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Strange Science

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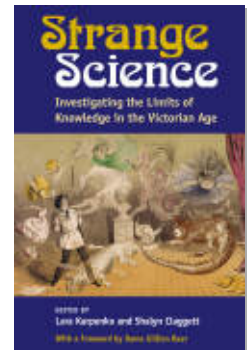
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CHAPTER 2

Discriminating the
“Minuter Beauties of Nature”

*Botany as Natural Theology
in a Victorian Medical School*

Meegan Kennedy



The man of the world . . . will find a knowledge
of botany [to be] a new source of pleasure.

—Edward Forbes, *An Inaugural Lecture on Botany*

In his 1843 pamphlet *An Inaugural Lecture on Botany, Considered as a Science, and as a Branch of Medical Education*, the naturalist Edward Forbes argues that botany, rather than anatomy or physiology, should anchor the medical curriculum. Forbes, professor of botany at King’s College, had himself left medical school as a youth to devote his life to natural history. In a series of rhetorical switchbacks, his lecture oddly promotes both botany’s practical relevance—its relevance to pharmacology and to reasoning skills—and its pleasures, beauties, and even fancies. This unusual emphasis on pleasure allows Forbes to argue that botany functioned as an antidote to medical study, providing spiritual discipline and bringing morality into the corrupting atmosphere of the teaching hospital. Such a claim would not have been uncontroversial. Given botany’s grounding in the contested sexual categorizations framed by Carl Linnaeus, its status

as either science or moral compass was dubious. Forbes, however, positions botany as a purifying scientific activity by aligning it with what Barbara Gates calls the “narrative of natural theology,” which considers the study of natural history to be spiritually and morally uplifting.¹ However, Forbes is speaking at a time when that narrative was being superseded in medicine by an empirically based clinical curriculum. His lecture demonstrates that, even as its medical faculty explored new laboratory sciences like physiology and chemistry, King’s College privileged an older, natural theology model wherein medical and moral paradigms explicitly reinforced each another. Forbes strategically used his institutional context to negotiate a unique solution to the pedagogical and professional demands of the moment. He offers an understanding of botany as a dual pursuit: both a modern science that trains the student in the pragmatic skills of clinical observation and reasoning, and a traditional skill that hones the moral judgment and aesthetic appreciation of the man within. Forbes presents a fascinating counterpoint to the pioneering John Lindley, a vocal member of the anti-Linnaean, modernizing force in botany, who taught at the University of London. Although Forbes also taught using the system promoted by reformers, he contends that botanists should still revere the Linnaean system despite its limitations. He draws upon the narrative of natural theology to argue that botany’s moral (old school) value in fact produces its (new school) scientific and intellectual value. Forbes’s text demonstrates the careful negotiations between competing values and contexts that were important in professionalizing both botany and medicine.

Forbes wrote at a moment when scientific workers were—as Richard Yeo has shown—still debating the nature and meaning of science, either by drawing upon the authority of natural theology, or by attempting to establish a culture distinct from it.² This turn toward method (that is, the development of established procedures for scientific investigation) changed the meaning of virtue for the man of science; Forbes’s lecture offers a balance between earlier and later, explicit and implicit models of scientific virtue. Steven Shapin locates the ideals of “Stoic fortitude and self-denial . . . disengagement and integrity” in eighteenth-century science, replaced in the late-Victorian period by the specialized expertise and technocracy of the methodical scientist.³ Lorraine Daston and Peter Galison offer a different model, identifying the wisdom of the sage in the eighteenth-century model of objectivity they call “truth to nature,” which was supplanted by an ideal of self-denial, exactitude, patience, and disinterested inquiry in the nineteenth-century model they call “mechani-

cal objectivity.”⁴ Both Shapin’s and Daston and Galison’s models posit a movement from an explicit, external expression of scientific virtue to an implicit one. The economy of natural theology underlying eighteenth- and early nineteenth-century science was widely thought to produce an explicit virtue, a godliness, in its students, as its ultimate goal. Shapin attributes this to what was considered to be the sublime subject matter of God’s Creation, the uniquely revelatory quality of natural knowledge, and the character of the “priests of nature” who chose to study Creation.⁵ For Daston and Galison, the “mechanical objectivity” of nineteenth-century science (which can overlap with natural theology) then relies upon and produces a practical virtue implicitly, as a kind of by-product or side effect, through long-standing habits of laborious scientific work. For Shapin, twentieth-century technocracy, which he expressly opposes to natural theology, also relies upon implicit virtues like familiarity and reliability in its practitioners.

Forbes’s lecture, however, delicately embraces *both* botany’s history in natural theology and its newer, more scientific and professional systematics; and he cannily suggests that botany produces a hybrid bloom: both the older and newer, the spiritual and practical, the explicit and implicit forms of scientific virtue. The careful balance of his argument becomes clear upon comparison with an earlier lecture by Lindley, who had mounted a wholehearted defense of botany as a modern science. Forbes and Lindley provide a useful case study of how a modern, impersonal model of science—achieved through rigorous attention to method and producing an implicit model of practical scientific virtue—developed unevenly, alongside a continued investment in a science explicitly grounded in personal morality and in the tradition of natural theology.⁶ At the intersection between these two models, where Forbes’s lecture stands, botany takes on not only a practical and a moral but also, as this chapter will show, a remarkably fanciful role.

Unsettled Questions

When Forbes gave his lecture, the medical curriculum was in a state of flux. Thomas Neville Bonner argues that “no question in the nineteenth century was more agitated than the precise formulation of the educational and practice requirements for becoming a doctor.”⁷ Education could range from a classical university education followed by medical training, to studies at a practical medical school, to a simple appren-

ticeship.⁸ Physiology and chemistry were still young, and many students subscribed to extracurricular private lectures or gained scarce clinical experience through private courses.⁹ By 1840 most medical curricula included anatomy with dissection, physiology (usually book-taught), *materia medica* (pharmacy), and practical clinical work; botany and natural history might be included but were not widespread.¹⁰

Early nineteenth-century botany was in a similarly tenuous state, so that Forbes’s claims for its value in the medical curriculum were weakened by the associations of botany with theoretical discord, sexual immorality, popular science, and (paradoxically) genteel womanhood. Botanists were fundamentally riven by divisions over the work of Carl Linnaeus, who had formalized the study of plants in his *Systema Naturae* (1735) in a taxonomy that sought to comprehend all plants over the range of the globe.¹¹ Stressing classification and nomenclature, he rejected earlier methods categorizing plants based on flower color and shape (number and shape of petals, leaves, roots) or other features. Having proven that plants reproduce sexually, Linnaeus established a binomial nomenclature: a plant’s stamens (male structures) indicated its class, and its pistils (female) its order. His pioneering binary system allowed names to be used simply for identification rather than description. By selecting for a predetermined characteristic, Linnaeus promoted an “artificial” system—arbitrarily prioritizing one structure, thought essential to all plants, above other attributes of a plant. “Natural” (materialist) systems were less discriminating, some even attempting total description; but a universal, limited (artificial) taxonomy made it easier for botanists to navigate the storehouse of known information about the vast variety of plants.¹² The restricted focus of the Linnaean system enabled its strengths: it was simple to understand and use; it was consistent and stable; it required only observation of (usually) easily visible features; it enabled fast, accurate reference to specific plant species; and it could be widely applied across different types of plants, with good predictive power.

But early nineteenth-century botanists noted drawbacks to the Linnaean system. It was rigid and limited, and it was difficult to apply the system to plants with nonessential sexual characteristics. Thus, even as it became increasingly influential, critics developed alternative systems. For instance, Antoine-Laurent de Jussieu, in his *Genera Planterum* (1789), followed his uncle Bernard in examining multiple affinities of a plant, including its environment.¹³ Theirs was a comprehensive, “natural” system that was not focused on a single feature or even on morphology.

A. G. Morton argues that, as evolutionary thinking began to appear in the mid-eighteenth century, researchers increasingly sought more information about species, moving away from artificial models to natural ones. The emphasis in botany, he claims, “shifted from observation of a limited number of characters regarded as essential for identification and classification, to the investigation of species in the round with the aim of attaining as full as description as possible in terms of morphology and anatomy . . . [with] physiology, development and relations to the environment.”¹⁴ By the early nineteenth century, most academic botanists considered the Linnaean system to be wrongheaded, but the binomial scheme nevertheless persisted for its simplicity and consistency.

These disagreements threw the field into confusion. By 1799 the Linnaean Robert Thornton noted fifty-two competing botanical systems, a state of affairs that one botanist called “system-madness” and “epidemical.”¹⁵ In 1829, Lindley remarked that “in Botany the fundamental principles are still unsettled; the world is much divided about them, and the purpose of the science, except as an accomplishment, is far from being generally understood.”¹⁶ Even given that “science” was still a developing category, the uncertainties within botany hindered its claim to scientific legitimacy.

Botany was additionally burdened by controversy over the Linnaean “Sexual System” of plant classification. Linnaeus’s focus on the sexual structures of plants and his frequent use of analogies between plant reproduction and human marriage suggested, to some, an unhealthy and even immoral emphasis on lower functions—especially because few plant species are monogamous.¹⁷ Erasmus Darwin’s promotion of the analogy between human and plant sexuality and Sir Joseph Banks’s reputation as a libertine underscored botany’s dubious reputation, arousing restrictions on women naturalists and critique from conservative naturalists such as country clergymen.¹⁸

Botany also suffered from its association with the popular pursuit of natural history. As Lynn L. Merrill defines it, “natural history” is characterized by an interest in singularity (in the object for itself), the distinction between objects of study (as in a collection), and a “personal, evocative,” and emotional tone. “Science,” in contrast, is characterized by an interest in general laws (in the object for what it can tell us), the relationship between objects of study (again, as in a generalized law), and a neutral, “detached [and] objective” tone.¹⁹ Nonetheless, naturalists could make important contributions to science; Merrill shows that the role of the gentlemanly amateur naturalist was entangled with that

of the (at this time still rare) professional researcher in biology, botany, zoology, and geology. But the popularity of natural history led observers to underestimate its seriousness. Lindley says defensively, “Many people think that Natural History is nothing more than the amusement of shuffling or cutting natural objects, according to the caprices . . . of different observers.”²⁰ Such perspectives were reinforced by phenomena like the “fern craze,” which popularized the study of plants as a fad in interior decoration.²¹

Another aspect of botany that complicated its claims to scientific legitimacy was the view that it was primarily a genteel pastime for women. Despite plants’ analogous relationship to human sexuality, they were thought to be more appropriate objects for women to study than land or sea creatures. When studied using sanitized texts that omitted reference to the crucial sexual structures, plants, bolstered by the narrative of natural theology, were considered spiritually uplifting and appropriate for women and the children they taught.²² Frequently, botany was linked with the most domesticated, even feminized branch of natural history.²³ As Lindley complained, “It has been very much the fashion of late years . . . to undervalue the importance of this science, and to consider it an amusement for ladies rather than an occupation for the serious thoughts of man.”²⁴ Many natural history texts for women, however, were written by professional researchers like Lindley. Also, women naturalists significantly contributed to the development of botany as a science. Mary Anning, famed for discovering the first *Ichthyosaurus* fossil at age eleven, donated many botanic specimens to the Museum of Natural History. The American botanist Mary Treat collected for Asa Gray at Harvard and corresponded regularly with Darwin, correcting him on the traps of *Utricularia* (bladderworts) when her microscopic research disclosed tiny hairs triggering the trap to open.²⁵ Yet even the title of Treat’s popular text, *Home Studies in Nature* (1880), reinscribes natural history as a private (domestic) rather than public (scientific) study.

Whether due to its theoretical uncertainties, its unseemly fascination with sexual structures, or its association with popular natural history and women’s leisure, many questioned botany’s legitimacy as a proper science. Consequently, botany’s place in a medical education was questioned, particularly because accepted medical curricula focused on subjects thought to be practically useful. University of London instructors had even met resistance in the 1830s after proposing that the curriculum include theory of science, but medical schools eventually accepted the sciences of pathological anatomy, physiology, and to some extent,

chemistry.²⁶ Botany, however, was not seen as being as immediately applicable to the practical or theoretical concerns of medicine. Forbes admits, “That the medical student acquires but little by his attendance at botanical lectures, is not an uncommon fancy among the senior members of the profession. Some eminent men have gone so far as to denounce it as lost time.”²⁷ Indeed, Forbes followed the practice, common in Edinburgh, of teaching botany out of doors in the country,²⁸ but *Punch* had mocked just such excursions two years earlier as yielding only “chickweed, chamomiles, and dandelions,” concluding, “The knowledge of the natural class and order of a buttercup must be of the greatest service to a practitioner in after-life in treating a case of typhus fever or ruptured blood-vessel.”²⁹ In short, Forbes declared his dedication to botanical science at a time when its legitimacy and relevance to medicine was ever more in question.

“Men Must Be Educated into Such”

Despite this popular and academic resistance, Forbes maintained that botany is indeed practical for medical students. His *Inaugural Lecture on Botany*, however, also complicates the notion of what exactly is practical for medical students, suggesting that what is most immediately practical may not be what is, in the long run, the most valuable to a medical man. He agrees that botany is both scientific—“of all the natural-history sciences BOTANY is the most advanced”—and medical—it “forms a connecting link between professional and purely scientific studies.”³⁰ If botany forms a bridge between science and medical practice, the most obvious argument for studying botany might be its pharmacological applications. However, *materia medica* was generally taught separately; perhaps for this reason, when Forbes does acknowledge the immediate practical value of botany in the pharmacopeia, he does so belatedly, reluctantly, and in passing, and as having only a secondary benefit. He says, “Though . . . the greatest benefit his botanical studies confer on the medical student is the making him a correct observer and careful reasoner, there is a fact-knowledge . . . of the greatest consequence in his profession. . . . [M]ore than 300 species of plants . . . furnish . . . articles of *Materia Medica*.”³¹

However, Forbes emphasizes mental and moral uses over practical ones, praising botany’s role in improving mind and character. He looks to longer-term goals, arguing for botany’s ability to develop the empirical habits of mind that characterize the scientific physician. Botany, he

claims, “train[s] the mind” to a state of “tone and vigour” by teaching the two most crucial skills of a physician, “*correct observation and accurate discrimination*.”³² He further explains,

The first depends mainly on the power of seizing all the features of an object or case with clearness and facility, detecting adventitious characters at sight, and excluding such from all influence on our conclusions. The second implies powers of just comparison, of perceiving the mutual relations of parts or facts, and of testing the possible agreement of statements with the circumstances which accompany them. Now though all men are endowed with the elements of these qualities, all are not born correct observers or accurate discriminators. Men must be educated into such. The mind must be trained to reason justly, the instruments of the mind to observe correctly.³³

Here, by identifying fundamental elements of medical reasoning and asserting that they can be taught, Forbes aligns himself with aspects of the new clinical medicine, which similarly emphasized observation and methodology. Also, his emphasis on discrimination reflects the growing importance of nosology, the classification and diagnosis of disease according to its observable symptoms.³⁴ The distinguished pathologist Sir James Paget also links these practices, saying,

I think it impossible to estimate too highly the influence of the study of botany. . . . It introduced me into the society of studious and observant men; it gave me an ambition for success . . . it encouraged the habit of observing, of really looking at things and learning the value of exact descriptions; it educated me in habits of orderly arrangement. . . . [The] unfelt power of observing and of recording facts . . . may justly be ascribed to the pursuit of botany. . . . [O]f the mere knowledge gained in the study . . . none had in my afterlife any measure of what is called practical utility. The knowledge was useless: the discipline of acquiring it was beyond all price.³⁵

Forbes’s claim that “the mind must be trained” and Paget’s praise of “the unfelt power of observing and of recording facts” reflects a new emphasis in the 1840s on professional medical training. The Medical Reform Act regulating professional training and standards did not pass until 1858, but sixteen similar bills had been proposed from 1840. Since the 1830s, physicians had shifted away from book learning and

ad hoc apprenticeship toward formalized programs in metropolitan schools of medicine.³⁶ Contemporary medical treatises and journals, like Thomas Wakley's reformist *Lancet*, demonstrate the influence of empirical methods and a new emphasis on the skills of clinical observation and reporting.

In his pamphlet, Forbes also outlines how botany practically promotes these desirable qualities of "correct observation and accurate discrimination." He posits,

The first lesson of natural history is observation. The study of an animal or vegetable species is the perfection of observation. . . . The study of a group or genus of animals or vegetables is in like manner the perfection of discrimination. . . . The mental process is the same at the bed-side of the patient and in the cabinet of the naturalist: its first element, correct observation, leading to correct diagnosis; the second, accurate discrimination, leading to sound methods of treatment.³⁷

Forbes's interest here in the relation between individual and group categories aligns diagnosis and botanical classification. However, in both passages above, Forbes's examples of observing and discriminating overlap: "observing" includes "detecting adventitious characters at sight, and excluding" them from consideration. In contrast, the mechanical objectivity identified by Daston and Galison aims at a complete, unfiltered, and unmediated record, one without judgment. Forbes's construct is closer to the earlier paradigm that Daston and Galison identify with eighteenth-century science, "truth to nature." In that model, a sage examines natural objects vis-à-vis an ideal of that object, filtering out unwanted artifacts of the individual or accidental, just as Forbes insists that the student must practice judgment about what is worthy to observe. He endorses the new empirical skills of medicine but has not fully embraced the skepticism of mechanical objectivity, because he does not reject the work of discrimination that anchors the eighteenth-century practice of "truth to nature."

The inconsistencies of Forbes's argument culminate in a paradoxical conclusion. He implies that botanical study is valuable to medicine mostly insofar as it *lacks* practical value.³⁸ Indeed, he says students should learn observation and discrimination away from the bedside: "No training is so strengthening as that which separates the process from the object of the process." Forbes warns of the "great evil in medical education" of teaching content and skill together, insofar as it "leads to habits

of loose reasoning, and blunts the most valuable power of detecting fallacies,” and results in “professional works notoriously abound[ing] in bad logic.”³⁹ With botany, however, “Who can rise up from such a study and not feel mentally strengthened?”⁴⁰ Forbes’s eccentric reasoning comes to the fore here in his claims of the practical value of an impractical study; and in his critique of the Continental method of bedside clinical instruction, in favor of a supposedly more logical, if bloodless, training in medical skill by way of plant biology, precisely because botany has so little to do with the human body.

These peculiarities of Forbes’s argument make sense, however, when he shifts to a third, implicitly greater, point: medical students should learn botany because its abstract reasoning will make them not just better doctors but better men. His rhetoric references an older tradition of science that suggests botany improves not only the mind but also character. This moral formation could have had a practical application, since British medical students were notorious for drunken hijinks, violent outbursts, and coarse or ribald talk.⁴¹ John Stevens, in a Scottish midcentury tract attacking man-midwifery, warns,

Imagine, forty or fifty gay young fellows, full of midnight sprees, and half-and-half, surrounding the patient with those sacred parts of her person all exposed to their indecent gaze! Bright and peering is the eye-glass of the dissipated fop, insinuating is the gross jeer of the medical libertine, the habitual scoffer at all human virtue.⁴²

Contemporaries suspected that medical study itself elicited this rowdy, coarse behavior, rendering hospitals dangerous for patients’ physical and students’ moral health. John James Audubon, after visiting the dissecting theater of surgeon Robert Knox (later infamous for his role in the Burke and Hare case), recalled, “I was glad to leave this charnel house and breathe again the salubrious atmosphere of the streets.”⁴³ Both the dissections and the discourse were offensive; even the professors used bawdy language and told obscene stories in the dissection room and the lecture hall.⁴⁴

Forbes was well aware of the unsavory reputations of both hospitals and their students, so he prescribes a particular form of learning to guard against the miasma of the hospital:

One great evil which has tended to retard the intellectual advancement of the medical student, especially in this great city, has been

the separation of his studies from all association with the pursuits of the scholar and the philosopher. The air of a hospital is mentally unwholesome, unless mingled with a full proportion of collegiate atmosphere.

Part of the problem was simply the narrowness of hospital study, focused exclusively on the body; Forbes warns that an “exclusive professional education” causes a dangerous “contraction of the mind.” But he also hints at immorality in terming hospital air “unwholesome,” in contrast to “the very neighbourhood of literary and scientific studies,” which “has a purifying and elevating effect on the mind of the student.”⁴⁵ Botany—as both intellectual exercise and natural theology—epitomizes this spiritual discipline, providing a “new source of pleasure” to jaded medical students, who thus acquire wholesome “after-occupations” away from the hospital.⁴⁶ Because botany is not directly relevant to hospital work, it is not defiled by that environment and can correct for the taint of medical study. Here again, Forbes offers a series of counterintuitive claims: that botany is productive to medical students because it is irrelevant to them; that it is useful for their occupation because it is enjoyable as an “after-occupation”; that it is morally purifying because it is so pleasurable. But these help explain Forbes’s puzzling shifts. While the historical context of medical curriculum reform demanded that he tout the practical utility of botanical study, he believed botany valuable for its blend of practical and moral skills—that is, for its ability to train the skills needed in medicine but also to *distance* students from the coarse atmosphere of the hospital and dissecting room.

Forbes’s argument about botany’s moral and practical utility puts into focus the tensions that characterized shifting beliefs in contemporary medical thought. For instance, he draws on the miasma theory of disease in describing the corrupting nature of hospital air. Early nineteenth-century physicians proposed climatological theories of illness, which emphasized the dangerous effects of environment more than the individual vector of contagion. Certain locales were thought to be miasmatic, where the bad air carried disease, and temperature and wind direction might influence health by rendering bodies more vulnerable to illness. In her 1860 book *Notes on Nursing*, Florence Nightingale argues that “the first essential to a patient” is “to keep the air he breathes as pure as the external air,” and she exhorts her readers to “always air your room, then, from the outside air.”⁴⁷ Just as fresh air provided a wholesome, health-

giving element in blowing away the stale air of the sickroom, studying open-air plants, Forbes suggests, promotes mental and moral health by opening the narrow, pernicious confines of medical study to the fresh air of botanizing. Forbes’s vision of the virtuous medical man also shares little with the bourgeois discipline demonstrated by the emergent practitioner of mechanical objectivity, who strives to be patient, focused, and capable of heroic efforts of nearly mechanical reportage. Critical of this paradigm, Forbes claims that, “shut out from the spirit of letters, of science and of art, exclusively occupied with one set of thoughts and practices, the man sinks into the drudge.” But botanical study makes “the young physician and surgeon . . . a scholar, a man of science, and a man of taste; and, above all, imbued with sound principles of religion and morality.”⁴⁸ Forbes’s use of “scholar” here nods to the classical education still common for physicians. His mention of “science” acknowledges the rise of clinical medicine; while his interest in “taste” recalls the crucial role of discernment and suggests that medicine should remain a profession in the older sense, marked by gentility more than education, certification, and society membership.⁴⁹ Forbes places religion and morality above the classical foundations of medicine, its increasing claims to science, or its traditional status as a profession.

Forbes’s argument that botany improves moral health follows logically from botany’s roots in natural history, especially the narrative of natural theology: the philosophy, popularized by William Paley’s 1802 text *Natural theology, or, Evidences of the existence and attributes of the Deity*, that natural history is the record of Creation and that a close reading of that record can produce a wonder engendering a better knowledge of God.⁵⁰ Peter Mark Roget had explained, in his *Animal and Vegetable Physiology* (1834), the fifth Bridgewater Treatise arguing for the trace of God in the Creation: “To Man have been revealed the Power, the Wisdom, and the Goodness of God, through the medium of the Book of Nature.” The student of Nature, by “contemplation” of natural objects, feels “admiration and . . . gratitude” and “refines” his soul.⁵¹ Minuteness, beauty, mechanical contrivance, wonder, and the sublime ground the narrative of natural theology; the Paleyite observer first marvels at the tiny structures of nature, miniscule but apparently perfect, then experiences a spiritual epiphany. Roget says of the fibrils of feathers,

A construction so refined and artificial . . . and so perfectly adapted to [its] mechanical object . . . cannot be contemplated without the

deepest feeling of admiration, and without the most eager curiosity to gain an insight into . . . such minute and curious workmanship. . . . [N]one is more fitted to call forth our profoundest wonder at the comprehensiveness of the vast scheme of divine providence.⁵²

Forbes engages this narrative to argue that botany became more potent a tool for theological conversion as it became more scientific. Studying plants, he says,

led at length from empiricism to science . . . the herborist ripened into the botanist [and a] new light broke upon him. . . . The wonders of [plant] structure were exposed. . . . [T]heir history became a store, from whence could be drawn at pleasure numberless admirable examples of the perfection of design in creation, and of the benevolence and omniscience of the Creator.⁵³

In fact, Forbes argues that natural theology actually inspired botanical science, when “earnest unbiassed studies originating in the admiration of the wonders and beauties of creation, and deep reverence for the great Origin of all things, were the corner-stones of botanical science.”⁵⁴ Even in his own day, he claims, those “who have journeyed much in foreign lands have felt the delight of examining some beautiful and strange flower . . . and many an idler has been metamorphosed into a man of science by . . . such accidental direction of his attention to the minuter beauties of nature.”⁵⁵ Many contemporary botanical texts tapped the narrative of natural theology like this; for example, in the journal *Botanist*, Samuel Maund cites Paley as inspiration.⁵⁶ But most of these write for a general audience, exemplary of the growing divide Ann B. Shteir identifies between moral (“polite”) and scientific botany. In contrast, Forbes addresses a professional audience and argues that botany has value for that audience precisely because of its links to natural theology; that natural theology makes botany more, not less, scientific. He thus strives to reintegrate polite botany with scientific botany even as he adopts the new, natural systematics. If, as I’ve been arguing, Forbes acknowledges the faultlines of botanists’ split between an “aesthetic, moral, and spiritual orientation . . . [and a] utilitarian or scientific approach,”⁵⁷ he also contends that, by reintegrating the strands of botany, naturalists might secure it greater cultural authority as a foundation of the new medical science as well as the established moral tradition.

The Clue to the Labyrinth

Forbes’s unwillingness to relinquish botany’s past treasures—whether natural theology or Linnaean taxonomy—becomes clear in comparison to a similar lecture delivered fourteen years earlier. The reformer John Lindley, like Forbes, had been a new botany professor publishing his inaugural remarks to the University of London.⁵⁸ Most of Lindley’s examples, unlike those of Forbes, are not moralistic but resolutely pragmatic: we use vegetable matter in many daily activities, so we should study plant life;⁵⁹ the physician relies upon plant-based medicaments, so he should study plants and their properties.⁶⁰ Lindley also lauds horticulturists like Thomas Andrew Knight, who achieved “the complete subjugation of the unmanageable constitution of the Pine-apple.”⁶¹ Artists, too, need botany for practical reasons: botanical study prevents embarrassing “blunders” such as painting “flowers stuck upon parts where they could not more have grown than a man’s head beneath his arms.”⁶² Although Lindley offers an extended, lush description of plant life, his aim is determinedly utilitarian: “If the vegetable world is thus indispensable to our very existence, and if it is really subject to the influence of certain fixed laws, can it be doubted that it is of the utmost importance to the world to be acquainted with these laws? And what is that acquaintance but Botany?”⁶³

It may seem counterintuitive that Lindley, writing earlier, endorses a practical scientific approach to botanic study, while Forbes, the later writer, ultimately endorses both botanical science and a moralist approach informed by botany’s traditional link with natural theology. Lindley pressed for the newer, “natural” system of classification of Jussieu, which acknowledges multiple aspects of the plant, to replace the “artificial” Linnaean system, which considers only stamens and pistils. Both Lindley and Forbes taught a Jussieuan system—Forbes had actually joined Jussieu’s class briefly while visiting Paris⁶⁴—but their emphasis in discussing the predecessor Linnaeus is telling. Lindley damns the artificial system for “rendering Botany a mere science of names, than which nothing more useless can be well conceived.”⁶⁵ He concludes that the Linnaean system is “a positive and serious evil.”⁶⁶ In her reading of the text, Shteir recalls the association between the Linnaean system and botany for ladies. Although Linnaean terms were sometimes considered inappropriate for women, his system was the default for traditionalist and popular texts. Thus Lindley’s “rejection of Linnaean

botany is a rejection of polite botany in favor of utilitarian botany [and by] the mid-1840s . . . literary botany and scientific botany became distinct discourses.”⁶⁷

In contrast, Forbes, nearly fifteen years later, urges botanical science to make peace with its roots in natural theology and to embrace the moral strengths promised by its contemporary, genteel associations. Forbes rows against the tide of increasing science, professionalism, and specialization here, offering a hybrid vision of old and new, polite and scientific botany. His embrace of the “minuter beauties” of botany and natural theology apparently inspires him to return to Linnaeus with similarly romantic prose. He lavishes two pages on Linnaeus, praising him for his “two ingenious artificial schemes”: “a universal [botanical] language” that offered “the greatest means of furthering the progress of natural history,” and “the making of an index to a great section of the book of nature.”⁶⁸ The shift away from science and method is evident in Forbes’s language. When he needs a rationale for keeping the Linnaean system, critiqued by so many others, Forbes uncharacteristically turns to a far-fetched, fanciful metaphor. The Linnaean system is “a most valuable auxiliary,” he says, because

the understanding of things depends greatly on the perception of their order and relations. When that order and those relations require deep study . . . the man who gives us a clue, however insignificant it may be in its own nature, . . . endow[s] the despised instrument with golden value. Such a clue did Linnaeus give when he put forth the sexual system. . . . The clue to the labyrinth, then, having served such noble purpose becomes a consecrated object, and should rather be hung up in the temple than thrown aside with ignominy. The traveler returning from his adventurous and perilous journey of discovery, hangs up his knapsack with affection on the wall of his study.⁶⁹

Just as the science of botany leads us to recognize the wonders of creation, Forbes says, the Linnaean system led us to recognize the value of taxonomy. Here he reframes the rationalist “order and relations” of taxonomy as a romantic tale. The botanist becomes a seeker in an unknown land, questing in a labyrinth, carrying a noble, consecrated object (the Linnaean system) that provides a clue to those mysteries. This excursion metaphorically transports us to an exotic, dangerous locale. A generally favorable notice of Forbes’s lecture in the *Annals and Magazine of Natural History* wryly comments, “We are quite willing to hang this system up

in the temple anywhere as long as it does not interfere with plants . . . we should never wish again to disturb its dignity by carrying it into the fields.”⁷⁰ But Forbes insists these flights of fancy, including aspects of the Linnaean system itself, are compatible with modern scientific realism. Just as British botanists ventured into colonial lands for specimens to bring home for study and reference, Forbes implies, Linnaeus led botanists through the mysteries of the plant world until—Forbes deftly returns us to the quotidian—the homecoming botanist hangs the battered knapsack (the no-longer needed sexual system) on the “wall of his study.” Forbes acknowledges that the system was considered “insignificant,” but he also describes it in terms of wonder and mystery, a mode familiar from natural theology. He acknowledges that the sexual system is “despised” but urges us not to cast it away. Rather, we should recognize it as the mystical “clue to the labyrinth,” a “consecrated object” with “golden value.”

Given Forbes’s emphasis on rational processes of observation and the general shifts at the time toward a more scientific medical curriculum, his fanciful, elaborate metaphor may seem a peculiar rhetorical choice. However, this metaphor of the labyrinth, and its sacralization of Linnaean polite botany as the clue to nature’s mysteries, allows Forbes to pivot back to moral concerns. This shift signals both his position within the debates over curriculum and his institutional context. Lindley had spoken to, and from, the University of London, whereas Forbes addressed his students and colleagues at King’s College. The University of London, also then known as “London University,” was founded as an alternative to Oxford and Cambridge in 1826. The founders, inspired by the radical educational and social philosophy of Jeremy Bentham, had Jewish, utilitarian, and dissenting support in establishing a secular university for the urban middle classes. The university offered courses in new areas of study like political economy, English literature, classics, and science. In 1828, King’s College was founded as a religious, Anglican, and traditionalist response to the University of London, but because neither of the two competing institutions had degree-granting authority, they combined as constituent colleges (“University College” and King’s College) of the newly chartered University of London in 1836 to secure this right. These years were marked by acute competition between the schools, and, as J. Reynolds Green explains, “Botany was one of the chairs affected. Lindley was made Professor at University College in 1829, and King’s, not to be outdone, founded a Chair only two years later.”⁷¹

Lindley, then, aligned his aims with those of his secular university in

promoting rationalist investigation and the new sciences: “In this new Institution we will see . . . whether it is not possible to found a school of Botany in London worthy of being associated with those of Medicine, Zoology, and Natural Philosophy.”⁷² Forbes also associates his aims with those of his college, but in a very different institutional context and in very different terms:

That which Lord Bacon said of all knowledge is especially true of this department, that it “is not a couch whereupon to rest a searching and restless spirit; or a terrace for a wandering and variable mind to walk up and down with a fair prospect; or a tower of state for a proud mind to raise itself upon; or a fort or commanding ground for strife and contention; or a shop for profit or sale;—but a rich storehouse for the glory of the Creator and the relief of man’s estate.”⁷³

Such a conclusion neatly dismisses other motivations as crassly materialistic and reinstates the narrative of natural theology in asserting that knowledge—here, the study of botany—is valuable simply for its insight into the products of a divine Creator. Forbes’s defense of Linnaeus aligns with this allegiance to botany’s idealized origin as moral and spiritual instructor. Although Forbes endorses Jussieu earlier in this text, his conclusion—and its embrace of metaphor—promotes a compromise between traditional and modern, fanciful and pragmatic, polite and systematic approaches to botany and the spiritual and practical virtues of science.

Forbes’s attempt to blend polite and scientific botany did not reflect trends in the larger botanical community, but, surprisingly, he may have helped preserve a place for botany in the medical curriculum for a time. The *Annals and Magazine of Natural History* reviewed his remarks with approval, taking both Forbes and the new sciences seriously; in a nearby article, Arthur Hill Hassall responds to Forbes’s earlier critique of his work on polytypes.⁷⁴ In 1854, Forbes attained his life’s goal, the appointment as professor of natural history at the University of Edinburgh (just before his untimely death). He reiterated his views on medical education in his inaugural lecture, and the acceptability of those views is evident in that the lecture was published in both the Edinburgh *Monthly Journal of Medical Science* and the *Medical Examiner*, even being quoted at length in a letter to *Nature* in 1883.⁷⁵ By 1855 botany was required for licensure as a surgeon or apothecary, and by 1884 required for physicians. Anxiety over the moral health of students persisted; the president of the British

Medical Association in 1868, William Stokes, voiced this concern in his address to the membership.⁷⁶ Botany was, however, eventually crowded out of the medical curriculum as the new sciences and practical clinical experience became necessary; indeed, T. H. Huxley singled it out (with zoology) as unnecessary to the medical curriculum in his 1874 lecture “Universities: Actual and Ideal.”⁷⁷

Forbes’s and Lindley’s texts, however, demonstrate the importance of institutional context and the uneven pace of scientific change. The University of London accommodated Lindley’s condemnation of Linnaeus and his advocacy for the natural systematics advancing botanical science. The setting of the religious and traditional King’s College allowed Forbes, years later, to champion botany on broader terms, echoing the moral narrative of natural theology. The struggle between the “art” and “science” of medicine was fervent, and botany was battling for professional recognition. But for Forbes the greatest value botany offered to students was not its contributions to the science of medicine—its pharmacological resources or ability to hone medical observation and discrimination—but its links to the art of medicine. By teaching the appreciation of minute beauties, Forbes believed, botany preserved this gentlemanly tradition and its moral strengths. His lecture reminds us that modernizing the medical curriculum involved not just innovation but also hesitation, negotiation, and compromise; and that medicine was, like other sciences, deeply involved in the changing status of natural history and natural theology in the nineteenth century.

Notes

1. Barbara T. Gates, *Kindred Nature: Victorian and Edwardian Women Embrace the Living World* (Chicago: University of Chicago Press, 1998), 38–39. Gates cites Greg Myers for the “narrative of natural history” and the “narrative of science.” Myers, *Writing Biology: Texts in the Social Construction of Scientific Knowledge* (Madison: University of Wisconsin Press, 1990), 142–43.

2. Richard Yeo, *Defining Science: William Whewell, Natural Knowledge, and Public Debate in Early Victorian Britain* (Cambridge: Cambridge University Press, 1993), 29–35.

3. Steven Shapin, *The Scientific Life: A Moral History of a Late Modern Vocation* (Chicago: University of Chicago Press, 2008), 36–42.

4. Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone, 2007).

5. Shapin, *The Scientific Life*, 82–83.

6. Indeed, Steven Shapin argues that personal virtue remains tied to “the scientific life” even into the era of contemporary technoscience; personal qualities remain

both central to science and under erasure in narratives about “what scientists do.” *Ibid.*, 4–5.

7. Thomas Neville Bonner, *Becoming a Physician: Medical Education in Britain, France, Germany, and the United States, 1750–1945* (New York: Oxford University Press, 1995), 63.

8. M. Jeanne Peterson, *The Medical Profession in Mid-Victorian London* (Berkeley: University of California Press, 1978), 5.

9. Bonner, *Becoming a Physician*, 81–85, 90–91, 100–101. For an American example, see Ephraim Cutter, *Partial Syllabic Lists of the Clinical Morphologies of the Blood . . .* (Trenton: [n.p.], 1892).

10. Bonner, *Becoming a Physician*, 145.

11. See Bettina Dietz, “Contribution and Co-production: The Collaborative Culture of Linnaean Botany,” *Annals of Science* 69, no. 4 (2012): 551–69.

12. Carl Linnaeus proposed his ideas in his *System Naturae*, first published in 1735, the tenth (1758) edition of which set forth his binomial nomenclature. Linnaeus, *System Naturae* (Stockholm: L. Salvius, 1758). As Alan Morton points out, however, Linnaeus frequently used empirical evidence, basing his genera on natural groupings. Morton, *History of Botanical Science: An Account of the Development of Botany from Ancient Times to the Present Day* (London: Academic Press, 1981), 264, 298–308.

13. Antoine-Laurent de Jussieu, *Genera Planterum* (Paris: Herissant and Barrois, 1789). Bernard worked with Antoine-Laurent in the preparation of this work.

14. Morton, *History of Botanical Science*, 293.

15. Thomas Martyn, *Memoirs of John Martyn . . . and of Thomas Martyn . . . Professors of Botany* (Piccadilly [London]: Hatchard & Son, 1830), 135, quoted in David Allen, *The Naturalist in Britain: A Social History* (Princeton, NJ: Princeton University Press, 1994), 34, quoted in Londa Schiebinger, *Nature’s Body: Gender in the Making of Modern Science* (Boston: Beacon, 1993), 14.

16. John Lindley, *An Introductory Lecture Delivered in the University of London . . .* (London: Taylor, 1829), [3].

17. See, for example, Amy King, *Bloom: The Botanical Vernacular in the English Novel* (Oxford: Oxford University Press, 2003), 19–29 and 50–58; Schiebinger, *Nature’s Body*, 12–14, 28–37.

18. Samantha George, *Botany, Sexuality, and Women’s Writing, 1760–1830: From Modest Shoot to Forward Plant* (Manchester: Manchester University Press, 2007). Banks was a renowned naturalist and instrumental in the work at Kew Gardens, but his exploits in Tahiti prompted gossip and satires on his supposed libertinage; see, for example Pamela Cheek, *Sexual Antipodes: Enlightenment, Globalization, and the Placing of Sex* (Stanford: Stanford University Press, 2003), 143–45, and Patty O’Brien, *The Pacific Muse: Exotic Femininity and the Colonial Pacific* (Seattle: University of Washington Press, 2006), 63–67. For the sexual system as immoral, see also O’Brien, *Pacific Muse*, 13–15.

19. Lynn Merrill, *The Romance of Victorian Natural History* (Oxford: Oxford University Press, 1989), 90–96.

20. Lindley, *Introductory Lecture*, 12.

21. For a description of the “fern craze,” see David Elliston Allen, “Tastes and Crazes,” in *Cultures of Natural History*, ed. N. Jardine, J. A. Secord, and E. C. Spary (Cambridge: Cambridge University Press, 1996), 394–407.

22. Gates, *Kindred Nature*, 38–39. See also Londa Schiebinger, *The Mind Has No Sex? Women in the Origins of Modern Science* (Cambridge: Harvard University Press), 243; and King, *Bloom*, 57.

23. For the feminine associations of botany, see Gates, *Kindred Nature*, 64, 140; Ann B. Shteir, “Women in the Polite Culture of Botany,” in *Cultivating Women, Cultivating Science: Flora’s Daughters and Botany in England, 1760–1860* (Baltimore: Johns Hopkins University Press, 1996), 33–58; Schiebinger, *Mind Has No Sex*, 241–44; Samantha George, “‘Unveiling the Mysteries of Vegetation’: Botany and the Feminine,” in *Botany, Sexuality*. For attempts in the 1830s to masculinize botany and distinguish professional from popular botany, see Shteir, “Defeminizing the Budding Science of Botany,” in *Cultivating Women, Cultivating Science*, 147–70.

24. Lindley, *Introductory Lecture*, 14.

25. Mary Treat, *Home Studies in Nature* (New York: Harper & Brothers, Franklin Square, 1885), 147–62, esp. 147, 157–60, 162. The Darwin Correspondence Project notes that Treat exchanged fifteen letters with Darwin, far more than most female naturalists represented. “The Public and Private Face of Mary Treat,” DarwinLetters, posted by Philippa Hardman, accessed June 10, 2015, <http://www.darwinproject.ac.uk/gender/2011/10/12/the-public-and-private-face-of-mary-treat>.

26. Bonner, *Becoming a Physician*, 144, 156.

27. Edward Forbes, *An Inaugural Lecture on Botany, Considered as a Science, and as a Branch of Medical Education . . .* (London: J. van Voorst, [1843]), 7.

28. [John Hughes Bennett], “Biography of the Late Professor Edward Forbes,” *Monthly Journal of Medical Science* 1 (January 1855): 82.

29. “The Physiology of the London Medical Student, No. 4: Of the Manner in Which the First Season Passes,” *Punch*, October 23, 1841, 177.

30. Forbes, *Inaugural Lecture*, 6, 3.

31. *Ibid.*, 12. Forbes lauds the practical use of botany in many nonmedical fields, including agriculture, chemistry, zoology, geology, and in a military or colonial context. “Even to the man of the world it may afford profit and pleasure,” he says. *Ibid.*, 13–15.

32. *Ibid.*, 7, 8.

33. *Ibid.*, 8.

34. Bonner, *Becoming a Physician*, 14; Charles Newman, *The Evolution of Medical Education in the Nineteenth Century* (Oxford: Oxford University Press, 1957), 97.

35. Stephen Paget, *Memoirs and Letters of Sir James Paget* (London: Longmans, Green, 1901), 27–28. Paget’s memoirs were written in 1880–85 and published in 1901. Here he recalls his apprenticeship before hospital-pupillage, 1830–34.

36. For a good overview of this transition, see Bonner, *Becoming a Physician*.

37. Forbes, *Inaugural Lecture*, 9–10.

38. This is perhaps not surprising, given Forbes’s lack of sympathy with medicine, a study he took up to please his father. John Hughes Bennett, a fellow student at Edinburgh, recalled upon Forbes’s death that “he could never conquer his dislike to medicine as a profession. He was seldom seen in the dissecting-room or Infirmary. Even his attendance on the purely medical classes was of no great use to him, as he did little but sketch the features of the professor or of the surrounding students.” “Biography,” 76. Another biographical account notes, “As for medicine it had no interest for him, except as including certain departments of Natural History, and for its own more special studies he had an unconquerable aversion.” George Wilson and Archibald Geike, *Memoir of Edward Forbes, F.R.S., Late Regius Professor of Natural History in the University of Edinburgh* (London: Macmillan, 1861), 70; see also 184–87.

39. Forbes, *Inaugural Lecture*, 10.

40. *Ibid.*, 9.

41. Newman, *Evolution of Medical Education*, 41–47; Peterson, *Medical Profession*, 40; Bonner, *Becoming a Physician*, 8, 72–75, 215.

42. John Stevens, *Man-Midwifery Exposed*, 2nd ed. (London: William Horsell, n.d.), 16–17. In Scotland, half-and-half is a dram of whisky with a chaser of beer. Stevens’s text is undated, but it is collated in the Wellcome Library in a collection titled “Aberdeen Medical-Chirurgical Society, Tracts (1850s–1871).”

43. Maria R. Audubon, *Audubon and His Journals*, vol. 1 (New York: Scribner’s Sons, 1899).

44. Newman, *Evolution of Medical Education*, 42–45; Bonner, *Becoming a Physician*, 210.

45. Forbes, *Inaugural Lecture*, 11.

46. *Ibid.*, 14, 8.

47. Florence Nightingale, *Notes on Nursing* (New York: Dover, 1969).

48. Forbes, *Inaugural Lecture*, 11–12.

49. Susan Faye Cannon, *Science in Culture: The Early Victorian Period* (New York: Dawson and Science History Publications, 1978), 145ff.

50. William Paley, *Natural Theology: Or, Evidence of the Existence and Attributes of the Deity* (London: R. Faulder, 1802).

51. Peter Mark Roget, *Animal and Vegetable Physiology Considered with Reference to Natural Theology*, vol. 1 [Bridgewater Treatise V] (London: William Pickering, 1834).

52. Forbes, *Inaugural Lecture*, 571–72.

53. *Ibid.*, 6.

54. *Ibid.*, 17.

55. *Ibid.*, 14.

56. Samuel Maund, “Preface,” *Botanist* 1 (1836), quoted in Shteir, *Cultivating Women, Cultivating Science*, 159.

57. Shteir, *Cultivating Women, Cultivating Science*, 153.

58. Lindley, *Introductory Lecture*.

59. *Ibid.*, 17–18.

60. *Ibid.*, 19–21.

61. *Ibid.*, 22.

62. *Ibid.*, 23.

63. *Ibid.*, 18.

64. Wilson, *Memoir of Edward Forbes*, 219.

65. Lindley, *Introductory Lecture*, 9.

66. *Ibid.*, 10.

67. Shteir, *Cultivating Women, Cultivating Science*, 157–158.

68. Forbes, *Inaugural Lecture*, 16–17.

69. *Ibid.*, 19.

70. “Bibliographical Notices: An Inaugural Lecture on Botany . . .,” *Annals and Magazine of Natural History: Zoology, Botany, and Geology* 12, no. 75 (1843): 123.

71. J. Reynolds Green, *A History of Botany in the United Kingdom from the Earliest Times to the End of the 19th Century* (London: J. M. Dent, 1914), 363–64.

72. Lindley, *Introductory Lecture*, 14.

73. Forbes, *Inaugural Lecture*, 23. Forbes slightly misquotes Bacon here, who opens the passage, “But the greatest error of all the rest, is the mistaking or misplacing of the last or farthest end of knowledge . . . as if there were sought in knowledge a couch . . . and not a rich storehouse.” Francis Bacon, *Of the Proficiency and Advancement of Learning, Divine and Moral*, in *The Works of Lord Bacon: With an Introductory Essay, and a Portrait*, vol. 1 (London: William Ball, 1838), 13.

74. “Bibliographical Notices,” 120–23; Arthur Hill Hassall, “Observations on Two

of Professor Edward Forbes’s ‘Retrospective Comments,’” *Annals and Magazine of Natural History: Zoology, Botany, and Geology* 12, no. 75 (1843): 117–20.

75. Forbes explains, “It is this training of the mind in correct methods of observation that gives the Natural History sciences so much value as instruments of preparation in professional education.” He demonstrates a familiar impatience with the insistence on practical subjects, exclaiming, “Not unfrequently do we hear the shortsighted and narrow-minded ask, what is the use of zoology, or botany, or geology to the physician and surgeon? what have they to do with beasts, or plants, or stones? Is not their work among men, healing the sick? . . . Vain and stupid questions all.” And he offers a similar emphasis on “wholesome” food for the mind: “Were the sciences . . . to be entirely professional, we should warp and contract the minds. . . . [T]he collateral sciences [like botany] . . . prevent an undue dissipation of the student’s thoughts” (563), “Inaugural Lecture. By Edward Forbes, F.R.S., F.G.S., Professors of Natural History in the University of Edinburgh. Delivered March 15, 1854.” *Monthly Journal of Medical Science* 18 (July 1854): 560–68. Republished in part as “Upon the Pleasures and Advantages of a Knowledge of the Natural Sciences,” *Medical Examiner: A Monthly Record of Medical Science* 10 (July 1854): 437–39 and quoted at length in John H. Balfour, letter to the editor, *Nature*, December 18, 1873, 121–22.

76. Peterson, *Medical Profession*, 55.

77. For information on the medical curriculum, see Peterson, *Medical Profession*, 62; Bonner, *Becoming a Physician*, 217–18; Thomas Henry Huxley, “Universities: Actual and Ideal,” in *Collected Essays*, vol. 3: *Science and Education* (London: Macmillan, 1893), 189–234.