Visualising the Unseen, Imagining the Unknown,
Perfecting the Natural
Visualising the Unseen, Imagining the Unknown, Perfecting the Natural: Art and Science in the 18th and 19th Centuries

Edited by

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with sincere gratitude
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INTRODUCTION

In *Voyage into Substance* and *Body Criticism*, Barbara Maria Stafford rightly points out that the visualisation of knowledge is a phenomenon common to both art and science from the Enlightenment to the present. Art and science are both fundamentally visual in terms of how they understand, collect, organise, create and disseminate knowledge, and much of this is evident in the modern period. Moreover, in *Body Criticism* particularly, she suggests that, at some point, the increasingly text-based priorities of academia came to devalue visual literacy, resulting in the perceived disciplinary break between art and science, leaving the latter oblivious to its own visual nature. While presenting a thorough historical study of the “interanimations” of the two disciplines, Stafford advocates for a contemporary renaissance in visual training and literacy. A similar theme of the unity of art and science under the banner of the visual links the various essays in this book, highlighting several historical moments of connectivity between the two disciplines.

Throughout history, both art and science have been employed to visualise things unseen and to image/imagine things unknown as part of the quest to understand nature. In light of this, perhaps our contemporary tendency to see art and science as completely divergent, mutually exclusive fields of study with similarly distinct methodologies (and to privilege science over art in most aspects of our culture) may be profitably re-examined. This volume brings together recent work by both junior and senior scholars treating the art/science connection in eighteenth- and nineteenth-century art. The reader is asked to draw her/his own conclusions about the similarities and differences between those historical moments and the present.

* * *

In the first chapter, “Training the Naturalist’s Eye in the Eighteenth Century,” Daniela Bleichmar examines three related ideas. First, she looks at how visual skills were critical for eighteenth-century European naturalists. Such skills were necessary for collecting and classifying, as well as investigating nature. Bleichmar points out how naturalists required a specialised visual training, which she argues went beyond sight to
become a kind of expert viewing, an authoritative vision akin to connoisseurship—“not merely sight,” she says, “but rather insight.”

Second, Bleichmar demonstrates how natural history was dependent on not only visual skill, but also on certain elements of material culture—i.e. images, specimens, and text. She examines how books created, standardised and disseminated modes of observation, description, nomenclature, classification, and representation. Her arguments centre particularly on how images were especially critical to the production, collection and dissemination of natural history knowledge. In much the same way that Jonathan Richardson described painting’s superiority to poetry by writing “[painting] Pours Ideas into our Minds, Words only Drop ’em,” Bleichmar suggests that by bringing together visual and material information, the natural history image constituted a potent object of knowledge, which was itself collectible as a kind of specimen. Bleichmar then goes on to examine how those visual and material aspects of natural history, which were bound together in the image, were intimately connected to issues of colonialism and trade. The information contained and displayed in the visual representations created and enforced an ordering of the natural world that paralleled the creation and enforcement of imperial and economic control.

The second chapter of this book is devoted to yet another type of cultural product representing the convergence of visual and material aspects of natural history, albeit one which we might hardly call “natural.” In “Art is to Life as Flowers are to Nature: Vegetable Visions during the French Revolution,” Paula Lee discusses the proposed role of T.J. Wenzel’s mass-produced artificial flowers within an unrealised plan for a Garden of Artificial Plants at the Musée d’Histoire Naturelle in Paris. Despite their easy identification with ancien régime luxury, artificial flowers became central to the French Republic’s enthusiastic support of Wenzel’s scheme for artificial plant production as a means of employing the idle, disabled, and otherwise disadvantaged, and central to the subsequent plan for a garden of artificial plants put forth by Guillotin in the National Assembly. Guillotin hoped that the plants could be displayed side-by-side with living specimens at the Museum of Natural History, formerly the Jardin des Plantes du Roi. The garden was justified by the artificial plants’ visual accuracy and eternal bloom for use as a pedagogical device, which could instruct the citizen-public and inspire some of them to pursue botanical study for the benefit of the nation.

Lee’s examination of the political and social circumstances that kept the garden from being realised reveals the debates surrounding agricultural and land reforms and hints at the discourse surrounding the usefulness of
art itself and its place in the revolutionary Republic. Her discussion is set within the context of a time when revolutionary and nationalistic fervour encouraged the ploughing-under of public and private gardens and the cultivation of more useful, edible crops such as potatoes. The artificial plant garden’s potential pedagogical benefits and deeper social lessons of harmonious existence among different classes and species (analogous to socioeconomic and ethnic strata among *citoyens*) seem not to have outweighed the glaring handicaps of decorativeness, artificiality, and wasted acreage.

The visual and material culture of botany is also the subject of the third chapter. In “Robert Thornton’s New Illustration: Imaging and Imagining Nation and Empire,” Meghan Doherty examines Thornton’s *New Illustration of the Sexual System of Linnaeus* and considers the three-volume tome’s combination of detailed scientific tables and diagrams illustrating the Linnaean system of classification, and its large colour plates of flora in “evocative landscape environments.” Doherty argues first that the inclusion of both sterile scientific tables and artfully conceived illustrations of plants, set within the splendour of their natural surroundings, effectively brings together in one *magnum opus* the intellect and sensation, thought and feeling.

Doherty points out that the combined intellectual and sensory stimulation apparent in Thornton’s work may be understood to reflect the publication’s chronological position between the Enlightenment and Romanticism: The three volumes were published between 1799 and 1807. The rationalism of the data charts and diagrams, mostly present in the first two volumes, demonstrates the orderly function and application of Linnaean taxonomy. This leads to the third volume, which is full not of conventional illustrations of botanical specimens floating in the negative space of the page, but rather of depictions of plants naturalistically placed within lush landscape environments. Doherty reasons that the book as a whole presents “the atmosphere of change in scientific and artistic thinking at the end of the eighteenth century,” and therefore bridges the gap between the Enlightenment and Romanticism.

Moreover, Doherty argues that Thornton’s text attempts to reconcile certain incongruities between British national and imperial identities. The influx into London of flora from distant lands under British imperial control was unrelenting, and it tested the limits of the Linnaean system’s efficacy in identifying and classifying unknown species. Similarly, the expanding empire challenged notions of national identity as subjects resident in the “exotic” peripheral lands under British control were required to self-identify as British. Calling on Thornton’s own rationale
for his publication as a national homage and British trophy to honour Linnaeus, Doherty argues that the mode of presentation of the colour plates in the third volume attempts to resolve the British identity crisis in botanical form; the illustrations, depicting both native and foreign plants, which could all be considered “British,” are presented as a series of views from a Neoclassical temple (Temple of Flora) in an English garden. Doherty discusses how the imagined garden space becomes a site of control and assimilation of the peripheral to the dominant English cultural centre, while it simultaneously expands British identity to include much more than “Englishness.” Thornton’s Temple of Flora is in some ways similar to Guillotin’s plan for a garden of artificial plants, discussed by Paula Lee in the preceding chapter, in that it too is an ideal garden whose function is both botanically pedagogical and socially edifying, intended to serve the needs of a changing nation, but with goals that were ultimately unrealised.

Art’s potential to communicate didactic scientific and moral lessons is the subject of the fourth chapter, Gabriela Jasin’s essay, “Newtonian Science and Lockean Epistemology in Chardin’s Soap Bubbles.” Taking Dorothy Johnson’s well-known essay as a point of departure, Jasin looks more deeply at the image and sees that Jean-Baptiste-Siméon Chardin not only portrayed the Lockean idea that recreation was fundamental to childhood learning, but also depicted an understanding of how children gain knowledge via sensory experience. In this instance, according to Jasin, that knowledge is Newtonian physics. The sense critical to the transmission and display of Newton’s science is sight.

Jasin argues that Chardin’s Soap Bubbles is more than a mere vanitas painting. Rather, Chardin surpasses that venerable tradition by incorporating the science of Newtonian physics into a visual lesson. The knowledge demonstrated by the activity of blowing bubbles is passed visually from the older boy to the younger, who will confirm his visual lesson by participating next. Jasin argues that where a vanitas image necessarily focuses on the temporality of the event shown, conveying the moral lesson of finite time (and, by extension, mortality), Chardin extends time indefinitely by including several visual details to indicate to a perceptive viewer that the younger boy will soon apply the knowledge he is gaining through observation by blowing his own bubble. The potential shift from passive visual observation to active imitation implies further continuity through time. Unlike teacher and pupil themselves, the knowledge passed between them is immortal. The lesson for the viewer is not so much moral and finite as empirical and infinite.
Jasin argues further that Chardin’s clearly different take on a conventional vanitas subject evinced his ability to emulate, rather than merely imitate, and showed his new desire to demonstrate that ability more overtly. She situates her argument within the context of the artist’s shift from still-life to genre scenes, which occurred at about the time Soap Bubbles was painted. She rightly points out how Chardin’s emulation shows itself in the subversion of the vanitas tradition and in the careful attention to the empirical facts of Newtonian science and Lockean epistemology, resulting in what amounts to a triumph of the Moderns over the Ancients—i.e., Locke and Newton (and Voltaire) over Descartes.

Jasin’s re-evaluation of Soap Bubbles makes a cogent point about the artist’s own extracurricular knowledge and intellectual abilities: Chardin certainly knew and understood Locke’s theories of childhood education as well as (via Voltaire’s translations and commentaries) Newton’s optical and colour theories. Similarly, in chapter five, I re-examine Joseph Wright’s Derbyshire landscape paintings in light of both contemporary geological theory and local mining practice, making an analogous case for the latter artist’s knowledge in those fields.

In “Seeing the Surface, Penetrating the Depths,” I suggest that the art historical tendency to view Wright’s Derbyshire landscape paintings solely within the aesthetic discourses of the Sublime and the Picturesque overlooks the artist’s specific choices of scientifically and industrially significant locations. Geological science and the lead-mining industry are also important keys to understanding the paintings’ full historical context and the artist himself. I argue more strongly than others that John Whitehurst’s geological research fundamentally shaped Wright’s way of seeing the landscape around him. While the artist’s gaze may have scanned its surface, his mind was certainly aware of the hidden depths beneath and their significance for Whitehurst’s Vulcanist concept of planetary origins. Moreover, to support this connection between surface and depth, artist and geologist, I point out that actual mining practice relied, like that of landscape painting, on the visual analysis of surface detail. Miners believed themselves able to reckon the subterranean locations of metalline veins and mineral ores by “reading” the signs that were visually apparent in the lay of the land, its topographical surface. Therefore, there was a visual similarity between the miner’s gaze and that of the landscape painter, and it was perhaps possible (or thought to be so) that an experienced miner could “read” the painted landscape in the same way as the real one.

Furthermore, I argue that Wright’s Derbyshire landscape paintings have intrinsic historical content. Just as geological theories were
increasingly more reliant on the visual evidence of natural history rather than human historical records (the Bible) to determine the Earth’s developmental events, Wright’s landscapes could be understood to imply a visual narrative of natural history because their subjects are geologically and mineralogically significant locations. My claim is further supported by the fact that lead-mining was found in the eighteenth century to have had a particularly ancient historical pedigree in Derbyshire, dating back to the days of Roman Britannia and even to Anglo-Saxon times. I demonstrate that Wright, an artist with formal training and academic credentials, could certainly have conceived of the landscapes as historical and didactic. Wright may well have similarly viewed the lead-mining moguls in the Derbyshire area as the inheritors of an ancient and productive industry, part of a modern patrician class.

Similar to my own arguments about intrinsic historical content in Wright’s landscapes, Alexandra Karl argues that Arnold Böcklin’s mythological paintings have intrinsic Darwinian content. In “Darwin or Dionysus? The Fabulous Beasts of Arnold Böcklin,” Karl refutes the common view that Böcklin’s mythological beasts were created simply as highly personal attempts to reinvigorate the historical genre of classical mythology.

Using the evidence of contemporary critical responses, Karl reconstructs the public reception of Böcklin’s work and demonstrates how the paintings were seen by many contemporaries to function symbolically within a Darwinian context. Karl points out that although Charles Darwin did not suggest the earlier existence of a man-animal hybrid as a step in the evolutionary process, the idea that man’s evolution included such prehistoric hybrid creatures was popularly accepted among supporters of evolutionary theory. This was particularly the case in Germany, where Darwin’s evolutionary ideas were enthusiastically embraced, spawning such apocryphal notions of man’s prehistory. As fossil remnants of prehistoric man were unearthed in the nineteenth century, an iconography of prehistoric man became increasingly necessary from both scientific and artistic perspectives.

Karl argues that Böcklin used classical mythology to give form to contemporary concepts about man’s position in nature and to image/imagine/visualise man’s animal prehistory. Mythological man-animal hybrids, like centaurs and mermaids, became demystified creations whose unflattering forms derived, according to Karl, from the artist’s direct observation of specific animal segments in modern zoos and aquaria. These were not the classically proportioned creatures handed down from Antiquity. As such, they came to symbolise an unseen,
unknown, metamorphic state in man’s evolution, presenting an imagined mythological parallel to prehistoric man’s presumed bestial qualities.

Moreover, Karl points out that such direct observation of live animal specimens was made possible by the modern establishment of such institutions as zoos and aquaria. Additionally, such experiences were increasingly sanctioned in academic art education, which came to embrace and to value *plein-air* observation of nature. Therefore, Karl sees Böcklin as operating within accepted academic art practice on the one hand, while extending the limits of Neoclassical aesthetics on the other to re-present classical antiquity in light of widespread (though incorrect) notions of *Darwinismus* for contemporary nineteenth-century audiences.

Similarly, Maria Gindhart, in “Touched by Science: Albert Besnard’s Painted Programme for the School of Pharmacy in Paris,” considers the intersection of mythology and science in the imagined imagery of prehistoric man in Besnard’s *Primitive Man*, one of a total of seventeen paintings executed by the artist at the school. The French painter’s depiction of early man was described by contemporary critics as having simian and/or faun-like features. Gindhart argues that Besnard’s visualisation of an apocryphal Darwinian theory utilized elements of classical beasts and extant apes to create part of an iconography of prehistory. Referencing mythological creatures like fauns and satyrs, as Böcklin had done, would have been appropriate for the academically trained Besnard. Such hybrid creatures tapped into a relatively universally understood cultural reference to legendary beings that embodied human thinking and bestial instinct, as Karl also notes in the previous essay. But unlike Böcklin’s, Besnard’s figure is immediately recognised as completely human; the mere subtlety of the simian/faun features indicated to perceptive critics a “primitive” ancestor of modern man, who is the subject of another scene in Besnard’s decorative cycle. Furthermore, Gindhart points out that common ideas associating “bestial” features with the primitive (as well as with criminality and with non-Caucasian physiognomies) allowed *Primitive Man* to be seen in even greater contrast to *Modern Man*’s (Caucasian) refinement and successful socioeconomic progress, appearing as he does among the trappings of Western industrial capitalism and bourgeois family life.

Gindhart’s discussion of Besnard’s *Primitive Man and Modern Man* are only part of her larger examination of the artist’s painted programme for the School of Pharmacy, executed between 1883 and 1888. She analyses the terms of the prestigious commission, its execution, and its critical reception, in order to understand more fully the rationale for its subjects and their arrangement *in situ* in the school’s vestibule. Gindhart
focuses particularly on the series of eight smaller paintings that represent a sweeping history of the earth from prehistory to the nineteenth-century present. Citing the critic Louis Gillet, who found these paintings the most successful attempt to adapt scientific theories to artistic ends, she explains how others came to describe Besnard’s working method for depicting prehistory as similar to that of Georges Cuvier of the National Museum of Natural History. Cuvier believed that known fossils and other fragmentary remnants of prehistoric creatures could be used to reconstruct a whole organism based on a logical correlation of parts. Similarly, many imagined that Besnard, who Gindhart admits was familiar with the collections of prehistoric antiquities at the Museum of National Antiquities, artistically reconstructed prehistory using objects in such collections.

Without discounting Gillet, however, Gindhart argues that the paintings’ success lies not in their reliance on specific artefacts, but in their lack of factual specificity. This scientific ambiguity derives from the fact that although biological, geological, and oceanic changes are shown to take place across the series’ chronology, there is no attempt to specify the process of that change or the precise timeframe in which it takes place. The result is an artistically conceived scientific symbolism, a depiction of a secular Genesis no less epic or didactic than famed paintings of biblical accounts. Thus, Gindhart concludes, it fulfilled the needs of the positivist Third Republic while not compromising Besnard’s artistic vision of “deep time.” Moreover, the painting’s symbolism remained timeless and uncompromised as scientific debates modified evolutionary theories over subsequent decades.

The contradistinction of prehistoric and modern man, which Gindhart discusses in relation to Besnard’s depictions for the School of Pharmacy, is also central to the controversy surrounding the exhibition of Fernand Cormon’s painting of Cain and his family at the Salon of 1880. In Chapter 8, “The Complexity of a ‘simple Greek statue’: Classicism in the Age of Evolution,” Martha Lucy examines the critical reception of Cormon’s biblical scene. Like the figures in Besnard’s *Primitive Man*, Cormon’s Cain and family are depicted as prehistoric hunter-gatherers with distinctly atavistic qualities and other signifiers of their status as less-evolved. The recasting of an Old Testament subject as a group of rough and ready cave dwellers was unflattering, potentially sacrilegious, and shocking to many. While some were excited by and enthusiastic about the artist’s erudite application of contemporary evolutionary theory to historical painting, others were horrified when confronted with their partially evolved biblical ancestors. Lucy particularly focuses on one critic’s comment: Louis Enault
was disgusted at the vulgarity of Cormon’s figures and wished to replace the entire scene with a “simple Greek statue.”

Lucy points out that while it is easy to understand Enault’s comment as a fairly predictable aesthetic response to what he perceived as an ugly breach of academic convention, she argues that, seen within the context of the evolutionary debate, Enault’s desire for a classical figure reveals a great deal more than mere aesthetic preference. She demonstrates that the response, with its proposal of the classical body as the alternative, indicates a pervasive anxiety over the evolutionary body. Central to the claims of evolutionary theory was the lack of fixity of form; however, according to Lucy, the classical body came to stand for the immutable perfection of humanity. It became an icon, she says, bound up with meanings beyond aesthetics to include a denial or repression of Darwinian ideas.

To make the matter more plain, Cormon’s picture was exhibited side-by-side with Puvis de Chavannes’s *Ludus Pro Patria*, a celebrated example of late-nineteenth-century classicism that highlighted the immutability of ideal human form, particularly when compared to Cain. The juxtaposition of the paintings was not only a physical reality of the Salon, but also a main feature in the critical responses to the pictures. Within the evolutionary debate, the classical body stood for fixed, unchanging, boundaries of form. It was stability, while the evolutionary body was flux. Lucy argues that the classical body’s visualisation had the potential to erase evolutionary theory, repress the anxiety over man’s animal origins, and to deny the idea that modern man’s civilisation was but a veneer that could be easily pierced by lingering base instinct.

In her essay, Lucy is careful to explain that anti-evolutionary notions of the classical body were different from late-eighteenth-century ones. Neoclassical theorists embraced the classical body in Winckelmann’s terms as an empty ideal that rid the human form of the imperfections of nature. Nineteenth-century critics in the era of evolutionary debate, however, upheld the classical body not for what it lacked (natural imperfection), but for what it had—indeed, as Lucy says, for what it insisted upon: the immutable perfection of the human species. Darwinian supporters, on the other hand, likely found earlier humans to be perfectly suited for their particular moment despite the suggestion that evolutionary necessity seemed to imply that imperfect forms were constantly moving toward unattainable perfection. In other words, artists and scientists on both sides of the evolutionary debate, like the artists and scientists discussed in each of the preceding chapters, were equally concerned with
visualising the unseen, imagining the unknown, and perfecting (or finding perfection in) the natural.

Notes


In an age that identified vision as the means to investigate and understand nature, perhaps the worst tragedy that could befall a naturalist was to lose his eyesight. This was the unfortunate condition of Georg Everhard Rumphius (1627-1702), a German doctor, naturalist, and collector living in the Moluccas in the employ of the Dutch East India Company. Despite this considerable challenge, over the second half of the seventeenth century Rumphius amassed an incomparable collection of natural objects, many of which he sold to the Grand Duke of Tuscany as the basis of an impressive natural history cabinet. Rumphius also had many items drawn, and wrote or dictated their scientific descriptions in preparation for publication. These images and texts furnished the material for two titles appearing posthumously over the first half of the eighteenth century, *The Ambonese Curiosity Cabinet* (1705) and *The Ambonese Herbarium* (1741-55). Both works included the same portrait of Rumphius (Fig. 1-1).

The engraving shows Rumphius, aged sixty-eight, sitting at a worktable crowded with plants, shells and books. Corals and other natural marine products fill the shelf on the wall behind him, while two specimens are suspended with string from nails on the wall. In the foreground, in the lower left corner, a book or notebook is open to a page showing the image of a plant, while the facing page is used to name the authors of the drawing and the engraving. Unable to see the objects on the table, the naturalist fixes his vacant gaze outside the frame of the image and uses his hands to examine the objects on the table. His serious face is tense with
concentration as his hand actively and forcefully investigates the objects it holds. This, clearly, is not a depiction of an invalid but a portrait of a naturalist at work. The Latin encomium underneath the portrait proclaims: “Though he be blind, his mental eyes are so sharp that no one can best him at inquiry or discernment. Rumphius is German by birth but his loyalty
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and pen are completely Dutch. Let the work say the rest” (Rumphius 1999).

The paradoxical portrait of the blind naturalist with incomparable eyesight encapsulates three related ideas that I examine in this essay. First, naturalists considered visual skill the defining trait of their practice and the basis of their method. Collecting and classifying, the twin obsessions of eighteenth-century natural history, were predicated on the ability of the trained eye to assess, possess and order. Nature was investigated through sight, and the eye provided the instrument with which to approach the world as well as the means to discipline it. The investigation of nature depended upon the analysis of visual information, and the naturalist was defined first and foremost as an observer. For this reason, the process of becoming a naturalist revolved around visual training. Naturalists’ notion of sight went beyond the physiological act of seeing to involve an expert type of viewing that involved training and specialised practices of observation and representation—not merely sight but rather insight.

Second, Rumphius’s portrait reminds us that natural history was not only a visually oriented practice but also one that relied heavily on material culture. If the eye was the consummate tool of the eighteenth-century naturalist, this eye was an extremely active creature, in constant motion among drawn or engraved images, specimens in collections, and textual information in manuscript or print. Illustrated books were particularly important to eighteenth-century naturalists, who valued their libraries as much as their specimen collections.1 As I will describe in this essay, books standardised methods for collecting and collating material and established shared guidelines for observing, describing, naming, classifying and representing. In this way, books provided a visual and verbal vocabulary that was shared by naturalists throughout and beyond Europe. They provided standards against which naturalists could gauge the value of their own work, as well as models for them to emulate or react against. Thus, books helped to define and arbitrate a community of competent and relevant reader-practitioners.2 Books also served to demarcate what naturalists actually needed to do in the field, namely, to describe any local productions not included within the European printed inventory of global nature, to rectify any discrepancies, and to resolve incomplete or erroneous descriptions.

Furthermore, printed books provided naturalists with the illustrations they needed to approach nature, with parameters for producing new images, and with a medium for presenting their own contributions to natural history.3 Printed illustrations allowed travellers to ascertain whether the plants and animals they encountered were truly unknown, in
which case they could be introduced into the literature and linked to their discoverer’s name—ideally, accompanied by an image. In the eighteenth century, images provided an entry point to the exploration of nature, functioned as a key instrument for producing knowledge, and constituted the foremost result of natural investigations. Images operated at every point of a trajectory that moved from the collection of natural data to its incorporation into a global inventory of nature through textual description and visual representation.

Third, the engraving intimates that the visual and material aspects of natural history were inextricably linked to European colonialism and global trade. Rumphius accumulated his remarkable collection of natural specimens in the Moluccas, and this provenance mattered to readers of the books that catalogued the collection. Although the ways in which European naturalists and collectors understood natural specimens and nature as a whole changed greatly throughout the early modern period, a constant remained throughout: a predilection for naturalia from distant lands. The reasons for this interest went beyond exoticism, although this was certainly a factor. The collection—of objects, images or textual descriptions—ideally functioned as a microcosm representative of the whole world, whether natural objects formed part of sixteenth- and seventeenth-century Wunderkammern or existed within the ordered cabinets of the eighteenth-century taxonomist who attempted to compile an exhaustive catalogue of nature. Naturalists and collectors, authors and readers, all considered travel, natural history and the exploration of distant and exotic lands to be integrally connected. The French naturalist Michel Adanson, for instance, combined in a single book his descriptions of Senegalese shells with an account of his travels through the region. The book’s title is Natural History of Senegal. Shells; its subtitle, With an Abbreviated Relation of a Voyage to This Country in the Years 1749-1753. In the Preface to the second section, Adanson anthropomorphised shells and presented conchology as ethnographic travel literature. He wrote,

If we examine attentively this new and entirely forgotten population [shells], if we consider in particular the beings that compose it, we will discover in their customs, in their actions, in their movements, in their way of life, an infinity of very curious things, of interesting facts capable of capturing the attention of the avid and intelligent observer. (Adanson 1757: xvi)

In this way, Adanson drew explicit connections between the act of observing, the naturalist’s persona as a capable observer, the study of natural history and the experience of travel. Other authors shared these
associations. For the French pharmacist Fusée Aublet, the most significant problem with European knowledge of American flora in the late 1750s was that the majority of available textual descriptions and images were either inaccurate or incomplete. Naturalists, he urged, desperately needed more exact and complete descriptions and figures, and for these they depended on travellers who could observe, describe and illustrate accurately and appropriately (Aublet 1775: xxvi). As Pierre André de Latreille made clear in his continuation to Buffon’s *Histoire naturelle, générale et particulière*, not every traveller was capable of providing the type of results that would prove useful to naturalists. He explained,

I admire the courage of those travellers who, to enlarge our collections, brave the furies of the vast Ocean, and face a thousand dangers to collect … rare or unknown plants and animals. But I think that zoology would gain more if skilled observers spread throughout different regions of the world studied, at great length and over many years, the natural riches [of those regions]. (Latreille 1802-5, vol. 1: 61)

Skilled ways of seeing served as a mechanism for identifying, translating, transporting, and ultimately appropriating nature.

**Training the naturalist’s eye: visual culture in eighteenth-century natural history**

Carl Linnaeus’s *Systema Naturae* (1735), one of the central works of the eighteenth-century taxonomical turn, proposed not only a system but also a concomitant work procedure based on specialised techniques of observation. The *Systema* presented tables outlining a taxonomy of the vegetal, animal and mineral kingdom. A separate chart provided Linnaeus’s sexual system of botanical classification, guiding the reader step by step through the process of determining to which one of twenty-four classes any given plant belonged. The process consisted of posing a standard series of set yes-or-no questions, with each answer eliminating certain choices until one arrived at the plant’s classification. Linnaeus was proposing not only a taxonomy but also a methodology based on observation, a point made even more clearly a year later when the twenty-four classes were depicted pictorially by the great botanical illustrator Georg Dyonisius Ehret.

Ehret’s table included twenty-four figures, one representing the distinguishing traits of each of the Linnaean plant classes, which are characterised by the structure of the flower and seed. Figure A in the table represented the first class, *monandria*, characterised by having one
stamen; figure B showed the second class, *diandria*, with two stamens; figure F the sixth, *hexandria*, with six stamens, and so on with various combinations of stamens and pistils. The table was reproduced or adapted in countless botanical books of the time, and contributed greatly to the popularity of Linnaean classification, making it appear simple, direct and seemingly foolproof. The shift from chart to table offered a different representational technique as well as a move towards making methodology invisible. By eclipsing the interrogation procedure, it suggested that the Linnaean system provided an immediate taxonomy based exclusively on sight, without the need for logical analysis. In order to classify a plant, it promised, the botanist needed simply to look at a flower, count its stamens and pistils, and note their structural arrangement. The chart transported theory out of the page, internalising it within the eyes of the naturalist.

Linnaeus’s *Philosophia Botanica* (1751) pushed the emphasis on visuality further. The book, a collection of aphorisms on botanical principles and practices, provided definitions of botanical terms as well as parameters for the naturalist’s behaviour. Much of the *Philosophia* was dedicated to training the botanist as an observer and a classifier through textual and visual instruction that detailed what to look for when studying a plant. Linnaeus took a special interest in combining textual and visual instructions. The eleven plates in the book depict the different possible structural variations of each part of the plant, providing a visual botanical glossary. The first plate presented sixty-two possible leaf shapes, with the accompanying text providing a Latin term for each type—specialised observation practices connected form to classification as well as to specialised terminology (Fig. 1-2). The other ten plates in the book extended this visual vocabulary to offer templates for describing how the leaves are aggregated into branches, how the branch is positioned into the stem, what the roots look like, and so on, ending with a depiction of a type of wooden armoire in which herbarium specimens would be stored. These plates were copied or adapted in practically every single botanical textbook, and provided a visual and verbal vocabulary shared by naturalists throughout and beyond Europe. Rather than books to read, *Systema Naturae* and *Philosophia Botanica* were books to use. Botanical eyes and botanical memories were trained through laborious exercises in viewing comparatively and establishing correspondences. Linnaeus was proposing not only a taxonomical system and a methodology based on observation, but a specific type of observation, in which objects were always seen against one another. The practice of natural history involved a constant triangulation among specimens, textual information and images.