

Entangled Itineraries

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Materials, Practices, and Knowledges across Eurasia

Edited by Pamela H. Smith

University of Pittsburgh Press

In memory of Ronald E. Smith (1931–2018),
whose love still journeys with me

Published by the University of Pittsburgh Press, Pittsburgh, Pa., 15260

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Manufactured in the United States of America

Printed on acid-free paper

10 9 8 7 6 5 4 3 2 1

Cataloging-in-Publication data is available from the Library of Congress

ISBN 13: 978-0-8229-6577-0

ISBN 10: 0-8229-6577-1

Cover art: Rectangular world map from Fatimid treatise,
Book of Curiosities of the Sciences and Marvels for the Eyes.

Cover design: Melissa Dias-Mandoly

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aphrodisiac, and was at the same time taboo for Buddhist monks in South Asia. It was a key occult drug used for expelling evil spirits and vermin in all Asian cultures. In East Asia, in particular, *awei* redefined the explanatory paradigm of healing and medical theory, its unique stench again playing a key role. But the same stench disqualified it as an East Asian and European food.

This changing materiality did not disrupt its popularity in South Asian markets but, in East Asia, caused a gradual decline after the fourteenth century. Being a traveling material with an unknown raw state that went through uncontrollable production processes before it reached East Asia, *awei* was increasingly brought into doubt as a valued commodity, as demand for it increased from a global market. Confusing information about its provenance and authenticity was coupled with changing principles of drug use in East Asia. In centers such as Canton, Hangzhou, and Quanzhou, conflicting information was particularly abundant. Meanwhile, drugs perceived to possess drastic transformative powers lost their appeal and gave way to milder, often local ingredients. *Asafetida*'s unique stench, moreover, amplified its perceived abrasive nature.

Europeans picked up the global interest in and demand for *asafetida*, however, as East Asians were turning their backs on it, albeit in a completely different context. The opening of new transoceanic routes after the sixteenth century, combined with a search for ancient knowledge, ignited a search for materials mentioned in Dioscorides's *Materia Medica*. To compare *asafetida* with the classical material known as *silphium*—and from there to unravel the differences between various *Ferula* plants—became a tantalizing project for traveling diplomats, doctors, merchants, local traders and gardeners, and natural historians in major European trading companies, medical faculties, and their botanical gardens, and in the nineteenth century in newly created laboratories. *Silphium* remains an object of research even today (see figure 7.6). As seeds and plants were exchanged, acclimatized to new regions, and the chemical contents of all types of *asafetida* were investigated, a whole new set of knowledge accumulated around the material complex "*asafetida*." The "true" appearance of *asafetida*, its plant, and its manufacture remained more elusive than ever, however, even as knowledge about it was codified anew in a network of global hubs of trade and scholarship, including Bombay, London, Paris, Geneva, Edinburgh, Edo, and Canton.

Chapter 8

Smoke and Silkworms

Itineraries of Material Complexes across Eurasia

Pamela H. Smith, Joslyn DeVinney, Sasha Grafit,
and Xiaomeng Liu

A remarkable sixteenth-century French compilation of mostly practical recipes for various art and technological processes contains much evidence of the movements of materials: both short-span itineraries within Europe—including silkworms and the blue dyestuff woad between southern France and Spain, dyes and pigments from Italy, amber from the Baltic, metals from Germany—as well as long-span pathways of dyestuffs such as turmeric and stick lac from South Asia, cochineal from Central America, and the tree resin, dragon's blood from the Canary Islands and North Africa, techniques of damascening armor from the Near East, and "damasking" cloth by resist dyeing it with "Moresque" templates, likely derived from the Ottoman Empire. Among all this evidence of the movement of materials and techniques across Eurasia, there are two unusual and puzzling recipes which are the focus of this essay, one labeled "Medicine of the orientals against all maladies" and another with the heading "The Work done in Algiers."¹

The anonymous manuscript in which these recipes appear is a 170-folio first-person account of processes carried out in a workshop, together with recipes and observations collected perhaps on visits to other workshops. Most of the manuscript is written in the same hand, although a scribe seems to have been involved in taking down some parts. The anonymous author is an experienced practitioner but does not appear to have been part of an identifiable trade association. He knows some Latin, although far from perfectly. Perhaps he is the son of a craftsman, trained in a workshop, with grammar school or even some university training, who then went to work for a rich merchant of Toulouse (where the manuscript seems to have been compiled), or for a noble

family, such as the Béthunes, whose library contained the manuscript after its probable composition in the 1580s and before the Béthunes donated their books and manuscripts to the king's library (now the BnF) in the seventeenth century.² The manuscript's 170 folios contain a collection of mainly technical recipes in no apparent order for objects that might have formed the contents of a type of collection much in fashion in the sixteenth century called a *Kunst-kammer* (Chamber of Art). Ms. Fr. 640's recipes would have pleased a collector with such a *Kunst-kammer* because this kind of collection sought to show off the imitation of nature's artifice by means of the artifice of the human hand. The manuscript contains instructions for the draughtsman, recipes for pigment making, metal casting and metal coloring, imitation gem production, arms and armor making, grafting trees, surveying land, a practice of taxidermy to manufacture monstrous composite animals, making papier mâché masks, and much more. The author may have been based in Languedoc, as he mentions towns of this area, particularly Toulouse.³ He may have had ambitions to publish a "book of secrets," such as that published under Alessio Piemontese's name for the first time in 1555, which then circulated widely throughout Europe. Although they sound esoteric, books of secrets generally comprised collections of mostly straightforward recipes for various art, medical, and utilitarian ends.

"Medicine of the orientals against all maladies"

Of over forty medicinal recipes in the manuscript, "Medicine of the orientals against all maladies" on folio 77r is the only entry that refers to "orientals," the only one that advises taking in the smoke of a dried herb as a treatment, and the only example of the use of a pipe.⁴ Investigating the remedy in this recipe and the entry's careful drawing of the pipe opens up a wider history of pipes and smoking that suggests the global movement of medical and ritual practices across Eurasia and beyond over a very long time. "Medicine of the orientals against all maladies" is a neatly written recipe, second from the top of fol. 77r between recipes "Against redness of the face" and for "Fatty earth" (figure 8.1).⁵

The recipe begins with the command to "dry rosemary in the month of May."⁶ Next, "fill this bowl with powder made of it [rosemary], and put a lit charcoal on top."⁷ After filling the bowl of the clay pipe with the crushed rosemary and charcoal, then "receive the smoke by a quite tightened mouth, and a part will come out by your nose. But if you want to purge the head also pinch the nose. Against colds, rheums, and other maladies."⁸ It is noteworthy

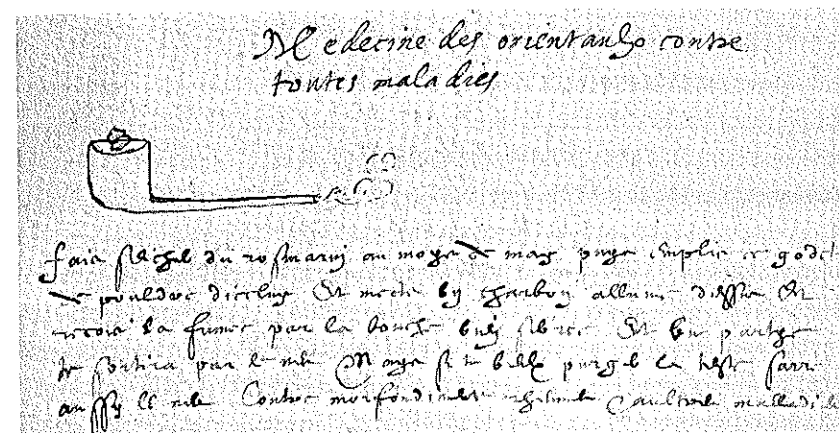


FIGURE 8.1. Sketch of the pipe for taking in the smoke of rosemary, in the entry entitled "Medicine of the orientals against all maladies." Fol. 77r, Ms. Fr. 640, "Recueil de recettes et secrets concernant l'art du mouleur, de l'artificier et du peintre." Département des manuscrits, Bibliothèque nationale de France. Public domain.

that these instructions direct the reader to bring the smoke into the head (not inhale it into the lungs).⁹ Drawing rosemary smoke into the head to remedy colds and rheums fits squarely within general humoral theories of balance—as well as imbalance—in specific organs caused by "accumulations of crude or otherwise morbid, harmful matter," or "fluxes." One of these fluxes, a "catarrh" or a "rheume" was attributed to "watery, mucous or corrupt matter that had accumulated in the head."¹⁰ Thus, the instruction to take smoke into the head aligns with the common sixteenth-century notion that treatments should target the specific location of the ailment. Moreover, as rheumes and catarrhs were "cold" ailments, and rosemary was considered a hot and dry herb, it stands to reason that it was used against head colds, as described in folio 77r.¹¹ The use of aromatic smoke as a remedy for colds or fluxes is related to the concept of infected air, in which airs could be corrected or protected by good smells, especially of aromatic herbs such as rosemary.¹² This concept led to practices of fumigating bodies and living spaces by taking in the aroma or smoke of strong-smelling substances.¹³

Rosemary

Rosemary occurs as an ingredient in another medical recipe in the manuscript, folio 102v, which instructs how to make an "infusion of anthos or rose-

mary" intended "for the elderly" by distilling the oil of rosemary, a common method for extracting the plant's aromatic oils and other substances perceived to contain medicinal virtues.¹⁴ Rosemary was viewed at this time as beneficial in aging and enhancing memory, but the medicinal virtues of rosemary possess a long and global history.¹⁵ In ancient Greece, rosemary was worn as a wreath upon the head for better memory during examinations and was also placed under pillows or beds to prevent nightmares.¹⁶ Rosemary appeared in the writings of Dioscorides (40–90 CE) and Galen (130–210 CE) and, by the latter Middle Ages, possessed rich symbolic meanings in Europe.¹⁷ Christian legends reported that the shrub received its virtuous blue flowers from the mantle of Mary and would not grow taller "than Christ's height on earth," ceasing at the age of thirty-three to grow higher, increasing only in breadth.¹⁸ Sixteenth-century references to rosemary frequently mention its use by the Romans to treat jaundice after drinking.¹⁹ The name "rosemary" comes from the Latin compound of *ros* and *marinus* (*rosmarinus*) or "sea dew," which alludes to its native habitat along the Mediterranean coastal region.²⁰ In his widely circulated *Historia Stirpium* from 1542, Leonhart Fuchs (1501–1566) refers to the works of Dioscorides and Galen when outlining rosemary's properties, and he mentions the herb's Greek name, *libanotis*, which was "called *rosmarinus* by the Romans."²¹

By the sixteenth century, rosemary's reputation as a kind of medical panacea was widely acknowledged in European herbals and medicinal treatises. The fourteenth-century English friar Henry Daniel (c. 1315–c. 1385) wrote an entire treatise on the herb, describing the numerous medicinal virtues of rosemary and listing a variety of medical conditions it could be helpful for, from gout, colds, and hair thinning to nightmares, memory loss, and aging skin.²² The first known English herbal of 1525 calls for boiling the "hot and dry" herb and drinking the water, "for it is much worth against all evils in the body."²³ Rosemary was seen as especially efficacious for problems of the brain. Shakespeare's widely quoted "there's rosemary, that's for remembrance" is also found in the herbal of Rembert Dodoens (1517–1585): "the Arrabians and their successours Physitions, do say that Rosemarie comforteth the brayne, the memory, and the inward senses, and that it restoreth speech."²⁴ Like Fuchs, Dodoens also cites Dioscorides and Galen about its property, when boiled, to work against jaundice. Pietro Andrea Mattioli (1501–1577), in the 1579 French translation of his commentaries on Dioscorides, provides nearly three pages on the herb.²⁵

Rosemary's virtues stemmed from its nature as a "hot and dry" herb. Fuchs mentions rosemary as a hot condiment herb, and the herb appears in other contemporary herbals in culinary recipes for the balancing of the body.²⁶ This explains why rosemary is used to treat a cold ailment in the recipe on folio 77r, albeit as a fumigant—also a common usage. Friar Daniel's manuscript suggests that if "pou hawe gret cold in þin hed take þe smoke of his bark in þin nase and þou shalt felyn helpe."²⁷ Fuchs states that "the later physicians say that rosemary as a fumigant eases a cough and dripping [noses], and what is especially noteworthy, when burned it renders the house safe during pestilence by its fumes diluting the danger of impure air." He notes that "today [rosemary] is planted everywhere in gardens and pots. However, in Narbonne, in France, it grows so abundantly that the inhabitants burn no other wood."²⁸ Dodoens states that "rosmary groweth naturally, and plentifully, in divers places of Spayne and France, as in Provence and Languedoc. They plante it in this countrie in gardens, and mayntayne it with great diligence."²⁹ The herbal writer John Gerard (1545–1613) also noted that "rosemarie there is such plentie thereof in Languedocke, that the inhabitants burne scarce any other fuell."³⁰ Clearly, rosemary grew abundantly in France during the sixteenth century, and botanical knowledge about the herb circulated in southern France in texts.³¹ The availability of rosemary and knowledge about its medicinal characteristics were not the only reasons for its popularity as a fumigant. Sixteenth-century beliefs about the relationship between smell and medicine were also important.

Smell

Aroma has played a role in medical thinking since antiquity. In *Airs, Waters, and Places* and *Nutriment*, Hippocrates mentions "bad smells" in the context of disease diagnosis and prevention.³² Until the late seventeenth century, physicians expressed a belief in a porous "breast- or nipple-like" plate separating the nasal and cerebral cavities. In *The Olfactory Organ*, Galen argued that the nose "was no more than a passage which carried smells up to the true olfactory organ, the brain itself."³³ Thus, with no barrier of protection, the brain could be affected by both "good" and "bad" smells. In addition to the physiognomy of sensory reception, the view that smells were material substances also contributed to their significance in narratives of health. In his work on smell and health, Richard Palmer lists instances of smells as part of treatment for "cold complexions of the brain, for various kinds of headache, for catarrh, for melancholy, and for nervous conditions."³⁴

The intersection of medicine, aromatics, and perfumery present in Ms. Fr. 640 thus reflects common links drawn between scent and health in the sixteenth century. The development of distilling and the extraction of essential or volatile oils meant that the use of volatile scents—whether in scented candles, rosewater, or aromatic herbs and flowers—was commonly employed to perfume clothes, bedding, soaps, spirits, and liqueurs.³⁵ Because it was widely available, rosemary was extensively employed during periods of plague, both in its essential oil form and also burned as a fumigant, to act as a prophylactic or remedy.³⁶ The connections between olfaction, aroma, fumigation, and health were common in early modern Europe, but the burning of aromatics for both bodily and spiritual health goes far back into the human past. It is recorded in Greek and Roman practices, for example, where it was part of Dionysian/Bacchic rites and is embodied during Christian ceremonies in the burning of aromatic resins such as frankincense and myrrh as materials that through their smell and smoke materialized ideas of spirit and directed thoughts to the heavenly sphere.³⁷ As one recent author put it, “smells were concretely evident when sights, sounds, and tastes were not; olfactory experience was tangibly perceived, although it did not involve the body’s limbs as did touch. These qualities made smell a singularly effective means of discerning divine presence or absence, demonic activity, or moral condition. Such significations expressed the cosmological orientation of the ancient Mediterranean world, whereby olfactory codes served to structure human experience in relation to divine order.”³⁸

The Pipe?

Rosemary use was thus common throughout the Mediterranean and especially in southern France where Ms. Fr. 640 was compiled. But what about the pipe? How common was it to smoke rosemary in a pipe? By the mid-seventeenth century, Nicholas Culpeper (1616–1654) echoes earlier texts in recommending rosemary for a variety of maladies but also provides examples of other materials to use as fumigants aside from rosemary, including rue, bitumen, and crushed amber.³⁹ Significantly, in *The English physician* (1653), he advises “to burn the Herb [rosemary] in houses and chambers” to “correcteth the air in them” and says “the dried Leavs shred smal and taken in a Pipe like as Tobacco is taken, helpeth those that have any Cough or Phtisick, or Consumption.”⁴⁰ While Culpeper’s text is witness to an increased use of pipes for smoking in the later seventeenth century, the Ms. Fr. 640 recipe seems to

be a rare usage of the pipe in the late sixteenth century. Historians writing on the history of pipes in a global context typically assume that pipe smoking is associated solely with tobacco, taking for granted that the smoke is inhaled into the lungs, not held in the head as recommended by Ms. Fr. 640.⁴¹ For example, in their introduction to *Smoke: A Global History of Smoking*, Sander L. Gilman and Zhou Xun begin their history with Columbus’s encounter with Native Americans smoking dried tobacco leaves. Widely cultivated in the Americas by both indigenous peoples and colonists by the sixteenth century, tobacco had been used in ritual and medicinal practices for millennia since its first cultivation in the Americas between the sixth and fourth centuries BCE.⁴² By the sixteenth century, tobacco twigs were being burned by North American Indians to treat chest conditions, perhaps indicating that the smoke was inhaled into the lungs.⁴³ Thomas Harriot (1560–1621), however, in his 1588 text about his travels to Virginia discusses the benefits of using tobacco and speaks of taking it into the head: “the leaves thereof being dried and brought into powder: they take the fume or smoke thereof by sucking it through pipes made of claie into their stomacke and heade; from whence it purgeth superfluous fleame and other grosse humors, openeth all the passages of the body: by which meanes the use thereof, not only preserveth the body from obstructions; but also if any be, so that they have not beene of too long continuance, in short time breaketh them: wherby their bodies are notably preserved in health.”⁴⁴

The spread of tobacco smoking apparently led to the diffusion of the clay pipe as a smoking implement around the world, although tobacco was also consumed in cigars, by sniffing, and by chewing.⁴⁵ According to Gilman and Xun, what surprised sixteenth-century Europeans was the use of the pipe to deliver the smoke instead of fumigating in “rooms full of smoke.” The English were perhaps the first to manufacture white-ball clay pipes toward the end of the sixteenth century.⁴⁶ A 1573 entry in a chronicle notes an unusual practice of “taking-in of the smoke of the Indian herbe called ‘Tobaco’ by an instrument formed like a little ladell.”⁴⁷ Meanwhile, the French in Florida had been introduced to tobacco smoking with clay pipes earlier in the sixteenth century. The chronicler John Sparke reported on John Hawkin’s voyage to the West Indies in 1565, writing, “The Floridians when they travell, have a kind of herbe dried, who with a cane and an earthen cup in the end, with fire, and the dried herbs put together, doe sucke thorow the cane the smoke thereof.”⁴⁸ It is probably impossible to precisely date and trace the introduction of clay

pipes into Europe, but it seems that this type of pipe was new in the period of Ms. Fr. 640, and the author-practitioner's inclusion of a sketch of the pipe may have come from his recent encounter with it.⁴⁹

Medicine of orientals

Finally, an obvious question about the author-practitioner's heading "Medicine of orientals" is to ask what "oriental" meant in sixteenth-century France. Although the term generally was used to refer to "Easterner," the reason for the use of the term on folio 77r is impossible to ascertain from the body of the recipe, especially as the author-practitioner does not seem to associate "oriental" with "exotic" but instead uses "oriental" simply to denote the origin of materials.⁵⁰ It is especially puzzling because rosemary was widely grown in France at the time but was not recorded in sixteenth-century Eastern—specifically Chinese—medicine as being smoked in pipes. After its introduction from *Dagin* (the premodern Chinese name for the Roman Empire) around 200 CE as an ornamental plant in the royal garden, rosemary is recorded for the first time in the eighth-century *Bencao Shiyi* 本草拾遺 (A supplement to materia medica) as preventing and expelling harmful *qi*, and "when burned, it exorcises evil spirits." The early tenth-century *Haiyao bencao* 海藥本草 (Foreign materia medica) also suggested its use as a mosquito repellent when mixed with notopterygium root and burned.⁵¹ By the sixteenth century, Li Shizhen's *Bencao gangmu* 本草綱目 (Compendium of materia medica) quoted both these uses for rosemary but evaluated it as an aromatic only used for sachets.⁵²

The term "orientals" in Ms. Fr. 640 is perhaps instead related to the diffusion of pipe-smoking practices from another part of the "East." Tobacco smoking had spread to Asia and Africa by the sixteenth century, and to South Asia, where the Mughals "mixed tobacco with other more familiar leaves, spices and sandalwood" and "drank" it (meaning "inhaled") by means of a water pipe or hookah.⁵³ The use of water pipes in Persia, India, and China would have been known to sixteenth-century Europeans via trade and travel.⁵⁴ During the early usage of clay pipes in Europe, therefore, dry pipes and Eastern water pipes may have been conflated, leading to the use of "oriental" in Ms. Fr. 640.⁵⁵

While the question of why "orientals" was used in this manuscript is thus likely to remain unanswered, it is clear that the recipe "Medicine of the orientals against all maladies" is a product of the global itineraries of materials,

practices, and objects in the early modern world. The use of dried rosemary in a clay pipe, although perhaps not as common as the use of tobacco, is not surprising given the widespread availability and use of rosemary in France as an aromatic fumigant and as a medicine in a variety of forms. The introduction of the clay pipe to Europe as a smoking implement is hard to date precisely, but it appears to have been a relatively new item in the mid- to late sixteenth century and was perhaps still associated with the spiritual meanings it possessed for Native Americans or possibly conflated with fumigation practices from the East that, like the burning of aromatics in Europe, could have both spiritual and medicinal significance. The author-practitioner's inclusion of a careful drawing of the pipe in the recipe on folio 77r probably indicates his unfamiliarity with the pipe, but whether he had personal experience using the aromatic smoke of rosemary in a clay pipe as a medicine or he learned about this practice from other sources, perhaps even copying it from another text, will—like many questions to do with long span routes of materials, objects, and practices—remain obscure. Even more tantalizing questions arise with regard to the entry on folios 52r–v of Ms. Fr. 640, in a recipe entitled "The Work done in Algiers."

"The Work done in Algiers"

"The Work done in Algiers" on folios 52r–v of the manuscript is an odd mix of gold-seeking alchemical aims—almost the sole such "alchemical" entry in the manuscript—combined with quite practical considerations and ordinary ingredients. In many ways, apart from its alchemical aim of making a powder that transforms antimony into gold, this recipe is of a piece with the rest of the manuscript in its attention to practical details, first-person perspective, and materials common to a workshop. Its practical tone is worth quoting in full:

The Work done in Algiers

Take a colt of three or four years and feed it on barley and straw cut in the manner one feeds horses in Spain, and water it with good fountain or river water. I do not know if it would be good sometimes to water it occasionally with water of sulfurous baths, and to sometimes give it fenugreek or other hot foods, for the intention of the worker is to use the heat of his dung, and the climate here is cooler than that of Algiers. Keep it in a warm and close place and make sure that none of its manure and urine should be lost, of which you will make a heap or two in order that while one cools the other will be at the appropriate heat to

continue. Also take a large glass flask as thick as you can, and one finger thick if it can be so made, and of the capacity of one pitcher or earthen jug. Around the feast of St John put into it a dozen and a half chicken eggs, that is to say, the yolk without the egg white and the germ. Others say sixty yolks. And with this dozen and a half of egg yolks put in half an ounce (others say sixty eggs, half a pound) of female silkworm eggs. And after having thoroughly luted [coated with protective clay] the flask (I do not know if there needs to be air for the generation), put it and bury it in the heat of the dung up to the neck, and leave it there until several worms are engendered. And then remove the flask and do not bury it in the dung any longer, but only keep it placed on the hot layer of dung until all the worms will have eaten and consumed one another, bustling and stirring, and only one remains. When this is the case you need to feed it at regular intervals, day and night, with the aid of two men, who by intervals will take care of it, and you will feed it with an egg yolk covered with a gold leaf or with a liquid yolk with the gold leaf incorporated, and take care that it does not want for such food (some say one egg yolk per hour, others three, but the thing itself will demonstrate the practice). Nourished in this way it will achieve its growth in seven weeks or two months and will become like a snake, one span and four fingers long, and one pound in weight, and as the wings begin to arise on it, one will need to make it die, doing so with a charcoal fire in a ring around the bottle one span distant from it, and then stopper and lute the bottle well in order that it does not exhale. [52v] Or to be safer, retire from there until the fire completely died down and all is cooled, for its exhalation would be dangerous. And for the occasion when you feed it with pincers, wash your mouth with good vinegar and take some preservative and plug yourself up well. Once it is dead, put it in a linen cloth or a canvas of silk and fold it and hang it from the ceiling where the air and sun dry it. Once it is quite dry, pulverize it in a mortar and keep this powder carefully, because one dram of this on 3 pounds of molten antimony reduces it to finer gold than the other one. But it does not have as much weight. For this work you also need to choose the oldest antimony that you can, which has often been melted and finely hammered into sheets or other works, and purify it before by melting and throwing it into some honey and vinegar. The term of the work is nine months from the feast of Saint John until the 25th of April.

This recipe appears among instructions for making ink with which to print plates, for the proper mode of harvesting linseed for oil, and for keeping pigments fresh and their colors bright. A folio further on, there appear purely practical instructions for raising silkworms (the Spanish silkworm eggs, it is

noted, producing one and a half times as much as the ones from Languedoc), as if the Work of Algiers, too, is just another process for silkworm growth. Indeed the two entries do appear to be connected, if not for producing silk: "The Work done in Algiers" on 52r-v and "Silkworms," a page away on fol. 53v-54r, both involve growing silkworms from eggs, and the dates mentioned in "Algiers" for starting the process of growing silkworms in the flask are aligned with the end of one complete lifecycle in "Silkworms"—worms, pupation, moths, mating, and laying of eggs—in order to begin the cycle again by hatching the worms from eggs. The author-practitioner is familiar with early modern sericulture practices, and his detailed account of raising silkworms seems to be the result of firsthand experience.

Compared to other contemporary works on sericulture, however, the author-practitioner's account is lacking in one crucial particular—it contains not nearly the same detail on deriving silk from the cocoons but instead provides much more information on the entire life cycle that produces eggs. This is a marked difference from other literature on silkworms. Of course, it may be a coincidence that a recipe for using silkworm eggs to create a gold-producing powder, "as they do in Algiers," occurs one folio earlier (fol. 52r), but there are other similarities that could indicate that the purpose of "Silkworms" is not to extract silk threads from cocoons but, rather, to prepare freshly laid silkworm eggs for "The Work done in Algiers."

Holy Days

The overlap of timing seems especially important: The "Algiers" entry concludes, "the completion time for such work is nine months from Saint John's day [June 24th, near the summer solstice] until 25th April." The corresponding timing in "Silkworms" states: "They [the hatched moths] finish spinning and laying eggs in three weeks and around Saint John's Day. And at that time one keeps their eggs and seed until Holy Week." The occurrence of Holy Week (the week immediately preceding Easter) shifts each year, as does Easter (always the first Sunday after the first full moon occurring on or after the spring equinox), but April 25th is the latest possible date upon which Easter can fall.⁵⁶

The correspondence of these dates in the two entries betrays a deeper connection to a cycle of growth and rebirth observed both in nature and in the Christian liturgical year. John the Baptist's Day, occurring close to the summer solstice (the longest day in the year), followed by the significant period of nine months (the length of human gestation) to the feast of the Resurrection

(occurring near the spring equinox), a time of rebirth of the natural world and the turning point of the solar year—all add clear symbolic dimensions to these entries on silkworms. Moreover, the author-practitioner seems to be thinking of resurrection when he writes about the silkworms shedding their skins on folio 52r that “from their birth until the time when they make their cocoons and their prisons, sleep and rest 4 times, and each time remain 4 or five days resting without eating, as if they were dying for rebirth another time.” This reference to resurrection is also present in a poem on the nature of silkworms by “Bishop Vida,” who is briefly cited in the margin of folio 53v. The following excerpt from Vida’s *The silkworm: a poem in two books* is representative:

Imprison’d dark within the silky ball
Compleat their labours, and resign their breath
Exhausted, sinking in the shades of death.
Go wond’rous race, thrice happy artists go
Meet fate content, to you the sisters owe
A second birth; kind Venus shall requite
Your toils, and raise you to the realms of light⁵⁷

This “second birth” is reminiscent of the author-practitioner’s words about the silkworms, “dying for rebirth another time.” A later poem by seventeenth-century Christophe Isnard also connects silkworms with the resurrection of a phoenix.⁵⁸

This celebrated artisan, of an immortal life,
Comparable to no other being in its fate
Leaves and takes up life again, as soon as it emerges,
And the end of its course, is followed by another.
If for this the Phoenix, is the envy of others,
This worm would have occasion to raise itself with greater strength,
For being beyond the reach of death
Its form is ravished [that is, carried away] from its body four times.⁵⁹

Silkworms, then, were not just prized for their economic value but could also be employed for their symbolic power.

Alchemy

The “Algiers” recipe involves hatching silkworm eggs in an enclosed flask where they feed on egg yolks and, eventually, consume each other. When the

sole surviving silkworm grows to resemble a serpent, it is burned and produces a toxic vapor. Its ash is to be used to transmute metals into gold. A common preoccupation across the practices and the knowledge systems of the major religions and medical texts across Eurasia was the relationship between body and spirit. Practices and substances in the material world were understood to body forth the processes and significances of the spiritual realm. Nowhere was this more prominent than in the laboratory practices and the texts of alchemy. Alchemy is often misunderstood and caricatured as a vain search for gold, but as any reader of alchemical texts soon comes to see, it is also a complex of esoteric and exoteric practices and beliefs—simultaneously pure pious meditation and practical bodily techniques, often to produce the most quotidian of goods such as dyes, acids, and mineral compounds. It resulted not only in many useful substances but also much theorizing about the natural world. Through its regularized processes of transformation by fire, acids, and (what we would call today) chemical reactions, alchemy gave much scope to its practitioner for bringing about the transformation of substances and the generation of new materials. It can be understood as an early modern “science of transformation.” One of its enduring mysteries was how to transform materials from one state to another, from solid to liquid, and finally, to volatile spirit. It is not surprising, then, that ordinary artisans and religious reformers alike regarded alchemy and its transformation of materials—especially metals—to be a demonstration of the connection between material and spiritual worlds.

This recalls the resurrection of the silkworm and the process in the flask during the “work of Algiers.” The toxic fumes generated by burning the surviving silkworm in the flask is significant in light of another recipe in Ms. Fr. 640 that also produces a potent agent, a “horrible poison,” by enclosing lowly creatures—in this case, snails—within a flask. This process (spanning folios 55r–v) involves allowing the snails to putrefy into a poison that will kill a person when spread on a board on which he steps, or on his stirrups. Although snails rather than silkworms are involved in this particular recipe, it contains several parallels to “Algiers”: the snails are sealed in a glass bottle, fed boiled egg yolks, and kept in the bottle buried in horse manure until the substance turns into a powerfully toxic substance. Like “Algiers,” the preparation of this poison also happens around midsummer, “in the month of June and July.”⁶⁰

These recipes for closing silkworms and snails in flasks to transform them into a powerful material appear related to those in a twelfth-century metal-

working account by the pseudonymous Theophilus in which basilisk powder is the key ingredient for making "Spanish Gold."⁶¹ Here, basilisks are raised in sealed brass vessels. They develop from chicks hatched from eggs laid by cocks, growing serpent tails in the process, before being finally burned into ash from which "red gold" can be produced.⁶² As Pamela Smith has treated elsewhere, there are similar accounts in another metalworking text, the *Rechter Gebrauch der Alchimei* (1531), which outlines a process of sealing lizards in a vessel to create gold: "In a pot wide at the bottom and narrow at the top, with a cover that has air holes in it, place nine lizards in the milk, put the cover on, and bury in damp earth. Make sure the lizards have air so that they do not die. Let it stand. . . . The lizards will have eaten the brass from hunger, and their strong poison will have compelled the brass to transform itself to gold."⁶³

There are many similarities between the recipes in Ms. Fr. 640 for the work of Algiers, the "horrible poison," and the processes of creating gold and gold-producing agents in the texts of Theophilus and the anonymous book of metal and alchemical recipes, the *Rechter Gebrauch*: enclosing low creatures in a flask, feeding them foodstuffs not normally eaten by them (eggs for silkworms and snails; brass, dirt, and milk for lizards), and transforming the animals into a highly valuable or inordinately poisonous substance through a process of putrefaction and regeneration. On folio 98r, the author-practitioner also notes the relationship between metals, lizards, and gold: "Leadsmiths say that making a lizard die in the melted tin makes the tinning become very golden," adding more prosaically, "Or else putting in sal ammoniac."

These recipes for producing agents of transformation from various types of low creatures may be connected with their physical properties: snakes and lizards shed their skins; lizards can regenerate their tails when detached; lizards, snakes, and frogs emerge from the ground fully grown after freezing winters; and insects, salamanders, frogs, toads, and other such creatures were regarded as generating spontaneously from putrefying materials.⁶⁴ These associations with generation and regeneration make sense of practices such as dried frogs being used in amulets for childbirth.⁶⁵ We have already seen that the author-practitioner and his contemporaries made the silkworm a metaphor for spiritual resurrection, but no earlier metalworking texts known to the authors of this chapter make use of the silkworm as a powerful alchemical agent to produce gold.

Silkworms and *Gu*

Instead, the author-practitioner's use of silkworms has an intriguing similarity to a body of knowledge from China that dates back to 1400 BCE, the concept of *Gu*.⁶⁶ *Gu* refers to procedures associated with certain—usually minority—cultures in the southwestern regions of China. These procedures had the aim of producing wealth or poison. They worked by sealing creatures such as poisonous snakes and insects in a vessel, where they consume each other until there is but one survivor, which is called the *ku*.⁶⁷ The traditional Chinese character for *Gu* is succinctly captured in the strokes of its written form. *Gu*, in fact, is formed from two radicals, *Chong* and *Min*:

蟲 (*chong*) + 皿 (*min*) = 蠱 (*gu*)

Chong is both an all-inclusive term in premodern Chinese culture designating a broad range of legendary creatures and mundane animals and narrowly defined as a category that refers to small residual creatures including worms, insects, snakes, and small reptiles.⁶⁸ *Min* literally means vessel or receptacle. The *Gu* character is formed by the character for *Chong* in its upper register while *Min* constitutes the lower register. Thus, the character itself embodies the placing of worm bugs in a vessel for the process of *Gu*.⁶⁹

Around the twelfth century, *Gu* began to be associated with another term: *Jincan* (金蠶), which translates as golden (金) silkworm (蠶). The concept of the golden silkworm predates its associations with *Gu* as "the silkworm that generates silk thread, literally spitting out money." *Jincan* 金蠶 (golden silkworm) from Xu Xuan's 徐鉉 (916–991) *Jishen lu* 稽神錄 (Records of the investigation of spirits) tells of a man finding (and discarding) a gold-colored silkworm larva inside of a perfectly round stone.⁷⁰ Twelfth-century Chinese scholars identified several morphological varieties of *Gu* based on the surviving creature from the vessel, of which the golden silkworm (*jincan*) was the most powerful.⁷¹ The twelfth-century author Cai Tao 蔡絛, a scholar and official in the Northern Song dynasty, was the first to record the practice, noting that the golden silkworm originated from Sichuan and spread to provinces including Hunan, Hubei, Fujian, and Canton.⁷² From that point on, a variety of texts began to identify and classify the *Jincan*, including medical texts that provided antidotes for its harmful properties. One text from the Southern Song dynasty, most likely from the first half of the thirteenth century, con-

tains a concise and informative account of the practice: "Southern people rear golden silkworms. The silkworm has a golden color and feeds on silk textiles from Sichuan. Its excrement is used to poison people by adding it into food. Whoever eats this will die. The silkworm can bring fortune to its owner, and make him rich. It cannot be killed by water and blade. [If one wants to get rid of it, one must] place the silkworm into a gold or silver vessel and leave it on the road. Whoever picks it up will become its new owner. This is called 'marrying out the golden silkworm.'" ⁷³ Various sources discuss the duality inherent in the *Gu* practice: it is capable of bringing both fortune and failure, of being both a poison and a benefit, similar to processes in European texts.

Another similarity of the "Algiers" process and *Gu* practice can be found in the timing of the processes: recall that in "Algiers," the silkworm eggs are to be fed egg yolks in a flask that was buried under manure around the Feast of Saint John, the date associated with the summer Solstice in the Gregorian calendar. The traditional Chinese *Gu* preparations occurred on the "fifth day of the fifth month." ⁷⁴ This was during the Duanwu 端午 Festival, associated with the summer solstice in the lunar calendar. ⁷⁵

In "Knowledge in Motion," Pamela Smith explored the material complex of ideas and practices around vermilion making, which involved the color red, blood, gold, and lizards. This complex, integrated into Arabic and Latinate alchemical discourse, is especially noteworthy in the use of lizards in processes that aimed to transform and ennoble substances. She follows this complex from China through the Islamic world to Europe. ⁷⁶ The intriguing recipe in Ms. Fr. 640, "The Work done in Algiers," seems to indicate yet another trace of this complex and to suggest the very long span movement of a material complex—made up of materials, practices, and ideas and centered on the transformation of substances—from China, through the Islamic world of North Africa and Spain, to Toulouse in southern France, where it crystallized in writing in the recipe compilation of a curious craftsman.

Conclusion

Both processes examined in this essay contain echoes of the various material, ritual, and textual resources with which human beings in different places and times explored the relationship of body to spirit and investigated the great mysteries of generation, transformation, and regeneration. In the case of the Native American pipe, this new object was incorporated into a field of materials and practices involved in spiritual and physical prophylaxis and healing.

In the case of the silkworm, a thing variously valued and meaningful in different spheres of human interaction—agrarian, economic, metaphorical, and religious—emerged as part of a knowledge system that sought to explore and explain material transformation.