MERCHANTS & *Marvels*

Commerce, Science, and Art in Early Modern Europe

Edited by

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Routledge
New York London

Published in 2002 by

Routledge
29 West 35th Street
New York, NY 10001

Published in Great Britain by

Routledge
11 New Fetter Lane
London EC4P 4EE

Routledge is an imprint of the Taylor & Francis Group.

Printed in the United States of America on acid-free paper.

10 9 8 7 6 5 4 3 2 1

Library of Congress Cataloging-in-Publication Data

Merchants and marvels : commerce, science, and art in early modern Europe / edited by Pamela H. Smith and Paula Findlen.
p. cm.
Includes bibliographical references and index.
ISBN 0-415-92815-X (hb) — ISBN 0-415-92816-8 (pbk.)
1. Art and science. Nature (Aesthetics). 3. Commerce—Europe—History. I. Smith, Pamela H., 1957– . II. Findlen, Paula.
N72.S3 M47 2001
704.9'43'094—dc21 2001016008

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83. AGI, Justicia, 1146, N. 3, R. 2, block 3, image 359, undated spring 1545 statement from Sancho Gutiérrez. Emphasis mine.

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From Blowfish to Flower Still Life Paintings

Classification and Its Images, circa 1600

CLAUDIA SWAN

At its broadest span, this essay is about how early modern (pre-Linnaean) natural history organized its experience of the natural world. More narrowly, I am conerned with the *visual* organization of the natural world by means of naturalistic figuration (mimetic pictures) and schematic representation (grids). Much of the chapter will focus on naturalistic representation in the classification of blowfish in the first decade of the seventeenth century in the Netherlands, and on grids and schematic tables in natural history of the period. I conclude by suggesting that the coexistence of these two modes of representation is a crucial feature of early modern natural history and that, taken together, they may help to explain how botanical still-life paintings are structured, compositionally and epistemologically speaking. In other words, this essay treats the organization of the natural world by images and the impact of natural history's modes of visualization on the new genre of flower pictures ca. 1600.

CHAOS IN THE MICROCOSM: THE CASE OF ULISSE ALDROVANDI

Ulisse Aldrovandi, who died in 1605 at the age of 83, ranks among the most renowned sixteenth-century natural historians. Aldrovandi was professor of logic and philosophy and lecturer in simples (medical preparations from plants and minerals) at the University of Bologna. From 1568 until his death he served as director of the university's botanical garden, which he helped found. During his lifetime, Aldrovandi was known to European medics, naturalists, princes, clerics, pharmacists, and scholars as a collector who amassed a truly staggering number of natural specimens, which he housed in a kind of proto-museum, and many of which were illustrated in his massive volumes on insects, birds, wood, metals, monsters, and other classes of *naturalia*.[1] His

fame endured: in 1750 the great naturalist Georges-Louis Leclerc, Comte de Buffon (1707–88), dubbed him "the most diligent and knowledgeable of naturalists" and philosopher/encylopedist Denis Diderot (1713–84) referred to him as "the most universal and complete modern naturalist."[2]

Diligent, knowledgeable, universal, and complete: these adjectives were used even in the sixteenth century to describe Aldrovandi's efforts to observe the natural world and to make it available for observation. Buffon and Diderot, taken together, offer an apt, if antithetic, introduction to Aldrovandi's natural history. Unlike his exact contemporary Carl von Linné/Carolus Linnaeus (1707–78), Buffon did not believe in the necessity of systematic taxonomy. Diderot in his turn drove the production of that immense and powerful machine of calibrated knowledge, the *Encyclopédie*. While Aldrovandi amassed, arranged, studied, taught, and published as many specimens of the natural world as he could get his hands on, he did not find it necessary to offer a systematic mode of organization for them. In the sixteenth century, naturalists resorted regularly and without apology to what subsequent natural historians would take to be arbitrary and convenient modes of organization.[3] The alphabet, for example, was sufficient for Leonhart Fuchs, one of the three so-called fathers of German botany and the author of a suite of volumes on the plant world first published in the 1540s. Generally speaking, very broad morphological or Aristotelian classes served as the brackets between which sixteenth- and seventeenth-century naturalists arranged the stuff of nature, which they so eagerly tracked down, studied, observed, dissected, dried, bought, sold, taught, published, displayed, advertised.[4]

In 1595, Aldrovandi described his collection as follows:

> Today in my microcosm, you can see more than 18,000 different things, among which 7000 in fifteen volumes, dried and pasted, 3000 of which I had painted as if alive ("*al vivo*"). The rest—animals terrestrial, aerial and aquatic, and other subterranean things such as earths, petrified sap, stones, marbles, rocks, and metals—amount to as many pieces again. I have had paintings made of a further 5000 natural objects—such as plants, various sorts of animals, and stones—some of which have been made into woodcuts. These can be seen in fourteen cupboards, which I call the Pinacotheca. I also have sixty-six armoires, divided into 4500 pigeonholes, where there are 7000 things from beneath the earth, together with various fruits, gums, and other very beautiful things from the Indies, *marked with their names, so that they can be found* (emphasis added).[5]

Contemporary observers were regularly stupefied by the contents of Aldrovandi's collection—his microcosm, as he calls it here. One visitor wrote of his heart being aflutter and his breath bated in anticipation of seeing all

that Aldrovandi had amassed.[6] In the final years of his life, Aldrovandi arranged to have ownership of what he even called the "eighth wonder of the world" transferred to the city of Bologna, a gift accepted gladly by the city's senators.[7] Aldrovandi's efforts are exemplary of what Paula Findlen has called Renaissance curiosity (as opposed to Baroque wonder), of the efforts to contain the infinite manifestations of nature in a single space—also called a museum.[8] Curiosity, however, did not always sponsor recognizable modes of classification.

One organizing principle for Aldrovandi's efforts, as for his possessions, is to be found in the praxis of medicine. Some of the most noteworthy contents of his museum and others of the time had or were thought to have medicinal application—from bezoar stones to dragon skeletons to myriad plants and spices. But if his own notes are any indication, to enter the space of Aldrovandi's microcosm was to give way to what seems from the present perspective of the life sciences relative chaos—chaos in pigeonholes and armoires. Likewise, the headings under which he collated his working notes were distinctly rudimentary from the point of view, say, of systematic taxonomy. They were arranged alphabetically, topically, and geographically. The staggering number of images of the contents of the collection he had made and that he stored in the collection itself is important too. Not because these images contributed to the classification of the contents, but because the net effect of their presence would have been to mirror, and to multiply, the vast number of items at hand. It comes as something of a relief when Aldrovandi tells us that the forty-five hundred pigeonholes in the sixty-six armoires in which he had placed seven thousand dried specimens were "marked with their names, so that they can be found."

THE ENDS OF NATURALISM: BLOWFISH

In the brief description of his collection cited above, Aldrovandi enumerates the specimens he owns in the same breath as images of such objects, which in their turn constitute a substantial portion of the whole. The images Aldrovandi cites are continuous with the rest of the collection in a significant regard: they are, as we know from the woodcuts made for publication in the volumes he authored, naturalistic representations of natural specimens. They were, as he specifies here and elsewhere, drawn or painted *al vivo*.[9] What role do such images—purposefully morphological characterizations—play in contemporary classificatory schemes and efforts?

The blowfish and, specifically, the blowfish as it came to be represented in the context of Dutch natural history ca. 1600 may offer an answer to this question. The blowfish was a widely popular specimen in natural history ca.

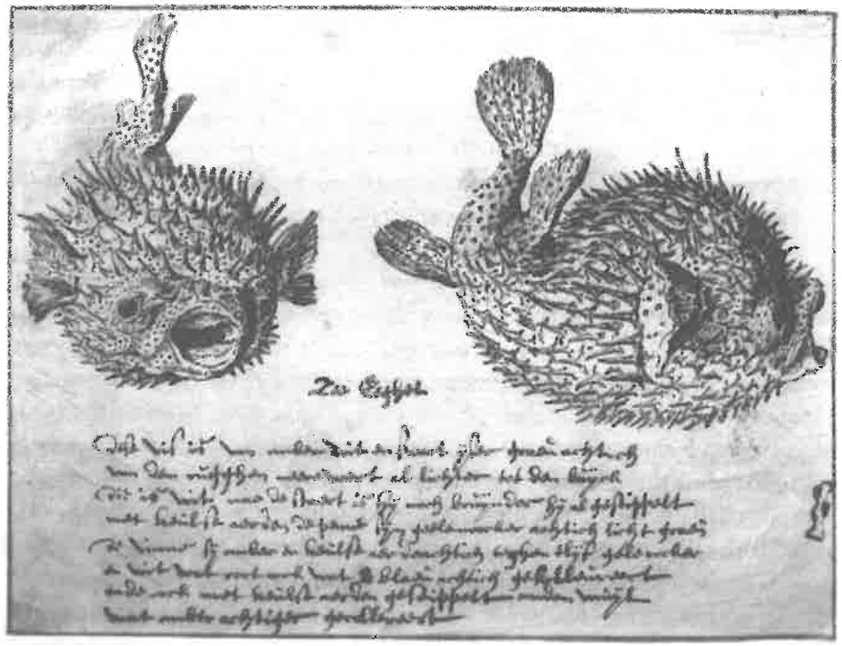

Figure 4.1 Jacques de Gheyn II, *Blowfish*, pen and ink drawing, ca. 1605 (Rijksmuseum, Amsterdam). Photo courtesy of the Rijksmuseum–Stichting, Amsterdam.

1600, prized for its exoticism.[10] On the evidence of contemporary prints we know blowfish to have been displayed prominently in a number of illustrious collections, where they frequently were hung from ceilings.[11] A single specimen was also depicted by the Dutch artist Jacques de Gheyn II (1565–1629). De Gheyn cultivated close contacts with members of the medical faculty at Leiden University during the years that he lived in the city of Leiden and his drawing of a blowfish is coeval with published accounts by the great botanist and fellow Leidenaar Carolus Clusius (1526–1609) of what Clusius declared to be four different kinds of blowfish. Close analysis of de Gheyn's and Clusius's verbal and pictorial descriptions of the blowfish is especially revealing—of the difference between an artistic representation of a natural historical specimen and a natural historical representation of the same, as well as of the ways in which naturalistic representation served the ends of contemporary classification strategies.

De Gheyn's drawing of a blowfish (*Diodon hystrix;* fig. 4.1), preserved in its inflated form, is dated on stylistic grounds to the first decade of the seventeenth century. It consists of two views of the dead fish, frontal and lateral, and a lengthy inscription. In translation, the inscription reads:

> Sea-Hedgehog—this fish is umber white and iron black grayish/ becoming lighter from the back down to the belly/ this is white toward the tail it is even browner and spotted/ with Cologne earth the spines are yellow ochreish light gray/ the fins are umber and Cologne earthish against the body yellow ochre/ and white somewhat red and also somewhat blueish in color/ and also spotted with Cologne earth and the jaw/ rather umber-like in color.[12]

De Gheyn may have observed this fish in a private collection, or among the natural historical specimens belonging to Leiden University. In 1601, he was commissioned by Dr. Pieter Pauw, professor of anatomy and botany, to engrave a plan of the botanical garden (fig. 4.2).[13] De Gheyn's is a schematic plan, intended to describe the layout of the garden. It contains individual plots in which botanical specimens were planted and from which their identification and uses were taught to students of *materia medica*—the makings of medicines. This practice is illustrated by the figure of the robed professor,

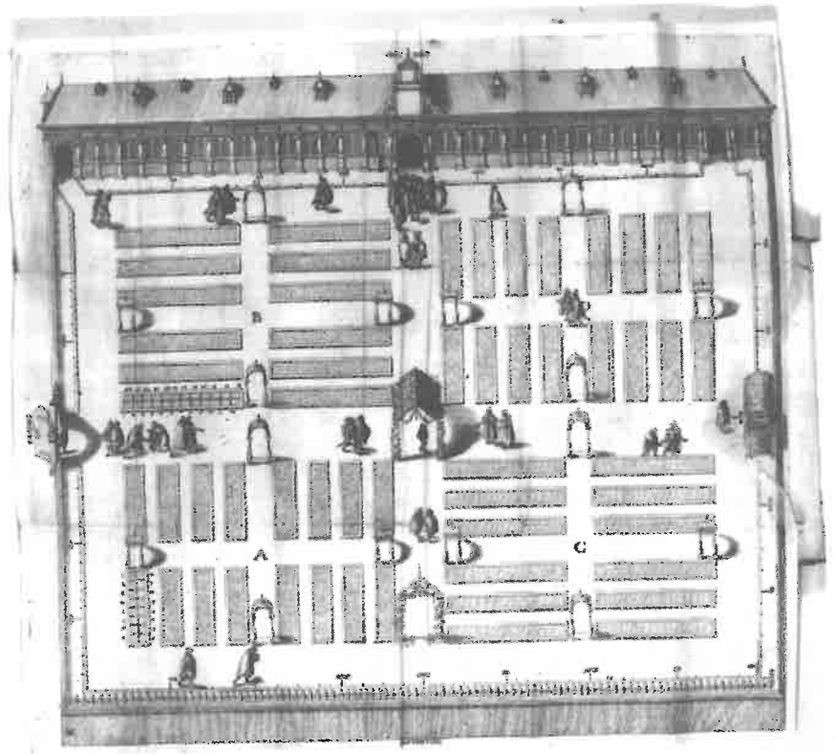

Figure 4.2 Jacques de Gheyn II, *Leiden University Hortus Publicus*, engraving, 1601. Photo courtesy of National Herbarium of the Netherlands, Leiden.

surrounded by an attentive audience, in the distant center of the image; he points to one of the plots in the garden, in much the same way as we know the medical faculty to have taught from the contents of the garden in the years around 1600.[14] In effect, de Gheyn's plan of the garden records its physical characteristics as well as its function within the university curriculum; like the anatomical theater, constructed in the mid-1590s, the university's collection of *naturalia* served as a focal point in medical instruction.

In the gallery at the far, western edge of the garden, which was constructed in 1599, specimens of a variety of *naturalia* were housed. A carcass of a blowfish is listed in the two existing inventories of the gallery, alongside a number of rarities including coral, an imbricated shell, the beak of a foreign bird, an Indian ink pot, a crab, pygmy clothing, two Indian hammocks, walrus teeth, and the like.[15] That the blowfish was a prized item in the collections of the Leiden University is also shown by its inclusion in another plan of the garden, by William Swanenburgh and dated 1610 (fig. 4.3), by which time the garden and the anatomical theater had become tourist attractions.[16] The blowfish was also recorded in a major natural history text written by a close associate of de Gheyn's and the director of the university garden—Clusius's *Exoticorum Libri Decem* (Ten books of exotica), a vast

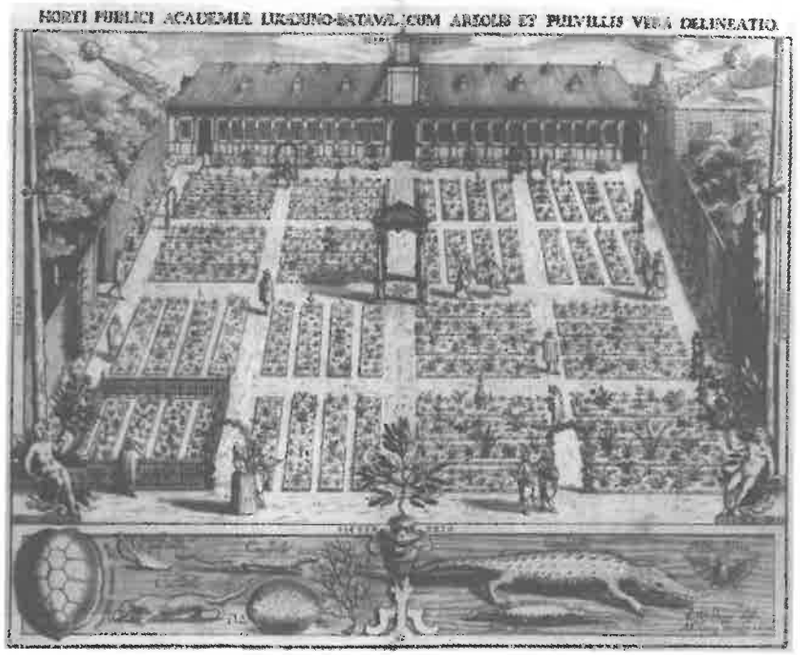

Figure 4.3 Willem Swanenburgh after I.C. Woudanus, *Leiden University Hortus Publicus*, engraving, 1610. Photo courtesy of Rijksmuseum-Stichting, Amsterdam.

compendium of wonders of the natural world Clusius compiled in Leiden and published there in 1605.[17] That de Gheyn would have had access to a specimen of the *Diodon hystrix* in Leiden seems clear; moreover, the status of this fish as an object of curiosity at the time is amply documented.[18] How de Gheyn views the blowfish and the modes of verbal and visual description he engages to describe it are what is crucial here.

De Gheyn scanned the surface of the prickly orb of fish before him, first from in front of it and in line with its line of sight and then, in the rendering at the right of the sheet, from its right side. Finally, he scanned it again in order to record, in the inscription below, the shifting colors of its body. The continuity between the abbreviated and spiky forms of the drawing and the forms of the text below is suggestive, and the pace with which he describes the alterations of color from the back to the belly and from the fins to the body (the text is entirely without punctuation) is consistent with the sustained pattern of lines defining the fish above. Significantly, the descriptive responsibilities of the verbal and the visual accounts de Gheyn provides are distinct: the drawing of the fish conveys the form, and the inscription the color. De Gheyn's written description does not reiterate what is made visible in the accompanying image; it supplements it. And by describing the colors of the fish in the colors of pigments (Cologne earth, umber white, iron black grayish, yellow ochreish light gray) de Gheyn describes the fish *as a picture*.

De Gheyn's drawing offers a verbal description that is functionally distinct from the visual description it provides. His verbal description is of a different order—the order of color, of a painter's colors. The inscription does not allude to an external frame of reference beyond the palette, and in this sense the description de Gheyn proposes is entirely self-referential: "This fish" to which de Gheyn refers in the opening line of the inscription is no longer the fish hanging in the Leiden gallery, or the fish returned to the Netherlands after long voyages, the component of a collection of *naturalia*, or this fish as compared to any similar or other fish. "This fish" is the fish of de Gheyn's drawing, the fish of a picture in the making.

Reconstituted according to de Gheyn's indications—colored in—such a picture would effectively convey the forms and colors of this exotic natural specimen. To a very significant extent these were the characteristics according to which distinctions of class and sort were made within contemporary natural history.[19] That this is so is borne out in Clusius's accounts of the natural world in general, and in his description of the *Diodon hystrix* in particular, which is directly relevant to assessing the status of de Gheyn's description. In his voluminous *Exoticorum*, Clusius documents the four fish he identifies as blowfish in the course of four separate chapters of book 6. Of the first three of the fish he describes, Clusius writes that he had observed them hanging in "museums" belonging to individuals in Amsterdam and in Montpellier.[20]

Each of Clusius's entries on these four fish — what he calls the *Histrix piscis* and three related fish, which, following Guillaume Rondelet, the French icthyologist, he names the *Orbis spinosus*, the *Orbis muricatus*, and the *Orbis muricatus alter*— is accompanied by a woodcut that represents the fish described (figs. 4.4, 4.5, 4.6, and 4.7).[21]

In his text, Clusius makes reference to drawings that served him variously in the process of classifying the specimens he describes. One acquaintance, Jacob Plateau, donated drawings of two of the fish;[22] the Leiden pharmacist Christian Porret is credited with having provided Clusius with another.[23] At one point Clusius states that a drawing was made for him to enable him to compare specimens.[24] Clusius's dependence on images in the course of assembling his account of the *Diodon hystrix* is noteworthy; that each of his entries is illustrated with a woodcut reflects a conviction, amplified in his text, that images convey information crucial to description and some form of rudimentary classification. Within the context of late sixteenth-century natural history, the combination of text and image here is entirely conventional. But if Clusius's descriptive method exemplifies the industry standard insofar as it corresponds to the manner in which verbal and visual description are coupled throughout natural history writing of the time, his account of these four fish also provides an excellent example of the limits of contemporary classificatory strategies.

The degree to which Clusius relies on external, observable characteristics in order to describe and classify the specimens he records is typical of contemporary natural history. Clusius's verbal description of the *Histrix piscis*, for example (fig. 4.4), amounts to a meditation on the impenetrable surface of the spiny fish. Its dimensions are given, measured from its shriveled lips to the root of its tail and around its center, and then the specimen is, as it were, fleshed out by a description that dwells on its superficial characteristics. He seems to write as he scans the object: it is "without scales and covered merely with a whitish skin or hide, strewn with firm and sharp spines on all sides." A description of its somewhat protuberant mouth and wrinkled lips and teeth follows, with conjectures about the predatory techniques of the fish; from the eyes, with their raised eyebrows and four prickly spines, Clusius moves along the body. The dimensions of the fins and the coloration of the body are noted ("the skin of the belly is white, and the back is dark, with many distinct dark spots") and, finally, the orifice through which the fish is thought to breathe and the differing inclinations of its spines are recorded.[25] Ultimately, he informs the reader that he is unable to discuss the internal structure of the fish, which was not native to local waters, because it was available to him only in dried form.[26]

If on the one hand the lack of live blowfish in the Netherlands compounded their exoticism, it also made for highly unstable classification.[27] Depending on

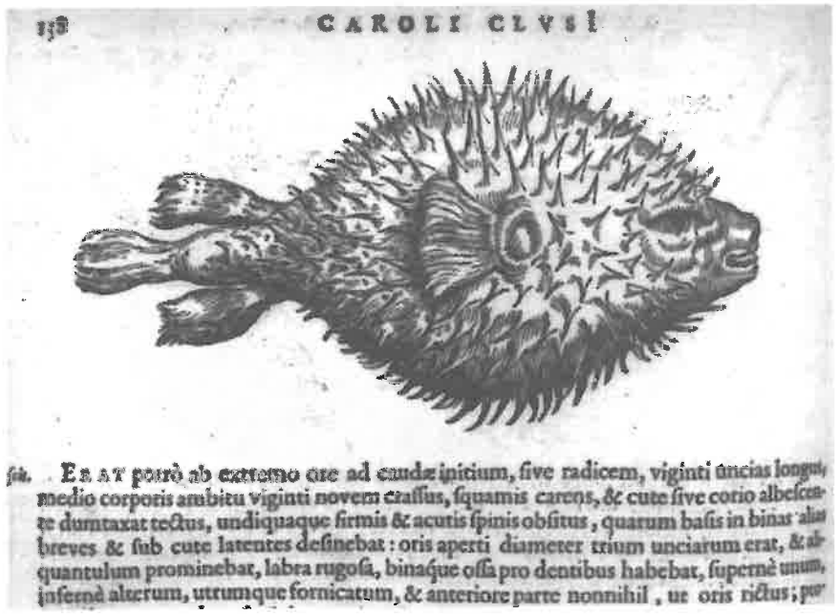

Figure 4.4 Anonymous, *"Histrix Pisicis,"* woodcut in Carolus Clusius, *Exoticorum Libri decem*, Leiden, 1605. Photo courtesy of the National Herbarium of the Netherlands, Leiden.

Figure 4.5 Anonymous, *"Orbis spinosus,"* woodcut in Carolus Clusius, *Exoticorum Libri decem*, Leiden, 1605. Photo courtesy of the National Herbarium of the Netherlands, Leiden.

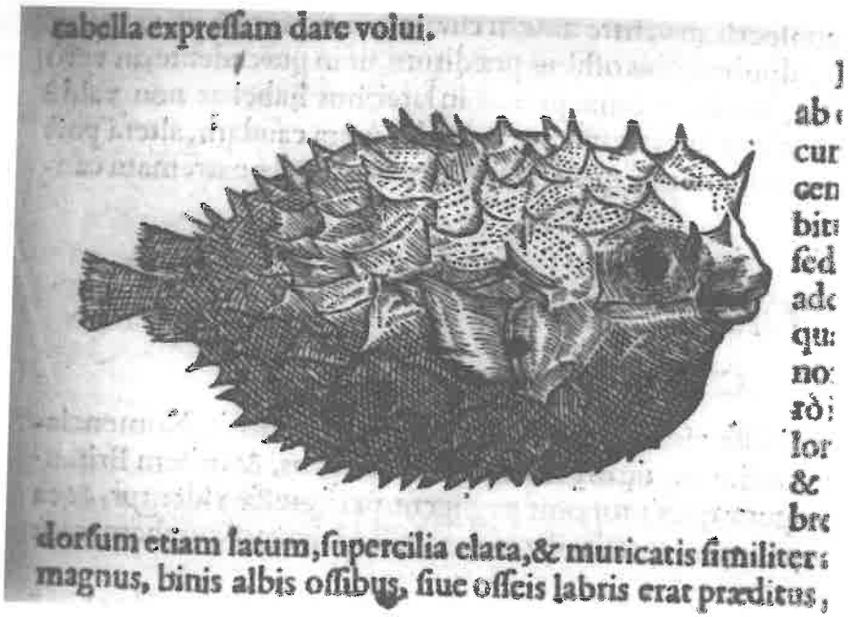

Figure 4.6 Anonymous, *"Orbis muricatus,"* woodcut in Carolus Clusius, *Exoticorum Libri decem*, Leiden, 1605. Photo courtesy of the National Herbarium of the Netherlands, Leiden.

the conditions under which they were imported, specimens were not always intact, or they had been carelessly dried and so were deformed. To Clusius and his contemporaries, variegation of form, however, pointed to differences of biological sort or kind, rather than to the uncontrolled means of procuring specimens. In fact, the four fish Clusius describes and names individually are probably all of a single species — the *Diodon hystrix*. It is on the basis of external, visible, quantifiable characteristics that Clusius isolated what he perceived to be four separate kinds of fish, and his dependence on images in the classification of varieties of the *Orbis* demonstrates this to a fault.

Throughout Clusius's *Exoticorum*, as also in most contemporary natural history publications, images served to complement verbal description; they also, where they were the only available evidence, served as a basis for it, as well as for classification. Insofar as the criteria for classification Clusius uses are reducible to form and color, they amount to information an image can impart. It is especially significant that, within Clusius's account of these types of fish, the *Orbis muricatus alter* (fig. 4.7) is recorded as a variant solely on the basis of an image provided by an acquaintance. It was not possible, Clusius writes, for him to observe this particular fish, "but I received from Jacob Plateau a colored picture of it." This image was later supplemented,

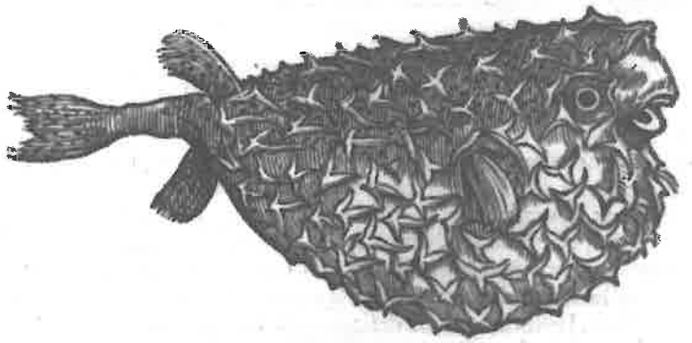

Figure 4.7 Anonymous, *"Orbis muricatus alter,"* woodcut in Carolus Clusius, *Exoticorum Libri decem*, Leiden, 1605. Photo courtesy of the National Herbarium of the Netherlands, Leiden.

Clusius notes, by information Plateau provided regarding the dimensions of the fish.[28] Because the criteria for classification Clusius engages are more or less exclusively descriptive and quantitative, images may even play a subversive role: classificatory strategies were woven around images taken on faith.

That Clusius depended on images to supply him with the information necessary for purposes of classification is evident in his works on the plant world as well. Given Michel Foucault's arguments for the "epistemological precedence enjoyed by botany" among the natural sciences of the classical age, it is perhaps surprising that Clusius should have relied on images of fish to the extent that he did. Foucault writes:

> The area common to words and things constituted a much more accommodating, a much less 'black' grid for plants than for animals; in so far as there are a great many constituent organs visible in a plant that are not so in animals, taxonomic knowledge based upon immediately perceptible variables was richer and more coherent in the botanical order than in the zoological. . . . Because it was possible to know and to say only within a taxonomic area of visibility, the knowledge of plants was bound to prove more extensive than that of animals.[29]

In his works on plants, which culminated in the publication in 1601 of his *Rariorum Plantarum Historia*, Clusius supplemented his descriptions of flowers, for example, with considerations on relative scale, the time of the year they blossom, and their provenance; but the characteristics most crucial to their classification are those that can be observed in the immediate presence of the specimen.[30] Or, as we have seen in the case of the *Orbis muricatus alter*, those that can be recorded pictorially. In his groundbreaking chapter on tulips in the *Rariorum*, Clusius describes a variety of dwarf tulip within the category of the "intermediates"; it blossoms between the "early" and the "late" varieties. This class is described generally as follows:

> The dwarf [intermediate] tulip is not more than a foot high, usually even less, and in its leaves and flower it strongly resembles the early tulip. All its segments are pointed, but the outer ones are much longer, externally dull red but at the outermost margins greenish; the inner segments are of a brilliant, fiery red throughout. The claws are yellow and radiating, but marked with a jet-black patch in such a way that the latter appears encircled by a mere golden aureole and bears some likeness to an eye; the filaments and their anthers are blackish. It should be noted that its bulbous root is woolly; the outer membrane enveloping and covering the substance of the bulb is so tightly filled with an abundance of dense, white, soft stuffing that it must form a very soft resting place for the bulb.[31]

From the opening sentence of his description, Clusius moves the reader to imagine the plant described. The dwarf tulip resembles the early tulip in its overall appearance; and in the more specific rendering of the appearance of this flower, we are led from part to part by gradations and shifts of color. At the center of the plant, and of the description, we encounter in an almost specular manner (we are looking into the tulip from above, observing the appearance of the golden aureole) "some likeness to an eye." The sensual engagement with the object, which culminates in an empathic description of the outer membrane of the bulb ("a very soft resting place" for it) is driven by a single organ—the eye.

One further example of the dwarf tulip is discussed by Clusius in the text immediately following that cited above. Here again, as in the case of the *Orbis muricatus alter*, Clusius incorporates this specimen into his account on the basis of an image alone, and in the absence of actual experience of the specimen. "Also another kind of dwarf tulips is found," he writes, "which, however, I have not seen."

> But I received a drawing in natural colors ["*iconem suis coloribus expressam*"] of it in the year 1596 from the learned Johan de Jonge, Minister at Middelburg, to which had been added the following description:

> "I send you a picture ['*contrefeytsel*'] of a certain tulip, drawn after the plant itself, that is to say of natural size in regard to the plant as well as to the stalk, the flower, the leaves (which should have been drawn slightly longer and narrower) and the bulb, which I dug up in order to enable the artist to properly draw it. . . . "
>
> The whole plant, then (as far as I have been able to gather from the drawing), is not bigger than the palm of a hand, producing four narrow, keeled leaves resembling those of the Montpellier tulip, from among which arises a little stalk of the height of an inch or a little higher, leafless (in contradistinction to the habit of other tulips), purplish green, and carrying on its top a flower consisting of six segments, externally somewhat purplish, internally whitish, its center occupied by an oblong pistil fenced in by six yellow little stamens. . . . That it has flowered in April I deduce from the fact that my correspondent sent me the drawing by the beginning of May.[32]

Sustained observation and morphological comparison are the means to classification, and to the extent that these processes depend on the visual aspects of the specimen to be classed, an image "drawn after the plant itself" and "in natural colors" was deemed sufficient to supply the necessary information.

Such images as Clusius cites and publishes mark the limits of his analysis, which depended crucially on visually apprehensible information. The case of Clusius is exceptional to a degree: unlike many of his contemporaries, he had relatively little interest in the pharmaceutical properties of the plants and other natural objects he described. In fact, it is Clusius who is most renowned for having studied and cultivated rare and exotic species of flowers—tulips, lilies, and other foreign bulbous varieties—as curiosities rather than as remedies. This is not to say that the images he relied on were any different from the images his fellow "fathers of Netherlandish botany" Rembertus Dodonaeus (1517–85) or Matthias Lobelius (1538–16), for example, included in their voluminous accounts of the plant world. Indeed, many of the woodcuts in Clusius's publication were printed from woodblocks in the possession of his publisher Cristoffel Plantin that were also used in Dodonaeus's and Lobelius's great herbals.[33] Clusius's taxonomic efforts, though, were driven by morphological rather than utilitarian (pharmaceutical) concerns. And in this sense images could be said to play a distinct role in his efforts, in principle if not always in fact.

There are two crucial differences between Clusius's verbal description of the "porcupine fish" and de Gheyn's inscription on his drawing of the *Zee-Eeghel*. De Gheyn shows no concern with the dimensions of the fish or its

origins or the relation of this dried specimen to the living fish; and the terms in which he describes its coloration are in effect painterly. It is in the verbal, not the visual, information imparted by de Gheyn's image that we can locate its functional prerogatives; it is only its inscription that distinguishes de Gheyn's image from those published by Clusius. It should be clear from the foregoing that sixteenth-century natural history depended on morphological description to such an extent that it would have allowed for the assimilation of precisely this kind of image for scientific ends. Nothing is intrinsically scientific about either de Gheyn's or any of Clusius's or his acquaintances' images; they are capable of being impressed into service of a scientific kind. They become the labels, in a sense, behind which names may be stored.

This circular tale is intended to call attention to the ways in which naturalistic representation served and furthered the ends of a natural history concerned, as Foucault put it, with "the nomination of the visible."[34] Elsewhere, I have written at some length about the role of verifiably naturalistic images—images that could stand in for what they represent—in natural history of this period.[35] I want now to call attention to a different form of visual representation common, not to say integral, to this natural history. This is the grid, the schematic, rectangular representation that so very frequently occurs in the context of the practice and publication of natural history in the sixteenth and early seventeenth centuries.

TABULATION

It is difficult, when examining the relations between visual representation and the praxis of natural history in the early modern period, to overlook the grid and its affiliate, the tabular diagram.[36] Examples abound. Matthias Lobelius's 1581 volume on plants, one of the most renowned botanical publications of its time, concludes with a striking section, "Vande Succedanea," which consists principally of a series of nearly twenty schematic grids (fig. 4.8).[37] Lobelius's herbal shares the distinction, with the publications of his contemporaries Dodonaeus and Clusius, of being copiously illustrated—each of the roughly thirteen hundred pages of text contains at least two woodcuts. The grids in the concluding section of the book come as something of a surprise, given the predominance of naturalistic images overall. The title of this last section of Lobelius's voluminous publication specifies that the individual tables illustrate which dried substances—herbs, roots, flowers, seeds, resins, gums, stones, woods—may be substituted for others for medicinal ends. Lobelius's grids or "tables," as he calls them, offer suggestions for the organization of dried specimens in what Aldrovandi called

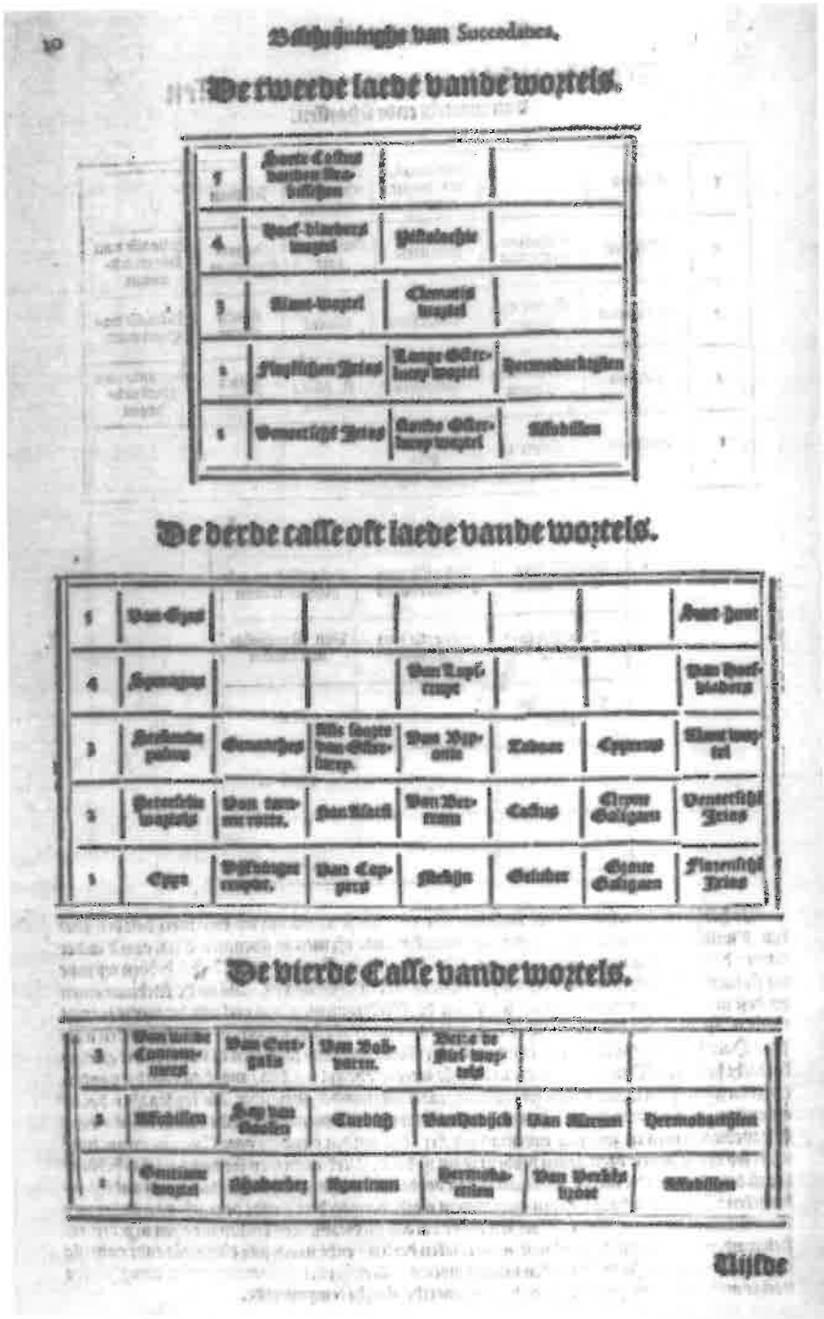

Figure 4.8 Anonymous, woodcut in Mathias Lobelius, *Kruydtboeck*, Antwerp, 1581. Photo courtesy of the National Herbarium of the Netherlands, Leiden.

"pigeonholes"—that is, compartments or drawers in larger pieces of furniture. The pigeonholes schematically represented in the Lobelius woodcuts were intended to correspond to the drawers of a pharmacist's cabinet; the scheme according to which their contents are ordered is a functional—and distinctly pharmaceutical—one.

The kinds of specimens itemized in these woodcuts were, as we have seen in both Aldrovandi's case and the case of the Leiden botanical garden, collected and studied in the immediate proximity of living specimens—plants in particular. The basic units of the Leiden University garden (figs. 4.2, 4.3) are similar to those of numerous early modern academic gardens: multiple individual plots, which in Leiden were arranged in larger rectangular beds. They are itemized and numbered in the plot at the lower left of de Gheyn's plan and in the plot at the far lower left of the upper left quadrant (fig. 4.2). Each small plot of the Leiden garden—in 1594, there were fourteen hundred—contained five specimens at most, and generally speaking one or two.[38] None of those specimens, incidentally, is represented in de Gheyn's plan of the garden. This is particularly interesting in light of the fact that this engraving was produced in conjunction with Professor Pieter Pauw's publication, in 1601, of a catalog of the "Hortus publicus" or public garden.[39] Pauw's is a strange catalog, for it consists of a text preface followed by pages and pages of sets of rectangular boxes (fig. 4.9).[40] Pauw explains in the preface that students of plants were to adapt the catalog to their own experience—to take it with them to the garden and to fill in the rectangles with the names of the plants growing in the rectangular plots of the garden. The space of phytographic experience was, indeed, the rectangular grid. Active phytographs translated their experience of the plots de Gheyn represents in bird's-eye view into the spatially coordinated charts, or tables, of the plants the plots contained. This translation corresponds more or less directly to the way in which the contents of Lobelius's herbal—a series of individual, naturalistic descriptions of plants—are staged against the pigeonholes of the schematic cabinet.

The assemblages of medicinal, protobotanical, zoological, icthyological, ethnographic, mineralogical data such as we know Aldrovandi to have cultivated, and medical professionals throughout Europe in the sixteenth and seventeenth centuries to have studied, were consistently structured and represented by way of the grid. The great and widely traveled Dutch doctor Bernardus Paludanus (1550–1633), for example, amassed a collection of *naturalia* (plant, animal, and mineral specimens) and *artificialia* (primarily ethnographic specimens) at the end of sixteenth century that, although holed away in the northern port town of Enkhuizen, was renowned throughout Europe.[41] In a series of brilliant protocapitalist moves he sold, reconstructed,

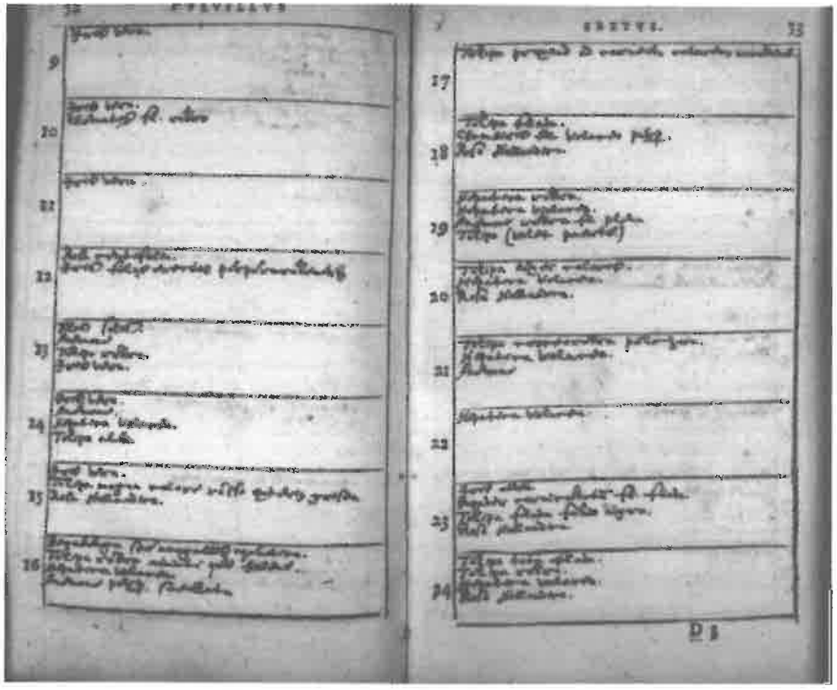

Figure 4.9 Pieter Pauw, *Hortus Publicus*, Leiden, 1601, pp. 52-53. Photo courtesy of the National Herbarium of the Netherlands, Leiden.

and sold again his curiosities, dried animals, minerals, fossils, plants, tusks, and so forth. His collection was the focus of intense admiration on the part of foreigners and native Hollanders alike; hardly a naturalist of the time failed to mention, let alone pay homage to or visit, Paludanus's collection, and the total number of visitors is in the thousands. An elaborate description of Paludanus's collection was compiled by Friedrich of Wurtemberg (1557–1608), one of the doctor's many distinguished guests. The future duke, who was at the time of his visit expanding his own *Wunderkammer* in France, published a catalog of the contents of the Enkhuizen collection in 1603.[42] Notably, it consists of several pages of grids, in which the contents of the collection are itemized (fig. 4.10). These grids seem to correspond to the actual storage of the specimens in the collection, in cabinets or drawers; in all likelihood, Friedrich transcribed the collection in this manner in order to transpose it to his own.

The reason for the widespread use of grids may well be directly related to the problem evident in Aldrovandi's description of his own collection:

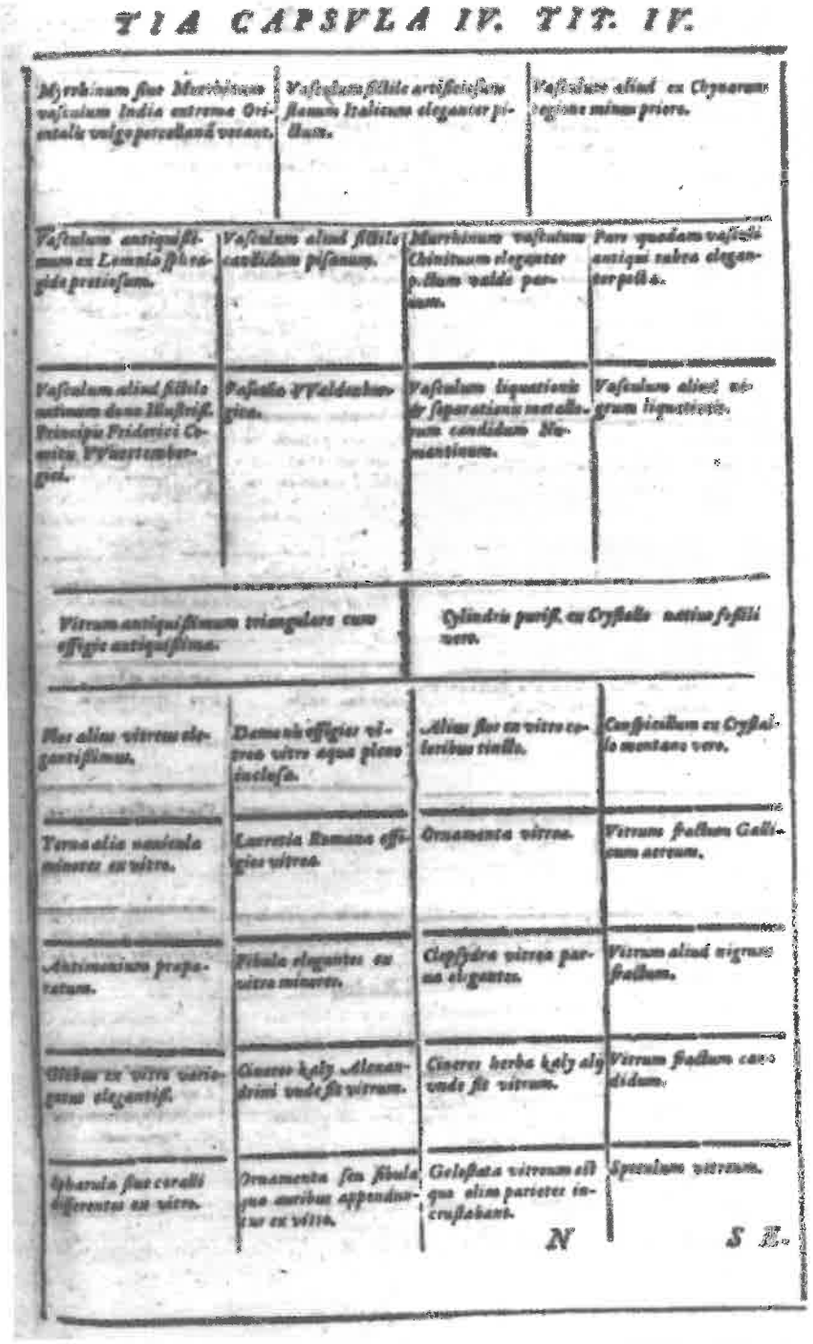

Figure 4.10 *Warhaffte Beschreibung zweyer Raisung*, Tübingen, 1603. Photo courtesy of Amsterdam University Library (ZKW).

Where to put it all? How to pigeonhole the vast ranges of data and specimens that were accumulated? The grid asserts no necessary genetic or relational order between the things it organizes and, crucially, it is infinitely expansive. Nonhierarchical and nonchronological, the grid allowed for precisely the kind of serial differentiation that drove natural history at this moment in its development.

Generally speaking, the death of the naturalist Conrad Gessner (1516–65) is lamented as untimely and said to have deprived contemporary natural history of one of its greatest agents.[43] In a sense, his death by plague was productive, for it encouraged a posthumous production—edited by friends and hangers-on—that invokes and represents Gessner's efforts in telling ways. In 1587, Caspar Wolf (1532–1601), a student of Gessner's and his successor as municipal physician in Zurich, published a handbook under Gessner's name, called *De Stirpium Collectione Tabulae tum Generales, tum per duodecim menses* . . . , or "The general and annual tables for the collection of plants."[44] This small volume consists entirely of a series of lists, called tables. Page after page contains a typographically sparse accumulation of names and various qualities of plants. Wolf's volume is divided into four parts, each of which amounts to a different organizational grid, mapped onto the plant world. The first part, called "The General Table of Plants," contains enumerations of the sorts and parts of plants, which serve as means for differentiating them.[45] The qualities surveyed range from "Substance," which covers both the type of plant (tree, herb, fruit, legume, and so on) and its "constitution" (hard, soft, dense, fragile) to "Quantity," and "Qualities of the Object," to "Location" (where it grows), and, finally, "Virtues" and "Uses." The remaining sections of the book are: "On the Collection of Plants in General," which provides general instructions on when to pick and how to dry plants and seeds;[46] "The First Table of Plants, Flowers and Fruits, enumerated in alphabetical order," a list of plants, by Latin name, with indications of when the plants flower, bear fruit, and seed;[47] and "The Second Table, containing plant names in German and in Latin," which is organized according to the months of the year, and in which the plants are listed according to when they flower, bear fruit, and seed.[48] What do these "tables" add up to? Generally speaking, they provide evidence of the extent to which the tabular model—the serial categorization of entities—structured the experience of the natural world, for Gessner as for Wolf. In the final section of Wolf's handbook, one rudimentary scheme of classification (*Tempus*, or when plants mature) is crossed with another—the alphabet. That overlay of schemes is indicative, of the consistency with which use (and specifically medicinal or pharmaceutical application) structures natural historical experience. Wolf's preface to this volume contains the following specification for "The Use of these Tables":

> These tables will be useful not only for those concerned with pharmacy, or for apprentices to this science, but for all those who have an interest in the study of plants. All those who enjoy, be it winter, summer, or fall, going out in the countryside, following partly their own impulse toward knowledge, and partly driven by the necessity of taking a break and exercising their own bodies—let them take the opportunity, thanks to these tables, to go looking for plants, those they know, and to hope to find new ones.[49]

Here, as in the case of Pauw's interactive catalog of the Leiden garden, a tabular model or grid structures experience of the natural world.

Very much remains to be said about early modern classification. Generally speaking, the period under discussion, the later sixteenth century, is just about the time in which a medicinal, pharmaceutical, use-oriented botany gives way to a more purely morphological botany. As mentioned earlier, Carolus Clusius is often cited as a primary agent of this shift. What is implicit in such claims for a transition from a more or less alchemical relation to the natural world—What are its intrinsic properties? What can it do for me?—to a pre-Linnaean move to systematically account for the natural world, is that the transition brings order with it. One of the aims of this article has been to demonstrate that a certain order—visually represented by the grid—was already operative; recuperating it and reconstructing its applications are crucial in understanding early modern experience, and representations, of the natural world. The coordinates of this order might be reduced to serial differentiation; above all the grid allows for comparison of specimens, which have been extrapolated from their "native" contexts and offered up to the language of Gessner and Wolf, for example. Are such specimens soft? Hard? Oily? Dry? Two-part? Three-part? Trees? Legumes?

The grid or tabular model of organization is artificial and schematic, but not necessarily hierarchical. It is, rather, serial. What is perhaps most remarkable about this mode of natural historical observation and schematization is that it is fundamentally nonconclusive. Just because the vanilla bean is long, brown, and contains a certain number of seeds does not legitimate placing it in any privileged relation to other beans, seeds, or foreign plants. The market will do that. This brings us to a class of images I want to adduce by way of conclusion. More or less contemporaneously with the blowfish and the grids discussed here, a "new" genre of painting emerged full force in northern Europe. The first decade of the seventeenth century saw the production of a significant number of these paintings, which conform in technique and subject matter, and had not previously been widely produced or generally marketable. By the mid-seventeenth century, they were countless. Jacques de Gheyn II himself is credited with having painted one of the first three. This "new" genre is the flower still-life painting which

Figure 4.11 Jacques de Gheyn II, *Flowers in a vase and small animals*, watercolor and gouache on vellum, 1600. Photo courtesy of the Fondation Custodia (Coll. F. Lugt), Institut Néerlandais, Paris.

typically, in the early years, consists of numerous flowers gathered together in isolation, and offered statically to the viewer's gaze.[50]

The flower still-life attests to sustained interest in naturalistic representation of the blowfish kind; each painstakingly rendered specimen stands in for its real counterpart and, taken together, they come to be referred to as microcosmic representations of gardens (see fig. 4.11). Simultaneously, it makes sense to think about the structure of these pictures, and of their viewing, as pertaining to the tabular model. Consider, for example, that many of the flower still-life paintings, or botanical portraits, produced in the early seventeenth century consist of vases filled with more stems than could readily be fit into the vases and that the flowers represented are more often than not shown blossoming simultaneously, whereas in fact, or in nature, they do not. The counternaturalistic impact of these pictures is crucial. If these paintings were—initially at least, in the first decades of the seventeenth century—painted and collected as "botanical portraits,"[51] and served to record and preserve the appearance of the individual specimens so carefully arranged, to what degree does the sequential, nonnarrative structure of such

pictures bear comparison with the grids and tables of natural historical experience? Conventional art historical interpretations have read these images—the flower still-life paintings of the early seventeenth century—as allegories of vanity and the brevity of life.[52] By way of a counterproposal, I want to cite a passage from a philosophical dialogue written in the 1580s by the great neo-Stoic Justus Lipsius (1547–1606), which goes some way in suggesting that attempting to recuperate modes of experience might be more productive than insisting on emblematic or allegorical readings of paintings of the natural world. And that the apparently disjunctive range of scientific representation I have cited—from naturalistic renderings of blowfish and tulips to schematic diagrams of gardens—are not only compatible, but inseparable.

This passage is from Lipsius's *De Constantia*, a dialogue that takes place in a garden, as befits a good Erasmian encounter.[53] The garden of *De Constantia* may well be fictional, but the story of Lipsius's actual gardens is entirely relevant to the foregoing. Lipsius, from the city of Louvain in the southern Netherlands, was professor at the Leiden University from 1578 until 1591.[54] When Lipsius left Leiden, he left two gardens behind, one of which was impressed into immediate service as the university teaching garden before the plots of that garden were dug in 1594, and the official garden opened.[55] Lipsius writes:

> Observe for me these numerous flowers/ how they grow: how these are brought out of their sheaths/ those out of their buds/ see how this one dies suddenly and falls down/ and another one grows on its stem. Finally/ see how one sort of flower is distinguished from and can be compared to/ thousands of others/ solely on the basis of its form/ color, and appearance/. . . . Now/ bring your scrupulous eyes here/ and regard for a moment this sheen and the beautiful colors. See/ how this flower [is] a beautiful purple in color/ this one blood red/ this snow white/ this one like a flame/ this shines like gold . . . even the very best painter cannot possibly replicate them . . . Would that God would allow me to live peaceably among these treasures. . . . among these flowers of the known and the new unknown world.[56]

For Lipsius, the garden is a spectacle, a source of wonder. He encourages "scrupulous eyes" to follow the forms of the individual plants as they change over time and as they vary from one to the next. The "treasures . . . of the known and new unknown world" offer their incomparable colors and sheen for careful, sustained observation. The terms of Lipsius's description are fairly pat; where he lapses into simile it is to compare the coloring of the flowers to gold or to fire—the visible properties of these treasures exceed the products of humans, and of the painter in particular. At the same time,

he invokes specific patterns of observation when he states that each sort of flower can be distinguished from and compared to others on the basis of its visually apprehensible, external characteristics. It is this comparative morphology that motivates the use of naturalistic representations (which will strive to equal the "sheen and beautiful colors" Lipsius records) and, at the same time, drives the tabulation of the natural world.

Notes

Many thanks to Pamela Smith, Paula Findlen, and Peter Reill for the invitation to present this material at the colloquium *Commerce and the Representation of Nature in Early Modern Europe* (UCLA, October 1999), and for the helpful commentary they and many other participants offered. I am also grateful to Mary Fissell and other members of the History of Medicine, Science, and Technology Colloquium at Johns Hopkins University, for offering both the opportunity to present these materials and a variety of productive responses; to the Department of Geography at the Pennsylvania State University; to the History and Philosophy of Science program at Northwestern University; to Cees Lut, Librarian, National Herbarium of the Netherlands, Leiden; to Carla Teune, Hortulana, Hortus Botanicus, Leiden; and to Londa Schiebinger, Amy Greenberg, Rich Doyle, Peter Parshall, Roelof van Gelder, Florike Egmond, Paolo Bernardini, and David Freedberg.

1. See, principally, Sandra Tugnoli Pattaro, *Metodo e sistema delle scienze nel pensiero di Ulisse Aldrovandi* (Bologna: Cooperativa Libraria Universitaria Editrice Bologna, 1981); Giuseppe Olmi, *L'inventario del mondo. Catalogazione della natura e luoghi del sapere nella prima età moderna* (Bologna: Il Mulino, 1992); Paula Findlen, *Possessing Nature. Museums, Collecting, and Scientific Culture in Early Modern Italy* (Berkeley and Los Angeles: University of California Press, 1994).

2. As quoted by Giuseppe Olmi, "Arte e Natura nel Cinquecento Bolognese: Ulisse Aldrovandi e la Raffigurazione Scientifica," in *Le Arti a Bologna e in Emilia dal XVI al XVIII secolo. Atti del XXIV Congresso Internazionale di Storia dell'Arte*, ed. Andrea Emiliani, 4 vols. (Bologna: CLUEB, 1982), 4: 151–173, esp. 151.

3. See, e.g., Pattaro, *Metodo e sistema*, 19: "Infine, come esempio del procedimento (*modus*) col quale l'Aldrovandi tentò di realizzare il proprio ideale erudito ed enciclopedico, si può portare la sua *Selva universale della scienze* o *Pandechion epistemonicon* [unpublished]. Quest'-opera, che fu completata nel 1589, è una sorta di dizionario, in ottantatre volumi, ove le materie piú disparate sone prese in esame per ordine alfabetico con amplissimo corredo di riferimenti e d'informazioni, e fu concepita esplicitamente dal naturalista bolognese affinché fosse di guida a chiunque desiderasse 'sapere o comporre sopra qual si voglia cosa naturale o artificiale,' onde trovare 'a quel proposito quel che n'hanno scritti i poeti, i teologi, i legisti, i filosofi, gli istorici.'" More generally, on early modern classification, see F. S. Bodenheimer, "Towards the History of Zoology and Botany in the XVIth Century," in ***La science au seizième siècle. Colloque de Royaumont 1957*** (Paris: Hermann, 1960), 285–296; Michel Foucault, *The Order of Things. An Archaeology of the Human Sciences* (New York: Vintage Books, 1970); David Knight, *Ordering the World. A History of Classifying Man* (London: Burnett Books, 1981), esp. chaps. 2 and 3; Scott Atran, *Cognitive Foundations of Natural History. Towards an*

Anthropology of Science (Cambridge and Paris: Cambridge University Press, 1990); Brian W. Ogilvie, *Observation and Experience in Early Modern Natural History* (Ph.D. diss., University of Chicago, 1997), esp. 337–343. My thanks to David Freedberg for allowing me to read his unpublished lecture, "Naming the Visible: Art and Natural History in the Circle of Galileo" (Munich, 1991).

4. See references cited in previous note and Agnes Arber, *Herbals, Their Origin and Evolution. A Chapter in the History of Botany (1470–1670)* (Cambridge: Cambridge University Press, 1986; 1st ed. 1912); Allen J. Grieco, "The Social Politics of Pre-Linnaean Botanical Classification," *I Tatti Studies* 4 (1991): 131–149, esp. 139ff.

5. As quoted by Lorraine Daston and Katharine Park, *Wonders and the Order of Nature, 1150-1750* (Cambridge: MIT Press, 1998), 154; see also Findlen, *Possessing Nature*, 17–31.

6. Findlen, *Possessing Nature*, 24; the visitor was Pietro Andrea Mattioli (1501–78), one of the most famous Renaissance doctors and botanical authors.

7. Ibid.

8. Ibid., passim.

9. See Giuseppe Olmi, "Osservazione della natura e raffigurazione in Ulisse Aldrovandi (1522–1605)," *Annali dell'Istituto storico germanico italiano in Trento* 3 (1977), 105–181; Olmi, *Inventario del mondo, passim*; Claudia Swan, "*Ad vivum, naer het leven*, from the Life: Considerations on a Mode of Representation," *Word and Image* 11 (October–December 1995): 353–372.

10. Blowfish is the common name for the porcupine fish, which is of the order *Tetraodontiformes*, and is most visibly characterized by spiny or plate-form scales. The stomach of two families of this order—*Diodontidae* (porcupine fish) among them—is highly modified such that it can inflate to enormous sizes; hence "blowfish." Inflation is caused by ingestion of water into a ventral diverticulum of the stomach when the fish is frightened or annoyed; deflation occurs when the fish expels the water. Inflation by air can also occur, when the fish is removed from the water or on death. The bodies of all porcupine fish are covered with sharp spines, which may become erect when the fish inflates. They generally have two fused teeth. Joseph S. Nelson, *Fishes of the World* (New York: J. Wiley, 1984), 379–386. Blowfish are native to the Pacific and Indian Oceans.

11. Examples of engravings showing the blowfish hanging from the ceiling of a collection include "The Museum of Francesco Calzolari" by Hieronymus Viscardus after Io. Bapt. Bertonus, in Benedictus Cerutus and Andrea Chiocco, *Musaeum Franc. Calceolari* (Verona: Apud Angelum Tamum, 1622); anonymous engraver, "The Museum of Ferdinando Cospi," in L. Legati, *Museo Cospiano* . . . (Bologna: Giacomo Monti, 1677). These prints are frequently reproduced in studies of cabinets of curiosities; see, for example, Ellinoor Bergvelt et al., *Verzamelen. Van Rariteitenkabinet tot Kunstmuseum* (Heerlen: Open Universiteit, 1993), figs. 64, 76, and 82.

12. "Zee eeghel/ dese vis is van omber wit en swart ijser graeu achtich/ van den rugghen neerewert al lichter tot den buijck/ die is wit nae de staert is hij noch bruijnder hij al gestippelt/ met keulse aerden de penne sijn geelenoocker achtich licht graeu/ de vinne sij omber en keulse aerdeachtich teghen tlijf geleoocker/ en wit wat root oock wat [illegible mark] blaeu achtich gekolleureert/ ende oock met keulse aerden gestippelt omden muijl/ wat omber achtiger gecollereert." Rijksmuseum, Amsterdam, inv. no. A3971 (149 x 197 mm, pen and brown ink on gray-brown paper). I. Q. van Regteren Altena, *Jacques de Gheyn. Three Generations*, 3 vols. (The Hague: M. Nijhoff, 1983), vol. 2, cat. no. 896, pl. 370; see also vol. 2: 119. Cf. K. G. Boon, *Netherlandish Drawings of the Fifteenth and Sixteenth Centuries. Catalogue of the Dutch and Flemish Drawings in the Rijksmuseum*, 2 vols. (The Hague: Govt. Pub. Office, 1978), cat. no. 242; and *Jacques de Gheyn II. Drawings*, exh. cat. (Rotterdam and Washington: Museum Boymans-van Beuningen, 1986), cat. no. 83: *Two Studies of a Porcupine Fish (Diodon hystrix)*.

13. Jan Piet Filedt Kok and Marjolein Leesberg, The New Hollstein. *Dutch and Flemish Etchings, Engravings and Woodcuts, ca. 1450–1700 (Jacques de Gheyn)*, 2 vols. (Rotterdam: Sound and Vision, 2000), no. 213. On de Gheyn in Leiden, see Florence Hopper, "Clusius' World: The Meeting of Science and Art," in *The Authentic Garden. A Symposium on Gardens*, ed. Leslie Tjon Sie Fat and Erik de Jong (Leiden: Clusius Stichting, 1991), 13–36; Claudia Swan, *Jacques de Gheyn II and the Representation of the Natural World in the Netherlands ca. 1600* (Ph.D. diss., Columbia University, 1997).

14. See, *inter alia*, *Leidse Universiteit 400. Stichting en eerste bloei 1575–ca. 1650*, exh. cat. (Amsterdam: Rijksmuseum, 1975); Swan, *Jacques de Gheyn II*, chapter 5, "*'t Onderwijs der cruyden*: The Leiden University *Hortus* 1587–1600." The practice of teaching *materia medica* from the garden became widespread throughout Europe at this time; see Karen Meier Reeds, *Botany in Medieval and Renaissance Universities* (New York and London: Garland, 1981), passim.

15. For the inventories of the collection of *naturalia*, see *Leidse universiteit 400*, cat. nos. D24–26; Erik de Jong, *Natuur en Kunst. Nederlandse tuin- en landschapsarchitectuur 1650-1740* (Amsterdam: Thoth, 1993), "*Hortus Sanitatis*. De hortus botanicus en de hortus medicus als wetenschappelijke tuin," 190–234, esp. 202ff. In an appendix de Jong provides transcriptions of the two most important inventories of the collection housed in the *ambulacrum* (1617 and 1659) and cross-references them to Carolus Clusius, *Exoticorvm libri decem: Quibus Animalium, Plantarum, Aromatum, aliorumque peregrinorum Fructuum historiae describuntur* . . . (Leiden: Ex Officinâ Plantinianâ Raphelengii, 1605) and to a copy hereof that Clusius revised by hand, presently in the Leiden Universiteitsbibliotheek (UB nr. 755 A3). A version of this essay by de Jong was previously published as "Nature and Art. The Leiden Hortus as 'Musaeum'," in Tjon Sie Fat and de Jong, *The Authentic Garden*, 37–60. A very early source, to the best of my knowledge never cited, is the catalog by P. Pauw of the Leiden garden; see below, note 38.

16. Hollstein, vol. 29 (1984), Swanenburg(h), H. 32.

17. See above, note 15; the relevant chapters are Clusius, *Exoticorum* 21–24: 137–140.

18. Cf. the passage from *The Tempest* in which Trinculo exclaims, on finding Caliban: "What have we here? a man or a fish? dead or alive? A fish: he smells like a fish; a very ancient and fish-like smell; a kind of, not of the newest, Poor-John. A strange fish! Were I in England now, as once I was, and had but this fish painted, not a holiday fool there but would give a piece of silver: there would this monster make a man: when they will not give a doit to relieve a lame beggar, they will lay out ten to see a dead Indian (II.ii)." That fish and other sea creatures were put on public display in Leiden and Amsterdam is amply recorded in Clusius's *Exoticorum*.

19. See esp. Atran, *Cognitive Foundations of Natural History*; Ogilvie, *Observation and Experience*, 337–343.

20. Clusius writes that the *Histrix piscis* and the *Orbis spinosus* were available to him in a "museum" of a merchant in Amsterdam; see Clusius, *Exoticorum*, 137–138. The third kind he describes, the *Orbis muricatus*, he saw in Guillaume Rondelet's "museum" in Montpellier (139). Cf. (written of the *Orbis spinosus*) "Exenteratus autem erat hic piscis, quemadmodum & alij ejusdem generis, quos istîc variœ magnitudinis apud diversos mercatores videbam: satis enim diligentes sunt in ea urbe rerum exoticarum conquisitores, quas à nautis ex sua navigatione reducibis redimere solent" (139).

21. Clusius cites book 25 of Guillaume Rondelet, *L'histoire entière des poissons* . . . (Lyon: Bonhomme, 1558); Clusius, *Exoticorum*, 139.

22. These are the *Histrix piscis* (Clusius compares the specimen he describes and illustrates to the fish in Plateau's drawing) and the *Orbis muricatus alter*; see Clusius, *Exoticorum*, 138, 140. Plateau is also mentioned in Carolus Clusius, *Rariorum Plantarum Historia* (Antwerp: Ex. Off. Plantiniana, apud Ioannem Moretum, 1601), passim.

23. Namely, a drawing of the *Orbis muricatus*; Clusius, *Exoticorum*, 139. Porret is cited throughout the *Exoticorum*; see F. W. T. Hunger, *Charles de l'Escluse (Carolus Clusius) Nederlandsch Kruidkundige 1526-1609*, 2 vols. (The Hague: Nijhoff, 1927; 1943), Vol. 1: 268.

24. The woodcut of the *Orbis spinosus* is, Clusius explains, based on a drawing that was made in order for him to compare this specimen with the *Histrix piscis*; images of the *Orbis spinosus* and the *Histrix piscis* face each other head-on across the binding of the volume. "Ut autem faciliùs utriusque differentia observari possit, illum, permittente Mercatore, idem Volcardus in meam gratiam delineabat, ego verò in adposita tabella deinde exprimi curabam" (*Exoticorum*, 138).

25. Clusius, *Exoticorum*, 138.

26. Ibid. "De internis partibus nihil pronunciare queo, quandoquidem à recens capto fuerant exemptœ & abjectœ, & corium dumtaxat à nautis funiculorum fragmentis suffarcinatum, ut commodiùs resiccarent & conservarent, mihi fuit conspectum."

27. "In quo mari captus esset hic piscis, nemo certi quidpiam pronunciare poterat," he writes of the *Orbis muricatus*; Clusius, *Exoticorum*, 140. On p. 137, however, he identifies the *Histrix piscis* as having been captured in the "American Ocean."

28. "Horvm trium subsequentium Orbium historiam adeò exactè describere non licebit, ut superiorum [*Orbis muricatus*], quia ipsos pisces videre mihi non contigit, sed eorum icones coloribus expressas dumtaxat accipiebam à Iacobo Plateau, nullis adscriptis notis, è quibus magnitudinis corporis & ejus partium conjecturam facere possem: post aliquot tamen menses à me admonitus, hujus & sequentis mensuram, longitudinem & ambitum designantem, mittebat" (Clusius, *Exoticorum*, 140).

29. Foucault, *The Order of Things*, 137.

30. More generally, on the representation of variable qualities of plants, see also David Freedberg, "The Failure of Colour," *Sight & Insight. Essays on Art and Culture in Honour of E.H. Gombrich at 85* (London: Phaidon Press, 1994), 245–262.

31. Clusius, *Rariorum*, lib. 2: 147; as trans. by W. Van Dijk, *A Treatise on Tulips by Carolus Clusius of Arras* (Haarlem: Enschedé en Zonen, 1951), 50.

32. Clusius, *Rariorum*, lib. 2: 148; Van Dijk, *A Treatise on Tulips*, 52. The letter from Johannes de Jonghe, dated 14 May 1596 and received by Clusius in Leiden on 2 June, is in the Leiden University Library (Cod. Vulc. 101); it and seven others written to Clusius by residents of Middelburg were transcribed and published by F. W. T. Hunger, "Acht Brieven van Middelburgers aan Carolus Clusius," *Zeeuwsch Genootschap der Wetenschappen* (1925), 110–133; for the letter from de Jonghe, see 111–113. See also Laurens J. Bol, *The Bosschaert Dynasty. Painters of flowers and fruit* (Leigh-on-Sea: F. Lewis, 1980), 17–18, who suggests that the Middelburg flower painter Ambrosius Bosschaert may have painted this (lost) drawing and another drawing sent to Clusius by another Middelburg resident in 1597.

33. See F. de Nave et al., *Botany in the Low Countries (End of the 15th Century–ca. 1650)*, exh. cat. (Antwerp: Plantin Moretus Museum, 1993); Swan, "*Ad vivum, naer het leven*."

34. Foucault, *The Order of Things*, 132.

35. C. Swan, "*Ad vivum, naer het leven*."

36. By grid I mean a rectangular diagram, divided into small rectangles. On dichotomized and bracketed outlines, and on class logic, see W. J. Ong, *Ramus, Method, and the Decay of Dialogue. From the Art of Discourse to the Art of Reason* (Cambridge, Mass.: Harvard University Press, 1958), esp. chaps. 8 and 9; cf. *idem*, "From Allegory to Diagram in the Renaissance Mind: A Study in the Significance of the Allegorical Tableau," *Journal of Aesthetics and Art Criticism* 17 (June 1959): 423–440.

37. *Kruydtboeck oft Beschrijuinghe Van allerleye Ghewassen, Kruyderen, Hesteren, ende Gheboomten* (Antwerp: Christoffel Plantijn, 1581): "Vande Succedanea, dat is te seggen/ van drooghen oft cruyden die by ghebreke d'een voor d'ander ghebruyckt worden . . . " (15 pp).

On p. 1, Lobelius complains that prior publications on medicinal simples were "sonder eenige ordeninghe/ onderscheydt oft verstant" ("lacking all order, distinctions, and judgment"). "Vande Succedanea" and its tables were reprinted in *Den Leytsman ende Onderwijser der Medicijnen, oft ordenlijcke uytdeylinghe ende Bereydingh-boeck vande Medicamenten*, eds. Pieter van Coudenberg and Matthias Lobelius (Amsterdam: Hendrick Laurentsz., 1614).

38. See Peter Pauw, *Hortvs Pvblicvs Academiæ Lvgdvno-Batavæ. Eivs Ichnographia, Descriptio, Vsus. Addito quas habet stirpium numero, & nominibus* (Leiden: Ex Officina Plantiniana apud Christopher Raphelengius, 1601) fol. 4r. Actual evidence of what was planted—and grew—in the garden in 1601, 1602, 1604, and later years is provided by the copies of Pauw's catalog, which were filled in by Pauw himself and others for presentation to the trustees of the university; several of these are in the National Herbarium of the Netherlands, Leiden.

39. Pauw, *Hortvs Pvblicvs*.

40. There are a total of 176 pages in the catalog. In 1603, the catalog was printed in Leiden by Ioannes Patus (Ex. Officinâ Ioannis Patii, Academ. Lugduno-Bat. Typographi), in revised edition; the page size is smaller, and there are minor changes to the text. That de Gheyn's engraving of the garden was intended for inclusion in the book when it was first published is clear from the marginal note in the 1601 edition that reads, "ad ea quæ sequuntur, inspicienda erit Horti ichnographia, inserta pagina" (fol. 7v.); this marginal note does not occur in the 1603 edition.

41. See F. W. T. Hunger, "Bernardus Paludanus (Berent ten Broecke) 1550–1633. Zijn verzamelingen en zijn werk," in *Itinerario voyage ofte schipvaert van Jan Huygen van Linschoten 1579–1592 IIIe deel,* ed. C.P. Burger and F. W. T. Hunger (The Hague: M. Nijhoff, 1934), 249–268; H.D. Schepelern, "Naturalienkabinett oder Kunstkammer. Der Sammler Bernhard Paludanus und sein Katalogmanusckript in der Königlichen Bibliothek in Kopenhagen," *Nordelbingen. Beiträge zur Kunst- und Kulturgeschichte* 50 (1981): 157–182; E. Bergvelt and R. Kistemaker, eds., *De wereld binnen handbereik. Nederlandse kunst- en rariteitenverzamelingen, 1585-1735* (Zwolle/Amsterdam: Waanders Uitgevers/Amsterdams Historisch Museum, 1992); Roelof van Gelder, "Paradijsvogels in Enkhuizen. De relatie tussen Van Linschoten en Bernardus Paludanus," in Roelof van Gelder, Jan Parmentier, and Vibeke Roeper, *Souffrir pour Parvenir. De wereld van Jan Huygen van Linschoten* (Haarlem: Uitgeverij Arcadia, 1998), 30–50, esp. 35–41.

42. *Index Rervm Omnivm Natvralivm, a Bernhardo Palvdano, Medicinæ Doctore, et Civitatis Enckhvsensis Physico experientissimo, collectarum*, in *Warhaffte Beschreibung Zweyer Raisen* (Tübingen: In der Cellischen Truckerey, 1603), 46ff. (24 unnumbered pages); see Van Gelder, "Paradijsvogels in Enkhuizen," 36–38.

43. The classic study is Hans Fischer, *Conrad Gessner. Leben und Werk* (Zurich: Kommissionsverlag Leemann, 1966); cf. Hans Fischer, G. Petit, J. Staedtke et al., *Conrad Gessner 1516–1565. Universalgelehrter, Naturforscher, Arzt* (Zurich: Orell Fussli, 1967). See also the facsimile edition of the watercolors by Gessner of plants, which he died before publishing; H. Zoller and M. Steinmann, *Conradi Gesneri Historia plantarum. Gesamtausgabe*, 2 vols. (Zurich: Urs Graf Verlag, 1987–1991).

44. Caspar Wolf, *De Stirpivm Collectione Tabulæ Tvm Generales, Tvm per Dvodecim Menses, cum Germanicis nominibus, & alijs hactenus à nemine traditis, olim per Conradum Gesnerum conscriptæ ac æditæ . . .* (Zurich: Ch. Froschauer, 1587); Universiteitsbibliotheek Amsterdam, 613 H 27.

45. "Conradi Gesneri de Partibvs et Differentiis Plantarvm Physica Syn-nopsis . . . in tabulas methodicè digesta," fols. 1r.–40v.; a header runs throughout these folios, identifying them as "Tabulae stirpivm in genere."

46. "De Collectione stirpivm in genere," fols. 41r.–55v; the page header for this section is "De Collectione in genere."

47. "Tabvla Stirpium prima, alphabetice envmerans . . . ," fols. 56r.–116r.

48. "Tabvla secunda stirpivm nomina Latina et Germanica continens, quæ singulis mensibus aut florent aut fructum maturant . . . ," fols. 116v.–147v.

49. "Tabvlae istæ non pharmacopolis tantùm, tyronibus præsertim & minus exercitatis, vtiles sunt futuræ, sed omnibus stirpium notitiæ studiosis. Qui cum singulis ferè mensibus vernis, æstiuis & autumnalibus, partim cognitionis, partim animum remittendi & corpus exercendi gratia, rusticatum exire soleant, occasionem ex hisce tabulis capient, quænam eis plantæ potissimum quærendæ aut sperandæ sint."

50. The literature is vast. See especially Beatrijs Brenninkmeyer-de Rooij, *Roots of Seventeenth-Century Flower Painting. Miniatures, Plant Books, Paintings*, ed. R. E. O. Ekkart; trans. Ruth Koenig (Leiden: Primavera Press, 1996); Paul Taylor, *Dutch Flower Painting 1600–1720* (New Haven, Conn.: Yale University Press, 1995); Sam Segal, *Flowers and Nature. Netherlandish Flower Painting of Four Centuries* (The Hague: Government Publishing Office, 1990); Norbert Schneider, "Vom Klostergarten zur Tulpenmanie. Hinweise zur materiellen Vorgeschichte des Blumenstillebens," in G. Langemeyer and H. A. Peters, *Stilleben in Europa* (Münster: Landschaftsverband Westfallen-Lippe, 1979), 294–312.

51. Bol, *The Bosschaert Dynasty*, 46; see also, on this phenomenon in France, Antoine Schnapper, *Le géant, la licorne, et la tulipe. Collections et collectionneurs dans la France du XVIIe siècle. I - Histoire et histoire naturelle* (Paris: Flammarion, 1985), 354 and 358–360, where Schnapper speaks of "les 'portraits' de fleurs ou de fruits commandés par un amateur désireux de péerenniser le souvenir des pièces les plus précieuses, mais essentiellement périssables, de sa collection."

52. For a recent example of such an approach, see A. Chong, W. Kloek et al., *Still-Life Paintings from the Netherlands 1550–1720*, exh. cat., trans. R. Koenig et al. (Zwolle: Waanders Publishers, 1999), passim. For another counterproposal, the focus of which is on the social and economic formations that inform still life paintings, see E. A. Honig, "Making Sense of Things: On the Motives of Dutch Still Life," *Res* 34 (autumn 1998), 166–183.

53. *De Constantia* was first published in Leiden in 1584, and was reprinted in a variety of European languages (Dutch, French, German, English, Italian, Spanish, and Polish) in as many as eighty editions throughout the seventeenth century. The first Dutch translation, by Jan Moretus, was published as *Twee Boecken vande Standvasticheyt*, Leiden, 1584 (*Over standvastigheid bij algemene rampspoed*, trans. and annotated P. H. Schrijvers [Baarn: Amboboeken, 1983]). The Erasmian model of the humanist's garden is set out most famously in the colloquy *The Godly Feast* (*Convivium religiosum*, 1522); trans. and ed. C. R. Thompson, *The Colloquies of Erasmus* (Chicago: University of Chicago Press, 1965), 46–78, esp. 46–47 and 51–52.

54. In 1578, at the age of thirty, Lipsius was made a professor of history and law at Leiden University; he and his wife lived at Leiden for thirteen years, until 1591, at which time he returned to Flanders (Louvain) and to Catholicism, from which he had converted to Lutheranism when he took a post at Jena in 1572.

55. Mark Morford, "The Stoic Garden," *Journal of Garden History* 7 (1987): 151–175, esp. 165–167.

56. Trans. mine, from German (1st German ed., 1601); bk. 2, cap. 2.

"Strange" Ideas and "English" Knowledge

Natural Science Exchange in Elizabethan London

DEBORAH E. HARKNESS

During the reign of Elizabeth I, a public well—the traditional neighborhood locus for gossip, news, and information—stood at the crossroads of Bishop's Gate and Threadneedle Streets in London, near the Royal Exchange. Given the colorful occupations of many area residents, and its proximity to Bedlem hospital, one can but imagine that the quality of gossip there was high. Within a few square blocks lived an extraordinary assortment of characters, many of whom made hands-on investigations into the marvelous workings of nature. When John Dee was in London he lived right in the thick of this neighborhood, along with his mathematics pupil Sir William Pickering, and Sir Thomas Gresham, builder of the Royal Exchange. Several members of the Royal College of Physicians also made Bishop's Gate their home, such as the botanically inclined Peter Turner, and the Venetian-born Dr. Caesar Aldemare, who had been trained at the famous medical school in Padua. Aldemare was one of the many foreigners in Bishop's Gate, and the voices of Bedlem would have had to be very loud to drown out the cacophony of tongues generated by the Flemish, French, Dutch, German, Italian, and Spanish residents. These "strangers" included many natural science practitioners: instrument makers, surgeons, midwives, alchemists, and distillers. Neither a humanistically informed natural philosophy, nor a university-taught Galenic medicine, nor a hands-on skill in technology is sufficient to describe the range of interests and activities within the metropolis of London. And so I fall back on "science," which was used commonly in the period to describe those things that required knowledge, but not exclusively theoretical or exclusively practical knowledge. As John Securis explained in his *Detection and querimonie of the daily enormities and abuses co[m]mited in physick*, "science is an habite, . . . [a] ready, prompt and bent disposition to do any thynge, confirmed and gotten by long study, exercise, and use." Securis's emphasis on