

lost but only misplaced. My intention was to write a book that could serve as a kind of Baedeker's guide to a strange and unfamiliar City in an effort to help readers explore this overlooked landscape and its inhabitants by immersing them in the sights, sounds, smells, and personalities of science as it was understood in London during the Elizabethan period. At the end of the book, for readers interested in what I think these stories have to offer historians of science and the urban experience, there is a coda in which I try to situate my work in the context of other scholarship in the history of science in general and early modern science in particular. Scholars who have thumbed through this introduction in vain for references to academic arguments about the Scientific Revolution and feel it essential to understand my methodology and point of view at the outset will want to read that coda now. But I hope that many readers will be willing instead to turn the page and slip among the naturalists on Lime Street, where our tour of the City starts with James Garret, a Flemish apothecary with some very bad news for a London publishing house. Garret will be the first of many guides who will point out the buried but still discernible social foundations of the Scientific Revolution in Elizabethan London.

1

LIVING ON LIME STREET

*"English" Natural History and the
European Republic of Letters*

In 1597 James Garret, a Flemish apothecary who lived and worked in London, paid a visit to the shop of Bonham and John Norton, one of the City's busiest and most prestigious publishers. The Nortons specialized in expensive, large-format books, and they were in the process of readying John Gerard's massive manuscript of *The herball or Generall historie of plantes* for the presses (Figure 1.1). It was the most ambitious English-language publication on the subject that had ever been attempted, and its release promised to make Gerard a household name as ladies bought up copies so that they could trace the illustrations in their embroidery and consult its medical lore, and as plant fanciers purchased the item to be conversant with all the newest discoveries of flora from around the globe. The shop would have been abuzz with activity: apprentices carrying paper, journeymen setting the movable type in trays and inking them before loading them into large, imposing presses. Garret would have had to duck to avoid jostling damp sheets of paper pegged up on lines to dry, then swerve to keep from knocking into customers perusing the Nortons' latest releases, such as Plutarch's *Lives of the noble Grecians and Romanes* (1595) and a new edition of Monardes's *Joyfull newes out of the new-found worlde* (1596). What Garret was about to reveal, however, would bring part of the Nortons' operations to a sudden, though temporary, halt.¹

Garret presented the Nortons with the unwelcome news that John Gerard's costly new *Herball* was a mess of inaccuracies, plagiarized passages, and improperly placed illustrations. According to the Flemish apothecary, Gerard's most egregious fault was his crude use of Mathias de L'Obel's (1538–1616) taxo-

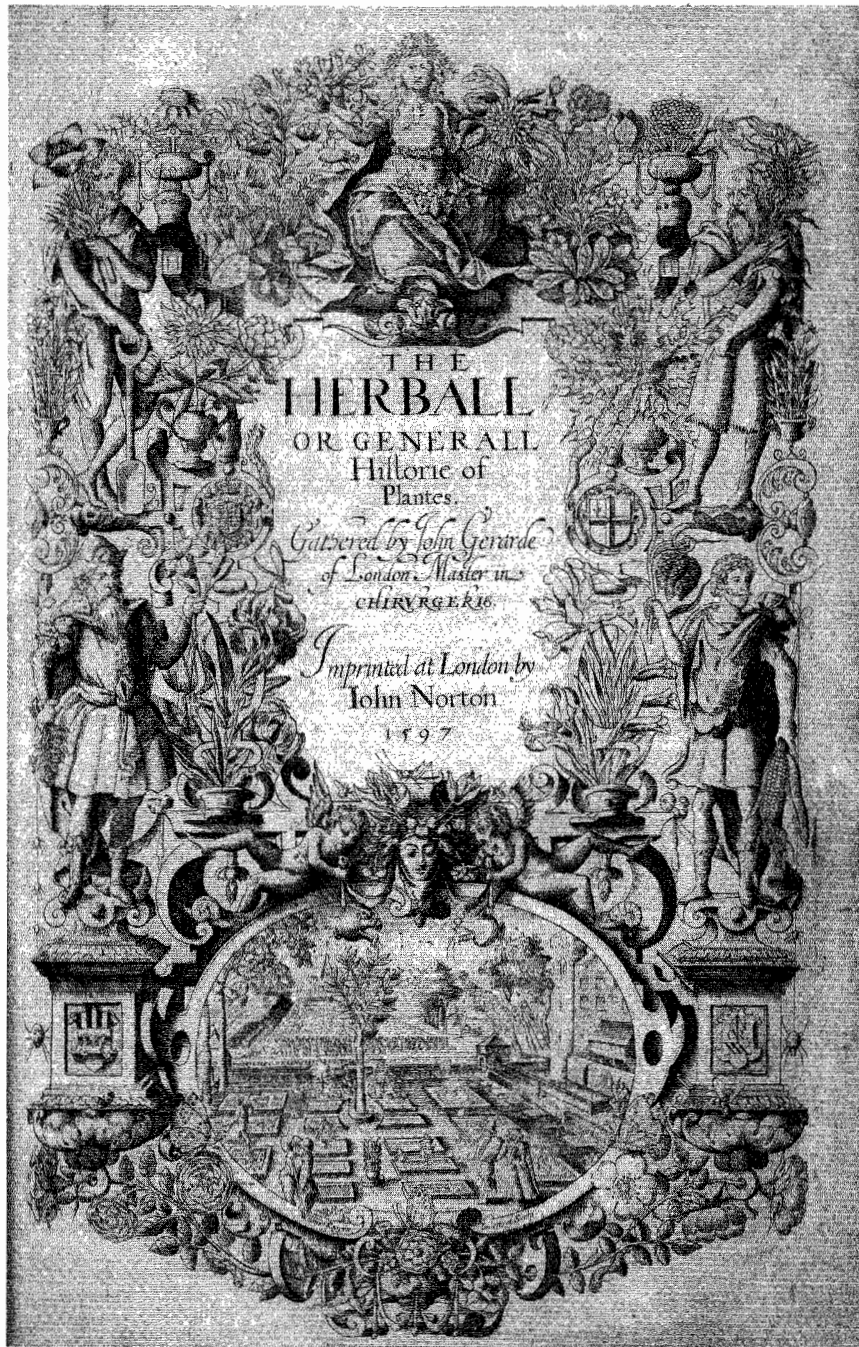


Figure 1.1. Title page from John Gerard's *Herball* (1597). Its ornate appearance was an indication to the potential buyer of the grandeur and costliness of the publication.

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nomie system for plants, which he had developed along with Pierre Pena in the *Stirpium adversaria nova* (1571). Garret complained that Gerard's new *Herball* was not in fact new at all. Instead, it had been cobbled together — not terribly effectively — by combining L'Obel's work with a translation of a well-known Flemish herbal by Rembert Dodoens that most who were interested in the subject already owned. Garret was L'Obel's neighbor in the parish of St. Dionysius Backchurch, and the two men shared a passion for plants as well as a common immigrant status. To sit by and watch an English Barber-Surgeon like Gerard take credit for the painstaking work of his friend was too much for Garret to bear.

The Elizabethan period was an age when the standards for plagiarism were notoriously low, and Garret's claim that *The herball's* author had liberally borrowed from other published books would not have been enough for the Nortons to call a halt to the printing process. But the Nortons did want to make a profit on this expensive new book of Gerard's, so Garret's charge that the book was inaccurate was cause for concern. Who would be willing to spend so much money on a book that they could not rely upon to accurately identify common medicinal plants and the more exotic plant specimens pouring into London from the New World and beyond? Garret's observations that there were mistranslations of the Flemish herbal that served as Gerard's source, that the illustrations of plant specimens did not always appear alongside the correct descriptions, and that some illustrations were even inserted upside down had the potential to cut the Nortons' audience dramatically and make them a public laughingstock. Because *The herball* was a costly publishing endeavor involving hundreds of pages and expensive woodcuts, the Nortons became understandably alarmed at the fiscal implications of Garret's message.

After taking a long, hard look at the manuscript, the Nortons realized that they had to do something to amend it. *The herball* was not yet in a fit state to roll off the presses and into the hands of London's eager book buyers. Their solution was to hire Garret's neighbor, Mathias de L'Obel — the same man who had already (albeit unwittingly) made a substantial contribution to the work — to proofread the translations, fix the mismatched illustrations, and right its other textual wrongs. L'Obel began the laborious work of editing straight away and made numerous corrections in the manuscript before John Gerard, tipped off to what was going on in the Nortons' print shop, barged in and had him dismissed. Gerard was outraged at the interference of a foreigner in his great English work and cast aspersions on L'Obel's heavily accented use of English. L'Obel was internationally renowned for his expertise with plants and had the added prestige of possessing a doctorate from France's premier medical institution, the University of Montpellier, but this mattered little to the English Barber-Surgeon. L'Obel was

just as furious with Gerard, whose studies he had furthered by providing access to rare plant specimens and, even more important, to his numerous friends who occupied high positions in royal gardens and university medical schools throughout Europe.²

The Nortons finally went ahead with the publication of Gerard's *Herball*, and it sold well despite its length, cost, and the fact that the quality of the work plummeted dramatically in Book III, where the author turned to the subject of grasses. Those who were charitably inclined could attribute this failing to Gerard's intellectual exhaustion, while those less so could point out that the change in tone marked the spot where L'Obel was dismissed from his thankless job of editing the manuscript. Today, however, the efforts that Garret made on behalf of his friend L'Obel are largely forgotten, consigned to a dustbin of publishing anecdotes. Few have ever heard of James Garret, and Mathias de L'Obel's name is known only to serious students of botany and curious gardeners who wonder how the *lobelia* got its name. *The herball's* author, John Gerard, on the other hand, is remembered as Elizabethan England's premier naturalist. In his own time, however, his reputation was mixed, and the publication of *The herball* marked not the apotheosis of England's first great botanist but the development of a schism in London's natural history community.

Until the publication of *The herball*, London's naturalists revolved like satellites around the parish of St. Dionysius Backchurch in the center of the City where Garret and L'Obel were neighbors. There, on a twisting street only a tenth of a mile long, the two men played a key role in a natural history community that included English and foreign members. It was a wealthy area, and most of the community's members were successful merchants, physicians, apothecaries, and City politicians. Other London naturalists, such as Gerard, paid frequent visits to Lime Street to examine the natural curiosities housed in cabinets there, and to walk the paths of the many fine gardens that graced the parish. They could also post letters to their foreign correspondents, since the postmaster for the Dutch community lived on Lime Street and had an excellent network of friends who sped those letters on their way across Europe no matter how incompetent the political system, vicious the religious dispute, or violent the warfare. Members of the Lime Street natural history community were interested in collaboration and welcomed men like John Gerard into their circles with warm collegiality. Lime Street may have been one of the Republic of Letters' more remote European outposts, but its members conducted business within the parameters of a code of conduct that was rigidly enforced to promote the exchange of information and the courteous acknowledgement of friendly contributions to one's own studies. When John Gerard put *The herball* together, he vi-

olated the rules that governed this closely knit community of students of nature. From 1597 Gerard was an outcast and had to rely on competition rather than collaboration, the patronage of a few court figures rather than the support of a European network of naturalists, and by continuing to set his work out in print rather than engaging in the lengthy (and typically unpublished) collaborative projects that were representative of the Lime Street community.

Gerard may have suffered for a few years from the sting of being shunned by the Lime Street naturalists, but in the long run they paid a higher price: they have been largely forgotten. Gerard's *Herball* has become a monument of early botanical knowledge that has overshadowed the Lime Street community. Not all the blame for this can be put at Gerard's door, however. While the Lime Street naturalists worked at their collaborative projects and wrote letters to like-minded students of nature, Gerard published his book — imperfect though it was — and it now serves as a touchstone for historians of botany. Some of the Lime Street naturalists did publish, but their works were highly specialized and never received the popular acclaim that Gerard enjoyed. So while members of the Lime Street community are, as we will see, often mentioned individually in historical studies of the Republic of Letters, humanism, and natural history, they do not often appear as part of a coherent and vital intellectual group. And because many of them were immigrants, some members of the community are left out of narratives about the development of "English" science. To fully understand the significance of the Lime Street naturalists, however, we must see them as they saw themselves: as an important community interested in natural history with links to other naturalists in England and on the European continent. To do so, we need first to understand how the community was constituted and how it functioned. Then we will be in a better position to examine their intellectual interests and the debates they engaged in with other leading naturalists at home and abroad. Finally, we will explore how this vital, dynamic group of collectors, plant hunters, and students of nature were lost to historical view through a grand publishing venture and the ambitions of its author.

FRIENDS AND FAMILY: THE LIME STREET COMMUNITY

In 1606 James Cole (1563–1628), a silk merchant and Flemish immigrant, married his second wife, Louisa de L'Obel, the daughter of the famous Flemish naturalist and physician Mathias de L'Obel, in the city of London. It was a moment that the local community and the European Republic of Letters were eager to celebrate. The groom was congratulated by friends at home and abroad for choosing a wife who was not only "beautiful and loving" but also the daughter of

a "more diligent searcher after plants than Dioscorides." One friend writing to Cole from the Continent treated the match as an ideal arrangement for the groom and his new father-in-law. He did not mention the bride at all, but commented only that the marriage must make Cole especially pleased because "you have obtained a father-in-law with whom you can continually converse on a part of your studies."³ When the Cole family and the L'Obel family became entwined in marriage, the ceremony gave formal permanence to the warm relationship that had existed between them for years in the central London neighborhood of Lime Street.

Elizabethans were struck by the area's prosperity. John Stow, in his *Survey of London* (1598), described Lime Street as an expanse "of fair houses for merchants and others" that twisted and turned from St. Dionysius Backchurch and Fenchurch Street in the south to the parish church of St. Andrew Undershaft and Cornhill Street in the north.⁴ Today the landscape is altered from Stow's time. St. Dionysius Backchurch is gone: the medieval church fell prey to the Great Fire of London in 1666, and the rebuilt church was demolished in the nineteenth century. Though St. Andrew Undershaft remains, its once lofty tower is now dwarfed by the neighboring Lloyd's building, and its walls are ringed by motorcycles and scooters parked by City workers. A modern visitor to London can still walk the narrow street, however, which maintains its Elizabethan layout, and can make a pilgrimage to Stow's monument in St. Andrew Undershaft, where the lord mayor of London goes once every three years to put a fresh quill pen in the hands of a stone effigy dedicated to Elizabethan London's best-known historian.

Lime Street had a relatively low population density by Elizabethan standards, and was blissfully free from the apartment-style dwellings known as tenements — old houses converted into multihousehold residences. Behind high walls and through great gates were gardens and a tennis court, and everywhere there was an audible hum of activity. Lime Street's numerous surgeons and apothecaries welcomed patients into their shops and sent apprentices and servants scurrying into nearby markets for supplies. Members of the Pewterers' Company walked the street to enter their guild's hall for ceremonial dinners and to attend meetings. Artists and builders took a shortcut down a small alley on the west side of the street and ended up in the Leaden Hall, whose attics were used to construct and store props and scenery for City pageants and festivals, high above the main floor where the more mundane business of weighing wool and grain took place.

Elizabethan Lime Street boasted the cosmopolitan assortment of residents that was fast becoming the norm in London: English, French, Flemish, and Italian. The southern end of Lime Street, down by St. Dionysius Backchurch, in-

tersected with Lombard Street, once the haunt of London's European merchants who met there twice a day to exchange news and information until 1568, when they were expected to transact their business under the protected porticoes of the Royal Exchange.⁵ Many of these Europeans had become permanent residents of London, most to avoid religious persecution, some because of economic opportunity. These immigrants, or "Strangers" as they were called in Stow's time, never became a sizable part of the City's population — at most, the Strangers constituted slightly more than 5 percent of London's population — but few residents were unaware of their presence.⁶ The merchants, skilled craftsmen, and simple tradesmen who came from exotic locales like Venice and Antwerp made an impression on London's English residents that was far deeper than their relatively small numbers might suggest.

While any Elizabethan visitor could have grasped these visible and audible features of Lime Street easily and quickly, other significant neighborhood activities would have been harder to discern. For behind garden walls, inside the apothecary shops, and within the well-appointed houses of the merchants lived an important community of naturalists. Lime Street was the English outpost of a Europe-wide network of students of nature — including plant hunters, gardeners, rock and fossil collectors, and scholars interested in animals and insects — who eagerly studied the marvelous and manifold properties of the animal, vegetable, and mineral kingdoms. Both Strangers and English citizens from the neighborhood around Lime Street made contributions to natural history, enjoyed an active correspondence with other humanists in Europe-wide networks of correspondence and exchange, and forged intellectual alliances that transcended linguistic and national boundaries.

The Elizabethan City was riddled with neighborhoods like Lime Street, where common interests shaped social and intellectual life and an urban sensibility emerged that blended cosmopolitanism with nascent nationalism, competition with collaboration, and theoretical learning with practical experience. Because of the ephemeral nature of most social and intellectual interaction, which relies heavily on face-to-face conversation, it is hard for historians to establish who belonged to a given community or neighborhood, not to mention what those individuals gossiped and thought about as they met over dinner, or in an apothecary's shop while buying a medical elixir to ease their aches and pains.⁷ What makes Lime Street unusual is not that it existed but that its existence is well documented in correspondence, bequests in wills, and passing references in printed natural history texts published in England and abroad. These materials enable us to see the Lime Street neighborhood and the naturalists who lived there as friends and intellectual colleagues. We are able to peep into the houses

and shopfronts along Lime Street, where animal and insect specimens were studied and classified, fossils were examined and displayed in curiosity cabinets, and rare plants were cultivated and propagated.

It was not easy to forge a natural history community in early modern Europe. You needed an elusive combination of ingredients that, after being mixed and compounded, only then resulted in the intellectual vitality apparent on Lime Street. First and foremost you needed to find other men and women who shared your passion for deciphering the curious natural world through the study of plants, antiquities, and zoological specimens.⁸ Once they were located, mundane issues could stunt the development of an otherwise promising community. Naturalists needed ample financial resources so that they could acquire specimens for their own studies, the books that kept them informed of far-flung developments in natural history, and the leisure to engage in the work itself. Not every member of a community needed to be fabulously wealthy, but at least one individual had to be able to finance such a costly and labor-intensive endeavor. And a great natural history community required that most valuable of all urban commodities—space. Space was needed to cultivate gardens, since so much of natural history focused on the study of plant specimens, and unoccupied land came at a high premium in an early modern city like London.

In order to truly flourish, a community of naturalists like the one on Lime Street also needed to be able to forge connections with others who might have access to different plants, animals, and mineral specimens. These specimens were the intellectual capital of the Republic of Letters, an early modern Euro—a form of intellectual currency that could travel freely and be exchanged easily no matter where the specimens originated, or where they concluded their journey. Rare plants, cultivated and propagated in Lime Street gardens, became important items of exchange, accompanying letters to learned naturalists in Italy, Germany, France, and the Netherlands. Through these exchanges the Lime Street community established its identity and reputation within the wider Republic of Letters.⁹ Such high-stakes correspondence demanded that at least one member of the community be able to read and write Latin—and other European languages were desirable commodities, as well. Linguistic facility was necessary for the community to remain familiar with influential printed natural history texts, many of which were available only in Latin. Intellectual relationships with other naturalists often depended on how “learned” a group was, and this estimation (like the plants grown in their gardens) became valuable capital in the Republic of Letters.

The Lime Street community had these important resources—passion, wealth, space, connections, and learning—and mobilized them all in the pur-

suit of natural history. At the heart of the community was a man who possessed each of these commodities in abundance: the silk merchant James Cole. Cole lived at the southern end of Lime Street, near St. Dionysius Backchurch, and commanded considerable wealth. His ordinary, English-sounding name hid a Flemish immigrant background with distinguished antecedents: his mother, Elizabeth Ortels, was the sister of the celebrated Antwerp cartographer known by his Latinized nom de plume, Abraham Ortelius. Cole’s mother had worked until her marriage in her famous brother’s cartography shop, mounting the maps on linen and hand coloring them according to the wishes of each buyer. Her son, christened Jacob Coels in Antwerp in 1563, became James Cole only after his family fled religious persecution in the Netherlands and joined the hundreds of Huguenot refugees living in London.¹⁰ From his youth, the family seems to have seen in James the intellectual curiosity and abilities of his uncle, and the two became close through occasional visits and regular correspondence.

Their letters reveal that James Cole was a well-read Latinist with an avid interest in plants, fossils, old coins, and other curiosities. Cole does not appear to have been formally educated, either at the grammar school or university level, and while contemporaries saw him as an autodidact, his early love of learning may have been fostered by his well-educated mother. By the age of twelve he was studying Greek and receiving simple Latin letters from Ortelius, who also sent his young nephew parcels of books. In his mid-twenties Cole went to Antwerp to stay with his uncle and aunt, Anna. “He does not pass his time uselessly,” Ortelius wrote proudly to James’s father back in London; “he studies, he writes. He learns every day, which I observe with pleasure.” Cole’s studies were not limited to natural history, and he also delved into matters of history, theology, and philosophy. “I found him passionate and knowledgeable about ancient things,” the antiquarian Marquardus Freherus reported to Ortelius.¹¹

Cole was a highly respected scholar in his own community, and a published author who wrote a wide-ranging assortment of treatises popular enough to be reprinted and translated, including a work in praise of the study of plants, a description of the plague in London, and religious texts. A devoted student of history, Cole transformed his knowledge of ancient Roman festivals into a useful political tool when he helped to design the Dutch Church’s festivities celebrating the coronation of England’s new king, James I, in 1603–4. Working with his friends the physician Raphael Thorius and the architect Conraet Jansen, Cole penned elegant verses praising the new king. In his printed works, Cole also displayed his learning, as well as his love of versifying. His *Syntagma herbarum encomiasticum* (1606, 1614, 1628) was a brief discourse in verse on the joys of plant study and collection. The perils of the plague made a deep impression on Cole,

and he vividly described the progress of the disease across London during the late summer and autumn of 1603 in *The State of London During the Great Plague* (*Den staet van London in hare Groote Peste* [1606]). A rare eyewitness account of the sights, sounds, and smells of an early modern plague epidemic, Cole's work explained how doctors counseled patients to carry sweet-smelling herbs to ward off contagion, and how the urban population survived the psychological and social difficulties associated with the spread of the disease. A staunch Protestant, Cole also wrote about his religious faith, including an interpretation of Psalm 104, *Paraphrasis . . . van den CIIII Psalm* (1618, 1626) and an exhortation for Christians to make a "good death," *Of death a true description* (1624, 1629).¹²

Cole's interest in natural history, his education, and his connections with learned men throughout Europe were built upon a family foundation, and the cornerstone of that foundation was his famous uncle, Abraham Ortelius (1527–98), a book and antiques dealer in Antwerp, developed a passion for geography and natural history which led to his appointment in 1570 as royal cosmographer for Philip II of Spain.¹³ His *Theater of the World* (*Theatrum orbis terrarum*, 1570), the most important atlas printed in the early modern period, catapulted Ortelius to fame, while his business affairs — dealing in antiquities and books and compiling maps — helped him to cultivate close relationships with other scholars in the Republic of Letters. He was a careful and consistent correspondent, never failing to look for a rare imprint or to make an impression of a unique coin that he thought one of his friends might value. They reciprocated by sending him the latest news from voyages of exploration and fragments of manuscripts that touched on his interests in the ancient or natural worlds. Ortelius was Cole's role model, and the young man self-consciously styled himself after his uncle, signing his own budding correspondence within the Republic of Letters "Jacobus Colius Ortelianus" so that the relationship between the Antwerp cartographer and the London merchant would not go unnoticed.

Cole's letters were sent throughout Europe under the auspices of another maternal relative, Emmanuel van Meteren (1535–1612), his mother's first cousin. The van Meteren family, like the Cole family, had fled the Netherlands for religious reasons. Van Meteren's father, Jacob, played a key role in the publication of the first English Bible in the 1530s, and the family established itself as a pillar of the Protestant refugee community in London. As an adult, Emmanuel lived on Lime Street, became the consul for the Dutch merchants in London, and occupied the all-important office of postmaster. Reliable mail service was an essential component of any natural history network, since specimens ranging from tulip bulbs to rhinoceros horns needed to circulate between interested naturalists. Accompanying these specimens, of course, were the letters on which the

European natural history community in particular, and the Republic of Letters more generally, depended in order to thrive. Having the hub of a Europe-wide mail- and package-distribution center right on Lime Street no doubt made Cole's life somewhat more convenient, but it was van Meteren's skillful management of the post that made him indispensable. When the artist Marcus Gheeraerts wanted to send smoked herring to Antwerp, or Ortelius wanted gifts to arrive at his sister's house in London, they inevitably went through Emmanuel van Meteren and his formidable network of middlemen, merchants, sailors, and travelers to ensure that precious messages and gifts reached their destination. Emmanuel van Meteren, like Ortelius, was part merchant and part intellectual, but his interests focused on history. After years of painstaking work and publication delays, van Meteren's study of recent events in the Netherlands, *Belgische ofte Nederlandsche Historie van onzen Tijden*, finally rolled off the presses in 1599. James Cole played an important role in its completion, as he served as van Meteren's proofreader. "I am doing nothing at present except reading Emmanuel's history," Cole wrote to Ortelius in 1590/91, and "correcting its spelling a little." Cole did his work carefully — it took him two months to read through the first six chapters — and van Meteren dedicated the work to him.¹⁴

His mother's relatives gave Cole an entrée into learned circles, and he was attentive to ways he could further increase his status both in England and abroad. While his first marriage to Maria Theeus, the daughter of a prominent member of the Dutch Church in London, gave him additional presence among the Stranger community, his second marriage to Louisa de L'Obel strengthened his existing position in the Republic of Letters. Cole's father-in-law, Mathias de L'Obel, was known for his pioneering work on botanical taxonomy and his work with Pierre Pena on the *Stirpium adversaria nova* (1571). During his first visit to England, between 1569 and 1571, he met with the French naturalist Charles de L'Écluse to do some fieldwork in Bristol and struck up a friendship with Hugh Morgan, Queen Elizabeth I's apothecary, who had a number of novel West Indian plants in his garden. In 1585 L'Obel returned to London to take up permanent residence at the southern end of Lime Street. Once in London, L'Obel cultivated patrons as well as plants, and in time he won a position as supervisor of Lord Zouche's gardens in Hackney. The L'Obel family continued to seek out, and win, high-placed patrons in the next generation, when Mathias de L'Obel's son, Paul, was appointed apothecary to James I shortly after his coronation in 1604.¹⁵

Surrounded by family on Lime Street, and tied to his uncle Abraham's extensive network of business associates and correspondents, James Cole occupied a place at the heart of London's most distinguished community of naturalists. In

addition to Cole and L'Obel, the neighborhood boasted an internationally renowned Flemish apothecary skilled in cultivating and distilling plant materials for use in medical treatments. James Garret (d. 1610) was prosecuted by London's medical establishment, the City's College of Physicians, for practicing medicine without its permission — though this doesn't seem to have made a dent in his considerable reputation or his trade. Garret was well known in London for importing novel drugs and plants from the East and West Indies, and his fellow apothecaries knew that they could rely on his manuscript translation of José de Acosta's useful treatise on these drugs, since no printed translation was then available.¹⁶

Like Cole and L'Obel, Garret was connected to a wide circle of naturalists, including Jean-Henri Cherler and Charles de L'Écluse (1526–1609), the latter of whom described him as “my dear friend, a man of honour, greatly delighting in the study of herbarism.”¹⁷ L'Écluse is remembered today for altering the face of European gardens with bulbs and tulips brought from the East, including irises, hyacinths, lilies, and crown imperials, and for writing important botanical treatises. His affection for Garret may have stemmed from their mutual passion for tulips, which Garret cultivated and propagated in his London garden plot along the City's crumbling wall in Aldgate. When L'Écluse visited England in 1571 and 1579, he stayed on Lime Street with his friends Garret and L'Obel. He was also in London in 1581, when he received some strange roots Sir Francis Drake had gathered on his 1580 voyage through the Straits of Magellan. L'Écluse, in honor of this gift, named the specimen Drake's Root.¹⁸ Because L'Écluse's expertise was matched only by L'Obel's during the sixteenth century, for brief periods the small stretch of Lime Street was the residence of *both* of Europe's most influential plant specialists.

England's premier enthusiast for the study of animals and insects also lived in the Lime Street neighborhood, and was a part of Cole's community of naturalists. Thomas Penny (c. 1530–88), like James Garret, established a popular medical practice despite the best efforts of the College of Physicians to quash it, and also actively engaged in the exchange of specimens with others in London and abroad. But animals and insects were even more fascinating to him, a passion fostered in Zurich, where he studied with the naturalist Konrad Gesner in 1565. When Gesner died a few months later, Penny left the city with some of Gesner's animal studies, then turned his attention to the study of plants. He arrived at the French university of Montpellier, where he became friends with the medical student Mathias de L'Obel, who would one day be his neighbor in London. While still in Europe, Penny also became close to Joachim Camerarius (1534–98), the author of pioneering books in fields of study that would become botany

and zoology. Camerarius described Penny in his *Hortus medicus* (1588) as “the eminent London doctor, very skilled in natural history, my particular friend.”¹⁹ Camerarius received a number of plants from Penny, including spurge and sedums, which were included in his studies, and he returned this professional favor by sending Penny insect specimens.

Penny returned to London in 1569 and moved into a house near the Cole, Garret, and van Meteren families adjacent to the Leadenhall Market. It was Penny who drew Thomas Moffett (1553–1604), another physician and naturalist, into the orbit of Cole's Lime Street community. Moffett was a London native who had been at Cambridge with Penny before studying abroad at the University of Basel. Moffett, like his friends Garret and Penny, was frequently at odds with the College of Physicians, which disapproved of his foreign notions about medicine, especially his interest in the controversial new chemical medicines of an itinerant German medical practitioner called Paracelsus. Despite the difficulties he experienced with the London medical establishment, Moffett was known to enjoy the friendship of other learned men of his time. “To the knowledge and learning he acquired by his studies,” William Oldys wrote in the eighteenth century, “he added the improvements that were to be gathered from conversation with learned and knowing men.” A 1580 visit to Italy introduced him to the joys associated with the close study of insects, which remained his passion after his return to England. After Penny's death, Moffett gathered up all his friend's manuscripts concerned with insects and compiled them with his own observations into a monumental work of more than 1,200 pages. No London printer would agree to publish it, especially since Moffett could not resist tinkering with it and adding new entries whenever an exciting specimen came to his attention. It was only after Moffett's death, when his apothecary sold the tome to another immigrant friend of James Garret and the L'Obels, Théodore Turquet de Mayerne, that the volume finally saw the light of day as *The Theatre of Insects, or Lesser Animals* (*Insectorum sive minimorum animalium theatrum*) of 1634. Only Moffett's georgic verses promoting the planting of mulberry trees and the cultivation of silkworms were published in English in his own time.²⁰

Cole, L'Obel, van Meteren, Garret, Penny, and Moffett were the key members of the Lime Street naturalist community. A few other men who lived nearby — William Charke (fl. 1581–93), Johannes Thorius, and Johannes Radermacher — were linked to the group, but their interests either were confined to a single discipline (William Charke was an avid student of geography, and Johannes Thorius was a physician who remained committed to medicine) or were so wide ranging (as in the case of the merchant and historian Johannes Radermacher) that they did not regularly participate in the conversations about nat-

ural history that are my focus. Other Lime Street residents known to have had an interest in natural history, such as alderman and mayor Sir James Harvey, do not seem to have been included at all in the group's conversations, deliberations, and exchanges. Though Harvey lived in one of the largest houses in the neighborhood and was highly respected in local naturalist circles for his famous Lime Street garden (John Gerard visited Harvey to see his "mad apple," or eggplant, bear fruit in an unusually warm year), he does not appear in the evidence about the community that now survives.²¹

London's small neighborhoods and bustling streets provided ample opportunities for communities like the one on Lime Street to flourish. As a port city, London could also serve as an *entrepôt* to other far-flung destinations and people. Though often hidden behind English-sounding names like Cole and Garret, the composition of the Lime Street neighborhood reminds us of the truly international character of London during the age of Elizabeth. London was home to numerous European religious refugees, as well as continental merchants and craftsmen seeking a more lucrative market for their goods and services. As a result, neither London specifically, nor England more generally, could boast a distinctively "English" science at the time. The international character of Elizabethan science makes it remarkably similar to other cosmopolitan areas of early modern Europe, such as Florence, Prague, and Leiden. Like their European counterparts, men and women interested in the study of nature and living in London in the sixteenth century could find a wealth of new ideas and approaches right on their own street, as well as by communicating with friends and relatives abroad.

London also provided the Lime Street community, and other communities like it, with sufficient economic opportunity that they could engage in the work of the natural sciences without needing to seek out patrons for their financial survival. A striking feature of the Lime Street community was that its individual members were economically self-sufficient. A physician with a good practice like Penny, a busy apothecary like James Garret, and a prosperous silk merchant like James Cole simply did not need to find a noble patron or a position at court to make ends meet. Cole's father's silk business was so successful, for example, that he bore the dubious distinction of paying the highest tax of any of the Strangers living in the wealthy parish of St. Dionysius Backchurch.²² The profits of a medical practice, an apothecary shop, or a mercantile business freed members of the Lime Street community to explore their intellectual interests, buy books, acquire specimens, and even make extensive trips abroad.

Among the Lime Street community only the L'Obel family had strong court connections, and even those cannot be said to have been entirely beneficial.

Though L'Obel was closely connected to Edward la Zouche and his garden at Hackney, for example, he was banned from the garden in 1600. When L'Obel was charged with stealing plants and broadcasting the fact that it was he — and not his aristocratic patron — who was responsible for the garden's distinctions, Zouche was forced to sever their relationship or suffer damage both to his horticultural investment and his reputation. "I am not so out of love with my garden," Zouche fumed in a letter to L'Obel after the naturalist walked out of the garden with several bags of valuable plants and bulbs, "that I would have it made worse than it is." L'Obel may have been drawn to plant theft because Zouche was unable to pay him a sufficient salary for his work. Zouche hints, however, that Mrs. L'Obel played a role in the affair by entertaining delusions of grandeur about her husband and his position in his patron's world. Zouche complained to Mathias de L'Obel that he "would willingly to my cost [have] had . . . your company ever," but the "greatness of Mrs. L'Obel's mind . . . hindered it." L'Obel's son, Paul, fared no better when he left the safety of Lime Street and the City for the perils of court patronage. Shortly after becoming the king's apothecary in 1604, he was embroiled in controversy and implicated in the murder of Sir Thomas Overbury, one of the king's favorites. Overbury, who was taking drugs supplied to him by Paul de L'Obel, died after ingesting poison in the Tower of London in 1613. In the king's efforts to find a perpetrator of the crime, fingers began to point in L'Obel's direction, and in spite of the fact that he was almost certainly innocent, his reputation was ruined during the lengthy inquiry and trial.²³

Even had they needed the money, the naturalists in the Lime Street community may have had excellent reasons for eschewing the court whenever possible. These reasons appear to have been shared by a number of their European friends and correspondents. Rudolf II's court physician, Johannes Crato, complained endlessly to Ortelius about the grind of court life, and longed for a quieter life in the city of Antwerp. Johannes Rumler made even more pointed remarks to James Cole in 1609 regarding the elevation of both Paul de L'Obel and Rumler's brother, Wolfgang Rumler, to royal favor at the court of King James. Though Rumler admitted that his brother "deserves great praise for pleasing princes," he urged Cole to warn Wolfgang not to trust in his sudden success. "Court life," Rumler wrote, "is a life of splendid misery." Rumler compared the hollow rewards of the court to the benefits associated with his own career trajectory: "I am practicing as a physician in my native city," he wrote with satisfaction, "and am independent of everyone."²⁴ Even if these statements warning against court patronage ring a bit hollow, Rumler's letter suggests that avoiding the perils could be a deliberate strategy for naturalists able to rely on their independent financial status as silk merchants, physicians, and apothecaries to fund their research. Like

the English-sounding names that disguise foreign residents of London, however, such occupations can also serve to screen Elizabethan naturalists and other practitioners from the historians of science who want to uncover their activities.

The cosmopolitanism of London and the opportunities that the City provided for financial well-being fostered the Lime Street community's activities and served to engender the spirit of cooperation and collaboration that helped them to study the natural world. Instead of competing for limited resources, the Lime Street naturalists plied their complementary trades and swapped information and specimens without having either to cater to the whims of patrons or to engage in the fierce rivalries of court life. In the case of the Lime Street naturalists, London's urban sensibility helped them to maintain a fruitful tension between English and Stranger, market forces and collegiality, collaboration and competition. These attitudes overlapped in important ways with codes of conduct in the Republic of Letters. Within those complicated European networks, London's Lime Street naturalists secured a reputation for learning, congeniality, and intellectual civility.

MAPS, TULIPS, AND SPIDERS: COLLECTING AND COLLABORATING ON LIME STREET

On 9 January 1586 Abraham Ortelius wrote from Antwerp to his twenty-three-year-old nephew James Cole in London.²⁵ England was at war with Spain, with the Netherlands providing a bloody battlefield for the struggle between one waning and one ascendant imperial power. But there was no mention of these tricky matters in Ortelius's letter, which related to natural history and the study of antiquities. Though the two men were separated by geography and political disputes, it is clear that Ortelius and Cole felt that they were part of a seamless community of shared interests and associations. There was nothing strange, therefore, when Ortelius asked to see James's sketch of a rhinoceros horn, because he thought he had seen a man hawking it in an Antwerp market. In an earlier letter James had asked for his uncle's assistance on behalf of his friend and neighbor Thomas Penny, who was trying to gather up his notes on insects and was still looking for rare and unusual specimens to distinguish the work. Ortelius, sadly, had no arthropods to send Penny, save a Neapolitan tarantula which had already been featured in Pier Andrea Mattioli's 1557 discourses on Dioscorides' *materia medica*. Nonetheless, Ortelius praised Penny's project, which he thought would make a unique contribution to learning.

A year later Ortelius again wrote to James Cole, and again the letter centered on matters of common concern to naturalists: this time geography, history, and

plants. In the letter Ortelius thanked his nephew for ascertaining the precise location of "Wigandecua," or Virginia, from the newly returned members of the Roanoke expedition. Ortelius also praised James's knowledge of history, while lamenting the fact that his nephew could not take advantage of his well-stocked Antwerp library for his studies. To close the gap between Antwerp and London, Ortelius enclosed some valerian and sunflower seeds (one of the trendiest garden flowers at the time) gathered from his garden by James's aunt Anna.²⁶ Ortelius reckoned that sending seeds to James was like "sending owls to Athens" because his nephew was such an accomplished gardener. Ortelius hoped that they would serve as an adequate substitute for the African marigold seeds that James wanted, and which the Antwerp cartographer could not procure from his European contacts.

It was through the circulation and collection of these *naturalia* — a packet of seeds, a drawing of a rhinoceros horn, a spider, a snippet of information about Virginia — that the Lime Street community expressed its vitality at home and made its reputation abroad. Though it is easy to dismiss these objects as intellectual bric-a-brac, the fragmentary evidence of an unsystematic interest in the natural world, each item was part of an intricate web of exchange that stretched from Russia to the New World, from Denmark to Africa. Every time a dried plant specimen changed hands it became infused with new cultural and intellectual currency as its provenance became richer, its associations greater. Every gift of a flower bulb or a fossil came with an unspoken understanding that the recipient would take the specimen and not only credit its donor but find some way to repay the donor either directly or indirectly with something of equal value and importance.²⁷

Within this circuit of exchanges natural objects led double lives; they were both subjects of study and inquiry, and artifacts cherished for their rarity and beauty. As subjects of study, natural objects provoked commentary and argument as their features and merits were debated and discussed within the community. As material objects, they were hoarded in cabinets, were swapped for other desired items on a naturalist's wish list of specimens, and provided cultural ornamentation that spoke to kings and queens interested in the rare and unusual, as well as to scholars and intellectuals. At a time when most of Europe was locked in war over matters of religion and imperial ambition, the exchange of natural objects prompted an intellectual civility that stood in stark contrast to national disputes. While a naturalist like Cole might have difficulty traveling from Protestant England to the Spanish-occupied Netherlands, his sketch of a rhinoceros horn or a seed packet could cross borders with relative ease and foster friendships that rose above linguistic, religious, and national obstacles.

Tracing natural objects as they traveled between scholars, appeared in learned commentaries, and came to rest, temporarily, on the shelves of a collector's natural history cabinet provides us with a way of seeing the Lime Street community in action and embedded in a larger network of intellectual exchange. Two impulses governed the Lime Street naturalists: the urge to collaborate, and the urge to collect. As with so many aspects of life in early modern London, including the study of nature, this involved a delicate interplay between cooperation and competition. Whether the object in question was a tulip or a map, discovering more about it and how it passed from individual to individual can illuminate the Lime Street community, and help us understand how a cosmopolitan city like London could serve to foster an interest in the natural sciences.

The Lime Street naturalists' urge to collaborate and their compulsion to collect found primary focus in the area of plants—their collection, propagation, and identification. After plants the Lime Street naturalists were most interested in animal and fossil specimens, with books, maps, and antiquities rounding out the list. Though this might seem like a bewildering and incoherent range of interests, in the sixteenth century they represented the classic components of natural history, as exemplified in a cabinet of curiosity. Cabinets of curiosity were temporary resting places for natural and artificial objects of wonder and delight. Frequently and provocatively crossing the ancient divisions between the natural and the artificial, an early modern curiosity cabinet could hold unicorn horns and mummified remains as well as artistic representations of shells, statues honoring the human form, and mechanical gizmos of every description. Monarchs throughout Europe assembled enormous collections of rarities, most notably the Holy Roman Emperor Rudolf II. Elizabeth I also had a cabinet of curiosities that she kept in her private chambers, which housed portrait miniatures and precious gems, along with her correspondence. At Greenwich, the Queen kept a room filled with clocks, globes, a saltcellar modeled to resemble a Native American inlaid with precious stones and ornamented with feathers, and rare tapestries made of peacock feathers. The Swiss traveler Thomas Platter reported that these were gifts from lords she had favored, “for they were aware that her royal Highness took pleasure in such strange and lovely curios.” Her chief minister, William Cecil, also had a cabinet full of “rare things of workmanship” that included rocks, coins, and other antiquities, including a strange mineral specimen sent to him from Prague by the notorious alchemist Edward Kelly.²⁸

By the end of the century, the collecting bug had bitten the middle class and many London residents had curiosity cabinets. The Barber-Surgeon and naturalist William Martin (fl. 1575–1606), for example, had a collection of curios that included portraits of recent kings and queens of England, the likeness of a “He-

brew physician that spoke twenty-eight languages,” an ostrich egg, maps of Jerusalem and Ostend, books, and surgical instruments. One item from Martin's collection, a picture of the ancient plant-hunter Dioscorides, may even have made its way into James Garret's collections on Lime Street.²⁹ When the Swiss traveler Thomas Platter visited London in 1599, Lime Street's Mathias de L'Obel took him to visit the house of Sir Walter Cope (1553?–1614) in the nearby suburb of Kensington to talk about Londoners' addiction to tobacco and to see his curiosity cabinet. Nestled among a fearsome assortment of weapons were feathered headdresses, clothes from China, an assortment of shoes, instruments, the horn and tail of a rhinoceros, the far rarer horn that had sprouted out of an English woman's head, an embalmed child, caterpillars, Virginian fireflies, a pelican's beak, a sea mouse, and an entire Native American canoe “with oars and sliding planks, hung from the ceiling.” “There are also other people in London interested in curios,” Platter wrote, but he was confident that Cope was “superior to them all for strange objects, because of the Indian voyage he carried out with such zeal.”³⁰

We know that the Lime Street naturalists had similarly varied collections of natural and artificial objects. Thomas Penny maintained a “dried garden,” or *hortus siccus*, a collection of preserved plant specimens that he kept safely between sheets of paper. He also collected representations of insects as well as actual specimens, and these later passed into the hands of his friend Thomas Moffett. Moffett treasured his “storehouse of Insects,” where he kept his rarest specimens, including an African grasshopper that he received from Pieter Quiccheberg of Antwerp, the son of the famous collector Samuel Quiccheberg. James Cole inherited Abraham Ortelius's large collection of natural objects, maps, and antiquities—including artifacts from the New World, the therapeutically treasured gallstones of Persian goats known as bezoar stones, precious gems, and ancient marble statues—and stored them all on Lime Street within two large curiosity cabinets that had both shelves and drawers.³¹ Cole kept the cabinets in his countinghouse, where most merchants locked up their most valuable items as well as business profits and ledgers. While historians often focus on these splendid cabinets and their quirky contents, I want to shift our focus from the objects in their temporary resting place and consider instead how they were acquired, discussed, and traded within the Lime Street community and abroad. To do so we need to explore references to fieldwork, travel, and exchange in their correspondence, manuscripts, and published works.

One of the striking features of life on Lime Street was the collaborative spirit of its residents and their intellectual activities as they worked together on common problems or in pursuit of commonly valued knowledge. The late sixteenth

century was a time of enormous excitement and challenge, as naturalists tried to sort through the overwhelming range of new plants and animals that seemed to be coming into their hands from every direction, and working with other students of nature eased the difficult business of comparing and contrasting previously unknown species. Moffett and Penny enjoyed doing fieldwork together, wandering "here and there a-sampling." L'Obel and Penny also went out into the field to examine plant specimens. James Garret helped Moffett study the field cricket by pulling off its wings and rubbing them together "very cunningly" to determine whether their music came, as other naturalists thought, from their wings or from a kind of hollow tube in the insect's stomach. Garret also studied the habits of the worms he observed living in his garden violets for Penny's work on insects, reporting that they were "very small and black, and run very fast." The English physicians Peter Turner and William Brewer joined Thomas Penny on an expedition in Heidelberg, where they were students in the 1570s.³²

Working with a wide range of European naturalists provided members of the Lime Street community with additional collaborative opportunities and gave them a way to establish their expertise and to acquire additional specimens. Moffett and Penny received wasps, an illustration of a praying mantis located in Greece, and depictions of magnificent butterflies from the onetime Lime Street resident Charles de L'Écluse, who was then living in Vienna. These included an image of a butterfly that was so splendid and unusual Moffett rhapsodized that it was "as if Nature in adorning . . . this had spent her whole painter's shop."³³ Lime Street returned the favor when James Garret sent L'Écluse dried plant specimens from the New World and the fruits from the clove berry tree, while Thomas Penny sent him a blue-flowered gentian.³⁴ James Cole asked Franciscus Raphelengius, the nephew of the famous Antwerp printer Christopher Plantin, to send him a white tulip if he could find one, and sent Marcus Welser, a family friend living in Augsburg, rose bushes and flower bulbs. Many new plants found their way to Cole's garden thanks to Ortelius, who sent his nephew the seeds of an American chestnut tree and the rare plane tree. The French physician Jean Antoine Sarrasin (1547–98) thought Penny might like a picture of a praying mantis he had seen in Geneva, and Abraham Ortelius offered to send him his Neapolitan tarantula for inspection. Joachim Camerarius (1500–1574), the Leipzig naturalist, also sent Penny illustrations of an unusual ox-horn beetle in the Duke of Saxony's curiosity cabinet, as well as specimens of two kinds of weevils found in German barns. James and Pieter Quiccheberg sent insects from Antwerp and Vienna, including beetles, wall lice, and grasshoppers. And the surgeon Edward Elmer sent rare Russian beetles back to London for examination by the Lime Street naturalists.³⁵

The mailbags contained all manner of intriguing objects and ideas as they passed between London and the European continent: hairy caterpillars from Normandy, strange biting caterpillars from Hispaniola, and scorpions from Barbary all found their way to Lime Street through the post. Sometimes, contributions came from closer to home. Thomas Knyvett (1545/6–1622) and his brother Edmund, "famous for his curious search into the knowledge of natural things," frequently sent information from their studies of insects to Moffett and Penny. Edmund Knyvett sent Penny a painted portrait of a small silver fly that sat on flowers, which helped the naturalist to frequently spot them in "hedges, and places with privet," as well as depictions of a beetle and a caterpillar. In addition to information about dragonflies, the physician and naturalist William Brewer kept Moffett and Penny posted on the angling habits of local fishers, carefully watched the generation of a glowworm, and then sent a specimen of the insect he found on the heath to Penny after he had carefully desiccated and preserved it. Lancelot Browne (d. 1605), a London physician, told Penny about a small fly that nestled in flowers "for warmth's sake and feeding." Not all of Lime Street's English informants were learned men, or of high birth, however. A simple "country man" shared his observations about the life cycle of the fly with Penny, for example, and the physician later hired an area resident to study the fen cricket, to "observe as often as might be its condition, and to make relation of it."³⁶

Collaborative ventures like these often sprang from fieldwork. Out in the field, the goal was to observe something novel, rare, or peculiar. One of the great benefits associated with the study of these natural wonders was that through them "the minds of the studious may be filled with variety and rarity," as Thomas Moffett explained. L'Obel, in particular, loved fieldwork, a passion that was born during his student days at the University of Montpellier and which continued throughout his life. With Thomas Penny, L'Obel studied plants in Geneva and the Jura Mountains. In England he spotted a yellow "Star of Bethlehem" in a cornfield in Somersetshire, and observed a type of ivy-leaved mustard growing on the rocks in Portland near Plymouth. While traveling on the northwestern border of England and Wales, L'Obel identified two new plant varieties: a yellow pulsatilla and a blue-flowered butterwort. "I am discovering some beautiful plants in the mountains!" L'Obel enthused to his son-in-law James Cole. Moffett was also a tireless fieldworker, scouring "all Helvetia, Germany and England" for firsthand knowledge of a particular species of grasshopper, but he was unable to find his elusive prey. When he spotted an unusual specimen, like the "rare fly, not every where to be seen . . . that feeds on a mud wall made with mud and putrefied materials," Moffett preserved it "though dead, in a box for the rarity of it."³⁷

Trips abroad represented working journeys for the Lime Street naturalists

rather than opportunities for recreational travel. Fieldwork could be conducted in new environments, specimens previously seen only in books could be examined *in situ* growing wild or in cultivated gardens, and friendships made through correspondence could be strengthened by face-to-face contact. James Cole undertook a natural history tour of Europe in the summer of 1597 after the death of his first wife, Maria Theeus.³⁸ Accompanied by another "learned Englishman," Cole traveled throughout Europe, visiting the naturalist Joachim Camerarius in Nuremberg, the historian Marcus Welser in Augsburg, and the collector Adolphus Occo in Aachen before sweeping the length and breadth of Italy. In Italy, Cole and his English friend visited Professor Magini at the University of Bologna to see whether he had any interesting ancient maps, met artists in Florence, and visited Fulvio Orsino's unparalleled precious stone collection at the Vatican in Rome (odd as it might seem for two avowed Protestants to gain entrance there).

But it was in Naples, at the house and museum of the della Porta brothers, that Cole encountered a collaborative spirit of science reminiscent of his experiences back home on Lime Street. At the home of Giambattista and Giovanni Vincenzo della Porta, Cole had the opportunity to experience the late-sixteenth-century Neapolitan intellectual scene at its best. Naples was a center for natural history with an active intellectual colony linked to Rome's Lincean Academy, and the presence of well-known naturalists like Niccolò Stelliola and Ferrante Imperato, as well as polymaths like the della Portas, drew in visitors from all over Europe.³⁹ Cole was dazzled by Giambattista della Porta's mathematical studies on the quadrature of the circle, and by Giovanni Vincenzo della Porta's work on the judicial astrology of Ptolemy, but their museum of rare coins and marble statues made an equally strong impression and may have inspired renewed efforts by Cole to collect curiosities for his Lime Street cabinet.

While Naples was impressively remote from London by early modern standards, even more exotic fieldwork opportunities were emerging as voyages of exploration opened up new worlds. Eager naturalists were quick to acquire examples of novel specimens from North America, South America, and Africa, since the conditions of travel made excursions to these far-flung regions difficult and dangerous. Acquisition of these desirable, trendy natural commodities was not cheap, as Thomas Moffett discovered when he had to purchase a praying mantis "from Barbary that was brought out of Africa with some cost to us." It was far more cost efficient, and more in keeping with the bonds of obligation one cultivated in the Republic of Letters, to procure exotic specimens from friends like Pieter Quiccheberg in Antwerp, who sent Penny a young African grasshopper, which Moffett continued to treasure in his storehouse of insects after his friend's death. Other friends also made valuable contributions to the Lime Street com-

munity's efforts to study nature, as when Ludovicus Armacus, "a very diligent surgeon," brought Penny a grasshopper from Guinea and a caterpillar from Africa, and the artist taken on Raleigh's Roanoke expedition, John White, gave him another grasshopper "brought forth from Virginia."⁴⁰

Because information was coming into the hands of the Lime Street naturalists from so many different sources — from their own fieldwork, from reports of fieldwork conducted by friends, and from intelligence gathered by informants as far away as Russia and New Spain — they carefully distinguished between the natural objects they witnessed themselves and those known only secondhand. Moffett noted that he had seen four small dragonflies, but not the thin, gray dragonfly that fed on apples which William Brewer brought to Penny's attention. Moffett made such careful distinctions because reported facts were not always reliable no matter how credible the source was. "The chameleon which some have reported, but falsely, to feed only on air," Moffett wrote with satisfaction, "feeds on flies, which, with his tongue six inches long, putting it forth suddenly and waving it to and fro, he hits [them] unawares, draws [them] to him, and devours them, as I have seen with mine own eyes in the year 1571." He was equally gratified when his own observations confirmed his friend Peter Turner's reports that earthworms fed "most greedily on a piece of white, unleavened bread."⁴¹

In light of the problems associated with verifying secondhand reports, the Lime Street naturalists preferred receiving actual specimens of plants and animals, or even careful drawings, rather than verbal descriptions. Like a cabinet of curiosities, an image of a plant, insect, or animal froze the specimen in time and allowed the naturalists to share it with other interested parties and study it minutely and at their leisure. An artistic representation of a natural object could impart a greater sense of verisimilitude to the viewer than a description, especially when the descriptive power of words seemed unequal to the task of accurately capturing an especially rare or magnificent specimen. Moffett was glad that he received an elegant drawing of a colorful butterfly from his friend Charles de L'Écluse because it was "easier to wonder at and admire, than with fit expressions to describe." Even so, representing a specimen — in words or visually — was recognized as an imperfect process of translation from the real object. "How hard and uncertain it is to describe in words the true proportion of plants (having no other guide than skilful, but yet deceitful, forms of them, sent from friends . . .) they best do know who have most deeply waded in this sea of simples," wrote Mathias de L'Obel.⁴²

Much of the reliability associated with drawings and other representations of plants and insects depended on the quality of artists one could call upon to make the drawings. Though Ortelius praised Cole's drawing abilities, he was surely an

amateur when compared to artists known to the Lime Street community like Marcus Gheeraerts the Elder, Marcus Gheeraerts the Younger, John White, and Joris Hoefnagel.⁴³ Even when a careful line drawing was made for publication or to send to a friend, the absence of color could limit its usefulness to other students of nature. Moffett carefully instructed his readers how to modify the line drawings that were to be included in his published *Theater of insects* to make them better reflect live specimens. "We have here set down exactly the form and magnitude of the Cranesbill-Eater," Moffett wrote next to a drawing of a hairy caterpillar, but in order to fully appreciate what it looked like, the reader "must make the white spots that adorn its black girdles of an iron color; and paint the belly and feet, and the white space between the girdles, with a leek-green color." Moffett gave similar instructions for hand-coloring the line drawing of a tarantula: "If you paint the white places with a light brown, and the black with a dark brown, you have the true spotted Tarantula."⁴⁴

Whether from a live example, a preserved specimen, or a representation, simple observation did not always lead to perfect understanding of a natural object. Sometimes, closer study was required. In 1587, for example, the physician Thomas Moffett traveled to the west of England. He found an entire wasps' nest in a small village and decided to verify written reports that the females of the species lacked a stinger. Undaunted by the prospect of studying an insect capable of injuring him, Moffett poured hot water on the nest and killed all of the wasps. Closer examination of the dead wasps led Moffett to conclude, "I think they all in general are armed with stings," since he "could find none that had not a sting, either within their bodies, or sticking out." Mathias de L'Obel and Pierre Pena poisoned dogs in Paris, Louvain, and Heidelberg with arsenic and mercury in order to test the efficacy of its antidote, the herb "True Love." And Penny and William Brewer experimentally verified Dioscorides' theory that the salamander, contrary to legend, was not capable of living in fire when they incinerated one they found in the hills around Heidelberg.⁴⁵

The cultivation of gardens gave naturalists like those on Lime Street another important opportunity to make hands-on inquiries into nature and to display their collecting prowess. Ortelius was jealous of his nephew's London garden, and the rare muscari, tulip, narcissus, and lily specimens he had there, some of which were completely unknown in Antwerp.⁴⁶ Thomas Penny's garden offered Mathias de L'Obel his first glimpse of water betony. L'Obel sent Gaspard Bauhin plants from his London garden to help him complete his *Pinax theatri botanici* (1623). Plants came into Lime Street from all corners of the globe, with the expectation that their health and welfare would be carefully tracked as they became acclimatized to English conditions. Ortelius sent to Lime Street South

American sunflower seeds and North American chestnuts that he had acquired from friends with New World connections. The French naturalist Nicholas Fabri Claude de Peiresc sent fragrant, colorful styrax shrubs to Mathias de L'Obel and James Cole, along with some double daffodils fresh from Argiers. "I hope that you will find within some curiosity worthy of your beautiful little garden," Peiresc wrote to Cole in the note that accompanied the package, since they "grow here in France" but are not "very common where you live."⁴⁷

Despite Cole's splashy horticultural successes, James Garret was the most skilled practical gardener among the Lime Street naturalists, internationally renowned both for his ability to propagate new and ever more colorful varieties of tulip as he unwittingly exploited the virus that was becoming rampant in the flower stock, and for his ability to procure new plant specimens from all over the world. John Gerard, who was to become Garret's enemy, explained in *The herball* how the apothecary had "undertaken to find out, if it were possible, the infinite sorts [of tulip], by diligent sowing of their seeds, and by planting those of his own propagation, and by others received from his friends beyond the seas for the space of twenty years." Gifts of plants poured through the door of his drugstore on Lime Street: West Indian grasses, seeds from the Peruvian balsam tree obtained by Lord Hunsdon, new species of beans, a potted *Herba mimosa* brought out of Puerto Rico by the Earl of Cumberland, and a Virginian version of the china root.⁴⁸

Not all plants were as hardy as Garret's tulips, however, and transplanting new or unfamiliar plants into cold, English gardens involved real risk, for the specimens did not always survive their first winters in the ground. Mathias de L'Obel's precious ginger specimen obtained from William of Nassau's garden "perished through the hardness of the winter." While visiting his uncle in Antwerp in 1588, James Cole planted some new specimens sent from Nuremberg by Camerarius, including foxglove, pink lily of the valley, fritillaries, and purple anemone. None of the plants fared well, and Ortelius wrote the following spring that most of them had failed to emerge from the earth after the winter passed. Despite these gardening setbacks, Ortelius kept Cole posted as to the more promising fate of a red and white tulip that the two had planted in Antwerp.⁴⁹

Years of observation, fieldwork, travel, correspondence, collaboration, and collection informed the work of the Lime Street naturalists. Thomas Moffett drew attention to the benefits associated with their hard-won expertise when he discussed the work of older bees in a beehive: they should be ranked above "the rest in industry and experience, for years have taught them skill." As time passed and their knowledge grew, the Lime Street naturalists became wary of hasty conclusions about the intricacies of the natural world. Moffett was reluctant to in-

clude anything in his treatise on insects that was not "confirmed by long experience," especially if those insights might be challenged by readers. After finding several accounts of how glowworms, when combined with quicksilver in glass beakers, could create special lighting effects, Moffett asserted, "I will not believe [it] until such time as the experiment be made before mine own eyes."⁵⁰

This discernment helped the Lime Street naturalists extract the choicest morsels of natural knowledge from the bewildering variety of the created world. Only after making specific observations could general theorizing take place. An example of just such a step-by-step process occurred between Ortelius and James Cole in 1589 on the subject of fossils. Ortelius had been discussing and receiving fossils from his European contacts for years before Cole began to put forward his own ideas about these rare, inorganic "jokes of nature," which God had deliberately sprinkled about to delight and distract students of nature. In 1579, for example, a Flemish admirer sent Ortelius a stone in which the cartographer could "observe the wonderful ingenuity of nature." The stone was hollow and contained smaller stones inside which caused it to rattle. Also inside were "various shells of snails, mussels, and cockles turned into stone." Cole's friends on Lime Street were also intrigued by the puzzling objects. In the winter of 1579 Thomas Penny sent a fellow naturalist a large tooth unearched from a Cambridge field, and he also observed small worms "with six feet in old rotten stones," which amazed his neighbor Moffett, who had always understood "that all things . . . though they may corrupt in time, yet they will breed no worms."⁵¹

Fossils were a great mystery to early modern naturalists, and theories abounded as to when and how the animal and plant remains became trapped in the earth. While most scholars believed that fossils were inorganic, some were perplexed at the structural similarities between fossil remains and now-living creatures. One obstacle to drawing a clear connection between, for instance, an enormous fossilized bone and the bone of a much smaller living creature, was partially explained away when a theory emerged that these off-scale remains found in the earth actually grew there. When reports reached Lime Street from abroad of living animals found trapped in stones, these occurrences only made the debates about whether fossilized specimens were organic or inorganic more pressing, and more confusing. The Swiss physician Felix Platter was clearly veering toward the notion that fossils were somehow organic when he reported to Moffett that "he found a great live toad in the middle of a hard stone that was sawed in sunder." Platter concluded that the toad "was bred there" in the midst of the stone. Moffett found himself agreeing with Platter, for the German reports that would once have seemed "incredible and monstrous" could now be juxtaposed with accounts coming from a quarry in Leicestershire that noted the very same occurrence.⁵²

Cole reached a daringly different conclusion. He believed that the shells and the animals within them were indeed the vestiges of organic creatures that had once inhabited the earth. Neither their inordinate size nor their placement could sway his belief. As for the fossilized shells that came to rest on the mountains where so many collectors found them, Cole explained that the earth had hardened into stone around the organisms before or around the time of Noah's Flood.⁵³ Ortelius, while claiming to have no ideas of his own on the subject, was troubled by the sheer impossibility of Cole's theories, especially the notion that fossilized shells were not inorganic jokes of nature but organic remains of living creatures, perfectly preserved. Ortelius felt that the other alternative to the inorganic theory of fossils—that the fossilized remains of animals had somehow "grown" in the earth from normally sized organic remains—had not been entirely ruled out, either. Prompted by his examination of an enormous petrified snail in Antwerp, Ortelius admitted that nothing that large could possibly have lived on the earth, so if fossilized shells were organic they must have grown in the earth.

Cole and Ortelius were not the only members of their extended community to weigh in on the subject of fossils. Another of Ortelius's correspondents, the French antiquary and naturalist Dionysius de Villers, argued with him over his notion that fossils could grow in the earth, pointing out that while individual bones left in the earth might grow to enormous size through some mysterious nutritive quality in the soil, how could one explain enormous skeletons found in their entirety? Villers believed that the answer could be only that once a race of giants had roamed the earth, a conclusion he reached after studying a huge tooth (probably a mammoth tusk) in his curiosity cabinet. Moffett, musing over the same troubling evidence of the fossil record over on Lime Street, and perplexed by Penny's belief that worms had grown inside crumbling stones, concluded that rocks could indeed breed organic life forms, despite the contrary opinions of ancient philosophers. "I began to weigh the matter narrowly, and to put into an equal balance, without fraud, all of their opinions," Moffett wrote, and "at last I found that our Ancestors were here and there most foully deceived, and I ascribe more to my eyes and the eyes of Penny, than to all their [ancient] words."⁵⁴

These are not the amateur ramblings of casual collectors—these are state-of-the-science deliberations about one of the most pressing natural history debates of the period. It was not until 1616 that Colonna, in his *Dissertation on Tonguestones*, publicly suggested something akin to Cole's theory that fossils were neither the enlarged remains of once organic creatures, nor inorganic jokes of nature, but exact imprints of otherwise unknown organic creatures which had once lived on earth.⁵⁵ With two other Italian naturalists, Agostino Steno (1629–1700) and Nicolaus Steno Scilla (1638–1686), Colonna was able to articulate and pub-

lish a theory of fossil remains that sounded remarkably like Cole's much earlier, private arguments. After comparing living creatures with fossilized remains, the three men set forth a convincing case as to why fossils were organic, setting off a firestorm of controversy that continued to consume the attention of naturalists well into the nineteenth century.

Fossils were not the only confusing aspect of the natural world, and the Lime Street naturalists and their friends devoted similar attention to two other zoological mysteries: the barnacle goose and the tarantula. Abraham Ortelius was a key figure in these exchanges, for he had a high reputation throughout Europe for his knowledge of animals, and naturalists from the Netherlands to Naples consulted him about rare and exotic species. It was the naturalist Niccolò Stelliola, for example, who asked Ortelius to share everything he might discover about another joke of nature: the barnacle goose (Figure 1.2). The barnacle goose was reputed to be born from a rare tree in northern Scotland that sprouted barnacles rather than fruit. From these barnacles hatched a goose that wandered away from the tree on four, rather than two, feet. The fact that no barnacle tree, nor any barnacle goose, had ever been found did not deter naturalists from looking for them. Stelliola felt sure that Ortelius would know what there was to know about the rare species, reminding him that anything he could divulge would represent "a great service to students of nature" and might incidentally prove his theory that two of the goose's four reputed feet were actually wings. Thomas Penny, on the other hand, asked Ortelius to confirm James Cole's reports that the cartographer had a tarantula specimen that had four eyes. This revelation surprised Penny, since he could not remember any other naturalist mentioning the fact, and sketches made for him in Italy showed only two eyes. Despite Ortelius's reluctance to style himself as an expert on animals and insects, Penny urgently requested that he have the tarantula — and any other rare specimen that he might know of in Antwerp — sketched immediately. Penny assured Ortelius that he would pay any price for the drawings through the agency of their local postman, Emmanuel van Meteren.⁵⁶

Despite the Lime Street naturalists' interest in careful observation, experimentation, and the framing of hypotheses and conclusions, they were not eager to leap into the thickets of natural philosophy and make statements about God's overall plan for the cosmos, or to engage in debates about first causes or final movers. Students of nature had to avoid claims that they completely understood the natural world. Thomas Moffett warned "how foolishly and vainly man's wisdom doth many times vaunt itself . . . if not founded upon right Reason, the mistress of all Arts and Sciences." "There are many productions of nature," Moffett counseled, "the causes whereof it is impossible for any man to know, much less

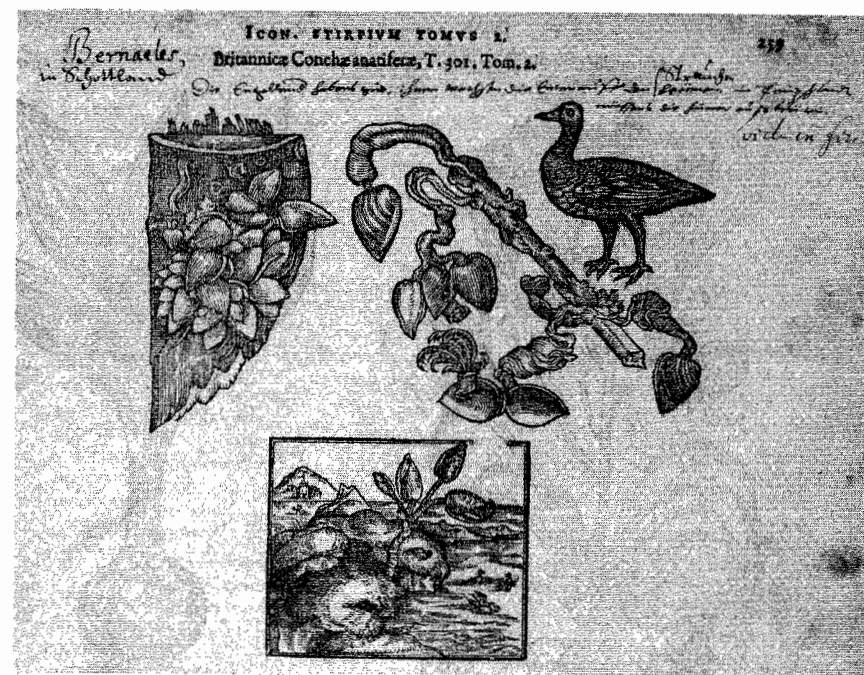


Figure 1.2. Scotland's famed "barnacle goose," from Mathias de L'Obel's *Plantarum, seu stirpium icones* (1581). The Lime Street naturalists were contacted by other students of nature for their expertise with native British flora and fauna. Reproduced with the permission of the Henry E. Huntington Library.

to show to others." This, Moffett argued, was really God's plan: to keep mankind admiring the power of God while acknowledging human blindness and ignorance. God created natural marvels like fossils and tarantulas "only for his glory, that he might both confound the shallow understandings of men, and also teach them to acquiesce in his wisdom." When "searching out the natural causes of things," Moffett concluded, "it is impossible to go any farther."⁵⁷

As the Lime Street naturalists collaborated on their projects and shared the results of their inquiries with one another, they became more aware of the value of personal experience and the importance of verifiable knowledge about the natural world. The evaluative urban sensibility that already helped them to cope with the interplay that existed in London between collaboration and competition, English and Stranger, private and public also helped them to make distinctions between the experiences of their many informants and the information that they discovered themselves and witnessed with their own eyes. As all Londoners

knew, you could not believe everything you were told — even if the one doing the telling was a famous naturalist or a learned friend. Underlying Lime Street's collaborative efforts there was a fine thread of competition, as individuals within the community strove to put forward more exact and reliable information about the natural world. But it was competition from without, rather than within, that ultimately obscured Lime Street from historical view.

LOSING LIME STREET

The Lime Street naturalists kept busy collecting and collaborating, and Elizabethans knew that an active, important natural history community existed in the heart of Elizabethan London, one that was equal to any in Europe in terms of interest and abilities. Yet the names of James Cole, Thomas Penny, James Garret, and even Mathias de L'Obel, are strangely absent from the standard histories of botany and the history of science. The main reason for their absence, I believe, is the English Barber-Surgeon John Gerard. John Gerard represents everything that the Lime Street naturalists were not: he was not part of the economically self-sufficient Lime Street community, he was not able to keep collaboration and competition in balance, and he did not obey the rules of appropriate collegial behavior established in the Republic of Letters. Instead, he relied on patronage, individual ambition, and his willingness to enter the publishing market for his success.

As we have seen from the complicated circle of exchanges that bound the Lime Street community together and linked them to important figures abroad, the work of natural history depended upon collaboration and cooperation as much as it did competition. These collaborative enterprises in turn depended on strict adherence to codes of civil, learned conduct to keep disputes in check. Adopting proper forms of address on letters, acknowledging learned assistance, and promptly repaying obligations were ways of expressing respect and collegiality. The economy of obligation that underpinned the Lime Street community could escape from the taint of mercantile buying and selling only if it was conducted in a way that was polite, impeccably honest, and transparently cooperative. Expressions of civility abounded in the letters, manuscripts, and printed treatises written by the Lime Street naturalists, whether they were addressing internationally renowned authors and scholars, aristocrats, or local luminaries. Moffett described Joachim Camerarius as "that most learned and courteous gentleman" and William Brewer as "a learned man and an excellent naturalist" and "a learned man and my good friend." Moffett also prized Brewer's "integrity of conversation," which, along with the physician Peter Turner, was "second to

none." Among the nobility Moffett praised Edmund Knyvett for being "a Knight that is very courteous to learned men, and singularly noble both by descent and virtue."⁵⁸

Like curiosity cabinets, the popular friendship albums (*alba amicorum*) of the period froze these carefully cultivated cordial relationships on the page.⁵⁹ Like the cabinets, however, their seemingly static appearance belies the ways in which they, too, were mobile objects of exchange. Today they are museums of friendship, but in their own time they were shipped around Europe either in their entirety or in loose sheets to be bound later into a treasured volume. It seems, for example, as though everyone active in the European Republic of Letters inscribed something in Abraham Ortelius's friendship album, which passed into James Cole's hands after his uncle's death in 1598. Notable English intellectuals, such as the historian William Camden and the mathematician John Dee, carefully inscribed mottoes, epigrams, and illustrations in Ortelius's album. Like an early modern version of a modern photograph, your page in a friendship album was meant to conjure up an image in the owner's mind of shared experiences, happy memories, and ongoing amity. Sometimes, the pages even included carefully trimmed engraved portraits to better conjure a friend's face.

Emmanuel van Meteren and Mathias de L'Obel's son, Paul, owned friendship albums that have survived. Other Lime Street residents inscribed mementos into these albums, as well as into other European and English collections. Emmanuel van Meteren's album includes entries by James Cole, Abraham Ortelius, and Charles de L'Écluse, as well as beautiful still-life miniatures by artists like Joris Hoefnagel and Lucas d'Heere. Nicholas Fabri Claude de Peiresc also ornamented his pages, expressing his undying friendship for the Flemish historian. Paul de L'Obel's friendship book was similarly star-studded, including the autographs of the classical scholar Joseph Scaliger, France's royal gardener Jean Robin, his father's old friend and neighbor Charles de L'Écluse, and King James I's two apothecaries, Wolfgang Rumler and Lewis de Myre, as well as entries by his brother Matthew and brother-in-law James Cole (Figure 1.3).⁶⁰

In the albums and correspondence of the period, scholars and intellectuals had to negotiate a fine line between modesty and self-promotion. They wanted their entries to be noted and admired by others in the Republic of Letters, but they also wanted to be appropriately self-deprecating. After William Camden inscribed his entry into Abraham Ortelius's friendship album, illustrated with the head of Hermes and astrological symbols, he wrote to his friend, "I gladly wrote my name in your album and have added my symbol, though it deserves no place among so many clever ones, being a specimen neither of fine thought nor of

beautiful expression.” Despite Camden’s protestations, it is clear that a great deal of time — and often money — was lavished on most album entries. The English secretary of state Sir Thomas Wilson followed the example set by many who were artistically challenged: he hired a painter to illuminate his page in Ortelius’s album. Each expenditure of time, effort, and money was worth it, however, if it added luster to one’s reputation and elevated one in another’s esteem. After James Cole returned the classicist Johannes Woverius’s album to him, for example, he received hearty congratulations for his well-worded entry and for bestowing on Woverius tangible proof of their friendship.⁶¹ Cole’s learning was now a matter of public record within Woverius’s highly influential Flemish circle of philosophers and artists.

Every letter and every exchange between individuals in the Republic of Letters was padded out with compliments and gifts — but each came with strings attached to bind the giver and the recipient into further complicated obligations and exchanges. “Really, Abraham, your nephews overwhelm me with presents,” Johannes Faviola chided Ortelius in a letter brimming with insincerity that included a postage-due receipt for a few gifts he received in Middleburg from the Cole family in London and for which he now wanted reimbursement. Like the expressions of modesty in a friendship album, expressions of thanks, reluctance, and gratitude had to be taken with a grain of salt and carefully sifted through for double meanings. When Rudolf II’s court artist, Joris Hoefnagel, wrote to Abraham Ortelius in 1593, his letter was a tour de force of the delicate steps required to make, and fulfill, promises of friendship and cooperation in a way that kept the wheels of exchange turning. Ortelius had done some business for Hoefnagel, so the artist sent him “a little drawing from my hand, hoping that it will not displease you,” along with an old drawing of a flowerpot he had long ago dedicated to the cartographer as a token of thanks. It turns out that having paid off one debt, Hoefnagel now wanted Ortelius’s assistance completing his “book of art” that already had examples of “about three hundred good and notable masters.” “This study requires the help of friends,” Hoefnagel earnestly explained, “and for the little flowerpot I desire nothing but art for art.” Later in the letter, after sharing the latest news, Hoefnagel dropped broad hints as to the artists whose works he would like to acquire: “I possess nothing by Henry Bles, nor of Joos van Cleve, Frans Floris, or the Pourbuses.”⁶²

Despite Herculean efforts to avoid offense and embody the spirit of generosity at every opportunity, relationships in the Republic of Letters and on Lime Street were sometimes peppered with competition, tension, and conflict. James Cole was especially trying to his uncle, who often felt slighted by his nephew’s hasty arrivals and departures in Antwerp and the cavalier way the young man treated the

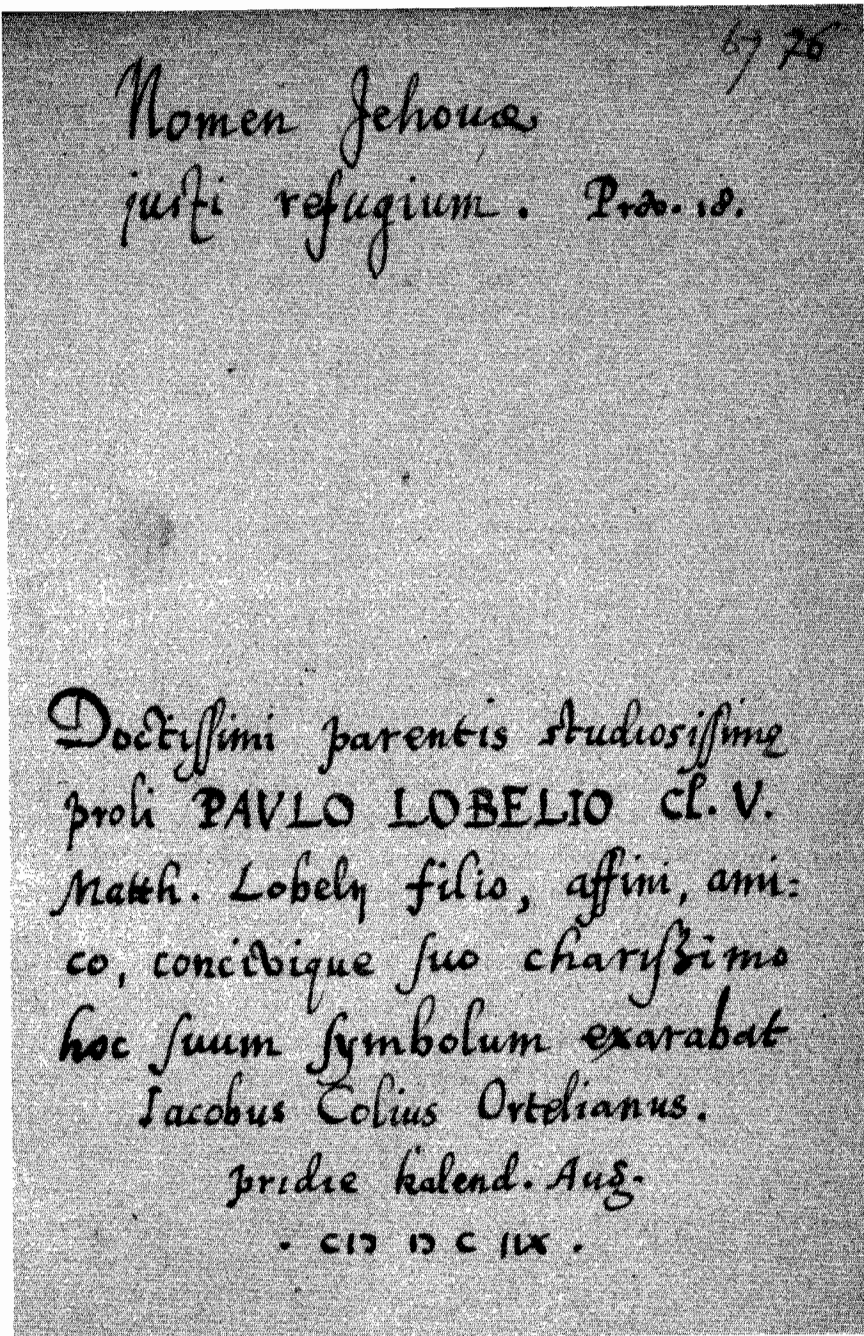


Figure 1.3. James Cole’s entry in the *album amicorum* or friendship album of his brother-in-law Paul de L’Obel. Tangible signs of friendship, like those here, were valued in the European Republic of Letters. Harley MS 6467, reproduced with the permission of the British Library.

offers of advice he received from Ortelius's friends. These were the elder statesmen of the Republic of Letters, and had all been carefully cultivated by Ortelius for decades, so the geographer was easily exasperated by reports about Cole's lapses of civility. The Augsburg Marcus Welser sniffed that he was glad to meet Cole during his 1597 visit, but "he made no use" of the advice given to him about his future travels. The Heidelberg professor Jan Gruter reported to Ortelius that Cole was with him so briefly they had barely spoken three words. He could only hope that Cole would make up for his hasty departure by writing to him. Later, Cole did repair their relationship through correspondence and gift giving, thereby proving to Gruter that he was still "retained in memory even though absent."⁶³

Civility was all the more important given the serious confessional differences and political struggles that divided so many countries in the early modern period. Within the Republic of Letters, whose members lived in regions like the Netherlands and France that were rocked by serious religious disputes, religion was bound to be an issue. Cole sometimes explained his reluctance to visit Ortelius in Antwerp by referencing how troubling he found it to contemplate entering the Spanish-occupied Netherlands, given his firmly Protestant outlook. Cole's attitude was prudent, but his uncle was still hurt by his refusals. "I invited you to stay with us, but I will excuse you," Ortelius wrote Cole in 1593. "I suppose that religion, which binds all good persons, binds you also." But, as in any community based on bonds of family, friendship, and obligation, Cole's decision had consequences, as his uncle was quick to remind him. "I would willingly have entrusted all that I possess into your hands," Ortelius commented dourly in the final lines of his letter; "now I will think of another."⁶⁴

Given the deeply ingrained practices of civility in the Republic of Letters, it was a particularly delicate business to criticize the work of a friend, as James Cole discovered when he notified his uncle of the errors he found in Charles de L'Écluse's edition of Garcia da Orta's work on the plants of southeast Asia. Ortelius, proud of his nephew's perspicacity, sent the remarks on to his old friend, who responded somewhat tartly that he was grateful that Cole had pointed out those parts of his work that "were not clear" so he could amend his new edition. Though L'Écluse remained on warm terms with other Lime Street naturalists like Garret, the atmosphere between him and Cole remained chilly. Years later, Cole tried to treat with delicacy L'Écluse's subsequent brush-off of his own work in praise of the study of plants, the *Syntagma herbarum* (1606). "I doubt whether I could, as you advise, offer the work to him [L'Écluse] without blushing," Cole wrote to Ortelius. "Four years ago in Frankfurt I asked him to read it, but he professed to have no time . . . [and] I fear to intrude upon him again." Still, Cole

sent a copy of the whole work to his uncle so that he could send it on to L'Écluse in apparent ignorance of their squabble.⁶⁵

To avoid public embarrassment, it was often prudent to take a proactive stance and correct one's own mistakes before a colleague was obliged to step into the breach and do it for you. Mathias de L'Obel, upon discovering certain inaccuracies in his published illustrations of ginger, took John Gerard a new illustration while he was writing *The herball*. L'Obel explained to Gerard that he had relied for the illustration on an "honest and expert apothecary, William Dries . . . [who] sent me from Antwerp to London the picture of ginger, which he held to be truly and lively drawn." Later, L'Obel realized it was simply copied from a Flemish herbal rather than sketched from life, and was full of misleading inaccuracies, especially with regard to its foliage. Rather than "suffering this error any further to [be] spread abroad," L'Obel told Gerard about the mishap so that he could be spared the embarrassment of perpetuating the mistake.⁶⁶

Given L'Obel's efforts, it is all the more surprising that Gerard abandoned the clear rules of conduct governing relationships in both London and the European Republic of Letters and ran afoul of the Lime Street community, committing what the historian Charles Raven has described as "almost all of the sins of which a man of letters or of science can be guilty."⁶⁷ Gerard's *Herball* was a monumental project, constructed of 1,400-plus folio pages of woodcuts and descriptions. First printed in 1597, the work was reprinted repeatedly in the seventeenth century and used by everyone from apothecaries who made medicines to fine ladies who embroidered twirling tendrils of peas and fanciful cucumbers on their bed hangings and petticoats. Scattered references within the work to the naturalists who lived on Lime Street and a letter of praise from Mathias de L'Obel suggest that Gerard's massive achievement was known and admired by the Lime Street community. If we consult the evidence outside the text, however, we reach a very different conclusion.

Most of the external evidence demonstrates that the careful balancing act between competition and collaboration that was a crucial component of the urban sensibility of London's communities of science was proving difficult to maintain with respect to the Lime Street naturalists and John Gerard. First, he was literally an outsider who resided on the far side of London in the suburbs of Holborn. There was more space for gardens there, but there was not the vital intellectual community that could be enjoyed in the City's center on Lime Street. What Gerard lacked in terms of companionship he more than made up for by seeking out patrons and positions at court, where he was not only appointed surgeon to the queen but also made superintendent of William Cecil's gardens on the Strand and at his country house, Theobalds. Gerard spent most of his life shut-

ting between the court, his own gardens at Holborn, and his duties for Cecil. He gained access to a number of rare specimens through Cecil, many of which came into England in diplomatic pouches, such as a double white daffodil from Constantinople, which flowered once and never again, despite careful tending.⁶⁸ He was solicitous, too, of the many aristocrats who sent him specimens from their gardens, including Mathias de L'Obel's patron Edward la Zouche, Lord Zouche. Gerard received a number of seed varieties, including Italian mustard seeds, from Zouche, "which do flourish in my garden, for which I think my self much bound unto his Lordship."⁶⁹

Gerard was also connected to London's two chief medical organizations, the College of Physicians and the Barber-Surgeons' Company. While there was often tension between the company and the college, Gerard petitioned the college to appoint him superintendent of a special physic garden that would be devoted entirely to the study of the medical uses of plants. In 1586 the college granted his request, although there is no evidence that the garden was ever established. Still, Gerard enjoyed good relations with members of the college. Physician Stephen Bredwell joined him in plant-hunting expeditions around London, including one on which they inspected a veronica growing in the village of Barnes. When *The herball* was published, Bredwell wrote one of the many letters published at the front of the volume in praise of the work, mentioning both Gerard's skill as a gardener and his avidity for fieldwork.⁷⁰

Like the Lime Street naturalists, Gerard carefully cultivated his relationships with other scholars at home and abroad. Among European naturalists, Gerard counted a number of important figures his friends, including Charles de L'Écluse and Joachim Camerarius, who gave Gerard a German iris and the seeds of a goat's thorn bush, which grew successfully for two years before they perished "by some mischance." Gerard regularly exchanged plants and seeds with Jean Robin, the French royal gardener. Robin sent him cress seeds, hyacinths, a "rare and strange" *epimedium* (which Gerard christened "Barrenwort"), a crocus, and double yellow daffodils from Paris. In England, Thomas Hesketh and the apothecary Thomas Edwards both sent him plants found on their plant-hunting excursions. A preacher living in Hatfield, Robert Abbot, told Gerard of native orchids that grew near the Queen's childhood home. And Nicholas Lyte (1517–85), a Somerset merchant and active naturalist, gave Gerard cabbage seeds from France, a yellow carnation from Poland, and even rarer specimens from Syria he had acquired through a business associate in Aleppo.⁷¹

Gerard engaged in frequent fieldwork during the course of his studies. He observed plants growing in Kent and Essex, went hunting for plants in a village outside London with Robert Wilbraham, and was the first to identify a type of daf-

fodil he saw in an old woman's garden in Wiltshire. Fully utilizing the riches of his own backyard, Gerard made frequent trips into the fields around London, noting the presence of wall pennywort on the door between Chaucer's tomb in Westminster Abbey and the old palace, and finding garlic and orchid specimens in Islington, creeping pinks in Deptford, whitlow grass growing in tufts on the brick wall in Chancery Lane, bugle in the village of Charleton, bittersweet in a ditch by the Earl of Sussex's house in Bermondsey Street, speedwell near the churchyard in Chiswick, and mustard in Edmonton. In the outer reaches of Southwark, where criminals and Catholic sympathizers were executed, Gerard found the water plant called "Great Arrow Head." Hampstead Heath and the surrounding woodlands also provided him with excellent opportunities to study native species, including orchids, yellow pimpernel, goldenrod, hyssop, and lily of the valley.⁷²

An avid gardener, Gerard published the first edition of his catalogue of garden plants in 1596, giving us a glimpse of the specimens that grew behind his garden walls.⁷³ At least part of his garden was devoted to the medicinal herbs and plants he knew so well, noting that he grew several kinds of dock in his garden for his "use in physic and surgery." In addition to English natives, Gerard was devoted to collecting exotic rarities. He planted sugar cane in his garden, and found that the "coldness of our climate made an end of mine." Gerard had similar problems with other West Indian natives like rice, but had more success with tobacco, with which he had "experimented every way to cause it quickly to grow." Mediterranean plants, like the "Sea Onion" he obtained from sources in Constantinople, were typically more reliable transplants than those from the New World, though Gerard did not succeed in making Syrian cotton seeds flourish. The unexpected growing habits of some transplanted specimens were quick to get his attention. After Henry Lyte gave him Roman beet seeds, Gerard planted them in his garden, where they grew to enormous proportions and put forth a good quantity of seeds in 1596. Mother Nature had some tricks up her sleeve, however, for when Gerard planted the gathered seed "taken from that plant, which was altogether of one color" they brought "forth plants of many and variable colors," he wrote. "Nature doth seem to play and sport herself . . . as the worshipful gentleman master John Norden can very well attest, unto whom I gave some of the seeds aforesaid, which in his garden brought forth many others of beautiful colors."⁷⁴

Given Gerard's interests in collecting plant specimens, doing fieldwork, cultivating his garden, and corresponding with naturalists at home and abroad, the Lime Street community should have provided a congenial set of friends with whom he could consult about matters of common concern. In fact, the Lime

Street naturalists sometimes appear in *The herball*, amid the references Gerard makes to his own garden, to his own fieldwork, and to the plant specimens he acquired from friends. References to members of the Lime Street community demonstrate that they did indeed extend their collaborative spirit to Gerard and his studies — at least at first. James Garret showed him a rare garlic bulb that grew in his garden, and gave him specimens including an unusual lily and a European “Lady’s Slipper” orchid, for example.⁷⁵ James Cole, described by Gerard as “a learned merchant . . . exceedingly well-experienced in the knowledge of simples,” told him of his discovery of a native orchid called “Lacy Traces” in the fields around Stepney. Cole also shared the precise location in the village of Hogsdon, where he found the rare rose ribwort growing wild. Gerard was also friendly with Mathias de L’Obel before the debacle surrounding *The herball*’s manuscript. The two men traveled together into Kent to “discover some strange plants not hitherto written of” that he included in *The herball*. Gerard was forced to cite L’Obel repeatedly because of the many new species he had named in the course of his studies, and Gerard graciously admitted that L’Obel “very properly” Latinized the name of an English grass. Though the two men chatted companionably about how residents of the Netherlands made an oatmeal-like gruel from the seeds of dew grass, Gerard’s competitive stance toward his illustrious friend was evident in his dismissal of L’Obel’s description of the eight anemones known to him in favor of the “twelve different sorts” growing in his own garden.⁷⁶

How can we account for Gerard’s reluctance to fully admit how much he was indebted to the Lime Street naturalists? One possible answer lies in his marked ambivalence toward foreigners and foreignness. Running through *The herball*, and Gerard’s life, was a pronounced fascination with, and anxiety about, the presence of European immigrants and their status in England. Tensions between the European Strangers and proper English citizens were common in Elizabethan London. When medieval and early modern Londoners searched for someone to blame for crime, poverty, epidemic disease, or economic hard times, they often scapegoated the immigrants who lived in their midst. Sometimes the tension turned into violence, as on the first day of May in 1517, when a riot broke out between disgruntled London apprentices and wealthy Strangers out to celebrate spring at the maypole erected in the Lime Street neighborhood, in front of St. Andrew Undershaft.⁷⁷ Despite the undeniable friction that from time to time divided people in the City — no matter where they were born or what language they spoke — the immigrants were a resource for new technologies, new ideas, and new cultural practices. Strangers introduced industries like pinmaking into England and established schools that offered foreign-language

instruction to London citizens; and artists like Hans Holbein and Marcus Gheeraerts made significant contributions to the development of English art.

Nonetheless, Gerard spoke for many when he mocked the interest that some English citizens showed in foreign novelties, seemingly unaware that he shared the tendency with them. In his discussion of goldenrod and its use in medicinal preparations, he heaped scorn on the unsophisticated London consumers who spent half a crown on an ounce of imported, dried goldenrod while turning their noses up at fresh specimens gathered in Hampstead. “This verifies our English proverb, *far fetched and dear bought is best for ladies*,” Gerard wrote dismissively of the willingness of Londoners to pay any price for the rare, the imported, and the strange.⁷⁸ But such predilections were symptomatic of the ambivalence that the society at large had toward the immigrant population: they found the new, exotic, and strange attractive provided they could own it, control it, and ultimately subjugate it.

It is revealing that Gerard collected nonnative rarities eagerly, and cultivated them carefully, but seemed almost triumphant when they failed to thrive in the hardy English soil. When William Cecil’s double white daffodil from Constantinople failed to flower a second time, Gerard noted that “it should appear, when they were discharged of that birth or burden which they had begotten in their own country, and not finding that matter, soil, or climate to beget more flowers, they remain ever since barren and fruitless.” While he barely touched on the considerable number of nonnative daffodils that easily naturalized in English gardens, Gerard spent an inordinate time dwelling on the foreign failures.⁷⁹

But some flowers, after careful cultivation, could be naturalized, or, in Gerard’s words, “made denizen.” Here Gerard’s phrase illuminates the complicated relationship that he and other Elizabethans had with the foreign presence in England, for denizens were immigrants granted the status of semicitizen, with slightly reduced taxes and slightly more privileges. To be made denizen was to begin the process of cultural assimilation, blending into English society until, in a few generations, none of your neighbors was likely to know that your family had once been Strangers. Of a species of woundwort native to the French region of Narbonne, Gerard wrote, “These plants grow naturally about the borders or brinks of rivers . . . whence they were brought into England, and are contented to be made denizens in my garden.” Gerard reserved the status of denizen for plants that neither propagated recklessly nor perished quickly, but (under his firm guidance) predictably, and safely, grew. Gerard was annoyed at the “French Mercury” he brought home from a bishop’s house in Rochester, “since which time I cannot rid my garden from it.” Sometimes simply passing through an English middle man was enough to transform a plant from feeble foreign specimen

to robust English denizen. Gerard received jimsonweed seeds from Jean Robin in Paris that "did grow and bear flowers, but perished before the fruit came to ripeness," but the jimsonweed seeds he received from Constantinople from Lord Zouche "bear fruit and ripe seed." Noble and splashy flowers, like the Persian Lily or the Crown Imperial, were given the privileged status of "denizen" because, once transplanted, they continued to benefit the English landscape. "This Persian Lily grows naturally in Persia and those places adjacent, whereof it took his name," Gerard wrote, "and is now (by the industry of travelers into those countries, lovers of plants) made a denizen in some few of our London gardens."⁸⁰

Given Gerard's anxieties about immigrants and foreign plant specimens, it is not surprising that he guarded *The herball* so jealously from the interference of Garret and L'Obel. Perhaps it was the knowledge that he had roused the indignation of the Lime Street naturalists that made Gerard especially eager to shield his work further with staunch English supporters. Gerard dedicated the work to his patron, William Cecil. With the exception of L'Obel's (forged) letter, all the remaining prefatory materials were penned by English physicians, surgeons, and naturalists who highlighted the enormous contribution Gerard had made to *English* science. Latin poems touting Gerard as a "botanologian," and a "surgeon and herbarist" poured from the pens of medical men like Frances Herring and Thomas Newton. Gerard included not the usual one letter to the reader but three: one by the physician Stephen Bredwell, one by the surgeon George Baker, and one written by Gerard himself. The letter from Baker is especially illuminating, since it mentions an intellectual duel with a foreign naturalist. "I do not think for the knowledge of plants, that he is inferior to any," Baker wrote. "I did once see him tried with one of the best Strangers [in matters of natural history] that ever came into England," Baker continued with satisfaction, "and one whole day we spent therein, searching the rarest simples. But when it came to the trial, my French man did not know one [plant] to his four."⁸¹

Despite this English bulwark, subsequent naturalists expressed frustration regarding the quality of Gerard's *Herball*. When Thomas Johnson decided to edit and update the work in 1633, he attempted to sort out some of its problems, including mismatched illustrations and incomprehensible names. Johnson found it more difficult to manage Gerard's inconsistent use of sources and his tendency to conflate different plant species and to draw conclusions from those conflations. "Our author in this chapter was of many minds," Johnson finally wrote, throwing up his hands in exasperation at Gerard's muddled treatment of the saffron crocus. When Gerard turned to varieties of gentian, Johnson wrote, "Our

author in this chapter so confounded all [of the plants], that I know not well how, handsomely to set all right." Johnson found Gerard's descriptions of some specimens "so barren, that little might be gathered by them" by students of nature. Johnson also called some of Gerard's fieldwork into question after visiting two sites where Gerard claimed he had seen a ragwort that was thought to be an alpine native. "I have been at the former and latter of these places to find out plants, yet could I not see this plant," wrote Johnson. While it grew "in the garden of Mr. Ralph Tuggy . . . I fear [it is] hardly wild in this kingdom."⁸²

Gerard may be considered the father of English botany because of *The herball*, but he was by no means the best, or even the best known, naturalist in Elizabethan London. That honor fell instead upon a community of men in the heart of the City who worked tirelessly to increase natural knowledge and kept their competition in check with collaboration. But the Lime Street naturalists, like so many other groups that we will meet in the following pages, made a fatal miscalculation: their community was so vital and exuberant they could not imagine that it would ever cease to make notable contributions to the study of nature. As a result, they did not publish their findings but relied on face-to-face interaction and manuscript records. This might not have been important in their own time, since they clearly found all sorts of ways to communicate their ideas and progress to their friends and associates. But the failure to publish proved fatal after the Lime Street naturalists died and faded from memory. Even seventeenth-century accounts that were published of Gerard's egregious misuse of the community failed to resurrect the Lime Street naturalists in the popular memory, for there was nothing to resurrect. Today they lie buried, like the parish church of St. Dionysius Backchurch where so many of them once worshiped, under many layers of later activity.

The legacy of Gerard's *Herball* is really a message of survival: publish or perish. Urban communities like the one on Lime Street could be impressive and internationally renowned in their own time, but such communities were not impervious to the passage of time. Intellectual exchange, when it was based on manuscripts and proximity, was dynamic but it was also fragile. This was a lesson that subsequent English naturalists, as well as other students of nature, learned well. Though there were always a few reluctant holdouts like Isaac Newton, whose work had to be pried out of his hands by friends who insisted that others were about to publish similar findings and scoop his great discoveries, most rushed their findings into print. English science became inextricably linked to authoritative publications, but a surprising amount of face-to-face interaction

and community negotiation was still required to get any manuscript through the press.⁸³ Print was a valuable weapon in the arsenal of any student of nature, but it is a weapon that has historically cut both ways. Here it cut out London's most prestigious and active community of naturalists from the historical record. In the next chapter, we will see how it gave coherence to a community in search of a public identity.

THE CONTEST OVER MEDICAL AUTHORITY

*Valentine Russwurin
and the Barber-Surgeons*

Valentine Russwurin, an itinerant medical practitioner from the central European town of Schmalkalden, carved out a place for himself in London's bustling medical market sometime in the late spring of 1573, when he set up a temporary market stall just outside the Royal Exchange, at the commercial heart of the City (Figure 2.1). There he displayed his collection of extracted bladder stones removed from reportedly happy and healthy patients, presented testimonials related to his ability to surgically treat cataracts, and held up samples of a powerful ointment that he had developed to combat skin diseases — all the while keeping up a steady patter to amuse and entertain his audience. Russwurin's stall was one of hundreds of structures that sprang up every year in London and filled the gap between the limited number of shopfronts available for rent and the growing market of urban consumers interested in buying books, clothes, food, and other goods and services. In a city like London, where business and trade were regulated, foreigners like Russwurin, along with women who could not fully belong to trade guilds or companies, and scores of other people who just wanted to make a quick profit, resorted to selling their goods and services directly to the crowd. Often no more than slightly raised platforms that provided a higher vantage point for hailing shoppers, or small tables for displaying a selection of wares, such stalls were popular among unlicensed medical practitioners like Russwurin in part because they could be taken down quickly when officials were notified of their unlicensed, and therefore illegal, activities.¹