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The Many Books of Nature: Renaissance Naturalists and Information Overload

Brian W. Ogilvie

Renaissance natural history emerged in the late fifteenth century at the confluence of humanist textual criticism, the revival of Greek medical texts, and curricular reform in medicine.¹ These streams had been set in motion by a deeper tectonic shift: an increasing interest in particular, empirical knowledge among humanists and their pupils, who rejected the scholastic definition of scientific knowledge as certain deductions from universal principles.² Natural history, which had been seen in antiquity and the Middle Ages as a propaedeutic to natural philosophy or medicine, emerged from this confluence as a distinct discipline with its own set of practitioners, techniques, and norms.³

Ever since Linnaeus, description, nomenclature, and taxonomy have been taken to be the *sine qua non* of natural history; pre-Linnaean natural history has been treated by many historians as a kind of blind groping toward self-evident

¹ Karen M. Reeds, "Renaissance Humanism and Botany," *Annals of Science*, 33 (1976), 519-42; Charles G. Nauert, Jr., "Humanists, Scientists, and Pliny: Changing Approaches to a Classical Author," *American Historical Review*, 84 (1979), 72-85; R. Palmer, "Medical Botany in Northern Italy in the Renaissance," *Journal of the Royal Society of Medicine*, 78 (1985), 149-59; Vivian Nutton, "'Prisci dissectionum professores': Greek Texts and Renaissance Anatomists," *The Uses of Greek and Latin: Historical Essays*, ed. A. C. Dionisotti, Anthony Grafton, and Jill Kraye (London, 1988); Karen Meier Reeds, *Botany in Medieval and Renaissance Universities* (New York, 1991).

² See Arno Seifert, *Cognitio historica: Die Geschichte als Namengeberin der frühneuzeitlichen Empirie* (Berlin, 1976); Barbara J. Shapiro, "History and Natural History in Sixteenth- and Seventeenth-Century England: An Essay on the Relationship Between Humanism and Science," in *English Scientific Virtuosi in the Sixteenth and Seventeenth Centuries: Papers Read at a Clark Library Seminar, 5 February 1977* (Los Angeles, 1979); Lorraine J. Daston, "Baconian Facts, Academic Civility, and the Prehistory of Objectivity," *Annals of Scholarship*, 8 (1991), 337-63; Peter Dear, *Discipline & Experience: The Mathematical Way in the Scientific Revolution* (Chicago, 1995); and Barbara J. Shapiro, *A Culture of Fact: England, 1550-1720* (Ithaca, 2000).

³ See my forthcoming book, *The Science of Describing: Natural History in Renaissance Europe*.

principles of binomial nomenclature and encaptic taxa that were first stated clearly by the Swedish naturalist. But this teleology is misleading, for natural history in the Renaissance, from the late fifteenth through the early seventeenth century, was not a taxonomic science. Rather, it was a science of describing, whose goal was a comprehensive catalogue of nature. Botany was at the forefront of that development, for the study of plants had both medical and horticultural applications, but botanists (*botanici*) rapidly developed interests that went beyond the pharmacy and the garden, to which some scarcely even nodded their heads by 1600.

Renaissance naturalists in late fifteenth-century Italy and their pupils focused initially on the problem of identifying the plants described by ancient writers, especially the elder Pliny and the Greek herbalist Dioscorides, both active in the first century AD. By the 1530s, their successors had shifted from identification to description. At the same time the community of botanists grew and spread throughout Western and Central Europe. A natural yet unintended consequence of this flurry of descriptive activity and intellectual exchange was that the number of species known to naturalists exploded, from the hundreds to the thousands, and these species were described in a growing flood of books. Renaissance botanists sprang the limited bounds of factual knowledge that had characterized ancient and medieval natural history, creating an information explosion with which naturalists have struggled ever since.

In 1534 a slim volume appeared from the press of Johann Gymnicus in Cologne. Written by Euricius Cordus, a professor of medicine at the University of Marburg, the *Botanologicon* presents an account in dialogue form of a botanizing expedition from Marburg to a suburban garden and back along the banks of the river Lahn.⁴ Cordus, his young son Valerius, and a handful of others identified the plants that they encountered, and their discussions allow us to see how naturalists in the early sixteenth century saw their task.

Cordus and his companions brought along two books, of which the most important was an edition of Dioscorides's *De materia medica*. This work of a Greek physician of the first century AD was their main guide to identifying the plants they found. In using Dioscorides as his guide to nature, Cordus was following in the footsteps of his teacher at the University of Ferrara, Niccolò Leonicensi, who had spent nearly two decades in a controversy over the relative merits of Dioscorides, Pliny, and the Arab medical writers, from 1492 to 1509.⁵ According to Leonicensi, Pliny had confused botany by mistranslating

⁴ See Edward Lee Greene, *Landmarks of Botanical History*, ed. Frank N. Egerton (2 vols.; Stanford, 1983), 1, 360-67, and Peter Dilg, "Studia humanitatis et res herbaria: Euricius Cordus als Humanist und Botaniker," *Reze*, 1 (1971), 71-85; also Peter Dilg, *Das Botanologicon des Euricius Cordus: Ein Beitrag zur botanischen Literatur der Renaissance* (Marburg, 1969).

⁵ See Peter Godman, *From Poliziano to Machiavelli: Florentine Humanism in the High Renaissance* (Princeton, 1998).

Greek words or misidentifying plants; his medieval successors had added to this confusion of words. Proper medical knowledge must be founded, he argued, on good Greek texts, and for *materia medica* that meant Dioscorides.⁶

Though better than Pliny, Dioscorides was not faultless. His descriptions of plants were often so concise as to be cryptic; he was, after all, describing things that were well known to his readers. By Leoniceno's day the relationship between Dioscorides's words and the plants they described were no longer so clear, and in the controversy over Pliny, both Leoniceno and his opponents recognized that only careful observation of real plants would settle the dispute. Such observations form the core of Cordus's *Botanologicon*.

Cordus saw the naturalist's task as recognition or decipherment: when looking at a particular plant, he and his companions tried to find the corresponding plant in Dioscorides. We now know that the Mediterranean flora described by the Greek physician differs significantly from the northern European flora that Cordus examined, but he did not have the benefit of this knowledge. As a consequence, he concluded that nature was extremely variable and that the same species of plant could have different-colored flowers and grow to greatly varying heights depending on climate and location. Only taste, which revealed the plant's medicinal qualities, was an infallible character.

The belief that nature was variable and the ancients had described most, if not all, plant species acted as a conceptual brake to information overload. In the next generation this brake would be loosed, leading to a flood of species and publications. The beginnings of this flood could be seen in the second book that Cordus took on his excursion: the *Herbarum vivae eicones*, with woodcuts by Hans Weiditz and text by Otto Brunfels.⁷ Brunfels paired images with classical texts, but for a few plants he could find no matches. These "herbae nudaе," naked herbs as he dismissively called them, were harbingers of the future: plants unknown to the ancients whose discovery and description would be the chief goal of the next two generations of naturalists, from the 1530s through the end of the century.

Despite its magnificent illustrations, the *Stirpium historia* of Leonhart Fuchs, published in 1542, is arguably a successor to Brunfels in its focus on identifying German plants with those described by the ancients.⁸ The shift from recognizing plants described by the ancients to discovering those unknown to the classical writers is better displayed in the 1539 *Kreutterbuch* of Hieronymus

⁶ See Godman, *From Poliziano to Machiavelli*, and my discussion in *The Science of Describing*.

⁷ Otto Brunfels, *Herbarum vivae eicones: Ad naturae imitationem, summa cum diligentia et artificio effigiate, una cum effectibus earundem, in gratiam ueteris illius & iamiam renascentis herbariae medicinae* (Strasbourg, 1530-32).

⁸ Leonhard Fuchs, *De historia stirpium commentarii insignes, maximis impensis et vigiliis elaborati, adjectis earundem vivis plusquam quingentis imaginibus* (Basel, 1542).

Bock and the posthumous *Historia plantarum* of Valerius Cordus, Euricius's son, which was published in incomplete form in 1561 based on the manuscripts left by Cordus at his death in 1544 at the age of 29.⁹

Bock's plant book, published without illustrations, provided the most precise verbal descriptions of plants that had ever been written. By the 1551 edition Bock had described some 800 plants, about half again as many as were known to the ancient writers.¹⁰ When possible, he tried to identify plants with those known to the ancients, but he felt no compulsion to do so. As a result, he distinguished carefully between plants that Euricius Cordus had lumped together. Bock wrote his book in part to advertise the natural remedies that German plants could provide, so that physicians and apothecaries would not need to rely on expensive imports, and he wanted to make sure his readers could identify the plants. Although his goal was largely medical, it was not exclusively so, and his careful observations and distinctions provided a model for later naturalists.

Valerius Cordus, too, observed plants carefully and showed little concern with matching them to the ancients' descriptions. His history of plants begins with the sundew, a plant unknown to ancient writers, and the second book is devoted to plants that were either imprecisely described by the ancients or completely omitted by them.¹¹ Even if Cordus's editor Conrad Gessner was responsible for the arrangement, the differences were telling. Cordus's individual descriptions emphasize the differences between even quite similar plants: his chapters on the buttercups (*Ranunculae*) distinguish twelve different species.

Bock, Cordus, and their contemporaries were turning their energies toward describing new plants, making ever smaller distinctions between varieties or species. They did not consciously aim at novelty, but their careful distinctions resulted in hundreds of new plant species. The great histories of plants published from the late 1530s through the 1550s were still medically oriented, even if medicine was not the only reason that their authors pursued natural history, and they were intended to be as comprehensive as possible.¹² As a consequence, they came to contain many more plants than known to the an-

⁹ Hieronymus Bock, *New Kreütter Büch von underscheydt, würckung und namen* (Strasbourg, 1539); Valerius Cordus, *Historia plantarum*, in Valerius Cordus, *Annotationes in Pedacii Dioscoridis Anazarbei de Medica materia libros V*, ed. Conrad Gessner (Lyon, 1561).

¹⁰ Brigitte Hoppe, *Das Kräuterbuch des Hieronymus Bock, wissenschaftshistorische Untersuchung: Mit einem Verzeichnis sämtlicher Pflanzen des Werkes, der literarischen Quellen der Heilanzeigen und der Anwendungen der Pflanzen* (Stuttgart, 1969), esp. 44; André Cailleux, "Progression du nombre d'espèces de plantes décrites de 1500 à nos jours," *Revue d'Histoire des Sciences*, 6 (1953), 42-49.

¹¹ Cordus, *Historia plantarum*, fol. 86^r, 109^v.

¹² See my essay "Encyclopaedism in Renaissance Botany: From *Historia* to Pinax," in *Pre-modern Encyclopaedic Texts*, ed. Peter Binkley (Leiden, 1997).

cients, even in the case of Pier Andrea Mattioli, whose own history of plants was organized as a commentary on Dioscorides.

Their successors from the 1560s through the end of the century continued to distinguish plants carefully, and they consciously aimed at novelty. Carolus Clusius, the most prolific of this generation of naturalists, concentrated on plants that were either imperfectly described by, or unknown to, not only the ancients but also his contemporaries. His publications, especially his 1576 and 1583 histories of less common plants, eschewed encyclopedism, emphasizing rather the novelty and rarity of the plants described within them.¹³ Natural history had changed radically: from a closed world it had become an almost infinite universe.

Such were the origins of the information overload of sixteenth-century natural history. To some five hundred plant species, which any knowledgeable naturalist could retain in memory, hundreds and then thousands more were added, creating difficulties for the expert and leading students to despair. Modern ethnobotanical research suggests that these problems were not merely subjective. Most human societies classify the natural world into no more than five hundred different basic taxa or types. Only in the sixteenth century did the number of known species exceed that number.¹⁴ In the long run this information overload led botanists to develop taxonomic schemes; in the short run it led to chaos. By emphasizing precise descriptions and novelty, naturalists created a *confusio rerum*, a confused mass of new things that tyros and experts had to master. The limited task of naturalists from Leoniceno to Euricius Cordus had burst its limits.

This confusion of things was accompanied by a *confusio verborum*, a confusion of words. Leoniceno had tried to pare down the vocabulary of natural history by excluding the barbarisms of Pliny, the Arabs, and medieval Latin herbalists. He and Euricius Cordus tried to label each plant they observed with a pre-existing name. Their successors faced the opposite problem: each new plant needed a new name. Because plants were usually related to some previously described plant, they were named by adding an adjective or adjectival phrase to their relative's name, producing at first binomials and, with the passing of time, increasingly lengthy and ungainly names. In 1539 Bock had distin-

¹³ Carolus Clusius, *Rariorum aliquot stirpium per Hispanias observatarum Historia, libris duobus expressa* (Antwerp, 1576); *idem, Rariorum aliquot stirpium, per Pannoniam, Austriam, et vicinas quasdam provincias observatarum historia, quatuor libris expressa* (Antwerp, 1583). These books were gathered and expanded in Clusius's *Rariorum plantarum historia* (Antwerp, 1601).

¹⁴ See Scott Atran, *Cognitive Foundations of Natural History: Towards an Anthropology of Science* (Cambridge, 1990), esp. 167, and Brent Berlin, *Ethnobiological Classification: Principles of Categorization of Plants and Animals in Traditional Societies* (Princeton, 1992), 96-101.

guished two kinds of garlic, the common garden garlic and wild garlic. By 1583, Clusius had identified four kinds of mountain garlic, “most of which ... [had] not yet been observed.”¹⁵ He called the first *Moly montanum latifolium*, broad-leafed mountain garlic, and distinguished it from the others on the basis of the shape and size of their leaves and the color of their flowers.

Each new plant needed a new name, and each naturalist who discovered a new plant would give it a name. Inevitably, the same plant would receive two, three, or even more names, as an increasingly large and active community of naturalists scoured the countryside around the cities and towns of Western and Central Europe. The number of plants grew, but the number of names grew even more quickly.

As a result, mastering natural history took ever more time and effort. Pliny the Elder had breezily remarked that the science of herbs could easily be learned in a brief amount of time.¹⁶ Experts knew better of course, but even so, in the 1480s half an hour of study each evening for a few months had prepared the Venetian Ermolao Barbaro to comment on the botanical texts of Pliny and Dioscorides.¹⁷ By contrast, in 1554 Rembert Dodoens had admonished his readers that learning botany required both “careful examination of all plants and exact reading of many ancient writers”; he added that “it is scarcely possible that the life and diligence of one or a few men could be equal to the task.”¹⁸ Dodoens’s emphasis on *ancient* writers is confirmed by Conrad Gessner, who around 1550 drew up a list of botanical writers: in Gessner’s twenty-six page bibliography, nineteen pages were devoted to the ancients, most of them Greeks. Gessner listed close to eighty “more recent” writers, but only three, “Jerome Bock, Jean Ruelle, and Leonhart Fuchs, shine among the others like suns among lesser stars.”¹⁹

By 1600 naturalists had described several thousand species of plants, and they had published dozens more important botanical works. Botany had gone from being a fact-poor discipline to a fact-rich one. Adriaan van de Spiegel, who published the first botanical textbook in 1606, provided his readers with a selective list of authors to read.²⁰ Spiegel’s selective list nonetheless included

¹⁵ Clusius, *Rariorum stirpium per Pannoniam historia*, 211-13.

¹⁶ Pliny the Elder, *Natural History*, 25.5.9.

¹⁷ Reeds, “Renaissance Humanism and Botany,” 527, citing a letter from Barbaro to Pontico Faccino, July 1484.

¹⁸ Rembert Dodoens, *Histoire des plantes, en laquelle est contenue la description entiere des herbes, c’est à dire, leurs Especies, Forme, Noms, Temperament, Vertus & Operations: non seulement de celles qui croissent en ce país, mais aussi des autres estrangeres qui viennent en usage de Medecine*, tr. Carolus Clusius (Antwerp, 1557), sig. *iii’.

¹⁹ Conrad Gessner, “De rei herbariae scriptoribus,” Hieronymus Bock, *De stirpium, maxime earum, quae in Germania nostra nascuntur, ... Commentariorum libri tres*, trans. David Kyber (Strasbourg, 1552), sig. a8^v ff.

²⁰ Adriaan van de Spiegel, *Isagoges in rem herbarium libri duo* (Padua, 1606), 124ff.

eight ancient authors and their modern commentators, two Arab writers, and no fewer than sixteen modern books—all this for the beginner! Faced with the plethora of botanical information, the casual student must have felt overwhelmed.

Serious scholars too felt threatened, if not overwhelmed, by the explosion of botanical information. But by the turn of the seventeenth century they had developed several techniques for managing new information and integrating it with what they already knew. On the one hand they routinized the presentation of botanical information, by adopting standard descriptive terminology and forms; on the other they developed guides to nomenclature and attempted to compile botanical encyclopedias that would sum up the results of new discoveries and present them as a comprehensive whole. By 1600 these methods had proven to be inadequate, if useful; botanists in the early seventeenth century invented new ways of channeling information, the local flora, and the dictionary of synonyms.

The ancients had largely neglected botanical description. Theophrastus, the most philosophical of them, described plants accurately but unsystematically; like his teacher Aristotle, he was more interested in explaining the causes of plants. Pliny was a compiler who identified a few salient characteristics. Galen did not describe plants at all, believing that verbal descriptions were inadequate.²¹ The most systematic of the ancients, Dioscorides, was writing for a medical audience familiar with common plants, so his descriptions were most precise in the case of exotica—that is, if he happened to know which plants produced the resins, gums, and seeds that were sold in the pharmacies of the Roman Empire.²²

The earliest Renaissance naturalists, such as Brunfels and Fuchs, borrowed ancient descriptions (though Fuchs disguised many of his borrowings). Their successors, above all Bock and Valerius Cordus, did not. Both Bock and Cordus were careful observers, alert to small differences between species; Cordus in particular developed a routine form for descriptions that would be used by most subsequent Renaissance botanists.²³ He began with the plant's stem or trunk, and branches if it had any; after that he moved to leaves and flowers. The root came last, as if the plant had been observed *in situ* for a season and then at last uprooted. This sequence remained invariant, with one telling exception: by the early seventeenth century, Caspar Bauhin and other botanists who worked from herbaria, not in the wild, put the root first instead of last.²⁴ Notes on odor

²¹ Reeds, *Botany*, 32.

²² See John M. Riddle, *Dioscorides on Pharmacy and Medicine* (Austin, 1985).

²³ Greene, *Landmarks*, I, 374-76.

²⁴ Caspar Bauhin, *Prodromos Theatri Botanici* (Frankfurt, 1620), *passim*.

and taste followed, but by 1600 they were less common than they had been half a century earlier.

This standard form made it easier for the reader to take in a description; reading became routinized, and naturalists could quickly get a sense of how a plant developed and how it looked at any stage of its growth. The same generation also established standard descriptive terms. Theophrastus provided a model; Dioscorides did not, but in 1537 Benedict Textor published one extracted from Dioscorides's descriptions and organized by subject.²⁵ Most of his list was devoted to "differences of plants based on their parts."²⁶ Textor's list was far more comprehensive than most sixteenth-century descriptions, but he provided a range of possibilities from which naturalists could select. Fuchs's 1542 herbal contained a glossary of botanical terms, which also help set the parameters for botanical descriptions down through Linnaeus, who radically transformed botanical description.²⁷

Standard terms and forms allowed naturalists to quickly assimilate a botanical description. Glossaries of synonyms, combined with indices, allowed them to quickly find any plant whose name they knew. Dioscorides had opened many of his descriptions with a brief list of the names a plant had, a tradition that many medieval herbalists continued. Renaissance naturalists, too, from the 1540s began their descriptions with "nomina." In the first generation, herbals generally listed at least four names: common names in at least one vulgar tongue, Latin names used by pharmacists, Latin names used by ancient authorities, and Greek names. The latter two categories were often contested, as they depended on the identifications that naturalists made based on the brief or muddled descriptions of ancient works; the former two, based on personal investigation and interrogation of pharmacists, were more certain.

Renaissance naturalists did not only add ancient names to the medieval list of *nomina*. They also took advantage of print technology by adding indexes. In 1542 Fuchs listed Greek, ancient Latin, modern Latin, and German names; in the next decade Dodoens's *Histoire des plantes*, a 1557 translation of the 1554 Dutch original, added Dutch and French names. The indexes allowed pharmacists and naturalists who needed a specific description to find it; they also allowed the latter to find out what identifications the author of a botanical work had established between ancient texts and modern plants. Many earlier natural histories, like Bock's 1539 *Kreutterbuch*—though, significantly, not Fuchs's 1542 herbal also included indexes to medical properties; these books, used by apothecaries and lay healers, would continue to be reprinted well into the eigh-

²⁵ Benedict Textor, *Stirpium differentiae ex Dioscoride secundum locos communes, opus ad ipsarum plantarum cognitionem admodum conducibile* (Venice, 1537).

²⁶ Textor, *Stirpium differentiae*, fol. 15^r-72^r: "Stirpium differentiae a partibus ipsarum petitaе."

²⁷ Fuchs, *De stirpium historia*, sig. â3^r-4^v; William T. Stearn, *Botanical Latin: History, Grammar, Syntax, Terminology and Vocabulary* (London, 1983³), 26-28, 37-39.

teenth century. But from Fuchs through the seventeenth century, scholarly naturalists eschewed medical indexes. They had different concerns. At first they continued to list medicinal properties, but by the 1570s many naturalists were omitting them entirely.

They were also publishing more and more books, many of which, like Clusius's works, eschewed encyclopedism. As a result the encyclopedic herbals of the 1540s and 1550s no longer summed up the state of the field. Standardized descriptions and terminologies helped naturalists understand each new addition to the world of plants, but name lists and indexes could no longer keep them abreast of the whole. These circumstances led to the first encyclopedic herbal in two decades, the 1587 *Historia generalis plantarum*.

The "Lyon history" or herbal, as this text was often called, was published anonymously, but it was largely the work of Jacques Dalechamps and Jean (or Johann) Bauhin.²⁸ The publisher, Guillaume Rouille, claimed with the modesty of his trade that the book contained all, or almost all, known plants.²⁹ Though this was an exaggeration, the work was the largest herbal to date. It attracted attention but also scorn from its readers; two of them published detailed critiques in 1600 and 1601.³⁰ Despite these critiques Adriaan van de Spiegel thought it was better than all earlier works, for the beginner at any rate, and it was useful enough to be translated into French.³¹

The Lyon herbal adopted an unabashedly anthropocentric order, with plants grouped according to heterogeneous *differentiae*. Some of the classes anticipate modern taxa: for example, book four describes grains and legumes, and book six is devoted to umbelliferous plants. But book eight contains "odorous plants," while book eleven has "plants which climb on other plants."³² Scholars seeking anticipations of Linnaeus have criticized this hodge-podge but no contemporaries really did any "better," by modern standards.³³ Beyond the Theophrastean distinction of plants into trees, shrubs, bushes, and herbs, they grouped plants by general similarity or, as in the Lyon herbal, according to especially salient characteristics.

²⁸ Correspondence of Jacques Dalechamps with Joachim Camerarius II (Universitätsbibliothek, Erlangen, Germany, Trew-Briefsammlung, s.v. Dalechampius).

²⁹ *Historia generalis plantarum, in libros XVIII. per certas classes artificiose digesta* (2 vols.; Lyon, 1587-88), sig. *2^r.

³⁰ Caspar Bauhin, *Animadversiones in historiam generalem plantarum Lugduni editam* (Frankfurt am Main, 1601).

³¹ Spiegel, *Isagoge*, 129-30; Ernst H. F. Meyer, *Geschichte der Botanik* (4 vols.; Königsberg, 1854-57), IV, 397, 399.

³² *Historia generalis plantarum*, sig. *5^r (table of contents).

³³ E.g., Georges Métaillé, "Histoire naturelle et humanisme en Chine et en Europe au XVI^e siècle: Li Shizhen et Jacques Dalechamp," *Revue d'Histoire des Sciences*, 42 (1989), 353-74.

Even had the Lyon herbal lived up to its publisher's claim that it was truly comprehensive and accurate, it would not have served the needs of many naturalists. Its very bulk made it difficult to manage, and it failed to fill an ever more pressing need: the need for a guide to botanical literature. The next *magnum opus* in the field, already in the works a few years after the Lyon herbal, would take the form initially not of a history of plants but of a dictionary of their synonyms. Its author, the young Caspar Bauhin, was responding to the confusion of words in late sixteenth-century botany.

Born in 1560, Bauhin had experienced firsthand the difficulties produced for learners by the botanical information explosion. He realized that both beginners and experts needed a guide not only to the different forms of plants but to the literature describing them. The problem of synonyms was particularly vexed: the same plant could have a dozen or more Latin names, each given by a different botanist. Bauhin's "synonyma" were to clean this Augean stable.³⁴

Earlier naturalists had compiled brief lists of synonyms.³⁵ But Bauhin provided a comprehensive list that gave precise references to the literature, and on the basis of his herbarium, a collection of dried plants, he pronounced decisively on the proper identity of plants and names. The *Phytopinax* (1596) was only partially complete when published, but nonetheless whole herbaria were rearranged according to its ordering of the plant world.³⁶ It was followed twenty-seven years later by a complete version: Bauhin's *Pinax Theatri Botanici* (1623).³⁷

This work claimed to be an "index to the works of Theophrastus, Dioscorides, and the botanists who have written in the last century." It listed some six thousand plants with their synonyms and in many cases *differentiae*. The *Pinax* provided immediate access to the multiplicity of the plant world, including the six hundred new species Bauhin had described three years earlier in his *Prodromus*. But to find the descriptions, the reader had to turn elsewhere, to one of the authorities cited in Bauhin's text. The general history of plants, a commonplace in the 1540s and 1550s, had become an elusive dream. In the cold light of day it evaporated, leaving behind its replacement, the index to botanical literature.

³⁴ Caspar Bauhin, *Phytopinax seu Enumeratio plantarum ab herbariis nostro seculo descriptorum, cum earum differentiis* (Basel, 1596), sig.á3^v-4^v; see "Encyclopædism in Renaissance botany."

³⁵ E.g., Conrad Gessner, *Catalogus plantarum Latinè, Graecè, Germanicè, et Gallicè* (Zurich, 1542).

³⁶ Walther Rytz, "Das Herbarium Felix Platters: Ein Beitrag zur Geschichte der Botanik des XVI. Jahrhunderts," *Verhandlungen der Naturforschenden Gesellschaft in Basel*, 44 (1. Teil, 1932-33), 1-222.

³⁷ Caspar Bauhin, *Pinax Theatri Botanici, sive Index in Theophrasti Dioscoridis Plinii et Botanicorum qui a seculo scripserunt opera* (Basel, 1623).

If the *Pinax* was encyclopedic on a large scale, Bauhin also produced a small-scale encyclopedic text: a catalogue of plants growing in the vicinity of Basel, aimed at botanical tyros who were to learn from field expeditions near the town.³⁸ This 1622 *Catalogus* condensed Bauhin's own detailed knowledge of the area and made it available to students. The origins of the modern local flora are to be found in this and similar contemporary pedagogical texts.³⁹ If the *Phytopinax* and *Pinax* addressed an audience of experts who needed a guide to the literature, the *Catalogus* solved the beginner's problem by restricting its scope radically, to the point where the number and variety of plants to be mastered were once more within the learner's grasp.

Taken together, the *Pinax* and *Catalogus* demonstrate an ingenious solution to the problem of information management. Neither, by itself, was a complete encyclopedic guide to plants. In fact Bauhin considered the *Pinax* only an interim solution. His projected *Theatrum botanicum* would finally fulfill the task that the Lyon herbal had attempted and failed to do.⁴⁰ But this task proved too great; when Bauhin died in 1624, the work was still incomplete. Eventually the first volume appeared, edited by Bauhin's son Johann Caspar but that was in 1658.⁴¹ By that time the work was outdated, and no further volumes were published. When the dream was finally realized, in John Ray's *Historia plantarum* (1686-1704), it was by a man who was first and foremost a naturalist, not a physician. Even in Ray's time, the *Pinax* was still considered useful, so much so that William Sherard, an English botanist of the late seventeenth century, devoted tremendous efforts to revising it.⁴² Seventeenth-century botany found guides to its literature indispensable. The book of nature had become illegible unless it was accompanied by nature's bibliography.

This solution could only be temporary. New European species continued to be described, and the far-flung empires of the seventeenth century added exotics to the mix. The seventeenth century would mark the beginnings of taxonomy as the central intellectual problem for natural history. As a consequence the gardeners and *amateurs des fleurs* who had collaborated with more scholarly naturalists in the sixteenth century lost interest in the increasingly dry and wordy botanical books that flowed from their pens, opting instead to form a

³⁸ Caspar Bauhin, *Catalogus plantarum circa Basileam sponte nascentium cum earundem synonymiis et locis in quibus reperiuntur* (Basel, 1622).

³⁹ Ludwig Jungermann's *Catalogus plantarum quae circa Altorfium Noricum et vicinis quibusdam locis* (Altdorff, 1615) is often considered the first local flora.

⁴⁰ Everard Vorst to Caspar Bauhin, 11 March 1619 (Universitätsbibliothek, Basel, Switzerland, MS. G2 I 1, fol. 226).

⁴¹ Caspar Bauhin, *Theatri botanici sive historiae plantarum Ylber primus*, ed. J. C. Bauhin (Basel, 1658).

⁴² Joseph Ewan and Nesta Ewan, *John Banister and his Natural History of Virginia, 1678-1692* (Urbana, Ill., 1970), 12-17.

new community with its own books in which pictures dominated the text. Sixteenth-century natural history had drawn its vitality from humanists, physicians, apothecaries, and gardeners, but in abandoning the ancients, *materia medica*, and showy novelties, Bauhin and his successors dissolved the connection of botany with the broader culture of Baroque Europe. Flowers and trees continued to be planted, admired, and depicted, but scholars and amateurs no longer had as much to say to one another. Scholars, driven by the need to master the information overload that they had unwittingly produced, turned their energies to taxonomy. In that sense Renaissance natural history contributed vitally to the history of pre-Linnaean taxonomies. But its contribution was indirect: the system of nature was the grandchild not of primitive taxonomies but of the sixteenth-century science of describing.

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