

Introduction

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A bowl of water desires to enter the cucumber next to it and does so overnight; a physician presents a lamp eternally powered by blood to prove he is not a charlatan; a surgeon advises his patient not to freeze off the new nose he has sewn out of arm skin onto his face; guests in a foreshortened garden arch grow conscious that their host watches through hidden sight lines; a diamond threatens to crack, then heals itself; a statue of Christ opens its mouth, and the faithful know the priest has tugged a rope; a merchant eyes an Aztec feather cloak, delighting in the knots he cannot see. These are instances of how early modern Europeans experienced ingenuity—as innate powers of matter, crafty technique, or a maker's character.

These instances belong to the overlapping histories of art and science, both of which have placed makers and making at the center of the new regimes of attention, knowledge, and value that—however troublesome the language of Renaissance or Scientific Revolution—characterize the early modern period. Across early modern Europe, contemporaries both lauded and reviled makers, their abilities, and even certain materials as “ingenious.” This volume seeks to show how ingenuity united the experience of substances, made things, and makers, but also allowed for distinctions to be made between the qualities proper to each. Over the last two decades, historians have turned toward practice and materials, inviting us to bind our categories of analysis more tightly to the contours of past experience. One such category is ingenuity.

As an early modern keyword for thinking about makers, their authority,

and their abilities, the language of ingenuity is fertile with tensions and associations.¹ Inventive intellect, ingenuous character, and penetrating insight could mark out an epistemic elite. Yet the very same words could imply low cunning and merely clever novelty. Historians have something to gain from embracing this ambivalence because it spans the spectrum between rarified intellectual histories and more polyvocal cultural and social histories.² Certainly, previous studies of ingenuity typically privileged three emphases that are different from our own, emphases often given ancient pedigrees. First, the history of engineering owes deep debts to *ingenium*, where the very word was first used for Roman siege engines and other machines, then denoted the distinctive minds of engineers in medieval encyclopedias, and finally became the source of the word engineer in most early modern vernaculars.³ Second, ingenuity was conceptualized within rhetorical treatises. When Cicero and Quintilian gave advice on verbal technique, they regularly invoked the rhetorician's inventive ability, sometimes innate and sometimes trained, as the source of powerfully crafted speech.⁴ Third, art theorists of the early modern period often applied this terminology to powers of invention in describing the divine qualities of artists.⁵

To be sure, all three traditions intertwine in influential early modern accounts of the arts. The rediscovered architectural and mechanical work of Vitruvius as well as the early writings of Leon Battista Alberti made *ingenium* the source of visual and mechanical invention.⁶ In the domain of letters, Cicero's and Quintilian's advice soaked through early modern Europe in countless handbooks. Many of these singled out ingenuity as the teachable site of poetic invention, perhaps reaching a high point in Baltasar Gracián's writings, which coiled a whole poetics around the conceptual framework of ingenuity.⁷ For art theory, Alberti's *Della pittura* (1436) and Giorgio Vasari's *Vite* (1550) set the agenda, placing *ingegno* among the defining features of great painters, sculptors, and architects.⁸ Modern historians of these traditions have mostly predicated ingenuity of outstanding individuals, characterized by powerful, creative, and original minds. The history of ingenuity has been subservient, that is, to a history of genius.⁹

We are not repeating this history but hope to redirect it. Early modern ingenuity was much larger than genius, and its cultural reach extended far beyond the relatively small domain that genius commanded before its apotheosis in early Romanticism.¹⁰ In this volume we take our departure from lexical studies, extending into conceptual, social, and environmental domains. Ingenuity was a commonplace that brought together a wide range of definitions, things, practices, and people. This book therefore pursues inge-

nity away from the usual airy peaks of geniuses, proposing instead to enter the populous, rich valleys where this commonplace structured the experience of materials, technique, and makers.

The main actors in this book are makers, a demographic that more and more preoccupies historians of both science and art. This is in part because old narratives have been repopulated from below. Historians of science have come to see how thoroughly the natural knowledge of theorists drew upon “invisible technicians.”¹¹ Academies of *virtuosi*, republics of letters, lovers of the arts, anatomy theaters, and courtly *Kunstammer* all depended on the skill of makers for their riches, and the networks of traveling projectors, apothecaries, gardeners, alchemists, surgeons, and clockmakers delivered the know-how needed to probe the limits of knowledge and craft new marvels.¹² To advertise their ingenuity in markets or at court, makers traded in appearances, dissimulation, and the ability to achieve maximal effect with an economy of means. Such strategies were not just whimsical but could be deadly serious examples of the resourcefulness required to negotiate these hugely competitive environments.¹³ Nor was this solely a celebration of invention and creative freedom. Alessandra Russo has begun to observe how Europeans used ingenuity as a quasi-anthropological category to assess the humanity of non-European peoples and their legal potential for exploitation.¹⁴ The moral enterprise of assessing humanity quickly shades into the dark side of ingenuity. Early modern makers often served bloody conquest or required the enforced labor of slaves within and outside of Europe. Even in period terms, recent studies of early modern makers have shown how mimetic skill could put them dangerously close to fakers and tricksters.¹⁵ Human nature, deception, and their various valuations are therefore major themes running throughout this volume, helping to bring into view the moral economy of early modern makers.

The knowledge of makers has pushed historians to consider more closely the experience of matter. Francesca Bray has summed up recent prominent trends, stating that “science is not just knowledge *about* matter: it is also knowledge that comes *through* matter.”¹⁶ Similarly, historians of art have enthusiastically taken up Michael Baxandall’s invitation in *The Limewood Sculptors of Renaissance Germany* to engage the materiality of art objects in order to understand past aesthetic experience.¹⁷ Matter and objects themselves often seem to speak, to act cleverly, to demand a response.¹⁸ That intuition has led historians to use performative methods in the laboratory in search of the phenomena that early modern makers experienced.¹⁹ Thus recipes, medicines, collections, tools, and other artifacts can be read as codifications of makers’

knowledge and techniques, or what Pamela Smith has called “artisanal epistemology.” By experiencing the reconstruction of an early modern recipe, the historian can learn from anthropology, identifying the constants of human experience across time and space in order to illuminate the ways knowledge is codified in that recipe.²⁰ Reconstructive methods can help us to read texts better, whether explaining what “fatty earth” might mean, or highlighting the physical resistances and difficulties of the craft procedure itself.²¹

Such methods have deepened collaborations between conservators, museum experts, and academics, pressing historians to ask more urgently how historical actors framed their experiences of materiality. What features of past experience *differ* from our own? An especially productive topic has been how, in early modern Europe, matter seemed capable of its own making—*natura naturans*—so that it was somehow “animated” or “spirited.”²² This was sometimes a religious language: the Eucharistic host was one important example, as were relics. But even the later mechanical enthusiasts of the eighteenth and nineteenth centuries found themselves resorting to organic language.²³ The experience of matter, bubbling with vitality and its own creative powers, was all the more intriguing for those who hoped to surpass Aristotle’s account of a soulish universe with a new natural philosophy, one that could encompass both artisans’ ateliers and courtly curiosities. Those empirical projects required categories for dealing with matter’s innate powers of generation. Ingenuity was an important conceptual idiom for such experience of matter, as the chapters of Part I especially show.²⁴

The focus on makers and matter has changed our view of knowledge itself as, since the 1970s, practices have moved to a central place in historical accounts of knowledge.²⁵ Even the most abstract certainties of mathematics now appear to depend on processes of making, so that the very notion of proof emerges out of cognitive and social practices of specific times and places.²⁶ It begins to seem no accident that mathematicians and artists—mathematics and art then being mechanical disciplines associated with craft—together deployed similar languages of ingenuity to gain status.²⁷ This focus on technique helps us see another side of early modern ingenuity. As long as it ran closely with genius, notions of wit and esprit seemed chiefly linked with spontaneity, light touch, and ease. Yet early modern practitioners associated ingenuity with labor, difficulty, and endurance as well.²⁸ Thus the category of ingenuity helps us not only to discuss the performative aspects of artistic practice and knowledge-making (e.g., gesture, grace, and naturalness) but also to draw our eyes to matters of training: workshop culture, master–apprentice relations, and tacit knowledge. *Ingenuity in the Making* therefore alights on

technique—a problematic term, as Chapter 9 below shows—as a distinctive aspect of ingenuity in practices of making, relating to the skill, discipline, and strength of working hands.²⁹

This book pursues these three interlacing themes: matter, technique, and makers. While each chapter has something to say on all three themes, each has been allotted to the section in which it speaks loudest.

We begin with matter in Part I, where we find *ingenuity* an idiom for the experience of matter's vital powers across the period. Jennifer Rampling uses Chapter 1 to examine how Giles Du Wes, librarian to Henry VIII, dramatized Nature as an ingenious figure, reflecting matter's power to generate new metals as well as life; matter's ingenuity therefore teaches and prompts a like response from the alchemist, who must cooperate with nature to achieve his ends. In making matter an active partner with the practitioner's learning and generating of novelty, Du Wes drew on themes that Rampling finds at key points in the major authorities who defined late medieval alchemy. Similar experiences of matter influenced those most commonly associated with the later mechanical philosophies, Francis Bacon and Robert Boyle. For years the overseer of royal patents to inventors, Bacon certainly appreciated the insights of mechanicians over the forms of Aristotle. Yet matter resisted simple mechanization. Doina-Cristina Rusu shows in Chapter 2 that Bacon's own efforts to grapple with concrete instances of natural change found matter pregnant with appetites, desires, and even habits of deception. Similar experience of nature as full of activity shaped Boyle's influential experience of gems. In Chapter 3 Michael Bycroft nuances the usual account of Boyle as arch-theorist of even unseen properties as the product of inert primary qualities. On the contrary, Boyle theorized about the liveliness of matter, and he did so because he trusted the language of ingenious matter in which expert craftsmen and merchants discussed and evaluated gems.

Ingenuity offered an environmental framework for examining the properties of the earth itself, suggesting homologies between the matter that characterized a locale and the people born in that place. For Bacon and Boyle this was a sociological link: the nature of their informants fitted the nature of the matter they considered. Andrés Vélez-Posada shows how such analogies could be extended to the environment. In Chapter 4 he considers the massively growing industry of mining and offers ingenuity as the category that early moderns used to link the craft of miners to local natures (i.e., the various geological characteristics of the mountains they mined), which could

be extracted as distinctive ores and displayed in the artful design of *Handsteine*. These artifacts consciously and playfully functioned both as tools of extractive states and as games for knowing statesmen.

Part II, our second thematic cluster, focuses on technique, the engagement of laboring hands with matter. Tina Asmussen in Chapter 5 builds on the themes of Part I, presenting the ingenuity of miners as carved into their bodies as well as the sides of deforested mountains. In particular, she extends the environmental framework of ingenuity into a “workscape,” in which miners presented their own toil as a moral, spiritual response to nature’s creativity. Such examples draw our attention away from the well-known intellectual traits of the ingenious individual to emphasize instead the embodied nature of skill. This may seem clear in the case of mines, sites driven by sweat and machines; yet early modern desks also were described as sites of ingenious labor. In fact, ingenuity was perhaps most often invoked in contexts of pedagogy, whether in the classroom, the artist’s workshop, or the anatomist’s theater. In Chapter 6 Hannah Murphy examines the case of calligraphy. The German manual writer Johannes Neudörffer took up the framework of ingenuity to argue for the transformative power of this craft skill: he presented *Verwandlung* (literally, “metamorphosis”) as a scribal mode of fertile composition that could be understood only in performance. Writing here displays not verbal skill but dexterity of hand and eye, fine imagination of an ever-multiplying line. Neudörffer’s students, Murphy shows, traced this technique anew in their own work, so that apprenticeship in the imitation of a pen’s movements became the vehicle for invention.

It is a commonplace that a culture of ingenuity unites mind and hand. Art historians have long perceived the importance of ingenuity in the changing social value of artistic craft; historians of science, by contrast, have tended to focus on the ways that the title of *ingeniosus* could be a backhanded compliment, a head-pat to mere mechanics.³⁰ Chapters 7 and 8 extend both insights to anatomy and experimental medicine. In the former Viktoria von Hoffmann focuses on the lexical range occupied by ingenuity in Renaissance anatomy. Considering Italian anatomists from Vesalius to Berengario da Carpi, she argues that although this lexis was deployed to award special status to particular innovations, its most striking uses relate to the manual skills of dissectors and demonstrators. In the latter chapter Evan Ragland illustrates the ways that these terms shaped debates on experimentalism in Leiden over the course of the seventeenth century. Ragland shows how ingenuity became a key attribute among medical students in the decades when they began to think about themselves as medical *experimentalists*, turning to

“reason and experience” together to test William Harvey’s accounts of the blood’s circulation.

The word *technique*, especially in relation to ingenuity, presents an opportunity for clarifying the stakes of these studies. The word captures the associations with skill found in the ancient Greek idea of *techne* and Latin *ars*, lexical neighbors to ingenuity. But *technique* in our contemporary sense did not exist in any European language until the very end of the early modern period. In Chapter 9 Marieke Hendriksen focuses on the overlapping decline of ingenuity and rise of technique in the late eighteenth century. She shows that the effort to identify the special status of fine art, distinct from crafts, required a language of skill shorn of any whisper of intellectual insight—shorn, that is, from the intellectual side of ingenuity—giving rise to technique. This suggests ingenuity can nuance the classic story of the painter or sculptor rising above mere craftsmen.³¹

Part III focuses on makers’ ingenuity on display. Finely wrought crafts such as sculpture, engineering, machine-making, and featherwork allowed observers to make judgments about the nature of their makers. Here a central contribution is our focus on the ambivalences of ingenuity in the display of its productions. Ingenious creations could display the insight and learning of their makers. But mimesis always requires an effort to deceive, and cunning ingenuity could also mark the deceptive character of makers.

What was the experience of those deceived? Christina Neilson takes on this problem directly in Chapter 10, considering a widespread form of devotional deception in late medieval Europe—automata of Christ whose mechanical motions were intended to stoke the devotion of the faithful. Protestant reformers saw these as evidence of monkish ingenuity; however, Neilson offers evidence that late medieval believers knew well the mechanical deceptions, but experienced them as injunctions to pious awe. In Chapter 11 Denis Ribouillault considers the case of aristocratic Renaissance gardens, filled by patrons with mechanical inventions, especially sundials. The garden was a fitting metaphor for their owners’ fertile, creative intellects; like the moving statues of Christ, the wondrous objects in these geometrical spaces were supposed to heighten the respect of viewers.

But such deception was not merely wonder at an engineer’s insight. In Chapter 12 Vera Keller points out that alchemy is usually linked with gauzy mysticism and spirited charlatanry—not with artisanal or mechanical ingenuity. Her chapter considers the polemical *Biolychnium* of the physician and alchemist Johann Burggrav. The *Biolychnium* aimed to draw Catholic and Lutheran criticism as a faked work of charlatanry—and in so doing reveal

the obtuseness of such critics' *ingenia* when they couldn't spot that it was itself a joke. (Meanwhile, those who understood and suitably used the book to sharpen their own *ingenium* would participate in the progress of knowledge.) As a result, the book plays with the links between ingenuity and deceit, ingenuity and crafty invention, ingenuity and progress—all of which were lost when later Romantic accounts of ingenuity entirely misread the book, falling into the trap Burggrav had set.

The final two chapters begin to relate ingenuity to the early modern global experience. Europeans not only experienced non-European handiwork as products of ingenuity but reflected on ingenuity as a marker of humanity. In some cases the craft of distant peoples stimulated an emotional experience, Stefan Hanß argues. In Chapter 13 he examines the emotional registers Europeans invested in their accounts of astonishing new visual phenomena such as New World featherwork. By using a microscope, Hanß reveals the fine knotwork that prompted early modern viewers to reach for a language of ingenuity. In Chapter 14 Anna Grasskamp looks at the next step beyond appreciating the ingenuity of other peoples, examining its role in European patterns of acquisition and imitation. She shows how European appraisals of ingenuity defined the hierarchies of objects spatially organized in German *Kunstkammern*. Materials from stones to porcelain were imbued with the unique properties of their origins. This is what made them valuable enough to transport, but in traveling they lost precise links to their origins, and their value was shaped instead by the containers, craft, and new contexts within which they were encountered. This meant, paradoxically, that "differences between local and foreign goods could be tacitly bridged through imitation."³² This is a somewhat darker evaluation of European accounts of ingenuity. For if imitation could replace the original, then craftsmen in one place could outdo those elsewhere, and European ingenuity was poised for conquest.