation from molecular structure to predicted physiological effects that is currently provoking debate over the relation between resemblance and efficacy in fields including pharmacology, psychology and philosophy. Conversely, on the largest of scales, as Skulberg, Sparre and Veel show in their contribution to this volume, humans have never even directly experienced some 95% of the matter of which the universe is composed. Their chapter discusses a project that seeks to replicate the entire material cosmos in digital form: *Illustris*,

a set of cosmological hydrodynamical simulations produced using scientific data. Skulberg *et al.* argue that the visual simulations produced on the basis of this data raise a fundamental question: How do we represent the universe we inhabit, both the matter we can directly experience and that we cannot?

As Kromholz discusses in her chapter, conservators of contemporary art have to deal with the practice of material mimesis in relation to invisibility in yet another manner. Her essay investigates which mimetic practices are most appropriate for dealing with material loss when caring for an artwork. From art made from highly perishable doughnuts, to a melting piece made of ice or sculptures that were meant to be eaten, Kromholz argues that the engagement with the material language of the artwork is crucial for the development of effective decision-making strategies for their long-term preservation. The "meaning" of the ephemeral artwork must endure over time, in spite of its essential (indeed, definitional) impermanence which leads to the loss of the original matter. As with medieval saints, something beyond "the thing" continues.

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CHAPTER 17

Material as Subtext in Ephemeral Art

Sophie Kromholz

This chapter offers an exploration of how an in-depth look at material, and the question of when mimetic practice is appropriate, inform what it means to care for an artwork. Artworks fabricated in the twentieth century have drastically changed. This in turn demands a re-evaluation of the purpose and values shaping conservation theory and practice, in order to meet the needs of modern and contemporary artworks. Whereas the conservator was traditionally charged with the role of preserving the perceived authentic material state of an artefact, this is no longer always relevant or desirable for contemporary artworks. The contemporary art conservator's role can thus be seen as having shifted from preserving and maintaining original material, to being charged with the task of reinterpreting artworks as they inherently change (Scheidemann 2009, 8). It is a process which reflects how preservation practices mirror the ideology of their time. In trying to preserve the meaning of an artwork, the contemporary art conservator has come to interpret a much more open context which allows for a greater variety of original creative intentions. Conservators are thus increasingly gathering information to contextualise artworks – their purpose and values – led by the framework of the artwork in question. When we consider mimetic practices such as material replacement for stability and visual integrity, and whether or not to apply them to contemporary artworks, the process of investigation allows us to map out the framework in which an artwork functions. Questions of what 'care' is lead us to a better understanding of what 'needs' are.

In order to begin to find solutions to the problems posed by modern and contemporary artworks, first, for any work, a conservator must ask what the work is, in order to understand what framework needs to be upheld: what is significant to the work, and what treatments are permissible?[1] In order to begin to answer these questions, modern guidelines have been set up by those working with contemporary artworks, which generally include interviewing the artist, where possible, in order to register the artwork's context (Irvin 2005).

At a basic level, contemporary art conservators have started researching the behaviour of new art materials and technologies in order to understand and assess their process of ageing better, and how this might be combated where appropriate. This research is shared amongst professionals to create a

growing body of knowledge. But in addition to looking at what the material is, the question is to consider why the material is. Standard conservation methodology is coming to include new models which incorporate documentation, material-condition research, and significantly clarifying the artist's intent (Wharton 2005). Following this inclusive model, conservators are tasked with first identifying whether any physical change in an artwork is desirable, or whether preventive conservation efforts are warranted. After understanding which degrees of change are acceptable or even desirable, a conservator can begin to consider what options are available for carrying the artwork forward. This includes studies of material analysis, addressing research literature as well as the artist's documented intent, and perhaps even considering whether it is the artist who gets the final say.

I am interested in the questions that material manipulation raises: when and how material is applied and replaced, and what this tells us about the perimeters of the artwork. Both of the case studies which will be discussed within this chapter are artworks that are constructed of ephemeral materials, which is to say that they are works which are physically vulnerable. Technically, all material is physically vulnerable, and, as is increasingly echoed across conservation, nothing lasts forever. However, there are differing degrees of vulnerability, and some material artworks are inherently less stable than others. The ephemerality that will be discussed is not necessarily intentional, as will be elucidated by the examples given. For *Bag of donuts* (1989) we can clearly see that the artist has played a significant and conscious role in mitigating this ephemerality, applying mimetic tools of both material substitution and later replication, in attempt to counteract what conservators in contemporary art refer to as a work's inevitable 'inherent vice' caused by its very material selection. Inherent vice should be understood as the anticipated material vulnerability. For instance, a work made out of ice will inevitably melt. In some cases, the material can be stabilised, for instance by regulating the room temperature – as with Marc Quinn's self-portrait series, *Self* (1991), cast from the artist's own blood, discussed in Jeroen Stumpel's chapter in this volume. The blood portraits are intentionally and permanently kept frozen, or indeed sometimes an artwork's material can be replaced. By contrast, in Francis Alÿs' work *Silencio* (2013), the artist seems largely unaware of his work's physical vulnerability, and is merely uninformed about this aspect of his work. Ephemerality, as used within the context of this chapter, therefore indicates a short-lived or transitory nature, caused by either material selection or construction, and necessitating some form of intervention if a physical work is to endure. Mimetic interventions – to replace and stabilise – can in some instances become a means to conserve and promote longevity. In conversation

with the material, and through a deeper look at how it provides narrative, we gain a deeper understanding of the artwork as a whole and insight into its needs and care.

1 Bag of Donuts

Bag of donuts (1989), by American artist Robert Gober (b. 1954), is one of a total edition of 8. Each edition consists of an identical bag which the artist carefully hand-cut and shaped out of archival paper and filled with a dozen doughnuts made from actual dough. Each edition was signed and dated by the artist, with 'R Gober 1989' on the underside of the fabricated bag. *Bag of donuts* is potentially problematic on many levels, and raises a variety of issues, starting with the selection of material, i.e. the highly perishable doughnuts. As this work is discussed in more detail, I will pay specific attention to the role that the material plays in shaping it, how the dough has been manipulated, and what the role of the artist and the conservator are in this. It is this dialogue of material manipulation which sheds light on and pertains to the discourse of conservation theory.

In October 1989, a solo exhibition of Robert Gober's works opened at the Paula Cooper Gallery in New York City. The artist's works were arranged in multiple rooms. In the second room – against the artist's work *Male and female genital wallpaper* – sat the sculpture *Bag of donuts*, displayed on a pedestal (Smith 1989). With *Bag of donuts*, the artist attempted to represent the original object by using its associated materials and production techniques, which included making doughnuts out of actual dough, a dozen in each bag, and the construction and use of a paper bag. The work perfectly mimicked a nondescript bag of doughnuts one might purchase in a doughnut shop.

The opening of the show was attended by, among others, the critic, curator, and artist Ed Brzezinski. A seemingly unaware Brzezinski took one of the doughnuts out of the bag, and bit into it. As Brzezinski later commented: 'I noticed this bag of doughnuts sitting on a pedestal. Plain doughnuts with no sugar. I figured somebody had brought them and then gotten tired of them. So I grabbed one and bit it. It tasted stale' (Birnbaum 1997).

Eating artworks is not completely uncommon or always undesired. As part of the Eat art! exhibition at the Busch-Reisinger Museum in 2002, German artist Sonja Alhäuser (b. 1969) constructed a work entitled *Exhibition basics*, consisting of three wholly edible sculptures – chocolate pedestals, dyed pale green with food colouring to match the museum's other nonedible pedestals. On top of the chocolate pedestals stood caramel vitrines housing marzipan figurines

of artists Joseph Beuys and Dieter Roth, an homage to two artists who experimented with foodstuffs as art materials between the 1950s and 1980s, as well as an edible figurine of the artist herself.

The relationship between the art audience and Alhäuser's works is one of literal consumption, – whereby the audience receives the artwork through eating it. The sensual process of consumption causes the inevitable destruction of the work, yet this simultaneously finalises it. As clarified by the artist, 'the audience is needed to effectively complete the work, to help it fulfil its destiny of being destroyed to be created' (Peacock 2006). The participatory consumption of the work informs the experience, whereby the audience does not simply watch the work unfold, but actively helps to unshape or unmake it. As Alhäuser explained, 'I use chocolate, popcorn, and caramel to construct these objects because I want to entice visitors to nibble on them, to engage all their senses in an appreciation of the work' (Peacock 2018).

Brzezinski, in taking a bite out of *Bag of donuts*, was less fortunate. First and foremost, he had failed to recognise the artwork as indeed 'an artwork'. Gober had not created the work for consumption. Moreover, Brezinski's unfortunate interaction with the doughnut did not go unnoticed. Another visitor at the opening exclaimed: 'Hey, this isn't Dunkin Donuts!', while the artist approached Brzezinski and stated: 'This person saw you take a bite out of my doughnuts and put it in your pocket. You break it, you buy it.'[2] After this, gallery attendants ejected Brzezinski from the exhibition venue.

By this time, Brzezinski had learned that *Bag of donuts* was indeed not just a bag of doughnuts. The doughnuts, through their placement on a pedestal, in an art exhibition in a gallery, composed by the artist, had been transformed into an artwork. Placement – the gallery – signposts the context through which material is to be read. *Bag of donuts* was more than just its namesake. Moreover, the doughnuts had been transformed not only in status – raised from foodstuff to artwork – but also in material composition. The artist had, in collaboration with conservator Christian Scheidemann, found a means of manipulating the dough in order to extend the work's overall longevity. This probably caused the doughnuts to taste stale, as Brzezinski noted. Scheidemann degreased the doughnuts in order to avoid staining the paper bags, treating them in a low-pressure tank with acetone, after which they were refilled with paraloid B72, an acrylic resin, in order to ensure their structural integrity (Mead 2009). Moreover, Gober had coated his doughnuts with Rhoplex, a preservative chemical. Both processes could be considered mimetic tools for the purpose of preventative conservation. Brzezinski threw up, and was taken to hospital in an ambulance, where he was informed that, as the chemical was dry, it would pass through his system, but that he was lucky, for if it had been liquid, it would likely have killed him.[3]

Gober compared his work to 'natural history dioramas about contemporary human beings' (Mead 2009). *Bag of donuts* captivated and confused as it played on themes of objecthood and realness. Given Brzezinski's response to the work *in situ*, it is fair to say the artist successfully accomplished this confusion. In 2013, *Bag of donuts* was displayed at the National Gallery of Modern Art in Edinburgh, and one of the doughnuts went missing. As with the 1989 incident, the artist replaced the missing doughnut, another mimetic intervention as part of a conservation effort.

So we are presented with doughnuts which have been physically altered, and with an installation which features new components – the replaced doughnuts. The significance of this is that we see how material can be understood as the subtext for an artist's practice and theory. In the case of Gober's work, the material here asks us to think of when a bag of doughnuts is indeed more than a bag of doughnuts, and each doughnut is itself a transformed doughnut, built for longevity: a super-immortal doughnut, if you will. When things are not what they seem, this raises a discussion around material and context – whether mimetic manipulation adds to or detracts from the work. When things are not what they seem, we are able to reconsider what the real thing is. Material change, as illustrated through mimetic practice, forces a dialogue around what we see as the artwork. Works such as *Bag of donuts* elucidate the fact that there is a dialogue occurring between the artwork's narrative and its form, which must be clarified by the artist if we are to understand where the perimeters of the artwork are and how we can indeed authentically represent and display the work.

2 Decision Making and Material Identity

In order to address material and its role within an artwork, the *Stichting Behoud Moderne Kunst* (SBMK), which is the Dutch Foundation for the Conservation of Contemporary Art, has produced a decision-making model for the conservation and restoration of modern and contemporary art. The model was presented at the symposium *Modern art: who cares?* in 1977, and is still used today. It highlights the importance of understanding meaning and the application of material, which is described as follows:

> The meaning of a work, however, is layered and certainly not unambiguous. One can speak of meaning imparted by the artist, but also by a context (criticism, group, style, time), by a place (collection, country, 'site-specific'), or event (performance). In addition, the choice of material and working method has consequences for the meaning of the work.

> Finally there are also ideological (political, philosophical and religious) layers of meaning.[4]

Material identity, as with the works illustrating this chapter, is constructed not only through the selection of material, but also through its application, as well as any actions undertaken on the material, e.g. chemically altering it or replacing it. Their material is, to borrow from art historian Rebecca Gordon, both structure and signifier, because of the significance of both material selection and its application. Gordon introduces the idea of 'material as structure' and 'material as signifier' in her article 'Material significance in contemporary art' (Gordon 2013). The notion of material as 'structure' is developed from artists she has interviewed, whereas the notion of material as 'signifier' is developed from the ideas of earlier scholars whom Gordon acknowledges, including the philosopher and semiotician Roland Barthes (1977). In this sense, echoing the philosopher and communication theorist Marshall McLuhan (1994), 'the medium is the message.' And sometimes – but not always – this includes physical change as part of the message. McLuhan was active in communication theory, but his overall postulation – that a medium actively shapes how a message is received – has increasingly been applied in other fields, including arts practice. The significance of McLuhan's statement is inadvertently reiterated by conservator Christian Scheidemann, in his essay 'Material as language in contemporary art', where the selection of material and its application are seen as critical elements to reading and understanding the artwork as a whole.[5] What is brought to the fore with increasingly unconventional art materials is the question as to what the material selection conveys and how it informs the artwork. Material instability can sometimes situate and contextualise the artwork – decomposition might be desirable. But, as we see in instances such as Gober's *Bag of donuts*, the material might inform the artwork, but the material's inherent fragility can and should in some instances be mitigated. This notion that the material of art is fundamental for understanding the artwork's meaning also finds traction in earlier art historical discussions pertaining to more traditional modes of art, including the art historian Henri Focillon's *Vie des formes* (2004, published in English as *The life of forms in art*). Here Focillon emphasised the importance of considering the material of art in understanding its meaning. This argument can be pushed further, as is done in this chapter, to state that not only material selection, but also material change due to its inherent properties, or else through its construction and subsequent action, tell us something about an artwork and shape an artwork's overall message and experience.

Gober's super immortal doughnuts are no longer your average deli doughnut. All materials move and act to a certain degree; no physical material is completely stable. However, consideration must be paid to materials which rapidly degrade and to the question of how to cope with inevitable material changes. What is done with artworks which are particularly unstable offers interesting insights into their maker's practice and the intended lives of these works. For instance, the American artist Janine Antoni (b. 1964) has created works out of foodstuffs similar to those used by Gober, such as chocolate and fat, and has, like him, not embraced the transience of her works. Antoni actively participates with conservators in trying to find suitable conservation strategies for physically preserving her works and ensuring some form of longevity, often incorporating mimetic tools. In Antoni's case, the deliberate material decisions are, as the art historian Martha Buskirk (2003, 137) describes it, 'not an end in themselves, but (serve) as a means of addressing a wide range of cultural as well as personal references.' Here, the artist is aware of the material's intrinsic physical characteristics, and uses them by sculpting her works through gnawing and licking, as well as using their symbolic and cultural associations. However, she is unwilling to let her pieces fall prey to what in contemporary art conservation is referred to as the material's 'inherent vice' – a fragility or instability caused by the selection and/or assemblage of materials which makes the work increasingly difficult to maintain (Wharton 2011, 166). All material artworks carry some sort of inherent vice by default. The follow-up question is what we do about this. Here the answer depends in part on the artist's intent. For some works, inherent vice is a mere byproduct of material selection, though seemingly a somewhat inconvenient one. Artists such as Antoni and Gober collaborate with conservators to find suitable ways to combat this material instability, sometimes by replacing material, at other times by finding ways to manipulate it or replicate the visual work.

However, artists may use the same organic, highly changeable material for very different ends. Therefore, impermanence cannot be assumed from material alone (Heuman 1999, 10). Where possible in collaboration with the artist, the conservator discovers the framework of the artwork, whether it is transient or more permanent. In the latter case, the artist generally stipulates the terms upon which the work can be continued, such as whether or not the work's original material is significant. Discussions with the artist that evaluate the artist's intent and the conceptual importance attributed to temporality, as well as to the material authenticity of the work, serve as an early measure for predicting and anticipating possible intervention and treatments to understand where the future of the artwork might be (Cross *et al.* 2012, 18). They help us to address what changes are considered desirable for the work.

Countering what we have seen with Gober's work, it should also be noted that artists creating ephemeral works are not always concerned with their work's longevity. In fact, they may be opposed to the material work having any sort of long-term existence. Here, artist Jean Tinguely's auto-destructive works form a prime example. Although many of Tinguely's moving machines or *Meta-matics* were not envisioned as temporary works, the artist also created specifically temporary pieces – the first of which was *Homage to New York* – a work which performed its own 'suicide'. It was commissioned in 1960 for the Sculpture Garden of the Museum of Modern Art in New York. The work had been assembled out of various scrap materials compiled into a faltering machine designed to self-destruct. The machine clumsily did not quite manage to end itself of its own accord, so the artist intervened with an axe to help finalise the work's destruction (which was simultaneously its completion). Eventually the work also caught fire, thereby reaching its conclusion. As stated by the artist:

> *Homage to New York* was for me an attempt to liberate myself from the material. The best way to do this was to make it self-destroying, like Chinese fireworks, so that during the event – and naturally it became an event, a spectacle – all these materials, even the smoke, became part of the sculpture.[6]

The significance of the work lay in the tension of its performance and its irreproducibility – turning the work into a moment shared and experienced by a select few. The artwork was therefore less material object and more transient performance. As Tinguely went on to say: 'What was important for me was that afterward there would be nothing, except what remained in the minds of a few people, continuing to exist in the form of an idea.'[7] In instances like these, the artist's conscious anticipation of building memory for the viewer turns the memory itself into what could be considered an intangible document and an indispensable part of the work. *Homage to New York* existed in the material performance and was supposed later to lie only in memory.

MoMa, however, did in fact salvage various bits out of the wreckage, storing them in their permanent collection under the heading *Fragment from Homage to New York* (1960). These fragments became *de facto* art artefacts, precious by their usurpation into the museum collection. It is questionable, however, whether the artist would have approved of this archiving and the subsequent status attributed to the fragments. Arguably, despite the museum's attempt to salvage parts of the physical work, the "authentic" artwork, or the piece's "true essence" escapes the salvaged fragments. For Tinguely, based on

his statements, the actual artwork lay not in the material fragments left over, or indeed the initial structure; rather, it lay in the machine's short-lived performance. As discussed by British artist Michael Landy (b. 1963), who curated a show on Tinguely, conjoint with his own work, at Tate Liverpool: '[Tinguely] wanted you to just witness the sculpture's extinction but not possess it'(Pollard 2009). Here the value of temporariness is clear, in that it is used as a way of invoking questions within the viewer, opening up the discussion of the biography of a work of art – what it is meant to do, how it functions, and for how long. We need to be wary of the aestheticisation of the object taking precedence over the performative nature of the artwork as a whole, for this impacts how we might treat the physical work. There is a risk of not letting works perform as they are intended to, because we become precious about trying to conserve the material, or else, as in the case of MoMA, become precious of temporary artwork debris, treating these like valuable relics. It is not only artists, but also those individuals such as collectors and bodies such as museums, who contextualise and set the boundaries of artworks.

This precious collecting, and in turn contextualisation, can be seen in a lot of what are known as Fluxus objects. In this case there has been a great deal of scholarly concern around the fetishisation of the physical objects and remnants, which some feel threatens the core performative nature of the movement and risks perverting the contextualisation and focus of the works as a whole.[8] The Fluxus objects, much like the auto-destructive works by Gustav Metzger or David Medalla, are 'transient interactive objects' (Philips 1997, 161). They are inherently meant to change, and significant value should not be placed on the material object.

The conservator of such a work of art must ask what the role of material is in terms of its symbolic reference: its visual role, as well as the importance of its possible temporality. What structure keeps the work alive? For intentionally ephemeral works that are physically transitory, the conservator has to work with more abstract concepts, such as how to preserve that which, in its physical essence, cannot be kept. The struggle, as described by artist Vera Lúcia Carmo (2014), is that 'the object of conservation [has] ceased to exist, leaving only the object of exhibition'. In other words, the material object is no longer necessarily the point; rather, as sometimes with Tinguely, it is the work's limited performance. This begs the question: how can the performance be preserved? To address the problems posed by these types of works, the role of conservator becomes that of 'someone who manages change' (Tate 2018).

Ephemeral artworks such as the Swiss-born artist Urs Fischer's *Untitled* (2011) confront this inevitability of dematerialisation head-on, from inception onwards. *Untitled*, produced for the fifty-fourth Venice Biennale, consisted of

three burning candles in the shape of Fischer's office chair, a wax figure of his friend Rudolf Stingel, and a full-scale replica of Giambologna's *Rape of the Sabine women* (1583). All of the wax figures contained wicks which were lit, and over the duration of the exhibition continued to burn and melt. The significance of Fischer's work was perhaps most eloquently described by Guardian writer Jonathan Jones, who illuminated the experience: 'Fischer's candle-man haunted me later when I was walking the decaying streets of Venice. It will haunt me for a long time. It is a beautiful, funny, frightening emblem of time's fatal arrow' (Jones 2011). The tension of the work lay in the encapsulated experience of its inevitable loss, and the subsequent memory created of something that was, and cannot be repeated – a lost form, a past moment. Effectively experience driven artworks such as this play upon what Severin Fowles discusses as the 'carnality of absence'. As he elaborates, 'When absences become object-like, when they seem to exist not merely as an afterthought of perception but rather as self-standing presences out there in the world, they begin to acquire powers and potentialities similar to things' (Fowles 2010, 25, 27). The viewer is arguably left with some aspect of the work after it is gone, whereby, as with Fischer's *Untitled* (2011), the work can be said to continue to haunt the viewer precisely because it no longer exists. Scheidemann (2009, 9) makes a case for this kind of experience, claiming that 'a work of art often is considerably more than just the components of its material in the consciousness of the average viewer'. Instead, the artwork encapsulates an experience, triggering later memory. With the changed dynamic of twentieth-century art practice, artworks are no longer understood as confined to, or solely existing within, their physical shells; rather, as exemplified by the temporary artwork, they lie in the experience and framework within which they move and are read. Part of the challenge conservators and collectors face lies in coming to terms with the vulnerability of some material artworks and trying to negotiate alternative ways of caring for these works. Sometimes this means respecting their intended material obsolescence. The conservator Pip Laurenson (2006) proposes that conservation efforts should focus on the 'identity' rather than the 'state' of an object.[9] Although she develops this framework for time-based media artworks, she notes, critically, that she would envision its use for a wider range of artworks.

The ephemeral nature of some artworks thus raises inevitable questions regarding their material significance and durability. The imposed temporality, furthermore, greatly challenges traditional conservation conventions which aim, as evaluated by Muñoz-Viñas (2005, 15), to 'keep something as it is, without changing it in any way: retaining its shape, status, ownership, use, etc.' Instead

it is increasingly clear that the methodology for conservation of contemporary art must take a more inclusive and individual approach into account, whilst still adhering to some guidelines (Davenport 1995, 52). The parameters of an artwork and possible conservative measures can both be elucidated from considerations not only of material selection, but also, critically, the artist's condoned interventions, e.g. Gober's modified doughnuts, where the mimetic role of the acrylic resin, and later complete replacement of a missing doughnut in the Edinburgh exhibition, play a central role.

3 *Silencio*

Silencio (2003), created by the Belgian-born, Mexico-based artist Francis Alÿs (b. 1959) is an installation piece which consisted of a room covered in 525 bright pop-art coloured rubber mats, each featuring the image of a finger being pressed to lips. The audience was invited to walk over the mats, which were fabricated near the artist's residence in Mexico according to his design, and related to the typical doormats present in every Mexican doorway.

The work, which is currently in a private collection, was shown in 2010 at the Bonnefantenmuseum in Maastricht, where the artist had been nominated for and won a prestigious prize, the Biennial Award for Contemporary Art. At the time, the Bonnefantenmuseum was interested in acquiring *Silencio*, and asked conservator Claartje van Haaften to look into the durability of the work – how long would this piece last? What were the specifications for caring for it? Van Haaften's considerations included: What is the rubber? Chemically, how stable is it? How can you diminish the wear that comes from the inevitable visitor interaction with this work, such as high heels, dirt, or even just the impact of daylight? But first of all, the focus was on the following: What was the work made of – what type of rubber? How were the mats constructed? A questionnaire was prepared for the artist – first of all, trying to figure out the ingredients of the material and the process of fabrication: how much heat, what glue, how much glue, which colorants, how they were mixed together – as all these aspects would impact the longevity of the rubber mats. The artist answered, with the aid of someone who worked at the factory. However, upon further investigation and through testing the actual material, Van Haaften discovered that the material was not in fact made of the components that the artist thought it was. Moreover, the work had been produced over a long time period, approximately seven years, as it was fabricated in a small four-person factory, so there was a clear variation between the mats depending on age, how

they were constructed and how they were holding up over time. There had been changes in the production and the material that had been used to produce all 525 mats.

In conservation, while conservators increasingly involve the artist where possible, and ask what is right, it must also be asked whether the artist is always right. As the case of *Silencio* illustrates, sometimes it is simply the case that the artist does not know. Sometimes the questions being asked by conservators for collectors are not an important part of the work for the artist. In the case of *Silencio*, where the artist thought the work might last a hundred years, the conservation team concluded that the work might last thirty at most. Here the process through which the material was made and the small production in Mexico seemed to connect the work to the reference which had inspired the artist, namely, the ever-present Mexican doormats. Replacing the material or indeed the manufacturing process would have altered the work's reference. Yet both material and process inevitably impact the longevity of the work, and therefore also impact the decision-making process for both the care and acquisition of the work.

4 Conclusion

When material is problematic, and when things are not what they seem to be, they ask us to look closer, be it as conservators, art historians, or other art audiences. Change – and the possibility of change – directs questions and furthers dialogue. The possibility of the mimetic – to replace material and visually manipulate – is an opening into a discussion of where the boundaries, and even the authenticity of an artwork lies. *Bag of donuts* and *Silencio* alike remind us that there is no standardised approach, but that instead, for each artwork, those charged with its care are guided by questions and a desire to understand what shapes the artwork, and how we can continue to represent this authentically. For *Bag of donuts*, the artist assisted in both the work's material manipulation and its replacement. By contrast, in the case of *Silencio*, the work is what it is, and its material, in its selection and fabrication were determined not only by the artist, but also by the means through which the artist envisioned creating the work: small traditional Mexican labour. Though there are some pragmatic changes within the process of fabrication, afforded by the factory producing the mats over the course of seven years, subsequent material manipulation and intervention were not considered. The work's ephemerality clarified the work's process and echoed its circumstances.

Rather than simply looking at these two works as specific individual cases, they can be taken together to illustrate a larger framework in which they make sense and can be read, experienced, and cared for. Although the long-term conservation strategies vary for each work, together *Bag of donuts* and *Silencio* highlight a series of questions and considerations of what is possible, and how mimetic interventions such as material manipulation and visual assimilation influence an artwork. Discussions around mimetic practice can be used to map the requirements for an ephemeral artwork to persist. What these two case studies illustrate, then, is how material management is a lens by which to evaluate not only conservation practices, but also the theories which guide it, the questions which are asked, and the way in which art narrative is shaped and understood, and pertains to the role of the artist, the conservator and an artwork's material. In discussion, the conservator Claartje Van Haaften stated that, in conservation, there is no hard science with hard facts, but rather a great deal of subjectivity. The role of conservators thus requires an awareness of the perspective from which they are negotiating, with a thought to the long-term view. How are artworks projected into the future, and how might the future look back at current action and intervention? Van Haaften looks at artworks and considers alternative display methods – the various ways in which an artwork can be exhibited. She proposes that there is no standardised approach, but rather that conservators are guided by the historical viewpoint and theory of their time.[10] To develop effective decision-making strategies for the long-term preservation of ephemeral artworks, or indeed any artworks, we return to a work's physical material, and consider what role it plays within the artwork as a whole. The significance of the material provides the subtext to the work: the material explains the work's construction. The questions raised around material are a matter of understanding how something is put together in order to understand the thing itself and how to care for it. Through exploring material and its possible manipulation – when to change, copy, or replace – we begin to deconstruct the very means through which artworks are themselves framed and understood.

Acknowledgements

For those who love swansongs and the fractured ways we replay them. I wrote this for you.

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Endnotes

1 McGrath 2004, 50–53, 510.
2 *New York post* (5 October 1989), referenced in Gmelin 1996.
3 Gmelin 1996.
4 SBMK 1999.
5 Scheidemann 2005, 77.
6 Tinguely 2009.
7 Mundy 2013; Muñoz-Vinas 2005, 205.
8 Zycherman 1995, 126.
9 Laurenson 2006.
10 Van Haaften, personal interview, 7 December 2015.

CHAPTER 18

"Mock Observations" of Galaxies

Emilie Skulberg, Martin Sparre and Kristin Veel

After three months of runtime and using over 8,000 compute cores, a set of cosmological hydrodynamical simulations called Illustris was complete in 2013. Spanning over 13.8 billion years of cosmological evolution, this set of simulations represents a region of the universe in a cube (fig. 18.1). In the largest simulation, the side length of the simulation cube is 106.5 megaparsecs (a unit

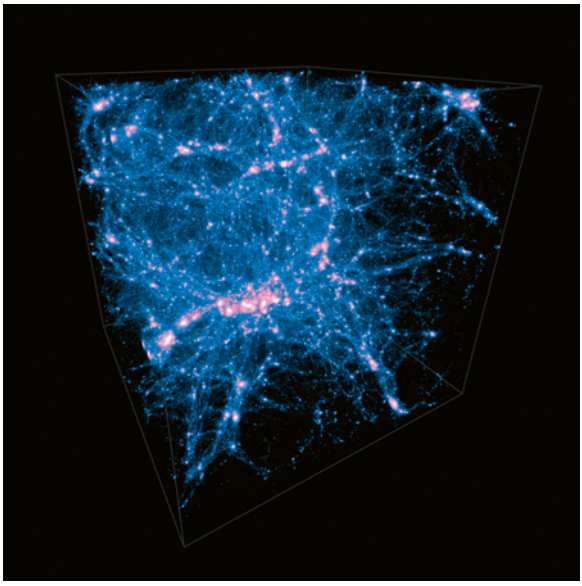

FIGURE 18.1 This visualisation represents the large scale structure of the universe, known as the 'cosmic web'. The density of the so-called 'dark matter' is shown here as the pink filaments, where the brightest areas represent the most dense concentrations of dark matter in Illustris. Original caption: 'Exterior view of the dark matter density distribution in the full Illustris-1 box at redshift zero' (Illustris Collaboration, 2015b)
CREDIT: ILLUSTRIS COLLABORATION, COURTESY OF MARK VOGELSBERGER

used to measure astronomical distances), which corresponds to 350 million light years.[1] This scale means that the simulation can represent the universe as a whole. We focus on visualisations based on Illustris, tying the question of mimesis to recent visual representations of the cosmos.

Illustris is the product of an international collaboration based primarily at Massachusetts Institute of Technology, Harvard-Smithsonian Center for Astrophysics, and Heidelberg Institute for Theoretical Studies. According to the Standard Model of Cosmology (also known as the LCDM model), normal (or baryonic) matter – that of which the Earth, stars and galaxies are made – is believed to account for only 5% of the cosmos, whilst the invisible dark matter and dark energy are thought to take up 26% and 69%, respectively.[2] Illustris marks a breakthrough in its realistic reproduction of a range of phenomena at different scales. Supermassive black holes, galaxy formation, and the large-scale structure of the universe come together in the simulation representing both visible and invisible matter as it develops over time. The output from simulations such as Illustris is often referred to as 'synthetic data', and in the case of Illustris takes up 200 terabytes of storage.[3] To perform research based on Illustris, an astrophysicist would typically download only part of the data output. This would then be stored as a matrix describing the characteristics and coordinates of particles in the three-dimensional space of the simulation cube (as an example, see fig. 18.2). The particles of the virtual universe of Illustris represent phenomena in the universe such as stars, dark matter, or black holes, and these particles have different properties depending on what they represent. The largest simulation, Illustris-1, contains 6,028,568,000

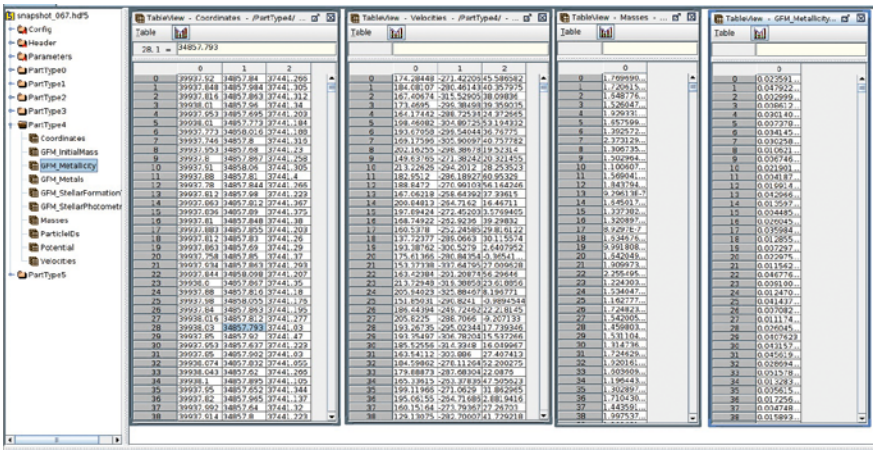

FIGURE 18.2 Example of synthetic data output from Illustris
PHOTO: MARTIN SPARRE

particles representing dark matter alone. This can be overwhelming, even to the trained eye of an astrophysicist working with computational theoretical physics.

Several theorists have described big data as 'messy'.[4] As the historian Orit Halpern (2015, 5) writes, 'data is not always beautiful. It must be crafted and mined to make it valuable and beautiful', recalling the Greek verb *kosmeō*, as described by the classics scholar Gregory Vlastos (2005, 3):

> In English *cosmos* is a linguistic orphan, a noun without a parent verb. Not so in Greek which has the active, transitive verb, *kosmeō*: to set in order, to marshal, to arrange [...] In the Greek the affinity with the primary sense is perspicuous since what *kosmos* denotes is a crafted, composed, beauty-enhancing order.

Vlastos' explanation of *kosmos* could certainly be relevant in relation to the visual dimension of Illustris, where the overwhelming matrix of numerical values is transformed into colourful visual representations showcasing the virtual universe. Halpern (2015, 21) reminds us that 'In the present, visualization is often understood not only as a process but also an object, a subject and a discipline, a vocation, a market, and an epistemology'. Despite the attention given to cosmological simulations in journals, magazines, preprint articles, the news, and social media, many of them have yet to be explored in existing scholarship within the humanities. Taking this as our cue, the present chapter will read visualisations based on the Illustris simulation against the theme of mimesis, as it appears in Plato's corpus, with an emphasis on the *Timaeus*. Mimesis here is seen on a cosmological scale, which is helpful for tackling the representational questions that are being rearticulated with a project such as Illustris. This chapter will examine visualisations of both normal and dark matter in Illustris, in order to show how the notion of mimesis can be used as a vehicle for unpacking these visualisations. We will employ the ambivalence of mimesis in Plato's corpus, from *Republic x* to the *Timaeus*, to qualify and inform the discussion of the visualisation of cosmological simulations. As the art historian Ernst Gombrich (1960, 83) writes in *Art and illusion* (1959), 'There are few more influential discussions on the philosophy of representation than the momentous passage in the *Republic* where Plato introduces the comparison between a painting and a mirror image. It has haunted the philosophy of art ever since'. In the *Timaeus*, however, the demiurge, a divine craftsman thought to be the personification of reason, transforms chaos into cosmos by giving shape to the visible world, based on the harmonic proportionality of the eternal model.[5] *Mimesis* is often translated to 'imitation' in concise definitions.[6] However in

Plato's work, mimesis plays a range of roles. As the classics scholar Stephen Halliwell (2002, 70–71) writes in his attempt to 'diagnose [...] Plato's prolonged and profoundly ambivalent relationship with mimesis', there are two main ways in which mimesis is used in Plato's corpus.

> The first, a kind of 'negative theology', which leads sometimes in the direction of mysticism, is that reality cannot adequately be spoken of, described, or modeled, only experienced in some pure, unmediated manner (by *logos*, *nous*, *dianoia*, or whatever). The second is that all human thought *is* an attempt to speak about, describe, or model reality – to produce 'images' (whether visual, mental, or verbal) of the real. On the first of these views, mimesis, of whatever sort, is a lost cause, doomed to failure, at best a faint shadow of the truth. On the second, mimesis – representation – is all that we have, or all that we are capable of. In some of Plato's later writing this second perspective is expanded by a sense that the world itself is a mimetic creation, wrought by a divine artist who, at one point in the *Timaeus* (55c6), is expressly visualized as a painter.

In the *Timaeus*, the demiurge's creation can be seen as mimesis on a cosmological scale. Through reason, the visible universe, '*that which becomes*', resembles the eternal order '*that which always is*'.[7] The cosmos, as it appears in the *Timaeus*, is composed by geometrical shapes fitting perfectly together, reflecting the eternal, immutable model. This brings us back to Vlastos (2005, 3), who traces *kosmos* back to 'the active, transitive verb, *kosmeō*: to set in order, to marshal, to arrange'. In the present chapter, the team behind the Illustris project is viewed as a modern demiurge: in the creation of the simulation, massive amounts of theory and data from observations are used, and 'set in order' through the code, giving each particle its place in the virtual universe. The visualisations based on the simulation furthermore transform the 'messy' big data output to a harmonious re-creation of the cosmos.

As the philosopher of science Laura Perini (2010, 148–151) writes, it is important to distinguish between scientific models and visual representations in science (see also Anna Maerker's contribution in this volume). Visualisations from Illustris are visual representations, based on a simulation which is produced from AREPO (the simulation code used to construct Illustris), using both theoretical physics and astrophysics as input. The simulation is based on the Standard Model of Cosmology, but should not be conflated with the model. While mimesis has previously been applied to studies of representations in science, for instance in the case of scientific models, this chapter focuses on the visual aspect of the Illustris Project.[8] Although research on images in science

has developed in recent decades, astrophysics is a discipline which has so far received little attention.[9] With this chapter we contribute an account of visualisations of both dark and normal matter. Key to this last category of visualisations is the distinction between real and 'mock' observations.

1 Mimesis and 'Mock Observations'

A researcher wishing to create a visualisation based on the data output from Illustris will typically start out by searching for the relevant synthetic data from Illustris, such as dark matter in a certain section of the simulation cube during a particular point in the time evolution of the simulation. The researcher then writes a code in Python, controlling the angle from which the pixels representing the particles are seen, as well as the colours used to represent certain phenomena.[10] Once the visualisation has been produced, they can zoom in and out of the image, to get an overview of particular pixels in the visualisation representing the data output. 'Mock observations' are visualisations based on the synthetic data output from a simulation, but produced with the purpose of resembling the real universe as it appears through observations. By creating images from Illustris in a fashion similar to the construction of Hubble Space Telescope (HST) observations, astrophysicists are able to compare the virtual universe of Illustris to observations.[11] On the website of the Illustris Collaboration (2015c), one of the mock observations is presented as a recreation of 'one of the most iconic images in astronomy, the Hubble Space Telescope "Ultra Deep Field" (the image below is split in half, to the left and right – one half is real, and one is simulated, can you tell which?)' (fig. 18.3). In order to find the separation between the two images, one has to look closely – the left-hand side of the image is the 'real observation' from the HST, while the mock observation from Illustris can be found on the right-hand side. It thus becomes apparent how the Illustris visualisations are carefully crafted to resemble images over whose representational power there is already a consensus.

A major result from Illustris was its realistic reproduction of different types of galaxies. Therefore, an important part of research done on it entails comparing 'synthetic images' of galaxies in Illustris with images of galaxies as they appear from observations.[12] Many astrophysicists performing research based on Illustris choose to investigate a single galaxy. When the simulation reaches the present time, however, it shows 41,416 galaxies.[13] To help astrophysicists navigate in this massive dataset, a catalogue of galaxies, called the 'Illustris Galaxy Observatory', is available from the Illustris website (Illustris

FIGURE 18.3 Original caption used to describe the visualisation on the website of the Illustris Collaboration (https://www.illustris-project.org/media/, see Illustris Collaboration, 2015b): 'Hubble eXtreme Deep Field observations (2.8 arcmin on a side) in B, Z, H bands convolved with Gaussian point-spread functions of sigma = 0.04, 0.08, and 0.16 arcsec, respectively. Divided down the middle: real observation (left side) and mock observation from Illustris (right side)' IMAGE CREDIT, LEFT: NASA, ESA, G. ILLINGWORTH, D. MAGEE, AND P. OESCH (UNIVERSITY OF CALIFORNIA, SANTA CRUZ), R. BOUWENS (LEIDEN UNIVERSITY), THE HUDF09 TEAM. PUBLIC DOMAIN. IMAGE CREDIT, RIGHT: THE ILLUSTRIS COLLABORATION, COURTESY OF MARK VOGELSBERGER

Collaboration 2015a). By means of a search tool, researchers can adjust several parameters, such as 'Black Hole Mass Limits' or 'Gas Mass Limits', enabling them to find the type of galaxy they are interested in amid the "messiness" of big data (the sample of mock observations in fig. 18.4, for instance, shows only disk galaxies).

In the *Timaeus*, we also find a frequent alternation in scales between macrocosm and microcosm, aptly described by philosopher Thomas Kjeller Johansen (2004, 6), whose work we will discuss several times throughout this chapter, because of his engagement with the intersection between mimesis, *ekphrasis*, and natural philosophy in *Plato's natural philosophy*:

> Whilst devoid of neither argument nor conceptual analysis, the work equally persuades by *painting a picture* in words of our world as predominantly good and beautiful [...] As a picture, the work draws us in by its detail and completeness, 'from the creation of the cosmos down to the nature of man' (27a6). The *Timaeus-Critias* can in part, then, be viewed as a philosophical *ekphrasis*, or depiction in words, of the whole cosmos.

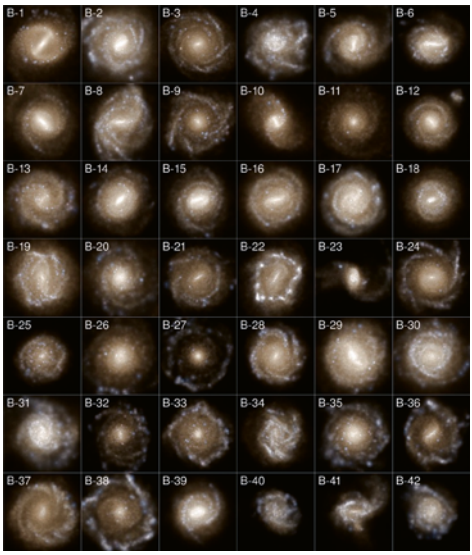

FIGURE 18.4
Original caption used to describe the visualisation on the website of the Illustris Collaboration (https://www.illustris-project.org/media/, see Illustris Collaboration, 2015b): 'Sample of 42 blue, disk galaxies, showing the stellar light distribution (SDSS g,r,i band composites)'
IMAGE CREDIT: ILLUSTRIS COLLABORATION, COURTESY OF MARK VOGELSBERGER

One could add that it is not only 'by *painting a picture* in words', but also by painting one in numbers, that Plato expresses the beauty and harmony of the cosmos. In the cosmogony of the *Timaeus*, the creator of the cosmos is described as moulding existence by forming a harmony out of parts. In *Tim.* (35c2–36b5), Timaeus combines words and numbers in his description of the role of proportions in the creation of the universe.

> These connections produced intervals of 3/2, 4/3, and 9/8 within the previous intervals. He then proceeded to fill all the 4/3 intervals with the 9/8 interval, leaving a small portion over every time. The terms of this interval of the portion left over made a numerical ratio of 256/243.[14]

Throughout the *Timaeus*, the reader travels between different scales and follows the ways in which each component fits into the whole. The geometrical aspect of the image of the cosmos 'painted' by Plato in the *Timaeus* is what the 'full-blooded mathematical [Platonist]' Johannes Kepler (1571–1630) would build upon in his modified version of the Copernican system in *Mysterium Cosmographicum* (1596) (fig. 18.5).[15] The Platonic Solids, described in *Timaeus* as the construction elements of the universe, are five geometrical figures, where the tetrahedron represents fire, the octahedron air, the cube earth, the icosahedron water, and the dodecahedron is the shape of the universe itself.

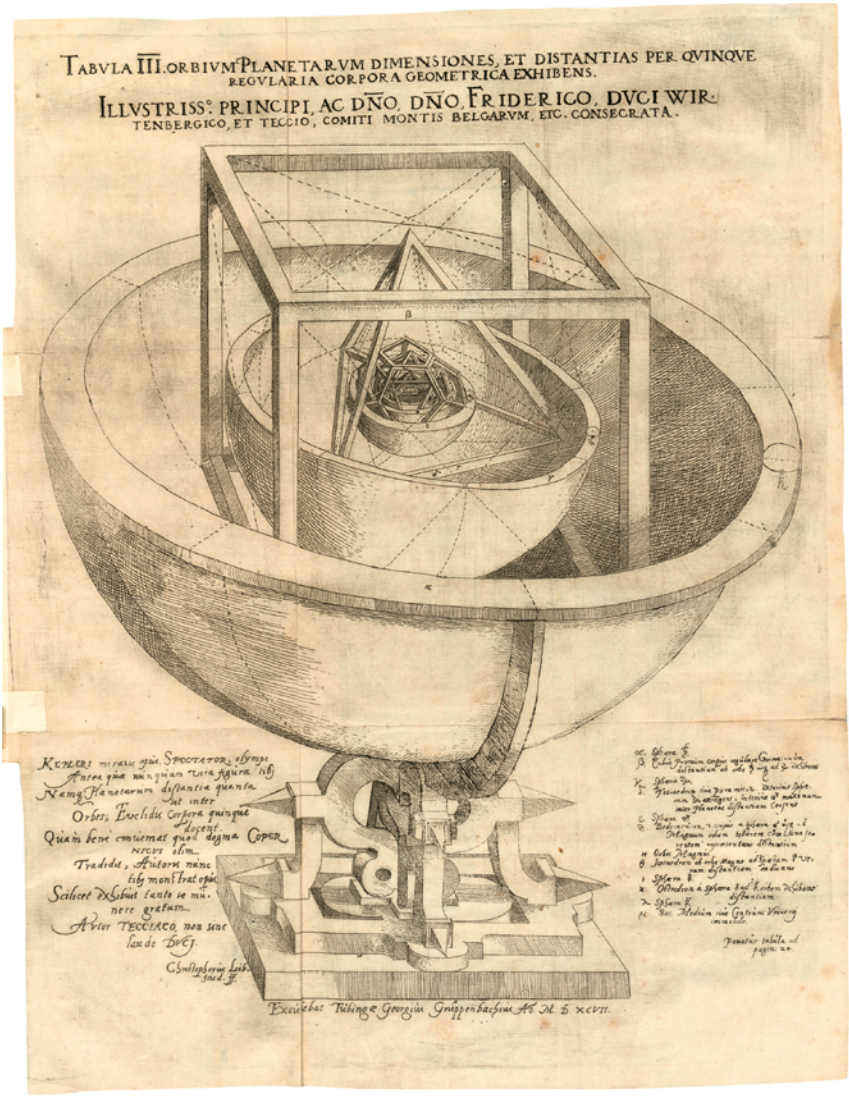

FIGURE 18.5 Johannes Kepler's illustration of the orbits of the planets in the Solar System, in *Mysterium Cosmographicum* (Tübingen 1596)
PUBLIC DOMAIN MARK

When nested inside each other, the distances between these convex regular polyhedra resemble the distances between the orbits of the planets in the solar system (Gaukroger 2006, 176–178).

In Plato's vertical world of thought, mathematics ranks very high (Shapiro 2005, 3). It is also central in relation to astronomy. In 'one of the most disputed passages of Greek literature, Plato in the *Republic*' tells us that we should 'study

astronomy by means of problems, as we do geometry, and leave the things in the sky alone'.[16] In one school of thought, the passage is regarded as favouring a 'purely speculative study of bodies in motion having no relation to the celestial bodies that we see', while others hold that 'what Plato meant was that astronomers must get to know the real motions of the heavenly bodies as opposed to their apparent motions as seen by us on earth' (Bulmer-Thomas, 1984, 107). How can this vertical line of thinking in relation to the world of appearances, contrasted with the eternal forms modelling the construction of the universe, inform our present understanding of Illustris as a simulation meant to build a bridge between theory and observation? The purpose of mock observations is to appear as close as possible to real observations. Recalling mimesis as it appears in *Republic* X, mock observations might be seen as imitations of observations of visible phenomena. In line with this interpretation, one could speak of mock observations as an inversion of the vertical thinking of Plato, using mathematics and reason in order to reach downwards, to replicate the visible phenomena best.[17] If we look at the ontology of the virtual universe in relation to the visualisations, however, the simulation is bound together by encoded mathematics and data: a harmonic unification of numbers, resembling the 'mimetic model of the cosmos' found in the *Timaeus*.[18] In the *Timaeus*, if we follow Johansen, we see a painting of the universe in words, attracting the reader with the harmonic interplay between the whole and its parts. The part of this painting describing the Platonic Solids is not a representation in the sense of a mirror image of the visible world – rather, it is the cosmos seen from a perspective above sensory perception – a universe of theory, painted with words and numbers. The data visualisations based on Illustris, too, show us a universe recreated through the use of theory. Mortals, Timaeus tells us, are not able to completely grasp the otherworldly order. All we can hope to do is to provide a likely myth or story (*eikōs muthos*) or a likely account (*eikōs logos*).[19] The *account* of the universe could be seen as yet another level of mimesis present in the *Timaeus*. Following Johansen, in *Critias*, Critias describes his own account, as well as the explanation given by Timaeus, as:

> 'imitations' (*mimēsis, apeikasia* 107b5), perhaps echoing Timaeus' wish that *his* account be received as a mere *eikōs logos* or *eikōs muthos* of an *eikōn* of an intelligible paradigm (*Tim.* 29d). Both *logoi*, then, are presented to us as imitations of a sort.[20]

The reader, Johansen continues (2004, 31), is encouraged to take into consideration the famed passage in the *Republic* describing mimesis (595a–608b), in relation to the status of the account in the *Timaeus-Critias*, through the reference to painting found in *Critias*:

> It is inevitable, I suppose, that everything we have all said is a kind of representation and attempted likeness. Let us consider the graphic art of the painter that has as its object the bodies of both gods and men and the relative ease and difficulty involved in the painter's convincing his viewers that he has adequately represented the objects of his art.[21]

However, whereas in *Republic* X the artist's painting is negatively viewed, on account of the superficial reproduction of the appearance of the phenomena, akin to that of a mirror's reflection, the account of Timaeus is another story altogether. Timaeus is described as being very knowledgeable in astronomy, and the explanation of the cosmos is based on his expertise. On this point, Johansen (2004, 35) argues, mimesis as it appears in the *Timaeus-Critias* differs from mimesis in the notorious passage in *Republic* X. Furthermore, Timaeus acknowledges that he cannot give certain answers to the origin and hidden nature, of the cosmos – by emphasising the status of his account as 'likely', he avoids the deceptive character of mimesis, unlike the seducing mirror-like painting described in *Republic* X. Rather than seeing mock observations as imitations of mirror images, recalling *Republic* X, one could also argue that Illustris works within the Platonic world of thought: Illustris visualisations are produced by specialists in the field of astrophysics, making the simulation one of the most 'likely accounts' of the cosmos seen today. The likelihood of the account is emphasised through the publication of images such as the Hubble eXtreme Deep Field mock observations from Illustris.

2 Touching Dark Matter

The Illustris Project has gained international attention in major news media, with eye-catching headlines such as: 'Universe evolution recreated in lab' (7 May 2014, *BBC news*), 'Universe recreated in massive computer simulation' (7 May 2014, *The guardian*), 'Stalking the shadow universe' (16 July 2014, *The New York times*), and 'How our universe grew up' (8 May 2014, *CNN*).[22] Much like large-scale projects such as the HST, communicating the success of Illustris would have been important to its creators as they prepared for new simulations using AREPO. Results from two projects building upon Illustris have already been released: a series of simulations in a project called IllustrisTNG, which improved upon the original version, and the Auriga Project, which gave a detailed view of the Milky Way.[23] Several studies of recent astronomical imaging have found that publicity and funding are significant factors in pushing researchers to produce observations intended for communication

to the general public.[24] False-colour observations, sometimes referred to as 'pretty pictures', have been a topic of contention amongst the art historians who have studied them. While James Elkins introduces them as 'hopped-up versions of legitimate photographs, with the colours intensified or falsified', Elizabeth A. Kessler argues that false-colour images from the HST are aesthetically valuable, as they are processed in such a way as to evoke the feeling of the sublime.[25] Our aim here is not to contribute to this highly interesting discussion of the aesthetic value of false-colour observations. Rather, we want to shift the focus slightly by noting, firstly, that we see a similar development within computational theoretical physics, where it has become common practice to produce colourful, dynamic, and sometimes interactive visualisations from cosmological simulations. Secondly, we note that although funding and publicity likely played a role in pushing researchers to produce the compelling 'synthetic images', Illustris is one example of how the demarcation between 'pretty pictures' and images used in communication to specialised audiences within astronomy or astrophysics is not clear-cut. Although the visual representations most commonly used in peer-reviewed literature on Illustris are plots (understood here as graphical visual representations of data), synthetic images are also used in articles within journals such as *Nature* and *Monthly notices of the Royal Astronomical Society*. Moreover, the ways in which the visualisations are used are similar across communication to intended audiences of varying degrees of specialisation. Synthetic images work to persuade the viewer of the accuracy of the simulation as aids for gaining an overview of Illustris, or for navigating within it. The comparison between the HST observation and the synthetic image in fig. 18.3, for example, appeared in a press release as well as in *Nature*, in both cases functioning as a visual argument for the quality of the simulation.[26] Another example is navigation within the virtual universe. We saw how Illustris Galaxy Observatory uses synthetic images to help researchers find galaxies relevant to their research. Similarly, both in videos used in communications with the general public, and in oral presentations to specialists, information about scale and time provides a way for viewers to orient themselves both spatially and temporally within Illustris. Studies of diagrams in theoretical physics have shown the important role diagrammatic 'paper tools' have played to help students and researchers approach challenging topics.[27] Although Illustris visualisations do appear in print form – in 2018, for instance, one of them came to decorate an official stamp in Germany (fig. 18.6) – they are more commonly encountered on screens of sizes ranging from smartphones to planetariums. Where Penrose diagrams helped 'physicists struggling through the notorious conceptual and mathematical subtleties of GR', virtual tools in

FIGURE 18.6 German stamp featuring a visualisation based on the Illustris simulation COURTESY OF ANDREA VOSS-ACKER, WUPPERTAL (DESIGN) AND © THE ILLUSTRIS COLLABORATION (IMAGE), COURTESY OF PETER SAUERESSIG

the form of synthetic images are used to help viewers grasp a virtual universe on the scale of megaparsecs (Wright 2013, 134).

Quite unlike synthetic images, the visual style of the plots used in peer-reviewed literature on Illustris are perhaps best characterised by what art historian Kemp has called *non-style* – the 'draining of obvious ornamentation, stylishness, and pictorial seductions'.[28] In various ways, synthetic images are instead crafted to look naturalistic, depending on whether they represent dark or normal matter. In the case of mock observations of galaxies, we saw how their close resemblance to observation was emphasised. Visualisations of *invisible* phenomena instead appear naturalistic because they are shown in perspective, whereby some strands within the cosmic web appear closer than others. Visual representations using a naturalistic style do not necessarily portray objects as they are observed, or even phenomena which exist.[29] With visualisations of dark matter, the viewer sees dark matter illuminated, as though crawling up from Plato's cave. Indeed, the Latin *illustris* can be translated to 'bright', 'brilliant', 'shining' or 'pervaded with light'.[30] Although dark matter cannot be observed, in synthetic images the elusive matter is not only luminous but, as we shall see, becomes yet more tangible and material through rotation and close-up shots in videos.

Some videos from Illustris showcase the simulation in its full size, where the viewer sees the simulation cube from an outside viewpoint; while in others

the viewer appears to be placed inside the simulation. In 'A virtual universe', a video appearing in a *Nature news* feature on Illustris, moving visualisations from both within and outside the simulation are used.[31] In the following, we study this feature as an example of how the visualisations are contextualised and used to communicate Illustris to non-specialists, as well as the ways in which they allow for audiences to interact with Illustris.

'A virtual universe' begins by zooming in on an animation of a galaxy, whereupon we see an explosion, while in voiceover, we are told about the Big Bang. This is followed by an explanation of Illustris: 'To test our theories scientists have built a computer model of the universe. A simulation so complex that calculating it on a single desktop would take 2,000 years'. We now see the simulation as a whole in a cube, spinning before us, before shifting to a different video from Illustris. Here, we start out by viewing dark matter, zooming in (see Figure 18.7). The field shifts, showing stellar light from a galaxy instead. The video then zooms out, while the scale in parsec is visible on the left side.

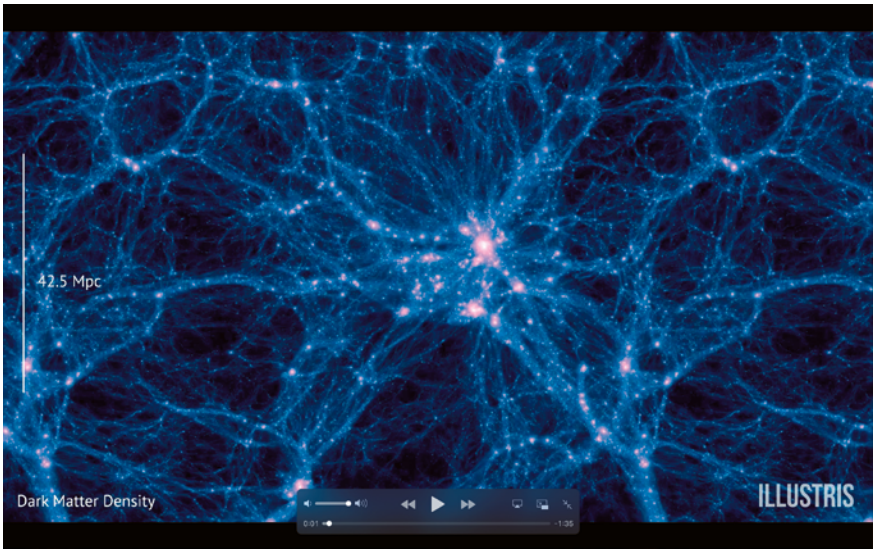

FIGURE 18.7 Screenshot from the original video on the Illustris Project's website [Illustris Collaboration, 2015b]. Original caption: 'Continuous zoom-in from the scale of the entire simulation volume (100 Mpc) to the scale of an individual spiral galaxy (10 kpc), highlighting the diversity of structure across spatial scale, the large dynamic range of the simulation (106 per dimension), and the relationship between dark matter, gas, and stars' [Illustris Collaboration, 2015b]

CREDIT: ILLUSTRIS COLLABORATION, COURTESY OF MARK VOGELSBERGER

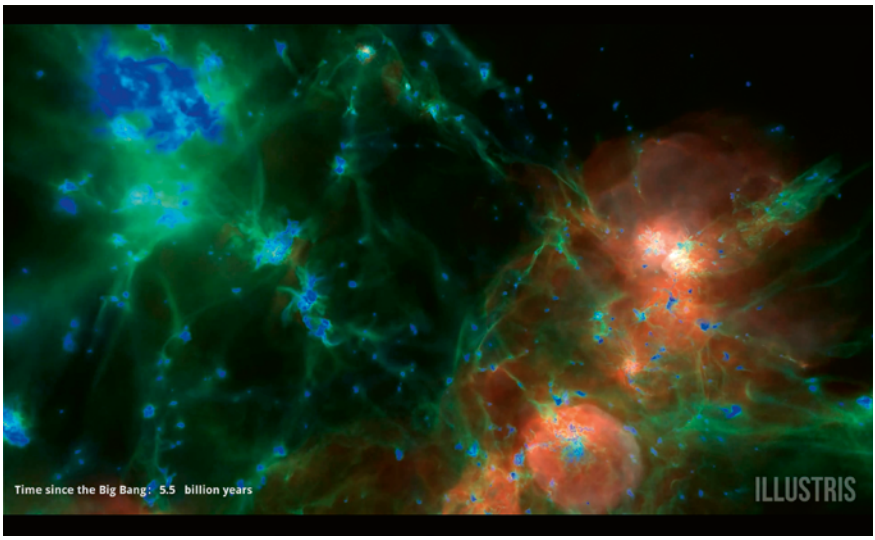

FIGURE 18.8 Screenshot from the original video on the Illustris Project's website. Original caption: 'Time evolution of a 10Mpc (comoving) region within Illustris from the start of the simulation to z = 0. The movie transitions between the dark matter density field, gas temperature (blue: cold, green: warm: white: hot), and gas metallicity' [Illustris Collaboration, 2015b]
CREDIT: ILLUSTRIS COLLABORATION, COURTESY OF MARK VOGELSBERGER

'The model', the voiceover narrates, 'doesn't just tackle the universe's huge range of scales. It also richly describes the forces at work. Much better than previous attempts'. The next video shows gas temperature in a cube on the left side, and dark matter on the right. Another cut is made to an Illustris visualisation where we see the cosmic web spinning before us, in what could be described as a close-up, portraying the dark matter as if the viewer could stretch out their hand and touch the large-scale structure of the universe. The field shifts from dark matter to normal matter, where the distribution of colour (from blue through green to red, and finally white) represents temperatures from low to high (fig. 18.8).[32]

Supermassive black holes dominate the largest galaxies, and cause gas to be blown out 'in these violent, white bursts'. Again we see a shift, as the video now shows the chemical composition of the region within the simulation, and soon we see dark matter again. At this point, we are close to the universe in its present state. '14 billion years of the universe's evolution has pulled a tightly woven dark matter web into a looser network of giant galaxy clusters', the voiceover tells us, while the visualisation of dark matter gradually shifts to show galaxy

clusters.[33] Again, a video which zooms in and out of a galaxy is shown, followed by an animation of an explosion. Finally, we see an animation depicting galaxies, moving close to an individual galaxy, before the animation shows a space telescope in the foreground, and the Earth in the background.

In these videos of the virtual universe, we see current theories and data 'in action', with explosions, zoom effects, and rotation in 360 degrees. Commenting on the mapping of dark matter, David Turnbull has argued that dark matter and energy represents a 'whole new ontology and epistemology', with the new understanding of mass and existence bringing with them new forms of cosmological research. Turnbull has described this as a 'hyperbolic' line of argumentation used in order to make what is invisible visible. We suggest a more subtle view of the 'new ontology' introduced with dark matter visualisations, one which considers their contextualisation.[34] Although dark matter can be '[brought …] into existence' (Turnbull 2017, 208) through maps or visualisations from simulations, these often appear in the context of verbal descriptions stressing the lack of certainty around what, as physicist Max Tegmark (2014, 70) puts it, 'is really little more than a name for our ignorance'. In the case of Illustris, dark matter is illuminated and made to appear yet more material using a range of visual techniques, but is at the same time framed as artificial and virtual. This framing of the visualisations as a way of representing the ontology of a *virtual* universe is characteristic of communications about Illustris targeting the general public. This was likely encouraged by members of the Illustris Collaboration, as the press releases and interviews take the same approach. Interestingly, we see the same in the case of visualisations of normal matter in peer-reviewed papers, where they are referred to as *mock observations*, constructed from *synthetic data*, or alternatively as 'mock UDF' (i.e. 'Ultra Deep Field'), 'mock images', 'mock data products', and 'synthetic images'.[35] While the accuracy of the simulation is emphasised, so is its artificiality, which, when combined, serves to showcase the abilities of the creators of the virtual universe. Although science has travelled far from the view of the universe seen in the *Timaeus*, Illustris seems to be driven by a desire resembling that expressed in the *Timaeus*: to reveal the laws governing the behaviour of the universe, in order to recreate this harmony.

3 'Move over, Matrix'

At the thought of divine power, the philosopher, politician, and writer Edmund Burke (1729–1797) tells us, 'invested upon every side with omnipresence, we shrink into the minuteness of our own nature, and are, in a manner, annihilated

before him' (Burke 2015, 56). In the Illustris visualisations, the cosmos is visualised on a scale which surpasses that of the Earth, since planets are too small to appear in the simulation. While we cannot speak of anything resembling a geocentric worldview in the visualisations, we could describe the view of the cosmos, given to us through Illustris, as anthropocentric, since creators of Illustris and beholders of its visualisations can gain a sense of control of the virtual universe. Kemp (2006, 35–36) makes a similar observation, although in connection with a much earlier illustration of the universe – Johannes Kepler's reinterpretation of the Platonic Solids in the *Timaeus*, in his illustration of the Solar System (fig. 18.5):

> Kepler has depicted his scheme for the construction of his own cosmological model [...] as if he were acting as a microcosmic emulator of God [...] The model, whether God's or made by human agency, is by implication something which can potentially be viewed and envisaged perspectivally from any point within or outside the system.

While this God's-eye view of the cosmos offers a myriad possibilities in relation to perspective, it is placed on a plinth. From this foundation we can clearly determine the angle from which we view the model. On its plinth, the 'great folding plate' is exhibited as a model, resembling, indeed, an armillary sphere, as if placed in the study of a scholar. The model, then, seems to illustrate the possibility of a human omnipresent gaze, enabled by natural philosophy. The same could be said about the Illustris visualisations, which are exhibited as man-made constructions, as images based on 'synthetic data'. It is in taking up a God's-eye view that Earth's place in the cosmos shrinks into the minuteness. Through the Illustris visualisations, the beholder is shown a rotating three-dimensional view based on the Standard Model of Cosmology, at multiple scales. The virtual universe is shaped by the modern demiurge of the Illustris Collaboration. The viewer takes on the same position as that of the reader of the *Timaeus*, gaining access to a 'painted' picture of the cosmos, attracting us with the harmonic interplay between whole and parts in the account of the formation of the cosmos. If we regard the Illustris simulation as an anthropocentric view of the cosmos, it is so in the sense that the virtual universe is constructed, and under the control, of the team behind Illustris. Yet as the output of AREPO is not predictable, Illustris escapes from that control. The sense of control a viewer can experience comes from the virtual medium in which they encounter the visualisations: in the videos of the development of the cosmos from shortly after the Big Bang to the present, the viewer can fast-forward, stop, or rewind the visualisation of the cosmological evolution.

On the back of discussions following Thomas Nagel's concept of the 'view from nowhere', the historian of science Charlotte Bigg has analysed planetariums in the early twentieth century.[36] Bigg shows how viewpoints were embodied in pedagogy through certain placements of bodies of students and other spectators visiting, or preparing to visit, planetariums. Here we see a context in which disembodiment is an important part of the point of view, but in the context of a visualisation where dark matter is given body.

Unlike the imagined viewpoint of mock observations (a telescope), in dark matter visualisations, the point of view is not framed as a telescope, since dark matter is not visible through observation. HST observations, some of which the mock observations from Illustris seek to emulate, have given us magnificent views of the cosmos – from false-colour images showing 'a universe filled with glowing gases in vivid colours, galaxies swirled together in bands of light and dark, and innumerable stars' to the famed Hubble Deep Field images.[37] 'As a mechanical eye', Kemp (2006, 242) writes, 'the Hubble telescope stands in a long succession of human endeavours to create the ultimate form of sight'. To Kessler (2012, 19), the HST 'stretches humanity's vision beyond what Galileo ever imagined' from its orbit above the Earth's atmosphere. Elkins (2008, 101) focuses on the intense pursuit to expand the limits of what can be observed. With the Hubble Deep Field North, the 'most wonderful visual act was the attempt to see *beyond* the faintest galaxies on the plate – to see something in the black regions between the faint bright spots, at the very end of the visible universe'. Kemp and Kessler characterise the HST in terms of a technological extension of human vision, in part due to its physical extension into outer space, and Elkins in terms of an expansion of the boundaries of the visible universe, through the approach and treatment of observations. While the HST observes in all directions, it is still bound in its orbit around the Earth. With the Illustris visualisations, the viewer's position is disembodied: any point in the simulation can be taken as a centre, and become a point of view. This sense of control over a virtual replication of our universe brings to mind works of science fiction such as Lana and Lilly Wachowski's movie *The Matrix* (1999).

Indeed, there is a direct connection between *The Matrix* and the communication of Illustris. On 7 May 2014, a press release introducing Illustris was published on the website of the Harvard-Smithsonian Center for Astrophysics. *The Matrix* was here used to introduce the reader to the universe of Illustris, appearing in the first sentence: 'Move over, *Matrix* – astronomers have done you one better. They have created a realistic universe using a computer simulation called "Illustris"' (Aguilar & Pulliam 2014). In *The Matrix*, the majority of the human population lives in the Matrix, unaware that their bodies are in

fact placed in cells, in order to exploit body heat and electrical impulses as sources for energy. The film has been tied to several philosophical discussions and traditions, including Plato's allegory of the cave. The Matrix is a simulated reality, created by machines that dominate the territory of the Earth. Human rebels fight against agents, computer programmes disguised as humans within the Matrix. Towards the ending of the film, the protagonist, Neo, is shot and killed by Agent Smith, but rises again. When agents shoot at Neo, he stops the bullets. Neo now sees the code of the Matrix and is able to bend the laws of the system through his insight. The viewer, here, sees the universe through Neo's point of view: the hallway and agents, written in code. There is a similar allure to the visualisations from Illustris: they showcase the current conception of the universe, as it is reproduced from a code written by astrophysicists. 'The matrix', as the philosopher and lawyer Paul W. Kahn writes (2013, 122), 'is a perfect system of representation, on the one hand, and a completely illusory world, on the other [...] There is a logic – the code – that guarantees coherence'. The reference to *The Matrix* in the Illustris press release works to emphasise the closeness of the Illustris simulation compared to observations. Yet Illustris is not naturalised in the way the Matrix is. In the press release from the Harvard-Smithsonian Center for Astrophysics, Shy Genel, a member of the Illustris Collaboration, is quoted saying: 'Illustris is like a time machine. We can go forward and backward in time. We can pause the simulation and zoom into a single galaxy or galaxy cluster to see what's really going on'.[38] The possibility of travelling through time and space in the virtual universe of Illustris recalls the ending of *The Matrix* where 'we see [Neo] flying, free of gravity, above other humans, as he dissolves the Matrix and offers them release' (Freeland 2002, 213). Similarly, no source of gravity limits the beholder to a particular point of reference within Illustris. This brings us back to Kepler's illustration. While being able to see both individual galaxies and the cosmic web in 360 degrees, viewers of an Illustris visualisation are unable to position themselves within the virtual universe. There is no plinth indicating what viewpoint the viewer takes up within the simulation cube. It is not only the Earth which can be said to 'shrink into the minuteness' in the Illustris simulation – by achieving the omnipresent God's-eye view, the viewer, too, disappears into the space of Illustris.

4 Conclusion

In this chapter, we have examined 'mock observations' and visualisations of dark matter from the Illustris simulation in terms of mimesis on a cosmological

scale. The Illustris Collaboration can be seen as a modern demiurge, constructing an orderly cosmos out of the chaos of big data, connoting not only the *Timaeus*, but the root of the word *kosmos*, found in the Greek verb *kosmeō*. Through data visualisation, the team behind Illustris opens up the black box of big data, enabling the viewer of the Illustris visualisations to access this God's-eye view of the virtual universe. Videos from Illustris permit the viewer to see the simulation in rotation, in multiple fields and scales, and to perform a virtual travel through 13.8 billion years of cosmological evolution. The view of the cosmos seen in the Illustris visualisations seems to have left behind anything resembling a geocentric image of the world – planets which could have created associations to the Earth are too small to appear in the simulation, and unlike the HST, which orbits the Earth, in Illustris any point in the simulation cube can become a point of view.

Whereas the HST is described as a technological extension of the human gaze, or a 'mechanical eye', the viewpoint in the Illustris visualisations is a disembodied one. While the Illustris visualisations cannot be described as in any sense resembling a geocentric view of the cosmos, they may be understood as anthropocentric, in the sense that the virtual universe is under the control of the Illustris Collaboration, and the viewer of the visualisations can achieve a similar experience as that of the Illustris Collaboration when controlling, for instance, a video showing the development of the universe. Whereas Kepler places his illustration of a cosmological model on a plinth, with the visual dimension of Illustris, the achievement of the omnipresent gaze renders the beholder unable to establish their own viewpoint in relation to the visualisation.

Since the completion of Illustris in 2013, two sets of simulations have been produced using the AREPO code. New cosmological simulations are constantly being developed, growing in both scale and complexity. One could argue that the visual dimension of Illustris is one of the ways in which the public can best view the current state of understanding of the universe within astrophysics. To the layman, the data output of Illustris is entirely inaccessible. Yet the striking visualisations based on the simulation open the black box of these data – through the visual dimension of the project, everyone, including the general public, can view the cosmos, as it is reproduced based on the Standard Model of Cosmology. As noted in the beginning, despite the attention given to cosmological simulations in academic writing as well as public media, many of these simulations have yet to be explored in existing scholarship within the humanities. The release of cosmological simulations gives us a way to study portrayals of our view of the cosmos given by astrophysicists, and, due to the widespread attention they gain, the ways in which a variety of audiences

engage with them. As yet more cosmological simulations are released, future studies are needed to analyse their production; the written, verbal, and visual communication of them; their circulation in printed and online media; as well as the responses they solicit, and ultimately how these simulations contribute to how we think about and imagine the universe we inhabit.

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Endnotes

1 Hydrodynamics is the study of fluid motion, which in this instance refers to cosmic gas. A simulation is here understood as an 'imitation of the operation of a real-world process or system over a period of time', following Banks & Sokolowski 2009, 5. See works by Galison (such as 1997) and sources cited therein for literature on simulations within the history and philosophy of science, Frigg & Reiss 2009 for a critical review of literature in philosophy, and Durán 2018 for a general introduction. While several simulations exist within the Illustris Project, the Illustris simulation is often referred to in the singular, since Illustris-1, the simulation containing the most particles, is usually used for research and to create visualisations. For information on the various simulations, see Nelson *et al.* 2015.

2 These are estimates based on the 2015 results from the Planck Satellite (Ade *et al.* 2016).

3 See e.g. Vogelsberger *et al.* 2014 and Springel 2010 on Illustris, and Borgman 2015, 89–90 for an introduction to synthetic data in astrophysics.

4 See Aiden & Michel 2013, 19; Mayer-Schönberger & Cukier 2013, 32–49.

5 See Vlastos 2005, 26; Plato & Cornford 1997, 27; Johansen 2004, 95, note 6.

6 See for instance Blackburn 2008, 235; Bunnin 2004, 434. For discussions of this translation and the etymology of mimesis, see Halliwell 2002, 13–14, 17–22.

7 *Tim.* (27d5–6), following Plato 1997. Original emphasis.

8 For a discussion of the use of the concept of mimesis in relation to different kinds of representations in science, amongst others, see Galison 1997 and Frigg & Hunter 2010, and references cited therein. For an analysis of the Standard Model of Cosmology in light of the account of the cosmos in the *Timaeus*, see Brisson & Meyerstein 1995.

9 See Cambrosio *et al.* 1993, 662 for an introduction to pioneering work within this field. For an overview of research on scientific imaging, see Hentschel 2002, 2014; Pauwels 2006, and further references cited in Hopwood 2015, 309, n. 10. For existing research on contemporary astronomical imaging, see Lynch & Edgerton jr. 1988, 1996; Elkins 1999, 2008; Hannestad 2018; Kessler 2011, 2012; Turnbull 2017; Vertesi 2015, and references cited therein. See Hentschel 2014, 258 for literature on visualisations from the Millennium simulation.

10 Most visualisations based on Illustris are constructed using Python, a standard programming language in astronomy (Goodman 2012, 7).

11 See Torrey *et al.* 2015 for a detailed description of the construction of mock observations.

12 For an example of this, see Snyder *et al.* 2015.

13 Vogelsberger *et al.* 2014, 177.

14 *Tim.* (35c2–36b5), Plato 1997.

15 Shapin 1996, 59. On Kepler's so-called polyhedral theory, see Stephenson 1994 and references cited therein.

16 Bulmer-Thomas 1984, 107; *Rep.* VII (530b5–6), in Plato 1997.

17 Regarding astronomy in the *Timaeus*, Plato allows for an exchange between reason and perception (see, e.g., *Tim.* 47a1–b2). See Johansen 2004, 160–176 for a detailed analysis of astronomy in the *Timaeus*, as well as Gregory 2000 and Vlastos 2005.

18 Halliwell 2002, 321, n. 24.

19 *Tim.* (29c8–d3; see also 68c–d and 59c–d); *Tim.* (30b, 48d, 53d, 55d, 56a, 57d, 90e).

20 Johansen 2004, 31. *Critias* is the unfinished dialogue following the *Timaeus*, in a projected trilogy where *Hermocrates* – likely never written – is assumed to be the third dialogue.

21 *Crit.* (107b5–c2), translated by Diskin Clay in Plato 1997.

22 Ghosh 2014; Sample 2014; Overbye 2014; Landau 2014.

23 For IllustrisTNG, see Pillepich *et al.* 2018; Springel *et al.* 2018; Nelson *et al.* 2018. For the Auriga project, see Grand *et al.* 2017.
24 Lynch & Edgerton Jr. 1988; Elkins 1999, 2008; Kessler 2011, 2012; Vertesi 2015.
25 Elkins 2008, 87; Kessler 2011, 2012.
26 For the press release, see Aguilar & Pulliam 2014; for the *Nature* publication, Vogelsberger *et al.* 2014.
27 On 'paper tools', see Klein 2003. On paper tools in theoretical physics, see Kaiser 2005; Wright 2013, 2014.
28 Kemp 2000, 4; id. 2010.
29 Kemp 1990; Kusukawa 2012.
30 *OLD* 1968, 830.
31 Stoddart & Gibney 2014 links to the video.
32 Transcriptions from the voiceover in the video 'A virtual universe'; see Stoddart & Gibney 2014.
33 Stoddart & Gibney 2014.
34 Turnbull 2017, 207. See also de Swart *et al.* 2017, de Swart 2020, Bertone & Hooper 2018, and sources cited therein for the history of research on dark matter.
35 Vogelsberger *et al.* 2014, 177–178; Torrey *et al.* 2015, 2753.
36 Nagel 1986, Bigg 2017: see 204–205 for an introduction to the discussion following Nagel's work.
37 Kessler 2012, 57.
38 Quoted in Aguilar & Pulliam 2014.

Looking Back, Crafting Futures

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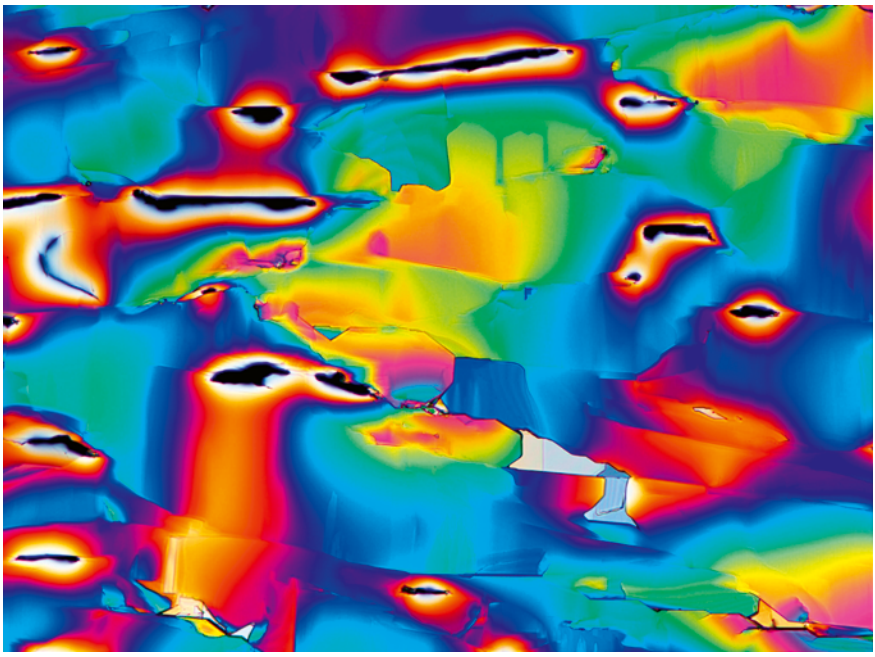

FIGURE P7 Mimesis within mimesis: this image of saccharine crystals depicts a material used to imitate sweetness. At its inception in the late nineteenth century, saccharine was prohibited from sale in some countries. This material remains a metaphor for fakery, as in the 'saccharine smile'. The image itself, artificially coloured, generates a double mimesis, at once iconographical and material

CHAPTER 19

Afterword

Esther Leslie, Samuel Iliffe, Lucas M. Mueller, Pauline Krijgsheld, Ann-Sophie Lehmann, Sophie Pitman, Samir Boumediene, Benjamin Aldes Wurgaft, Leah Anderson and Maximilien Urfer

Following Patrick Joyce and Tony Bennett in their widely-read account of *Material powers* (2010, 21), with *The matter of mimesis* we seek 'to extend thinking beyond the familiar division between what is and is not "material"'. Ongoing debates in anthropology and the sociology of knowledge over 'assemblages', 'actants' and 'quasi-objects' (hybrids of the social and the natural) are currently reshaping scholarly models of materiality in ways that challenge claims about material determinism. The implications of these discussions for other disciplines are still unfolding. Our volume has approached materiality from the vantage point of the replicated object, a fruitful and provocative instance that allows us to construct the complex relations between social and political agency, meaning, making and use for a variety of different cultures and circumstances. At the same time, we as scholars feel a need to be reflexively attentive to our own position, given the major transformations in techniques, media and technologies of replication such as 3D printing, cloning, and digital humanities that are in the process of reshaping not only our labour as scholars, but even its object; not only our source materials, but even our understanding of what counts *as* a source; not only our daily lives, but even our sense of self. Such was historically the case with new media. Benjamin's *The work of art in the age of mechanical reproduction* (1936), for example, famously grapples with the way that theories of artistic creativity based on appeals to subjectivity, genius and autonomy were challenged by the mechanical reproduction of works of art. Benjamin saw the value of a work of art as both reduced by reproduction and rendered subject to political interventions which altered its original meaning. Today, we face similar challenges, albeit posed by very different media, which present viewers with increasing difficulties in differentiating between reality and its many representations, as the essays of both Conte and Kromholz in this volume vividly illustrate. It is not *infidelity* in the act of representation that concerns us (as it did early moderns); rather, it is the ever-growing *accuracy* that new technologies afford that is problematic, for it seems to obliterate even the possibility of authenticity, originality and especially uniqueness. In

William Gibson's *Neuromancer* (2001), one of the trademarks of high-quality virtual reality is its reproduction of imperfections such as dirt, which approximated the virtual world more faithfully to the real one than cheaper VR. This theme of reality as underpinned by imperfection, with its play on Platonism, is addressed in our volume by Henning's chapter on another new medium of reproduction, the daguerreotype.

Authors of science fiction have long warned of the dangers of going astray in the world of the mind, of blurring the boundary between the material and the ideal. New materials and new media constantly throw up new challenges of precisely this kind. We have ourselves become hybridised with our artefacts. The objects of material mimesis can stand in various kinds of relations to ourselves, relations which are not only historically and culturally specific, but also prospective. Their outcomes and effects are indeterminate. In the film *Elizabeth harvest*, which supplies the epigraph for our book – an updated version of the Bluebeard myth – the eponymous character is a woman who has been cloned multiple times by her scientist husband so that he can murder her again and again. As the capacity to replicate encompasses even the fabric of living bodies, so the purposes to which material mimesis can be put diversify ever more, from lightbulbs to artificial meat, from the Shroud of Turin to nanoparticles, from 'antique' ceramics to geckel.[1] So too do the forms of identity and agency needed to engage with them.

♦ *What follows is an exploratory enterprise*. The matter of mimesis *is a work with multiple dimensions, spanning numerous disciplinary areas, a quality dictated by the broad-ranging implications of its subject matter. Our introduction raised more avenues of enquiry than could possibly be addressed in a single volume, and material mimesis, as an act, embraces a plurality of disciplines. As editors, we decided that inviting a single scholar from our current, carefully honeycombed world of specialisms would not facilitate the kind of broad-ranging perspective we sought to accomplish with this book. Accordingly, we invited a number of specialists working in very diverse fields to provide contributions. We asked them to respond to three questions*:

– What would you describe as the main way in which your work engages with material mimesis?
– What kinds of groups of practitioners and users are involved in your work?
– How do you envisage mimetic material practices changing future material culture and/or society?

♦ *This Afterword is the product of their reflections. It makes clear that not only are different disciplines involved in practices of material mimesis, it is also possible to* express *material mimesis – to write and reason about it – in very different ways. The contributors have adopted very different perspectives upon what material mimesis is, who does it, and how it might develop in the future, as material needs, uses and significance transform or vary over time and place.*

♦ *We begin with* Esther Leslie*, a critical theorist who explores the ways in which matter and materials – chemicals, plastics, liquid crystals, dyestuffs, glass, ice, dairy, to name some examples – shape and are shaped by historical, political processes*:

Esther Leslie: Tender Empiricism

In relation to the various objects I have looked at of late – liquid crystals, milk and butter, clay and porcelain, clouds and fog, the glass of touchscreens – I have been interested in the ways in which a material suggests its own modes of approach, its theoretical unravelling, as suggested by Goethe's 'tender empiricism': All factuality is already theory, he observes. This is how I might first understand material mimesis – to read a liquid crystal is to explore it from the perspectives of liquidity – how it allows for flow – and crystallinity, in what ways it freezes the world, social relations, and in what ways its flips from phase to phase offer new ways of engagement socially and historically. The clouds and fog arrive with a flurry of ideas of fuzziness and obscuring, of naturalised forms and mobility – all of which are transferred into their apprehension in the hi-tech world of cloud computing and fogging networks. Milk is a material of endless extension, distributed in our cultures as milk of kindness, as sexualised fluid, as white supremacist token, as prerequisite of a technological quest for enhanced humanity, and on and on. Milk spills into various histories, and has the capacity to be present in various forms – liquid, solid, powder, emulsion, froth or foam. It can be, has been, poured, pressed, cast, extruded. It is formless, but may take on any form, any shape – the shape of vessels or the shapes pressed into it when in solid form as butter or ice-cream – blocks or coils, or sometimes cartoonic characters or body parts. Milk may be indexical. In that indexicality, I find compressions of significance. My recent work is on how wind and rain built a synthetic chemical industry in Teesside, in the North East of England. Natural capacities forged history and social forms in the conglomerate Imperial Chemical Industries, which gave a boost to synthetics

in the UK, a problematic one, yet no less problematic now it is no longer in existence, and it leaves a wrecked environment behind it.

I have worked with artists who seem drawn to my poeticising of materials, finding within them political, social and historical resonance, ways in which they as materials transform worlds or close off possibilities – for example Geraldine Juárez, who works with gorilla glass from smart phones and with ice. Or Philippe Parreno and Agnieszka Kurant, who were drawn to liquid crystals. Or Kerstin Schroedinger and Mareike Bernien, who developed filmwork around the idea of artificial dyes and colour processing in Nazi Germany and the GDR, with reference to my book *Synthetic worlds: Nature, art and the chemical industry*. I have worked most with Melanie Jackson, collaborating on various projects. One goes under the title *The Urpflanze*, and was about Goethe's imaginary plant that contains, coiled up within itself, the potential to generate all possible future plants – Walter Benjamin extends this into a notion of the anticipatory idea of all future forms coiled up in select objects. Science nowadays looks to primordial plant matter for clues on how to proceed. Plant science becomes an art of morphology and mutation, re-presentation and transformation, characteristics it shares with the medium of drawing. Contemporary plant science assumes the ability to create as yet undreamt of botanical objects, using an array of tools and techniques, such as nanoscience, transgenics and biomimicry. Our work on milk, called 'Deeper in the pyramid', allowed the mingling of writing, painting, video-work, sculpture, print forms and exploratory work with actual materials – the powders, liquids and solids of dairy – to empirically explore material meanings and capabilities. This led to a commission to explore butter for an Irish art biennale. Grass-fed cattle making butter becomes a material slide into a panoply of themes around veins, gold, extraction, invention, witches, bogs, the dairy and more in relation to Irish and global history.

Contemporary science spends much energy on advanced materials, engineered substances that improve on nature. Sometimes they draw on nature, plunder its aspects, in order to find ingenious ways to do things that were previously done elsewise or never done before. Biomimetics applies principles from engineering, chemistry and biology to the synthesis of materials, synthetic systems or machines that have functions that mimic biological processes. Biomimetics recognises nature as the progenitor of complex materials and structures, for example, a mosquito-control device inspired by the mechanism of the carnivorous *Utricularia vulgaris* plant, a kinder hypodermic needle based on the mosquito's proboscis, made of several thin needles, lower air-resistant turbine blades with humped edges similar to the humpback whales, thermal clothing modelled after polar bear fur, micro-mist spray

technology copied from beetles, hydroelectricity captured in something modelled on the bell shapes of jellyfish, solar-powered signs with pollution filtering mechanisms motivated by marine creatures like salpidae, paddlefish, and peacock worms, bat sonar imitated to fly drones around obstacles in the dark, the wrinkling of a skin to repel dirt or to clean. These activities, such as the last mentioned, sometimes involve nonlinear behaviours that challenge old notions in physics. And space-time is reconceptualised from the perspective of the non-human. Slime moulds for one have been used for urban design, specifically road planning. *Physarum polycephalum*, the 'many-headed slime', is a plasmodial, single-celled organism that expands from a single point, in its quest for food sources. Having located them, its many branches die off, leaving a slimy, single-celled efficient route between the nodes of food sources. There are suggestions, not fully comprehended, that the slime may possess a memory of those lost routes, which could be operationalised one day. The possibilities of mimesis are immense, compelling potentially a re-recognition of nature's remarkableness and a demoting of bourgeois arrogance.

♦ Samuel Iliffe *is a Designer as well as a Material Scientist and Engineer, with an interest in how new materials can be used to solve everyday problems. In his work, there is a seamless relationship between the natural world and scientific practice: the two articulate in the imitation of evolutionary solutions to problems of materality.*

Samuel Iliffe: Against Anthropocentrism

Now

As a design engineer I am interested in using elements of mimesis to broaden our traditionally anthropocentric view of the world. The humble desert ant can trace its way back home after travelling miles across featureless desert, which from a human perspective seems like magic. However, scientists have discovered that these ants can perceive polarised light, and, using it as a compass along with dead reckoning, they can locate their way home. A project I was part of called Aweigh attempted to materialise this perception for humans, using polarised light sensors connected to an LCD display, acting as a form of navigation that didn't rely on GPS.

Mimicry can be used to imbue information into a material, like recreating the texture of wood in plastic to feel more 'natural' to humans, but the effects can be even more profound with animals. Certain smells (or semiochemicals) can carry information to animals that is imperceptible to humans. Queen

Mandibular Pheromone, or QMP, is used by the queen honeybee to attract her worker bees. It is possible to impregnate this semiochemical into materials like plastic and immediately attract honeybees, and this technique is frequently used in beekeeping. In a research project called Aromavert, I created a toolkit which could enable other designers to use these cues, specifically for steering animals away from danger. In one example, I looked at seabirds which are inadvertently caught in fishing nets as bycatch. Using a chemical found in the liver of sharks, these birds can be repelled from the nets almost immediately.

To test the design, I went gillnet fishing with one of the last gillnetters on the Thames. It was a baptism of fire, heading out with the fisherman on his boat, catching fish and learning about their life. He was open to new designs, but fishing is a tough business, where things must work without fail, so I knew that whatever I designed would need to be simple and robust (and not affect the fish catch in any way). The final design was an infuser containing the repelling chemical, attached to the net container that the fisherman used.

Throughout these designs I constantly collaborated with scientists and researchers. My role as a designer is often to look at new potential applications of work done by other scientists. When done without respect for the scientists' work, this will come across as akin to stealing or appropriating, but when done correctly, design not only applies the research to society, it brings that research to a wider audience, and helps people understand its importance.

Future

There are lots of possible shifting events, known in the design world as weak and strong signals, that relate to mimetic material practices and which will shape society.[2] Strong signals like the climate crisis and the connected loss of biodiversity are making it painfully evident that we must change our use of materials.

We will be incorporating more 'biomaterials' that mimic the desirable properties of fossil fuel-based materials like plastic. Much of my work with the design studio Atelier Luma has been uncovering the uses for algae for this purpose. Algae refers to a large group of organisms known for supplying 60–70% of the oxygen to the planet, as well as sequestering carbon dioxide. If algae can be used to mimic other materials, like plastics, they might offer a version that is not only less harmful but positively beneficial to the planet, while still being economically viable.

We might start using mimetic material practices to change the idea of waste, perhaps borrowing from the aesthetics of the antique or vintage item, and moving away from a material being simply for one purpose.

I hope we will use mimesis to improve our understanding and empathy towards each other and our ecosystems. By translating information outside our perception to information we can perceive, we can begin to truly empathise with the world around us.

♦ Lucas Mueller *is a historian interested in environmental crises in the nineteenth and twentieth centuries. He investigates how scientists have represented natural disasters and hazards in laboratory studies, field experiments, and computer simulations to study cause and effect and to control damage. In these practices, mimesis is deeply embedded in the way scientific knowledge-claims are demonstrated and made credible*.

Lucas Mueller: Mimesis, Analysis, and Synthesis in Regulatory Science

Identifying, measuring, and monitoring contaminants have constituted key mimetic practices of late twentieth-century regulatory science. From setting standards for the amount of contaminant allowed in food, to comparing the prevalence of a 'natural' toxin to such standards, regulatory scientists produced these abstractions through the analytical power of animal experiments and physicochemical instruments. Scientists determined and synthesised the molecular structures of toxins, then simulated and reproduced them in an experimental setting as standards, mimetic artefacts by means of which to regulate the nutritional quality and commercial value of food. This standardised and routinised form of science has become central to the governance of health, trade, and environment in the late twentieth century.

The history of aflatoxin as a standard for assessing food quality illuminates the mimetic practices in regulatory science. Aflatoxins are some of the most potent carcinogenic substances known to science, causing lethal liver cancer. In the spring of 1960, veterinarians were investigating mass mortality of poultry on British farms. Initially they identified peanuts from specific feed consignments to be the source of Turkey 'X' disease, but soon discovered aflatoxin, excreted by *Aspergillus* moulds found within the feed, as the final cause of the mortality. The scientists isolated aflatoxin by feeding samples to living ducklings, which acted as 'mimetic detectors', validating the samples' toxic contaminant by reproducing its effects, the avian disease.

By November 1963, the US Food and Drug Administration began to cultivate the mould on a massive scale to produce aflatoxin as a research substance and

standard. The FDA's Division of Microbiology cultured the mould, the Division of Food extracted and purified aflatoxin, and the Division of Pharmacology tested it on ducklings.[3] This material was distributed to laboratories around the globe. As such, aflatoxin became a 'natural kind' from which to measure, compare, and contrast the supposedly natural contamination of food. Chemists and nutritionists at the Massachusetts Institute of Technology were among the recipients, obtaining 200 mg of crude extract from the FDA.[4] They purified the substance and determined its molecular structure with a whole array of analytical devices, including mass spectrometer, nuclear magnetic resonance spectroscopy, and day-old White Pekin ducklings. In 1963, they published the structure, a graphical rendering of the essence of that which was once signified by a strange avian disease. In 1967, they synthesised this molecule in the laboratory as a mixture of different atomic arrangements.[5] Researchers succeeded in synthesising aflatoxin in a single form forty years later.[6] Was that the most perfect mimesis of the food-born illness?

This vignette suggests that regulatory science's mimetic practices have depended on context to create nature and artifice. The notion that Turkey 'X' disease was reducible to the natural toxicity of substances like aflatoxin, which have a molecular structure, is not a natural fact but the product of a political economy of industrialised feed and food, and of practices of molecular sciences in the late twentieth century. Scientists relied on utilitarian as well as aesthetic judgements to decide which representation of nature was sufficient to serve as a standard that revealed the really real toxicity.

♦ Pauline Krijgsheld *is a biologist with an interest in how composite biomaterials can inspire innovative design solutions and new concepts of sustainable materials. Just as organisms can exercise mimicry to advantage, she argues, so too humans can put potential natural resources to use by exploiting expert knowledge of material properties in a sustainable and regenerative manner.*

Pauline Krijgsheld: Fungi for the Future

Nature can be seen as an 'effective and giant laboratory where trial and error experiments take place through evolution' (Bar-Cohen 2016). Nature constantly changes, and therefore, species and organisms are continuously evolving new mechanisms to avoid extinction, for example resistance to parasites. This is nicely illustrated by Lewis Carroll in *Alice through the looking-glass* (1871), when the Red Queen tells Alice*:* 'now, *here*, you see, it takes all the running you can do to keep in the same place'. Her words basically indicate that,

in order to be able to keep up (or to survive), you need to change continuously. We can make use of this knowledge that has been gained during evolution, for instance in mimicry, and incorporate it in new strategies or materials.

Müllerian and Batesian mimicry occur in nature from insects to plants. We may all be familiar, through the example of a wasp and an innocent insect like a hoverfly in the garden, with the use of Batesian mimicry by a harmless species that mimics or imitates the warning signals of a predator. When we think of the yellow and black stripes of wasps and bees, we may also recognize how similarity among unpalatable species confers mutual benefit (Müllerian mimicry).

Mimicry occurs at all levels, from microscopic to macroscopic, as can also be seen in nature: for instance, the plant pathogen *Fusarium oxysporum* is a fungus that infects roots using a functional homologue of the plant regulatory peptide RALF (rapid alkanization factor), in order to increase its infectious potential and at the same time suppress host immunity (Masachis *et al.* 2016). We ourselves can mimic, albeit on the larger scale. For instance, by examining the 'water collection properties' of the spines of the cactus *Opuntia microdasys*, we can mimic a mechanism for collecting water from air. In another example, the mechanism of the specialist neuron Lobula Giant Movement Detector (LGMD) in locusts can be mimicked to provide an algorithm that prevents collisions in self-driving cars. We can also learn from natural decomposers, creating new biodegradable materials out of waste products by researching fungal materials.

The use of fungi as material is not a new idea. In 3400 BCE, Iceman Ötzi carried with him an object made from the fungi *Fomes fomentarius* (tinder fungus) and *Fomitopsis betuline* (birch polypore), which he probably used as tinder. For this purpose, he used a part of the fungi that was treated by beating and placed into a 'firelighter kit' together with other plant and stone materials. Many consider fungi or moulds to be disgusting, as in the cases of mouldy food or rotten fruit, or a bathroom with black mildew. However, besides their uses as tinder or foodstuffs (e.g., edible mushrooms), fungi are valuable in many ways. For instance, they play a very important role in nature in degrading organic waste.

Fungi grow by means of hyphae, which form a network, the mycelium. By secreting enzymes, fungi are able to degrade polymers such as cellulose in the waste they colonise. We can use this ability to create materials; we can even create materials from waste products like sawdust, or the remains of tomato plants after the tomatoes have been harvested. These pure mycelium (fungal) or composite (substrate and mycelium together) materials can contribute to a circular economy: the materials are both natural and biodegradable. Currently,

we can create a range of mycelium (composite) materials possessing a variety of properties: they can be cork-like, leather-like, or foam-like. But there is still scope for improving and diversifying these properties.

In the project 'Research through design', we worked together with designers and artists to create tailor-made mycelia and new concepts of sustainable materials. Designers used the mycelium to make objects ranging from shoes and clothes (for example, a mycelium dress) to art objects. To get a better understanding of the uses of the materials, we have investigated the production factors influencing the mechanical properties of mycelium-based composites in collaboration with designers from TU-Delft and the Design academy Eindhoven. We found that if we changed the fabrication process, different performances could be produced from mycelium materials. The type of mushroom-forming fungus used, the substrate and the method of processing the material all influenced performance. For instance, the combined application of heat and pressure resulted in a composite material with a density, elastic modulus and flexural strength similar to that of natural materials like wood and cork.

Back in 2014, when we started working with fungal materials on the NWO project 'Mycelium design', we had to convince the public of the safety and usefulness of fungal materials. The first reaction was that fungal materials would not fit in a living room. Nowadays, however, many start-ups have adopted the interesting properties of fungal materials, and art, bricks and packaging material are being designed out of mycelium-based material, as well as vegan leather. I believe in the future we will look back in amazement at the indiscriminate use of non-renewable materials like plastics, which are so difficult to break down, and finally end up as waste in the environment, or piled up in giant landfills, or (in nature) causing harm to humans, animals and plants. I think we have been 'standing still' for too long, and haven't kept up with an environment that has changed.

Our projects will continue to see how far we can investigate and improve fungal materials for a variety of applications, from building a house on the moon to materials that can conduct electricity. Currently, we are seeing start-ups in the production of acoustic panels, dresses, shoes, packaging materials, surfboards, and even caskets from fungal material. In the future we will sit on circular-economy-proof, mycelium-based furniture, or even live in houses made out of fungal hyphae.

♦ *Trained as an art historian*, Ann-Sophie Lehmann *develops a process-based approach to art and visual material culture in her research. She studies how materials, tools, and practices partake in the meaning-making of art; how images and*

texts represent and reflect creative practices; and how knowledge about making engenders material literacy. In her contribution, Lehmann calls for an inclusive and precise terminology to describe materials' multifariousness across disciplinary boundaries.[7]

Ann-Sophie Lehmann: Speak, Materials!

In its beginnings, the material turn in the humanities and social sciences established itself against the hegemony of language and text as dominating concepts in theoretical discourse. While such concepts had initially helped to expose objectivist and empirical world views as constructions, as texts with particular authors rather than truths, this came at the cost of materials and things, which were driven out of discourse, and rendered irrelevant and invisible. This is the state of affairs that Arjun Appadurai criticised and aimed to change in his seminal edited volume *The social life of things* in 1986, and it still appears to be dominant in 2003, when Karen Barad (2003, 801) writes that 'Language has been granted too much power [...] every "thing" – even materiality – is turned into a matter of language or some other form of cultural representation'.

Things, and the materials from which they are made, have definitely arrived, and need not be positioned against language any more. What is more, because things and materials have become an accepted, even required aspect of scholarship, particularly in the histories of art and science, it now becomes possible to point out a curious blind spot within the critique of language's hegemony: the material turn itself has largely been effective through language. Scholars of material culture did not leave language behind and start to converse with things – like those at the Academy of Lagado, in Jonathan Swift's brilliant parody on the ambition of replacing language entirely with material objects – but materialised their scholarship through and in writing. On the one hand, the continuity of language as primary scholarly medium explains why some theoretical writings of the material turn can remain curiously abstract, despite their promise of direct material engagement. On the other hand, scholars who actually work with things, materials and processes adapted their language to fit their object of study better. This is no easy task. In 'The language of art history', Michael Baxandall (1979) found the field to be in need of a demonstrative language that could precisely describe what there was to see and experience in a work of art. Because of its sequential nature, language, he wrote, was intrinsically inapt for capturing the makeup of things, particularly when it came to their materials and textures. He famously illustrated this point through the

description of a green lead pencil. Finding words for its particularities, such as 'the scalloped edge of the green paint at the point where it meets the conical end', he actually demonstrated that the gap between words and materials bears a productive potential, if one only takes care to find and shape one's words in such a way that they resist languages' reductive force. Literally writing things 'up' and not 'down' results from the awareness of language's deficiencies, and can produce words more sensitive to their material environment.

I believe that the next step for the study of the histories of materials is to think about and develop a shared language for materials, in which a refined understanding of languages' comparative structure is paramount. Every artist, conservator, art historian, historian of science, chemist, philosopher and materials scientist knows that one material is not another. Yet the generic terminology used to diversify one of the largest possible container terms our language offers – 'materials' – suggests otherwise. Such a language would capture and relate chemical formulae, explain idiosyncratic behaviour in particular historical and geographical settings using different languages, and it would pay attention to the general and specific role materials play in works of art and science.

Material mimesis lies at the heart of a language sensitive to materials, because language relies so much on comparison, metaphor and likeness. To describe material mimesis – the interrelations of materials through superficial visual or physically and chemically deeply engrained likenesses – a refined vocabulary is paramount. In fact, literary studies introduced mimesis as a theoretical concept to understand how fiction is developed from descriptions of the real world.[8] A sensitive language is needed to describe the bafflement we experience in the face of mimesis, something which Michael Taussig (1993, xviii) pinpointed as its core quality: 'to marvel at its wonder or fume at its duplicity, is to sentiently invoke just that history (of imitation) and register its profound influence on everyday practices of representation'. The hundreds of new materials synthesised and engineered during the Industrial Revolution bear witness to that history, for their names derive in part from the materials they are in themselves, and in part from those they mimic. Take for instance the poetic *Galalith*, which means 'milk stone'. Subsumed under the family name of plastic, it was produced by hardening the milk protein casein with the toxic organic compound formaldehyde. The result had the visual and material properties of ivory and horn. It could be carved, turned on the lathe, and dyed with aniline. H. G. Wells (1922) wrote of such synthetic materials that 'many of the first employments of these gifts of science have been vulgar, tawdry, stupid or horrible. The artist and the adaptor have still hardly begun to work with the

FIGURE 19.1 'Original-Kunsthorn Marke "Galalith"'. Sample card no. IV, showing the different colour variants of Galalith or 'milk stone', a new material synthesised of milk proteins and produced in the early twentieth century to imitate horn and ivory. Mustertafel mit Galalith-Erzeugnissen Nr. 4, Internationale Galalith-Gesellschaft Hoff & Co. Harburg (Hamburg) 1928–1930

endless variety of substances now at their disposal'. From this nameless variety, Galalith assumed identity by being named. Worked into buttons, combs, piano keys and knife handles, and with a surprising durability, it convinced myriads of users of its authentic character, one bridging the division between animal (milk), vegetable (formaldehyde), and mineral (stone) – though the last only in name.

A masterfully comical evocation of mimesis's potential to excite wonder and irritation at one and the same time was, like Baxandall's seminal article, written in 1979. In *The hitchhiker's guide to the galaxy*, Douglas Adams (1995, 92) lets his thirsty hero stumble upon a particularly deceitful specimen of material mimesis in the cafeteria of a spaceship. Here, Arthur Dent finds 'a Nutri-Matic machine which provided him with a plastic cup filled with a liquid that was almost, but not quite, entirely unlike tea'. To let such materials speak, those that are almost, but not quite, entirely unlike others, is the next challenge for the material turn and those who study materials in all their beautiful, mimetic and mimicking complexity.

♦ Sophie Pitman *is a cultural historian of the early modern period with a particular interest in clothing, textiles, sumptuary law, and issues of luxury. She considers how mimesis in fashion operated to overcome the stumbling-block of social distinction in the face of sumptuary legislation in the early modern period:*

Sophie Pitman: Fashion Materials

Many iconic early modern fashions did not rely on the most sumptuous materials, but instead utilised innovative fabrics and techniques that imitated the sensory effects of luxury materials. Through my research, which examines material mimesis using archival, visual, and material sources and through hands-on reconstruction, I explore the ways in which skilled craftspeople imitated visual and material effects in textiles and other materials, which led to new craft specialisations, diversified the market, cleverly skirted legal restrictions, and enabled people across the social spectrum to participate in fashion. I am also interested in recovering how mimetic fashions might have been thought about by the early modern men and women who wore them.

Mimetic materials provided the non-elite with fashionable dress within their budget and in line with sumptuary laws that often restricted the use of fine fabrics, rare dyestuffs, and exaggerated silhouettes. Many of these imitations, like mockado (velvet woven with wool and linen or hemp rather than silk) or copper lace (simulating gold) were made by enterprising immigrants, women, and children who were not part of official guild structures, and so invented desirable novelties that were not yet controlled or taxed. We can often follow their material negotiations by seeing how imitation goods retained visual and physical traces of their inspirations. For example, cast pewter buttons still copy the three-dimensional raised patterns created when silk is wrapped around wooden buttons.

Some guilds restricted their members from working with mimetic materials in order to protect both buyers and sellers (there could be harsh penalties for deliberately deceiving a buyer and thus damaging the guild's reputation). But many successful simulants were adopted by guilds or new corporations, such as the Venetian *supialume* makers who controlled the manufacture of blown glass imitation pearls from 1672 onwards. Most mimetic fashions were not designed to mislead the purchaser, but were presumably worn in the hope that they would give a suggestive impression at a slight distance. Sumptuary laws sometimes explicitly forbade the use of fake materials, suggesting that convincing visual effects might be more problematic than the material 'truth'.

For example, Spanish legislation specifically noted in 1551 that hats could not be adorned with gold decorations, even if the gold was fake.[9]

Simulation materials were eagerly consumed by those wealthy and elite enough to acquire the real thing, so they should not be regarded as inferior substitutes. Mockado fabric and 'artificial pearls' are found in elite accounts, so they must have appreciated these alternatives for silk velvets and natural pearls which were both legally and financially available.[10] Courtly splendour required such a magnificent display of extravagance that members of the elite also needed what Timothy McCall (2018) has termed 'material fictions' such as *oricalco* (brass gold substitute) or paste gems and coloured foils in order to create the effect of shimmering brilliance expected of the elites on a vast scale.

In March 2020, the Refashioning the Renaissance project reconstructed Isabella Cortese's recipe for 'counterfeit pearls that look natural', which involved making clay beads, coating them in Armenian bole and egg white, gilding with silver, and adding lustre with parchment glue.[11] While we were initially skeptical of these materials as we worked up close with burnishers and brushes – how could sheet-silver mimic white pearl? – when we glanced across laboratory benches at one another's pearls, we realised that the imitation worked successfully at a distance. Cortese's imitations even promised to improve on nature: 'when you compare it with a real pearl, this will always seem more beautiful to the eye for being more lustrous and rounder'.[12] The language used regarding these objects suggests that mimetic materials were highly regarded simulations of nature made by skilled human hands, fit for even the most important of occasions. When James I was crowned at Westminster, he wore a mix of real and fake gems in his cloth of estate; the invoice lists topaz, sapphire, emerald and ruby alongside 'Stones lyke topasses […] lyke saphyres […] lyke emaraldes […] and other made stones'.[13]

I believe that 'made' materials could be so successful that many early modern imitations are hiding in plain sight. As scholars turn their attention to the mimetic materials of fashion, we might start to reconsider what we see in historical portraits (does Eleonora di Toledo wear a real or a 'more beautiful' fake pearl in her portrait?) and re-examine objects in museum collections using scientific testing to check that objects are what we assume (are velvets woven with silk or blended fibres cleverly treated to imitate silk's lustre?) By paying attention to mimetic materials and reconstructing imitative processes, we can reveal how early modern fashions were not worn to imitate one's superiors but rather were creative responses to social, economic, legal, and material restrictions. We might also consider how the culture of imitation relates to the later

FIGURE 19.2 Sophie Pitman holding a fake pearl made according to instructions by Isabella Cortese, *I secreti* (Venice: Giacomo Cornetti, 1584) next to a natural pearl
IMAGE COURTESY OF THE REFASHIONING THE RENAISSANCE PROJECT

development of synthetics that further accelerated the fashion world into the fast, dynamic, and environmentally damaging industry we know today.[14]

♦ *Trained as a historian of early modern knowledge,* Samir Boumediene *studies how everyday-life practices such as cooking, healing or gardening are governed and commodified. He's particularly interested in the history of plants and the use of* succedanea, *the substances chosen to substitute for medicinal materials. They raise vital questions about cure, trust, and above all what 'it' is that is to be imitated.*

FIGURE 19.3 Studio of Agnolo Bronzino, *Eleonora di Toledo*, *c.*1562–1572. Oil on panel, 77.8 × 58.7 cm

WALLACE COLLECTION, LONDON. IMAGE: CC-BY-NC-ND 4.0

Samir Boumediene: Differences that Matter: Material Substitution, Value and Innovation

In these comments, I will consider material substitution from research I've been conducting on the history of drugs and on the use of *succedanea*. In this perspective, material substitution involves a major philosophical question: what is difference? If we follow the classical distinction between difference of nature and difference of degree, we could consider material substitution as an illustration of the second case: a *succedaneum* is almost the same thing as what it replaces, but with a small difference of degree. In practice, things are more complex. You can replace a material by another one that is *very similar*, but you can also replace it with a *completely different* one.

In the first case, the key question is to determine the differences that matter and the ones that don't. For instance, *Artemisia absinthium* and *Artemisia vulgaris* can be used indifferently in some situations, because there are enough similarities between them. Such an assumption raises several issues, however. Firstly, if you can ignore some differences, you can also hide them, and this is why, in practice, substitution can facilitate fraud. Secondly, the situations in which differences *don't* matter are not as stable as it might appear: Alain Touwaide (2012) has shown that Ancient practitioners needed to follow rules that defined the people, diseases and contexts in which small changes could be hazardous. But, thirdly, the fact that differences *do* matter also opens other possibilities: if a *succedaneum* can in some cases be less efficient than the original, in other cases it can be better. Substitution allows therapeutic modulation and innovation.

Let's consider, now, the second case: how can one material replace another that is completely different? Here, the key question is to determine the property (or the set of properties) shared by two things. For instance, the malleability or resistance of some plastics make them useful for replacing ceramic, wood or bone. In these cases, the artificial substitute is expressly designed around the property it imitates. Although diametrically opposed to the previous example, this one raises exactly the same issues: the substitute may lead to fraud, it may be either worse or better, and it may pave the way for innovation. A specific question is raised when a product has been designed to have just one property. It can be an advantage if the material it replaces has other properties considered to be dangerous, but it can be a problem if the power of the original material resides in the complexity of its structure that the substitute does not mimic. The core of the debate between synthetic pharmacology and phytotherapy lies here.

Hence, the issue of difference is linked to another issue: value. By positioning heterogeneous items on a unitary scale, value creates at once commensurability

of and hierarchical differentiation between them. Here I will limit my comments to mercantile value, where the unitary scale is expressed by prices, and where the production of a commodity is captured in two ways of behaving with it: using and selling. This struggle between 'use-value' and 'exchange-value' was at the core of a notional transformation occurring during the sixteenth century. Until that time, as I have argued with Valentina Pugliano, the notion of the *succedaneum* was neutral: it referred to any kind of substitutive remedy.[15] With the development of the exotic drugs trade, a second, depreciative meaning began to appear: as with the German 'ersatz', *succedaneum* referred to a second-choice option. In the language of mercantile value, this was expressed as a lower price. Accordingly, the use of *succedanea* implied a calculation: for whom was low cost more important than better quality?

The depreciative connotation of *succedanea* has been reinforced by their link with fraud, which precisely consists of substituting a less valuable product for the original without declaring it. This has contributed to the neglect

FIGURE 19.4 A goa stone. Made in India from a paste of clay, crushed shell, amber, musk and resin, this object was a common early modern substitute for the stones found inside the stomachs of certain kinds of animal, known as bezoar stones, which served in medicine to treat numerous complaints and as an antidote to poisons. While contemporaries knew that artificial and natural bezoar stones differed in origin and composition, goa stones remained highly valuable commodities throughout the early modern period, and were stored in ornate containers, as shown here

of substitution as a theme in the history of knowledge. Some seminal works, however, have shown how crucial reproducibility was in early modern science and technology: what processes could be imagined to certify that two things or two phenomena might be considered equivalent? In the secrecy of laboratories and apothecaries' shops, fraud occurred not only when practitioners wanted to decrease their costs, but also when they confronted shortages of an ingredient. At any rate, creating an equivalent product, whether at a lower price or not, was a constructive way to face constraints.

If mimesis can be considered as the production of the self, it also consists in understanding the difference between self and other. Adulterating a product requires knowledge of how to conceal differences – and consequently also of how to see them. In seventeenth-century Livorno, for instance, the apothecary Giacinto Cestoni was considered the best supplier of exotic plants: the papers he left show that he knew exactly how they were adulterated. Following the intuition of historians of art, we could say that the best expert is always the *faussaire* or forger.

Another way to understand the role of substitution in the history of knowledge is to focus not only on the substituted thing, but also on the substituting thing. For instance, if we wanted to replace sugar, all ersatz substances will be considered to be 'quasi-sugar' and substitution will be considered to be emptiness. But if we examine this story from the point of view of the substitut*ing* product (stevia, for instance), substitution will be an addition that leads in this case to a new use of the plant. Many of the remedies employed against particular diseases were originally used as substitutes for others (something today referred to as 'drug repositioning'). A large part of the history of medicaments is to some extent continuous with the history of *succedanea*. Accordingly, the value of products derives not only from their acknowledged properties, but also from their capacity to imitate others, or, contrariwise, from their non-substitutability. In other words, high value belongs either to the product that cannot be replaced (in the history of pharmacy, the specific, i.e., the only substance that is effective for treating a particular disease), or to the product that can replace all the others (the panacea).

In today's world, we find this intertwined history of innovation, science, commerce and technology in debates surrounding forms of renewable energy (is it possible to replace carbon?), but also in the production of soy, an almost universal substitute for meat, forage, plastic, etc.[16] This leads me to a final remark. If the search for alternative solutions can be a motor for innovation, it can also make knowledge disappear. In a world where everything can be replaced by the kind of low-cost solutions William Morris criticised in his time,

many practices may be lost.[17] When overused, material substitution tends to lead us to forget that differences matter.

♦ Benjamin Aldes Wurgaft *is a historian, writer, and ethnographer whose recent work concerns copying meat by growing it in laboratories. This seemingly most obvious and ethical of mimetic acts, however, is fraught with complexities deriving from meat's entanglement with consumers' aesthetic expectations and their corporeal self-knowledge*:

Ben Wurgaft: Mimicked Meat

There are many ways to mimic meat, defined for these purposes as animal muscle and fat consumed as food. You can fold sheets of bean curd to imitate duck, chicken, pork, or beef, a method traditionally used to provide vegetarian meat in China. You can turn pea proteins into a kind of slurry, along with other ingredients, and then extrude them at high pressure and temperature to create a "burger" with something approaching the texture and flavor of conventional hamburger. Such tactics try to approximate the sensory qualities of animal muscle and fat while using a very different, plant-based, substrate. But why not mimic meat using animal cells? From 2013 to 2019 I conducted ethnographic research with scientists, engineers, and entrepreneurs who hope to produce 'cultured meat', which begins with animal muscle stem cells carefully cultivated in bioreactors.[18] At the time of writing, cultured meat is not yet a consumer product. Two motivations for creating cultured meat predominate. Many in the 'cultured meat movement' hope that they can replace much of conventional industrial agriculture with cultured meat, undercutting, first, the enormous cruelty to animals that industry entails, and second, the significant environmental footprint of that industry; by some accounts animal agriculture produces 14% of the world's greenhouse gases *per annum*, and is very expensive in terms of land and water used. From the perspective of mimesis, though, cultured meat entails both technical challenges and a certain critical perplexity, the latter because it does something quite unusual: copying a naturally occurring form, animal flesh, not by using a different substrate, but by using the expected natural substrate, artificially grown. You could call cultured meat a 'carnal skeuomorph'.[19] Skeuomorphs (Greek for 'container-shapes') are objects defined by their shape, rather than by a necessary relationship between material and shape. Sometimes they develop because a group of designers and builders continue to produce the same form while working with new materials.

In Classical Greek buildings, the 'dentils', little square protrusions under cornices, are thought to be a remnant of the ends of wooden cross beams used before the Greeks began building with stone. But what might it mean to take the form of meat (a chicken drumstick, say) and then fill it with lab-grown cells, producing meat as a kind of skeuomorph of itself? Such a gesture would imply that the material we call 'meat' has become significantly, and uncannily, plastic. This would utterly change the nature of meat as a material. Cultured meat could utterly sever the organic relationship between material and form. But notably, cultured meat scientists haven't yet (at least to this researcher's knowledge) successfully copied drumsticks, or any other form of meat that is clearly part of the animal body. This is because of one remaining technical hurdle yet to be cleared: the thickness of tissue we can grow in a bioreactor. While teams have successfully grown sheets of cells and then shaped strands of muscle fibers into a loose collection of tissue to produce hamburgers and sausages, a steak, or any other form of meat very reliant on texture, would be much harder. Such forms rely on layers of muscle grown (with some interleaving fat) in precise configurations, much as they occur in the animal body. To grow them would require a bioreactor capable of transporting nutrients to all the cells; mammalian cells, for example, can only thrive within some 200 micrometers of a nutrient supply, which is why sheets of cells are easier than more three-dimensional constructs. But if the future of meat mimesis remains unclear, the present is already uncanny. There are already versions of fast-food meat, such as the McDonald's McRib, which involve bits of meat pressed into new, meat-like shapes: meat's relationship with itself is becoming more skeuomorphic even as I write.

♦ Leah Anderson *is an artist and teacher whose research explores the status of the unique, the multiple, and the copy in the work of art and other cultural practices, with a keen interest in material and immaterial expressions of* (*con*)*text.* Maximilien Urfer *is an artist and teacher, with a diverse practice that interrogates the points of articulation and overlap between different media* (*sound, performance, video, drawing, painting, text …*) *and their cultural forms, embedded within a space without differentiation between art and life. They have been undertaking short informal studio collaborations since the beginning of 2020. Here, they reflect on whether all forms of mimesis are the same.*

Leah Anderson and Maximilien Urfer: But the Same Things (In Three Chapters)

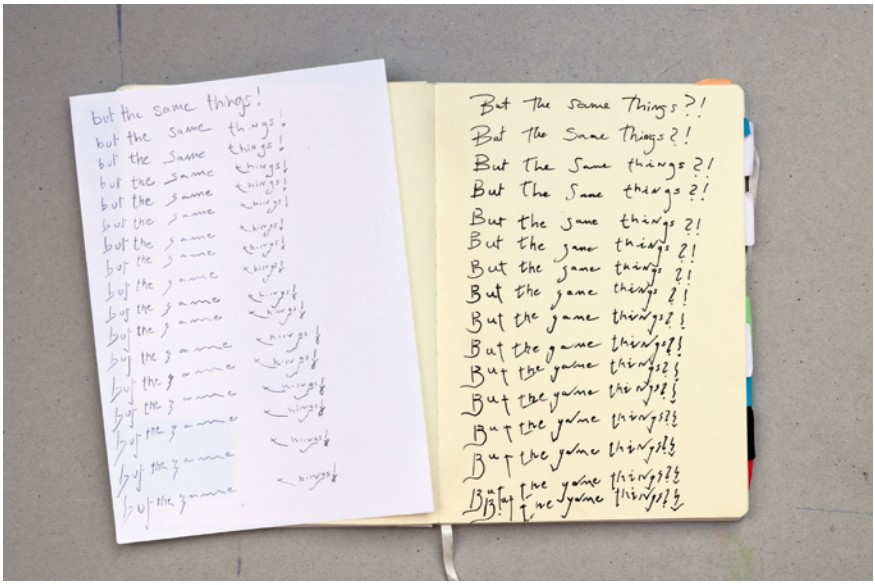

FIGURE 19.5 Maximilian Urfer and Leah Anderson, *But the same things* (2020). Pen and ink on paper

1

It's a weeknight in January, 2020. The two artist comrades are seated opposite each other on the train. They are going to the opening night of the Geneva Art Fair. They joke and laugh about the foibles of language and translation as well as the posturing of people who attend fancy art fair parties.

The irony is not lost on them.

MAXIMILIEN (in exaggerated local French accent): '*Mais les choses pareille!*'

(Between breaths of laughter): 'So how would you translate that literally?'

LEAH (in English): 'Hmm, let me think. I know: But the same things'.

MAXIMILIEN and LEAH: (laughter)

MAXIMILIEN (in English with a slight French accent especially on the 'th' of 'things'): 'But the same things. Yeah! But the Same things!'

MAXIMILIEN and LEAH: (laughter)

LEAH (mimics in English with an exaggerated French accent): 'But the same things! It works pretty well in English too'.

MAXIMILIEN and LEAH: (laughter)

2

It's a hot Wednesday in July, 2020. Maximilien and Leah are at the MODERNA art studio. They are drinking coffee and looking at a new stack of vinyl records. They begin playing different discs and messing around mimicking DJ gestures with the turntable system Maximilien set up. After an hour or two they redirect their attention to the mimesis project. They talk through their different ideas for a while, then Maximilien walks over to his shelf of paper, removes a sheet, and grabs a clipboard and pencil.

MAXIMILIEN: (In French): 'At some point it's like we are always saying to students at the school, isn't it? Stop overthinking and just do something [...]'

LEAH (opens her notebook to a fresh page, removes a pen from her desk and responds in English): 'Yeah you're right, let's give it a try'.

MAXIMILIEN (in French): 'What should the sentence be?'

LEAH (in English): '*But the same things*, of course'.

MAXIMILIEN and LEAH: (each writes the sentence on their respective pages of paper. They pass their papers and pen/pencil to the other and try to copy (as best they can) the sentence the other has written. They repeat this copying again and again, until their pages are full. It takes about 45 minutes. They chat, in a mix of French and English, about their observations of the activity unfolding, and the evolution of their project.)

3

It's a Wednesday in July, 2020. MAXIMILIEN and LEAH are in the music room trying out another activity and trying to work with some questions that remain after their mimetic drawing session earlier that month. They each play a two-minute segment on the keyboard and then try to recreate from memory (as best they can) the other's composition. As they listen to the recording playing back their sound experiment, they discuss what the limits between copying, reproduction, and mimesis might be.

LEAH (in French): 'Yeah, maybe that is it! Maybe that's where copying and mimesis are different'.

MAXIMILIEN (in French): 'Yeah. It's about how mimesis allows corruption and deviation in a copy because of how it incorporates the subjective'.

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Endnotes

1 Bijker 1995; Hughes 1985; Wurgaft 2019, 2020a; Miodownik 2014. 'Geckel' is the name of a biological adhesive that uses carbon nanotubes to mimic the structure of a gecko's feet (Autumn 2006).

2 Mueller 2021.

3 'Memorandum of conference. Subject: Aflatoxin (peanut mold toxicity)', 21 November 1962, Folder Aflatoxin Studies, 1962, 1963, vol 1; General Subject Files 1938–1974, 1963, 426.6 THRU 428.2.-.31, Box 3511; Records of the Food and Drug Administration, Record Group 88; National Archives at College Park, Md.

4 Asao *et al.* 1963.

5 Buechi *et al.* 1967.

6 Trost & Toste 2003.

7 Minar 1999.

8 Auerbach 1994.

9 Wunder 2019, 258.

10 See examples in Pitman 2016, 2019.

11 For more on this, see Pitman 2020a, 2020b.

12 Cortese 1584, 205.

13 Spilman & Herrick 1914, 94. Thanks to Michael Pearce for this reference.

14 This research is part of the Refashioning the Renaissance project that has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement number 726195).

15 Boumediene & Pugliano 2019.

16 Du Bois 2018.

17 Morris 1996.

18 See Wurgaft 2019.

19 See Wurgaft 2020b.

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STUDIES IN ART & MATERIALITY 7

Mimesis or imitation comes in many forms, from animal and plant mimicry to artistic copies 'from life'. This book offers eighteen essays addressing mimesis from diverse perspectives. From the recreation of galaxies to Iron Age torcs, from counterfeit dragons to modern waxworks, each chapter explores facets of material mimesis from prehistory to the present day. *The Matter of Mimesis* invites readers to compare practices of imitating, faking, and synthesising materials and objects in nature, art and science, raising questions about skills, techniques and politics of making that transcend historical and disciplinary boundaries and inform both our past and future worlds.

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BRILL.COM/SIAM
ISSN: 2468-2977
ISBN 978-90-04-39249-6