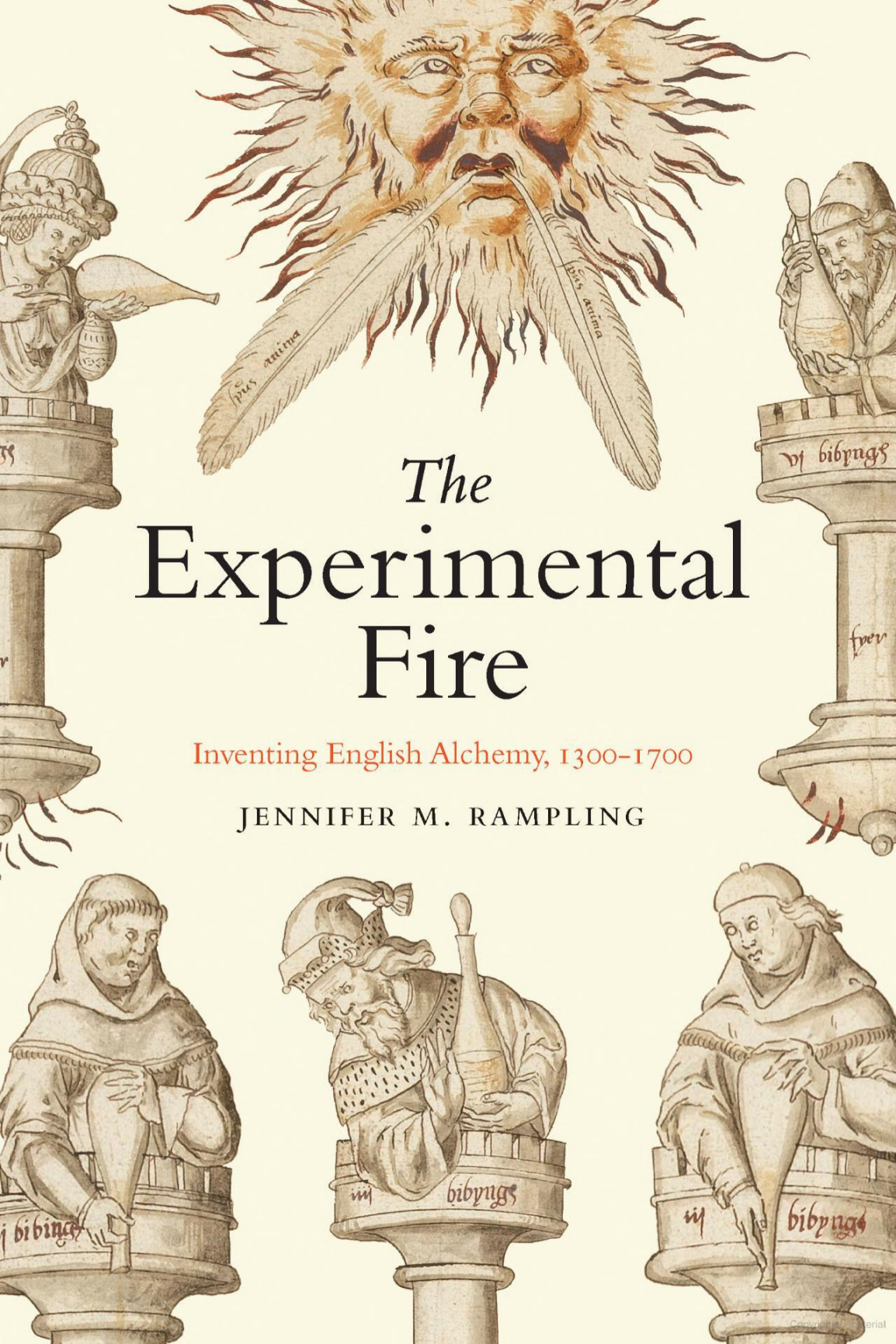

The Experimental Fire

Inventing English Alchemy, 1300–1700

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Abbreviations

Ashmole	Oxford, Bodleian Library, MS Ashmole
BCC	Jean-Jacques Manget, ed., *Bibliotheca Chemica Curiosa*, 2 vols. (Geneva: Chouet, 1702)
CCC	Oxford, Corpus Christi College Library
CCCC	Cambridge, Corpus Christi College Library
CRC	Jennifer M. Rampling, "The Catalogue of the Ripley Corpus: Alchemical Writings Attributed to George Ripley (d. *ca*. 1490)," *Ambix* 57 (2010): 125–201
Getty	Los Angeles, Getty Research Institute, MS
Harley	London, British Library, MS Harley
HMES	Lynn Thorndike, *A History of Magic and Experimental Science*, 8 vols. (New York: Columbia University Press, 1923–58)
ODNB	*Oxford Dictionary of National Biography* (Oxford: Oxford University Press, 2004; online ed., 2007)
OOC	George Ripley, *Opera omnia chemica*, ed. Ludwig Combach (Kassel, 1649)
Singer	Dorothea Waley Singer and Annie Anderson, *Catalogue of Latin and Vernacular Alchemical Manuscripts in Great Britain and Ireland Dating from before the XVI Century*, 3 vols. (Brussels: Maurice Lamertin, 1928, 1930, 1931)
Sloane	London, British Library, MS Sloane
TC	Lazarus Zetzner, *Theatrum chemicum*, 6 vols. (Ursel and Strasburg, 1602–61)

TCB	Elias Ashmole, ed., *Theatrum Chemicum Britannicum* (London, 1652)
Testamentum	Michela Pereira and Barbara Spaggiari, eds., *Il Testamentum alchemico attribuito a Raimondo Lullo: Edizione del testo latino e catalano dal manoscritto Oxford, Corpus Christi College, 244* (Florence: SISMEL, 1999). Excerpts are denoted by book and page reference (e.g., 1:172).
Trinity	Cambridge, Trinity College Library, MS

Conventions

Since many of the texts cited in this book have never been published in print form, I rely throughout on transcriptions from manuscripts, where words are often abbreviated and spelling is inconsistent. In such cases, I use italics to denote the expansion of abbreviated text. Text between "\ /" indicates subsequent additions or amendments to the manuscript. Where additional text is required to determine the sense of a passage, this is placed within square brackets, as in the representation of alchemical symbols (e.g., [mercury]). When manuscripts are cited in references, "||" denotes page endings. Original spelling and capitalization have been retained, including the frequent use of "v" for "u" (and vice versa) and of "j" for "i." Thorn (þ) is replaced by "th" in square brackets. Where appropriate I have modernized punctuation by substituting commas for periods and dashes.

In early modern England, 25 March marked the first day of the new year. Dates between 1 January and 24 March are therefore indicated in the format "5 March 1573/4."

The names of famous alchemists are preserved in their usual anglophone forms (Raymond Lull for Ramon Llull, Arnald of Villanova for Arnau de Vilanova). All translations are my own unless otherwise stated.

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As is usually the case with alchemical literature, this book rests upon the work of previous authorities, whom (in a departure from many medieval compilations) I hereby gratefully cite. My academic career would never have left port without the enthusiasm and erudition of Peter Forshaw and Stephen Clucas, who mentored my MA studies at Birkbeck, University of London, encouraged me to consider doctoral research, and supplied valuable advice and camaraderie throughout the PhD. Once embarked upon, the project remained on an even keel thanks to the calm good sense, humor, and unflagging patience of my supervisor, Lauren Kassell. Her wisdom and generous support underwrites both the book and many subsequent scholarly ventures. Peter Murray Jones trimmed sail with learned advice on many topics, and Hasok Chang provided endless encouragement during my postdoctoral fellowship in Cambridge. My colleagues in Princeton's History Department, and especially in the Program for the History of Science, have provided the most delightful of all scholarly harbors.

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teo Martelli, Erika Milam, Iris Montero Sobrevilla, Bruce Moran, Nicolette Mout, Signe Nipper Nielsen, Tara Nummedal, Kasper van Ommen, Cesare Pastorino, Michela Pereira, Will Poole, Katya Pravilova, Valentina Pugliano, Nicky Reeves, Helmut Reimitz, Anna Marie Roos, Simon Schaffer, Daniela Sechel, Katie Taylor, Pierre Teissier, Brigitte van Tiggelen, Anke Timmermann, Koen Vermeir, Keith Wailoo, and Tessa Webber. If I have omitted anyone, I apologize. In addition, Peter Wothers at Cambridge and Craig Arnold at Princeton generously furnished me with laboratory space for alchemical experiments, and Lawrence Principe provided important practical demonstrations of "Ripleian" alchemy. Rafał Prinke and Ivo Purš drew my attention to several important continental manuscripts. Special thanks to Elizabeth, Paul, Hasok, and Gretchen, who helped keep me going through the whole thing, and to Robin Sutton, who was there from the start.

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Introduction

What Is Mercury?

One thyng, one Glasse, one Furnace and no mo.[1]

On 20 July 1577, the gentleman alchemist Samuel Norton completed the preface to a treatise addressed to his sovereign, Elizabeth I, Queen of England. The *Key of Alchemy* offered Elizabeth a taste of the extraordinary physical transformations wrought by chemistry. Who would not be amazed, asked Norton, to see hard iron turned into soft water, or glass made to withstand the blow of a hammer? To watch flowing quicksilver form "a stedfaste masse," and fixed steel "flye awaye in smoke"? As if these astounding metallurgical effects were not enough, his science also taught how metals and minerals could be used to heal the human body: "Copper to becom medicinable, gould and silver to be potable, tynne to remove great sickneses, and lead in vertue exceedinge all, to haue almost the swettnes of sugare in taste." Using alchemical techniques, even minerals and deadly poisons could become perfect medicines—transformations that, Norton assured the queen, "will lightly be done, and are not of great difficultye."[2]

Yet in this remarkable list there is an interesting omission. Nowhere did Norton mention transmutation: the alchemists' dream of perfecting a technique for transforming base metals into silver and gold. His medieval authorities often referred to the agent of transmutation as the "philosophers' stone"

1. George Ripley, *Compound of Alchemy*, in *Theatrum Chemicum Britannicum: Containing Severall Poeticall Pieces of Our Famous English Philosophers, Who Have Written the Hermetique Mysteries in Their Owne Ancient Language. Faithfully Collected into One Volume with Annotations Thereon*, ed. Elias Ashmole (London: J. Grismond for Nathanial Brooke, 1652), 107–93, on 159; hereafter *TCB*.

2. Oxford, Bodleian Library, Ashmole 1421, fol. 169r-v.

(*lapis philosophorum*), a superperfected form of matter made using alchemical techniques.[3] This "stone" is typically introduced in the singular, implying that the whole practice of alchemy tends toward this one, universal end. Yet, rather than lingering over a single, unique stone, Norton offered a variety of alchemical products, including several with medicinal applications. In addition to mineral, vegetable, and animal stones, the *Key* described an elixir of life, a multipurpose "mixed" stone, and a "transparent" stone used for making precious gems.

Norton did not claim any novelty for his many-stranded approach. On the contrary, the Somerset practitioner was keen to state his alchemical credentials by positioning himself within a lineage of England's great adepts. His great-grandfather, he claimed, was the fifteenth-century Bristol alchemist Thomas Norton (d. 1513), author of a famous poem, the *Ordinal of Alchemy* (1477). Samuel's *Key* could also claim descent from another fifteenth-century master: its recipes had been extracted from a book compiled by the great English alchemist George Ripley, canon of Bridlington (fl. 1470s). Throughout the *Key*, Norton drew repeatedly on the authority of medieval English adepts, noting that, for their services in clarifying the obscurities of the alchemical art, no one deserved more honor than his own countrymen.[4]

Norton's treatise is emblematic of the alchemical preoccupations of the late sixteenth century, a period characterized by powerful optimism about the potential of the art. Writers were inspired by the transformative capabilities of chemical operations, yet also driven by a pressing need for practical solutions to economic, political, and medical problems. Across Europe, princes invested funds and credit in alchemical projects, medical practitioners appropriated alchemical techniques, and poets drew on alchemical language to express both material and metaphysical ideals. At the same time, alchemy was increasingly the butt of satire and polemic, as critics dwelled on the tricks and moral failings of those who professed to have knowledge of transmutation. A reputational chasm opened between "philosophers," who had truly mastered the secrets of alchemy, and others who had not, or who

3. The use of the term "stone" for the transmuting agent originates in Arabic alchemy, where *ḥajar* (stone) denoted the matter used to make the elixir, regardless of whether that matter was animal, vegetable, or mineral in nature. The term was translated directly into Latin as *lapis*. Sébastien Moureau, "*Elixir Atque Fermentum*: New Investigations about the Link between Pseudo-Avicenna's Alchemical *De anima* and Roger Bacon; Alchemical and Medical Doctrines," *Traditio: Studies in Ancient and Medieval Thought, History, and Religion* 68 (2013): 277–323, on 288–89.

4. Ashmole 1421, fol. 172v.

merely claimed to have done so—variously decried as fools, puffers, frauds, or simply "alchemists."[5]

It was in this environment of mingled optimism and skepticism that alchemical practitioners turned to the past in search of authoritative support for their current endeavors. In England, that usually meant looking across the English Channel to the lands of continental Europe: the source of influential alchemical texts and translations during the Middle Ages, and, in the sixteenth century, the site of continuing innovation in mining, metallurgy, chemical medicine, and the manufacture of chemical products, which English practitioners were eager to imitate. However, as the sixteenth century progressed and the Reformation reshaped English cultural life, Tudor alchemists became increasingly preoccupied with their medieval legacy. Competing with foreign practitioners for readers and patrons, they drew attention to their own Englishness. Past adepts, real and imagined—from Merlin and Saint Dunstan to Roger Bacon and John Dastin—were invoked in alchemical patronage proposals, the style of their alleged works imitated, and their accomplishments reenacted (so their early modern disciples claimed) through countless experiments. More recent writers like George Ripley and Thomas Norton in turn acquired a reputation for successful practice, and were enshrined in the pantheon of English alchemy as exemplars for new generations of hopeful adepts. Even Samuel Norton, the devoted Elizabethan interpreter of Ripley and Norton, eventually gained a lesser place in this pantheon, as his writings passed the torch of English alchemy down to his own seventeenth-century readers. Posterity thus achieved what Samuel was unable to accomplish during his own lifetime, by reinventing him as an alchemical philosopher—a new link in the golden chain that stretched back into antiquity.

READING LIKE AN ALCHEMIST

Samuel Norton was not the first to search for links between experimental practice and his own nation's history. European knowledge of the natural world expanded dramatically throughout the sixteenth and seventeenth centuries, a period still regularly characterized, albeit in increasingly broad

5. On the persona of the alchemical fraud, or *Betrüger*, in early modern Europe, especially in the German lands, see Tara Nummedal, *Alchemy and Authority in the Holy Roman Empire* (Chicago: University of Chicago Press, 2007). On associations with currency crime, see Jotham Parsons, *Making Money in Sixteenth-Century France: Currency, Culture, and the State* (Ithaca, NY: Cornell University Press, 2014), 223–31.

terms, as a scientific revolution. However, while early modern natural philosophers often emphasized what was new in their work, they were also deeply concerned to recover what was old. This engagement with the past, catalyzed by the rediscovery of ancient texts and artifacts, transcended disciplinary fields and, to an extent, territorial boundaries.[6] It was also, inevitably, value-laden. Whether gathering antique inscriptions, imitating classical artworks, or scouring medieval documents for evidence of early church practices, early modern knowledge-seekers were motivated by contemporary concerns, imposing their own political, religious, and scholarly preoccupations on frequently obscure or fragmentary source material. When these sources were missing or corrupt, ingenious readers might even attempt to fill the gaps by reconstructing "lost" content, in whole or in part.[7] One outcome was the invention of new traditions in the name of the old: from rewriting liturgy in the wake of the Reformation to seeking philosophical and scriptural precedents for new visions of the structure of matter.[8]

In this book, I trace how this fusion of authority and invention contributed to the development of a particular body of natural knowledge—alchemy—in the context of one national tradition. Over the last half century, historians of science and medicine have revealed the important role played by alchemy in shaping early modern scientific ideas and practices, as an experimental enterprise that was also grounded in sophisticated theories of nature. Historians of books and reading have also shown how readers studied past texts to shed light on problems they faced in their own time. But how, exactly, did book learning interact with practical experience? Did alchemical practitioners deliberately innovate, or did they rather view their experimental work as a form of historical reconstruction—an attempt to recover the lost practices of their medieval forebears?

In attempting to answer those questions, I have chosen to restrict my own reconstructive efforts to a specific place and time—the insular kingdom of

6. On natural philosophers' employment of humanist methods, including the study of ancient and medieval texts and philosophies, see, inter alia, Anthony Grafton, *Defenders of the Text: The Traditions of Humanism in an Age of Science, 1450–1800* (Cambridge, MA: Harvard University Press, 1991); on the English context in particular, Dmitri Levitin, *Ancient Wisdom in the Age of the New Science: Histories of Philosophy in England, c. 1640–1700* (Cambridge: Cambridge University Press, 2015).

7. Conjectural emendation, long employed in scriptural exegesis, provided one such technique; see Anthony Grafton, *Joseph Scaliger: A Study in the History of Classical Scholarship*, vol. 1, *Textual Criticism and Exegesis* (Oxford: Clarendon Press, 1983), 12–14.

8. On ecclesiastical traditions, see Anthony Grafton, "Church History in Early Modern Europe: Tradition and Innovation," in *Sacred History: Uses of the Christian Past in the Renaissance World*, ed. Katherine Van Liere et al. (Oxford: Oxford University Press, 2012), 3–26; on matter theory, Levitin, *Ancient Wisdom*, chap. 5.

England, from the beginning of the fourteenth century to the end of the seventeenth.[9] While limiting my scope geographically I seek to extend it temporally, and, in so doing, to chart how alchemists crafted a new kind of chemical practice, grounded in English history, over a significant chronological span. In England, this extended period witnessed the arrival of plague, the dissolution of the monasteries, the advent of Paracelsianism, and the rise of antiquarianism and experimental science: all of which affected how alchemical books were read, and to what ends. It is only by following texts and practices over time, and in granular detail, that we can grasp the cumulative impact of incremental changes in the science itself.

Alchemy offers promising fuel for this investigation precisely because its objects, although intimately concerned with the workings of nature, have no clear analogue in the modern sciences. No longer considered a fruitful topic of scientific study, alchemy in its premodern heyday nonetheless underpinned many activities, and offered answers to many questions, that are still considered germane to the chemical sciences today. Alchemy is not, however, the same as modern "chemistry," and most historians would agree that our understanding of its past can only be impoverished by attempts to read it solely in light of present-day definitions, standards, and expectations.[10] Yet our very willingness to take alchemy on its own historical terms is fostered by the assumption that its ideas and practices are no longer relevant to the science of our day—or, more bluntly, that they do not "work."

Early modern alchemists lacked that assumption. The recovery of alchemical knowledge invoked a special kind of antiquarian sensibility, one that was concerned not just with the form of practices in the past, but also with their effectiveness in the present. When sixteenth- and seventeenth-century alchemists opened their books, or assembled their materials for practice, they engaged with the medieval corpus as a tradition that, although temporally distant, was nonetheless living—and that promised incalcul-

9. By focusing on England rather than the British Isles more generally, I thereby regretfully exclude alchemy as practiced in Scotland, Wales, and Ireland. Alchemy was of course practiced elsewhere in the Isles, and attracted great interest at the Scottish royal court; see, for instance, the case of John Damian summarized in John Read, "Alchemy under James IV of Scotland," *Ambix* 2 (1938): 60–67.

10. The danger of driving a terminological wedge between "alchemy" and "chemistry" has been addressed by William Newman and Lawrence Principe, who propose the general use of "chymistry" as a solution: William R. Newman and Lawrence M. Principe, "Alchemy vs. Chemistry: The Etymological Origins of a Historiographic Mistake," *Early Science and Medicine* 3 (1998): 32–65. In this book I typically follow my historical actors in using "alchemy" and, more commonly still, "philosophy." To avoid anachronistic comparisons, I generally use "natural philosophy" rather than "science" when discussing the formal study of the natural world; on occasions when I do employ "science," I intend its broader, early modern sense of learned knowledge (*scientia*).

able material benefits, as well as unparalleled insight into the workings of nature.[11] In this context, medieval books provided vital sources of theoretical insight and practical instruction.[12] Even at the vanguard of developments in seventeenth-century chemistry, natural philosophers like Robert Boyle and Isaac Newton studied the fifteenth-century writings of George Ripley with attention, interest, and expectation of useful results.[13]

Like all living systems, medieval alchemy was also subject to change. Early modern readers knew that the task of extracting workable knowledge from these sources was no sinecure, and, like the editors of ancient texts, they sought to fill in the gaps. They studied, tested, and reinterpreted their authorities, using the most ingenious trials that reason and experience could suggest, often in ways unanticipated by the original writers. To translate is to interpret: accordingly, the very process of reconstructing past processes inevitably (and often unwittingly) transformed their content—and hence their practical outcomes—in a cyclical process that I call "practical exegesis."[14]

In this book I trace how this cycle of reinvention revolved in England over the space of four centuries, and how it resulted in alchemical change. During this period, successive generations of English alchemists transformed the theory and practice of their art: unpicking the clues of their forebears,

11. On the emerging concern with the past among early modern readers of English alchemica, see George R. Keiser, "Preserving the Heritage: Middle English Verse Treatises in Early Modern Manuscripts," in *Mystical Metal of Gold: Essays on Alchemy and Renaissance Culture*, ed. Stanton J. Linden (New York: AMS, 2007), 189–214; Lauren Kassell, "Reading for the Philosophers' Stone," in *Books and the Sciences in History*, ed. Marina Frasca-Spada and Nick Jardine (Cambridge: Cambridge University Press, 2000), 132–50. On English antiquarianism more generally, T. D. Kendrick, *British Antiquity* (New York: Barnes & Noble, 1950); Mary McKisack, *Medieval History in the Tudor Age* (Oxford: Clarendon Press, 1971); Graham Parry, *The Trophies of Time: English Antiquarians of the Seventeenth Century* (Oxford: Oxford University Press, 1995); Thomas Betteridge, *Tudor Histories of the English Reformations, 1530–83* (Aldershot: Ashgate, 1999); Angus Vine, *In Defiance of Time: Antiquarian Writing in Early Modern England* (Oxford: Oxford University Press, 2010).

12. See, for instance, the sources in Timothy Graham and Andrew G. Watson, eds., *The Recovery of the Past in Early Elizabethan England: Documents by John Bale and John Joscelyn from the Circle of Matthew Parker* (Cambridge: Cambridge University Press, 1998). On medieval manuscripts in domestic contexts, Margaret Connolly, *Sixteenth-Century Readers, Fifteenth-Century Books: Continuities of Reading in the English Reformation* (Cambridge: Cambridge University Press, 2019).

13. On Ripley's seventeenth-century reception, see chap. 9, below. On Boyle and his sources, see Lawrence M. Principe, *The Aspiring Adept: Robert Boyle and His Alchemical Quest* (Princeton: Princeton University Press, 1998); William R. Newman and Lawrence M. Principe, *Alchemy Tried in the Fire: Starkey, Boyle, and the Fate of Helmontian Chymistry* (Chicago: University of Chicago Press, 2002). On Newton, see Newman, *Newton the Alchemist: Science, Enigma, and the Quest for Nature's "Secret Fire"* (Princeton: Princeton University Press, 2018).

14. I introduce this term in Jennifer M. Rampling, "Transmuting Sericon: Alchemy as 'Practical Exegesis' in Early Modern England," *Osiris* 29 (2014): 19–34; see also chap. 2, below.

attempting to follow their instructions, and eventually feeding their own practical findings back into the textual record in the form of new treatises, recipes, and annotations. The cycle relied on a twofold process of reconstruction: not just the replication of practices, but the recovery of meaning hidden within texts. The densely encoded and frequently laconic guidance bequeathed by past philosophers to their hopeful descendants required a raft of special interpretative techniques, which challenged early modern readers just as they continue to perplex modern scholars. The history of practice is thus intimately related to the history of reading. To retrieve the original sense of a text—and hence to reconstruct, insofar as it is possible, the original practice—requires that we, too, learn to read like alchemists; or, even more specifically, like alchemical philosophers.

Throughout the book, I use the notion of the "alchemical philosopher" as a very particular instantiation of the natural philosopher: a reader-practitioner whose interests are neither wholly scholarly nor wholly grounded in craft, but who is presumed to have acquired special insight into the making of the philosophers' stone. While many alchemical writers self-identified as philosophers, the term was also bestowed as an accolade by later readers who recognized that success in the art trumped any formal educational qualifications. It therefore encompasses a remarkable range of historical actors: from university-trained scholars of European eminence, like Roger Bacon (ca. 1214–1292?) and John Dee (1527–1609), to men with mercantile or artisanal backgrounds, like the clothworker Thomas Peter (fl. 1520s–1530s) and unlicensed medical practitioner Thomas Charnock (1524/6–1581). Those who identified as alchemical philosophers also tended to view their knowledge as a route to social and economic advancement—thus, despite a wide disparity in their backgrounds, education, and connections, both Dee and Charnock aspired to become Elizabeth I's own "philosopher."[15] Accordingly, alchemical philosophy is often closely linked to patronage, although there was not always consensus over who counted as an adept: as we shall see, one man's philosopher was another man's fraud.[16]

15. Dee famously conceived of himself as a "Christian Aristotle" in search of royal patronage of the kind offered by Aristotle's own pupil, Alexander the Great—a trope discussed by Nicolas H. Clulee, *John Dee's Natural Philosophy: Between Science and Religion* (Oxford: Routledge, 1988), 189–99; Paula Findlen, *Possessing Nature: Museums, Collecting, and Scientific Culture in Early Modern Italy* (Berkeley: University of California Press, 1994), 352–65. Charnock sets out his aspirations in his *Booke Dedicated vnto the Queenes Maiestie*, British Library, MS Lansdowne 703, fol. 45v, discussed in chap. 6, below.

16. The classic study of alchemical courtly patronage is Bruce T. Moran, *The Alchemical World of the German Court: Occult Philosophy and Chemical Medicine in the Circle of Moritz of Hessen*

This hybrid status of alchemy raises the question of how its practitioners first came to view their enterprise as philosophical. Although alchemy was already viewed as a subject of philosophical provenance in Greco-Roman Egypt and the Islamic lands, in twelfth-century Latin Europe it was still a newcomer by the standards of other fields of knowledge.[17] Accordingly, its early proponents sought to establish its prestige by positioning it as *scientia* (learned knowledge), and hence proper to the study of natural philosophy, rather than as *ars* (craft knowledge). The discipline of scholastic natural philosophy—named for the schools where it first took shape—was itself a medieval invention, concerned with the content of Aristotle's natural books.[18] Its goal was to generate certain knowledge through the derivation of universal principles from particulars: a form of knowledge building distinct from artisanal or "mechanical" practices of the kind implicated in much alchemical activity.[19] By arguing that their work was similarly grounded in general, natural principles, proponents of alchemy claimed that it was as much a "science" as other branches of learned knowledge, and hence worthy

(1572–1632) (Stuttgart: Franz Steiner Verlag, 1991). Other important studies include R. J. W. Evans, *Rudolf II and His World: A Study in Intellectual History 1576–1612* (Oxford, 1973; repr., London: Thames & Hudson, 1997); Pamela H. Smith, *The Business of Alchemy: Science and Culture in the Holy Roman Empire* (Princeton: Princeton University Press, 1994); Nummedal, *Alchemy and Authority*; David C. Goodman, *Power and Penury: Government, Technology, and Science in Philip II's Spain* (Cambridge: Cambridge University Press, 1988); Alfredo Perifano, *L'alchimie à la cour de Côme Ier de Médicis: Culture scientifique et système politique* (Paris: Honoré Champion, 1997); Nils Lenke, Nicolas Roudet, and Hereward Tilton, "Michael Maier—Nine Newly Discovered Letters," *Ambix* 61 (2014): 1–47. Jonathan Hughes has written two speculative studies of royal interest in alchemy in medieval England, to be treated with caution: Jonathan Hughes, *Arthurian Myths and and Alchemy: The Kingship of Edward IV* (Stroud: Sutton Publishing, 2002); Hughes, *The Rise of Alchemy in Fourteenth-Century England: Plantagenet Kings and the Search for the Philosopher's Stone* (London: Continuum, 2012).

17. The arrival of alchemy was an outcome of the great Arabic-to-Latin translation movement of the twelfth and thirteenth centuries; see the references on p. 32, note 29, below. For an overview of alchemy's earlier history, see Lawrence M. Principe, *The Secrets of Alchemy* (Chicago: University of Chicago Press, 2013), chaps. 1–3. On alchemy as a *novitas* in Latin Europe, see Robert Halleux, *Les textes alchimiques* (Turnhout: Brepols, 1979), 70–72.

18. On the incorporation of Aristotle's *libri naturales* into the medieval curriculum, see Edward Grant, *The Foundations of Modern Science in the Middle Ages: Their Religious, Institutional, and Intellectual Contexts* (Cambridge: Cambridge University Press, 1996); Grant, *God and Reason in the Middle Ages* (Cambridge: Cambridge University Press, 2009). The significant role played by the mendicant orders in shaping the identity of medieval natural philosophy is examined (if somewhat provocatively) in Roger French and Andrew Cunningham, *Before Science: The Invention of the Friars' Natural Philosophy* (Aldershot: Ashgate, 1996).

19. On the relationship between art and nature in scholastic natural philosophy, and its consequences for the status of alchemy as *scientia*, see William R. Newman, "Technology and Alchemical Debate in the Late Middle Ages," *Isis* 80 (1989): 423–45; Newman, *Promethean Ambitions: Alchemy and the Quest to Perfect Nature* (Chicago: University of Chicago Press, 2004).

to be counted as philosophy. The English philosopher Roger Bacon went so far as to propose alchemy as the foundation of science and medicine, since it teaches how all things are generated from the elements.[20]

Despite these attempts, alchemy failed to secure a foothold in the medieval university curriculum, although its practitioners did not abandon their philosophical aspirations. By the fifteenth century, even less well-educated practitioners had learned to present their work in the form of "philosophical" treatises that expounded the theory of alchemy alongside its practice. This positioning did not convince critics like the naturalist Conrad Gessner (1516–1565). While admitting that the objects of alchemy (such as metals) were proper to natural philosophy, Gessner assigned it to the mechanical rather than the liberal arts on the grounds that it was practiced by ignorant and illiterate men.[21] In the face of such criticism, many alchemists made it their object to convince readers and patrons that they were, despite any deficiencies in formal education, highly literate within the specific context of alchemical philosophy. One way of doing so was to reproduce the distinctive methods and topoi of earlier authorities in their own alchemical writings. Such stratagems preserved the status of alchemy as a privileged form of knowledge, while allowing practitioners to retain their individual authority—and to keep their secrets.[22]

Such strategies place alchemists in an analogous position to that of other highly skilled artisans in early modern Europe who chose to redefine them-

20. Roger Bacon, *Opus tertium*, in *Opera quaedam hactenus inedita Rogeri Baconis*, fasc. 1, ed. J. S. Brewer (London: Longman, Green, Longman, and Roberts, 1859), 3–310, on 39–40; translated in William R. Newman, "The Alchemy of Roger Bacon and the *Tres Epistolae* Attributed to Him," in *Comprendre et maîtriser la nature au moyen age: Mélanges d'histoire des sciences offerts à Guy Beaujouan* (Geneva: Librarie Droz, 1994), 461–79, on 461–62.

21. Conrad Gessner, *Bibliotheca universalis, sive catalogus omnium scriptorum locupletissimus, in tribus linguis, Latin, Graeca, & Hebraica: extantium & non extantium veterum & recentiorum . . .* (Zurich: Christophorus Froschouerus, 1545) and *Pandectarum sive Partitionum universalium libri XXI* (Zurich: Christophorus Froschouerus, 1548); cited in Jean-Marc Mandosio, "L'alchimie dans les classifications des sciences et des arts à la Renaissance," in *Alchimie et philosophie à la Renaissance*, ed. Jean-Claude Margolin and Sylvain Matton (Paris: Vrin, 1993), 11–41, on 15–16.

22. On the intellectual and economic value of secret knowledge, and the various methods of preserving it (and, paradoxically, of publishing it) in medieval and early modern science, see especially Pamela O. Long, *Openness, Secrecy, Authorship: Technical Arts and the Culture of Knowledge from Antiquity to the Renaissance* (Baltimore: Johns Hopkins University Press, 2001); William Eamon, *Science and the Secrets of Nature: Books of Secrets in Medieval and Early Modern Culture* (Princeton: Princeton University Press, 1994); Elaine Leong and Alisha Rankin, eds., *Secrets and Knowledge in Medicine and Science, 1500–1800* (Farnham: Ashgate, 2011), 47–66. On alchemical traditions of secrecy, see Barbara Obrist, "Alchemy and Secret in the Latin Middle Ages," in *D'un principe philosophique à un genre littéraire: Les secrets; Actes du colloque de la Newberry Library de Chicago, 11–14 Septembre 2002*, ed. D. de Courcelles (Paris: Champion, 2005), 57–78; Principe, *Secrets of Alchemy*, esp. chap. 6.

selves as something more than manual workers. Painters and architects emphasized their own mastery of subject matter and materials, turning to classical models like Vitruvius in order to raise the status of their practice in the eyes of their patrons.[23] The flow of knowledge was not unidirectional: when patrons took note of the utilitarian applications of ancient knowledge, humanist scholars also profited from relating ancient knowledge to the practical problems of their own day.[24]

Yet alchemy differs from most fields of knowledge in the deliberate inaccessibility of its language, which requires aspirants to read widely and carefully in order to extract practical sense from the textual record. Its philosophically oriented treatises serve as guides to more than chemical operations alone: they also function as manuals of reading practice, educating their readers in the proper modes of communicating alchemical knowledge.[25] Understanding this function helps to explain the idiosyncratic form of many alchemical treatises, but also shows how they were meant to be read, and hence how we, too, must attempt to read them. For instance, students of alchemy are frequently warned to be suspicious of literal readings, to instead approach their texts on multiple levels in a manner reminiscent of medieval techniques of scriptural exegesis, delving into metaphorical and analogical interpretations of even outwardly straightforward terms, such as "mercury."

In such an exegetical minefield, changing or misconstruing a single word might alter the outcome of the work. Among the church fathers, Irenaeus had famously warned his own scribes to take care when transcribing his

23. There is a vast literature on the self-presentation of Renaissance painters; for an overview, see Francis Ames-Lewis, *The Intellectual Life of the Early Renaissance Artist* (New Haven: Yale University Press, 2000); Bram Kempers, *Painting, Power, and Patronage: The Rise of the Professional Artist in the Italian Renaissance*, trans. Beverley Jackson (London: Penguin, 1984).

24. Pamela O. Long, *Artisan/Practitioners and the Rise of the New Sciences, 1400–1600* (Corvallis: Oregon State University Press, 2011). Pamela Smith proposes that artisans from the late Middle Ages were successful in promoting their own "vernacular epistemology" as a counterpoint to text-based knowledge, based on their experience of working materials; Pamela H. Smith, *The Body of the Artisan: Art and Experience in the Scientific Revolution* (Chicago: University of Chicago Press, 2004); see also the collected essays in Sven Dupré, ed., *Laboratories of Art: Alchemy and Art Technology from Antiquity to the 18th Century* (Cham: Springer, 2014).

25. On the use of philosophical texts as manuals for expounding alchemical reading techniques, see Jennifer M. Rampling, "Reading Alchemically: Early Modern Guides to 'Philosophical' Practices," in "Learning by the Book: Manuals and Handbooks in the History of Knowledge," ed. Angela Creager, Elaine Leong, and Matthias Grote, *BJHS Themes* 5 (forthcoming). On the interpretative techniques employed by some prominent seventeenth-century English alchemists, see Newman and Principe, *Alchemy Tried in the Fire*, 174–88; Newman, *Newton the Alchemist*, chap. 2. Some other contentious fields, including natural magic and Kabbalah, called for similar interpretative expertise, as did the discipline of law; see Ian Maclean, *Interpretation and Meaning in the Renaissance: The Case of Law* (Cambridge: Cambridge University Press, 1992).

writings: an exhortation that still carried weight among alchemical writers a millennium later.[26] After all, when copying from heavily contracted medieval sources, a slip of the pen or skip of the eye is all it takes to transmute "vitriolum," or vitriol (a class of metal sulphates used to make mineral acids), into "vitrum," or glass: an error presenting obvious hazards for unwary readers. As Thomas Norton warned in the "Prohemium" to his famous poem, the *Ordinal of Alchemy*,

> And changing of som oone sillable
> May make this boke vnprofitable.[27]

Despite the frequency of such admonitions, in practice it was almost impossible to avoid altering a text, knowingly or otherwise. Reading is inherently a historical process, because readers living at different times and in different places did not approach their texts in the same way. Their interpretations of alchemical texts—and, consequently, their practices—were shaped by their own experience of substances and materials, and by the distinctive social, intellectual, and religious contexts within which they worked. These conditions must be borne in mind as we learn to mind the gaps between what alchemical treatises say, and how they were actually read.

RECOVERING ALCHEMICAL PRACTICE

When the Reformation wrought transmutations in every sphere of English life, alchemy was not excluded. From the 1530s, the libraries of religious houses, replete with alchemical books written or owned by former brethren, were dispersed. Those that survived the dissolution offer tantalizing glimpses of a lost world of monastic practice, littered with the names of priests, monks, friars, and canons both regular and secular, who pledged their credit on a bewildering array of chemical theories and practices. Given this bounty, it is surprising how little we know about the state of monastic alchemy in England prior to the Reformation.[28] The writings of named alchemists like

26. As related in Eusebius, *Historia ecclesiastica*; cited in Anthony Grafton and Megan Williams, *Christianity and the Transformation of the Book: Origen, Eusebius, and the Library of Caesarea* (Boston: Harvard University Press, 2008), 187. For similar concerns in medieval Europe, see Daniel Hobbins, *Authorship and Publicity before Print: Jean Gerson and the Transformation of Late Medieval Learning* (Philadelphia: University of Pennsylvania Press, 2013), 165–68.

27. *Thomas Norton's The Ordinal of Alchemy*, ed. John Reidy (Oxford: Early English Text Society, 1975), 10 (ll. 73–74); hereafter *Ordinal*.

28. Monastic alchemy still awaits systematic treatment. Although Sophie Page focuses primarily on magic rather than alchemy, her work provides useful context for English alchemy as well;

John Sawtrey of Thorney (fl. ca. 1400) and George Ripley of Bridlington provide precious, contextualizing landmarks in a sea of anonymous and pseudepigraphic texts whose provenance and dating have proved as difficult to fix as mercury itself. However, if we are to map the entire ocean we cannot rely on these islets alone, written by "alchemical philosophers" whose rhetoric, if not their practice, presents their activities as solitary, secret, and consistent with a unified, learned tradition. It is only when we brave the surrounding waters that we discover the true variety of approaches and ingredients employed by English alchemists: approaches preserved in hundreds of manuscripts, only a handful of which have received systematic study.

The sheer difficulty of charting this territory becomes obvious as soon as we search for a place to begin. Alchemical treatises often outline a detailed succession of chemical processes; but, as in any other serial procedure, knowing where to start is vital to success—one cannot ascend the ladder unless the first step is sturdily in place. Yet in alchemical writing, the final stages are often described with far greater consistency than the first step—namely, the selection of the starting materials, or *prima materia*. The identity of the elusive first matter is, in many alchemical texts, both the most closely guarded secret and the most intently sought.

For instance, alchemical philosophers often claimed that their work was founded upon one, single prime matter, requiring the addition of no other ingredient. For authority on this point, readers could turn to the most revered alchemical authorities—such as the *Emerald Tablet*, reputedly engraved on a precious stone by Hermes Trismegistus, the legendary founder of alchemy, which describes the marvelous working of "one thing" (*miracula rei unius*) whose father is the Sun, and mother the Moon.[29] The influential *Secretum secretorum* (Secret of Secrets), supposedly comprised of Aristotle's secret teachings to Alexander the Great, further emphasized the ubiquity of this matter, which is "founde in euery place, in euery time, in euery man."[30]

Sophie Page, *Magic in the Cloister: Pious Motives, Illicit Interests, and Occult Approaches to the Medieval Universe* (University Park: Pennsylvania State University Press, 2013). For a brief, general overview, see W. Theisen, "The Attraction of Alchemy for Monks and Friars in the 13th–14th Centuries," *American Benedictine Review* 46 (1995): 239–51. On the practice of alchemy by friars, see the collected essays in Andrew Campbell, Lorenza Gianfrancesco, and Neil Tarrant, eds., "Alchemy and the Mendicant Orders of Late Medieval and Early Modern Europe," *Ambix* 65 (2018); and chap. 2, note 3, below.

29. Hermes Trismegistus, *Tabula Smaragdina*, in J. Manget, *Bibliotheca Chemica Curiosa* (Geneva, 1702), 1:381; hereafter *BCC*.

30. Translation based on Ashmole 396 (fifteenth century), in *Secretum Secretorum: Nine English Versions*, ed. Mahmoud Manzalaoui (Oxford: Oxford University Press, 1977), 67.

Medieval alchemists often took such riddles to refer to mercury, or quicksilver: *mercurius* or *argentum vivum* in Latin, "argent vive" in Middle English. Mercury was an object of fascination to alchemical practitioners, both for its peculiar physical properties and for its role in medieval theories of metallic generation. According to the sulphur-mercury theory, two primordial vapors—a dry, earthy "sulphur" and cool, moist "mercury"—combine in varying proportions within the earth to create the various metals: *prima materia* in the most general sense. These two material principles do not correspond to elemental quicksilver and brimstone, but instead provide the fundamental constituents of all metals.[31]

Quicksilver had particular value for medieval writers, who sought to elevate alchemy's status as *scientia*. In Aristotelian natural philosophy, like must stem from like: thus a pear tree can bear pears, but not figs, and a lioness can produce lion cubs, but not a donkey. Alchemical theorists extended the analogy to the mineral kingdom, arguing that a transmuting agent capable of generating gold and silver should also derive from a metallic body: typically, from a purified and subtilized form of mercury. By assuming that mercury already contained its own, inner "sulphur," proponents of this approach could claim that additional sulphur was not required in the work, justifying the choice of mercury as their single, prime ingredient. This view, which underpins much late medieval transmutation theory, has been dubbed "mercury alone" by Lynn Thorndike, and, more recently, "mercurialist" by William Newman and Lawrence Principe.[32]

Yet the language of "one thing" posed problems in practice. Premised on the generation of metals, the mercurialist approach was more appropriate as a justification for gold-making (chrysopoeia) and silver-making (argyropoeia) than for other chemical applications, particularly medicinal remedies. Strictly interpreted, this philosophy eliminated a wide range of potential ingredients from all the kingdoms of nature, including such chemically interesting substances as herbs, blood, urine, eggs, and a wide variety of salts

31. The theory, based on Arabic adaptations of Aristotle's *Meteorology*, is examined by John A. Norris, "The Mineral Exhalation Theory of Metallogenesis in Pre-Modern Mineral Science," *Ambix* 53 (2006): 43–65. On some aspects of its medieval reception, see Newman, "Technology and Alchemical Debate"; Newman, *Atoms and Alchemy: Chymistry and the Experimental Origins of the Scientific Revolution* (Chicago: University of Chicago Press, 2006), chap. 1.

32. Lynn Thorndike, *A History of Magic and Experimental Science* (New York: University of Columbia Press, 1923–58), 3:58, 89–90 (hereafter *HMES*); Principe, *Aspiring Adept*, 153–55. William Newman argues for the origins of the "mercury alone" approach in the thirteenth-century *Summa perfectionis* of pseudo-Geber; William R. Newman, ed., *The Summa perfectionis of Pseudo-Geber: A Critical Edition, Translation, and Study* (Leiden: Brill, 1991), 204–8; hereafter *Summa perfectionis*.

and stones. Despite the formulaic protestations of writers who insisted on metallic kinds, a diversity of practices in fact seems to have been the standard rather than the exception in late medieval England. Even mercurialist authorities admitted that minerals like vitriol and salt were necessary as "helpers" in the work, to prepare metals for further operations. Nor could one doubt the impressive chemical effects wrought by salts, spirits, and organic products—effects that were already in common use among artisans engaged in metalworking, winemaking, painting, and dyeing, among other crafts. From the dissolution of gold in *aqua regia* to the strange transformation of lead into a white, sweet-tasting gum using vinegar, metals repeatedly succumbed to the power of materials that differed from them fundamentally in nature.

Mercury's double life, as both metallic quicksilver and material principle, thus marks only the start of its identity crisis, as its nature was subjected to continual reinterpretation and debate. Like another ubiquitous term, *lapis* (stone), "mercury" came to signify either the starting matter of the alchemical work, or any liquid substance employed in its manufacture: encompassing a host of animal, vegetable, and mineral substances that ranged from metallic quicksilver and mineral acids to distilled alcohol and human blood. This diversity is reflected in the notion (inherited from Arabic alchemy) that more than one kind of stone existed: each stone made using different materials, and targeted toward different ends. By 1390, the latter view was sufficiently well known in England for the poet John Gower (ca. 1330–1408) to include it in the alchemical section of his Middle English poem, the *Confessio amantis*. In one passage, Gower describes a "vegetable stone" used in medicine and an "animal stone" for sharpening human senses, in addition to the more familiar mineral stone that transforms "the metalls of every mine."[33]

This diversity raises interpretative questions: not just what "mercury" means in a given text, but also what it means to a given reader, or community of readers, at distinct points in time. In this book, I focus on identifying, mapping, and analyzing one of the most distinctive and influential strands of English practice, which I term "sericonian" alchemy after its elusive prime matter—an inexpensive "mercury" drawn out of base metals, which Ripley and his followers called sericon.[34] This approach was initially formulated in the fifteenth century on the basis of fourteenth-century continental authorities, and continued to prosper in early modern England, particularly in the context of patronage suits. It also rested on uncontested philosophical

33. John Gower, *Confessio Amantis*, vol. 2, ed. Russell A. Peck, trans. Andrew Galloway, 2nd ed. (Kalamzoo, MI: Medieval Institute Publications, 2013), bk. 4, ll. 2553–54.

34. I discuss this aspect of alchemical terminology in Rampling, "Transmuting Sericon."

authority, as a practice apparently grounded in the largest and most influential of all alchemical corpora: the huge body of writings pseudonymously attributed to the Catalan philosopher Ramon Llull—or "Raymond," as he became known in England.[35]

Unlike another major strand of European practice, based on writings pseudonymously attributed to Jābir ibn Ḥayyān (the Latin Geber), the sericonian approach offered a wide range of applications: not just transmuting metals, but also healing human bodies, prolonging life, and restoring youth.[36] On the other hand, it also differed from the primarily medical concerns of Paracelsus (1493–1541) and his followers, in offering an affordable route to gold-making.[37] As such, sericonian alchemy offered a versatile palette of products that proved attractive to practitioners from a range of backgrounds and with diverse practical and philosophical commitments. It also offered a tempting investment opportunity, adopted by generations of English alchemists who sought to attract prospective patrons with the promise of both health and wealth.

RECOVERING ENGLISH PRACTITIONERS

The meaning of "sericon" was not static. Like other alchemical cover names, or *Decknamen*, it changed form over the centuries as practitioners adapted

35. On pseudo-Lullian alchemy, see Michela Pereira, *The Alchemical Corpus Attributed to Raymond Lull* (London: Warburg Institute, 1989); Pereira, *L'oro dei filosofi: Saggio sulle idee di un alchimista del Trecento* (Spoleto: Centro Italiano di Studi sull'Alto Medioevo, 1992); Pereira, "*Medicina* in the Alchemical Writings Attributed to Raymond Lull (14th–17th Centuries)," in *Alchemy and Chemistry in the Sixteenth and Seventeenth Centuries*, ed. Piyo Rattansi and Antonio Clericuzio (Dordrecht: Kluwer, 1994), 1–15; Pereira, "Mater Medicinarum: English Physicians and the Alchemical Elixir in the Fifteenth Century," in *Medicine from the Black Death to the French Disease*, ed. Roger French, Jon Arrizabalaga, Andrew Cunningham, and Luis Garcia-Ballester (Aldershot: Ashgate, 1998), 26–52; William R. Newman, *Gehennical Fire: The Lives of George Starkey, an American Alchemist in the Scientific Revolution* (Cambridge, MA: Harvard University Press, 1994), 98–103. The key text of the corpus, the *Testamentum*, has been edited by Pereira; Michela Pereira and Barbara Spaggiari, eds., *Il Testamentum alchemico attribuito a Raimondo Lullo: Edizione del testo latino e catalano dal manoscritto Oxford, Corpus Christi College, 255* (Florence: SISMEL, 1999); hereafter *Testamentum*.

36. On the content and influence of pseudo-Geberian alchemy, see Newman, *Summa perfectionis*; Newman, *Atoms and Alchemy*.

37. On Paracelsian medicine, see Wilhelm Kühlmann and Joachim Telle, eds., *Corpus Paracelsisticum: Dokumente frühneuzeitlicher Naturphilosophie in Deutschland* (Tübingen: Max Niemeyer, 2001–); Didier Kahn, *Alchimie et Paracelsime en France à la fin de la Renaissance (1567–1625)* (Geneva: Librairie Droz, 2007); Allen G. Debus, *The Chemical Philosophy: Paracelsian Science and Medicine in the Sixteenth and Seventeenth Centuries*, 2 vols. (New York: Science History Publications, 1977). Debus's pioneering studies, while instrumental in developing the field, have to a large extent been superseded by more recent scholarship.

the medieval practice to accommodate new substances and techniques. Mapping these changes requires us to work primarily with manuscripts rather than print—an exercise in which we are aided by early modern readers, whose annotations and transcriptions (and occasional spillages) reveal the intensity with which they studied and discussed their medieval sources.

By tracing how these books circulated, we encounter previously unidentified networks of readers and practitioners, whose existence defies the stereotype of the solitary adept. While medicinal remedies might be quietly distilled at home, the labor and cost of chrysopoeia, not to mention its problematic legal status, meant that the quest for the mineral stone was often a corporate affair. The enterprise of alchemy saw monks and canons collaborating with secular priests, merchants, and artisans: exchanging books, debating ingredients, sharing space, and setting down their experience in treatises, poems, and recipe collections. Practitioners were no more "alone" than the mercury they professed to uphold, and their backgrounds were as diverse as their materials.

Within this mixed economy of alchemical collaboration, which often bridged crafts and communities, alchemical knowledge was mediated via Middle English as well as Latin. From the end of the fourteenth century, practitioners increasingly recorded their practices of reading and experiment in Middle English—although we should note that Latin texts still vastly outnumbered those available in English throughout the fifteenth century. Alchemy is the largest genre of Middle English scientific writing; the name of George Ripley alone is attached to more Middle English scientific and medical texts than that of any other author, outweighing Chaucer, Roger Bacon, Galen, and Hippocrates.[38] These writings were not produced only by clerics. English craftsmen and merchants also wrote vernacular commentaries that passed judgment on the learned Latin treatises of previous centuries, often imitating their style and philosophical framing, even as they stripped away conceptual material to privilege practical, replicable content.

Despite the attrition of the Reformation, large numbers of these texts survive in manuscript, few of which have received detailed scholarly attention.[39]

38. Linda Ehrsam Voigts, "Multitudes of Middle English Medical Manuscripts, or the Englishing of Science and Medicine," in *Manuscript Sources of Medieval Medicine: A Book of Essays*, ed. Margaret R. Schleissner (New York: Garland, 1995), 183–95. Voigts's findings are detailed in Linda Ehrsam Voigts and Patricia Deery Kurtz, comps., *Scientific and Medical Writings in Old and Middle English: An Electronic Reference* (Ann Arbor: University of Michigan Press, 2000), CD-ROM.

39. Although much remains unpublished, recent years have seen an encouraging increase in the number of critical editions, including the important corpus of interlinked alchemical verses now

Even in the case of well-known figures like Dee and Ripley, there is, therefore, still much to learn, either from the books they owned and compiled or, in cases where the originals have not survived, from later sixteenth- and seventeenth-century copies. For instance, Elizabethan transcriptions—themselves evidence of intense interest among late sixteenth-century readers—allow us to reconstruct one of English alchemy's most important "antiquities": Ripley's *Bosome Book*, a manuscript compendium of his writings on practical and philosophical subjects. While the recovery of this long-lost book caused a minor sensation among Elizabethan readers, soon communicated to the imperial court in Prague, its existence is now almost entirely forgotten. Yet, as Samuel Norton recognized in the 1570s, this manuscript offers a key to understanding Ripley's better-known works, including the *Compound of Alchemy*, one of the keystones of English alchemy. As Norton knew, even the most puzzling "philosophical" works can reveal much when read alongside one another.

Tracing the reception of these materials offers other clues to the lives and habits of English alchemists, revealed through their annotations, additions, and alterations to texts. In a science where success and credibility were viewed as contingent on sophisticated reading techniques, reader-practitioners approached their books with particular earnestness, pen in hand. This attitude will come as no surprise to historians of scholarship and of the book, who have long charted the efforts of humanist scholars both to dissect their reading matter using established readerly techniques, and to apply the bookish learning thus acquired to real-world situations and events—in our case, to chemical and medical practices.[40] In artisanal

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edited by Anke Timmermann, *Verse and Transmutation: A Corpus of Middle English Alchemical Poetry* (Leiden: Brill, 2013). See also Robert M. Schuler, *Alchemical Poetry 1575–1700, from Previously Unpublished Manuscripts* (New York: Garland, 1995); and Peter J. Grund, *"Misticall Wordes and Names Infinite": An Edition and Study of Humfrey Lock's Treatise on Alchemy* (Tempe: Arizona Center for Medieval and Renaissance Studies, 2011). Other important manuscript materials are discussed in Charles Webster, "Alchemical and Paracelsian Medicine," in *Health, Medicine, and Mortality in the Sixteenth Century*, ed. Charles Webster (Cambridge: Cambridge University Press, 1979), 301–34; Deborah E. Harkness, *The Jewel House: Elizabethan London and the Scientific Revolution* (New Haven: Yale University Press, 2007).

40. See particularly Lisa Jardine and Anthony Grafton, "'Studied for Action: How Gabriel Harvey Read His Livy,'" *Past and Present* 129 (1990): 30–78. On the practices used by other learned readers of scientific texts, see William H. Sherman, *John Dee: The Politics of Reading and Writing in the English Renaissance* (Amherst: University of Massachusetts Press, 1995); Renee Raphael, *Reading Galileo: Scribal Technology and the "Two New Sciences"* (Baltimore: Johns Hopkins University Press, 2017). On "reading alchemically" in the context of a wider early modern library, see Richard Calis et al., "Passing the Book: Cultures of Reading in the Winthrop Family, 1580–1730,"

and household contexts, too, handbooks and recipe collections (particularly those kept within a single shop or family) may preserve modifications added over long periods of time, as each new generation adds its tweaks and changes to the page—a process that often preserves the contributions of women practitioners in ways seldom encountered in "philosophical" tracts.[41] Yet although alchemical treatises intersect with recipe literature, the rhetoric of the former clearly distinguishes philosophical writings from mere conglomerations of receipts, which (they claim) strip alchemical secrets of complexity and nuance.

Throughout the book, I draw on such readerly interactions as evidence for my own reconstruction of the relationship between reading and experiment. While I have attempted to do so in some detail, this has also required compromises in terms of what can reasonably be included in a book of this length. It has not been possible to discuss every English alchemist, and many interesting and important figures—from medieval religious like John Dastin (ca. 1295–ca. 1383) and John Sawtrey to such sixteenth- and seventeenth-century practitioners as the mathematician Thomas Harriot (ca. 1560–1621), physician Francis Anthony (1550–1623), and Margaret Clifford, Countess of Cumberland (1560–1616)—consequently receive short shrift here. For similar reasons I do not discuss alchemical imagery in detail, reserving this analysis for a future study.[42]

In place of these familiar names and themes, I have chosen to concentrate on material that is, for the most part, new. Many of the sources I discuss have not been previously associated with named practitioners, yet these connections reveal hitherto unknown circles of readers, correspondents, and

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Past and Present 241 (2018): 69–141; on humanist reading more generally, Anthony Grafton, *Commerce with the Classics: Ancient Books and Renaissance Readers* (Ann Arbor: University of Michigan Press, 1997).

41. On cultures of English recipe books, see Elaine Leong, *Recipes and Everyday Knowledge: Medicine, Science, and the Household in Early Modern England* (Chicago: University of Chicago Press, 2019); Melissa Reynolds, "'Here Is a Good Boke to Lerne': Practical Books, the Coming of the Press, and the Search for Knowledge, ca. 1400–1560," *Journal of British Studies* 58 (2019): 259–88; Elizabeth Spiller, "Recipes for Knowledge: Maker's Knowledge Traditions, Paracelsian Recipes, and the Invention of the Cookbook," in *Renaissance Food from Rabelais to Shakespeare*, ed. Joan Fitzpatrick (Aldershot: Ashgate, 2009), 55–72. On distilling practices among elite women, see Alisha Rankin, *Panaceia's Daughters: Noblewomen as Healers in Early Modern Germany* (Chicago: University of Chicago Press, 2013).

42. Jennifer M. Rampling, *The Hidden Stone: Alchemy, Art, and the Ripley Scrolls* (Oxford: Oxford University Press, forthcoming). For excellent introductions to alchemical imagery, see Barbara Obrist, "Visualization in Medieval Alchemy," *HYLE—International Journal for Philosophy of Chemistry* 9 (2003): 131–70, www.hyle.org/journal/issues/9-2/obrist.htm; Principe, *Secrets of Alchemy*, chap. 6.

patronage-seekers, whose engagement with the writings of past adepts also sheds light on their own careers and practical commitments. For instance, newly identified texts allow us to revisit the trajectories of William Blomfild and Edward Kelley, two prominent alchemists who used their expertise as leverage while petitioning for release from prison, urgently penning treatises to King Henry VIII and Emperor Rudolf II, respectively. The marginal notes of another famous practitioner, Thomas Charnock, previously known only from seventeenth-century transcriptions, serve a different function on the page of his own fifteenth-century manuscripts. And our intuitions about the alchemical proclivities of the Tudor cosmographer Richard Eden, formerly reconstructed from court records and correspondence, can at last be tested against one of his own, previously unidentified manuscripts. To these well-known names we must add the contributions of English practitioners whose work has been, to a greater or lesser extent, overlooked—some anonymous, others whose names are still preserved, like Thomas Peter, who petitioned Henry VIII, and Richard Walton, who petitioned Elizabeth I.

The excavation of this alchemical tradition divulges something else as well: the role of personal, experimental practice in the broader context of national history. During periods of political, religious, and technological change, English men and women held onto alchemy as a source of knowledge and advancement. Their experience of alchemical reading altered their sense of what could be accomplished in nature, and what had been achieved in England's past—a sense cemented by their own autopsy of chemical transformations. To follow these alchemists as they acquired, applied, and marketed natural knowledge is, therefore, to build a bridge between the intellectual history of chemistry and the wider worlds of early modern patronage, medicine, and science.

CHAPTER ONE

Philosophers and Kings

Therfor take the stone animal, vegetable, and mynerall, the which is no stone, neither hath the nature of a stone.[1]

According to an early modern legend, King Edward III of England (1312–1377) once received a visiting alchemist from abroad. One version of the story, translated from a French exemplar, introduces the alchemist simply as Raymond, a master of arts and doctor of divinity who "after long and paynfull studdy" obtained the knowledge of alchemy. Seeking a virtuous prince who would aid in the defense of Christendom, Raymond went to Edward and offered to transmute enough gold and silver to finance a Crusade against the Turks. But the young king, faithlessly reneging on his promise, instead used his alchemical gold to fund self-aggrandizing wars against the French:

> The King so allway kept him as a prisoner, secretly in his contry, not suffering him to depart, and when his Army was reddye, the Kinge sent them into Frau*n*ce instead of goeing against the Sarasones, whervpon great hurte ensued to Fraunce, vnder pretence of that title w*h*iche Englishe yet say they haue to Frau*n*ce.[2]

The Raymond in this story was no lowly clerk, but the Majorcan philosopher, logician, and theologian Ramon Llull (1232–1316), his name anglicized

1. Ashmole 396, in *Secretum Secretorum*, ed. Manzalaoui, 67.

2. J[ean] S[aulnier], "A doctrine Concerning the transmutation of Mettalls written by the most reuerend Man Jo. S. & dedicated to his sonne," Sloane 363, fols. 19v-20r (seventeenth century). This is an English translation of Jean Saulnier's French treatise, written in 1432. On the original text, see Pereira, *Alchemical Corpus*, 44n42; J. A. Corbett, *Catalogue des manuscrits alchimiques latins* (Paris: Office International de Labraire, 1939, 1951), 2:153.

could result in capital sentences. A brutal and spectacular sting operation in 1278, which led to the arrest of around 600 Jews and numerous mint officials and goldsmiths, was aimed at curtailing clipping practices. Philip de Cambio, the moneyer of the London Mint, was among the hundreds sentenced to death, although the warden, Bartholomew de Castello, escaped by claiming benefit of clergy.[16] Yet, despite the terrific penalties for failure, the rewards for successful counterfeiting and clipping actually increased with the advent of the more valuable gold coinage. While counterfeiting the king's coin had always been treasonable, this status was formalized in the Treason Act of 1351/2.[17]

Illicit activity was not confined to laymen. Although Jews bore the brunt of the 1278 crackdown, plenty of English Catholics were engaged in the same practice, including the heads of religious houses. Guy de Mereant, prior of Montacute, a Cluniac house in Somerset, was fined for clipping coins in 1279 and again (with the additional offense of passing counterfeit money) in 1284.[18] No one order or geographical region held a monopoly on currency crime. William de Stoke, an Augustinian canon from the Essex priory of Little Dunmow, was charged, although probably not convicted, of counterfeiting gold and silver coins in 1369;[19] while in 1414 the abbot of Combermere, an impoverished Cistercian house in Cheshire, was accused of clipping gold coins.[20] Their religious profession did not prevent monks and canons from dabbling in dubious metallurgical practices, although it did partly insulate them from the penal consequences—a fact worth keeping in mind given the large number of English monks, canons, and friars, including heads of houses, who

16. Ibid., 68. The crackdown on Jews, accompanied by increased taxation of this community, was a precursor to the Edict of Expulsion of 1290; concerning which, see Robin R. Mundill, *England's Jewish Solution: Experiment and Expulsion, 1262–1290* (New York: Cambridge University Press, 1998).

17. "Declaration what Offences shall be adjudged Treason," 25 Edw. 3 Stat. 5 c.2. See J. G. Bellamy, *The Law of Treason in England in the Later Middle Ages* (Cambridge: Cambridge University Press, 1970), 85–86.

18. "House of Cluniac Monks: The Priory of Montacute," in *A History of the County of Somerset*, vol. 2, ed. William Page (London: Victoria County History, 1911), 111–15; *British History Online*, https://www.british-history.ac.uk/vch/som/vol2/pp111–115 (accessed 28 December 2014).

19. "Houses of Austin Canons: Priory of Little Dunmow," in *A History of the County of Essex*, vol. 2, ed. William Page and J. Horace Round (London: Victoria County History, 1907), 150–54; *British History Online*, https://www.british-history.ac.uk/vch/essex/vol2/pp150–154 (accessed 28 December 2014).

20. A. P. Baggs et al., "Houses of Cistercian Monks: The Abbey of Combermere," in *A History of the County of Chester*, vol. 3, ed. C. R. Elrington and B. E. Harris (London: Victoria County History, 1980), 150–56; *British History Online*, https://www.british-history.ac.uk/vch/ches/vol3/pp150–156 (accessed 28 December 2014).

ther instructions.[24] Probably Pygas had sued for a pardon, and the king may have been sufficiently intrigued by the composition of his alchemical metal that he was moved to "deal graciously" with an otherwise egregious case of illicit coining.

Yet, although the law perceived a connection between alchemy and currency crime, alchemical procedures technically applied only to the creation of the metal, not to the far more serious crime of forging coins. A less obviously treasonable alternative to coining alchemically produced metal oneself was to sell it directly to the mint—the course taken by the chaplain Willelmus de Brumleye in 1374. Using a process learned from William Shilchurch, a canon of the king's chapel of Windsor, Brumleye succeeded in selling a batch of metal made "by the art of alconomie" to the Tower mint.[25] The result was convincing enough that the keeper bought it for eighteen shillings. William was later arrested in possession of four pieces of counterfeit gold, which he had also tried to sell, although it is not clear whether this metal was of the same kind that had earlier impressed the keeper.

These cases reveal a certain official ambivalence with regard to alchemy. Successive governments sought to maintain the gold and silver content of English coin, the basic quality of which underwrote confidence in the currency. Counterfeiting coin was the most heinous offense, but men like William of Brumleye, who were not guilty of coining but who threatened to flood the mint with dubious, multiplied metal, still endangered the quality and reputation of the currency.[26] The problems associated with such practices undoubtedly underpin Henry IV's statute of 1403/4, which instructed that henceforth no one should "multiply Gold or Silver, nor use the Craft of Multiplication."[27]

24. Singer, 3:782: "Nos volentes cum prefato Johanne agere gratiose, vobis mandamus quod si contingat ipsum Johannem de prodicione predicta coram vobis per veredictum seu alio modo conuinci seu morti adiudicari, tunc execucioni iudicii in hac parte reddendi, quousque aliud a nobis habueritis in mandatis, supersedeatis."

25. National Archives, Coram Rege Roll, No. 448, 47 Edward III, Hilary Term, Rex m.15.d; also cited in Singer, 3:781: "cum arte Alconomie." For an English summary of the source, see H. G. Richardson, "Year Books and Plea Rolls as Sources of Historical Information," *Transactions of the Royal Historical Society*, 4th ser., 5 (1922): 28–70, on 39. On Brumleye, see Carolyn P. Collette and Vincent DiMarco, "The Canon's Yeoman's Tale," in *Sources and Analogues of the Canterbury Tales*, vol. 2, ed. Robert M. Correale and Mary Hamel (Cambridge: D. S. Brewer, 2005), 715–47, on 720–21.

26. Although the illegality of false metal was uncontroversial, some continental canon lawyers did speculate that genuinely transmuted gold could be sold legally: Nummedal, *Alchemy and Authority*, 151.

27. National Archives, Statutes of the Realm, 5 Henry IV, cap. IV; cited in Singer, 3:782: "Ordeignez est et establiz qu nully desorenavant use de multiplier or ou argent, ne use le art de

The wording of the statute acknowledged that multiplying was not identical to counterfeiting, since it affected the matter of the metal rather than its form. Yet, by forbidding the manufacture of unusual metal alloys, this measure closed a possible legal loophole that might have been exploited by practitioners who hoped to sell false metal to the Mint. Even if not intended for coinage, such metal could still be fraudulent if it resulted in overvaluation of goods, as John Herward of Rochester discovered in October 1414. Convicted of making false gold and silver bands for mazer cups, he was sentenced to stand in the pillory with the deceiving bands hung around his neck.[28]

The image of alchemy recorded in such cases is very different from the portraits of pious and learned adepts elaborated in philosophical treatises. By the end of the fourteenth century, a remarkable situation existed in which alchemy was simultaneously hailed as an elevated form of philosophy and damned as a fraudulent practice that threatened the integrity of English coin. The rhetorical distinction between philosophers and forgers would only widen during the fifteenth century, as the government struggled to both manage and exploit burgeoning interest in an art that was technically illegal, but still promised astonishing rewards.

THE PHILOSOPHICAL STATUS OF ALCHEMY

The history of English alchemy revealed by official records is one dominated by concern over transmutation and the multiplying of metals. As a history it is inevitably one-sided, since it records only practices that were illegal, or feared to be. Yet anxiety over alchemy's less salubrious associations also colored the vision of alchemy's past revealed in the writings of self-styled philosophers. Such writers typically emphasize the pious and philosophical over the pragmatic and profitable—a strategy that bolstered the reputation of the science as a branch of natural philosophy, while distancing its practitioners from associations with fraud. It is in the writings of devout reader-practitioners, many of whom were monks or friars, that we also find the medical and religious dimensions of alchemy most fully explored.

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multiplication: Et si null le face et de ceo soit atteint qil encourage la peyne de felonie en ce cas." Translation in D. Geoghegan, "A Licence of Henry VI to Practise Alchemy," *Ambix* 6 (1957): 10–17, on 10n1.

28. "Folios cxxxi–cxlii: Feb 1413–14," in *Calendar of Letter-Books of the City of London: I, 1400–1422*, ed. Reginald R Sharpe (London: His Majesty's Stationery Office, 1909), 122–30; *British History Online*, https://www.british-history.ac.uk/london-letter-books/voli/pp122–130 (accessed 28 December 2014).

Clement.[37] Another English monk of the early fourteenth century, John Dastin, penned alchemical epistles to Cardinal Napoleon Orsini and may have spent time at the papal court at Avignon, although little is known of his life or whether he acquired his knowledge in England or abroad.[38] The Englishman John Dombelay seems to have prepared both of his attested works, the *Stella complexionis* (1384) and *Practica vera alkimica* (1386), at the request of the Archbishop Elector of Trier, Kuno II von Falkenstein (1320–1388).[39]

These international connections also kept England supplied with alchemical material, including new treatises and practical innovations from abroad. Sometimes continental manuscripts came to England with returning students. Sophie Page has reconstructed the book collections of English monks, including Michael de Northgate and John of London, who studied at Paris before settling at St. Augustine's abbey in Canterbury in the early 1320s, bringing with them manuscripts of astronomy, medicine, magic, and

37. Roger Bacon, *Secretum secretorum cum glossi et notulis, tractatus brevis et utilis ad declarandum quedam obscure dicta Fratris Rogeri*, in *Opera hactenus inedita Rogeri Baconis*, fasc. 5, ed. Robert Steele (Oxford: Clarendon Press, 1920), 1–175, on 117–18. For the influence of the *Secretum* on Bacon's alchemy, see Stewart C. Easton, *Roger Bacon and His Search for a Universal Science: A Reconsideration of the Life and Work of Roger Bacon in the Light of His Own Stated Purposes* (Oxford: Blackwell, 1952), on 30–31, 73–73, 77–86, 103–104; Pereira, *L'oro dei filosofi*; Eamon, *Science and the Secrets of Nature*; William R. Newman, "The Philosophers' Egg: Theory and Practice in the Alchemy of Roger Bacon," *Micrologus* 3 (1995): 75–101; Newman, "Alchemy of Roger Bacon"; Obrist, "Alchemy and Secret"; Moureau, "Elixir Atque Fermentum."

38. On the dating of Dastin's writings, see *HMES*, 3:85–102; W. R. Theisen, "John Dastin's Letter on the Philosopher's Stone," *Ambix* 33 (1986): 78–87. The alchemist may have been the same "Magister John Dastin" granted a canonry in Southwell in 1317 by Edward III at Orsini's request: José Rodríguez-Guerrero, "Un repaso a la alquimia del Midi Francés en al siglo XIV (parte I)," *Azogue: Revista electrónica dedicada al estudio histórico crítico de la alquimia* 7 (2010–13): 75–141, on 92–101.

39. Dombelay's name is not known exactly, as it is variously attested in manuscript copies—for instance, as Dumbaley, Dumbeler, Dumblerius, Bumbelem, and Bumbelam. He appears as "DUMBELEIUS [JOHANNES] de Anglia" in Thomas Tanner, *Bibliotheca Britannico-Hibernica: sive, de scriptoribus, qui in Anglia, Scotia, et Hibernia ad saeculi XVII initium floruerunt, literarum ordine juxta familiarum nomina dispositis commentarius* (London, 1748), 237. The *Practica vera alkimica* is explicitly dedicated to Kuno II: *TC*, 4:912. The *Stella complexionis* is dated to 1384 by colophon—e.g., Ashmole 1450, pt. 4, fol. 131v: "Explicit libellus vocatus Stella Alkimie compositus .A. Johanne Bu*m*bule*m* de Anglia Anno domini 1384." Although the dedicatee is not mentioned by name in any of the manuscript copies I have examined, Dombelay addresses his patron as "Reverend Prince" (fol. 131v: "O Reuerende Princeps"), the appropriate form of address for the ruler of the ecclesiastical principality of Trier. Ashmole notes an alternative dedication at the end of his transcription of the text (itself copied from Christopher Taylour's 1584 transcription) in Ashmole 1493, fol. 97: "dedicated to K. Richard the 2d: King of England." However, he does not provide a source for this, and the internal and contextual evidence suggests that this dedication was proposed by a later reader on the basis of Dombelay's nationality and the date of his work, which happens to coincide with Richard II's reign.

alchemy, as well as theological texts.[40] The alchemist Philippe Éléphant, or Oliphant (fl. 1350s), who taught at Toulouse, seems to have been from the British Isles originally, possibly from Scotland.[41] John Dombelay was apparently in France when he composed the *Practica*, in which he incorporated material from another treatise (itself a commentary on an earlier work) written in Paris three decades earlier.[42] A century later, Richard Dove studied at both Orléans and Oxford before joining the Cistercian community at Buckfastleigh Abbey in Devon, where he compiled a manuscript, now Sloane 513, in which alchemical treatises sit alongside works on geometry, astronomy, and French verbs.[43]

Through such scholarly peregrinations, it did not take long for shifts in emphasis in alchemical theory to reach England from abroad. The same was true of interpretative methods. As new sources of authority arose, earlier treatises were reread in light of new information—an exercise that sometimes resulted in dramatic reinterpretations. The most consequential of these reconfigurations accompanied the rise of the "mercury alone" theory from the late thirteenth century, a doctrine whose impact can be seen by tracing readers' reception of the famous lemma from the *Secretum*, of the animal, vegetable, and mineral stone.

READING ALCHEMICALLY

By 1300 one of the most influential authorities for the use of organic ingredients in alchemy was *De anima* (On the Soul), compiled and translated from three lost Arabic treatises and pseudonymously attributed to Avicenna.[44]

40. Page, *Magic in the Cloister*, 11–12, 16, 18.

41. Guy Beaujouan and Paul Cattin, "Philippe Éléphant (mathématique, alchimie, éthique)," in *Histoire littéraire de la France*, vol. 41, *Suite du quatorzième siècle* (Paris: Imprimerie nationale, 1981), 285–363.

42. On Dombelay and the *Practica*, see *HMES*, 4:188–90.

43. Page, *Magic in the Cloister*, 127, citing David N. Bell, "A Cistercian at Oxford: Richard Dove of Buckfast and London," *Studia monastica* 31 (1989): 67–87.

44. The Arabic original of *De anima* (often referred to in scholarship as *De anima in arte alchimiae*) seems to have been composed in Spain in the twelfth century; Sébastien Moureau, *La "De anima" alchimique du pseudo-Avicenne* (Florence: SISMEL, 2016), 1:41–57. The combined text is important as evidence both for the reception of Jābirian alchemy in the Islamic West, and for the influence it exerted on Latin alchemical writing following its translation during the thirteenth century. For the early modern edition, see *De anima in arte alchimiae*, in *Artis Chemicae Principes, Avicenna atque Geber*, ed. Mino Celsi (Basel: Pietro Perna, 1572); for a modern critical edition, accompanied by an authoritative study of the text, see Moureau, *La "De anima" alchimique*. See also Moureau, "Questions of Methodology about Pseudo-Avicenna's *De anima in arte alchemiae*: Identification of a Latin Translation and Method of Edition," in *Chymia: Science and Nature in*

Walter of Evesham (fl. ca. 1280–1301), a monk at the Benedictine abbey of Evesham, near Worcester.[51] As with Bacon, something is known of Walter's broader interests, which ran the full gamut of the mathematical arts (attested by a treatise on musical theory, the *Summa de speculatione musicae*); works on optics and arithmetic; and an almanac for his abbey that starts in the year 1301.[52] Walter's range of interests is also reflected in the multiplicity of ingredients that he considers in his alchemical treatise, the *Ysocedron*—a title reflecting the work's division into twenty chapters.[53] Drawing heavily on *De anima*, Walter selects his starting materials from all the kingdoms of nature:

> The matter of the medicine is drawn from three things: that is, from animals, vegetables, and minerals. From animals we take human blood, hairs, and the eggs of chickens, and these are called "stones" by philosophers.[54]

The *Ysocedron* also discusses medicinal applications. For Walter, an affinity exists between minerals and human bodies. On the one hand, minerals make excellent medicines, as shown by the value of gold as a treatment for leprosy. On the other, human blood is excellent for treating metals.[55] Nor does Walter's concern with proportion detract from the practical bent of the treatise. Among his many recipes, for instance, he describes a red oil made by distilling egg yolks, noting that this operation works for eggs, but not for hair.[56]

Not all readers were convinced by *De anima*'s plurality of stones, however. For a medieval natural philosopher, the notion that metals could be

51. Walter Odington is not to be confused with the Walter Evesham who was attached to Merton College, Oxford, in the second quarter of the century: Frederick Hammond, "Odington, Walter (*fl. c.*1280–1301)," *ODNB* (accessed 11 May 2012).

52. Hammond, "Odington, Walter." Odington also composed a work on the age of the earth, *De aetate mundi*; see J. D. North, "Chronology and the Age of the World," in *Stars, Minds, and Fate: Essays in Ancient and Medieval Cosmology* (London: Hambledon, 1989), 91–115; Carl Philipp Emanuel Nothaft, "Walter Odddington's *De etate mundi* and the Pursuit of a Scientific Chronology in Medieval England," *Journal of the History of Ideas* 77 (2016): 183–201.

53. This treatise survives in five manuscripts, including an almost complete copy transcribed in 1474 by a Welshman, David Ragor: British Library, MS Add. 15549, fols. 4r–20v; edited by Phillip D. Thomas, *David Ragor's Transcription of Walter of Odington's "Icocedron"* (Wichita: Wichita State University, 1968), 3–24; hereafter *Icocedron*. See also *HMES*, 4:127–32.

54. *Icocedron*, 5: "Materia medicine a tribus elicitur, videlicet, ab animalibus, vegetabilibus, et mineralibus. Ab animalibus accipimus sanguinem hominis, capillos, et ova gallinarum, et ista lapides vocantur a philosophis."

55. Ibid., 7: "Et sunt affinia corpus hominis et mineralia quia mineralia sunt meliores medicine pro corpore hominis ut aurum pro leproso propter suam temperanciam, ita sanguis hominis pro metallo."

56. Ibid., 15: "De ovis sequirtur [*sic*] . . . Vitellos pone in descensorio, et descendet oleum totaliter rubeum . . . De capillis vero non curo in hoc opere."