Title
The Critical Tradition of Byzantine Botanical Illustration in the Alphabetical Dioscorides

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Publication Date
2019

Peer reviewed|Thesis/dissertation

The Critical Tradition of Byzantine Botanical Illustration in the Alphabetical Dioscorides

by

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A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

Medieval Studies

and

History of Art

in the

Graduate Division

of the

University of California, Berkeley

Committee in Charge:

Professor Diliana Angelova, Co-Chair

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Spring 2019

Abstract

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This dissertation recovers the history of Byzantine botanical illustration in the Alphabetical Dioscorides from its origins in the Hellenistic Period to its integration with early modern botanical illustration in the fifteenth century. Chapter 1 examines Pliny the Elder's *Naturalis historia* to establish how botanical illustration differed from descriptions and specimens as a way to create visual knowledge. It also connects the emergence of botanical illustration to Hellenistic rulers' study of botany. Chapter 2 delineates the different ways ancient botanical illustrations selectively depict plants. Chapter 3 assesses the relationship between illustration and text copying, in order to show how the makers of early illustrated herbals ensured and even emphasized the transmission of visual knowledge. Chapter 4 reconstructs Middle Byzantine (ca. 843-1204 CE) modes of botanical inquiry through a close study of the Morgan Dioscorides (New York, Morgan Library, MS M 652). It demonstrates the critical and innovative dimensions of the Byzantine botanical illustration, including the comparison and compilation of earlier pictures and the *ex novo* illustration of plants through direct observation of nature. Chapter 5 considers the continuation of this critical tradition and how it disseminated in the wider Mediterranean world in the Late Byzantine period (1204-1453 CE). Chapter 6 finally outlines contemporaries' shifting attitudes towards botanical illustration through close study of the frontispieces of the Vienna Dioscorides (Vienna, Österreichische Nationalbibliothek, med. gr. 1).

This study upsets the common scholarly view that Byzantine art and science were unconcerned with observation of the natural world. Botanical illustrations played a central role in the Byzantine botanical tradition by enabling the creation of visual knowledge. The study further characterizes Byzantine contemporaries' approaches to botanical study through the priorities expressed in their depictions of the natural world. Although researchers have routinely typified Byzantine art by its lack of natural forms and its artists' seeming unwillingness to depict the natural world through direct observation, evidence for detailed, "from life" depictions of plants in botanical manuscripts shows that Byzantine artists were capable of looking to nature. Byzantine conceptions of the natural world were not based on received classical texts and images, but also in direct experience of the natural environments within which Byzantine people worked and lived.

For My Parents

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Acknowledgments

This dissertation was made possible through the unwavering support and invaluable editorial insight of my dissertation committee co-chairs Diliana Angelova and Beate Fricke. I thank them for their many years of enthusiasm and expert guidance. I owe special thanks to Maria Mavroudi for her critical support and knowledge. I am especially grateful to her for hosting me at the Wissenschaftskolleg zu Berlin in November 2016, and for her mentorship through an Arts Research Center Fellowship for UC Berkeley Faculty and Graduate Students (Spring 2018). I thank the fellows, staff, and tireless Library Team at Wiko, as well as the fellows and staff of the Arts Research Center at UC Berkeley, in particular Director Julia Bryan Wilson and Associate Director Lauren Pearson. I am also indebted to Whitney Davis for his guidance in the project.

The expertise and assistance of many librarians, curators, and conservators whom I met during my fieldwork have also sustained this project. I thank Joshua O'Driscoll, Frank Trujillo, Maria Fredericks, John M. McQuillen, John Vincler and others at the Morgan Library; Yasmin Faghihi at Cambridge University Library; Isabelle Charmantier at the Linnean Society; Oliver Bridle and Stephen Harris, both with the Department of Plant Sciences, Oxford University; Giovanna Bergantino at the Biblioteca Antica del Seminario Vescovile di Padova; Monsignor Franco Buzzi and Dr. Don Federico Gallo at the Biblioteca Ambrosiana; as well as the librarians and staff of the Biblioteca Marciana, Biblioteca Apostolica Vaticana, Biblioteca Universitaria di Bologna, the Bodleian Library, British Library, Kongelige Bibliotek in Copenhagen, Natural History Museum Library, and Wellcome Library in London.

I carried out the first two years of my dissertation research (2014-2016) in residence at the Kunsthistorisches Institut, Florenz, through the financial support of The Kress Foundation. I thank the Foundation as well as the Institute's directors, Gerhard Wolf and Alessandro Nova, as well as the many friends and colleagues I met during that time, particularly Georgios Binos, Andrew Chen, Henrike Eibelshaeuser, Timo and Kristina Hagen, Francesca Marzullo, Tomasso Mozzati, Alexander Röstel, Jessica Richardson, Michael Tymkiw, and Didier Milleriot.

From Fall 2016 through Spring 2019, this project has been supported through a fellowship at The Center for Advanced Study in the Visual Arts at the National Gallery in Washington DC. I thank Dean Elizabeth Cropper and Associate Deans Peter Lukehart and Therese O'Malley, as well as Danielle Horetsky, Jen Rokoski, Jeannette Shindell, and Helen Tangires. I thank Yuri Long for creating a curatorial project that complemented my dissertation. This project benefitted from conversations with Maryan Ainsworth, Ravinder Binning, Alex Brey, C. Jean Campbell, Caroline Danforth, Elise Ferone, Michelle Foa, Michele Frederick, Ximena Gómez, Rena Hoisington, Annika Johnson, Steven Nelson, Rachel Grace Newman, David O'Brien, J.P. Park, Richard Powell, Tiffany Racco, Kimberly Schenk, Lauren Taylor, Jennifer Van Horn, as well as Abigail Quandt at the Walters Art Museum.

Finally, this project has benefitted from the encouragement, advice, and expertise of many friends, colleagues, and mentors: Benjamin Anderson, Elena Boeck, Niels Gaul, Cecily Hilsdale, Theresa Holler, Kriszta Kotsis, Derek Krueger, Henrike Lange, Anneka Lenssen, Caroline Macé, Andrea Mattiello, Kathleen Maxwell, Heba Mostafa, András Németh, Dominic Olariu, Fabio Pagani, Maria Alessia Rossi, Miriam Said, Andrew Sears, Lisa Trever, Linda K. Williams, Mario Wimmer, and Olga Yunak. I am especially grateful to Jess Genevieve Bailey, Armin Bergmeier, Ma'ayan Sela, and my sister, Meridith, and Forest Kernan for their support, friendship, and enthusiasm; my parents for their love and for inspiring my love of art, nature, and history; and finally to Byron Sartain for his enduring support and patience.

Introduction

The Mediterranean basin is home to around 10% of the known plant species in the world. Approximately 24,000 plant species inhabit a mere 2.3 million square kilometers. By contrast, the rest of Europe has about 6,000 or one-fifth the number of plant species, in an area over four times larger, roughly 9 million square kilometers.[1] Nearly 60% of plant species native to the Mediterranean are unique to the region itself.[2] Anyone traversing this varied landscape—its undulating coastlines and island chains; its marshes, beaches, and rocky shores; its high, frosty mountain peaks; its dense woodlands and forest groves nestled among grassy steppe and thicketed scrub—invariably encounters a bewildering array of plant life. Coming to terms with this staggering botanical diversity is no easy task. Ancient peoples living within this hot spot of plant endemism and diversity developed a vast, complicated botanical lore.[3] They named plants and interwove them into their myths and legends. They collected, compared, described and depicted them. This dissertation examines a central part of this larger botanical tradition: the role that pictures played in the creation of botanical knowledge.

In around 70 CE, the ancient pharmacologist Pedanius Dioscorides of Anazarbus (fl. 40-80 CE) penned the then most comprehensive attempt in Greek to compile and make sense of these diverse ancient accounts of the botanical world. The result, his Περὶ ὕλης ἰατρικῆς, *On medicinal matter*, is today often called by its Latin name, *De materia medica*.[4] This vast text comprises over 800 different substances, originally divided into five books: Book I on aromatics, oils, salves, trees and shrubs; Book II on animal parts and products, cereals, pot herbs, and sharp herbs; Book III on roots, juices, herbs and seeds; Book IV on more herbs and roots; and Book V on wines and minerals. *De materia medica* did not originally have illustrations, but other ancient works on medical botany did.[5] In time Dioscorides' work, too, was illustrated with pictures drawn from these other works. It was also abridged—made to focus just on herbs—and rearranged alphabetically. This alphabetically arranged, illustrated version of the text, the Alphabetical Dioscorides, is the focus of this dissertation.

De materia medica served as the basis for the study of botany and pharmacology in Greek and Arabic throughout the Middle Ages. Greek, Arabic, and later, Latin, scholars not only copied the text, but rearranged, edited, glossed, and commented on it. Pictures played a prominent role within this tradition. They appear in the earliest surviving "complete" versions of the text dating to the sixth century, and were reproduced throughout the Middle Ages, eventually making their way into the virtually text-free botanical atlases of the fifteenth century. Despite the prominence and abundance of plant depictions in the ancient and medieval Dioscorides, their role within the botanical tradition has attracted only cursory attention by scholars, who often

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[1] Werner Greuter, "Botanical diversity, endemism, rarity, and extinction in the Mediterranean area: an analysis based on the published volumes of Med-Checklist," *Botanika Chronika* 10 (1991): 63-79.

[2] Pierre Quézel, "Definition of the Mediterranean region and the origin of its flora," in *Plant Conservation in the Mediterranean Area,* ed. César Gomez-Campo (Dordrecht: Dr. W. Junk Publishers, 1985), 9-24; Greuter, "Botanical diversity," 63-79; Norman Myers, Russell A. Mittermeier, Christina G. Mittermeier, *et al.*, "Biodiversity hotspots for conservation priorities," *Nature* 403 (2000): 853-858.

[3] See Gavin Hardy and Laurence Totelin, *Ancient Botany* (New York: Routledge, 2016), esp. 1-3, for discussion of ancient botany as a tradition or art (βοτανικὴ παράδοσις or βοτανικὴ τέχνη).

[4] While dominated by plants, *De materia medica* also includes animal products, wines, and minerals. See John M. Riddle, *Dioscorides on Pharmacy and Medicine* (Austin: University of Texas Press, 1985).

[5] Giulia Orofino, "Dioskurides war gegen Pflanzenbilder: Die Illustration der Heilmittellehre des Dioskurides zwischen Spätantike und dem Hochmittelalter," *Die Waage* 30 (1991): 144-149. Most scholars agree that Dioscorides' work was originally unillustrated. For an exception, see Riddle, *Dioscorides on Pharmacy*, 180-217.

regard the illustrations as either having had a purely aesthetic or decorative function, or as having been so error-riddled from centuries of copying as to be effectively useless.[6] On the contrary this dissertation shows that botanical illustration played an important role in the Byzantine practice of botany: The Byzantine tradition of botanical illustration in the Alphabetical Dioscorides was a dynamic and critical tradition that developed, expanded, and experimented with modes of depiction, including "from life" plant depiction.

Ancient and Medieval Botanical Illustration

Apart from summary overviews and articles on individual manuscripts, few comprehensive studies of botanical illustration in the ancient and medieval Greek-speaking world exist.[7] One of the principle aims of the present study is to provide a fuller art historical account of the Byzantine tradition of botanical illustration, which has been insufficiently studied due to a dearth of studies addressing key manuscripts, such as the Morgan Dioscorides (see ch. 4), and a subsequent lack of adequately detailed overviews of this tradition as a whole.

Two studies have played a central role in establishing the main contours of the standard narrative of the early history of botanical illustration. The first, Charles Singer's "The Herbal in Antiquity and Its Transmission to Later Ages" (1927) early on linked various traditions of medieval herbal illustration to their classical forebearers, largely by tracing continuities through textual transmission.[8] Despite the preservation of these classical traditions of botany, Singer nevertheless described medieval herbals in degenerative terms. They are, in his words, "feeble works for feeble minds," products of the "wilting mind of the Dark Ages," a reflection of "the Decay of the Western Intellect."[9] Save for a few comments on an illustration's quality, naturalism, or anthropomorphism, he provides little analysis in the way of their visual properties.

While Singer largely focuses on continuity between antiquity and the Middle Ages, Otto Pächt takes up what he calls "the other end of the story, the way out of the tunnel of the Middle Ages" in his "*Early Italian Nature Studies and the Early Calendar Landscape*" (1950).[10] Following Singer, Pächt states that botanical illustration first emerged in the Hellenistic world with a high degree of naturalism, but that it degenerated over the course of the Middle Ages as a

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[6] Marie Cronier opposes pictures to "content," by which she means text, thereby presupposing that pictures do not have content. See Marie Cronier, "The Manuscript Tradition of Dioscorides' *De Materia Medica* from Byzantium to the Arabs," in *Hayat kısa, sanat uzun: Bizans'ta şifa sanatı; Life is short, art long: the art of healing in Byzantium,* ed. Brigitte Pitarakis (Istanbul: Pera Müzesi, 2015), 135-151, at 140. David Leith does the same in his discussion of the Antinoopolis codex. See David Leith, "The Antinoopolis Illustrated Herbal (PJohnson + PAntin. 3.214 = MP3 2095)," *Zeitschrift für Papyrologie und Epigraphik* 156 (2006): 141-156, esp. 156. Other scholars emphasize the errors in the tradition, e.g., Jean Givens, *Observation and Image-Making in Gothic Art* (Cambridge: Cambridge University Press, 2005), esp. 144-145.

[7] Most consider it either in the broader context of ancient scientific illustration, or the history of botanical illustration. For examples of the former, see Alfred Stückelberger, *Bild und Wort: Das illustrierte Fachbuch in der antiken Naturwissenschaft, Medizin und Technik* (Mainz am Rhein: Philipp von Zabern, 1994), 74-94; Heidi Grape-Albers, *Spätantike Bilder aus der Welt des Arztes. Medizinische Bilderhandschriften der Spätantike und ihre mittelalterliche Überlieferung* (Wiesbaden: Guido Pressler, 1977); Kurt Weitzmann, *Ancient Book Illumination* (Cambridge, Mass.: Harvard University Press, 1959), 11-15; Erich Bethe, *Buch und Bild im Altertum*, E. Kirsten, ed. (Leipzig: Harrassowitz, 1945), esp. 28-41; for the latter, see, e.g., Claus Nissen, *Die Botanische Buchillustration: Ihre Geschichte und Bibliographie* (Mannsfield, Conn.: Maurizio Martino, 1951), 1: 1-26.

[8] Charles Singer, " The Herbal in Antiquity and Its Transmission to Later Ages," *The Journal of Hellenic Studies* 47, part 1 (1927): 1-52.

[9] Ibid., 31.

[10] Otto Pächt, "Early Italian Nature Studies and the Early Calendar Landscape," *Journal of the Warburg and Courtauld Institutes* 13, no. 1/2 (1950): 13-47, at 25, n. 1.

result of stylization as well as the successive, uncritical, and mechanical copying of pictures.[11] Accurate illustrations based on the observation of nature only reappear with the invention of novel illustrative cycles for new botanical texts in the thirteenth century in Italy, as seen in the famous Egerton *Tractatus* manuscript now in London (British Library, MS Egerton 747).[12] But these illustrations remained schematic, as though "pressed flat—into profile or full frontal views—artificially arranged, prepared for the Herbarium; half picture, half diagram."[13] Fully naturalistic and illusionistic portrayals of plants, what Pächt calls "real life portraits of plants," finally emerge in the fifteenth century, as exemplified by the Carrara Herbal (London, British Library, MS Egerton 2020).[14]

In another article, published several decades later, Pächt further elaborates on the differences between these early modern Italian "portraits" of plants and the ancient and Byzantine traditions of botanical illustration.[15] For Pächt, tedious pictorial conventions subservient to didactic and instructional aims overburdened Byzantine modes of botanical illustration. These forces led Byzantine artists to abandon conceiving of depicted plants as objects in the world (*Gegenstandsvorstellung*).[16] As he notes, "In short, what the ancient illustrated herbarium offers is usually a manipulated nature, an empiricism aimed at recognizability and objective determinability, never the subjective impression of the thing as spontaneously perceived."[17] By contrast, the emphasis on plasticity, modeling, and natural patterns of growth in fifteenth-century Italian botanical illustrations enable them to appear as genuine recreations (*Nachschaffen*) that in the eyes of the viewer "awaken back to life" (*Wieder-zum-Leben-Erwecken*) the plant as a natural object in the world.[18]

While Pächt's analysis of the composition and structure of ancient and medieval botanical illustrations remains valuable, his categorical distinction between didactic function and illusionistic form is effectively impracticable. Pächt's insight that ancient and Byzantine illustrations aim to select and display particular properties would seem to be equally true of fifteenth-century botanical illustration, which undoubtedly also had didactic aims, as well as elements of artificiality and artistic mediation. Simply put, *all* botanical illustrations are instructional or didactic, manipulated, and aimed at recognizability, insofar as they are botanical. They invite a way of viewing that enables their beholders to create visual knowledge about the plant depicted. The principle differences between the ancient and modern modes of illustration are rather the various pictorial devices and conventions that they employ, and how those devices effectively enable the creation and cultivation of different forms of visual knowledge. This reworking of Pächt's analysis serves as the basis for the present study's approach to the depiction of plants in ancient and Byzantine botanical illustration (see below).

Earlier echoes of Pächt's view of ancient and Byzantine botanical illustration as preeminently didactic appear in his 1950 essay, where he compares them to "museum exhibits"

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[11] Ibid., 25-27.
[12] Ibid., 27-29.
[13] Ibid., 30.
[14] Ibid.
[15] Otto Pächt, "Die früheste abendländische Kopie der Illustrationen des Wiener Dioskurides," *Zeitschrift für Kunstgeschichte* 38, no. 3/4 (1975): 201-214.
[16] Ibid., 208.
[17] Ibid., 210. "Kurz, was die antike Herbarillustration bietet, ist in der Regel manipulierte, vordemonstrierte Natur, eine auf Wiedererkennbarkeit und objektive Bestimmbarkeit gerichtete Empirie, nie der subjektive Eindruck des in spontaner Wahrnehmung Erschauten."
[18] Ibid., 208.

or specimens "pinned down and neatly arranged for didactic purposes."[19] This emphasis on the didactic or instructional nature of ancient botanical illustrations goes back to earlier debates about the origins of book illustration. In a posthumous publication from 1945, Erich Bethe argues that the origins of book illustration were to be found in the instructional pictures (*Lehrbilder*) in scientific treatises, rather than the decorative illustrations (*Schmuckbilder*) in literary texts.[20] For, as Bethe argues, while pictures and diagrams are often necessary for the comprehension of scientific texts, pictures serve no essential function in literature. This categorical distinction between scientific utility and artistic autonomy reverberates through Pächt's work, and the subsequent research of others that followed in his wake.

Pächt's 1950 essay was also roughly contemporary to two comprehensive studies of the entire history of botanical illustration: Wilfrid Blunt's *The Art of Botanical Illustration* (1950) and Claus Nissen's *Die Botanische Buchillustration: Ihre Geschichte und Bibliographie* (1951).[21] Both publications remain useful as overviews and bibliographic resources, but they largely consider ancient and medieval botanical illustrations through the lens of modern botanical illustration. For example, although Nissen includes an insightful discussion of different forms of plant depiction in modern botany, he narrows its scope to those illustrations that effectively "substitute" for a specimen of the plant itself. [22] Neither study adds much to the history of botanical illustration in Byzantium apart from a few obligatory mentions of a few main manuscripts, the Vienna Dioscorides in particular. Subsequent studies of medieval botanical illustration have largely followed in the footsteps of Singer, Pächt, Blunt, and Nissen.

Minta Collins's *Medieval Herbals: The Illustrative Traditions*, published in 2000, but based on her 1995 dissertation at the Courtauld, remains the most comprehensive art historical overview of Byzantine botanical illustration.[23] On the topic of Byzantine herbals, Collins provides a valuable synthesis of previous studies of individual manuscripts, although historians have criticized her work for various inaccuracies and methodological problems.[24] As an art historical study, Collins usefully emphasizes the emergence of accurate "from life" depictions based on the direct observation of nature over the rise of illusionistic naturalism. She categorizes ancient and medieval botanical illustrations on a spectrum, ranging from “schematic,” with little to no resemblance to the plant, to “recognizable," and finally, to naturalistic or life-like pictures that show both “artistic accomplishment” and “botanical expertise.”[25] Collins further distinguishes between decorative but inaccurate plant "illustrations" and more accurate plant "portraits" that aim to record or instruct.[26]

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[19] Pächt, "Early Italian Nature Studies," 31.
[20] Erich Bethe, *Buch und Bild*, esp. 22-60, and 99-101.
[21] Wilfrid Blunt, *The Art of Botanical Illustration* (London: Collins, 1950), and Claus Nissen, *Die Botanische Buchillustration: Ihre Geschichte und Bibliographie* (Mannsfield, Conn.: Maurizio Martino, 1951).
[22] Nissen, *Die botanische Buchillustration*, 1: 3-4.
[23] See Minta Collins, *Medieval Herbals: The Illustrative Traditions* (Toronto: University of Toronto Press, 2000), 31-114.
[24] e.g., Vivian Nutton, review of *Medieval Herbals: The Illustrative Traditions,* by Minta Collins, *Medical History* 45, no. 4 (2001): 541-542; and, more trenchantly, Alain Touwaide, review of *Medieval Herbals: The Illustrative Traditions,* by Minta Collins, *Isis* 95, no. 4 (2004): 695-697.
[25] Collins, *Medieval Herbals*, 28. She defines naturalism in terms of the accuracy of pictorial delineation, as well as the inclusion of pictorial devices emulating three-dimensionality (e.g., overlapping stems and complex modeling) and seemingly "natural" aspects of growth (e.g., curving stems, pruned stems, falling petals).
[26] Ibid., 27.

Collins's study, which borrows many terms from Pächt, runs into some of the same difficulties.[27] She readily acknowledges, for example, that plant "illustrations" and "portraits" are not mutually exclusive categories. And while her study aims to correlate practical utility with depictive accuracy, the nature and consequences of those connections often remain unclear. Ute Mauch has further elaborated on Collins's categories. She usefully relates the process of detailed plant depiction according to a plant's habitual characteristics, following a general "Habituskonzept" of the plant, in opposition to abstracting or ornamental tendencies (Ornamentierung).[28] But as Gavin Hardy and Laurence Totelin note, "schematic plant illustrations can at times be more useful to students of botany than more 'artistic' portraits."[29] Mauch further emphasizes plant identification and depiction largely according to modern botanical concepts of family, species, and genus. Ultimately, these approaches, although useful and thoughtful explorations of ancient plant depictions in relation to modern botany and modern canons of representation, may not tell us much about how such pictures are related to premodern scientific and artistic practices and concerns.

In *Observation and Image-Making in Gothic Art* (2005), Jean Givens usefully and incisively distinguishes between illusionism, the extent to which a picture matches the visual field as perceived, and, on the one hand, naturalism, the "impression of life-likeness," and, on the other, descriptiveness, the "rendering of specific factual detail."[30] Givens restricts her definition of "descriptive" images to those that "visually communicate information concerning the external and sometimes, internal physical structure of real-world objects and phenomena, but they need not be lifelike."[31] The danger in applying this definition is to assess a premodern depiction according to modern understandings of plant morphology. Labeling pictures as being either descriptive or not, moreover, overlooks the fact that *all* representative pictures must be (more or less) descriptive of the things they depict. The term "descriptive" itself, though clearly a metaphor, also risks eliding the differences between verbal and pictorial representation—a fact that Givens is generally at pains to avoid. The present dissertation, therefore, aims not so much to evaluate the "descriptive" accuracy of ancient botanical pictures according to modern standards, but rather to characterize more positively what pictures show, how they show, and what they might tell us about contemporary understandings of plants. While, as Givens argues, the accuracy of an illustration can shed light on an artist's working methods, it does not fully account for an illustration's role within premodern systems of botanical knowledge, because scientific pictures are necessarily and actively implicated in the production and transmission of knowledge. A picture does not merely document an object in the world, it actively forms knowledge of the object it represents. Learning about plants from these ancient and medieval illustrations often means seeing actual plants according to how they are depicted. In the words of Nelson Goodman: "That nature imitates art is too timid a dictum. Nature is a product of art and discourse."[32]

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[27] Collins's notion of plant portraiture may go back to Pächt, "Early Italian Nature Studies," 26. Given the difficulty of defining the term portrait, this dissertation avoids this term. On portraiture, see Shearer West, *Portraiture* (Oxford: Oxford University Press, 2004), 21-41.

[28] Ute Mauch, "Pflanzenabbildungen des Wiener Dioskurides und das Habituskonzept: Ein Beitrag zur botanischen Charakterisierung von antiken Pflanzen durch den Habitus," *Antike Naturwissenschaft und ihre Rezeption* 16 (2006): 125-138.

[29] Hardy and Totelin, *Ancient Botany*, 120.

[30] Givens, *Observation and Image-Making*, 34.

[31] Ibid., 102.

[32] Goodman, *Languages of Art: An Approach to a Theory of Symbols* (Indianapolis: Hackett, 1976), 33.

Selectivity and Aspectivity

This dissertation proceeds from Otto Pächt's observation that ancient and medieval botanical illustrations typically appear "as if they had been pulled up by the roots and taken to the herbalist's studio, pinned down and neatly arranged for didactic purposes."[33] Pinning, a central practice in the preparation and display of zoological specimens, involves the manipulation and fixing of a specimen into a specific configuration in order to show aspects of its morphology. Central to both pinning and botanical illustration is the maker's decision regarding which of a specimen's features to show and how to show them. In general, Ernst Gombrich similarly notes that artists must pick and choose what to depict for the simple fact that pictures are restricted in scope whereas the "visual world is incalculably large."[34] Pictures represent a subject selectively according to only some of its properties of necessity.

Dominic Lopes develops this idea of selectivity further in terms of a picture's "aspectivity."[35] According to him, a picture can depict an object as having or not having a property, or as portraying *another* property that explicitly precludes the depiction of the other property in question. For example, the portrayal of a leaf's curvature often obscures its symmetry, leaf shape, and margins.[36] Showing the leaf's abaxial surface often precludes showing its adaxial surface. A picture can also be inexplicit or "inexplicitly noncommittal" about the possession of a property if it is vague about the presence of a given detail. Moreover, by Lopes's definition pictures *must* represent spatial properties. Pictures characterize the spatial qualities of the subject depicted, that is, they show how its properties are positioned in relation to each other. Consequently, pictures show aspects of objects as being "spatially unified." Spatial unification does not necessarily mean that depicted features share the same viewpoint (as in Albertian perspective), but merely that the picture indicates spatial relations between distinct parts of the scene.[37] In other words, pictures must have a spatial unity that relates different aspects to each other, regardless of how that unity is ultimately mapped. The representation of a plant's spatial properties further requires that pictures make a number of explicit non-commitments, due to the impossibility of fully representing a three dimensional subject within a two-dimensional picture.[38] Lopes's practical considerations of how pictures present their subjects have shaped the present study's approach to the depictive mechanics of ancient and Byzantine botanical illustration. My terminology, however, departs slightly from Lopes's in that I maintain a distinction between selectivity and aspectivity. I refer to how pictures selectively depict properties, primarily morphological features, and under what aspect, that is, how they establish spatial relations among select characters. In other words, what pictures show (selectivity) and how they show (aspectivity).

Applying this approach to ancient and medieval botanical illustrations moves our discussion of them away from earlier debates over their lifelikeness, naturalism, descriptiveness, or illusionism, and toward the question of their scientific pictorial content. Selectivity and

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[33] Pächt, "Early Italian Nature Studies," 31.

[34] Ernst H. Gombrich, *Art and Illusion: A Study in the Psychology of Pictorial Representation* (London: Phaidon Press, 1984 [1960]), 219.

[35] Dominic Lopes, *Understanding Pictures* (Oxford: Clarendon Press, 2004 [1996]), 119.

[36] Lopes adapts these categories from Ned Block, see Ibid., 118.

[37] Ibid., 126.

[38] Ibid., 125: "The reason is simply that not all spatial relations between objects in three-dimensional space can be represented on a two-dimensional surface. Selecting to represent some spatial relations makes other relations unrepresentable."

aspectivity are not only relevant to botanical illustrations insofar as they are depictions, but also as they are a means of creating and communicating visual knowledge about the plant portrayed. By attending to those "distinct qualities or properties" that designate particular kinds of plants, selectivity in depiction is analogous to the Aristotelian method of classifying according to *differentiae* (διαφοραί), that is, the distinguishing characteristics of a thing (see ch. 1). In doing so, this dissertation considers the details included in ancient and medieval plant pictures in relation to contemporaries' notions of botanical classification and understanding.

Visual Knowledge

The broader goal of ancient and medieval botanical illustration was to create and communicate visual knowledge about plants. Visual knowledge is an expression coined by the art historian John Lowden.[39] Lowden refers to the consistency of iconography in Byzantine religious images, a product of artists' training and familiarity with images. Visual knowledge is a matter of knowing what the depiction of a particular subject *should* look like within a given tradition. Lowden makes the case for understanding the transmission and circulation of images on their own terms, independently of text-based methods and the texts that they accompany. Lowden's concept of visual knowledge applies to scientific illustration with the notable difference that knowledge of what a plant should look like within a tradition is shaped not only by preexisting imagery, but also by firsthand experience with the subjects portrayed, verbal descriptions, and other aspects, such as the plant's name, medicinal properties, and how it fits generic categories. The central idea of visual knowledge motivating this dissertation, however, is that an entire body of knowledge about the visible world can be conveyed and transmitted through visual, depictive means, and in doing so serve a complementary and sometimes even a contradictory role vis-à-vis other (e.g., verbal) ways of creating botanical knowledge. While scholars have emphasized the role of the visual in the early modern sciences, the visual has played a relatively small role in shaping our understanding of ancient and medieval science, especially in the Greek-speaking Eastern Mediterranean.[40] Many scholars of ancient and medieval Greek science tend not to take pictures into account as an autonomous means of establishing knowledge about the visible world.[41] On the contrary, this dissertation shows that in the ancient and medieval Greek sciences, image-making was a viable means of knowledge-making in its own right.

Overview

Each chapter of this dissertation takes up a different aspect of the formation and development of botanical visual knowledge.

The first chapter, "Pliny the Elder's *Effigies herbarum*," examines different ways that ancient botanical authorities referred to plants and constructed knowledge about them. It uses

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[39] John Lowden, "The Transmission of 'Visual Knowledge' in Byzantium Through Illuminated Manuscripts: Approaches and Conjectures," in *Literacy, Education and Manuscript Transmission in Byzantium and Beyond*, ed. Catherine Holmes and Judith Waring (Leiden: Brill, 2002), 59-80.

[40] On science and art in Early Modern Western Europe, see Sachiko Kusukawa, *Picturing the Book of Nature: Image, Text and Argument in Sixteenth-Century Human Anatomy and Medical Botany* (Chicago: University of Chicago Press, 2012); Pamela H. Smith, "Art, Science, and Visual Culture in Early Modern Europe," *Isis* 97, no. 1 (2006): 83-100; and David Freedberg, *The Eye of the Lynx: Galileo, His Friends, and the Beginnings of Modern Natural History* (Chicago: University of Chicago Press, 2002).

[41] On scientific illustration as an autonomous art form in Byzantium, see Stavros Lazaris, "Scientific, Medical and Technical Manuscripts," in *A Companion to Byzantine Illustrated Manuscripts,* ed. Vasiliki Tsamakda (Leiden: Brill, 2017), 55-113, at 113.

Pliny the Elder's *Naturalis historia* to establish the similarities and differences between descriptions, depictions, and specimens (*exemplaria*). It shows that all three work by delineating characteristic and distinguishing detail by which a particular species can be identified. All three systems involve selecting characteristic traits and then choosing how to express those traits. Their main differences lie in how they represent those characteristic features. Pictures, descriptions, and specimens cannot indicate the spatial aspect of a plant in the same way. In outlining these differences, the chapter lays the ground for consideration of pictures as a separate way of knowing about plants. The chapter finally proposes that botanical illustrations may have first emerged in connection to practices of gathering herbs, collecting medicinal specimens, and cultivating gardens for Hellenistic rulers.

The second chapter, "Depicting Plants in the Ancient Herbal," picks up where the first one left off by considering the different ways that ancient botanical illustrations select and portray the distinguishing features attributed to particular plants. It surveys the main surviving ancient botanical illustrations from the earliest surviving papyrus fragments from Tebtunis, Egypt, dating to the second century to the last major illustrated Greek herbal with uncial text, the Old Paris Dioscorides. In doing so, it delineates the main differences in ancient approaches to plant depiction by attending to what plant parts were depicted, how were they depicted, and why. The chapter further characterizes the main pictorial conventions and thinking underlying them in the ancient tradition of botanical illustration.

The third chapter, "Production and Layout," explores the sequence of production in the illustrated herbals. It argues that early illustrated herbals prioritized the copying and transmission of pictures over verbal information. These priorities are manifest in the fact that illustrations were then produced prior to the copying of text, which often resulted in less room for text, leading to its loss and abbreviation. Over time, however, the more usual text-first mode of production supplanted the initial picture-first mode.

While the text-first mode placed more emphasis on text, it also allowed the text to serve as a way to organize and collate pictures taken from other sources, and added as needed. This is because the entire text could be copied, regardless if there were any pictures available in the source text. The blank spaces left by the scribe could then be filled in later, as new pictorial sources were procured. This process of pictorial compilation finds its fullest expression in the Morgan Dioscorides (New York, Morgan Library, M 652), a deluxe illustrated copy of Dioscorides from the late ninth or early tenth century, which forms the main subject of the fourth chapter, "The Morgan Dioscorides and Middle Byzantine Botany." This chapter asks how Byzantine scholars used pictures to expand the domain of visual knowledge about plants. The chapter identifies two different strategies: first, the collation of pictures from different branches of the extant manuscript tradition, and second, the addition of new pictures created *ex novo* either through the observation of nature or close reading of the text.

The fifth chapter, "The Dissemination of Byzantine Botanical Illustration in the Later Middle Ages," considers how specifically visual knowledge circulated independently of text in the Late Byzantine period. This chapter takes up two principle forms of evidence: marginal sketches and botanical albums. As in the Morgan Dioscorides, Late Byzantine medical experts also added marginal sketches to preexisting manuscripts in order to clarify or elaborate on earlier illustrations. They also copied the ancient illustrations into notebooks. Unlike the elaborative sketches added to earlier manuscripts, these sketches are only usable as memory aides to recall images of plants already known to the user of the book. This suggests, in turn, that Late Byzantine medical experts studied and knew plants by their pictures in the older manuscripts.

Secondly, the chapter examines how pictures circulated independently of texts in botanical albums. These botanical albums appear to have acted as separate reference works, perhaps used in conjunction with unillustrated versions of Dioscorides and other kinds of texts such as botanical lexica.

The sixth and final chapter, "The Frontispiece Cycle of the Vienna Dioscorides and Its Changing Narratives," takes a step back and asks the broader question how did Byzantine people think about their illustrated herbals. It does so through a close analysis of the frontispiece cycle from the Vienna Dioscorides and how it changes over time. While few textual sources comment directly on herbal illustration, the frontispieces indicate how some Byzantine people thought about the codex's pictorial contents. As users modified the frontispieces over time, they left behind evidence of shifts in how they conceived of the illustrated herbal. I isolate three distinct stages: the frontispiece cycle as the portrayal of the contents of a medical book; the subsequent relocation of a folio to the front of the cycle that marked the codex as an "encyclopedic" catalog; and finally, the relabeling of various personifications as Wisdom (Sophia) in the fourteenth century that recast the book's contents as the bestowal of knowledge by divine Wisdom. This final stage corresponds to contemporary attempts to reconcile ancient learning to Christian thought. This final stage also speaks to the broader importance claimed for medical knowledge in the Late Byzantine period, a fact borne out by comparison to other frontispiece cycles.

A Note on Plant Names

Whenever a plant name is mentioned in text, I provide first a transliteration of the Greek plant name in italic Roman letters, as encountered in the source document, its name in Greek letters followed by, if necessary, a more conventional spelling as given in Wellmann's edition of Dioscorides or the Liddell-Scott-Jones dictionary entry, then a common English name if available, based on Beck's translation of the text, the Liddell-Scott-Jones dictionary, or on my own, and possible identifications following the modern Linnaean binomial system of nomenclature, where I have striven to give the most up-to-date scientific plant names: e.g., *strobylea* (στροβυλέα, i.e., στρόβιλος, stone pine, *Pinus pinea* L.), or *kedrides* (κεδρίδες, juniper berries, likely from a prickly juniper, *Juniperus deltoides* Adams). (N.B. In many cases the spelling of a plant name varies within the source document.) These identifications are primarily tools for the benefit of the reader to understand what plant could be the subject of a given text or picture and to facilitate dialogue with other disciplines, such as pharmacology, history of botany, and ethnobotany. These identifications, however, do not work as one-to-one translations. Ancient plant names did not mean in the same way as modern English or Linnaean names. The ancient names are more flexible and loosely descriptive than their modern-day counterparts. The long history of their usage means that they could refer to very different plants in different contexts. Their identifications in this dissertation are based as much on what plant they seem to be, following the above dictionaries and translations, as on the probability that a given plant would have been intended according to its relative availability or familiarity in a given context.

Chapter One
Pliny The Elder's *Effigies Herbarum*

> *Praeter hos Graeci auctores prodidere, quos suis locis diximus, ex his Crateuas, Dionysius, Metrodorus ratione blandissima, sed qua nihil paene aliud quam difficultas rei intellegatur. pinxere namque effigies herbarum atque ita subscripsere effectus. verum et pictura fallax est coloribus tam numerosis, praesertim in aemulationem naturae, multumque degenerat transcribentium socordia* [var. *sors varia, fors varia, sollertia*]. *praeterea parum est singulas earum aetates pingi, cum quadripertitis varietatibus anni faciem mutent.*[1]
>
> In addition to these, the Greek authorities that we have already discussed on occasion, among them Crateuas, Dionysius, Metrodorus, published in a most attractive way, though it demonstrates almost nothing other than its difficulties. For they painted pictures of plants and then wrote down their effects. A picture with so many colors is truly misleading, especially in the imitation of nature, and the carelessness [or varying fate, or varying skill] of those copying them degenerates them greatly. Moreover, it is not enough for them to be painted at single moments in their lifetime, since they change their appearance with the fourfold variations of the year.

Evidence for the emergence of botanical illustration in antiquity is scant. It appears suddenly in Pliny the Elder's *Natural History*, a comprehensive account of the whole natural world and its products in thirty seven rich, if rambling and often inaccurate, books. Begun in 77 CE, the text was only "completed" two years later in 79 CE when its author died in the eruption of Mount Vesuvius.[2] Researchers have tended to take Pliny's statements on herbal illustration at face value as reflecting the general state of botanical illustration in the first century CE.[3] But they have generally done so without bearing in mind Pliny's broader project. I suggest here that Pliny's critique of herbal illustration is related to his more general criticism of Greek medicine and scientific literature, and to his own decisions as the author of an unillustrated work. And while previous scholars have recognized Pliny's criticisms as evidence for the difficulties of ancient botanical illustration, they have not considered how his *Natural History* might shed light on the function of such illustrations.[4] In this chapter, I not only reassess Pliny's critique of herbal illustration, but I also examine his text to see how he refers to the pictures and their use within the texts they accompany. I then discuss the authors of illustrated herbals, including what we know about them independently of Pliny. I finally use this information to reconstruct some of the circumstances underlying the emergence and continued production of illustrated herbals from the second century BCE to the time of Pliny's *Natural History* in 77-79 CE. Through an analysis of Pliny's *Natural History*, I argue that pictures were, along with names and descriptions, a way for ancient authors to refer to plants. But pictures differ from descriptions and are connected to other

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[1] Pliny the Elder, *Naturalis historia*, 25.4, ed. Mayhoff (Leipzig: Teubner, 1892-1909), 4: 118-119. Hereafter *NH*.
[2] The author's nephew, Pliny the Younger, recounts the Elder's death in two letters to his friend Tacitus. Pliny the Younger, *Epistulae* 6.16 and 6.20.
[3] See, for example, Collins, *Medieval Herbals*, 37-38; Givens, *Observation and Image-Making*, 17-18, 90, 144-145; Guglielmo Cavallo, "Introduction," trans. Salvatore Lilla, in *Dioscorides Neapolitanus. Biblioteca Nazionale di Napoli. Codex ex Vindobonensis Graecus 1. Commentarium.* ed. Carlo Bertelli, Salvatore Lilla, and Giulia Orofino (Rome/Graz: Salerno Editrice/Akademische Druck u. Verlagsanstalt, 1992), 9-13, at 9-10.
[4] For a discussion of Pliny's and problems of depiction, see Givens, *Observation and Image-Making*, 144-145.

forms of reference in Hellenistic botanical inquiry, namely the practice of collecting specimens. I suggest here that Hellenistic illustrated herbals replicated the relation of reference between a specimen and textual accounts of its properties. This interpretation allows us to view pictures as analogous to specimens, a special kind of specimen both inside and outside the text itself. The chapter thereby links the illustrated herbal to the broader scientific and research activities of the Hellenistic period, and shows that different forms of botanical inquiry and text were linked to broader, shared systems of reference.

Pliny's Critique of Herbal Illustration

Pliny's comments give us a picture of how illustrated herbals were produced and what factors complicated their use and production. He tells us that several Greek authors illustrated their herbals and how they did it, namely by painting likenesses of plants and by writing the plants' "effects" below the pictures.[5] Despite the attractiveness of these pictures, Pliny questions their utility.[6] They demonstrate "almost nothing" but their "difficulties." He follows with a thorough critique of herbal illustration: He frets over the misleading colors in the pictures, how poorly skilled copyists degrade the quality of the pictures over time, and how a picture indicating a single moment in the plant's life fails to capture the appearance (*faciem*) of the plant as it varies over the course of the year.

Ironically, the passage in which Pliny complains that copyists degenerate pictures over time was itself "corrupted" in transmission. Manuscripts read *fors varia* or *sors varia*, both of which suggest that the degeneration of the pictures is due to varying fate or chance, and is therefore, arbitrary, even unavoidable.[7] But the passage baffled editors. Karl Friedrich Theodor Mayhoff notes that his choice of *socordia*, or carelessness, echoes a reading of the passage preferred by Martin Hertz. Carl Friedrich Wilhelm Müller similarly wondered why should fate (Loos, i.e., Los, or Schicksal) have any bearing on what colors the copyist chooses to use when copying a picture? He suggested that *sors varia* is a corruption of *sollertia*, i.e., skill, "ein Wort, das Plinius sehr liebt."[8] He adds that *degenerat* need not be transitive, since it is the *sollertia* that degenerates.[9] Müller's reading suggests that a picture's many colors impede the exercise of the copyists' skill, thereby putting the burden of the pictures' degeneration not on the copyists' carelessness, or fate, but rather on the limitations of painting itself. Mayhoff, however, treats *sors varia* as a corruption of carelessness, *socordia*, on the reasoning that *degenerat* ought to be transitive and that *sollertia* does not degenerate pictures.[10] Whether we choose the manuscripts'

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[5] As Collins notes, Pliny's text could describe the stages of production. The pictures were executed first *and then* (*atque ita*) the text was added to them, written down or even *under* them (*subscripsere*). Collins, *Medieval Herbals*, 37. *Subscripsere* can mean to "write underneath or below" as well as to "write or note down," see Charlton Lewis and Charles Short, *A Latin Dictionary* (Oxford: Clarendon Press, 1879), s.v., *subscribo*. (hereafter Lewis and Short).

[6] Discussion of this passage is extensive. See Collins, *Medieval Herbals*, 37-38; David Freedberg, "The failure of colour," in *Sight and Insight. Essays on art and culture in honour of E.H. Gombrich at 85*, ed. John Onians (London: Phaidon, 1994), 245-162; Givens, *Observation and Image-Making*, 17-18, 90, 144-145; Stückelberger, *Bild und Wort*, 79-81.

[7] For the manuscripts, see *Naturalis historia,* ed. Mayhoff, 4: 118.

[8] Carl Friedrich Wilhelm Müller, "Kritische Bemerkungen zu Plinius' naturalis historia," *Schulnachrichten. 1887-1888.* Programm Nr. 164 (Breslau: Graß, Barth u. Comp. [W. Friedrich], 1888), 20.

[9] Müller, "Kritische Bemerkungen," 20: "Übrigens sehe ich keinen Grund, degenerare transitiv zu fassen. Die Kunstfertigkeit der Kopisten hat bedeutend abgenommen."

[10] *Naturalis historia,* ed. Mayhoff, 4: 119, "*pictura dicitur deterior fieri socordia.*"

fors/sors varia or *sollertia* or *socordia*, the end result is much the same: pictures degenerate over time through the act of copying.[11]

Pliny's criticisms, however, make sense in light of his larger project. While other Roman authors such as Vitruvius, Atticus, and Marcus Varro had their works illustratred, Pliny did not, presumably because of the practical concerns that he voiced.[12] Pliny's criticisms of Greek herbal illustration also fit with his general disdain for Greek physicians and Greek scientific literature. As other scholars have noted, Pliny disparages Greek specialists and learning throughout the *Natural History*.[13] Part of this attitude reflects broader Roman chauvinism and traditionalism, rooted in a cultural rivalry between Rome and the subjugated Greek East.[14] Pliny is especially dubious Greek medicine's mutability (*ars mutatur cottidie*); Greek physicians' proclivity for speculation, theory, and professional disagreements (*diversitas inter medicos*); and their complex remedies (*compositiones et mixturae inexplicabiles*).[15] These concerns point, on the one hand, to different cultural conceptions of medicine, and, on the other, to Pliny's broader aim of making Romans self-sufficient, that is, independent of Greek expertise.[16] His thoughts on the limited utility of herbal illustrations parallel other passages in the *Natural History*, where Pliny decries that Greek authors sacrifice utility and practicality for the sake of ostentatious presentation.[17] His comments against herbal illustration should not, therefore, come as a surprise.[18]

While understanding Pliny's criticisms in light of his larger project, we should not discount them entirely. They still reflect valid concerns likely shared by other ancient scholars. They may even reflect a larger ancient discourse on the relative merits of scientific illustration. Galen (ca. 129-200/216 CE), for example, criticizes a rival physician for investigating "whether painting was useful to doctors" while not bothering to define what a disease was.[19] Different

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[11] See Givens, *Observation and Image-Making,* 144-145.

[12] On the illustrations in Vitruvius, Atticus, and Varro, see Jocelyn Penny Small, *Parallel Worlds of Classical Art and Text* (Cambridge: Cambridge University Press, 2003), 124, 131-133, 135.

[13] Gabrielle Marasco, "L'introduction de la médecine grecque à Rome: une dissension politique et idéologique," in *Ancient Medicine in its Socio-Cultural Context. Papers Read at the Congress Held at Leiden University*, *13-15 April 1992,* ed. Ph.J. van der Eijk, H.F.J. Horstmanshoff, P.H. Schrijvers (Atlanta: Rodopi, 1995), 1: 35-48; Johannes Hahn, "Plinius und die griechischen Ärzte in Rom: Naturkonzeption und Medizinkritik in der *Naturalis Historia*," *Sudhoffs Archiv* 75 (1991): 209-239.

[14] Case in point is Cato the Elder's (234–149 BCE) hostility to Greek medicine and physicians. See Plutarch, *Cato the Elder* 23.1, and *NH* 29.5. See also Marasco, "L'introduction," 35-48.

[15] *NH* 22.14-15, 24.1, and 29.5. Hahn, "Plinius und die griechischen Ärzte," 231; G.E.R. Lloyd, *Science, Folklore, and Ideology*. *Studies in the Origin and Development of Greek Science* (Cambridge: Cambridge University Press, 1983), 135-149; Vivian Nutton, "Roman Medicine: Tradition, Confrontation, Assimilation," in *Aufstieg und Niedergang der römischen Welt. Teil II. Principat. Band 37.1,* ed. W. Haase and H. Temporini (New York: De Gruyter, 1993), 49-78; Karin Nijhuis, "Greek doctors and Roman patients: a medical anthropological approach," in *Ancient Medicine in its Socio-Cultural Context*, ed. van der Eijk, Horstmanshoff, Scrijvers (Amsterdam: Rodopi, 1995), 49-67, esp. 50-51, 60-61; Heinrich von Staden, "Liminal Perils: Early Roman Receptions of Greek Medicine," in *Tradition, Transmission, Transformation: Proceedings of two Conferences on Pre-Modern Science Held at the University of Oklahoma*, ed. F.J. Ragep, S.P. Ragep, and S. Livesey (Leiden: Brill, 1996), 369-418.

[16] Trevor Murphy, *Pliny the Elder's Natural History: The Empire in the Encyclopedia* (Oxford: Oxford University Press, 2004), 69. On different cultural conceptions of medicine, see Nijhuis, "Greek doctors," 50-51, 60-61.

[17] E.g., his comments on the titles of Greek scientific works, *NH*, Praef. 24.

[18] Compare here, for example, Pliny's criticisms of botanical illustration with his praise for Varro's *Hebdomades*. See *NH* 35.2.

[19] Galen, *De methodo medendi* 1.7.6, ed. Kühn, 10:53-54: κατ' οὐδεμίαν αὐτῶν ἐτόλμησεν εἰπεῖν ὅ τί ποτ' ἐστὶ νόσος, καίτοι γε μηδὲν πρὸς ἔπος ἐν αὐταῖς διεξέρχεται μέχρι τοῦ καὶ τὰ τοιαῦτα ζητεῖν, εἰ ζωγραφία χρήσιμος ἰατροῖς ἐστιν. For translation and commentary, see Galen, *On the Therapeutic Method: Books I and II*, trans. R.J. Hankinson (New York: Oxford University Press, 1991), 27-28, and comments at 145. See also Marie-Hélène

physicians doubtless took different positions on the matter, for despite Pliny's critiques, many of his contemporaries continued to produce and read illustrated herbals.[20]

Referring to Plants in Pliny's *Natural History*

Pliny's criticisms indicate that he had certain expectations about the kinds of information that those pictures might convey. He wants the pictures to reproduce plants' coloring accurately, and to indicate what they look like over the course of the year. Beyond these rather specific expectations, Pliny's comments on herbal illustration might be better studied for what they tell us about the purpose and use of plant depictions in herbal treatises. In other words, how, according to Pliny, do pictures of plants appear to function within the texts in which they appear?

To answer this question we can consider what Pliny says about herbal treatises, and how he talks about such texts, especially in relation to botanical inquiry more broadly. Pliny's term *effigies* refers to an artistic copy or imitation. It derives from the verb *effingere*, to form, mold or fashion, and to represent by imitation. It also means to rub gently, stroke, wipe clean or out. The verb in some ways conveys the process of image-making. Pliny notes that the *effigies herbarum* appear along with texts concerning the plants' effects (*effectus*) or medicinal properties. This juxtaposition would have linked the plant's name and likeness to a discussion of its properties. As Pliny only mentions *effectus,* some researchers have supposed that early illustrated herbals omitted descriptions of plants and only included information about their active properties.[21] In the following section, where Pliny picks up following his critique of herbal illustration, he contrasts these illustrated discussions of medicinal properties to unillustrated texts that rely on verbal descriptions or on names alone:

> For this reason the other writers have given verbal accounts only (*sermone eas tradidere*); some have not even given the shape (*ne effigie*) of the plants, and for the most part have been content with bare names, since they thought it sufficient to point out the properties and nature (*potestates vimque*) of a plant to those willing to look for it (*quaerere volentibus*). To gain this knowledge is no difficult matter; I at least have enjoyed the good fortune to examine all but a few plants through the devotion to science of Antonius Castor, the highest botanical authority of our time; I used to visit his special garden (*hortulo*), in which he would rear a great number [of specimens]…[22]

The passage indicates that authors of pharmacological treatises had several options when it came to how they referred to plants. Max Wellmann has interpreted this passage as indicating that there were only three approaches to writing about medicinal plants: texts with pictures and properties but no descriptions, texts with descriptions but no pictures, and texts with neither, only

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Marganne, *Le livre medical dans le monde gréco-romain*, Cahiers du CEDOPAL, n. 3 (Liege: Les Editions de l'Université de Liège, 2004), 42-43.

[20] This fact is plainly evident from the surviving papyrus fragments of illustrated herbals, see below. Cp. Givens, *Observation and Image-Making,* 87, n. 16, and 144-145.

[21] Max Wellmann, "Krateuas," *Abhandlungen der königlichen Gesellschaft der Wissenschaften zu Göttingen. Philologisch-historische Klasse.* Neue Folge, 2, no. 1 (1897): 3-32, at 20.

[22] *NH* 25.9: Quare ceteri sermone eas tradidere, aliqui ne effigie quidem indicata et nudis plerumque nominibus defuncti, quoniam satis videbatur potestates vimque demonstrare quaerere volentibus. nec est difficilis cognitio: nobis certe, exceptis admodum paucis, contigit reliquas contemplari scientia Antoni Castoris, cui summa auctoritas erat in ea arte nostro aevo, visendo hortulo eius, in quo plurimas alebat…

names and properties.[23] Wellmann perhaps draws too sharply distinctions between types of works that may have been blurrier at the time. We can, for example, easily imagine that some texts might depict, describe or merely name plants based on what sources and information were available to their authors. These differentiated approaches to writing about medicinal herbs do, however, indicate some of the different strategies available to ancient authors for referring to plants. The central problem was how to ensure that readers would be able connect medicinal properties to the appropriate plant. Names, pictures, and verbal descriptions are different ways of securing the text's capacity to *refer* its discussion or list of properties to a particular plant.

Names

Names by themselves may not have been entirely sufficient for referring to a particular plant. Names varied by region, and changed over time.[24] Many plants went by multiple names (synonymity).[25] Many names were shared by different plants (homonymity).[26] Sometimes authorities might also use false names to conceal the identity of a given plant (pseudonymity).[27] And many plants had no names, especially those that were uncommon, from other regions, or without known uses (anonymity).[28] Moreover, while many ancient names were descriptive,[29] they could be misleading by not clearly referring to the way in which they pertained to or described the plant.[30] Some names even applied ironically or antiphrastically.[31]

Still, while Pliny might express some exasperation with authors who rely on names alone, it would, he concedes, be easy enough for the reader to learn about plants by going to a garden or consulting someone knowledgeable. Pliny's confidence in the name is perhaps a reflection of what Andrea Guasparri has called his tendency to connect, "rather ontologically," a given name to the properties of its referent.[32] That faith in the link between a name and a set of properties is also indicative of everyday realities. Most people probably obtained simples from physicians, apothecaries (*pharmakōpolai*), herbalists or root-cutters (*rhizotomoi*), or other sellers.[33] Two medicine bottles dating to the first half of the third century CE and found at the *domus del Chirurgo* (house of the surgeon) in Rimini bear the letters ΧΑΜΑΙΔΡΥϹ (χαμαίδρυς, germander) and ΑΒΡΟΤΟΝΟΥ (ἀβρότονον, wormwood), accompanied by a Latin abbreviation, HABR.[34] When procuring drugs, most specialists and patients probably would have gone by

[23] Wellmann, "Krateuas," 20.
[24] Hardy and Totelin, *Ancient Botany*, 93-102.
[25] Ibid., 93, 101-103.
[26] Ibid., 72, 93. Another example would be *amaranton* (ἀμάραντον) which seems to be *Celosia spp.* in *NH* 21.8; whereas Dioscorides describes a *Helichrysum spp.*, see Dioscorides, *De materia medica* (hereafter *MM*), 4.57.
[27] Hardy and Totelin, *Ancient Botany*, 93, 103-104.
[28] Ibid., 93, 96.
[29] Ibid., 98.
[30] For example, ἀμάραντον (which means unfading or unwithering) in Pliny and Dioscorides refers to the persistant color of the flowers (*NH* 21.8, *MM*, 4.57), whereas in later lexica it often refers to the evergreen quality of the plant, see Armand Delatte, "Glossaires de botanique," in *Anecdota Atheniensia et alia*, (Paris: Droz, 1939) 2: 277-454, at 279, 304, 320, 341, 361, 367, 373, 418.
[31] On antiphrasis, see Hardy and Totelin, *Ancient Botany*, 100.
[32] Andrea Guasparri, "Explicit Nomenclature and Classification in Pliny's *Natural History* XXXII," *Studies in History and Philosophy of Science Part A* 44, no. 3 (2013): 347-353, esp. 350.
[33] On the different purveyors of drugs and simples in ancient Rome, see Jukka Korpela, "Aromatarii, pharmacopolae, thurarii et ceteri. Zur Sozialgeschichte Roms," in *Ancient Medicine in its Socio-Cultural Context. Papers Read at the Congress Held at Leiden University, 13-15 April 1992,* ed. Ph.J. van der Eijk, H.F.J. Horstmanshoff, P.H. Schrijvers (Atlanta: Rodopi, 1995) 1: 101-118.
[34] Jacopo Ortalli, "Rimini: la domus 'del Chirurgo'," in *Aemilia. La cultura romana in Emilia Romagna dal III*

such labels or even simply word of mouth. Prior knowledge of the substance's proper appearance, taste, smell, etc., may have only served to verify the name or identify a substance should the label have failed.

Descriptions and Depictions

Pliny would appear to imply that depictions and descriptions were interchangeable to some extent. Here pictures and descriptions both relate to the outward appearance of the plant. He refers to both in strikingly similar terms: the pictorial illustrations are *effigies*, whereas verbal descriptions (literally, "recount them by word," *sermone eas tradidere*) address the likeness or form, *effigie*. Pliny does not dispute then that a likeness or image (*effigies/effigie*) can secure the reference of a text; rather what matters for him is whether that likeness, image, or shape (*effigies/effigie*) is painted (*pinxere*) or transmitted verbally (*sermone …tradidere*). Pliny's way of referring to the visual aspect or morphology of a plant consequently opens itself to a certain ambiguity as it is sometimes unclear if he refers to a textual description or a picture:

> That plant, however, which the Greeks call *dracontion* has been pointed out to me *triplici effigie* (in three illustrations/in three forms); the first has leaves like those of beet, a thyrsus and a purple flower; this is like the *aron*. Others have pointed out a kind with a long root, which is as it were stamped and knotted, and with three stems in all, prescribing a decoction of its leaves in vinegar for the bite of serpents. The third plant (i.e., in the third description) pointed out had a leaf larger than that of the cornel and a root like that of a reed, the knots on it being, they said, as many as the plant is years old, the leaves too being also equal in number.[35]

Gavin Hardy and Laurence Totelin have seen this passage as a demonstration of Pliny's difficulties using illustrations to make accurate identifications of particular plants.[36] But Pliny does not appear to complain here about the illustrations. He rather notes that the plant with the Greek name *dracontion* occurs in three different forms—He may not in fact be referring to illustrations at all. It was common for authors to note that multiple plants might go by the same name, or that there were multiple varieties of the "same" plant.[37] His *triplici effigie* here parallels his use of *effigie* to refer to an herb's outward appearance, form, or shape within a verbal description. The passage's ambiguity concerning *dracontion* is heightened by the words *demonstratio* and *demonstratum*, that is, a showing or pointing out, "as with a finger"— "a vivid delineation," or "picturesque presentation."[38] It is not even clear if Pliny refers to a textual or pictorial source, as it might have been oral.

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secolo a.C. all'età costantiniana, ed. Mirella Marini Calvani (Venice: Marsilio, 2000), 513-526; Luigi Taborelli, "I contenitori per medicamenti nelle prescrizioni di Scribonio Largo e la diffusione del vetro soffiato," *Latomus* 55 (1996): 148-156; Stefano De Carolis, ed., *Ars Medica. I ferri del mestiere. La domus 'del Chirurgo' di Rimini e la chirurgia nell'antica Roma* (Rimini: Guaraldi, 2009); and Isabella Andorlini, "Gli strumenti perduti di Galeno," *La torre di Babele* 8 (2012): 239-247, at 246-247.

[35] *NH* 24.150; id autem, quod Graeci dracontion vocant, triplici effigie demonstratum mihi est: foliis betae, non sine thyrso, flore purpureo; hoc est simile aro. alii radice longa veluti signata articulosa que monstravere, ternis omnino cauliculis, foliis, decoqui ex aceto contra serpentium ictus iubentes. tertia demonstratio fuit folio maiore quam cornus, radicis harundineae, totidem, ut adfirmabant, geniculatae nodis, quot haberet annos, totidem que esse folia; hi ex vino vel aqua contra serpentes dabant.

[36] Hardy and Totelin, *Ancient Botany*, 114.

[37] On synonymity, see Ibid., 93-104.

[38] Lewis and Short, s.v. *demonstratio*.

That Pliny uses similar terminology to refer to the content and purpose of both pictures and descriptions indicates a certain degree of functional interchangeability. It raises the question: How might pictures substitute for descriptions, or vice versa? In his *Languages of Art*, Nelson Goodman hits upon this functional similarity between pictures and descriptions as a crucial underpinning for explaining how a picture can act as a representation. He notes,

> A picture that represents—like a passage that describes—an object refers to and, more particularly, *denotes* it. Denotation is the core of representation and is independent of resemblance. If the relation between a picture and what it represents is thus assimilated to the relation between a predicate and what it applies to, we must examine the characteristics of representation as a special kind of denotation.[39]

For Goodman both pictures and descriptions involve the creation and organization of labels—whether pictorial or verbal—that characterize objects by connecting them with particular characteristics or properties (in the broader, i.e., non-medical sense). By labels, Goodman refers to the classification of objects by means of determining what objects pertain to what categories (labels), and vice-versa, what labels pertain to what objects. As labels, pictures are themselves labeled when it comes to identifying the kind of pictures (i.e., labels) they are.[40]

According to Goodman, this process of making labels and thereby classifying objects is not a passive process of recording the world as it is. "Classification involves preferment; and application of a label… as often *effects* as it records a classification."[41] An object as represented by a description or a picture is itself invented in the process of representing it. It is, in Goodman's words, "a way of taking the world."[42] Objects are thus formed in the process of representing them: "That nature imitates art is too timid a dictum. Nature is a product of art and discourse."[43] Certainly for botanical illustrations, some pictorial features or labels should be able to point to features supposedly belonging to individuals within a class (*genus*) of objects. Goodman does not dispute that pictures can resemble their referents; rather, they need not resemble in order to be effective representations. This conclusion echoes a concern often raised in the study of illustrated herbals, namely, that scientifically useful illustrations need not closely resemble their referents. As Hardy and Totelin have noted, "schematic plant illustrations can at times be more useful to the student of botany than more 'artistic' portraits."[44]

Goodman's terminology here resonates with the classificatory and categorical thinking that undergirded ancient systems of plant classification. In the absence of a single or coherent species concept, individual plants were ordered into groups on the basis of shared features and distinguished according to differences (*differentiae*, διαφοραί). It was with the consideration of such differences that Theophrastus of Eresus (371-287 BCE) began his *Enquiry into Plants*.[45] Specialists then applied names and epithets in the process of distinguishing among genera and

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[39] Goodman, *Languages of Art*, 5.
[40] Ibid., 30.
[41] Ibid., 32.
[42] Ibid.: "...the object itself is not ready-made but results from a way of taking the world. The making of a picture commonly participates in making what is to be pictured. The object and its aspects depend upond organization; and labels of all sorts are tools of organization." This conclusion is more fully explored in Nelson Goodman, *Ways of Worldmaking* (Indianapolis: Hackett, 1978).
[43] Goodman, *Languages of Art*, 33.
[44] Hardy and Totelin, *Ancient Botany*, 120.
[45] Theophrastus, *Historia plantarum* 1.1.1 (hereafter *HP*).

subgenera. In this way, as Hardy and Totelin note, Theophrastus identifies five different types of radish mainly on the basis geography, though other forms of distinction might be used, such as color or whether or not the plant was cultivated.[46] In Goodman's terms ancient plant classification proceeded through the labeling of differentiating characters that defined the identity of given group of plants. The means of representing particular plants, either in pictures or descriptions, were therefore analogous to the process of classification (see ch. 2).

Pliny's criticism of botanical depictions largely centered on the difficulty of labeling—e.g., certain stages of growth are omitted. Misleading colors result in not only a poor resemblance, but also misclassifications and inaccuracies. At the same time, it seems doubtful that Pliny would have understood his own equivalence between pictures and descriptions in the same terms. Pliny's terminology emphasizes that both pictures and descriptions perform a "pointing" or reference function (*demonstratio*), and that both should or can concern the visible outward appearance or shape of an object (*effigies/effigie*). Both aspects are in line with Goodman's identification of the denotative function of representations. Goodman's language is, however, more general. It, moreover, points to the process of labeling and classification that underlies description and depiction. Pliny does not make explicit reference to these broader consequences of his discussion of pictures and descriptions.

Exemplaria effectusque

While Pliny suggests that pictures and descriptions of plants both denote the appearance of a particular plant, his *Natural History* provides further clues about the function of herbal illustrations. Just before Pliny mentions illustrated herbals, he tells us that the Pontic king Mithridates VI Eupator (135-163 BCE) sought out information on medicinal substances "from all his subjects," and that at his death he left behind "a box (*scrinium*) of these treatises (*commentationum*) along with specimens and [descriptions of their] properties (*exemplaria effectusque*)."[47] Mithridates' medical library was clearly not restricted to treatises, but also contained *exemplaria* and *effectus*, presumably in writing. *Exemplaria* may refer here to examples, samples, or specimens. [48] Mithridates' *exemplaria* might have included samples of drugs, perhaps even dried plant specimens.[49] Pliny also reports that Mithridates possessed a collection of gemstones (stored in a *dactyliotheca*), many of which would have been accorded therapeutic or magical properties.[50] Motivating the collection of *materia medica* was doubtless their rarity and the need for concrete objects of study. The cultivation of many Mediterranean plants in the Kingdom of Pontus would have been difficult, given its cold climate. Pliny notes that Mithridates could not grow laurel and myrtle at Panticapaeum (modern Kerch) in Crimea.[51]

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[46] *HP* 7.4.2, see Hardy and Totelin, *Ancient Botany*, 70-71.

[47] *NH* 25.7: is ergo in reliqua ingeni magnitudine medicinae peculiariter curiosus et ab omnibus subiectis, qui fuere magna pars terrarum, singula exquirens scrinium commentationum harum et exemplaria effectusque in arcanis suis reliquit.

[48] *Lewis and Short*, s.v., *exemplar*. The term can also refer to images, likenesses, and impressions.

[49] Contemporaries used dried flowers in garlands, wreaths, and chaplets. E.g., *NH* 21.8-9, 23; *MM* 4.57.

[50] *NH* 36.5 (37.11): Gemmas plures primus omnium Romae habuit - quod peregrino appellant nomine dactyliothecam - privignus Sullae Scaurus, diu que nulla alia fuit, donec Pompeius Magnus eam, quae Mithridatis regis fuerat, inter dona in Capitolio dicaret, ut Varro alii que aetatis eius auctores confirmant, multum praelata Scauri.

[51] *NH* 16.137. The story is adapted from Theophrastus, see Laurence Totelin, "Botanizing Rulers and their Herbal Subjects: Plants and Political Power in Greek and Roman Literature," *Phoenix* 66, no. 1-2 (2012): 122-144, at 135.

The other benefit of the collection would have been its mobility, unlike a garden, and the fact that specimens could provide witness to the appearance of a plant out of season.

That *exemplaria* were paired with *effectus* in the Mithridatic library raises the question of their equivalence with *effigies*, also paired with *effectus*. How is the relation between an *effigies* and its referent's *effectus* analogous the relation between an *exemplar* and its *effectus*? Both the *effigies* or *exemplar* helps to link a plant name to a set of properties. Both do so independently of a verbal text. They both *show* us what that plant *looks* like. Yet they differ in that the *effigies* is a representation, whereas the *exemplar* is itself the object. As a form of distributive denotation, the *exemplar* is both a kind of representation as well as a member of the group of objects that it represents. An *effigies* is merely a representation of that class of objects, and not a member of it.

As part of a collection or library linked to verbal formulations of *effectus*, the *exemplaria* are, in a sense, no longer external to discourse. Their presence in Mithridates' library and linkage to particular texts brings them into discourse. They remain, of course, complex objects. Fragile and difficult to store, they do not exist *within* a specific text in a fixed or absolute way, but are instead linked to it, through names, indices, or labels. They, therefore, belong to a wider system of reference that more broadly encompasses other resources for the of study plants, such as gardens. In contrast, the *effigies* appear directly above their *effectus* along with their names, that is, fixed to a text. While still being nontextual, the *effigies* are internal to texts—i.e., co-present with the written text on the material support of the papyrus roll. The *effigies* are necessarily to be viewed in the course of reading, even as a consequence of reading, in a way that is more logistically difficult for the *exemplaria*, handled separately of the text and its material supports.

That both the *effigies* and *exemplaria* share a role denoting the general appearance of individuals belonging to a larger class of objects while linking them to a set of *effectus* could suggest that the *effigies* substitute for the *exemplaria* within the text. That raises the question: What if herbal illustration emerged initially as a way of substituting for the presence of a specimen or *exemplar*, a means of concretely fixing the plant's form to the text? What if the earliest herbal depictions sought to resolve the complications of keeping and handling *exemplaria*? That the earliest examples of herbal illustration, discussed in the next chapter (ch. 2), depict individual plants as uprooted, without context, in the singular, and even with their limbs and leaves often appearing flattened as though pressed could speak to their having been conceived of as being like actual specimens. In this way, *effigies* allowed the *exemplar* to appear within a text in a more convenient and fixed configuration. In doing so, the *effigies* is not extraneous to the writing of a scientific text, but rather performs an important role in the construction of the text. As Bruno Latour has noted in his study of scientific narratives in a Brazilian soil study,

> The scientific text is different form all other forms of narrative. It speaks of a referent, *present* in the text, in a form other than prose: a chart, diagram, equation, map, or sketch. Mobilizing its own *internal* referent, the scientific text carries within itself its own verification.[52]

Illustrated Greek herbals thereby instantiate their referents through pictures. The pictures replicate a part of the wider reference system to which the *exemplaria* belong. By inserting the *effigies* into the text, and into a fixed configuration with the *effectus*, the illustrated herbal makes a part of the wider reference system available within the text itself. At the same time, as Latour

[52] Ibid., 56.

points out, external referents (i.e., the actual plants growing out in the world) only serve to fix the reference of discourse, as it is otherwise constructed from the "deambulatory" circulation of internal referents. The scientific narrative does not, therefore, concern the construction of resemblance between internal and external referents, but rather the transformation of the former. Latour here echoes our discussion of depictions and descriptions as inventing objects through the act of representation. As Latour notes, "the sciences do not speak of the world but, rather, construct representations that seem always to push it away, but also to bring it closer."[53]

Authors of Ancient Illustrated Herbals

While the above section examines how herbal illustrations might have functioned for Pliny, this section now considers the authors of illustrated herbals, and the contexts in which they worked. Pliny mentions the names of three Greek *auctores* of illustrated texts: Crateuas, Metrodorus, and Dionysius.[54] Pliny does not say that these authors invented herbal illustration. Nor does he say that only they illustrated their works. Other authors may have illustrated their herbals. Other ancient medical and scientific treatises, including works on anatomy, surgery, and bandaging, were probably also illustrated.[55]

The identification and contextualization of these ancient authors is a difficult task. Physicians often adopted similar professional names (e.g., Hippocrates or Aesclepius), which were handed down over generations.[56] Sources tend to be later than the authors they describe and could, therefore, reflect more a text's transmission than its original composition. For example, did Pliny know for certain that Crateuas, Metrodorus and Dionysios had their texts illustrated—Or did he merely encounter copies of their works that had been illustrated? We should bear these complicating factors in mind, as the following section attempts to address general trends among the authors Pliny mentions.

Crateuas

Of the three authors that Pliny mentions we know the most regarding Crateuas (c.100-60 BCE).[57] A portrait of him and several fragments attributed to him appear in the sixth-century Vienna Dioscorides (Vienna, Österreichische Nationalbibliothek, med. gr. 1).[58] In the preface to his *De materia medica*, Dioscorides refers to Crateuas as a *rhizotomos* (ῥιζοτόμος), literally a "root-

[53] Bruno Latour, *Pandora's Hope. Essays on the Reality of Science Studies* (Cambridge, Mass.: Harvard University Press, 1999), 30.

[54] The fact that Pliny only mentions three authors does not suggest that there were not others. Cp. Collins, *Medieval Herbals*, 37.

[55] Marganne, *Le livre medical,* 35-58; Stückelberger, *Bild und Wort*; Mirko Grmek and Danielle Gourevitch, *Les maladies dans l'art antique* (Paris: Fayard, 1998).

[56] I.e., the so-called *Berufsnamen*, see Heikki Solin, "Die sogenannten Berufsnamen antiker Ärzte," in *Ancient Medicine in its Socio-Cultural Context. Papers Read at the Congress Held at Leiden University, 13-15 April 1992,* ed. Ph.J. van der Eijk, H.F.J. Horstmanshoff, P.H. Schrijvers (Atlanta: Rodopi, 1995), 1: 119-142.

[57] Max Wellmann published ten fragments of Crateuas preserved in the Vienna Dioscorides, see Max Wellmann, "Krateuas," 2-32; see also fragments and testimonia *Pedanii Dioscuridis Anazarbei De materia medica*, ed. Max Wellmann (Berlin: Weidmann, 1914), 3: 139-146. Dioscorides mentions Crateuas in the preface to his *De materia medica.* Galen mentions Crateuas several times, for example, in the introduction to Book VI of his *De simplicium medicamentorum temperamentis ac facultatibus*. See also ps-Hippocrates, *ep.* 16, in *Hippocrates. Pseudoepigraphic Writings*, ed. and trans. Wesley D. Smith (Leiden: Brill, 1990), 70-73.

[58] The fragments concern the following: Ἀριστολόχια (f. 18r), Ἀριστολόχιος, i.e., στρογγύλη (f. 19v), Ἀνεμώνη ἡ φοινικῆ (f. 26r), Ἀσφόδελος (f. 27v), Ἀρνόγλωσσον (f. 29v), Ἄσαρον (f. 31r), Ἀναγαλλίδες ἀμφότεραι (f. 40v), Ἀργεμώνη (f. 29r), Ἀστέριον (f. 33r).

cutter."[59] The term is sometimes translated as "herbalist," although it is better understood more broadly as a "gatherer of simples."[60]

Rhizotomoi are different from *pharmakopōlai* or druggists, who sold drugs and mixed compounds, although the relationship between the two professional groups is not well understood.[61] Both are sometimes supposed to have practiced traditional or folk medicine often contrasted with rational Hippocratic medicine.[62] The *Rhizotomoi,* a lost play by Sophocles (496-406 BCE), a fragment of which was preserved in Macrobius's *Saturnalia*, paints a vivid picture of the ritualized practices associated with root-cutting in the fifth century BCE. In it, Medea, "naked, shrieking, wild-eyed," gathers the noxious juice of the *thapsia* plant with brazen implements.[63] Theophrastus similarly notes that root cutting, while sometimes reasonable, is often overly exaggerated and dramatized.[64] He approves of some practices, such as facing away while gathering noxious plants. Others he regards more skeptically, such as the avoidance of certain birds, the making of offerings, or drawing circles in the ground with specific implements.[65] Such practices may have served the practical ends of protecting the profession by dissuading others from collecting their own simples. By the Hellenistic period, however, Crateuas and other *rhizotomoi* do not appear to be closely associated with the "murkier aspects of classical Greek *rhizotomia.*"[66] The development of a "rational" tradition of *rhizotomia* may go back to the fourth century, where we find Diocles of Carystus (ca. 400-ca. 300 BCE) authoring a highly respected work called the *Rhizotomikon* (Ῥιζοτομικόν).[67] According to a scholion to Nicander's *Theriaca*, Crateuas also authored a work of the same name.[68] The fact that Theophrastus selectively approves of some rhizotomical practices could also hint at developments of the profession in response to rational medicine.

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[59] *MM* 1.1.

[60] See, e.g., Suzanne Amigues, *Théophraste. Recherches sur les plantes. Tome V. Livre IX. Texte établi et traduit par S. Amigues* (Paris: Les Belles Lettres, 2006), xxxiv: A vrai dire, la specialization professionnelle était moins stricte que ne le suggère notre classement des sources.

[61] Suzanne Amigues, for example, places the *rhizotomoi* at the bottom of a hierarchy, while Riddle suggests the *rhizotomoi* were above the *pharmakopōlai*. See Riddle, *Dioscorides on Pharmacy*, 5, and Amigues, *Théophraste*, xxxiv.

[62] See, e.g., Leanne McNamara, "Conjurers, purifiers, vagabonds and quacks? The clinical roles of the folk and Hippocratic healers of classical Greece," *Iris*: *Journal of the Classical Association of Victoria*, 16-17 (2003): 2-25, see also Luciana Repici, "Medici e botanica popolare," in *Medicina e società nel mondo antico: atti del convegno di Udine*, *4-5 ottobre 2005*, ed. A. Marcone (Firenze: Le Monnier università, 2006), 72-90.

[63] Macrobius's *Saturnalia*, 5.19.7. For a discussion of this passage as it relates to *rhizotomoi*, see John Scarborough, "The Pharmacology of Scared Plants, Herbs, and Roots," in ed. Christopher A. Faraone and Dirk Obblink, *Magika Hiera: Ancient Greek Magic and Religion* (New York: Oxford University Press, 1991), 138-174, at 144.

[64] *HP,* 9.8.5: Ἔτι δὲ ὅσα οἱ φαρμακοπῶλαι καὶ ῥιζοτόμοι τὰ μὲν ἴσως οἰκείως τὰ δὲ καὶ ἐπιτραγωδοῦντες λέγουσι.

[65] See *HP,* 9.8.6-8.

[66] Rebecca Flemming, "Empires of Knowledge: Medicine and Health in the Hellenistic World," in *A Companion to the Hellenistic World*, ed. Andrew Erskine (Oxford: Blackwell, 2003), 449-463, at 459.

[67] See Wellmann, "Krateuas," 4. The name of Diocles' work has been preserved in a scholion to Nicander's *Theriaca,* see *Scholia in Nicandri*, 647a, ed. Annunciata Crugnola, *Scholia in Nicandri Theriaka cum glossis. Testi e documenti per lo studio dell'antichità* (Milan: Cisalpino, 1971), 241: τὸν ἔρινον Διοκλῆς ἐν τῷ ῥιζοτομικῷ φησιν εἶναι ὅμοιον ὠκίμῳ· βοηθεῖ δὲ πρὸς τὰ θηρία. Diocles of Carystus is thought to have been active in Athens and written on a broad variety of topics related to medicine. See Daniela Manetti, "Dioklēs of Karustos," in *The Encyclopedia of Ancient Natural Scientists: The Greek Tradition and its Many Heirs*, ed. P.T. Keyser and G.L. Irby-Massie (London: Routledge, 2008), 255-257.

[68] *Scholia in Nicandri*, 681a, ed. Crugnola, 252: Ἄλλως· Κρατεύας ἐν τῷ ῥιζοτομικῷ προστίθεται ὅτι πρόβατον ἄρνα εἰ μὴ στέργοι, ἐάν τις κοτυληδόνα τρίψας μεθ'ὕδατος δῷ, στέργει. See also fr. 23 in *Pedanii Dioscuridis Anazarbei De materia medica*, ed. Max Wellmann (Berlin: Weidmann, 1914), 3: 139-146.

Max Wellmann has suggested that, in addition to his *Rhizotomikon*, Crateuas may have written two other works: the illustrated work mentioned by Pliny, and another work on metals, oils and spices. Wellmann assumes that the *Rhizotomikon* mentioned by the scholiast must be different from the illustrated work mentioned by Pliny, because the scholiast's citations involve descriptions of plants, which, he argues, cannot have been part of the illustrated works described by Pliny, in which only properties (*effectus*) were mentioned.[69] This illustrated work, Wellmann supposes, was for a more general audience.[70] Wellmann finds evidence for a second work on metals and spices in statements by Galen and Dioscorides.[71] Wellmann supposes that such writing could not have been part of the *Rhizotomikon*, because its title would preclude those topics. Wellmann's conclusions regarding the number of works written by Crateuas seem stretched. As Friedrich Ernst Kind has noted, and recently reiterated by Alain Touwaide, Crateuas could have written a single work on medicinal substances in the manner of Dioscorides' *De materia medica*, from which other works were later derived or extracted.[72] Crateuas may have simply written a single work on medicinal herbs, metals and spices, under the title *Rhizotomikon*, a version of which could have been illustrated by Pliny's time.

Elsewhere in Pliny's *Natural History* we learn that Crateuas named a plant *mithridateia* after Mithridates VI.[73] From this, scholars have variously supposed that Crateuas was in the entourage of Mithridates VI, that he lived at court, or that he was his personal physician.[74] Researchers have more recently expressed doubts regarding such claims.[75] Crateuas's naming of a plant after Mithridates VI is hardly proof of his presence at Mithridates VI's court. Gabriele Marasco has pointed out that Pompey's freedman Lenaeus, clearly not in the service of Mithridates, is also supposed to have named a plant after the Pontic king.[76] Pliny also tells us of a number of plants named after their royal discoverers: e.g., gentian after the Illyrian king Gentius, and Artemisia after the wife of Mausolus.[77] In those situations the royal person in question is

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[69] Wellmann, "Krateuas," 5.

[70] E.g., for "das Bedürfnis des Volkes," see Wellmann, "Krateuas," 21. See also Friedrich Ernst Kind, "Krateuas," in *Paulys Realencyclopädie der classischen Altertumswissenschaft* (Stuttgart: Alfred Druckenmüller, 1922), 11,2: 1644-1646, at 1644.

[71] See Galen, *In Hippocratis de natura hominis librum commentarii iii,* ed. Kühn, 15: 134-135: Κρατεύας δὲ καὶ Διοσκορίδης τῶν μεταλλικῶν φαρμάκων. See also, *MM* 1.1: οὐ μὴν οὐδὲ τῶν μεταλλικῶν ἢ ἀρωμάτων πάντων ἐμνημόνευσαν. Κρατεύας δὲ ὁ ῥιζοτόμος καὶ Ἀνδρέας ὁ ἰατρὸς—οὗτοι γὰρ δοκοῦσιν ἀκριβέστερον τῶν λοιπῶν περὶ τοῦτο τὸ μέρος ἀνεστράφθαι… Trans. Beck (Hildesheim: Olms-Weidmann, 2005), 1: "..nor did they in fact mention minerals or spices at all. On the other hand, Crateuas, the root cutter, and Andreas, the physician, both of whom are reputed to have addressed themselves to this part of the subject more completely than the rest…"

[72] Kind, "Krateuas," 1645; Alain Touwaide, "Crateuas," in *Brill's New Pauly: Encyclopedia of the Ancient World*, ed. Hubert Cancik and Helmuth Schneider (Leiden: Brill, 2003) 3: 920-921.

[73] *HN* 25.26.

[74] Max Wellmann, for example, refers to him as "Leibarzt des grossen Mithridates VI Eupator," Wellmann, "Krateuas," 3; Kind, "Krateuas," 1644, similarly states that Crateuas "lebte am Hofe Mithradates' VI"; Riddle, *Dioscorides on Pharmacy*, 5, also suggests "Crateuas practiced his profession in the court of Mithridates VI"; John Scarborough, "Crateuas," in *The Oxford Classical Dictionary*, 4th Edition, ed. S. Hornblower, A. Spawforth, and E. Eidinow (Oxford: Oxford University Press, 2012); Natacha Massar similarly states that Crateuas lived at Mithridates' court, Natacha Massar, *Soigner et servir: histoire sociale et culturelle de la médecine grecque à l'époque hellénistique* (Paris: De Boccard, 2005), 227.

[75] Touwaide, "Crateuas," and more recently, Hardy and Totelin, *Ancient Botany*, 44.

[76] Gabriele Marasco, "Les médecins de cour à l'époque hellénistique," *Revue des Études Grecques* 109 (1996): 435-466 at 457. After Pompey brought Mithridates VI's library to Rome, he tasked his freedman Lenaeus with its translation. Lenaeus subsequently attributed to Mithridates a plant whose properties were evidently first described by him—the proof was a note written in the monarch's own hand. See *NH* 25.27.

[77] *NH* 25.34-36

supposed to have named the plant after him- or herself, though other specialists may have simply attributed the discoveries of those plants to those monarchs. In other cases, a monarch might choose to honor one of his subjects when naming a plant. Pliny tells us that Juba II named a plant *euphorbia* in honor of his personal physician Euphorbus, brother to Augustus's physician Antonius Musa.[78] It is hard to know the nature of Crateuas' relationship with Mithridates VI simply given the fact that he named a plant after him.

Regardless of why Crateuas chose to honor Mithridates VI, a connection with the monarch hints at the wider intellectual context. Mithridates VI was widely known for his interest in medicine, especially toxicology, and was said to have tested antidotes on condemned men.[79] He was also said to have built up immunity to various poisons by consuming small portions of them each day.[80] Pliny tells us that Mithridates VI gathered information on medicinal substances "from all his subjects," and that he compiled a library of such treatises, as well as a collection of specimens (*exemplaria*).[81] Pliny notes that Mithridates VI invited Asclepiades of Bithynia, one of the most famous physicians of the day, then in Rome, to join him in Pontus.[82] Asclepiades refused, sending him written works instead. Pliny also notes that Zachalias of Babylon dedicated several books on gemstones to Mithridates VI.[83] The king himself authored several works, perhaps including recipes for compound drugs.[84] These examples show Mithridates VI to be an eager patron of the medical sciences. He corresponded widely with scholars and physicians and sought to attract them to his court, or solicit works from them. While Crateuas may not have been Mithridates VI's personal physician, he may have been among the scholars that were either at court or in dialog with the king. He might have also served as a root-cutter to Mithridates VI, as the king would have presumably had root-cutters supply him with *materia medica*.

Metrodorus

Little is known about Metrodorus. Pliny elsewhere states that Metrodorus was the author of a work called the *Epitomē rhizotomumenon* (ἐπιτομὴ ῥιζοτομουμένων), a compendium on herbal remedies.[85] Natacha Massar has noted that the only physician that we know of with this name from the Hellenistic period is Metrodoros of Amphipolis, a physician to Antiochus I Soter (r. 281-261 BCE).[86] As Massar notes, however, the evidence linking this Metrodoros to Pliny's is meager.[87] Georgia Irby-Massie has suggested instead that Pliny's Metrodorus might be the

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[78] *NH* 5.16

[79] Galen, *De antidotis* 2.7, ed. Kühn, 14: 150.

[80] *NH* 25.3. Little is known about Zachalias. Based on his name, he appears to have been a Hellenized Jew operating or born in Seleucia. See Jacob Neusner, *The History of the Jews in Babylonia* (Leiden: Brill, 1969), 8, 10.

[81] *NH* 25.7: is ergo in reliqua ingeni magnitudine medicinae peculiariter curiosus et ab omnibus subiectis, qui fuere magna pars terrarum, singula exquirens scrinium commentationum harum et exemplaria effectusque in arcanis suis reliquit

[82] *NH* 25.3, see John Scarborough, "Asklepiades of Bithunia," in *The Encyclopedia of Ancient Natural Scientists: The Greek Tradition and Its Many Heirs,* ed. Paul T. Keyser and Georgia L. Irby-Massie (London: Routledge, 2008), 170-171.

[83] *NH* 37.60

[84] See, for example, *NH* 23.77

[85] *NH* 1.18; see Georgia Irby-Massie, "Mētrodōros (Pharm.)," in *The Encyclopedia of Ancient Natural Scientists: The Greek Tradition and Its Many Heirs,* ed. P.T. Keyser and G.L. Irby-Massie (London: Routledge, 2008), 553.

[86] Massar, *Soigner et servir*, 227.

[87] We only know of Metrodoros of Amphipolis from a decree, dated sometime ca. 275-268/7 BCE, recorded on a marble stele at Ilion. Issued by Antiochus I's general Meleager, the decree honors the physician for healing a neck wound suffered by Antiochus I, and, more generally, for his service to the king and his son, Seleucus. The decree names Metrodoros a *proxenos* (public guest or friend or patron) and benefactor of the city Ilion, and grants him

Hippocratic commentator cited by Erotian (1st c. CE), or, following an earlier suggestion by Max Wellmann, an Asclepiadian pharmacist mentioned by Galen.[88] Pliny writes elsewhere that Metrodorus recommended using the herb *peplis* (πεπλίς, likely *Euphorbia spp.*) to help remove the afterbirth (χόριον) following delivery.[89] This could suggest Metrodorus's obstetrical expertise. Perhaps Metrodorus might be identified with a female physician named Metrodora, alive sometime between ca. 50 and 400 CE.[90] Holt N. Parker notes that Metrodora drew extensively on Hippocrates, which may be similarly suggestive of the Hippocratic commentator cited by Erotian. Also worth consideration, but is the possible connection between Metrodorus's illustrated herbal and an illustrated Latin herbal, the *Liber medicinae ex herbis femininis*.[91]

Dionysius

The identification of Pliny's Dionysius has presented researchers some difficulties, due to the prevalence of the name.[92] As early as 1897, Max Wellmann identified him with Cassius Dionysius of Utica (first-second century BCE, ca. 88 BCE).[93] This identification remains the most likely.[94] Both Marie-Hélène Marganne and Phillip Thibodeau have reiterated this

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citizenship, the right to own property, and the right to approach the council (*Boulē*) and people (*dēmos*). On the inscription, see Wilhelm Dittenberger, ed., *Orientis Graeci inscriptiones selectae*, 2 vols. (Leipzig: Hirzel, 1903), 220; E.D. Clarke, *Travels in various countries of Europe, Asia, and Africa* II, 1, III, (London: T. Cadell and W. Davies, 1817), 204; K.M.T. Atkinson, "The Seleucids and the Greek Cities of Western Asia Minor," *Antichthon* 2 (1968): 32-57; Wolfgang Orth, *Königlicher Machtanspruch und städtische Freiheit; Untersuchungen zu den politischen Beziehungen zwischen den ersten Seleukidenherrschern und den Stadten des westlichen Kleinasien* (Munich: C.H. Beck, 1977), 52-4, 73-4; for English translations of the inscription, see Stanley Burstein, ed. and trans., *The Hellenistic Age from the Battle of Ipsos to the Death of Kleopatra VII*, Translated Documents of Greece and Rome (Cambridge: Cambridge University Press, 1985), 26, and Roger S. Bagnall and Peter Derow, *The Hellenistic Period: Historical Sources in Translation* (Malden, Mass.: Blackwell, 2004), n. 79, 138.

[88] Erotian, *Epidemics,* 5.26; Galen, *De simplicium*, 1.29, 35, ed. Kühn 11: 432, 442; Irby-Massie, "Mētrodōros (Pharm.)," 553.

[89] *HN*, 20.214

[90] Metrodora's writings, including an abbreviated text on diseases of the womb are preserved in a single manuscript now in Florence (Biblioteca Laurenziana, *Pluteus* 75.3, ff.4v-19r). See Holt N. Parker, "Mētrodōra," in Keyser and Irby-Massie, eds., *The Encyclopedia of Ancient Natural Scientists: The Greek Tradition and its Many Heirs* (London: Routledge, 2008), 552-553. For the first edition, see Aristotelēs Kouzēs, "Metrodora's work, 'On the feminine diseases of the womb' according [to] the Greek codex 75,3 of the Laurentian library," *Praktika tēs Akadēmias Athēnōn* [=*Πρακτικά της Ακαδημίας Αθηνών*] 20 (1947): 46-68. Parker notes this edition is unreliable. Parker suggests a date for this text between ca. 50 and 400 CE, due to its mention of a speculum, which began to be used in the first century CE, as well as the absence of references to Soranus and Galen, whose writings were widely cited by the fifth century.

[91] The transmission of this text is not well understood. See Collins, *Medieval Herbals*, 154-163.

[92] Hardy and Totelin, *Ancient Botany*, 113-114.

[93] Max Wellmann, "Krateuas," 20, n. 27. See also Max Wellmann, "Cassius (42) Dionysius," in *Paulys Realencyclopādie der Classischen Altertumswissenschaft*, ed. Georg Wissowa (Stuttgart: Alfred Druckenmüller, 1899), 3,2: 1722.

[94] Other identifications have been made. Jacques André identified Pliny's Dionysius with a physician of the fourth century BCE. Jacques André, ed., *Histoire Naturelle* (Paris: Les Belles Lettres, 1974), 94, n. 1, and 98, n. 3 (*NH*, 25.8 and 22.67). Natacha Massar, too, identifies him as a physician of the fourth century, probably on the basis of André's edition, Massar, *Soigner et Servir*, 227, n. 122. Both may refer to a physician named Dionysius (ca. 340-300 BCE), see Robert Littman, "Dionusios (Med.)," in *The Encyclopedia of Ancient Natural Scientists: The Greek Tradition and Its Many Heirs*, ed. P.T. Keyser and G.L. Irby-Massie (London: Routledge, 2008), 259. Georgia Irby-Massie has suggested Dionysius (of Miletus?), alive in the first century BCE (ca. 75-35 BCE). See Irby-Massie, "Mētrodōros," 553. Fabio Stok merely notes that this Dionysius could be identified with the author named by Pliny. Fabio Stok, "Dionusios (of Milētos?)," in *The Encyclopedia of Ancient Natural Scientists: The Greek Tradition and Its Many Heirs*, ed. P.T. Keyser and G.L. Irby-Massie (London: Routledge, 2008), 264.

identification.[95] Although the name Dionysius is common, Pliny refers elsewhere in his *Natural History* to Cassius Dionysius of Utica either as Cassius Dionysius or simply as Dionysius.[96] The *nomen gentilicium* Cassius, although sometimes omitted, could suggest that Dionysius was a Greek-speaking freedman from the household of Lucius Cassius Longinus, the praetor who brought Jugurtha from Numidia to Rome in 111 BCE.[97]

Cassius Dionysius of Utica is known to have translated from Punic into Greek a landmark work on agriculture by Mago the Carthaginian, whom the Roman author Columella (4-70 CE) called the father of agriculture (*rusticationis parentem*).[98] Varro (116-27 BCE) reports that Dionysius of Utica translated and condensed Mago's 28-book work, subtracted 8 books and added information from Greek sources, resulting in a work of 20 books.[99] Dionysius dedicated the work to the governor of Africa, the praetor Publius Sextilius in 89 or 88 BCE.[100] Varro adds that Diophanes of Bithynia later abridged Dionysius's text into six useful (*utiliter*) books for king Deiotarus of Galatia (first century BCE, c. 60 BCE).[101]

Dionysius of Utica may have also penned a treatise on medicinal plants called the *Rhizotomika* (Ῥιζοτομικά). A scholiast of Nicander's *Theriaka* cites Dionysius as the author of a work by this name, while Stephen of Byzantium (fl. 528-535 CE) links a work of the same name to an author from Utica.[102] That the scholiast omits the *nomen gentilicium* Cassius could suggest that Dionysius' *Rhizotomika* circulated simply under the name Dionysius. The name of this work, *Rhizotomika*, could also provide an argument in favor of identifying Cassius Dionysius of

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[95] Marganne, *Le livre medical,* 41; Phillip Thibodeau, "Dionusios of Utica, Cassius," in *The Encyclopedia of Ancient Natural Scientists: The Greek Tradition and Its Many Heirs*, ed. P.T. Keyser and G.L. Irby-Massie (London: Routledge, 2008), 265.

[96] For Pliny's citation of the name Cassius Dionysius, see *NH* 11.15; for simply Dionysius, see, e.g., *NH* 1.1, among the indices of authorities for Books 8, 10, 14, 15, 17, 18.

[97] Thibodeau, "Dionusios of Utica," 265. See also Feliciano Speranza, *Scriptorum romanorum de re rustica reliquiae*, vol. 1 (Messina: Università degli studi, 1974).

[98] Columella, *De agricultura* 1.1.13. On Mago, see Vilhelm Lundström, "Magostudien," *Eranos* 2 (1897): 60-67; John Pentland Mahaffy, "The Work of Mago on Agriculture," *Hermathena* 7(1889): 29-35. See also, Jacques Heurgon, "L'Agronome carthaginois Magon et ses traducteurs en latin et en grec," *Comptes rendus des séances de l'Académie des Inscriptions et Belles-Lettres* 120 (1976): 441-456. Heurgon notes that Mahaffy confused P. Sextilius with C. Sextius Calvinus, see ibid, 444. See also *NH* 18.22, 1.18.

[99] Varro, *De re rustica*, 1.1.10, ed.Georg Goetz (Leipzig: Teubner, 1929), 9: Hos nobilitate Mago Carthaginiensis praeteriit, poenica lingua qui res dispersas comprendit libris XXIIX, quos Cassius Dionysius Uticensis vertit libris XX ac Graeca lingua Sextilio praetori misit; in quae volumina de Graecis libris eorum quos dixi adiecit non pauca et de Magonis dempsit instar librorum VIII. Hosce ipsos utiliter ad VI libros redegit Diophanes in Bithynia et misit Deiotaro regi. Mago's work was widely known for it length. See, e.g., Cicero, *De Oratore* 1.249.

[100] Thibodeau, "Dionusios of Utica," 265.

[101] Varro, *De re rustica* 1.1.10. Columella also notes that Diophanes of Bithynia abridged Dionysius's work, see Columella, *De agricultura* 1.1.10.

[102] For the scholion in Nicander's *Theriaka*, see Crugnola, ed., *Scholia in Nicandri*, 520a (p. 204): τριόφυλλον δὲ, ὡς Διονύσιος ἐν τοῖς Ῥιζοτομικοῖς, καὶ μινυανθὲς καλεῖ, Καλλίμαχος δὲ τριπέτηλον. On Stephen of Byzantium see his *Ethnica* (*Epitome*)*,* s.v. Ἰτύκη, ed. A. Meineke, 342, ll. 3-4: Ἰτύκη·πόλις Λιβύης, Τυρίων ἄποικος. τὸ ἐθνικὸν Ἰτυκαῖος. ἀφ᾽ οὗ Διονύσιος ὁ Ἰτυκαῖος ῥιζοτομικῶν πρῶτῳ. See also, Stephen of Byzantium, *Ethnica,* bk. 9, n. 121, in Margarete Billerbeck and Christian Zubler, *Stephani Byzantii Ethnika (Volumen II: Δ-I),* Corpus Fontium Historiae Byzantinae. Series Berolinensis 43/2 (Berlin: De Gruyter, 2011). As Thibodeau notes the identification of the Utican author in Stephen of Byzantium with Dionysius of Utica requires accepting an alteration to the text. Thibodeau, "Dionusios," 265. The manuscript names Diocles (ca. 400-300 BCE, see above), the author of a similarly titled work. But the Diocles who wrote the *Rhizotomikon* came from Carystus, a city in Euboea. It seems reasonable to revise Stephen of Byzantium's Diocles to Dionysius. See Meineke, ed., *Stephen von Byzanz. Ethnika,* 342.

Utica with the Dionysius who authored an illustrated herbal given that name's connection to a work associated with Crateuas.

Nicander

Pliny may have left out other medical authors who illustrated their texts. Writing in the early third century CE, Tertullian (c.150/170-c.230/240 CE) notes that Nicander of Colophon, an author of the second century BCE, "writes and paints" (*scribit et pingit*) of the scorpion's manifold evils.[103] It would seem that Nicander's verses, or a derivative text, had been illustrated by the time Tertullian wrote his *Scorpiace*.[104] Nicander of Colophon wrote two didactic poems: the *Theriaca* and the *Alexipharmaca*, two works on venomous animals, toxic plants and their antidotes.[105] Sometime between the third and fifth centuries CE, a certain rhetor named Eutecnius may have paraphrased Nicander's poems.[106] Later copies of the paraphrases and the poems themselves were illustrated, and include not only depictions of animals, but also plants either individually or as groups of ingredients in recipes for compound drugs.[107] Such illustrations may, however, be later. We do not know to what extent, if at all, Nicander's texts were originally illustrated. Indeed, many of the plants depicted in the sixth-century paraphrase are identical as those in the illustrated Dioscorides (see ch. 2). The plants in the later mid-tenth-century Paris Nicander (Paris, Bibliothèque nationale de France, MS gr. suppl. no. 247), moreover, do not appear to be derived from the same source as the paraphrases.

While the exact location and dates of Nicander's literary activity have been debated, many scholars now place him in the entourage of Attalus III Philometor (170-133 BCE), the last king of Pergamon.[108] While we cannot be certain if Nicander had his texts illustrated, his proximity to Attalus III could parallel Crateuas's relationship with Mithridates VI. Attalus III died one year prior to the birth of Mithridates VI. Like Mithridates VI after him, Attalus III was widely known for his interest in toxicology. According to Plutarch, Attalus III personally

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[103] Tertullian, *Scorpiace*, l. 3. On dating Nicander to the second century, see Jean-Marie Jacques, ed. and trans., *Nicandre: Oeuvres. Tome II: Les Thériaques. Fragments iologiques antérieurs à Nicandre* (Paris: Jacques, 2002), xix; idem, "Nicander," in *The Encyclopedia of Ancient Natural Scientists: The Greek Tradition and its Many Heirs*, ed. P.T. Keyser and G.L. Irby-Massie (London: Routledge, 2008), 573-574. See also Marco Fantuzzi, "Nicander," in *Brill's New Pauly: Encyclopedia of the Ancient World*, ed. Hubert Cancik and Helmuth Schneider (Leiden: Brill, 2006), 9: coll. 706-708.

[104] Dated to 202/203, 203/204 or 211-13. See Timothy D. Barnes, "Tertullian's 'Scorpiace,'" *The Journal of Theological Studies, New Series* 20, no. 1 (1969): 105-132.

[105] For edition, translation and notes, see A.S.F. Gow and A.F. Scholfield, ed. and trans., *Nicander: The Poems and Poetical Fragments* (Cambridge: Cambridge University Press, 1953)

[106] Sotera Fornaro, "Eutecnius," in *Brill's New Pauly: Encyclopedia of the Ancient World,* ed. Hubert Cancik and Helmuth Schneider (Brill: Leiden, 2004), 5: 231-232.

[107] See Paris, Bibliothèque nationale de France, ms gr. suppl. 247, e.g., ff. 4r-v, 5r, 16r, 17v, 18r, 19r-v, 20r, 21r, 22r, 27v, 28r-v, 29v, 30r-v, 31v, 44r, 45r, 46r, s. mid-10th c.; see also the paraphrases in the Vienna Dioscorides: Vienna, Österreichische Nationalbiblisothek, med. gr. 1, ff. 395r-v, 396r-v, 397r-v, 398r, s. early 6th c.; and the Morgan Dioscorides: New York, Morgan Library, MS M 652, ff. 339r-v, 340r-v, 341r-v, s. late 9th c. or early 10th c.

[108] See J.-M. Jacques, ed., trans., and comm., *Nicandre. Oeuvres, Tome II: Les thériaques. Fragments iologiques antérieurs à Nicandre* (Paris: Les Belles Lettres [Budé], 2002), xix, see also Phillip Thibodeau, "Attalos III of Pergamon, Philomētōr," in *The Encyclopedia of Ancient Natural Scientists: The Greek Tradition and Its Many Heirs*, ed. P.T. Keyser and G.L. Irby-Massie (London: Routledge, 2008), 179-180; and John Scarborough, "Attalus III of Pergamon: research toxicologist," in *Asklepios: Studies on Ancient Medicine*, ed. L. Cilliers (Bloemfontien: Classical Association of South Africa, 2008), 138-156; and Totelin, "Botanizing Rulers," 122-144.

cultivated a number of toxic plants in his royal gardens.[109] Galen notes that the king experimented with antidotes for toxic sea slugs, scorpion stings, snakebites, and spider bites.[110] Attlaus III was also said to test poisons and antidotes on condemned men, and, according to the historian Justin (probably second century CE), sent poisons as gifts to his friends.[111] The historian Adrienne Mayor has suggested that Mithridates VI may have emulated of Attalus III.[112]

The Origins of the Hellenistic Illustrated Herbal

While the evidence is limited, several trends emerge from the above discussions of authors and what Pliny says about the pictures and herbal texts. This section examines those trends and attempts to reconstruct from them the general set of circumstances that appear to underlie the production of illustrated herbals from the Hellenistic period until Pliny's death in 77 CE.

Books on the Art of Root-Cutting

Many of the authors who illustrated their herbals penned texts with titles related to root-cutting (*rhizotomia*). A number of works bore such titles. In addition to the *Rhizotomikon* by Diocles of Carystus, Crateuas's *Rhizotomikon*, the *Rhizotomika* by Cassius Dionysius, and Metrodorus's *Epitomē rhizotomoumenōn*, we also know of Mikion's (or Mikkion) *Rhizotoumena* (ῥιζοτομούμενα) or *Peri rhizotomikōn* (περὶ ῥιζοτομικῶν), the *Rhizotomikon* by Amerias of Macedon, and finally a work of the same name by the otherwise unknown Eumachos of Corcyra.[113] By the fourth century CE, Oribasius (c. 320-400 CE), physician to the emperor Julian, refers to works on root-cutting in general as *rhizotomiai*.[114] As a genre, we would expect these works to have some characteristics in common, although it is hard to determine what these might have been given that none survive.

Might herbal illustration have emerged in conjunction with the development and elaboration of these works on the art of root-cutting? Certainly some *rhizotomika* appear to have been illustrated; others, not. Max Wellmann supposed that early illustrated herbals belonged to a subclass of works on root-cutting, which he distinguished from other, more textually replete

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[109] Plutarch, *Demetrius*, 20.3, K. Ziegler, ed., *Plutarchi vitae parallelae*, 2nd ed. (Leipzig: Teubner, 1971), 3:1, Ἄτταλος δ' ὁ Φιλομήτωρ ἐκήπευε τὰς φαρμακώδεις βοτάνας, οὐ μόνον ὑοσκύαμον καὶ ἐλλέβορον, ἀλλὰ καὶ κώνειον καὶ ἀκόνιτον καὶ δορύκνιον, αὐτὸς ἐν τοῖς βασιλείοις σπείρων καὶ φυτεύων, ὀπούς τε καὶ καρπὸν αὐτῶν ἔργον πεποιημένος εἰδέναι καὶ κομίζεσθαι καθ' ὥραν.

[110] Galen, *De Antidotis*, 1.1, ed. Kühn, 14:2, ὁ γάρ τοι Μιθριδάτης οὗτος, ὥσπερ καὶ ὁ καθ' ἡμᾶς Ἄτταλος, ἔσπευσεν ἐμπειρίαν ἔχειν ἁπάντων σχεδὸν τῶν ἁπλῶν φαρμάκων, ὅσα τοῖς ὀλεθρίοις ἀντιτέτακται, πειράζων αὐτῶν τὰς δυνάμεις ἐπὶ πονηρῶν ἀνθρώπων, ὧν θάνατος κατέγνωστο. τινὰ μὲν οὖν αὐτῶν ἀνεῦρεν ἐπὶ φαλαγγίων ἰδίως ἁρμόζοντα, τινὰ δὲ ἐπὶ σκορπίων, ὥσπερ ἐπὶ τῶν ἐχιδνῶν ἄλλα. καὶ ἐπὶ τῶν ἀναιρούντων φαρμάκων τὰ μὲν ἐπὶ ἀκονίτου, τὰ δὲ ἐπὶ λαγωοῦ τοῦ θαλαττίου, τὰ δ' ἐπ' ἄλλου τινὸς ἢ ἄλλου. Πάντα δ' οὖν αὐτὰ μίξας ὁ Μιθριδάτης ἓν ἐποίησε φάρμακο, ἐλπίσας ἕξειν ἀρωγὸν ἐπὶ πᾶσι οἷς ὀλεθρίοις.

[111] Justin, *Phillipic Histories,* 36.4.3.

[112] Adrienne Mayor, *The Poison King: The Life and Legend of Mithridates*, *Rome's Deadliest Enemy* (Princeton: Princeton University Press, 2010), 58. Mayor's picture of Attalus is based in large part on Kent J. Rigsby, "Provincia Asia," *Transactions of the American Philological Association*, 118 (1988): 123-153.

[113] On Mikion, see *NH*, 20.258; *Scholia in Nicandri Theriaca*, ed. Crugnola, 617; Wilhelm Kroll, "Mikion (5)," in *Paulys Realencyclopädie der classischen Altertumswissenschaft*, ed. Wilhelm Kroll (Munich: Alfred Druckenmüller, 1980), 15,2: 1555; on Amerias of Macedon, see Athenaeus, *Deipnosophistai*, 15.681 f.; on Eumachus of Corcyra, see Giuseppe Squillace, "Tracce del *Rhizotomikon* di Eumaco di Corcira? (Nota ad Ateneo 15,681e)," in *Sulla Rotta per la Sicilia: L'Epiro, Corcira e l'Occidente*, ed. Giovanna de Sensi Sestito and Maria Intrieri (Pisa: Edizioni ETS, 2011), 315-327.

[114] Oribasios, *Collectiones medicae,* 7.26.31.

works within that genre.[115] Wellmann reasons that serious scholars such as Galen and the scholiasts to Nicander did not quote illustrated works, though this conclusion is based on his assumption that early illustrated herbals *never* included textual descriptions of plants. (References to Crateuas in the scholia on Nicander often include brief descriptions of the plant in question.) But it is possible that even those works might have had illustrations. On the other hand, if we suppose such works were valued primarily for their illustrations, it would make sense that their texts were not quoted. In the end, we cannot know if the divisions among the different kinds of *rhizotomika* were as clear-cut as Wellmann claims they were. Pliny does not say there were two different subgenres of *rhizotomika*, one for serious scholars, and one for a wider, non-specialist public. Nor does Pliny criticize the *textual* contents of the illustrated works. Such conceptions seem to reflect rather modern notions of what constitutes scholarly versus popular literature. It suffices at the present to say that the *rhizotomika* concerned medicinal plants, were sometimes illustrated, and may have concerned specific (i.e., "uprootable") kinds of plants.

Hellenistic Courts and Scientific Illustration

The Greek authors of illustrated herbals cited by Pliny were largely writing anywhere from the first or second century BCE to the first century CE. Even if herbal illustration had origins farther back in time, the Greek illustrated herbal as Pliny knew it was a product of the Hellenistic period. Herbals were not the only illustrated scientific treatises at that time. Works on astronomy, mathematics, zoology, medicine, including toxicology, anatomy, bandaging and chiropracty were also likely illustrated in the Hellenistic period.[116] That so many different kinds of medical works were illustrated at this time may point to larger developments across the Hellenistic world: the establishment of "research institutions" with collections of books and objects such as the library and *mouseion* in Alexandria, the rise of experimentalism, including systematic human dissection (and vivisection) in Alexandria (third-century, BCE),[117] and the concurrent emergence of different, opposing medical sects that contested each other's theories and methods. The rise of medical and scientific illustration in Greek might also relate to the elevated status of medical specialists in the Hellenistic world, who may have then been able to purchase or commission such works.[118]

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[115] This is evident in Wellmann's discussion of the adaptations to Dioscorides' *De materia medica*, see Wellmann, "Krateuas," 25: "Warum, so fragt man weiter, musste zu diesem Zweck der Text alphabetisch umgearbeitet werden, warum sind die Illustrationen grade auf die in einem ῥιζοτομικόν zu behandelnden Kräuter und Sträuche beschränkt worden?" On the different audiences, see ibid., 21: "Da diese drei illustrierten Herbarien oder wie man sie nennen will in der späteren Fachlitteratur ausser bein Plinius keinerlei Berücksichtigung gefunden haben, so glaube ich annehmen zu dürfen, dass sie in der Art der illustrierten Pflanzenkunden der Humanistenzeit eine mehr für das Bedürfnis des Volkes bestimmte, populäre Form der ῥιζοτομικά darstellen."

[116] Stückelberger, *Bild und Wort*; Marganne, *Le livre medical*, 35-58.

[117] On anatomy, see Flemming, "Empires of Knowledge," 451-457.

[118] Medicine was increasingly exalted as a practical and theoretical discipline, with the result that medical practitioners gained prestige and status. Their elevation of status may have resulted in shifting medical practices, such as the rise of compound drugs, which required expertise, or at least gave the impression of it. Compounds also required access to countless, often expensive ingredients. In tandem with this expansion of medical knowledge, the cult of the medical deity Asclepius and his many associates (e.g., Hygeia, Telesphorus, Panacea, Iaso, Aceso) became increasingly popular and spread throughout the Hellenistic world. See Flemming, "Empires of Knowledge," 461.

Hellenistic monarchs, aristocrats and oligarchs may have played an important role in motivating these shifts and in patronizing scientific illustration.[119] Some authors mentioned above had connections to Hellenistic monarchs, most notably Crateuas and Nicander. To them, we can add Apollonius of Citium, the author of an illustrated chiropractic manual, who may have been linked to the court of the Ptolemy Auletes (r. 80-51 BCE).[120] As Marie-Hélène Marganne has noted, these authors orbited the courts of Hellenistic kings who collected books and actively cultivated interest in the sciences.[121] Such Hellenistic courts would have been especially fertile ground for the creation and compilation of illustrated herbals due to the presence of skilled artisans and medical specialists as well as the availability of funding and reference resources, such as libraries, gardens, and collections of *materia medica*. We can suppose that these authors' connections to Hellenistic kings may have, therefore, been an important factor in motivating the illustration of their books.[122]

Both Mithridates VI and Attalus III were personally involved in toxicological research. Both are supposed to have actually tested antidotes and poisons on condemned persons, a form of experimentalism that recalls the vivisections carried out a century prior under the Ptolemies.[123] At the Pergamene and Pontic courts, active research on pharmacology and botany occurred in tandem with the exercise of monarchic power, which would also include the mustering of resources represented by Attalus III's gardens and the ongoing maintenance of the great library at Pergamum, built by Eumenes II (197-160) in imitation of the Ptolemaic *mouseion* and library in Alexandria.[124]

It is with Mithridates VI, however, that we get a clear sense of the breadth and scale that a Hellenistic monarch's personal research and collecting activities could assume. He assembled, inspired and patronized the writing of medical books, including works by Asclepiades of Bithynia and Zachalias of Babylon. His collection of texts and specimens, as well as his supposed inquiries about medicinal substances among his subjects together indicate an vast

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[119] On the link between Hellenistic science and royal patronage, see G.E.R. Lloyd, *Greek Science After Aristotle* (New York: Norton, 1973), 3-5.

[120] Marganne, *Le livre médical*, 35-36.

[121] Ibid., 43: "ces médecins gravitent dans un milieu de cour, autour de monarques intéressés par les sciences, – spécialement la toxicologie –, et collectionneurs de livres."

[122] Guglielmo Cavallo's suggestion that Crateuas's renown as an rhizotomos indicates less learning or rigor seems unfounded, see Guglielmo Cavallo, "Introduction," 9: "The portrait of Dioscurides which emerges from it [Dioscorides' preface] is not that of a ῥιζοτόμος or of a φαρμακοπώλις – these terms may apply to our herbalist or to an old-fashioned apothecary, who sells drugs which he himself prepares – but that of a very learned physician. His *Περὶ ὕλης ἰατρικῆς* cannot therefore be put on the same level as that of the illustrated herbals of Crateuas and of the other authors mentioned by Pliny." While Cavallo is right to note that the arguments by John Riddle in favor of Dioscorides' work having been illustrated from the beginning "are not cogent," his own rationale as quoted here is deeply problematic. That Crateuas was cited by both Galen and Dioscorides should be enough to suggest that his work was read and taken seriously by physicians, despite his being a mere ῥιζοτόμος. Pliny does not mention Metrodorus's and Dionysius's occupations, but rather uses the term *auctores*.

[123] Flemming, "Empires of Knowledge," 453-455.

[124] E.g., Andrew Erskine, "Culture and Power in Ptolemaic Egypt: The Museum and Library of Alexandria," *Greece and Rome* 42, no. 1 (1995): 38-48. On the emergence of libraries, see Thomas Hendrickson, "The Invention of the Greek Library," *Transactions of the American Philological Association* 144 (2014): 371-413; on Eumenes and parchment, see Richard R. Johnson, "Ancient and Medieval Accounts of the 'Invention' of Parchment," *California Studies in Classical Antiquity* 3 (1970): 115-122. On the influence and memory of the Alexandrian library, see Diana Delia, "From Romance to Rhetoric: The Alexandrian Library in Classical and Islamic Traditions," *The American Historical Review* 97, no. 5 (1992): 1449-1467.

infrastructure and network of operatives. As Bruno Strasser has noted of early modern and modern collecting,

> Establishing this kind of collection, like establishing empires, required the mastery of space. Collectors produced a movement of natural things, which were often dispersed across the world, toward central locations, just as empires produced movements of goods from colonies to metropoles. Unsurprisingly, colonial powers were collecting powers, and colonies constituted rich collecting grounds. The geographical reach of an empire represented an immense field for collecting.[125]

The expansion of Hellenistic collections and resources for pharmacological inquiry, may have been similarly tied to military conquest. According to Pliny, such practices find precedent in the actions of Alexander of Macedon (356-323 BCE), who, "inflamed by a desire to know the nature of animals," had "thousands of persons throughout the whole of Asia and Greece, all those who made their living by hunting, fowling, and fishing and those who were in charge of warrens, herds, apiaries, fishponds and aviaries," answer to the inquiries of Aristotle, "so that he might not fail to be informed about any creature born anywhere."[126] While the account is certainly apocryphal, it expresses an ideal about the relationship between empire, political power, and scientific inquiry.[127] This account parallels Pliny's report about Mithridates' inquiries among "all his subjects."[128] Mithridates' inquiries were not limited to the borders of his kingdom. The expansion of trade routes, gift-exchange networks, and communication through a kind of "republic of letters," aided by the spread of Greek as a scholarly language, would have enabled Mithridates VI to expand his collections of objects and books.[129]

The collection of books and specimens, the cultivation of plants for research, and experimentation with recipes and antidotes, are all related to the production of pharmacological knowledge, specifically the formation of particular plants as objects of knowledge. Together they are based upon a larger group of interrelated and interconnected systems of reference, involving names, descriptions, specimens, pictures, living plants. Although different, each kind of source helped to secure a reference concerning a substance's properties. That illustrations and specimens appear to be functionally analogous with respect to the aim and structure of reference, i.e., in their pairing non-textual representation with a name and set of properties, is indicative of larger, interrelated reference systems within the Hellenistic tradition of botanical inquiry. The

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[125] Bruno Strasser, "Collecting Nature: Practices, Styles, and Narratives," *Osiris* 27, no. 1 (2012): 303-340, here: 313.

[126] *NH* 8.17: Aristoteles diversa tradit, vir quem in his magna secuturus ex parte praefandum reor. Alexandro Magno rege inflammato cupidine animalium naturas noscendi delegata que hac commentatione Aristoteli, summo in omni doctrina viro, aliquot milia hominum in totius Asiae Graeciae que tractu parere iussa, omnium quos venatus, aucupia piscatus que alebant quibusque vivaria, armenta, alvaria, piscinae, aviaria in cura erant, ne quid usquam genitum ignoraretur ab eo. quos percunctando quinquaginta ferme volumina illa praeclara de animalibus condidit. quae a me collecta in artum cum iis, quae ignoraverat, quaeso ut legentes boni consulant, in universis rerum naturae operibus medio que clarissimi regum omnium desiderio cura nostra breviter peregrinantes.

[127] On this passage, see Flemming, "Empires of Knowledge," 450.

[128] *NH* 25.7.

[129] Mithridates corresponded widely with world-renowned physicians, such as Asclepiades. Pliny also notes that Zachalias of Babylon dedicated a treatise on stones to Mithridates (*NH* 37.60). In some ways, Justin's mention of Attalus III's gifts of poison, could hint at the king's use of gift-exchange networks to circulate objects of pharmacological interest.

Hellenistic illustrated herbal likely developed in tandem with the elaboration of these different forms of reference systems.

Translation and Emulation: Greek Botanical Inquiry in Rome

The libraries and research initiatives of the Hellenistic kings did not cease with Roman expansion; they merely changed hands. Pompey had Mithridates' library transferred to Rome and had his freedman Lenaeus translate into Latin the works therein, so that, as Pliny notes, his victory would "benefit life no less than the state."[130] In a similar way, the Roman Senate mandated that Mago's writings be translated into Latin, although they had already been translated into Greek. Carthaginian libraries, doubtless home to many other Punic works on plants and agriculture, apparently passed to Numidia, and thence to Juba II, another monarch interested in medicine, himself the authored of a treatise on *euphorbia*, named after his personal physician.[131]

The translation of knowledge from one language and culture to another poses a set of questions of particular relevance for the entire history of herbal illustration. Dionysius of Utica translated Mago the Carthaginian's works from Punic into Greek. Even Pliny, although he denies the utility of herbal illustrations, frequently faces the difficult task of identifying plants in Latin based on their Greek names—And it is in Pliny where we find the first concrete mention and criticism of herbal illustration. Multilingualism was a fact of life in the Hellenistic and Roman world. Many different languages and regional dialects were spoken: Latin, Greek, Punic, Persian, and other Iranian languages (e.g., Sogdian), Egyptian Demotic, Hebrew, Aramaic, Thracian, Dacian, Galatian, ancient Georgian, Armenian, and various Anatolian languages (e.g., Lydian, Lycian, Pisidian, Carian, Isaurian). Mithridates VI was reputed to have spoken 22 languages fluently.[132] The difficulties that plagued ancient phytonymy (synonymity, homonymity, pseudonymity, anonymity) would have been magnified in translation. Illustrations hold the promise of securing the reference of a text outside of the confines and limitations of a given language. They refer to and denote a particular plant independent of language.

Roman elites did not merely translate and preserve the scholarly texts of the Greek East, but they emulated its monarchs by establishing large gardens, and spaces for medical and botanical inquiry. Besides transferring Mithridates VI's library and collections to Rome, Pompey built a Pergamene style portico dedicated to Venus Victrix including a large garden planted with exotic species.[133] Another of Mithridates VI's foes, Lucius Licinius Lucullus also planted a Persian-style pleasure garden (*paradeisos*) on the Pincian Hill in Rome.[134] While there is little evidence that the Romans maintained anything like Mithridates' collection of specimens, it is clear that they continued to produce and read herbals, both illustrated and not, as well as

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[130] *NH* 25.7: Pompeius autem omni praeda regia potitus transferre ea sermone nostro libertum suum Lenaeum grammaticae artis iussit vitae que ita profuit non minus quam reipublicae victoria illa.

[131] Heurgon, "L'Agronome," 441-456, esp. 444.

[132] *NH* 7.24.

[133] See Kathryn Gleason, "Porticus Pompeiana: A New Perspective on the First Public Park of Ancient Rome," *Journal of Garden History* 14, no. 1 (1994): 13-27; eadem, "The Garden of Portico of Pompey the Great: An Ancient Public Park Preserved in the Layers of Rome," *Expedition* 32, no. 2 (1990): 4-13; Ann Kuttner, "Looking outside inside: ancient Roman garden rooms," *Studies in the History of Gardens & Designed Landscapes*, 19, no. 1 (1999): 7-35; eadem, "Culture and History at Pompey's Museum," *Transactions of the American Philological Association* 129 (1999): 347-373, esp. 355-356, and 369.

[134] Totelin, "Botanizing Rulers," 134.

maintain large libraries and gardens for study. Pliny notes in his own day that he learned about plants by studying at the *hortulus* of Antonius Castor.[135]

Conclusions

Ancient specialists in botany were well aware of the need to base knowledge on multiple forms and sources of information, by referring to texts, actual plants, personal experience.[136] Pictures were simply another kind of source. Each source had its merits and problems. In such a context it seems doubtful that illustrated herbals would have ever been recognized as entirely sufficient on their own, especially since other resources, including unillustrated texts as well as experts were typically also on hand.

The aim of the present chapter has been to interrogate Pliny's *Natural History* for what it might say about the function of Greek herbal illustration, and its connection to other forms of botanical inquiry. Like a description, the picture denoted the external appearance and morphology of a group of plants. But unlike a description, and like a specimen, it did so independently of language. By placing illustrations into their herbal texts, Hellenistic authors replicated a form of reference within a text that pertained otherwise to that between specimens and texts. And yet unlike specimens, illustrations are entirely invented and can only ever act as representations, whereas specimens are in some ways identical to what they represent.

Viewed in this light, the illustrated herbal becomes a part of the assemblage of multiple, different resources for botanical inquiry in the Hellenistic period. It performed a unique kind of reference, offering specifically visual knowledge in a mediated or invented form, and was probably consulted in conjunction with other forms of reference. The existence of these multiple forms of reference both within and outside the text, enabled users to match visual knowledge to literary, oral, and experiential means of knowing. If a picture proved to be difficult for Pliny to use on its own, it simply meant he had to refer to other forms of reference for comparison and verification.

[135] *NH* 25.9.
[136] See Hardy and Totelin, *Ancient Botany*, 33-62.

Chapter Two
Depicting Plants in the Ancient Herbal

While the previous chapter considered the earliest textual documentation of illustrated Greek herbals, this chapter considers the earliest surviving material evidence of them. This chapter asks what ancient botanical illustrations can tell us about how their contemporaries thought about plants or learned about plant morphology by looking at the pictures. The chapter looks less at the accuracy or naturalism of the pictures, and more at what the illustrations show and how they show. The survey of surviving material evidence here points to a fairly diverse range of depiction methods of which only a few survive. Approaches to depiction delimited the forms of interaction or engagement available to a roll or codex's user. In other words, the ability to use pictures to construct knowledge is related to their appearance and relation to the text. Pictures could function more as memory aids, or as devices for imagining the appearance of a plant, or as more "descriptive" documentations of the plant's properties. In tracing these different modes and uses of ancient botanical illustration, I also describe the pictures' connection to text, and, in particular, how illustrations were added to Dioscorides' originally unillustrated *De materia medica*. As a result, the chapter also considers the order, structure and origins of the illustrated Dioscorides. Finally, this chapter assesses how early illustrated herbals adapted depictive strategies from other genres and media in order to discern the extent to which herbal illustration is a distinct, even autonomous tradition. By autonomy, I mean the degree to which herbal illustrations follow their own idiosyncratic conventions.[1]

Botanical illustration did not emerge *ex nihilo*.[2] Botanical elements had appeared for centuries in a wide variety of media, ranging from textiles, glass, ceramics and metalwork, to monumental relief and painting. Such depictions vary tremendously according to the means and aims of a particular picture or genre, or the medium's limitations and possibilities. Plants often appear in narrative art.[3] They occur individually as emblems of individual cities (e.g., celery for *Selinus* in Sicily) or deities (e.g., laurel for Apollo, olives for Athena).[4] In religious art, plants form garlands and wreaths, which served as offerings, or as indications of sacred groves that were dedicated to particular deities.[5] Vegetables and fruits often appear in *xenia* still life paintings, which referred originally to the comestibles given by a host to his or her guests.[6] Plants also appear in sacro-idyllic landscapes, topographic paintings, and the illusionistic

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[1] Stavros Lazaris has recently claimed that scientific illustration represents an autonomous art form in Byzantium. He does not elaborate much on this point. Lazaris, "Scientific, Medical and Technical Manuscripts," 113.

[2] Other authors have noted similarities between the herbals and works in other media. See Riddle, *Dioscorides on Pharmacy*, 214-215.

[3] For example, in the fresco of Venus bringing Cretan dittany to heal the wounded Aeneas from the triclinium of the House of Sirico in Pompeii, now in the Museo Archeologico Nazionale di Napoli.

[4] Cities often took their name from the names of plants, e.g., Selinus from *selinon* (or celery), other cities identified with rare, commercially significant, or geographically restricted plants, such as the (now extinct?) *silphium* for Cyrene. Cities sometimes put their "emblem" plants on coins. On this phenomenon, see Hardy and Totelin, *Ancient Botany*, 120. See also F. Imhoof-Blumer and O. Keller, *Tier- und Pflanzenbilder auf Münzen und Gemmen des klassischen Altertums* (Leipzig: Teubner, 1889), W.K. Beatty, "Medical Numismatic Notes, XV: Some Medical Aspects of Greek and Roman Coins," *Bulletin of the New York Academy of Medicine* 50, no. 1(1974): 85-95; H. Baumann, *Pflanzenbilder auf griechischen Münzen* (Munich: Hirmer, 2000).

[5] See, for example, Laetitia La Follette, "Parsing Piety: The Sacred Still Life in Roman Relief Sculpture," *Memoirs of the American Academy in Rome* 56/57 (2011/2012): 15-35.

[6] On *xenia*, broadly, as still life, see Norman Bryson, *Looking at the Overlooked: Four Essays on Still Life Painting* (Cambridge, Mass.: Harvard University Press, 1990), 17-59.

tableaux of the so-called second style of Roman painting.[7] Finally, plants often figure as decorative elements in larger systems of ornament, as in the Classical architectural orders or the less rigid, fantastical architectural frames and candelabra associated with the third style of painting or with monumental reliefs such as the exterior dado of the Ara Pacis.[8] We also find some limited evidence of nature printing, that is, when a plant leaf (here: a grape leaf) is used as a stencil or stamp, in the dado zone of a frescoed wall from Room F in the Villa of P. Fannius Synistor at Boscoreale now in the Metropolitan Museum of Art in New York (fig. 2.1). While the original intent remains obscure, the painting suggests that Roman artists also dabbled with nature printing. Each of these media and genres requires different ways of rendering plants and different expectations would have governed audiences' viewing of them. As this chapter proceeds, it incrementally explores the idiosyncratic means and aims in ancient botanical illustration.

The Illustrated Herbal on Papyrus

The Tebtunis Roll

The oldest surviving fragments of an illustrated herbal come from the ancient city of Tebtunis, modern Umm El Baragat (Umm al-Borīgāt), on the southwest edge of the Fayum basin in Egypt.[9] There are roughly twenty fragments now in different collections.[10] That the fragments

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[7] The styles of painting were devised by August Mau in 1882. Although criticized, the classifications are still employed today. See August Mau, *Geschichte der decorativen Wandmalerei in Pompeji* **(**Berlin: Reimer, 1882); for critiques, see Hendrik Gerard Beyen, *Die pompejanische Wanddekoration vom zweiten bis zum vierten Stil* (Haag: Nijhoff, 1960); Wolfgang Ehrhardt, *Stilgeschichtliche Untersuchungen an römischen Wandmalereien: von der späten Republik bis zur Zeit Neros* (Mainz am Rhein: Von Zabern, 1987); Andrew Wallace-Hadrill "The Villa as Cultural Symbol," in *The Roman Villa: Villa Urbana*, ed. A. Frazer (Philadelphia 1998), 43-53; John Clarke, *The Houses of Roman Italy, 100 B.C.-A.D. 250: Ritual, Space, and Decoration* (Berkeley, Calif.: University of California Press, 1991), 30-77, 112-40; Jaś Elsner, *Art and the Roman Viewer: The Transformation of Art from the Pagan World to Christianity* (Cambridge: Cambridge University Press, 1995), 63; Peter Stewart, *Roman Art. Greece & Rome New Surveys in the Classics*, no. 34 (Oxford/Cambridge: Classical Association by the Oxford University Press, 2004), 74-92. On interior garden paintings, see Eva Börsch-Supan, *Garten-, Landschafts- und Paradiesmotive im Innenraum* (Berlin: Hessling, 1967), and Wilhelmina Jashemski, *The Gardens of Pompeii, Herculaneum and the Villas Destroyed by Vesuvius* (New York: Caratzas Brothers, 1979), 55-87. On topographic painting, see Eugenio La Rocca, *Lo Spazio Negato: Il paesaggio nella cultura artistica greca e romana* (Milan: Electa, 2008). See also Susan Silberberg-Pierce "Politics and Private Imagery: the Sacral-Idyllic landscapes in Augustan Art," *Art History* 3, n. 3 (1980): 241-251; Eleanor Winsor Leach, "Sacral-Idyllic Landscape Painting and the Poems of Tibullus' First Book," *Latomus* 39 (1980): 47-69; Paul Zanker, *The Power of Images in the Age of Augustus*, Trans. Alan Shapiro (Ann Arbor: University of Michigan Press, 1988), 285-291. See also essays in John Dixon Hunt, ed., *The Pastoral Landscape* (Washington DC: National Gallery of Art, 1992).

[8] Sara R. Yerkes, "'Living Architecture': Living Columns and Vegetal Urn. Shared Motifs in Roman Wall Painting and 'Neo-Attic' Furnishings," in *Terra Marique: Studies in Art History and Marine Archaeology in Honor of Anna Margueritte McCann*, ed. J. Pollini (Oxford: Oxbow Books, 2005), 149-168; eadem, "Vitruvius' Monstra," *Journal of Roman Archaeology*, 13 (2000): 234-251.

[9] The largest group of fragments, now in the Tebtunis Center at the University of California, Berkeley (P.Tebt. II 679 frags. a-f), was discovered by the excavation of Bernard Pyne Grenfell and Arthur Surridge Hunt in 1899/1900, and edited and published by J. de M. Johnson in 1913. J. de M. Johnson, "A botanical papyrus with illustrations," *Archiv für die Geschichte der Naturwissenschaften und der Technik*, 4 (1912-1913): 403-408. Three additional fragments in the Papyrology Rooms of the Sackler Library, Oxford, were edited and published by Wiliam John Tait in 1977 (P.Tebt. Tait 39-41). W. J. Tait, *Papyri from Tebtunis in Egyptian and in Greek* (London: Egyptian Exploration Society, 1977), 94-96. Tait suspected that these fragments may have belonged to the roll published by Johnson, a position echoed by subsequent authors. See Ann Ellis Hanson, "Text and Context for the Illustrated Herbal from Tebtunis," in *Atti del XXII Congresso di Papirologia, Firenze, 23-29, 1998,* Isabella Andorlini, Guido Bastianini, Manfredo Manfredi, Giovanna Menci, eds. (Firenze: Istituto Papirologico "G. Vitelli," 2001), 585-604.

have blank sides suggests that they once belonged to a roll.[11] The semi-uncial hand dates the fragments to the second century CE.[12] The text accompanying the illustrations has been identified as being similar to, but different from Dioscorides' *De materia medica*.[13] Conforming to Pliny the Elder's description of illustrated herbals, the text appears below the illustrations and focuses mainly medicinal properties (*effectus*).[14] The roll, however, also describes where to find the plants in addition to their properties, as suggested by the term φύεται, or "grows," which is typically used to signal where the plant can be found.[15] This information suggests that the text and illustration were intended to help a reader locate a plant. The information might have also reinforced the reference of a given text to a particular plant according to a wider system of reference.

Scholarly appraisals of the fragmented illustrations have typically been harsh. The first editor, J. de M. Johnson, calls the illustrations "crude and unreal."[16] Charles Singer notes that though "but a tiny fragment … we can see enough to say that its illustrations were of the most formal and diagrammatic character."[17] Kurt Weitzmann determines the plants to be executed in a "rather rough style—it was obviously not a luxury copy."[18] Similarly, Minta Collins portrays the illustrations as "small crude representations of plants painted in fanciful colours."[19] These assessments seem far-reaching given the nature of the evidence. We cannot know what the colors looked like without knowing, first, if other layers of color were lost, and, second, how the extant colors have been impacted by light exposure (i.e., photodegradation) or the conditions of burial, excavation and preservation. We cannot know if the roll was a "luxury copy" without knowing its dimensions and the cost of the colors used.

The designations "diagrammatic," "crude" and "rough" are misleading. The extremely fine brushstrokes, confident handling of the colors in the rendering of stems and leaves, especially evident in the careful "pooling" of color to suggest the modeling of leaves and stems, and the layering of red and black for the roots in fragments e and f (fig. 2.2 and fig. 2.3) suggest the work of a professional painter.[20] That this painter worked with several colors suggests that

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Kim Ryholt has identified three additional fragments: one in the Papyrology Rooms, Sackler Library, Oxford (Box 20, folder "2/5 FF" / P. Tebt. Tait 39 *add.*), and two at the Istituto papirologico "G. Vitelli" in Florence (PSI inv. 4160 a-b).

[10] P. Tebt. II 679 + P. Tebt. Tait 39-41 + P. Tebt. Tait 39 add. + PSI inv. 4169 a+b = Trismegistos 63596 = MP^{3}2094. See John Riddle, *Dioscorides on Pharmacy and Medicine* (Austin: University of Texas Press, 1985), 177-179; Daniela Fausti, "Erbari illustrati su papiro e tradizione iconografica botanica," *Testi medici su papiro, Atti del Seminario di studio (Firenze, 3-4 giugno 2002)* (Florence: Istituto Papirologico "G. Vitelli", 2004), 131-150; Marganne, *Le livre médical*, 37-42; Hardy and Totelin, *Ancient Botany*, 114.

[11] While the codex of the Naples Dioscorides also has largely blank versos, the rarity of codices dating to the second century lends support to the suggestion that the fragments belonged to a roll. On the rarity of codices in the second century, see Colin H. Roberts and T.C. Skeat, *The Birth of the Codex* (London: Oxford University Press, 1983), 35-37.

[12] See Johnson, "Botanical Papyrus," 403.

[13] It remains unclear if the text was perhaps one of Dioscorides' sources, or if it derived from his work. See Johnson, "Botanical papyrus," 403; Hanson, "Text and Context," 588.

[14] Hanson, "Text and Context," 588-589.

[15] Ibid.. The term φύεται appears in P.Tebt. II 679, frag. a, ll. 5-6, frag. c, l. 4, and P.Tebt. Tait 40, l. 3; and is further suggested in P.Tebt. Tait 41, l. 8, ἐν] τοῖς κήποις καὶ ἐν...

[16] Johnson, "Botanical Papyrus," 404

[17] Singer, "Herbal in Antiquity," 31.

[18] Weitzmann, *Ancient Book Illumination*, 11

[19] Collins, *Medieval Herbals*, 38.

[20] Cp. Collins, *Medieval Herbals*, 37-38.

they are not sketches or otherwise unfinished. Although the paintings lack complex modeling, such as highlights and form shadows, their impressionistic quality, particularly the pooling of colors at the base of the leaves and stems, creates pictorial depth through atmospheric perspective (see frag. e, fig. 2.2). This approach gives the plants a three dimensional quality.

These techniques for rendering plants align with those of Roman wall painting, as seen in the "Flora" or "Primavera" fresco at the Villa di Arianna at Stabiae (fig. 2.4).[21] A female figure turns towards a dark green ground suggestive of vegetation, but looks back over her right shoulder to pluck a flower. The linear ordering and relative density of splotches indicates the plant's form, with an overlay of lighter green blobs suggesting depth through atmospheric perspective. The plant's morphology is vague, particularly its leaf margins, shape, and floral structure. The absence of a continuous line linking the structure of the shoots gives us a disjointed sense of the plant's form. Such frescoes do not exhaustively document the plant's morphology, but rather evoke its presence within a *trompe l'oeil* tableau. The painters here emphasize the surfaces that are most visible and proximate to the viewer. The painter leaves "gaps" between parts and blank areas or a "screen" that allows the viewer to make perceptual projections that complete the figures by perceiving fictive structural relations between the plant's parts.[22] The viewer must "fill in" the gaps through essentially *Gestalt* principles of perception, whereby he or she conceives of the figure as an interconnected whole first, and then infers its details.[23] The blank ground is then ambiguous, as it is either background, or a gap to be filled by mental projections from supposing a more articulate plant form.

A consequence of this "impressionistic" approach is the loss of visual detail. Such pictures typically fail to define leaf shape, margin, and venation in a clear or consistent way. The omission of petioles and pedicels gives the impression of flowers and leaves floating in air. Consequently, we do not know if the flowers depicted in Tebtunis fragment e or the Oxford fragments are sessile or pedicellate. Floral structure remains ambiguous. As a result, such pictures risk the viewer's misapprehension of the plant's form. The pictures may likely have been intended to recall things already known, or to allow for the recognition of distinctions among a limited range of familiar species, by showing how this plant is different from others in the book. Either way, the pictures do not provide for an elaborate understanding of the plant's morphology.

The floral structures' ambiguity may reflect contemporary botanical thinking. The role of flowers in plant reproduction was not well understood.[24] Sexual reproduction in plants was apparently only recognized in the date palm.[25] Bees were thought to "steal" nectar from flowers.[26] A flower was often regarded merely as "a beautiful appendage."[27] In contrast, powerful medicinal plants were thought to be flowerless and of a wild or "harsh" character.[28] Theophrastus did not define the function of flowers, although he does distinguish them on the

[21] The figure may be Proserpina, Flora, a nymph, or personification. See Giovanna Bonifacio, Anna Maria Sodo, and Gina Carla Ascione, eds., *In Stabiano - Cultura e archeologia da Stabiae* (Castellammare di Stabia, Longobardi Editore, 2006), 129.
[22] Gombrich, *Art and Illusion*, e.g., 105-109, 182-191, 199-203, 208.
[23] See Ibid., 192-202.
[24] See Hardy and Totelin, *Ancient Botany*, 106, 111, 147.
[25] On the date palm, see Ibid., 132-133, 171-173.
[26] Ibid., 147, 179.
[27] Ibid., 106.
[28] Ibid., 167.

basis of their anatomy in several different ways.[29] Dioscorides pays flowers even less attention in his descriptions of plants.[30] He typically notes their color and compares them to other, more common flowers, only rarely commenting on their structure. The ephemerality of flowers also complicated attempts to define plants according to Aristotelian methods.[31] In practical terms, too, flowers are often unavailable as a means to identify a plant for the bulk of the year.

The Antinoopolis Codex

The next oldest surviving fragments of an illustrated herbal come from the ancient city of Antinoopolis: the so-called Johnson Papyrus, now in the Wellcome Collection in London (MS 5753, figs. 2.5 and 2.6), and P.Antin. 3. 214 frags a, c, d, and e, in the Department of Greek and Latin at University College, London.[32] The fragment's upright uncial bookhand has been dated to the end of the fourth or the beginning of the fifth century CE.[33] The papyrus fragments present the same kinds of information, in the same order, though they lack both the detail and the number of remedies listed in that text.[34] A second hand added explanatory notes and additional information.

Each side of the Johnson fragment preserves a painting with several lines of text below it. Side A contains a picture and text for *symphyton* (σύμφυ[τον], perhaps tuberous comfrey, *Symphytum bulbosum* C. Schimper). The other, Side B, shows *phlomos* (φλόμμος [sic], possibly mullein, *Verbascum sinuatum* L., although Dioscorides notes four different kinds, *MM* 1.28, 4.103). Charles Singer has pointed out that both *symphyton* and *phlomos* appear as synonyms for *helenion* (ἑλένιον, identified as calamint, *Calamintha incana* Boiss. ex Benth., or elecampane, *Inula helenium* L.).[35] Both plants could have been placed next to each other as a result of this synonymy. Daniela Fausti has also suggested that the plants may have been juxtaposed due to their sharing similar therapeutic functions, which would suggest an arrangement of the book according to drug action.[36] While these proposals may still hold, David Leith has given a fuller explanation for the arrangement of the book.[37] He argues that the text is an abridgement of a treatise on astrological botany, *De virtutibus herbarum*, dated to the first century CE. This text associates medicinal plants with planets and zodiac signs, and is, therefore, organized according

[29] *HP* 1.13.1-5. He distinguishes them according to whether they are "downy" (χνοώδης, probably very small flowers, since he gives the example of ivy or mulberry); "leafy" (φυλλώδης, i.e., large petals); large (μέγεθος) or small (ἀμέγεθος); monochromatic (μονόχροος) or dichromatic (δίχροος); with a simple corolla or doubled, "twofold flowers" (διᾶνθη); whether they have one fused petal or many petals; and according to the petals' relative location to the seed/fruit case (περικάρπιον). He finally notes differences between "fertile" and "infertile" flowers. The fact that some flowers do not produce fruit, led ancient authorities to suppose that some flowers were barren or infertile. Theophrastus notes that the flowers of the peach or citron (μηλέα Μηδική, *mēlea Mēdikē*, *LSJ* gives peach but Loeb translates as citron) that lack a "distaff" (ἠλακάτη) are infertile. Theophrastus obviously refers to male flowers lacking carpels or pistils. It is unclear if Theophrastus's "distaff" (ἠλακάτη) refers to either carpels or pistils.

[30] Hardy and Totelin, *Ancient Botany*, 111. Alain Touwaide, "Art and Science: Private Gardens and Botany in the Early Roman Empire," in *Botanical Progress, Horticultural Innovation and Cultural Change*, ed. by Michel Conan and W. John Kress (Washington, DC: Dumbarton Oaks Research Library and Collection, 2004), 37-49, here: 42.

[31] *HP* 1.1.2-6. Theophrastus notes that the most characteristic parts of plants—flowers and fruits—were particularly impermanent, leading him to conclude that plants could not be defined as Aristotle had defined animals.

[32] Fausti, "Erbari illustrati," 136-148. For the most recent edition, see David Leith, "Antinoopolis Illustrated Herbal," 141-156.

[33] Fausti, "Erbari illustrati," 137-138.

[34] Leith, "Antinoopolis Illustrated Herbal," 150-151.

[35] Singer, "Herbal in Antiquity," 33; Hanson, "Text and Context," 587-588; also *LSJ*, s.v. ἑλένιον.

[36] Fausti, "Erbari illustrati," 138, 140-142.

[37] Leith, "Antinoopolis Illustrated Herbal," 154.

to planets and the zodiac. The compiler of the Antinoopolis codex apparently left out all of the astrological content and reorganized the contents alphabetically. An alphabetical rearrangement of the *De virtutibus herbarum* would make *symphyton* and *phlomos* the last two entries in the book. As Leith notes, it remains possible that the compiler also referred to other texts. The Antinoopolis codex and *De virtutibus herbarum* may also draw upon a common source. The abridgment of the text, emphasis on medicinal properties, alphabetical order and presence of illustrations may have followed other illustrated *rhizotomika* (see ch. 1).

While both the Antinoopolis and Tebtunis papyrus fragments show plants as an individual specimen against a blank ground, they do so in markedly different ways. The Antinoopolis fragments show plants with more complex modeling, in multiple colors, and occasional thick outlines. There are as many as three colors layered in Side B, visible in the transition from the brownish green stems to the reddish brown and black roots. The roots depicted on both Side A and B are less carefully rendered than those in the Tebtunis fragments—the color seems thinner and does not include the fine brushwork and careful layering evident in the Tebtunis fragment. The darker color even appears to sit on top of the reddish brown roots—an approach that might go hand in hand with the use of heavy outlines.

The plant depictions on the Johnson papyrus demonstrate a variety of rendering techniques, and both an attention to and disregard of detail.[38] The leaves on Side B appear either as light green with thick outlines, or dark green without outlines. The two tones of green may indicate differences in the coloration of the upper- and undersides of leaves. The decision to outline only the light green leaves could indicate concern about the visibility of the leaves and their shape against the blank ground. The pooling of the darker green color could, as in the Tebtunis fragments, suggest modeling. Most of the leaves, especially the light green ones, appear rotated as though facing the viewer, flattened against the picture plane, giving the impression of shallow pictorial depth. Several leaves, however, have a slight curve and seem to be in profile. The plants depicted in the Antinoopolis fragments are more fully articulated than those depicted in the Tebtunis roll. The clear articulation of each plant part to the whole has the result that the blank ground can only serve as a background, and is not also a "gap" or depth to be filled in by the viewer's mental projections. The fact that the some aspects of the plant form are rotated to the side, might, however, allow the blankness of the ground to aid the viewer in comprehending the three-dimensional quality of the plant through unencumbered mental rotation of the figure.[39] Articulation and a blank ground emerge as two of the most stable features in the history of botanical illustration. The Antinoopolis fragment also hints at a broader tension between legible flattening of plant parts and the suggestion of depth that plays out in this history.[40]

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[38] This mix of rendering techniques corresponds to the depiction of plants in roughly contemporaneous mummy portraits. These panels and burial cloths often show carefully modeled faces, while hands, feet, clothes and attributes receive little or no modeling and often only a hard outline. See, for example, the burial cloth, dated ca. 230-250 CE, in London, British Museum (EA6715).

[39] On mental rotation, see R.N. Shepard, and J. Metzler, "Mental Rotation of Three-Dimensional Objects," *Science* 171 (1971): 701-703. Not without controversy, on the role of the motor cortex in mental rotation, see C. Eisenegger, U. Herwig, and J. Jäncke, "The Involvement of Primary Motor Cortex in Mental Rotation Revealed by Transcranial Magnetic Stimulation," *European Journal of Neuroscience* 25 (2007): 1240-1244, and S.J. Flusberg and L. Boroditsky, "Are Things That Are Hard to Physically Move Also Hard to Imagine Moving?" *Psychonomic Bulletin and Review* 18 (2011): 158-164.

[40] On the relationship between characterizing surface and depth in eighteenth century botanical illustration, see Michael Gaudio, "Surface and Depth The Art of Early American Natural History," in *Stuffing Birds, Pressing Plants, Shaping Knowledge: Natural History in North America 1730-1860,* ed. Sue Ann Prince, *Transactions of the American Philosophical Society* 93, no. 4 (2003): 55-74.

Despite the articulation and clear delineation of the plant, the Antinoopolis fragments demonstrate a number of ambiguities. For example, in Side B, while the artist places most leaves directly on the stem, some of them have a narrow projection at the base, which could indicate a petiole. On some branches the leaves seem to be alternate, in others they appear to be opposite. The depiction of *phlomos* on Side B also includes two faint buds or flower heads or fruit borne on long stems on the right side of the picture. It remains unclear what structures are depicted, especially as the exact identity of the plant cannot be determined.

The rendering of plants here is visibly distinct from that in the Tebtunis fragments. Overall, the painter of the Antinoopolis fragments shows greater concern with legibility and modeling, while eschewing the impressionistic approach, and fine brushwork of the Tebtunis fragments. Both sets of fragments, nevertheless, emphasize growth habit and the disposition of roots and shoots, while deemphasizing floral structure and fruit, leaf margin and shape. Both fragments also hint at a broader set of conventions for the illustration of herbals—a plant represented by a single individual including roots and shoots against a blank ground.

The Sinai Palimpsest Fragment

The Sinai Palimpsests Project has identified a fragment of an illustrated herbal as the undertext of a palimpsested parchment Arabic gospels in Sinai, Monastery of St. Catherine, Arabic "New Finds" NF 8, ff. 16v-17r (fig. 2.7).[41] An entire bifolio in the Arabic gospels, it was once half of a larger bifolio that apparently fell out of its original codex. It was erased, turned on its side, and reused for the Arabic gospel book from the mid-eighth to the late ninth century.[42] Many of the other undertexts in the manuscript are medical in nature. The small, loose majuscule dates to the fifth or sixth century.[43] The plant on ff. 16v-17r is labeled *phileterion* (φιλετεριον, i.e., φιλεταίριον), which, according to Pliny, was named after its discoverer Philetairos, king of Pergamon (343-263 BCE).[44] The plant on ff. 16r-17v is labeled *adianton* (αδιαντον, i.e., ἀδίαντον, maidenhair fern, *Adiantum capillus-veneris* L.). Following other illustrated *rhizotomika,* the text is shorter and excludes a verbal description of the plant. Nigel Wilson has proposed that the text may be a fragment of Crateuas.[45]

Both illustrations show the plant's shoots as rigid sprays, radiating outwards from a base growing out of a large root mass. Neither illustration shows flowers. The plants are fully articulated as in the Antinoopolis codex, but are more rigidly and symmetrically composed. That none of the plants' leaves appear to be in profile radically flattens the plants depicted. While the straightened limbs, flattening of the plant's shoots and leaves clarify leaf shape, structure and

[41] https://sinai.library.ucla.edu/

[42] On this manuscript, see Hikmat Kachouh, "Sinai Ar. N.F. Parchment 8 and 28: Its Contribution to Textual Criticism of the Gospel of Luke," *Novum Testamentum* 50, no. 1(2008): 28-57. Kachouh dates the Arabic manuscript to the second half of the eighth century. The metadata on the Sinai Palimpsests Project website gives the date of the codex as the second half of the ninth century.

[43] As of writing, the metadata published online at the Sinai Palimpsests Projects gives the date as "5th c. CE (501-600)" (sic), (accessed: 28 February 2018). Nigel Wilson suggests a broader range, inclusive of both fifth and sixth century. Nigel Wilson, personal communication, 2 March 2019.

[44] See Pliny, *NH* 25.64. (25.28). See also Reinhold Strömberg, *Griechische Pflanzennamen*, Göteborgs Högskolas Årsskrift 46, no. 1 (Göteborg: Elanders Boktryckeri Aktiebolag, 1940), 135. Both Dioscorides and Pliny note that the plant was also known as *polemōnion* (πολεμώνιον), after its other discoverer, Polemon of Pontus (d. 8 BCE). Dioscorides gives the main name of the plant as *polemōnion*, but lists *philetairion* as a synonym, see *MM* 4.8. The identification of the plant varies. It could be *Hypericum olympicum* L. Lily Beck also lists *Polemonium caeruleum* L. as a possible identification.

[45] Sinai Palimpsests Projects, https://sinai.library.ucla.edu (accessed: 28 February 2018)

arrangement, and obviate the need for mental rotation of the figure, these strategies do not provide for a clear understanding of the plants' three dimensional growth habit. The illustrations of plants in this fragment are stylistically similar to those that we will see in the Old Paris Dioscorides (Paris, Bibliothèque nationale de France, gr. 2179), and may hint at other sources for the illustration of that version of Dioscorides (see below).

The Alphabetical Dioscorides

Dioscorides' *De materia medica* was probably originally unillustrated, but instead relied on descriptions, largely comparative in nature.[46] This approach requires the reader have prior knowledge, or access to other sources or authorities in order to clarify the reference of the text to a given plant. Dioscorides' text was eventually illustrated by the first decade of the sixth century, and likely before it. The text was itself radically transformed. The chapters on herbs were reorganized alphabetically, while the chapters on trees, minerals, wines, oils, and animal products were discarded. As a result, the illustrated Alphabetical Dioscorides only included uprootable plants, perhaps with the intention of readapting it to follow the traditional form of an illustrated *rhizotomikon*, or book for root cutting.[47] Unlike older illustrated *rhizotomika*, the Alphabetical Dioscorides now contained both depictions and verbal descriptions of plants, as well as lists of synonyms. In doing so, the three different ways of referring to plants—names, pictures and descriptions—that Pliny had characterized as distinct approaches came together into a single work.

The two earliest surviving illustrated Alphabetical Dioscorides are the Vienna Dioscorides (Vienna, Österreichische Nationalbibliothek, med. gr. 1), produced in Constantinople and dated to the early sixth century, and the Naples Dioscorides (Naples, Biblioteca Nazionale, gr. 1), likely created in Italy in the late sixth century.[48] The similarities between the illustrations in the two manuscripts indicate they ultimately descend from a common source.[49] While the pictures in the Vienna Dioscorides are at a larger format and are often more carefully executed with fine brushwork and modeling, those in the Naples Dioscorides tend to be more often accurate.[50]

The Compilation of Illustrations in the Alphabetical Dioscorides

Researchers have long suspected that the illustrations in the Alphabetical Dioscorides came from earlier illustrated *rhizotomika*.[51] Max Wellmann noted that the Alphabetical Dioscorides often uses older plant names than those in Dioscorides.[52] He supposed that the compilers of the illustrations for the Alphabetical Dioscorides took the illustrations from an earlier work, notably

[46] See Orofino, "Dioskurides war gegen Pflanzenbilder," 144-149.
[47] Wellmann, "Krateuas," 25-26.
[48] On the dating and localization of the Vienna Dioscorides, see Mazal, *Der Wiener Dioskurides* (Graz: Akademische Druck-u. Verlagsanstalt, 1998), 1:4-5, and more recently, A.E. Müller, "Ein vermeintlich fester Anker. Das Jahr 512 als zeitlicher Ansatz des 'Wiener Dioskurides'," *Jahrbuch der Österreichischen Byzantinistik* 62 (2012): 103-109; on the Naples Dioscorides, see Guglielmo Cavallo, "Introduction," 11-13.
[49] Anton von Premerstein, Josef Mantuani and Carl Wessely, *De codicis Dioscuridei Aniciae Iulianae, nunc Vindobonensis Med. Gr. 1* (Leiden: A.W. Sijthoff, 1906), 110; Wellmann, "Krateuas," 24, Singer, "Herbal in Antiquity," 24-26; Minta Collins, *Medieval Herbals*, 48-56. More recently, Marie Cronier, "Un manuscrit méconnu du Περὶ ὕλης ἰατρικῆς de Dioscoride: New York, Pierpont Morgan Library, M. 652," *Revue des Études Grecques* 125, no. 1 (2012): 95-130.
[50] Collins, *Medieval Herbals*, 56
[51] Wellmann, "Krateuas," 24-25.
[52] Ibid., 26-30.

the illustrated treatise by Crateuas. Direct quotations of text attributed to Crateuas appear alongside several illustrations in the Vienna Dioscorides.[53] It remains unclear how many of the illustrations can be attributed to Crateuas's herbal.

Recognition that the Alphabetical Dioscorides probably drew on a variety of earlier illustrated *rhizotomika* raises the question how did the compilers match pictures to Dioscorides. In the simplest cases, the compilers probably matched the names of the plants in Dioscorides to those in the illustrated *rhizotomika*. But due to the variability of the names, the compilers would have likely had to rely on synonymy and textual descriptions as well. This method of compilation becomes especially evident when the text and illustration appear to be odds. For example, the depiction of an eryngo (ἠρίγγιον, ēringion, a kind of eryngo, likely sea holly, *Eryngium maritimum* L, Vienna Dioscorides, f. 126v; Naples Dioscorides, f. 78r, fig. 2.8) shows the long taproot terminating in a gorgon head. Dioscorides makes no mention of the head in his description of the long, black root. In the Alphabetical Dioscorides, however, *gorgoneion* appears as an alternate name for eryngo.[54] The original version of Dioscorides' *Materia medica* does not mention this alternate name. In the Naples Dioscorides, the main chapter heading even reads ἠρινγειον η γοργονιο[ν], "eryngo or *gorgonion*". The compiler of the Alphabetical Dioscorides probably matched a plant called *gorgonion* from another, now unknown source to Dioscorides' *ēryngē* (ἠρύγγη), likely on the basis of synonymy.

Synonymy appears to have also played a role in matching pictures to Dioscorides' chapter on *helichryson ē chrysanthemon* (ἠλίχρυσον ἢ χρυσάνθεμον, fig. 2.9). In Dioscorides *helichryson* designates a plant that would today be placed in the *Helichrysum* genus.[55] These tend to be small, upright perennial herbs with yellow flowerheads. Dioscorides notes that the plant was also called *amaranton* (ἀμάραντον), i.e., "unfading," because its flowers appear to retain their color when dried, though in fact it is the papery involucral bracts sheathing the base of the flowers that remain yellow. Their unfading color, however, made them ideal for making garlands and wreaths decorating statuary.[56] Pliny the Elder also describes a plant named *amarantus* (i.e., ἀμάραντον).[57] He notes that it is a hardy plant with a *spica purpurea,* a purple inflorescence. Similar to Dioscorides' *amaranton*, Pliny's *amarantus* is also useful for making chaplets.[58] Pliny's description of a purple *amarantus* does not match Dioscorides' *helichryson ē*

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[53] For fragments and testimonia of Crateuas, see *Pedanii Dioscuridis Anazarbei De materia medica*, ed. Wellmann (Berlin: Weidmann, 1914), 3: 139-146.

[54] *Gorgoneion* also appears as a synonym for *lithospermon*, see Strömberg, *Griechische Pflanzennamen*, 101.

[55] Perhaps *Helichrysum arenarium* L., *H. orientale* L, or *H. stoechas* L. Dioscorides, *De materia medica*, 4.57. ed. Wellmann, 2: 210-211: ἑλίχρυσον ἢ χρυσάνθεμον, οἱ δὲ ἀμάραντον, ᾧ καὶ τὰ εἴδωλα στεφανοῦσι. ῥαβδίον <ὀρθόν,> λευκόν, φύλλα στενὰ ἐκ διαστημάτων ἔχον πρὸς τὰ τοῦ ἀβροτόνου, κόμην κυκλοτερῆ, σκιάδια χρυσοφανῆ, περιφερῆ ὥσπερ κορύμβους ξηρούς, ῥίζαν λεπτήν. Φύεται δὲ ἐν τραχέσι καὶ χαραδρώδεσι τόποις. On identification with *Helichrysum spp.,* see Mihai Costea and François J. Tardif, "The Name of the Amaranth: Histories of Meaning," *SIDA, Constributions to Botany* 20, no. 3 (2003): 1073-1083, at 1075, with errors in the transcription of Greek.

[56] *MM* 4.57.

[57] Pliny, *NH* 21.23, ed. L. Jan and K. Mayhoff (Leipzig: Teubner, 1854-1865), 395: Amaranto non dubie vincimur. est autem spica purpurea verius quam flos aliquis, et ipse sine odore. mirum in eo gaudere decerpi et laetius renasci. provenit Augusto mense, durat in autumnum. Alexandrino palma, qui decerptus adservatur; mire que, postquam defecere cuncti flores, madefactus aqua revivescit et hibernas coronas facit. summa natura eius in nomine est, appellati, quoniam non marcescat.

[58] Garlands containing both *Helichrysum stoechas* and *Celosia argentea* were found during Flinders Petrie's excavations of Roman Fayum. See Renate Germer, "Ancient Egyptian Plant-Remains in the Manchester Museum," *The Journal of Egyptian Archaeology* 73 (1987): 245-246. The remains of a garland with *Celosia argentea* was also found in a burial at Hawara. It is now kept at the Liverpool World Museum, n. 56.20.475.

chrysanthemon, but rather, matches *Celosia argentea* L.[59] Closely related to today's grain amaranths, *Celosia argentea* is a weedy annual herb with coloful spike inflorescences.

In the Alphabetical Dioscorides, we find—as we would expect for a text based on Dioscorides—*amaranton* named as a synonym for *helichryson ē chrysanthemon*. Yet the long feathery inflorescences do not match those of *Helichrysum spp*, but rather those of *Celosia argentea*.[60] The synonym seems to have been used to match the picture to text, while some additional changes were made to the picture in order to match the text. For example, that the flowers of this "unfading" *helichryson ē chrysanthemon* are yellow, and not Pliny's purple, could be due to *chrys-* (χρυς-, i.e., "golden" from χρυσός, "gold") in the names *helichryson ē chrysanthemon*. *Celosia argentea* flowers can after all be white, yellow, orange, red, pink, or purple. While the leaves in the picture do not closely resemble those of *Celosia argentea* L, they could follow the text, which says the leaves as πρὸς τὰ τοῦ ἀβροτόνου—like those of wormwood.

Several researchers have attempted to identify the different sources that were used to compile the pictures for the Alphabetical Dioscorides. Premerstein, Mantuani and Wessely noted that the old index written in the Vienna Dioscorides (ff. 8r-10v) contains roughly half of the plants in the Vienna Dioscorides.[61] They observed some differences between the plants of the old index and those not in it. [62] But such approaches yield only limited results. Minta Collins has noted the old index does not adequately account for the illustrations' diversity.[63] Charles Singer believed that the illustrations most closely related to Crateuas would the most naturalistic. [64] Both Riddle and Collins reject Singer's reconstruction of Crateuas's herbal as too "simplistic."[65] Both note that naturalistic illustrations appear throughout the codex irrespective of their association with quotations of Crateuas. Heide Grape-Albers suggests dividing the illustrations into three groups on the basis of there degree of naturalism: she initially concurs with earlier scholars that the oldest and most naturalistic, which she calls "Hellenistic," can be associated with the old index.[66] She distinguishes it from another "late antique" group, which is the most recent group and is the least naturalistic. But she recognizes that these groups are not entirely uniform, and detects an intermediate group. The differences in the illustrations in the Vienna Dioscorides as well as between the old index and the actual contents of the codex might also merely indicate the multiple versions of the Alphabetical Dioscorides in circulation that were consulted and available. Such differences could speak to divergences within the same tradition, and not to the ultimate sources for it.

It remains to be seen if stylistic analysis can throw light on the ultimate sources of the illustrations. While there were likely multiple sources consulted and available, how many of them there were and what they looked is not easily determined. Contemporary depictions of plants varied tremendously even in the same works. For example, clearly distinct plant

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[59] I.e., *Celosia argentea* var. *cristata* (L.) Kuntze, i.e., *C. cristata* L., or *C. argentea* L. f. *cristata* (L.) Schinz. See Costea and Tardif, "Name of the Amaranth," 1075.

[60] *Chrysokomē ē chrysitēs* [χρυσοκόμη or χρυσίτης] in the Alphabetical Dioscorides actually seems to be a closer to Dioscorides' description of *helichryson ē chrysanthemon*. The situation is further complicated by the fact that ἀμάραντον appears in a list of synonyms for χρυσοκόμη or χρυσίτης.

[61] Premerstein, *et al.*, *De codicis Dioscuridei,* see the helpful "codicis conspectus," 193-220.

[62] Ibid.*,* 107-108.

[63] Collins, *Medieval Herbals*, 48-50.

[64] Singer, "Herbal in Antiquity," 5-7.

[65] Riddle, *Dioscorides on Pharmacy*, 190; Collins, *Medieval Herbals*, 48-49.

[66] Grape-Albers, *Spätantike Bilder*, 7-10.

depictions appear in the same paintings from rear wall of Room M from the villa of P. Fannius Synistor in Boscoreale, now in the Metropolitan Museum of Art, New York (fig. 2.10). Here we find clearly delineated ivy, with highlights on the leaf margins and the edge of the leading shoots, while grasses appear as sprays of disconnected, light and dark green splotches. At the same time, more distant plants were depicted in atmospheric perspective as vague, light green blobs as though fading into a milky sky. The grapevines in the middle ground retain highlights and forms shadows, although the leaf shapes and margins become sketchier. The grape clusters are similarly modeled. Tendrils appear as abstract curlicues with nested comas. The rear wall clearly demonstrates that Roman painters employed different conventions for depicting different plants—for example, sprays of color for grasses, attention to leaf shape for vines and ivy—, while the degree of detail was adapted to match the plant's supposed distance from the viewer.[67] If we did not know the grass, ivy and grapevine belonged to the same fresco and the same artistic tradition, we might be tempted to take them as the work of different artists, styles, or periods.

Descriptive Detail and Spatial Aspect

The plants depicted in the Alphabetical Dioscorides represent yet another system of depiction distinct from those in the Tebtunis roll, Antinoopolis codex, and Sinai Palimpsest. A simple comparison of these fragments with the Vienna and Naples Dioscorides makes such differences clear (e.g., *batos*, βάτος, bramble or blackberry, *Rubus ulmifolius* Schott, Vienna Dioscorides, f. 83r, fig. 2.11). The impressionistic quality and aerial perspective of the Tebtunis roll is altogether absent in the illustrations of the Alphabetical Dioscorides, which, more in line with the Antinoopolis codex, tend to rely on foreshortening and the superimposition of branches to indicate depth, and, therefore, growth habit. The occasional interlacing of different plant parts in the Alphabetical Dioscorides tends to flatten the picture. Similarly, while leaves and stems in the Alphabetical Dioscorides rotate in a variety of directions, many still rotate toward the viewer. The thick outlines on the edges of the leaves suggest leaf margin. Unlike in the Antinoopolis codex, however, the outlines in the Alphabetical Dioscorides are more consistently applied throughout the illustration. Darker shading on the leaves and stems indicate form shadows.

In general, the illustrations of the Alphabetical Dioscorides show more morphological details of the plants than do the illustrations in the papyrus and parchment fragments. The depictions in the Vienna and Naples Dioscorides that match tend to agree in their details, and are clearly descended from the same archetype. Nevertheless, illustrations in the Naples Dioscorides often appear cramped, having been adjusted to fit the limited space allotted. The brushwork in the Naples Dioscorides is often less refined: the black outlines appear to be thicker, and are often paired with an additional outline in yellow, which highlights the edge of the leaf.

As in the Antinoopolis codex, the use of thick outlines and modeling speaks to a particular approach to pictorial depth that plays on tension between presenting the plant as a round figure, or as flattened out. Kurt Weitzmann earlier noted this quality of flattening in the illustration of *ion porphyroun* from the Vienna Dioscorides (*ion porphyroun,* ἴον προφυροῦν, violets, i.e., *Viola odorata* L., fig. 17, Vienna Dioscorides, f. 148v).[68] As Weitzmann observes,

> It will be noticed that the plants are not designed in natural three-dimensionality, but rather as if they had been pressed. The reason, obviously, was not incapability, but… the

[67] See Gombrich, *Art and Illusion,* 192. Gombrich cites Horace, *Ars poetica*, *ll.* 361-365.
[68] Weitzmann, *Ancient Book Illumination*, 12.

> employment of the most advantageous viewpoint, since the perspective distant parts would be overlapped and therefore less clear."[69]

For Weitzmann such pictures appear flattened in order to illustrate plant parts more clearly for the viewer. The leaves indicate different properties of the plant depending on their disposition within the composition. Some leaves' curling edges reveal their undersides as sometimes whitish, sometimes a greenish-brown, the same color as the stems. Stippling suggests surface patterns or textures, while venation is indicated on both sides of the leaves with thin brush strokes in both a light and dark color. It is as though the illustration was designed to selectively show certain aspects of the plant's morphology. Weitzmann's casual observation underscores the relevance of Dominic Lopes's understanding of aspectivity for such pictures (see introduction). Lopes's terminology is useful for explaining the tensions inherent in ancient plant depiction. For example, the tug-of-war between flatness and depth in ancient botanical illustration revolves around this question of how to depict a plant's spatial properties, its three-dimensional growth habit, as well as the arrangement, shape and margins of its leaves. It is these tensions that explain the peculiar acrobatics of ancient botanical illustrations.

In similar terms, ancient plant depictions tend to treat flowers as inessential properties for visual knowledge of the plant. This trend generally continues in the Alphabetical Dioscorides, even though more detailed depictions of flowers do occur.[70] Some of these more detailed depictions show flowers at different stages of growth, and from different angles of view. For example, the depiction of *rhodon ē rhoda* (ῥόδον ἤ ῥόδα, rose, *Rosa spp.* L., Vienna Dioscorides: f. 282r, *MM* 1.99) shows several unopened flower buds in addition to opened flowers (fig. 2.12). The opened flowers are depicted as viewed from multiple directions, showing the backside, top and profile of the flower head.

Not all of the pictures in the Alphabetical Dioscorides show the roots of the plants. Many. Excluding plants and plant-like organisms do not have extensive root systems, we still find some plants with their roots obscured by substrate.[71] The illustration of the substrate in which a plant grows may refer to the terrain in which it is found. For example, the illustration of *kapparis* (κάππαρις, a caper bush, *Capparis spinosa* L., Vienna Dioscorides: f. 172v, Naples Dioscorides: f. 54r,) and *krambē agria* (κραμβη ἀγρία, wild cabbage, *Brassica cretica* Lam., Vienna Dioscorides: f. 183v, Naples Dioscorides: 84r, *MM* 2.121) growing out of rocky substrate may correspond to Dioscorides's description of the caper as growing on "rough ground" (ἐν τραχέσι), or of wild cabbage favoring "steep areas" (κρημνώδεσιν).[72] The depiction of *kynokephalion* (κυνοκεφάλιον, perhaps a snapdragon, *Antirrhinum maius* L. or *A. oronteum* L., Vienna Dioscorides: f. 159v, Naples Dioscorides: 51r, *MM* 4.131) growing in a sandy substrate,

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[69] Ibid.

[70] For example, the illustrations of *anēmone* (ἀνεμώνη ἡ φοινική, Vienna Dioscorides: f. 25v, Naples Dioscorides: f. 12r, *Anemone coronaria* L.), *bouphthalmon* (βούφθαλμον, Vienna Dioscorides: f. 75v, Naples Dioscorides: f. 27r, ox-eye, *Chrysanthemum coronarium, Leucanthemum coronarium*, or *Anacyclus radiatus* Loisel., *MM* 3.139), *hēmerokalles* (ἡμεροκαλλές, Vienna Dioscorides: f. 133r, Naples Dioscorides: f. 79r, Martagon lily, *Lilium martagon* L., *MM* 3.122), *iris* (ἶρις, Vienna Dioscorides: f. 147v, Naples Dioscorides: f. 42r, *Iris germanica*, *MM* 1.1), *kyklaminos*, (κυκλάμινος, Vienna Dioscorides: f. 164v, Naples Dioscorides: f. 47r, *Cyclamen graecum* Link, *MM* 2.164), *kapparis*, (κάππαρις, Vienna Dioscorides: f. 172v, Naples Dioscorides: f. 54r, a caper bush, *Capparis spinosa* L., *MM* 2.173), and *rhodon ē rhoda* (ῥόδον ἡ ῥόδα, Vienna Dioscorides: f. 282r, Naples Dioscorides: 129r, a rose, *Rosa gallica* L. or *R. centifolia* L., *MM* 1.99).

[71] We would not expect to find roots, for example, on lichens (Λιχὴν ὁ ἐπὶ τῶν πετρῶν, identifications vary, Sprengel says *Pettigera canina* Hoffm., or *Pettigera aphthosa* Hoffm.; Fraas says *Lecanora parella* Ach., Vienna Dioscorides: f. 216v, *MM* 4.53).

[72] *MM* 2.173 and 2.121, respectively.

however, presents unique difficulties (fig. 2.13). The accompanying text in the Alphabetical Dioscorides does not explain why the illustration of the plant lacks roots and why the plant is shown growing on a substrate. Theophrastus, however, says that *antirrhinon* (ἀντίρρινον), a synonym for *kynokephalion*, has no roots.[73] Pliny the Elder also notes that *antirrinum* has no roots.[74] The illustration of *kynokephalion* may indicate the putative rootlessness of the plant. If so, the illustration of *kynokephalion* relates to a broader botanical tradition than that contained in the text of Dioscorides. In doing so, the illustration provides clear evidence of how pictures work autonomously, and thereby expand upon the text.

Temporal Aspect

As the illustration of the rosebush demonstrates, the Alphabetical Dioscorides depicts plant parts at different stages of growth—flower buds and blooms, as well as older, tougher tissue. The depiction of different stages of growth echoes Pliny's concern that a plant's appearance needed to be depicted according to its "fourfold" variation over the course of the year—*praeterea parum est singulas earum aetates pingi, cum quadripertitis varietatibus anni faciem mutent*.[75] Such concerns could result in two completely different pictorial strategies: the painter could either emphasize seasonal variance, by showing the plant at different stages of its life cycle, or attempt to exclude seasonal variance entirely by emphasizing only the most permanent characters. We find both extremes in the Alphabetical Dioscorides.

The depiction of plant parts at various stages of growth is especially evident in the illustration of the bramble or blackberry, *batos* (βάτος, *Rubus ulmifolius* Schott, Vienna Dioscorides: f. 83r, Naples Dioscorides: f. 32r, *MM* 4.37, fig. 2.14). The illustrations provides flowers and fruit at different stages of maturity, including unopened floral buds, opened flowers, flowers loosing their petals in the midst of abscission (top left), mature fruit and possibly immature fruit. We also find new (apical) growth, and the broken end of a dead branch. The broken branch in particular is a convention used throughout the codex for signaling the bare appearance of a plant in winter, or the effects of senescence.[76] The illustration further shows the tendency of lower branches to root at nodes which allows the plant to grow into dense thickets. The leaves appear largely flattened and tilted toward the viewer, while many curl or bend to show their lighter colored undersides. The illustration gives the impression of having been designed specifically so as to show a variety of plant parts at different stages of growth.

Other illustrations in the Alphabetical Dioscorides of *geranion* (γεράνιον, a geranium, *Geranium spp.*, Vienna Dioscorides: f. 85r, fig. 2.15; Naples Dioscorides: f. 58r, *MM* 3.116) and *anemōnē hē phoinikē* (ἀνεμώνη ἡ φοινική, *Anemone coronaria* L., Vienna Dioscorides: f. 25v, fig. 2.16; Naples Dioscorides: 12r, *MM* 2.176) depict petals falling midair having abscised from a fertilized flower head. The pictures appear like snapshots, as though the petals were frozen in time. While seeming to depict a single instant or moment, the petals refer to the transition from one plant part to another, that is, from flower to fruit. In the larger composition, the petals clarify the temporal or sequential relationship between the bud, the flower head, and the seedpod. In this case, since the falling petals are related to the seedpod, the viewer can infer that the other closed forms are unopened flower buds. In this way, the petals clarify the temporal aspect and transformation of the plant from one life stage to another. In depicting discrete stages in the life

[73] *HP* 9.19.
[74] *NH* 25.129.
[75] *NH* 25.4.
[76] See Riddle, *Dioscorides on Pharmacy*, 212.

of the plant, the illustrations reflect an interest in ancient botany with annual processes, especially in fruiting and the development of seeds. Aristotle and Theophrastus, for example, considered fruiting the *telos* or purpose of the plant.[77]

On the other hand, many plant depictions in the Naples and Vienna Dioscorides do not depict inflorescences at all. For example, the depiction of *symphyton* (σύμφυτον, comfrey, *Symphytum spp.*) in the Naples Dioscorides (f. 132r, fig. 2.17) lacks an inflorescence entirely, as opposed to other illustrations where floral structures were deemphasized or vague. The outright absence of the *symphytum* flower may reflect an attempt to focus on more permanent characters, such as the leaves and roots. The decision not to portray the temporary parts of the plant, such as the inflorescence, could also relate to the thinking that more temporary parts of plants are less available for identification, or are less suitable for defining the identity of a plant (see above).

Names and Medicinal Properties

The depiction of falling petals in the illustration of *anemōnē* may also illustrate the name of the plant, as explained by Ovid, "for the winds from which it takes its name shake off the flower."[78] Descriptive plant names often impacted plant depiction in the Alphabetical Dioscorides.[79] Often the connection between a plant's name and its morphology or properties is obvious. For example, the bill-shaped seedpods of geranium or cranesbill resemble cranes (i.e., *geranoi*, γέρανοι). Other illustrations are less subtle. Illustrations of various kinds of *satyrion* (σατύριον, i.e., orchids, Orchidaceae family) often depict testicle-shaped corms (Naples, f. 133r, fig. 2.18). *Satyrion*, a name derived from the forest-dwelling satyr (σάτυρος), is just one name among others—e.g., ἐντατικόν, κυνὸς ὄρχις, πριαπίσκος, ὄρχις, ὄρχις σατύρου, σατύριον, σατυρίσκος—for different orchids. The word orchid in fact derives from ὄρχις, or testicles. The appearance and properties of the plant went hand in hand: many orchids were supposed to be aphrodisiacs.[80] Similarly, as noted above, the depiction of *eryngion* includes a medusa head at the end of the root in keeping with another name for the plant: *gorgonion* (fig. 2.8).

While the gorgon head relates to the plant's name, it might also relate to medicinal properties. Dioscorides notes that when suspended around the neck, the root destroys growths.[81] The medusa head is an apotropaic emblem, ubiquitous in the ancient world. In a similar way, the depiction of *symphyton* includes a cut leaf that could refer to the medicinal use of the plant's sap for closing wounds. The name *symphyton* means "grow together," and refers to the medicinal use of the plant's sap for gluing together wounds.[82]

Properties of Differential Growth

Some pictures can refer to a plant's properties of growth, as is apparent in the depiction of rooting nodes and apical growth in the illustration of the *batos* (fig. 21). The illustration of *skammōnia* (σκαμμωνία, scammony, *Convolvulus scammonia* L., Vienna Dioscorides: f. 331v, fig. 2.19, Naples Dioscorides: f. 155r, *MM* 4.170) would appear to relate in a similar to the growth of the plant. In many ways, it reflects the priorities that I note above. Its characteristic flowers have not been depicted, perhaps as they are especially short-lived. The root, a source of a

[77] See Hardy and Totelin, *Ancient Botany*, 147-149.
[78] Ovid, *Metamorphoses,* 10.725-739, trans. Frank Justus Miller, Loeb Classical Library 43 (Cambridge, Mass.: Harvard University Press, 1939) 117.
[79] On naming, see Hardy and Totelin, *Ancient Botany*, 95-104.
[80] See *MM* 3.126-128.
[81] *MM* 3.21: ἱστορεῖται δ᾽ ὅτι περιαπτομένη διαφορεῖ φύματα
[82] See Strömberg, *Griechische Pflanzennamen*, 77, 88.

resin that served as a common purgative in ancient medicine, appears prominently within the illustration. The word *skamma* (σκάμμα, from σκάπτω) refers to the action of digging, and could relate to the digging involved in harvesting of the plant's resin.[83] But the picture includes an unusual detail: the leaves and apical growth appear on a lower shoot as having just abscised. The leaves of the closely related bindweed, *Convolvulus arvensis* L., are known to abscise when in low light environments, such as under a dense juniper canopy.[84] The depiction of abscission here may serve as an aid to those searching for the roots of the plant, since the shoots ultimately leading to the root may not bear leaves, depending on where the plant is growing.

That the picture of *skammōnia* might especially emphasize how it can be found raises the question of how we should understand the broader use of the illustrated herbal. The depictions of *anemōnē*, *eryngion*, *skammōnia* and *symphyton* are certainly striking. By including references to names as well as medicinal properties and aspects of growth, the pictures create a visible and palpable link between a name, a set of properties, and the picture. For those interested in using the herbal as a guide for root-cutting, such connections would had an additional mnemonic value.

Illustrating the "Original" Arrangement of Dioscorides' *De Materia Medica*

The Old Paris Dioscorides

The original version of Dioscorides, arranged in five books according to drug action, was also eventually illustrated. The earliest surviving illustrated "original" version of Dioscorides is now in Paris (Paris, Bibliothèque nationale, gr. 2179). Guglielmo Cavallo has dated it to the end of the eighth century and has suggested an Egyptian-Palestinian provenance.[85] Scholars have noted that the text is of a higher quality than the other herbals discussed here.[86] The miniatures in the fragmentary codex tend to appear on right side of the text column (e.g., f. 2r) or occasionally in the margins, sometimes rotated horizontally so as to fit in the allotted space (e.g., f. 98r).[87] As with earlier illustrated herbals, the Old Paris Dioscorides typically shows one picture per plant named.[88]

The pictures in the Old Paris Dioscorides depart notably from those in the Alphabetical Dioscorides, as well as the Tebtunis Roll and Antinoopolis Codex in terms of their visual aspect. The plants in the Old Paris Dioscorides appear entirely on one plane parallel to the surface of the parchment, as though flattened, an effect further reinforced by a lack of modeling—the occasional hatching notwithstanding—and the delineation of the outer edges of plant parts with an even outline. Branches are typically symmetrical along a central axis, often coinciding with the main axis of the plant. Some plants have a more vine-like appearance and make S-shapes. The pictures generally seem streamlined and elegant, as all extraneous detail had been removed.

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[83] *MM* 4.170. See also, *LSJ*, s.v. σκάμμα, this term is not discussed in Strömberg, *Griechische Pflanzennamen*.

[84] A.L. Bakke and W.G. Gaessler, "The effect of reduced light intensity on the aerial and subterranean parts of the European bindweed," *Plant Physiology* 20 (1945): 246-257. See also P.B. Kennedy and A.S. Crafts, "The anatomy of *Convolvulus arvensis*, wild morning-glory or field bindweed," *Hilgardia* 5, no. 18 (1931): 591-622.

[85] Guglielmo Cavallo, "Funzione e strutture della maiuscola greca tra i secoli VIII-XI," *La paléographie grecque et byzantine, Colloques internationaux du Centre national de la recherche scientifique*, no. 559, Paris 21-25 October 1974, (Paris: Centre national de la recherche scientifique, 1977), 96-102.

[86] Marie Cronier, for example, notes, "The work is treated here as a classic text … to be preserved as meticulously as possible." See Marie Cronier, "The Manuscript Tradition," 140.

[87] See, for example, ff. 28r, 33r and 33v.

[88] Two notable exceptions, however, occur. Two illustrations of plants appear in the chapter on *tēlephion* (Τηλεφιον, i.e., τηλεφώνιον, *Andrachne telephoides* L., *MM* 2.186, f. 5v, fig. 2.28). The reason for the inclusion of both illustrations remains unclear. In the illustration of mushrooms (f. 107v), which includes multiple mushrooms under one entry.

While the pictures in the Old Paris Dioscorides do not resemble those in the Alphabetical Dioscorides in terms of their aspectual structure, they nevertheless depict many of the same morphological features, including an attention to the roots, leaf shape, and the general disposition of shoots. Despite their flattened aspect, many of the illustrations manage to show different sides of the same plant parts. For example, the illustration of *lōtos ho en aigyptō gennōmenos* (λωτός ὁ ἐν Αἰγύπτῳ γεννώμενος, i.e., "the lotus grown in Egypt", possibly *Nymphaea caerulea* Savigny[?], or *Nelumbo nucifera* Gaertn., *MM* 4.113, f. 117r, fig. 2.20) shows the flower in profile and head-on, as well as the underside (abaxial) and upper (adaxial) side of the leaves.[89] The painter here also carefully distinguishes between the leaf venation as it appears from the top and the bottom of the leaf. The vast majority of pictures in the Old Paris Dioscorides, however, do not show leaves and flowers from multiple views, but rather a single side. Plants in the Old Paris Dioscorides also often appear at multiple stages of growth. For example, the picture of *potamogeitōn* (ποταμογείτων, i.e., pondweed, *Potamogeton natans* L., *MM* 4.100, f. 113r, fig. 2.21) shows basal leaves at three different stages of senescence. As in the Alphabetical Dioscorides, a few illustrations in the Old Paris Dioscorides do not show the roots of the plants, evidently for similar reasons. For example, *asklēpias* (ἀσκληπιάς, i.e., swallow-wort, *Vincetoxicum officinale* Moench, *MM* 3.92, f. 48v, fig. 2.22) grows out of some rocks with no visible roots, echoing the text, which notes that the plant grows in the mountains.

In addition to depicting plant morphology, the pictures in the Old Paris Dioscorides also occasionally depict plants as they exude liquids.[90] The illustration of *skammōnia* (f. 134r, fig. 2.23) even shows a small vessel collecting liquid as it pours from a lower branch of the plant, which, nevertheless, does not closely match Dioscorides' description of the actual process for extracting resin from the plant. The depiction of a process related to the extraction or harvesting of the plant is unattested in the Alphabetical Dioscorides, although it is fairly common in illustrated Arabic Dioscorides and in Athos, Lavra, Ω 75, which fall outside the scope of this dissertation.

Sourcing and Spatial Aspect

Despite notable differences between the Old Paris Dioscorides and the Alphabetical Dioscorides, a number of researchers suspect that many illustrations in the Old Paris Dioscorides are descended from those in the Alphabetical Dioscorides.[91] Determining the relationship between the pictures of the Old Paris Dioscorides and those of the Alphabetical Dioscorides is difficult. The most basic approach involves simple comparison of the pictures, taking into account the number of changes needed to adapt one image to match another. That principle nevertheless must only remain as a guide. In most cases there is little (n=75, or 21%) or no (n=244, 68%) visible resemblance between the pictures in Paris gr. 2179 and the Alphabetical Dioscorides. A small number of pictures show some (n=35, 10%) resemblance, while a very small group could be described as matching (n=7, roughly 2%). These numbers are not absolute indicators of relatedness, but rather approximate degrees of resemblance.

It is conceivable that many more illustrations in the Old Paris Dioscorides are related to the Alphabetical Dioscorides, but that successive changes over time resulted in divergences.

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[89] The plant that Dioscorides describes appears to be *Nymphaea caerulea*.

[90] The illustrations of both *aloē* (ἀλόν i.e., ἀλόη, *Aloe vera* (L.) Burm. f., *MM* 3.22, f. 16r) and *tragion* (τράγιον, stinking tutsan, *Hypericum hircinum* L., *MM* 4.49, f. 85v) depict liquids streaming from them. Dioscorides mentions the medicinal properties of both plants' sap or juice.

[91] Riddle, *Dioscorides on Pharmacy*, 193; and Singer, "Herbal in Antiquity," 27-28.

Such changes might include stylistic or aspectual adjustments: a tendency towards symmetry, flattening out curved or foreshortened surfaces, and straightening of plant parts along the central axis. The illustration accompanying the entry on *chelidonion* (χελιδόνιον, *Chelidonium majus*, *MM* 2.180, f. 3v, fig. 2.24) in the Old Paris Dioscorides gives a sense of how much an illustration can change in the process of copying it. The pale red ink of the underdrawing is plainly visible. It is clear that in the initial underdrawing the basal leaves of the plant were bent over, which would have allowed depiction of both sides of these leaves, as occurs, for example, in the illustration of *isatis* (ἰσάτις, woad, *Isatis tinctoria*, *MM* 2.184, f. 5r, fig. 2.25). The painter, however, avoided this in depicting *chelidonion*, opting instead to paint the basal leaves as erect and superimposed. The shift between underdrawing and painting on f. 3v clearly indicates an aspective change: a decision to depict only one side of the basal leaves. The crimped or folded appearance of the woad leaves (on f 5r) also suggest how leaves as depicted in the Alphabetical Dioscorides might have gone from curved and foreshortened to creased and flattened. The potential ambiguity of these forms may have lead the painter to flatten the leaf entirely, as occurs for the *chelidonion*.

While previous scholars have commented on the possible connection between the Old Paris Dioscorides and the Alphabetical Dioscorides, the staggering degree of dissimilarity must also be addressed. It seems possible that the Old Paris Dioscorides might derive some of its pictures from other antique and late antique herbals. As noted above, the Sinai palimpsest suggests there were other available sources. We cannot be certain, however, how many illustrations must go back to these other sources.

Description-based Depiction

Several of the illustrations in the Old Paris Dioscorides that do not match the Alphabetical Dioscorides appear to "*ex novo*" creations based on Dioscorides' descriptions. The illustration of *lonchitis* (λογχίτης / λογχῖτης, possibly *Serapias lingua* L.*, MM* 3.144) on f. 65r (fig. 2.26) provides a striking example. The picture follows Dioscorides' description of the plant:

> *Lonchitis* has leaves like a sliced leek but wider and reddish; very many of them are near the root, bending on the ground as it were; it also has a few around the stem upon which there are flowers resembling little felt hats, shaped like gaping comic masks, and black. And there is something white that protrudes from their opening toward the lower lip, as if it were a little tongue. The seed is like a spearhead (*lonchē*, λόγχη), triangular, and encapsulated, whence it earned its name.[92]

The picture reproduces all of the major points of this description: the shape, color and disposition of the leaves, as well as the color, tongue- and mask-like aspects of the flowers. We might suppose that the illustrator of the *lonchitis* in the Paris Dioscorides did not have a picture of the plant from the Alphabetical Dioscorides available. But when we look at the *lonchitis* in the Naples codex (f. 113r, fig. 2.27), another possibility presents itself. The picture shows the flowers as shaped like dog heads and yellow, while the text describes them as black. Perhaps the image-makers responsible for *lonchitis* in the Old Paris Dioscorides or its model, recognizing the

[92] Trans. Beck, 245, *MM* 3.144: φύλλα ἔχει πράσῳ καρτῷ ὅμοια, πλατύτερα δὲ καὶ ὑπέρυθρα, πλεῖστα πρὸς τῇ ῥίζῃ, περικλώμενα ὡς ἐπὶ τὴν γῆν· ἔχει δὲ καὶ περὶ τὸν καυλὸν ὀλίγα, ἐφ' οὗ ἄνθη ὅμοια πιλίσκοις, τῷ τύπῳ δὲ κωμικοῖς προσωπείοις κεχηνόσι, μέλανα, λευκὸν δέ τι ἐξ αὐτῶν ἐξέχει ἀπὸ τοῦ χάσματος πρὸς τῷ κάτω χείλει ὥσπερ γλωσσάριον· τὸ σπέρμα δὲ ὅμοιον λόγχῃ, τρίγωνον, ἐν περικαρπίοις, ὅθεν καὶ τῆς ἐπωνυμίας ἠξιώθη, ῥίζα ὁμοία δαύκῳ. φύεται ἐν τραχέσι καὶ ἀνίκμοις τόποις. ταύτης ἡ ῥίζα διουρητικὴ πινομένη σὺν οἴνῳ.

mismatch between picture and text, opted to remake the illustration according to the textual description alone.[93] The low incidence of zoomorphism in the Old Paris Dioscorides would be consistent with this explanation.[94]

The matching of pictures to text speaks to the makers' fidelity to the text, a tendency that was less apparent in the Alphabetical Dioscorides, where divergences between text and image, particularly in the form of additional information, spoke to the value and autonomy of visual knowledge. Fidelity to the text could also be regarded as belonging to a kind of "naturalism," or notion of what nature should look like. Other researchers have missed this point. Minta Collins, for example, goes so far as to say that in the codex any "attempts to show the natural growth [of a plant] have been sacrificed to pattern."[95] But even in that case pattern as repeatable order also conveys the regularity of natural growth. Decorative plant form may have informed viewers' expectations for and understanding of natural form generally, as naturalism is always relative to culture-specific conceptions of what nature looks like and should look like when depicted.

Subsidiary Figures

Figures in the Old Paris Dioscorides

The six subsidiary figures placed near illustrations of plants in the Old Paris Dioscorides have attracted the attention of scholars. The six figures occur on ff. 2r, 3v, 4v, 5r, 5v, and 7v (figs. 2.24, 2.28-32).[96] Although there are only six figures at the beginning of the codex, the Old Paris Dioscorides lacks the first book and most of the second. More figures may have once populated the now missing parts of the codex.[97] That most of the remaining figures contain gilding could hint at the reason for the codex's fragmentation: namely, the salvaging of gold.

The figures are without clear stylistic parallels in contemporary book illustration. The closest comparanda seem to be Syriac illustrations of the sixth and seventh centuries.[98] Both the Paris Dioscorides and the earlier Syriac illustrations render figures with thick, oblong limbs, and similar proportions. Both use thick, splotchy layers of color, with thick outlines for edges and interior details that frequently fail to coincide with colors. The figures are clearly painted in a manner different from the plant illustrations. Outlines in the plant illustrations tend to be of uniform thickness and coincide with the lower layers of pigment. Despite the absence of

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[93] Cp. Singer, "Herbal in Antiquity," 28-29. Singer compares the Old Paris Dioscorides *lonchitis* to the picture of *lonchitis hetera tracheia* (λογχίτης [sic] ἑτέρα τραχεία, perhaps a holly fern, *Aspidium lonchitis, MM* 3.145) from the Vienna Dioscorides (f. 213v). He labels the Old Paris Dioscorides picture as unidentifiable, while he incorrectly identifies that from the Vienna Dioscorides as *Serapias lingua*, an identification based on *lonchitis* and not *lonchitis hetera tracheia*.

[94] As Charles Singer noted, the Old Paris Dioscorides' mandrakes, the quintessential anthropomorphic roots of antiquity, are not strongly anthropomorphic (f. 103v). Singer, "Herbal in Antiquity," 28-29. The only other surviving example of zoomorphism in the Old Paris Dioscorides is the depiction of *tragos* (τράγος, spelt, f. 98r, *MM* 2.93). The goat head axillary growths apparently reflect the name of the plant, *tragos*, or he-goat. s.v. τράγος, *LSJ*, 1809.

[95] Collins, *Medieval Herbals*, 91.

[96] Although the figures were probably executed after the plant illustrations and are painted in an entirely different way, their inclusion in the codex seems to have been intended from the beginning. Sketches in faint red pigment clearly preceded the execution of both the illustrations of the plants as well as the figures. The illustrators clearly left space to the figures. They may have been executed later or by a different miniaturist, perhaps one skilled in gilding.

[97] Kurt Weitzmann, "The Greek Sources of Islamic Scientific Illustrations" in *Archaeologica Orientalia in Memoriam Ernst Herzfeld*, ed. G.C. Miles (Locust Valley, NY: [Augustin], 1952), 244-266, reprinted in Kurt Weitzmann, *Studies in Classical and Byzantine Manuscript Illumination*, ed. Herbert Kessler (Chicago: University of Chicago Press, 1971), no. II., here: 29.

[98] For example, Paris, Bibliothèque nationale de France, syr. 341.

adequate contemporary comparanda, we can suggest that the figures may be archaizing stylistically, echoing classicizing iconographical elements such as the figures' bare feet, fluttering drapery, and pastoral costume.

Kurt Weitzmann and John Riddle suggest that the figures in the Paris codex have a didactic function.[99] Alain Touwaide adds that they also have a decorative role.[100] The three authors cite the figure beside the now unidentified *myos ōta* plant (Μυὸς ὦτα, lit. "mouse-ear," fig. 2.29). Holding his hand to his face, the figure apparently refers to the root's purported ability to cure eye ulcers or lachrymal fistulas (αἰγίλωψ).[101] Yet Minta Collins considers this figure the exception to the rule: most figures, she argues, "add no information to the plant illustration."[102] Closer study of each of the figures, however, tends to support the earlier assessments of Weitzmann, Riddle, and Touwaide. The figures in the Paris codex carry out a variety of functions: Most point or draw attention to specific parts of the plants, some refer to drug properties, while others may indicate a region or season.

The figure accompanying the illustration of two varieties of *anagallis* (ἀναγαλλίς, pimpernel, *Anagallis arvensis* L. And *A. caerulea* L., *MM* 2.178, f. 2r, fig. 2.30) wears animal skins and stands to the left, pointing towards the female (or blue) flower, thereby echoing the text: "Some say that the one that has the dark-blue flowers stems prolapses of the anus… and that the red-flowered aggravates them."[103] The figure may also relate to the anonymous authorities that Dioscorides cites. More speculatively, the haloed figure reclining under *cheladonion mega* (χελιδόνιον μεγα, perhaps *Chelidonium majus* L., *MM* 2.180, f. 3v, fig. 2.24) and draped in a mantle could refer to the heat of the summer months. Dioscorides notes that the plant is called *chelidonion* because it grows when swallows (i.e., *chelidones* χελιδόνες) appear, that is, during the summer. The figure beside *othonna* (ὀθόννα, unidentified, *MM* 2.182, f. 4v, fig. 2.31) wears similar garments. As the text refers to troglodytes, we can suppose the clothes might indicate a person of that cultural group.[104] Verso the following folio, we find a figure with a fluttering mantle and a box-shaped hat pointing to the leaves of *tēlephion* (Τηλεφιον, i.e., τηλεφώνιον, *Andrachne telephoides* L., *MM* 2.186, f. 5v, fig. 2.28).[105] The text suggests that the leaves be used as a poultice for treating a skin condition called *leukē* (λεύκη).[106] The figure crawling towards the *gentianē* (γεντιανή, Gentian, *Gentiana lutea* L. or *G. purpurea*, *MM* 3.3, f. 7v, fig. 2.32) grasps its lower leaves, which are singled out in the description of the plant in the text.[107]

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[99] Weitzmann, "Greek Sources," 29; John Riddle, *Dioscorides on Pharmacy*, 198-203; Alain Touwaide, "Le Traité de matière médicale de Dioscoride en Italie depuis la fin de l'Empire romain jusqu'aux débuts de l'école de Salerne. Essai de synthèse," in *From Epidaurus to Salerno*, ed. A. Krug (Rixensart: PACT Belgium, 1992), 275-305.

[100] Touwaide, "Traité de matière médicale," 300.

[101] *MM* 2.183: ταύτης ἡ ῥίζα καταπλασθεῖσα αἰγιλώπια ἰᾶται; Weitzmann, "Greek Sources," 29-30; see also Riddle, "Dioscorides," 198-199, and Touwaide, "Traité," 291-292.

[102] Collins, *Medieval Herbals*, 85.

[103] Trans. Beck, 171. *MM* 2.178: φασὶ δ' ἔνιοι τὴν μὲν ἔχουσαν τὸ κυανοῦν ἄνθος προπτώσεις δακτυλίου στέλλειν, τὴν δὲ τὸ φοινικοῦν ἐρεθίζειν καταπλασθεῖσαν.

[104] *MM* 2.182: οἱ μέν φασι τοῦ μεγάλου χελιδονίου χυλὸν εἶναι, οἱ δὲ γλαυκίου, οἱ δὲ τῆς κερατίτιδος μήκωνος τῶν ἀνθῶν χυλόν, ἔνιοι δὲ μεῖγμα ἀναγαλλίδος τῆς κυανέας καὶ ὑοσκυάμου καὶ μήκωνος χυλῶν, οἱ δὲ βοτάνης Τρωγλοδυτικῆς τινος, ἥτις ὀθόννα καλεῖται, εἶναι χυλόν, γεννᾶσθαι δ' αὐτὴν καὶ ἐν τῇ κατ' Αἴγυπτον Ἀραβίᾳ.

[105] It is unclear why there are two illustrations under this one chapter.

[106] *MM* 2.186: θεραπεύει δὲ καταπλασσόμενα τὰ φύλλα ἐπὶ ὥρας ἓξ λεύκην·

[107] *MM* 3.3: γεντιανή· δοκεῖ μὲν ὑπὸ πρώτου εὑρῆσθαι Γέντιδος, τοῦ Ἰλλυριῶν βασιλέως, ἀφ' οὗ καὶ τὴν προσωνυμίαν ἔσχηκεν· ἧς φύλλα τὰ μὲν πρὸς τῇ ῥίζῃ καρύᾳ ἢ ἀρνογλώσσῳ ὅμοια, ὑπέρυθρα…

That some of the figures or their attributes resist easy explanation does not mean that they serve only a decorative function. Enough of them relate to the text to suggest that they were all intended to communicate information, perhaps related to a broader botanical tradition, no longer extant. Even if the figures do not convey specific information, because it has been forgotten, they still direct the attention of the codex's users to particular plants. An empirical study of how models impact visual attention in modern advertisements found that when such figures gaze at the product rather than the viewer, the viewer spends more time gazing not only at the product, but also at the brand area or logo and even the entire advertisement itself.[108] The authors Hutton and Nolte suggest that by drawing attention to the product, the model sparks the viewer's interest in the product.[109] While these findings reflect primarily on the casual perusal of advertisements, and late capitalist commodity fetishism as well as modern modes of representation (e.g., photography, print, electronic display, and advertising), they remain suggestive as to the impact of similar subsidiary figures on viewers' visual attention in ancient botanical illustrations.

The Illustration of Coral for the Carmen de viribus herbarum

Too little survives to know how subsidiary figuration first emerged in botanical illustration. The figures in the Old Paris Dioscorides are not the earliest surviving examples; rather the earliest one is the female figure beside the coral in the *Carmen de viribus herbarum* in the Vienna Dioscorides (f. 391v, fig. 2.33).[110] The codex's early date casts doubt on Weitzmann's suggestion, seconded by John Riddle, that such figures emerged after Iconoclasm.[111] The half-nude female figure dons a crown of crab claws, large pearl earrings, an armlet and bracelets. She rests a paddle on her shoulder, and leans back, setting her elbow against an obsequious dog-faced sea monster or *kētos* (κῆτος).[112] Her lower body is draped in a dark blue cloth, hemmed in red and gold, while various fish swim in the surrounding water. Her attributes suggest she is a Nereid or sea goddess, such as Amphitrite or, less likely, Thetis.[113] She was probably originally intended to be a generic divinity suggestive of the marine habitat in which coral can be found, perhaps as a personification of the sea (*Thalassa*, θάλασσα).[114] Beyond indicating the sea, she gazes towards

[108] S. B. Hutton and S. Nolte, "The Effect of Gaze Cues on Attention to Print Advertisements," *Applied Cognitive Psychology* 25 (2011): 887-892.

[109] Hutton and Nolte, "Effect of Gaze," 891.

[110] On the coral, see Hartmut Böhme, "Koralle und Pfau, Schrift und Bild im *Wiener Dioskurides*," in *Bild/Geschichte. Festschrift für Horst Bredekamp*, ed. Philine Helas, Maren Polte, Claudia Rückert, and Bettina Uppenkamp (Berlin: Akademie Verlag, 2007), 57-72.

[111] Cp. Weitzmann, "Greek Sources," 29-30; Riddle, *Dioscorides on Pharmacy*, 201.

[112] The dog-faced *kētos* is a generic iconographic type. Oppian mentions several different *kētea* in his *Halieutika*, one of which is a *kētos*. Oppian, *Halieutika,* 1.360-382.

[113] Collins suggests a possible identification with Thetis. Collins, *Medieval Herbals*, 97, n. 62. Contemporaries may not have agreed on her identification. For example, various Middle Byzantine sources identified a statue of sea goddess crowned with crabs in the Forum of Constantine in Constantinople as Thalassa, Thetis, or Amphitrite. Sarah Bassett, *Urban Image of Late Antique Constantinople* (Cambridge: Cambridge University Press, 2004), cat. no. 115, pp. 207-208. Arethas (10th c.) reports that the statue was of Thetis, though his contemporaries called it Thalassa, while Kedrenos (fl. 11th c.) calls the figure Amphitrite. See also R.J.H. Jenkins, "The Bronze Athena at Byzantium," *The Journal of Hellenic Studies* 67 (1947): 31-33. The confusion over the statue's identity may even date to the statue's installation in the forum. Sarah Bassett thinks the statue was originally Amphitrite, but was repurposed as Thetis in order to create a Judgment of Paris statuary group in the Forum. Bassett, *Urban Image*, cat. no. 115, pp. 207-208.

[114] Mazal, *Wiener Dioskurides*, 2: 47. Mazal favors an identification of the figure as Thalassa. A depiction of Thalassa appears in the Church of the Apostles in Madaba, see Henry Maguire, *Nectar and Illusion: Nature in Byzantine Art and Literature* (Oxford: Oxford University Press, 2012), 16.

the coral and points to it with an open right hand, presenting it to the viewer, and thereby reinforcing optical engagement with the picture of coral.

The Yerevan Fragment

A fragment of an illustrated Dioscorides of the "original" recension was also preserved as a flyleaf to an Armenian manuscript in Yerevan (Yerevan, Matenadaran, MS arm. 141, fig. 2.34).[115] The slanted ogival uncial hand dates the fragment to the ninth century. The text concerns *androsaimon* (ἀνδρόσαιμον, *MM* 3.156), *koris* (κόρις, *MM* 3.157), and *chamaipitys* (χαμαίπιτυς, *MM* 3.158). Only the illustration of *koris,* a kind of St John's wort (*Hypericum empetrifolium* Willd.), apparently survives.

The illustration of *koris* in the Yerevan Fragment represents a form of illustration different from what we see in the fragments and the other Dioscorides. It omits the plant's roots, making the plant appear as though it were a branch. There is little modeling, and the leaves are visible from only one side, and under a single, flattened aspect. With the exception of leaf shape and arrangement, the picture lacks differentiating detail, which might suggest that the plant was less familiar to the makers of the codex, or that the picture served only a limited role in acquainting the codex's users with the plant. This form of illustration may relate to late antique depictions of plants as boughs, as seen in the fourth-century vaults of Santa Costanza, Rome (fig. 2.35). If so, then monumental and decorative botanical imagery may have had an influence on herbal illustration, similar to the connection noted here between Roman wall painting and the Tebtunis Roll. Alternatively, this approach to illustrating the plant may have emerged over time as a means to conserve space in the development of the illustrated "original" recension of Dioscorides. As Minta Collins has observed, this approach to illustrating plants reappears in the Morgan Dioscorides in the late night and early tenth century (see ch. 4).[116]

Conclusions

Ancient botanical illustration varied tremendously from the second to the ninth centuries. The second-century Tebtunis roll demonstrates methods of depiction that align with contemporary wall painting: aerial perspective and an "impressionistic" approach emphasize proximate surfaces, and omit connective details such as petioles. Such depictions indicate the disposition of leaves, growth habit, and the overall *Gestalt* of the plant, but they require the viewer to imagine what the plant should look like. The illustrations would have best served as memory aids or as a means of narrowing reference within a relatively restricted range of possible identifications.The fragments of the fifth-century Antinoopolis codex show greater attention to details and the articulation of plant parts. The plants adopt multiple, contrasting approaches: a flattening of leaves with heavy outlines, combined with more careful or suggestive modeling of specific details. The benefit of this approach is that it gives a fuller and more documentary impression of the plants depicted. But compared to the illustrations in the Tebtunis roll, those in the Antinoopolis codex appear more flattened, having dispensed with aerial perspective. Both the

[115] Riddle, *Dioscorides on Pharmacy*, 193. Yerevan, Matenadaran, MS arm. 141. F.C. Conybeare took photographs and copies in 1888 and donated them to the Bodleian Library in 1892. It can now be found in Oxford, Bodleian Library, MS gr. class. E. 19. See Collins, *Medieval Herbals*, 112, n. 322. See also, Alain Touwaide, *A Census of Greek Medical Manuscripts: From Byzantium to the Renaissance* (London: Routledge, 2016), no. 0803, also Falconer Madan and Herbert Henry Edmund Craster, *A Summary Catalogue of Western Manuscripts in the Bodleian Library at Oxford with References to the Oriental Manuscripts and Papyri,* Volume 6*: Accessions, 1890-1915, Nos. 31001-37299* (Oxford: Clarendon Press, 1924), 62, no. 31528.

[116] Minta Collins, *Medieval Herbals*, 112, n. 322.

Antinoopolis codex and the Tebtunis roll share several features, including a blank background and the illustration of the plant as a single individual with both roots and shoots visible. They both also introduce a tension between a flattened and articulated aspect of the pictures, and the suggestion of depth as a way to indicate growth habit. Emphasis on the clarity of plant parts tends to result in a flattened visual aspect. The fifth- or sixth-century Sinai Fragment, although palimpsested, appears to conform to this pattern: an individual plant, full articulated, somewhat rigid and seemingly flattened, showing roots and shoots, and accompanied by minimal text attending mainly to the medicinal properties of the plant.

In time, Dioscorides' *De materia medica* was also illustrated. The text was shortened and alphabetically arranged, and illustrations were compiled and added from other sources. The compilers of the illustrations apparently matched pictures from these other texts to the chapters in Dioscorides, sometimes using synonyms when names differed. Because these pictures ultimately come from other textual sources, they often contain information absent in Dioscorides, but related to a broader tradition. Through the complex transmission of text and images, pictures emerge as complex accretions of visual information based on multiple sources. Each plant picture has its own history.

The illustrations in the Alphabetical Dioscorides portray multiple properties of plants. As in the Antinoopolis codex and Sinai Fragment, the illustrations tend towards an articulated and flattened spatial aspect, though with greater attention to modeling as well as to the curvature of leaves and branches. For example, leaves often appear foreshortened and twist and turn so as to expose their undersides. Nevertheless, they often rotated towards the viewer, clearly indicating leaf shape and margin. The illustrations in the Alphabetical Dioscorides are notably more elaborate in the quantity and quality of details when compared to the earlier surviving examples. Other properties of the plants influenced their composition, including the plant's name or synonyms, its habitat, and its purported medicinal properties. Perhaps reflecting Pliny's concerns about the ability of a picture to show how a plant varies over the course of the year, many of the pictures in the Alphabetical Dioscorides show different plant parts as they change over the course of the year. Such concerns may have also motivated the opposite approach—the elimination of variable morphological features, in order to portray the most permanent features, or to conform better to expectations about the nature of medicinal plants.

While the Alphabetical Dioscorides may have been the result of an attempt to adapt Dioscorides into an alphabetically arranged *rhizotomikon*, the original version of the text, arranged according to drug action, was also illustrated by the eighth century. Many of the illustrations in the Old Paris Dioscorides belong to the same tradition of botanical illustration as the Alphabetical Dioscorides, with many of the same conventions: a "complete" individual plant, fully articulated in its parts, ideally at multiple stages of development, and from multiple angles of view. Some pictures were apparently adapted to better fit the text. Some were even based entirely on the text. In contrast to the pictures in the Alphabetical Dioscorides, the pictures in the Old Paris Dioscorides demonstrate minimal modeling and are presented under an entirely flattened aspect. The Old Paris Dioscorides also includes more direct pictorial reference to the extraction or harvesting of medicines. A second divergence from the Alphabetical Dioscorides, the Old Paris Dioscorides also includes subsidiary figures that direct the viewer's attention and point out aspects of the plant such as medicinal usages, or habitat. In doing so, such figures participate in how the picture shows. While such figures are absent from the Alphabetical Dioscorides, they probably go back to earlier illustrated herbals, as is suggested by the inclusion

of the figure of *Thalassa* in the illustration of coral for the *Carmen de viribus herbarum* in the Vienna Dioscorides.

Finally, the Yerevan Fragment demonstrates a completely different approach to plant illustration from those in the Alphabetical Dioscorides, the Old Paris Dioscorides, and the non-Dioscoridean papyrus and parchment fragments. The Yerevan Fragment does not depict the roots of the plant at all. This cursory "branch" method of illustration, nevertheless, finds comparanda in other late antique depictions of plants such as the vaults of Santa Costanza. It is unclear if this "branch" method emerged due to crossover from monumental or decorative art, or if it emerged independently within the tradition of herbal illustration.

The extent to which ancient botanical illustration could be regarded as autonomous, both with respect to the text as well as the larger visual culture remains a complex issue. Picture and text were interconnected in complex ways and tended to grow closer together over time. Nevertheless, at the beginning of the tradition pictures were supposed to perform a depictive denotative function independently of the text. The text did not have descriptions, nor did it communicate the aspectivity or spatial interrelations among the different characters of the plant. Over time pictures were adapted or created *ex novo* in order to match the text. But as many of the pictures came from still other sources, and were created by different makers, they often communicate information not present in the text.

The question of the autonomy of botanical illustration in relation to other systems of representation is similarly complex. This chapter shows the tradition developed and generally adhered to a set of conventions for illustrating plants independent of broader trends, such as the representation of roots and shoots, a tendency towards a flattened spatial aspect, an attention to morphology, multiple angles of view, and the variation of plant parts over time. Still, botanical illustrations often adapt strategies from other genres such as the aerial perspective in the Tebtunis roll and the "branch" style of the Yerevan Fragment. Notably the Alphabetical Dioscorides and the illustrations of the Old Paris Dioscorides demonstrate fewer depictive strategies from other contemporaneous genres, and more strategies related specifically to the development of the botanical tradition itself, largely independent of other pictorial traditions, and beholden to its own conventions.

Chapter Three
Production and Layout

This chapter addresses how the priorities of visual knowledge were expressed through and impacted by the production and layout of illustrated herbals. It examines how herbals were produced and illustrated, and focuses on how the system of production impacted their layout. In doing so, this chapter considers the mechanisms underlying the material transfer of visual knowledge. This chapter represents the first attempt to compare broader production practices among the surviving material evidence for ancient botanical illustration. While many studies have already attended to evidence of production for individual volumes, none have considered broader production patterns that might apply to and thereby define these volumes as belonging to a class or genre with shared conventions.[1] Here I identify these larger production patterns, their impact on the layout or *mise en page* of the folios, and finally how those production patterns and layouts influence and were motivated by the concerns and priorities of the illustrated herbal as an idiosyncratic kind of work. I show in particular that in ancient illustrated herbals, illustration tended to precede the copying of the text and thereby privileged the transfer of visual knowledge over that of verbal information.

When confronted with an ancient or medieval illustrated book, most scholars usually assume that a scribe—working alone or in groups, and likely in consultation with the book's patron or recipient—copied the text leaving behind empty spaces for an illustrator to fill in later.[2] As a result of this arrangement of the production system, the physical parameters of the text column predetermined the size and format of the accompanying illustrations.[3] Yet production sequence not only impacted the format and physical relationship between picture and text, but also had consequences on the design of the entire production system. Typically the commissioner of a book hired a scribe, who, in turn, copied the text and then either returned it to the commissioner or sent it to other individuals tasked with punctuation (i.e., accentuation, described by the verb *stizein*) or illustration (i.e., ornamentation, *eis kosmēsin*).[4] By the fourth and fifth centuries in Egypt but likely elsewhere, commissioners and monastic scribes controlled the system of book production. Illustrators, gilders, and punctuators were contracted largely on an *ad hoc* basis to perform smaller tasks, and had, as a result, less responsibility for the realization of the final product.

The material, textual, and iconographic evidence surveyed in this chapter, however, indicates that there were other ways to illustrate a book. Up until the sixth century, almost all the available evidence of production sequence suggests that herbal illustrations were executed first and then followed by the inscription of titles, the copying of text, and any punctuation,

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[1] Principle studies that mention the production sequence for individual surviving examples of ancient herbal illustration, see Collins, *Medieval Herbals*, esp. 38, 51; Hanson, "Text and Context," 585-604; Leslie Brubaker, "The Vienna Dioskorides, and Anicia Juliana" in *Byzantine Garden Culture*, ed. Antony Robert Littlewood, Henry Maguire, and Joachim Wolschke-Bulmahn (Washington, DC: Dumbarton Oaks, 2002), 189-214, esp. 191; and David Leith, "Antinoopolis Illustrated Herbal," 141-156.

[2] Jonathon J.G. Alexander, *Medieval Illuminators and Their Methods of Work* (New Haven, Conn.: Yale University Press, 1992), 40. See Chrysi Kotsifou, "Books and Book Production in the Monastic Communities of Byzantine Egypt," in *The Early Christian Book*, ed. by William E. Klingshirn and Linda Safran (Washington, D.C.: Catholic University of America Press, 2007), 48-66.

[3] See also Weitzmann, *Illustrations in Roll and Codex: A Study of the Origin and Method of Text Illustration* (Princeton: Princeton University Press, 1947), 52-53.

[4] Kotsifou, "Books and Book Production," 48-66.

accentuation, or rubrication.[5] Only over the course of the sixth and seventh centuries can we observe a shift towards a text-first system of production. Even after this shift, illustrated herbals continue to bear the vestiges of the picture-first sequence of production, especially in the formatting of text and the physical relation between text and pictures. This chapter considers how production sequence—evident in formatting and superimpositions of text and picture—sheds light on the relationships between different stages of production. It further assesses the consequences of these production methods on costs, the design of the production system, and the intended use of the earliest illustrated herbals.

Evidence of the production sequence is presented here in chronological order. The chapter begins with the earliest record of herbal illustration in Pliny the Elder's *Natural History*, and goes on to consider ancient and late antique papyrus fragments of illustrated herbals from the second and fifth centuries followed by parchment codices up through the eighth century, when minuscule bookhands largely replaced uncial ones. While the focus of this chapter is Greek illustrated herbals, it makes additional comparison to the sixth-century illustrated Latin *Herbarius* of ps.-Apuleius Platonicus in Leiden (Rijksuniversiteit, MS Voss. lat. Q. 9).

The Picture-First Method

The earliest surviving material evidence for botanical illustration in ancient herbals on papyrus comes down to us in two groups of papyrus fragments now associated with two volumes: the Tebtunis roll dated to the second century CE, and the Antinoopolis codex dated to the fifth century.[6] Additional textual evidence for the illustration of herbals appears in Pliny the Elder's *Natural History*. As Minta Collins has already noted, Pliny's text could be read as describing the sequence of production and illustration.[7] The pictures were executed first *and then* (*atque ita*) the text was added to them, written down or *under* them (*subscripsere*).[8] Moreover, Pliny's statement that the plants' effects (*effectus*), i.e., their properties, were recorded might also suggest abridgment of the text. While this form of textual abbreviation or reduction does occur in later illustrated herbals, the fact, nevertheless, remains that Pliny does not mention it explicitly in his *Natural History*.

The fragments of the Tebtunis roll corroborate the production sequence that Pliny alludes to in his *Natural History*.[9] Fragments of the roll now at the Tebtunis Center at the University of California, Berkeley (II 679 a, e, f), provide clear evidence that the execution of the illustrations preceded the copying of the text. The papyrologist Ann Ellis Hanson has observed that the ink of

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[5] While the picture-first mode of production prevailed in the production of early illustrated herbals, it also appears in other illustrated books, such as the Vienna Genesis (Vienna, Nationalbibliothek, cod. theol. gr. 31), dated to the sixth century and likely copied in Constantinople. See Emmy Wellesz, *The Vienna Genesis* (London: Faber and Faber, 1960), 6.

[6] The Tebtunis roll P. includes Berkeley, Tebtunis Center, P.Tebt. II 679 frags. a-f, see Johnson, "A botanical papyrus with illustrations," *Archiv für die Geschichte der Naturwissenschaften und der Technik*, v. 4 (1912-1913): 403-408. Three additional fragments in the Papyrology Rooms of the Sackler Library, Oxford, were edited and published by Wiliam John Tait in 1977 (P.Tebt. Tait 39-41). W. J. Tait, *Papyri from Tebtunis in Egyptian and in Greek* (London: Egyptian Exploration Society, 1977), pp. 94-96. The Antinoopolis codex consists of the so-called Johnson Papyrus, now in the Wellcome Collection in London (MS 5753), and P.Antin. 3. 214 frags. a, c, d, and e, in the Department of Greek and Latin at University College, London

[7] Collins, *Medieval Herbals*, 37.

[8] *Subscripsere* can mean to "write underneath or below" as well as to "write or note down," see Lewis and Short, s.v. *subscribo*.

[9] Fausti, "Erbari illustrati," 131-150.

the letters at times overlaps the colors of the picture.[10] At the same time, the text appears cramped, as though it were "forced to accommodate the picture" – by being squeezed into the space allotted it by the illustrator.[11] For example, the spaces between lines of text, i.e., the interlinear spaces, narrow towards the bottom of fragment a, suggesting that the scribe ran out of room as he copied the text. In fragment f (fig. 2.3) the letters appear especially cramped perhaps because the darker colors of the root would have made any writing over it practically illegible. Letters overlap roots in yet another fragment of the same roll now in Oxford, P. Tebt. Tait 39, frag. 3.[12]

It is more difficult to tell the sequence of illustration from the fragments of the Antinoopolis codex (fig. 2.5-6). The format—a picture of a plant with text written under it—follows the same pattern described by Pliny and that was evident in the Tebtunis Roll. A trace amount of color on the edge of Side B could suggest that each page had multiple entries next to each other, perhaps two or three for each side of the folio, though the evident width of the margins, as indicated by side B, tends to counter this conclusion.[13] When compared to the Tebtunis fragments, there is much less crowding and no evidence of text overlapping the picture. David Leith has suggested that the text accompanying the pictures has been abridged.[14] Such shortening of the text may have helped to resolve problems such as the crowding that occurred in the Tebtunis fragments. Leith has also pointed out that the Antinoopolis codex appears to have required a special double ply papyrus to support the addition of illustrations, which is suggestive of the codex requiring more resources and a specialized production system.

The sequence of production in the earliest surviving parchment example of botanical illustration, the fifth- or sixth-century Sinai fragment (St. Catherine's in the Sinai, Arabic "New Finds" NF 8, ff. 16v-17r) also appears to have followed the picture-first mode of illustration (fig. 2.7), although it is difficult to tell due to the fact that it is palimpsested.[15] The layout suggests that the plant illustration existed prior to the copying of the text. In order for the scribe to know to put the text in the lower left corner of the folio, he or she would have had to have either known how much space the plant picture would take up, or simply worked around an illustration that had already been created. The former possibility might also indicate that the scribe and illustrator imitated a layout from a codex that followed the picture-first sequence of production. Again the layout of the Sinai fragment appears to correspond to Pliny's comments on the sequence and layout of the illustrated herbals that he saw: title, picture, properties.

The plant illustrations in the *herbarium* (ff. 2v-387) of the famous Vienna Dioscorides codex (Vienna, Österreichische Nationalbibliothek, cod. med. gr. 1), likely produced in Constantinople at the beginning of the sixth century, were also likely executed with the picture-

[10] Hanson, "Text and Context," 588.
[11] Ibid.
[12] See cat. no. 39 in W.J. Tait, *Papyri from Tebtunis in Egyptian and in Greek* (London: Egyptian Exploration Society, 1977), 94-96; see also, Hanson, "Text and Context," 588.
[13] This formatting also appears in the Naples Dioscorides.
[14] Leith, "Antinoopolis Codex," 152. Cp. Weitzmann, "Ancient Book Illumination," 12: "One of the pictures, representing the plant *symphyton* is richly shaded colors of violet, is of an impressive size, but leaves at the same time sufficient space for explanatory text underneath… Obviously in this and many other cases, the change from roll to codex did not affect the system of illustration."
[15] On this manuscript, see Kachouh, "Sinai Ar. N.F. Parchment 8," 28-57. Kachouh dates the Arabic manuscript to the second half of the eighth century. The Sinai Palimpsests Project website dates it to the second half of the ninth century. See https://sinai.library.ucla.edu/

first method of illustration.[16] As in the Johnson fragment, the makers left space throughout the codex not only for the text, but also quotations from Galen or Crateuas, and additional inset pictures.[17] Despite the spacious layout, a few folios provide evidence that illustration preceded copying of the text. On f. 152v, for example, we find a list of synonyms for a kind of "narrow-leafed" fleabane, *konyza leptophyllos* (κόνυζα λεπτόφυλλος, likely yellow or sticky fleabane, *Dittrichia viscosa* (L.) Greuter) crammed into the spaces around the roots of the plant (fig. 3.1). The list of synonyms marks the beginning of the entry for each plant and belongs to the body of the text itself and not to the title.[18] And again, on f. 134v, *thymelaia* (θυμελαία, perhaps spurge flax, also called flax-leaved daphne, *Daphne gnidium* L., *MM* 4.172) sits inside the text column, while the surrounding words make awkward accommodations such as the small, cramped letters wedged between the plant's branches (fig. 3.2).

A miniature from the frontispiece cycle in the same codex also seems to provide evidence of a picture-first production sequence (f. 6v, fig. 6.7). With the exception of the first folio, which contains a miniature of a peacock and which seems to be a later addition, the rest of the frontispiece cycle was likely conceived as a unified program that forms a narrative on the emergence of both the knowledge contained in the codex, as well as the material production of the book itself and its presentation as a gift to Anicia Juliana (see ch. 6). On folio 6v, we find an author portrait showing Dioscorides at work. A personification of *Epinoia*—thought, invention, design, afterthought, retrospection, or the power of thought—stands in a niche, holding a mandrake. A painter diligently copies the mandrake plant onto a sheet on an easel. At the same time, Dioscorides is completely absorbed in writing. His posture and attitude belong to a conventionalized type of author portrait, typically meant to show the writer in the act of composition. At first glance, the miniature seems to draw a clear distinction between depiction by the nameless painter and Dioscorides' textual production.

On closer inspection, though, we find that Dioscorides is in fact writing into a book that is already illustrated (fig. 3.3). The miniature could then demonstrate a contemporary awareness of how herbals were, or should have been illustrated. The miniature depicts the painter as being involved in and preceding Dioscorides' textual production.[19] That the frontispiece shows herbal illustration as part of Dioscorides' authorial practice, regardless if it was in actuality, demonstrates that at least some people in the sixth century imagined plant pictures playing an essential role in scientific texts. Moreover, that this point of view even existed tends to undercut the widespread opinion in current scholarship that pictures of plants played little to no role in contemporary scientific discourse and practice.[20]

Another illustrated herbal, likely produced in Italy and a copy of Dioscorides in Greek from the late sixth or early seventh century (Naples, Biblioteca Nazionale, cod. gr. 1), evidences a picture-first method of illustration. Unlike the Vienna codex, with its spacious formatting, the Naples codex places all pictures above the corresponding text columns, with rubricated titles

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[16] On the dating of the codex, see Müller, "Ein vermeintlich fester Anker," 103-109. Leslie Brubaker has also noted that the pictures were likely copied before the text. See Brubaker, "The Vienna Dioskorides," 191.
[17] See, for example, ff. 26r, 124v, 284v, 290r.
[18] While the regularity of the writing in the codex has made the identification of individual hands difficult [see, Hans Gerstinger, *Dioscurides. Codex Vindobonensis Med. Gr. 1, Der Österreichischen Nationalbibliothek.* Kommentarband zu der Faksimileausgabe (Graz: Akademische Druck-u. Verlagsanstalt, 1970), 6], the synonyms here seem to be written in the same ink and uncials as the passage on the following folio. Ff. 153v, 194v, and 201v provide similar evidence of the text having been executed after the painting of the pictures.
[19] Cp. Collins, *Medieval Herbals*, 37.
[20] Cp. Givens, *Observation and Image-Making*, 87, and 144-145.

standing between the picture and the text. In this way, the Naples Dioscorides generally follows the formatting observed in the earlier papyrus fragments. The pictures in the Naples Dioscorides were adapted to fit a space allotted them in the top half of the folio.[21] We can still see, however, that the manuscript followed a picture-first sequence of production, or at least copied a source that did, due to notable irregularities in the formatting of the columns: The text columns are not of uniform width (e.g., ff. 17r, 21r), nor are the widths of the intercolumnar spaces uniform or consistent throughout the entire manuscript (e.g., compare ff. 10r, 16r, 17r). The text from one column often spills into other columns (e.g., ff. 13r, 14r, 22r) or onto the verso of the folio (e.g., f. 35v, 39v). Nor are the titles aligned with the text column consistently across the manuscript (e.g., f. 16r). The titles even occasionally display the crowded letters (e.g., ff. 21r, 52r) seen in the Vienna Dioscorides and the Tebtunis fragments. Many of these formatting anomalies appear, for example, in the illustrations of *lykoskordon* (λυκόσκορδον), *leukakantha* (λευκάκανθα), *lychnis stepfanōmatikē* (λυχνίς στεφανωματική), and *lychnis agria* (λυχνὶς ἀγρία) on f. 112r (fig. 3.4): variable intercolumnar spacing, irregular column shape, cramped and crowded titles, and inconsistent alignment of title, picture, and text. That each column and title shifts down and to the left gives the impression of a particular sequence of production: first the illustrations, then, proceeding from left to right, the titles, and then the text.[22]

The Rise of Text-First Illustration

While the herbarium section of the Vienna codex seems to have followed the picture-first sequence of production, a series of texts on birds and venomous animals in the last fourth of the codex appear to follow the text-first paradigm of production (ff. 393r-485v).[23] This method is suggested by the spacing of the text column and by the blanks, which a scribe apparently set aside in order to receive illustrations, some of which were never added (fig. 3.5).[24] The scribe simply left blank spaces spanning the entire width of the column. Parts of this later section of the book simply have large, rubricated titles apparently substituting for the illustrations in the spaces that the scribes had left blank.[25] This approach contrasts with the minor botanical illustrations included at the beginning of the Nicander paraphrases (ff. 393r-398v), which appear to have been based in large part on the illustrations of plants in the *herbarium* section of the same manuscript. The coincidence of two different methods of illustration in the same codex may be due to its having being assembled in two different stages, with the picture-first herbarium probably preceding the text-first toxicological and ornithological treatises (see ch. 6).

The two different production sequences evident in the Vienna Dioscorides correspond with other sixth- and seventh-century illustrated herbals, which were executed in either way. A

[21] For example, Collins compares the illustration of *batos* on f. 32r of the Naples codex, with that the Vienna codex on f. 83r. See Collins, *Medieval Herbals*, 55-56; on the adaptation of miniatures, see Weitzmann, *Illustrations in Roll*, 83-84.

[22] Execution of the titles after illustration but before copying of the text body could have helped to prevent copying of the wrong text under a given picture. On confusion of pictures and titles, see S.S. Renner, J. Scarborough, H. Schaefer, H.S. Paris and J. Janick, "Dioscorides's *bruonia melaina* is *Bryonia alba*, not *Tamus communis*, and an illustration labeled *bruonia melaina* in the *Codex Vindobonensis* is *Humulus lupulus* not *Bryonia dioica*," *Cucurbitaceae 2008, Proceedings of the IXth EUCARPIA meeting on genetics and breeding of Cucurbitaceae*, *INRA, Avignon (France), May 21-24th*, ed. by M. Pitrat, (Avignon: INRA, 2008), 273-280.

[23] These texts include paraphrases of Nicander's Theriaca and Alexipharmaca (ff. 393r-437v and ff. 438v-459v), a paraphrase of Oppian' Halieutika (ff. 460r-473r), and the paraphrase of Dionysius of Philadelphia's Ornithiaka (ff. 474r-485v).

[24] See, for example, ff. 396r, 412r, 413r, 414v, 456r, 456v, 457v, 458v, 477r, 480r, 481r.

[25] E.g., throughout ff. 424r-430v, 432-438v.

manuscript now in Leiden (Rijksuniversiteit, MS Voss. lat. Q. 9) containing the Latin *Herbarius* of ps.-Apuleius Platonicus, likely copied in Southern Italy in the second half of the sixth century, is the earliest surviving illustrated herbal that clearly breaks in its entirety with the picture-first paradigm of illustration. While the plants depicted often penetrate into the fields of text, they always evade the text by running alongside or just between words. For example, the roots of *nymfea* (a water-lily, perhaps *Nuphar lutea* Sibth. & Sm., or *Nymphaea alba* L.) on f. 60v drape over words below the picture (fig. 3.6), while the root of *verbascum* (likely mullein, *Verbascum spp.*) on f. 63r dodges them. These interactions between picture and text suggest that the codex was illustrated according to a text-first mode of production. Yet, in doing so, the text-first codex retains the same spatial flirtations between word and picture that first emerged in the earlier picture-first illustrated herbals. The text-first codex thereby maintains the same kinds of word-image relationships that first appeared in picture-first codices.

Between the end of the seventh century and the thirteenth century, all surviving illustrated herbals from Byzantium as well as the Latin West appear to follow the text-first sequence of production. The Old Paris Dioscorides (Paris, Bibliothèque nationale de France, cod. gr. 2179), dated to the end of the eighth century and of Egyptian or Palestinian provenance, clearly follows the text-first mode of illustration.[26] The text does not appear to be abbreviated substantially and scholars have noted that the text is generally of a higher quality than the other herbals discussed here.[27] The roughly 400 miniatures in the fragmentary codex appear either within the right side of the text column or occasionally in the margins, sometimes rotated horizontally so as to fit in the limited space allotted them (see, for example, f. 98r, fig. 3.7).[28] The scribe tended to leave behind blanks for illustration by indentation so that the illustrations only span part of the text column. Kurt Weitzmann has considered this approach a holdover of a system of illustration that originated in papyrus rolls.[29] There is no evidence, however, to suggest that illustrated herbals on papyrus or rolls ever adopted this method at an early date, even if evidence for it is to be found in other genres. The surviving fragments of the Tebtunis roll and Antinoopolis codex both conform to the layout and system of illustration indicated by Pliny: a picture with text below it. We simply cannot say if the source text for the Old Paris Dioscorides was a roll or a codex.[30]

The illustration of the plants in the Old Paris Dioscorides seems to have followed not only the copying of the text, but also the rubrication and glossing of it.[31] Rough sketches traced in a pale red ink preceded the execution of the plant illustrations. Collins deduces that because the scribe often did not leave adequate space for illustrations, the exemplar must have had different illustrations or blank spaces for illustrations, but not the same illustrations.[32] But the available evidence cannot substantiate such conclusions. The front of the codex is now missing, and all we have now is the last part of the text. It seems just as likely that the scribe simply miscalculated how much parchment was needed, and was forced to economize as he or she reached completion of the project. Such a situation would also explain why figures were not

[26] Cavallo, "Funzione e strutture," 96-102.
[27] Marie Cronier, for example, notes, "The work is treated here as a classic text … to be preserved as meticulously as possible." Cronier, "Manuscript Tradition," 140.
[28] See, for example, ff. 28r, 33r and 33v.
[29] Weitzmann, *Illustrations in Roll*, 71-72. See also Riddle, *Dioscorides on Pharmacy*, 193.
[30] Cp. Collins, *Medieval Herbals*, 88.
[31] See Ibid., 85, and 113, n. 333.
[32] Ibid., 88-89.

included for most of the rest of the text. If the exemplar was much larger or if parchment was limited, we can easily imagine that the scribe was forced to make awkward accommodations.

The fragment of an illustrated Dioscorides in Yerevan was also created using the text-first mode of illustration (see fig. 2.35, Yerevan, Matenadaran, MS arm. 141, photographs also at Oxford, Bodleian Library, MS gr. class. E.19). The approach used here was essentially the same as that followed for the illustration of the texts on birds and venomous animals in the last fourth of the Vienna Dioscorides. The scribe simply left blanks within the text column, spanning the whole width of it. The illustrators could have executed pictures from a variety of different manuscript sources, some of which were not available at the time the text was copied. Such an approach might also suggest that the text was based on a codex with fewer illustrations, or none at all. The fact that the Yerevan fragment has text related to three chapters, but only one illustration, is also suggestive of its following a source manuscript with fewer illustrations.

Why did the text-first system of herbal illustration eventually rise to prominence? The shift of book production to monasteries during the fourth and fifth centuries would have altered profoundly the design of the book production system. Chrysi Kotsifou has shown that in Egypt by this time monastics were involved in all stages of book production.[33] The large public and private libraries, pagan schools, temples, and book dealers that had previously dominated the production, trade, storage, and dissemination of books had by then largely disappeared from the material record.[34] In surviving documentation of book production from late antique Egypt—including personal letters, lists of books, church inventories, and accounts of monastic collections—Kotsifou found "no reference to pagan or even secular works whatsoever after the fourth century."[35] While such works were still produced and read, they may have taken a back seat to the copying of religious texts. Given that the faithful transmission of texts was a central priority for most books, especially religious texts, it is not hard to see why the text-first mode of illustration eventually replaced other systems of illustration. It would seem that as monastic scribes and scriptoria streamlined book production in order to privilege textual transmission, special accommodations for particular genres and for pictorial transmission were less likely to be carried out. The copying and binding of texts often formed an important part of monastic craft industry.[36]

It, nevertheless, remains difficult to determine when the production of secular works eventually shifted to monasteries. Large urban centers such as Constantinople and Alexandria may have maintained libraries, scriptoria, and ateliers such as those of the classical world for much longer than other parts of the empire. Nor does it follow that monastic scribes were only capable of illustrating their work according to the text-first sequence of illustration. It is possible that some monasteries and monastic scribes may have specialized in the copying of particular genres and technical treatises.

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[33] Kotsifou, "Books and Book Production," 50.

[34] On Roman libraries, see George W. Houston, *Inside Roman Libraries: Book Collections and Their Management in Antiquity* (Chapel Hill, N.C.: University of North Carolina Press, 2014); for a discussion of librarian slaves, including copyists (*librarii*), see idem, "The Slave and Freedman Personnel of Public Libraries in Ancient Rome," *Transactions of the American Philological Association* 132, no. 1-2 (2002): 139-176.

[35] Kotsifou, "Books and Book Production," 52.

[36] For example, it appears to have been important to the monasteries in the region of Thebes. See Anne Boud'hors "Copie et circulation des livres dans la region thebaine (vii^{e}-viii^{e} siècles)," in *Et maintenant ce ne sont plus que des villages,..'. Thebes et sa région aux époques hellénistique, romaine et byzantine* (Brussels: Association égyptologique Reine Elisabeth, 2008), 149-161.

The Persistence of the Picture-First Mode of Illustration

The picture-first method of illustration continues to appear during and after the sixth century in large deluxe codices dominated by illustrations and made especially to order in Constantinople. Some scholars suspect, for example, that the Vienna Genesis (Vienna, Österreichische Nationalbibliothek, cod. theol. gr. 31), dated to the sixth century and likely copied in Constantinople, was produced and illustrated according to the picture-first mode of illustration. The text of the Vienna Genesis is sometimes abridged and appears cramped and squeezed.[37] In the Middle Byzantine period, we encounter the picture-first mode of illustration again in the famous Menologion of Basil II (Vatican, Biblioteca Apostolica Vaticana, gr. 1613).[38] In this manuscript, despite some notable exceptions, we generally find the production pattern of "one artist-one sheet," that is, the painters were each responsible for illustrating the recto and verso of a single bifolio leaf.[39] Curiously, the quires of this manuscript are fairly irregular—a feature that it shares with the Vienna Dioscorides.[40] It is tempting to link the irregular quire structure of both manuscripts to the picture-first mode of illustration. The Vienna Genesis and the Menologion of Basil II both indicate that the picture-first mode of illustration could be followed for manuscripts other than illustrated herbals, and that this mode of production survived the rise of the text-first mode of illustration. Both manuscripts were produced in Constantinople, so it is unclear how widespread or common the practice was outside that city especially if it was generally limited to large, deluxe volumes commissioned by the imperial family. Over the course of the thirteenth century, we again find the picture-first mode of illustration being used for producing illustrated botanical manuscripts (see ch. 6). This emphasis on copying pictures culminates in the production of botanical atlases or "picture books," entirely devoid of text (see ch. 5).

Layout Typologies in the Illustrated Herbal

This overview of production sequence in the illustration of ancient herbals has also hit upon its major forms of *mise en page* or layout. I refer here simply to the way in which an illustration is physically related to its associated text, and not to the layout of the text column itself, e.g., the number of lines, the number of columns per page. Although limited, the earliest surviving evidence—Pliny's comments, as well as the fragments of the Tebtunis roll and Antinoopolis codex—tends to point to a system of illustration in which the picture appeared above the accompanying text. This same approach to layout appears in the Naples Dioscorides. While it is the predominant layout evident in the earliest surviving examples of illustrated herbals, to label it a "papyrus" system in anyway would only introduce confusion with Weitzmann's "papyrus style" or Riddle's "papyrus tradition."[41] It would be useful to dispose of such terminology altogether, since such systems are continued in parchment and codices, and as the terms make unnecessary claims as to the systems' origins and etiology. So for the sake of simplicity and to avoid confusion, we might call this particular approach to *mise en page* the subscription illustration, in direct reference to its actual appearance and to the verb Pliny used to describe the copying of text in this system (*atque ita subscripsere effectus*).

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[37] See Wellesz, *Vienna Genesis*, 6.
[38] See Ihor Ševčenko, "The Illuminators of the Menologion of Basil II," *Dumbarton Oaks Papers* 16 (1962): 245-276. here: 245.
[39] Ibid., 265-270.
[40] Ibid., 271.
[41] Weitzmann, *Illustrations in Roll*, 71-72; Riddle, *Dioscorides*, 193.

A second system of illustration is to put the text and illustration on separate folios, ideally on facing pages. I refer to this system of illustration as full-page illustration. Sometimes two or three distinct illustrations might be included, for example in the illustration of two kinds of *konyza* (fig. 3.1, see above), but because the space of illustration takes up the full page, I still regard it as a full-page illustration. The Sinai fragment appears to be intermediate between the full-page illustrations of the Vienna Dioscorides and subscribed illustrations of the papyri fragments and the Naples Dioscorides. We can see how, as a result, the layout of the Vienna Dioscorides might have emerged from the earlier method of subscription. The approach to layout evident in the Sinai Fragment is similar to the illustration of the two *konyza* in the Vienna Dioscorides. Here we see the text subscribed in the lower left corner, just beside the plant. These examples indicate there is some overlap between these systems of layout.

The Vienna Dioscorides also demonstrates another form of illustration in which a smaller picture of a plant is inset into a larger section or embedded in the text column.[42] This inset approach to the layout of the folio sometimes occurs when accompanying quotations were added, such as those by Galen and Crateuas. (Not all of the quotations, however, appear with smaller, inset illustrations.[43]) Even in these cases where the illustration appears as if it were a kind of afterthought, the inserted text was nevertheless copied after the illustration.[44] The luxurious formatting of the Vienna Dioscorides may have in fact been intended to accommodate such pictorial and textual additions. Nigel Wilson has in fact recognized this approach to format and layout as significant to the early emergence of scholia.[45]

The Old Paris Dioscorides demonstrates two different systems of how illustration is related to the broader *mise en page*. Typically the scribe intended to have the illustrations inserted into a blank left by indenting the text column. Weitzmann has connected this method to the illustration of papyrus rolls, but as mentioned above, such an approach to classification seems misguided since all surviving evidence suggests that illustrated herbals on papyrus did not adhere to this system. I would, therefore, refer to this approach simply as indentation illustration or indented layout. Moreover, as the scribe of the Old Paris Dioscorides left less space for the copying of illustrations, the illustrator was sometimes forced to place the illustrations in the margins. As a result, he or she adopted an essentially different system: marginal illustration. In the marginal system of illustration the text block fills the main text column, while pictures are relegated to the outer margins, where it functions almost as though it were a kind of marginal gloss on the text. This system of illustration tends to emphasize the text.

A fifth approach to the layout of an illustrated herbal appears in the Yerevan fragment and in the texts on animals in the Vienna Dioscorides. The merit of this approach, which was also followed in the Morgan and Athos Dioscorides (see ch. 4), is that it allows illustrations to be filled in later as needed. More than the other approaches, this system of *mise en page* allows the text to function as a kind of scaffolding on to which illustrations could be added later, as more illustrated sources became available. I designate this approach as line break illustration. It bears some resemblance to later frieze illustrations in Middle and late Byzantine books, but can be

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[42] For example, the illustrations of *anemōnē hē agria melaina* (ἀνεμώνη ἡ ἀγρία μέλαινα, perhaps *Anemone coronaria* L., f. 26r), *arkeuthis mikra* (ἀρκευθίς μικρά, likely dwarf juniper, *Juniperus communis* L., f. 34r), and *thymelaia* (i.e., θυμελαία, perhaps *Daphne gnidium* L., *MM* 4.172 f. 134v).

[43] See the list of quotations in Nigel G. Wilson, "Two Notes on Byzantine Scholarship: I. The Vienna Dioscorides and the History of Scholia," *Greek, Roman and Byzantine Studies* 12 (1971): 557–558.

[44] In the illustration of dwarf juniper (*arkeuthis mikra, Juniperus communis* L.), for example, the illustration was copied but not the quotations, see f. 34r.

[45] Nigel G. Wilson, "Two Notes," 557–558.

distinguished from it as the illustrations in this system need not be horizontal or frieze-like, nor need they be scenic.[46] In a sense, the system of frieze illustration could be regarded as a species of line break illustration.

Conclusions

By executing the pictures first, makers ensured that there would be sufficient space for the pictures and that they would be up to standard before any accompanying text was added. This system of illustration may have initially emerged in response to the limitations of papyrus, which is less able to handle multiple layers of color when compared to parchment. Substantial modification or correction to an illustration on papyrus may have required starting over from scratch.

The picture-first sequence of production implied a radically different organization of the production system for book illustration. We can imagine that a commissioner would hire a scribe, who would contract an illustrator to execute the pictures. The illustrator could have then sent the work back to a scribe to copy the text, and then to others for any corrections, punctuation, or rubrication. Alternatively, the commissioner could have hired an illustrator from the beginning, who then gave the illustrated work back to the commissioner or to a scribe for the copying of the text. In another scenario, the illustrator could have been the same person as the scribe. These different scenarios have different consequences for the role the illustrator played in the initial formatting of the book, and in managing the project more generally. The illustrator could have conceivably managed the entire project, been responsible for determining the layout, or simply been charged with illustration, leaving any additional formatting, planning, or management to others involved in the project such as the scribe. Since scribes typically managed and directed the copying process, the first scenario seems the most likely as illustrators would presumably not have had the managerial skillset and network necessary to accomplish these tasks as easily as a scribe could have.

Whatever the specific design of the production system, illustrations would have driven up production costs substantially. The hiring of painters, the need for additional materials such as pigments for colors, and the different organization of the production system could have all potentially contributed to the costs of production. For example, the inclusion of pictures in the Antinoopolis fragment seems to have required the use of special double-ply papyrus. It seems doubtful, as a result of these considerations, that in antiquity illustrated herbals would have ever been cheap or widely available, no matter how limited the palette or inaccurate the pictures may seem to us now.[47] Once we establish that the illustrated herbals were essentially expensive to produce, we begin to get a better sense of their limited, special use, and why so few of them were copied in the first place.[48]

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[46] E.g., the "Frieze" gospels, Florence, Biblioteca Medicea Laurenziana, MS Laur. Plut. 6.23, or Paris, Bibliothèque nationale de France, gr. 74.

[47] Cp. Cavallo, "Introduction," 10: "But since illustrated books of this sort were probably very widespread"; cp., also, Collins, *Medieval Herbals*, 37-38.

[48] Of the ca. 250 medical Greek papyri discovered in Egypt, only two examples (the Tebtunis roll and Antinoopolis codex) appear to have been illustrated. See Marie-Hélène Marganne and Paul Mertens, "Medici et Medica, 2e edition (État au 15 janvier 1997 du fichier MP^3 pour les papyrus médicaux littéraires)," in '*Specimina' per il Corpus dei Papiri Greci di Medicina. Atti dell'Incontro di Studio (Firenze, 28-29 marzo 1996)*, ed. Isabella Andorlini, (Florence: Istituto Papirologico 'G. Vitelli,' 1997), 3-71. Marie-Hélène Marganne, "Compléments au fichier MP^3 pour les papyrus médicaux littéraires (État au 1er décembre 1999)," *Analecta Papyrologica* 12 (2000 [2001]): 151-161.

We can also understand why, given this expense, the priorities of the makers of illustrated herbals so often shifted in favor of illustration over the copying of the text. The people who would have had access to illustrated herbals probably could have had easier access to more textually replete, non-illustrated herbals. That is to say, if you wanted to read an herbal, you could and should always consult a cheaper, non-illustrated text, but if you wanted to *see* what the plants looked like without having to go into the field or to wait for the seasons to change, you could consult an illustrated one. Emphasis on the visual presentation of information, that is, visual content, over verbal or textual content does not, therefore, necessarily mean that illustrated herbals were any less suitable for practical or scholarly consumption, nor does it mean that they were "purely practical handbooks."[49] The reality probably falls somewhere in-between, simultaneously luxury object and handbook, likely shifting between the two functions on the basis of the specific circumstances that the volume found itself in (for a case study of this in relation to the Vienna Dioscorides, see ch. 6). The format and contents of the illustrated herbal, nevertheless, tend to emphasize its utility as a source for information. Hence, we find inset quotations from other medical authorities included in the most deluxe of the illustrated herbals covered here, the Vienna Dioscorides. The original intention appears to have been to have these inset quotations appearing throughout the whole volume, even though they do not. The close relationships between the text and the pictures also speaks to their important contribution in making the illustrated herbal a special genre or kind of text, as illustrated texts of more literary genres copied in parchment codices tend to have clear divisions between the body text and the pictures, either through spacing or devices such as borders and frames. It may be that this conception of the illustrated herbal as a luxurious "practical" volume goes back to an earlier idea of the medical codex as a kind of deluxe notebook, such as the expensive parchment tomes filled with medical recipes that Galen reported owning.[50]

Over time, emphasis on the copying of pictures seems to have led to the abridgement of the accompanying text and to sacrifices in its quality. Abridgement is materially evident as early as the late fourth or early fifth century in the Johnson fragment.[51] The tendency to abridge texts would continue into the Middle Ages.[52] As George Saliba and Linda Komaroff have noted, this trend is especially evident in later illustrated Arabic translations of Dioscorides' *De materia medica*.[53] The long history of textual abridgement could suggest that illustrated herbals were from the beginning conceived of as a primarily visual resource, a special kind of reference work that independently reinforced information more typically gleaned through writing or firsthand experience. In the early history of the illustrated herbal, however, makers probably did not intend to sacrifice text. The Old Paris Dioscorides testifies to the fact that some books could attempt to

[49] Cp. Cavallo, "Introduction," 10. Also, cp. Cronier, "The Manuscript Tradition," 140: "Such manuscripts were objects of luxury, worthy of individuals of the highest rank. They would have been extremely expensive books, by virtue of the quality of their illustrations and of the quantity of parchment used in their manufacture. ... These manuscripts are far distant from manuscripts made for medical use. Even if these books were used at hospitals during subsequent centuries, they were originally luxury objects and works of art attesting to the interest in natural sciences among the Byzantine cultural elite. Their textual content, by contrast, is extremely mediocre, and an indication that the illustrations were more highly prized than the content. These are above all picture books, in which the text had a far more subordinate role." Also, cp. Leith, " Antinoopolis Illustrated Herbal," 156.

[50] See Matthew Nicholls, "Parchment Codices in a New Text of Galen," *Greece and Rom*e 57, no. 2 (2010): 378–386.

[51] Leith, "Antinoopolis Illustrated Herbal," 152.

[52] See Cronier, "Manuscript Tradition," for an overview.

[53] George Saliba and Linda Komaroff, "Illustrated Books May be Hazardous to Your Health: A New Reading of the Arabic Reception and Rendition of the 'Materia Medica' of Dioscorides," *Ars Orientalis* 35 (2008): 6-65.

satisfy both the faithful transmission of a reliable text as well as the illustrations. Yet the very act of producing books—with particular costs (e.g, time, materials, labor) and the complex logistics of the production process (the design of the production system, including the sequence of production)—meant priorities had to be made. We can suppose that whenever the picture-first mode of illustration was applied, the text would have always been more susceptible to change and abridgement simply on account of these limitations and physical constraints. It may also be the case that the picture-first mode of illustration tends to result in irregular quire structures, as seen in the Vienna Dioscorides and the Menologion of Basil II.

The text-first production paradigm would eventually prevail in the illustration of herbals in the Middle Ages. It is in evidence in virtually all the herbals copied in Greek and Latin up until the thirteenth century. Throughout this period, however, text-first illustrated herbals still retained vestiges of the picture-first production paradigm evident in the spatial flirtations between picture and text, as seen here in the Leiden Ps.-Apuleius Platonicus.[54] We will see, however, that over the course of the thirteenth century the picture-first mode of herbal illustration remerged and culminated in the production of botanical atlases or "picture books," entirely devoid of text (see ch. 5).

[54] See also Lucca, Biblioteca Statale, cod. 296, 9th c.; Paris, Bibliothèque nationale de France, Ms. lat. 6862, early 9th c.; Florence, Biblioteca Medicea Laurenziana, Plut.73.41, 9th c.; Munich, Bayerische Staatsbibliothek, Clm. 337, late 10th c.

Chapter Four
The Morgan Dioscorides and Middle Byzantine Botany

The Morgan Library in New York possesses a remarkable parchment codex (New York, Morgan Library, MS M 652) that bears witness to the significant role that pictures played in the practice of botany in the Middle Byzantine Period (ca. 843-1204).[1] The manuscript's scribes first copied the text, leaving behind spaces for pictures, which were then copied from a variety of different sources. This process of pictorial compilation radically expanded the number and variety of plants represented within the Byzantine botanical tradition. While such practices may have existed earlier, the Morgan Dioscorides is our earliest surviving proof of them. This chapter shows that the illustrators of the Morgan Dioscorides brought together pictures of plants from different versions of the text that had developed separately from each other, even if the pictures were ultimately descended from the same archetypes. These approaches are evident in a number of occasions where the illustrators included multiple pictures of the same plant for individual chapters. In other instances, the illustrators supplied pictures for the text either based on the text itself, or through the observation of nature, a form of image-making supposedly alien to Middle Byzantine artistic practice. Subsequent readers continued to update illustrations in the codex in order to match their own observations and concerns. In these different ways, the Morgan Dioscorides provides compelling evidence for a dynamic tradition of Middle Byzantine botanical illustration involving experimentation and the observation of nature. A final section juxtaposes these patterns of image-making and use with the shifting intellectual movements and debates of the period.

The Codex and Text

The codex is quite large at roughly 15.5 x 11 inches (395/399 x 280/302 mm) with currently 769 miniatures spread across 385 folios, in 55 quires, although it may have originally featured up to 500 folios.[2] The Morgan *De materia medica* contains the earliest surviving example of an edition of Dioscorides based on both the illustrated Alphabetical Dioscorides as well as different recensions related to the Original Five Book text. The codex also contains two toxicological treatises falsely attributed to Dioscorides, and an anonymous text on antidotes that is similar (but different) to the second book of Galen's work on antidotes. Echoing the contents of the Vienna Dioscorides, there is also a poem on the powers of herbs, and paraphrases of Nicander's *Theriaka* and *Alexipharmaka,* as well as Oppian's *Halieutica*, all three attributed to Eutecnius.[3] The illustrations are restricted to Dioscorides I-IV, VI, and the Nicander paraphrases.

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[1] For comprehensive descriptions of the manuscript, see Marie Cronier, "Un manuscrit," 95-130; see also Nadezhda Kavrus-Hoffmann, "Catalogue of Greek Medieval and Renaissance Manuscripts in the Collections of the United States of America, Part IV.2: The Morgan Library and Museum," *Manuscripta* 52, no. 2 (2008): 207-324, esp. 212-230, which pertains to the Morgan Dioscorides.

[2] On this estimate, see Alessia A. Aletta, "Per una puntualizzazione cronologica del Morgan 652 (Dioscoride)," in *Praktika tou 6' Diethnous Symposiou Ellenikes Palaiographias (Drama, 21-27 Septembriou 2003*), ed. Basiles Atsalos and Nike Tsirone, 3 vols. (Athens: Société Hellénique de Reliure, 2008) 2: 771-787, at 780.

[3] For a summary of contents: Dioscorides of Anazarbos, De materia medica, in 5 books: I (Herbs, ff. 2r-199v), II (Animals, animal products, ff. 200r-214v, 216r-242v), III (Oils, ff. 221r-242v), IV (Trees, ff. 243r-269v), V (Minerals and wines, ff. 385r-v, 270r-305v), and two apocryphal toxicological treatises: Ps-Dioscorides, [IV] *Alexipharmaca* (ff. 306r-319v), [VII] *Theriaca* (ff. 319v-330v); Anonymous, *De antidotis* (ff. 331r-333v); Anonymous, *Carmen de herbis* (ff. 334r-338r); Eutecnius, *Paraphrasis in Nicandri Theriaca* (ff. 338r-v, 215r-v, 339-355v, 377r-384v, 356r-360v); Eutecnius, *Paraphrasis in Nicandri Alexipharmaca* (ff. 360v-375r), Eutecnius, *Paraphrasis in Oppiani Halieutica* (ff. 375r-376v).

While scholars have known of the manuscript for many years, it has only recently begun to attract more sustained interest.[4] In 1973, Anne Van Buren wrote a catalog entry on the manuscript, in which she dated the manuscript to the mid-tenth century, placing it at the court of Constantine VII Porphyrogennetos (r. 913-959) or his son.[5] She also distinguished several different sources for the illustrations in the manuscript. Minta Collins included the codex in her 2000 survey of medieval herbal illustration.[6] More recent treatments of the manuscript by Nadezhda Kavrus-Hoffmann, Alessia Aletta, and Marie Cronier have contributed more substantially to our understanding of the manuscript. All three researchers characterize its script as intermediate *bouletée* and *minuscola antica oblunga*, and have consequently recommended re-dating it to the late ninth or early tenth century.[7] This dating puts the production of the manuscript either at the end of the reign of Basil I (r. 867-886), or during the reigns of his sons, Leo VI "the Wise" (r. 886-912), or Alexander (r. 912-913). The commissioner and original recipient remain unknown.[8]

In the most recent (and first) philological study of the manuscript, Marie Cronier argues the Morgan Dioscorides probably drew on two different manuscripts, based ultimately on three separate philological units, which she labels Ma, Mb, and Mc (fig. 4.1). Ma consisted of the Five Book *De materia medica*, close to the original *De materia medica* by Dioscorides, plus two toxicological treatises (Books VI-VII).[9] Cronier believes that the patriarch Photius may refer to this arrangement of the text in his *Bibliotheca*.[10] She identifies the Ma source with chapters in the Morgan Dioscorides scattered throughout Books I-IV with titles including "by the Anazarbian" (τοῦ ἀναζαρβέως), a reference to Dioscorides, who came from Anazarbus. Cronier adds that Books V-VII may also derive from Ma.[11]

Cronier suggests another textual unit, Mb, was based on an Alphabetical Dioscorides and accounts for most of Book I. Cronier suggests that this source was closer to the Vienna Dioscorides than the Naples Dioscorides, because it shares some spelling variants with the former. The Morgan Dioscorides also includes lists of synonyms and excerpts from Galen and Crateuas that also appear in the Vienna codex. But because the Morgan Dioscorides does not reproduce all of the same errors found in the Vienna Dioscorides, it cannot have been copied directly from it, but rather another codex. Cronier also notes that the paraphrases in the Morgan codex were based on those in the Vienna Dioscorides.

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[4] Early treatments tend to be brief. E.g., Charles Singer, "Herbal in Antiquity," 25; Kurt Weitzmann, *Die Byzantinische Buchmalerei des 9. und 10. Jahrhunderts* (Berlin: Mann, 1935, reprinted Vienna: Verlag der Österreichischen Akademie der Wissenschaften, 1996), 34; idem, "Das klassische Erbe in der Kunst Konstantinopels," *Alte und Neue Kunst* 3 (1954): 41-59. There was also a facsimile printed in 1935.

[5] Anne van Buren, "*De Materia Medica* of Dioscurides," in *Illuminated Greek Manuscripts from American Collections. An Exhibition in Honor of Kurt Weitzmann*, ed. Gary Vikan (Princeton, N.J.: Princeton University Press, 1973), 66-69, here: 67. For a more recent catalog entry, see Kathleen Corrigan, "M.652" in *The Glory of Byzantium: Art and Culture of the Middle Byzantine Era, A.D. 843-1261*, ed. Helen Evans and William D. Wixom (New York: Metropolitan Museum, 1997), 237.

[6] Collins, *Medieval Herbals*, 59-69.

[7] Kavrus-Hoffmann, "Catalogue," 218

[8] Alessia Aletta suggests that Photios might have commissioned the manuscript, but she also acknowledges there is not much evidence to support such a claim. See Aletta," Per una puntualizzazione," 787. Nadezhda Kavrus-Hoffmann instead suggested Leo VI may have commissioned the codex for his physician or for a hospital, although she, too, notes that another elite could have commissioned the codex. See Kavrus-Hoffmann, "Catalogue," 226-227.

[9] Cronier, "Un manuscrit," 112-114.

[10] Ibid., 118-121

[11] Ibid., 109.

According to Cronier, both Ma and Mb units were used to compose Book I of the Morgan Dioscorides.[12] A final textual unit, Mc, appears to have also been used for Books II-IV. Like the chapters associated with Mb, the Mc chapters are typically of poor quality compared to the Ma chapters, although they typically accompany higher quality illustrations. Also like the Mb chapters, the Mc chapters do not include references to the "Anazarbian." Cronier suggests that the Mc source was likely a thematically and alphabetically arranged version of Dioscorides, perhaps originally compiled as an accompaniment to an Mb manuscript. Such a companion would have made up for the omissions in the Alphabetical Dioscorides. Cronier doubts that Mc ever existed separately of Mb, but that Mb+Mc were compiled together.[13] Ma was only added in the Morgan Dioscorides, so as to make up for omissions or corruptions in Mb+Mc.

While Marie Cronier attends to the different textual sources upon which the edition of the Morgan Dioscorides was based, she also occasionally enlists pictorial evidence as support for her argument. In this, Cronier suggests that the copying of pictures corresponds with the copying of text. She notes in particular that the pictures accompanying the Ma chapters are of lower quality and more schematic, whereas the pictures from Mb and Mc are more naturalistic.[14] Yet she also acknowledges that the illustration of the book was more complex—"la question des modèles picturaux est encore plus complexe et n'a pas à être traitée ici."[15]

The first part of this chapter picks up where Cronier left off: the question of pictorial models for the botanical illustrations in the codex, namely those in Book I on herbs and Book IV on trees.[16] Despite some exceptions, a general pattern in the sourcing of the illustrations emerges here that partly confirms and partly complicates Cronier's model for the edition of the Morgan Dioscorides. I identify here a single group of pictures linked to the Ma source, which I call the E group. The E group illustrations were themselves likely based on an earlier compilation of pictures that had been transmitted together. In contrast, there are at least three different sources for pictures associated with the Mb texts: Groups A1, A2, and A3. Finally, the pictures associated with the Mc texts tend to be more heterogeneous and are not easily grouped together. It seems likely that the Mc unit was either unillustrated, or only partially so, with gaps filled in later by other sources, or only first illustrated in the Morgan Dioscorides. Analysis of the illustrations of trees in Book IV tends to favor the latter. I identify at least two different pictorial sources (D2, D3) in Book IV that are completely different from each other, and speak to an *ad hoc* process of *ex novo* illustration based both on text as well as empirical observation.

Pictures from the Alphabetical Herbarium (Mb): the A1, A2, and A3 Group

As Marie Cronier notes, the first book on herbs in the Morgan Dioscorides is based on an Alphabetical Dioscorides similar to the Vienna Dioscorides, dubbed Mb, with missing entries supplied by an original version of Dioscorides (Ma). Cronier points out that the illustrations accompanying Ma tend to be of lower quality, whereas those associated with the Mb chapters tend to be larger and of higher quality. She recognizes, however, that occasionally pictures and texts do not match, giving some chapters a "mixed" quality. Such "mixed" chapters could have arisen simply as a result of the illustrator recognizing that a preferable illustration was available

[12] Ibid., 107-111.
[13] Ibid., 115.
[14] Ibid., 112.
[15] Ibid., 116.
[16] It does not consider in detail the illustrations of oils, essences, animals and animal products. See Zoltán Kádár, *Survivals of Greek Zoological Illumination in Byzantine Manuscripts* (Budapest: Akadémiai Kiado, 1978), 55-76, 122, 133.

in another source, or perhaps that that chapter in the source text was unillustrated. In this section, I distinguish between three different pictorial sources for the pictures associated with Mb texts, that is the Alphabetical Herbarium. Illustrations linked to Ma can also be subdivided into types, but these are stylistically uniform and all appear to have been copied together, suggesting they come from a single source. I show in the next section, this single source was itself likely a compilation of different pictorial sources.

The A1 Group

A large part of the illustrations in the first book of the Morgan Dioscorides clearly come from the tradition of the Alphabetical Dioscorides. Anne Van Buren suggests two possible pictorial sources for these pictures. She also identifies a third source for "rudimentary" pictures, which might correspond with pictures associated with Cronier's Ma.[17] While Van Buren supposes the Vienna Dioscorides was a source for the Morgan Dioscorides, she also recognizes some affinities with the Naples Dioscorides. This leads her to identify a separate group of illustrations in the Morgan codex related to the Naples Dioscorides. Marie Cronier has since established that the Vienna Dioscorides was probably not a direct source for Book I of the Morgan Dioscorides, although the fact that it was a source for the text of the paraphrases could raise the possibility that some of its pictures were also copied into Book I of the Morgan Dioscorides.

Slight differences in how the plants in the Morgan Alphabetical Herbarium are rendered, such as the treatment of highlights and modeling, could either be due to different pictorial sources, different artists, or both. As a result, we can only detect the existence of multiple sources when two illustrations are given for a single chapter or plant. Such doublings of the "same" plant fortunately occur a number of times, allowing me to distinguish three different pictorial sources connected to the Alphabetical Dioscorides. Provisionally, I define the first of these three groups, the A1 group, as the set of illustrations most closely linked to the Vienna and Naples Dioscorides. These illustrations were likely copied into the Morgan Dioscorides at the time of its initial production.

The A2 Group

A second group of illustrations (A2) more distantly related to the Vienna and Naples Dioscorides can be established on the basis of the doubling of illustrations for two separate plants: *melissophyllon* (μελισσόφυλλον, balm, *Melissa officinalis* L., *MM* 3.104, f. 1v, 102v, fig. 4.4, fig. 4.5) and *bettonikē* (βεττονίκη, i.e., βεττονική, possibly *Rumex spp.* or *Stachys officinalis* (L.) [=*Betonica officinalis* L.], *MM* 4.1, f. 22r, fig. 4.6). In both cases, we find that an A2 picture was added to an earlier A1 picture.

According to Cronier, the illustration of *melissophyllon* on the recto of the first folio was the result of poor coordination between illustrators: two illustrators separately copied the same plant following two different models. While one picture was kept inside the volume, the other was used as a flyleaf.[18] But the first folio lacks text, except for the red title. The picture almost takes up a full page. In the rest of the codex, the scribes and illustrators followed a single sequence of production whereby the text was copied prior to illustration. Moreover, very few illustrations in the codex take up as much space as the illustration of *melissophyllon*. These different working methods tend to undermine the idea that the *melissophyllon* on f. 1r was an error. Absent other explanations, we can regard its inclusion as intentional.

[17] Van Buren, "*De Materia Medica* of Dioscurides," 68.
[18] Cronier, "Un manuscrit," 116, n. 65.

This interpretation is confirmed by a larger pattern of including multiple pictures under a single chapter. In the chapter for *bettonikē*, we can also see two different, but similar pictures of the plant.[19] The picture on the left appears to overlap the picture on the right, so we can suppose that the right picture preceded that on the left. This second picture of *bettonikē* on the left is similar to the picture of *melissophyllon* on the first folio: They use similar colors that were applied and subsequently dried in similar ways. But while the picture of *bettonikē* was crammed into the available space beside the original illustration, such an approach was not possible for the second illustration of *melissophyllon* simply because there was no additional space on f. 102v. If so, we can hypothesize that the second *melissophyllon* was originally inserted into the codex closer to the main entry. At some later point, perhaps after the front part of the codex had gone missing, the leaf with *melissophyllon* migrated to the front of the codex to serve as a flyleaf. We can conclude that both A2 illustrations were intentionally added to the codex at about the same time, either during the initial production of the codex, or perhaps at a later point.

The fact that these different pictures provided additional information about the plant could provide an explanation for their inclusion. The picture of *melissophyllon* on f. 1r notably includes flowers, while the picture on f. 102v does not. The A2 *melissophyllon* then adds crucial morphological details omitted in the A1 picture. Similarly, the A2 *bettonikē* has a larger root and basal leaves, with more pronounced sinuses and teeth in its leaf margins, and more clearly delineated floral structures. The A1 picture, by contrast, has a daintier appearance with thinner stems and roots, smaller leaves, and less delineation of the flower heads. Despite these differences, it would not be hard to imagine that the A2 pictures may have derived from a source ultimately shared by the A1 group. Except for the flowers, the two pictures of *melissophyllon* resemble each other in the lower portion of the picture. Similarly, it would be easy to see how the A1 and A2 *bettonikē* could descend from a single archetype. The illustrators of the Morgan Dioscorides may have recognized the pictures as different enough to warrant their inclusion to the codex. If so, then we can see how the transmission and mutation of pictures over time would gradually lead to the multiplication of pictures whenever pictures from separate versions were compiled, and recognized as being distinct from each other. At the same time, it is also possible that the A2 pictures were created *ex novo* by adapting the A1 pictures including visual information gleaned from alternate sources, even from direct observation of nature.

The A3 Group

Besides the pictures of *bettonikē* and *melissophyllon*, nine other chapters containing two illustrations associated with the Alphabetical Dioscorides appear scattered throughout Book I of the Morgan Dioscorides.[20] These second pictures are typically smaller, less modeled, with a more restricted palette, dominated by pale greens, often with beige or tan-colored roots. As with the A2 group, they appear to have been executed after the main illustration because they either overlap that illustration, or are squeezed into a smaller area between blocks of text. For example, two different pictures appear in the same chapter for *ēryngion* (ἠρυγγιον, sea holly, *Eryngium maritimum* L., fig. 4.7). Though stylistically distinct, they are, as with the A2 group, similar enough to suggest a common source with the A1 group. The colors of the plant on the right are

[19] The picture looks more like *Stachys officinalis*. There appears to be confusion between *bettonikē*, identified with water dock, i.e., *Rumex aquaticus* L., and *kestron,* identified with betony. Chortasmenos treats them as synonyms in his annotations in the Vienna Dioscorides, f. 194v. (There is no *bettonikē* in the Vienna codex.)

[20] ἐριγερων (i.e., ἠριγέρων, f. 42v); ἐρύσιμον (f. 46v); ἠρύγγιον (f. 57r); θλάσπι ἑτέρα (f. 61v); κρίνον βασιλικόν (f. 84r); λυχνὶς στεφανωματική (f. 93v); πολύγονον ἄρρεν (f. 130r); σκόλυμος (f. 154v); and σινήπι ἄγριον (f. 157v).

bluer with highlights in yellow, whereas the plant on the left is a lighter color green, with less modeling. The picture on the left overlaps the one on the right, and was therefore likely copied after it.[21] This suggests there may have been at least two different versions of the Alphabetical Dioscorides available.

The second picture copied beside *erysimon* (ἐρύσιμον, likely hedge mustard, *Sisymbrium polyceratium* L., or *S. officinale* (L.) Scopoli, f. 103v, fig. 4.8) could give us an idea of what the source codex for the A3 group might have looked like. The A3 *erysimon* is visibly truncated on the left side. We can reason that it was copied from a source with less space available for illustrations. We can thus rule out a layout with full-page illustrations and ample margins such as the Vienna Dioscorides, or line break illustrations as in the Morgan Dioscorides. Rather, the A3 illustrations likely had a *mise en page* with a subscribed or indented text, as in the Naples Dioscorides or Old Paris Dioscorides, respectively.

As the pictures came from different sources, contemporaries may have understood them to be different attestations or documentations to the morphology and outward appearance of the same plant. They might have also understood the different pictures as indicating different types or kinds of the plant described in the text. It is clear that at least one Byzantine viewer understood the pictures as indicating different types or varieties. In a marginal note beside the picture of *erysimon*, he or she wrote "another *erysimon*" (ἐρύσιμον ἕτερον), i.e., another kind of *erysimon*. A tendency to view different pictures as different kinds of plants would have gradually led to the multiplication of the number of individual types or kinds of species over time. As contemporaries recognized differences in pictures of plants in other manuscripts, even if ultimately descended from the same sources, they could ascribe those differences to different sub-types or kinds of the same plant. The recognition of differences may have been assisted by observations of the natural world. For example, in the two illustration of *eryngion,* we can suppose that while the smaller paler *eryngion* might have refered to field eryngo or *Eryngium campestre* L., the larger blue *eryngion* was associated with sea holly or *Eryngium maritimum* L. Both species can found in the same dry coastal habitats. Someone familiar with them might easily infer that the different pictures of *eryngion* referred to two different varieties.

Pictures associated with the Original Five Book Dioscorides (Ma): the E Group

The pictures connected to Cronier's Ma source tend to be stylistically similar and share a palette with bright, saturated colors. I designate them as the E group. Cronier has described them as being lower quality than those of the Alphabetical Dioscorides. They are prevalent in Books I, V, VI, although some also appear in Books II, III, and IV. They typically show simple or minimal modeling, a flattened aspect, with minimal or no roots visible, except when the plant has a thick or fleshy root, or analogous structure, such as a bulb, corm, etc. Many feature drybrush at the plant's base, perhaps an indication of the broken edge of a branch or its roots (e.g., *aithiopis,* αἰθιοπις, f. 8v, fig. 4.9). Differences in the handling of color suggest two or three different painters executed the group. The pictures can be subdivided into several basic types: scrolling vines, often with grape-like fruit and stylized tendrils (e.g., *ampelos leukē,* ἄμπελος λευκή, f. 10v, fig. 4.10); woody branches (e.g., *antirhinon*, ἀντιρινον, f. 9r, fig. 4.11); trees (e.g., *daphnē hetera*, fig. 4.23); herbaceous shoots (e.g., *aithiopis,* f. 8v, fig. 4.9); and plants with large fleshy roots or root-like structures (e.g., *apios ē ischias,* ἄπιος ἡ ισχιας, f. 9v, fig. 4.12). The E group depictions of trees (e.g., *daphnē hetera*, fig. 4.23) is small in number (n=7), with the majority of

[21] I thank Frank Trujillo of the Morgan Library, New York, for his work assessing the layering of colors in the manuscript with a microscope, and Joshua O'Driscoll for supporting this work.

its pictures connected to chapters associated with Cronier's Ma source.[22] The pictures in this group often do not have many distinguishing features, although some do resemble the plant they depict, such as *asparagos petraios* (ἀσπάραγος πετραίος, likely asparagus f. 12v, fig. 4.13). While the E group illustrations cannot be traced to earlier extant sources, they probably go back to an earlier antique source or sources, now lost. For example, the branch type recalls the illustration on the Erevan Fragment (see ch. 2), as well as earlier depictions of branches, such as those in the vault of Santa Costanza (fig. 2.36). The scrolling vines echo the treatment of vines in Roman art, especially the stylized treatment of the tendrils (see ch. 2). This group of illustrations may ultimately derive from a standard Late Antique visual repertoire, in which case it would not reflect a separate or autonomous tradition of botanical illustration similar to the Alphabetical Dioscorides.

Multiple Pictures per Chapter

Occasionally, as with the A group, two or more E group illustrations appear together under the same heading. The chapter on *kyamoi heteroi* (κύαμοι ἕτεροι, "other beans," i.e., "the Egyptian bean," likely lotus, *Nelumbo nucifera* Gaertn., f. 75r, fig. 4.14) shows three different illustrations: the left picture shows the flower in profile, with the stamens, receptacle (carpels), and petals; the center shows an open bud, a fruit or seed pod, and leaves both head-on and in profile; the third shows an open flower, head-on. Each picture conveys different information about the plant. In this way, the illustrations actually recall forms of representation seen in the Alphabetical Dioscorides that emphasized as many different distinguishing features of the plant as possible within a single illustration.

Most doublings in the E group, however, fail to provide much in the way of detail, e.g., the illustrations of *aspalathoi* (ἀσπάλαθοι, camelthorn, *Alhagi maurorum* Medik.?, f. 6v, fig. 4.15), *asparagos petraios* (ἀσπάραγος πετραίος, asparagus, *Asparagus officinalis* L.*,* f. 12v, fig. 4.13), and *kyamos* (κύαμος, bean possibly *Vicia faba* L., f. 74v, fig. 4.16). In the case of the *aspalathoi*, the name is plural and the text mentions two varieties. The same explanation, however, cannot apply to the *asparagos* and the *kyamos*. The multiplication of pictures in the A2 and A3 groups might, however, provide an explanation. Perhaps the doubled illustrations in the E group originally derived from different sources, initially compiled in the same spirit as the A2 and A3 groups, but which perhaps began to resemble each other, as they were copied together

[22] *aigeiros* (αἰγειρος, black poplar, *Populus nigra* L., f. 243r), *brathy* (βράθυ, savin juniper, *Juniperus sabina* L., or stinking juniper, *Juniperus foetidissima* Willd.*,* f. 244v), *phēgos* (φηγὸς ἤτοι πρῖνος, alternate spelling in rubric title, Valonia oak or Holm oak, *Quercus aegilops* L. or *Quercus ilex* L., f. 245r), *eirēkē* (ἐρείκη, alternate spelling in the title, heath tree, *Erica arborea* L., f. 246r), and finally *melimēlea ēpeirōtikē* (Μελιμηλέα ἠπειρωτικῆ, "apples of Epiros," f. 258r). Some illustrations for chapters without "by the Anazarbian" in their titles could be related to the Ma source, which may be the case for the illustration of *apia*. The chapters that include τοῦ ἀναζαρβέως are as follows: *aigēros* (αἴγηρος, f. 243r), *akakia* (ἀκακία, f. 244v), *brathy* (βράθυ, f. 244v), *fēgos ētoi prinos* (φηγος ήτοι πρινος, f. 245r), *daphnē etera* (δάφνη ἑτέρα, f. 246r), *eirēkē* (εἰρήκη, f. 246r), *kisthos* (κίσθος, f. 248r), *heteron eidos kisthou* (ἕτερον εἶδος κίσθου, f. 248r), *heteron eidos kisthou* (ἕτερον εἶδος κίσθου, f. 248v), *krania* (κρανία, f. 249r), *peri tou mēlizontas karpou kranias* (περὶ τοῦ μηλίζοντος καρποῦ κρανίας, f. 249r), *kinnamōmon* (κιννάμωμον, f. 249v), *xylokinnamōmon* (ξυλοκινναμωμον, f. 250r), *pseudokinnamōmon* (ψευδωκιννάμωμον, f. 250v), *melimēlea ēpeirōtikē* (μελιμηλέα ἠπειρωτικῆ, f. 258r), *myrsinē* (μυρσίνη, f. 258v), *myrtidanon* (μυρτίδανον, f. 259r). Only two pictures associated with Ma texts in Book IV, that is, the pictures of *myrsinē* (myrtle, f. 258v) and *krania* (Cornelian cherry, f. 249r) can be said to belong to the D3 and D2 groups discussed below. Two other miniatures, i.e., those of *akakia* (ἀκακία, the Shittah tree*, Acacia* spp., *MM* 4.64, f. 244v) and *peri tou mēlizontos karpou kranias* (περὶ τοῦ μηλίζοντος καρποῦ κρανίας, f. 249r), do not match any of the groups discussed here or below, but may also come from the Ma source.

over time. If so, we can hypothesize that the pictures in the Ma source were originally compiled from several different sources. The Morgan Dioscorides then echoes earlier practices of pictorial compilation.

Separation and Dissection

Despite the frequent absence of distinguishing detail in the E group, it does occasionally demonstrate approaches to plant depiction that are important in light of the later development of scientific botanical illustration. Principal among them is the separation of plant parts. For example, in the rendering of the mandrake (μανδραγόρα, *Mandragora officinalis* Mill., f. 314r, fig. 4.17) in Book VI, the *Alexipharmaca* of ps.-Dioscorides, we find the fruit separated from the plant and presented on either side of it. This separation and breaking down of the individual specimen marks a step in the direction of dissection in botanical illustrations. Such an approach was entirely the absent in the pictures of the Alphabetical Dioscorides.

Pictures that provide interior views of their subjects represent a step even further in the direction of dissection illustration. For example, the illustration of *agalochon* (ἀγάλοχον, agarwood, aloeswood or eaglewood, that is the wood of trees in the *Aquilaria* genus infected by the mold *Phialophora parasitica* G.Ajello and C.J.K.Wang, f. 14r, fig. 4.18) shows three different cross sections of the trunk, each saturated with different amounts of resin. The left section would be least resinous; the right section, most. Although the tree rings appear here as spirals, such interior views, are still cross-sections, and nevertheless represent an important step in the direction of dissection illustrations.

"Dissection" illustrations with interior views, however, do not only appear with Ma texts. For example, we find interior views of a sea urchin (labeled περὶ ἐχείνου θαλαττίου, f. 214v, fig. 4.19) in Book II, the book on animals: on the left, the sea urchin has been sliced horizontally (transversely) so that it opens up to viewer; in the center it appears rotated as in a three-quarters profile view, clearly indicating the sectional slice; while the right presents an exterior view. Although the illustrations show an interior view of the organism, the sea urchin lacks clearly defined internal organs, except perhaps for gonads and ampullae, of which there are too many. The illustration is not then the product of a studied anatomical dissection, but merely indicates interest in seeing the inside of the organism, from different angles. While scholars have suggested that this illustration may go back to Aristotle's *Anatomai*, it is just as likely that such pictures may ultimately go back to renderings of food in Roman and Hellenistic art.[23] The tests (or exoskeletons) of sea urchins, for example, appear in the famous "unswept floor" (ἀσάρωτος οἶκος) mosaic, now in the Gregoriano Profano Museo in the Vatican, purported to be a copy of a second-century BCE mosaic in Pergamon by the artist Sosos (fig. 4.20).[24] Even if such precedents exist, however, it remains significant that such illustrations appear here in a scientific context.

Despite less distinguishing detail, minimal modeling, and a tendency to adhere to sets of conventions based on relatively limited typologies (branches, herbs, vines, etc.), the E group nevertheless foregrounds several novel approaches to depiction, such as dissection, that depart from the modes of depiction evident in the ancient Alphabetical Dioscorides. Its specific

[23] For summary, see Riddle, *Dioscorides on Pharmacy*, 207. See also Kádár, *Greek Zoological Illuminations*, 58-62; Jean Théodoridès, "Intérêt scientifique des miniatures zoologiques d'un manuscrit de Matiere médicale de Dioscoride (codex M 652, Pierpont Morgan Library, New York," *Acta Biologica Debrecina* 7-8 (1969-1970): 265-272, here: 267-268.

[24] *NH* 36.184.

association with Ma texts suggests that it represents a separate tradition of botanical illustration that developed in connection with the illustration of the Original Five Book Dioscorides.

The Book on Trees: the E, D2, and D3 Groups

Cronier sources the text for Book IV, the book on trees, to Ma and Mc, as these chapters had been excluded from the Alphabetical Dioscorides. The fourth book is, therefore, of especial interest because few of its pictures can be connected to the earlier Alphabetical Dioscorides.[25] Most of the illustrations derive from other sources, most of them (presumably) from the source Cronier calls Mc. Almost nothing has been published on the sourcing of these illustrations of trees and tree products.[26] I proceed here with an analysis of how the text and illustrations appear to have been compiled and then address the sourcing of the illustrations. I consider only the illustrations that represent trees or shrubs.[27] I discern three main groups. The first group is largely connected to Ma texts, and therefore belongs to the E group. We might expect the other two groups, D3 and D2, to be related to the Mc source, but I show here that they clearly belong two distinct groups of illustrations. Many of them may in fact be *ex novo* productions based on nature observation and reading of the text.

Compilation of Pictures and Text on Trees

The compilation and adaptation of texts and pictures for Book IV seems to have been complicated, probably already in the Ma and Mc manuscript sources. For example, the three different chapters on *kisthos*, or rockrose (i.e., κίσθος, ἕτερον εἶδος κίσθου, ἕτερον εἶδος κίσθου, ff. 248r-v), all of which are connected to the Ma source, appear in a single chapter in Wellmann's edition of Dioscorides. The pictures, however, are clearly different from each other and may derive from at least three different pictorial sources already compiled together in the Ma source.

Each chapter on rockrose corresponds roughly to three different plants mentioned in the chapter: the rockrose, the hypocist (ὑποκισθίς, i.e., *Cytinus hypocistus* L.), a plant parasitic to rockrose, and a second kind of rockrose, from which derived a gum called *ladanon* (ἕτερον εἶδος κίσθου ἐξ οὗτὸ λάδανον, f. 248v). But the divisions of the text and their titles do not closely follow these three different plants.[28] Moreover, the three chapters actually contain four

[25] In fact, only one, the wild vine (ἄμπελος ἀγρία, *Vinis vinifera* or *Vinis silvestris*, f. 244r) is derived from the Alphabetical Herbarium (see, for example, the Naples Dioscorides, f. 26r).

[26] Mahmoud Sadek argues that the illustrations of trees in Leiden or. 289 are largely independent of the pictorial tradition represented by Morgan 652 and the Juliana Anicia codex. Sadek further suggests, however, that drawings of trees from a manuscript such as Leiden or. 289 may have influenced later Greek illustrated versions of *De materia medica*. Some Greek inscriptions have in fact been added to the pictures in Leiden MS or. 289. I have not found evidence to support Sadek's hypothesis. See Mahmoud M. Sadek, *The Arabic Materia Medica of Dioscorides* (Quebec: Éditions du Sphinx, 1983), 151-155.

[27] Not all of the illustrations in the fourth book feature trees. Some feature "tree" products, such as the depiction of tools made from reeds (f. 252r), or oak galls (f. 253r). The book also includes organisms that cannot be regarded as trees, such as papyrus (f. 263v), Egyptian lotus (f. 256v), or mushrooms (f. 260v), all of which were originally excluded from the Alphabetical Dioscorides.

[28] The entry on the first κίσθος on f. 248r contains text corresponding to *MM* 1.97.1-2. The second chapter has the title "another kind of *kisthos*, from which [is made] *ladanon*" (ἕτερον εἶδος κίσθου ἐξ οὗτὸ λάδανον), while the text, related to *MM* 1.97.3, below it identifies yet another kind of rockrose called hēdōdōn (ἡδωδων, perhaps a corruption of λῆδον), and only mentions the oil called *ladanon* (λάδανον) in the last sentence, which could be taken as a gesture to the next chapter below, which resumes a full discussion of *ladanon*, picking up basically where it left off in *MM* 1.97.3 although it simply says "another kind of *kisthos*" in its title.

illustrations, with two pictures in the first chapter on rockrose. Both pictures here are similar (fig. 4.21), appearing flattened with a few leaves folded over, similar to illustrations in the Old Paris Dioscorides (ch. 2). The picture (fig. 4.22) for the second chapter resembles the branch type of the E group associated with Ma chapters. The picture in the third chapter is unlike any of the others, and may relate to other kinds of plant depictions (as in textiles and decorative headpieces). The text may have been divided with two possible aims in mind: first, to separate the three plants that Dioscorides mentions into separate chapters, and, second, to accommodate more illustrations.

This handling of the text is also evident in a short chapter on juniper berries (κεδρίδες), which was isolated from the main chapter on *kedros* (κέδρος, designates many different species of juniper and cedar, see below), but bizarrely, and perhaps accidently, entitled "a different bay laurel" (δάφνη ἑτέρα, f. 246r, fig. 4.23).[29] Unsurprisingly the codex gives us two very different pictures. The left appears to be a laurel; the right, a juniper. Not only do the pictures show different plants, they look very different from each other. The laurel resembles E group pictures. The juniper, however, looks more like a picture from the Alphabetical Dioscorides—it shows roots, shoots, and even a dead branch on the lower right side. The berries appear at different stages of maturation. The picture is even identifiable as a kind of prickly juniper, likely *Juniperus deltoides* R.P.Adams.[30]

Turning to the main chapter on *kedros* (κέδρος), we find two illustrations under a single chapter (f. 251v, fig. 4.24) linked to Cronier's Mc (but excluding the passage concerning juniper berries). As in the entry for juniper berries, these two pictures undoubtedly represent different plants. The plant on the left has a scaly trunk, needle-like leaves, and large cones held upright on its branches. The plant on the right has denser foliage, yellow "berries," a rough trunk, and needle-like or scaly leaves. The two pictures correspond to the text, which mentions two varieties of *kedros*: a big one and small, thorny one.[31] That the tree depicted on the left has rather large, upright cones suggests that it is not a juniper, but rather a cedar, perhaps *Cedrus libani* A.Rich.[32] Wellman's edition describes the "fruit" of the big *kedros* as smaller than that of a cypress.[33] In contrast, the Morgan Dioscordes says the fruit of the big *kedros* is *bigger* than that of the

[29] The text for this chapter is taken from *MM* 1.77.

[30] *Juniperus deltoides* R.P. Adams= *J. oxycedrus* L. subsp. *oxycedrus*, and subsp. *deltoides* R.P. Adams. The fruit of *J. oxcyedrus* var. *oxycedrus* is today noted to have stimulant and diuretic properties, which may be related to the properties named by Dioscorides (*MM* 1.79, see above, too). The wood of these two species is also today used for extraction of Cade oil, which can be used as an antiparasitic (antihelminthic), and for dermatitis. See Robert P. Adams, *Junipers of the World: The genus Juniperus*, second edition (Vancouver, BC: Trafford Publishing, 2008), 159-161, 237-239. See also idem, "*Juniperus deltoides*, a new species and nomenclatural notes on *Juniperus polycarpos* and *J. turcomanica* (*Cupressaceae*)," *Phytologia* 86, no. 2 (2004): 49-53; Robert P. Adams, Julie A. Morris, Ram N. Pandey, Andrea E. Schwarzbach, "Cryptic speciation between *Juniperus deltoides* and *Juniperus oxycedrus* (Cupressaceae) in the Mediterranean," *Biochemical Systematics and Ecology* 33, no. 8 (2005): 771-787; Robert P. Adams, "Morphological comparison and key to *Juniperus deltoides* and *J. oxycedrus,*" *Phytologia* 96, no. 2 (2014): 58-62.

[31] The beginning of the text (first five lines of the main text, excluding the rubric title) on f. 251 can be transcribed as follows: κέδρος | δένδρον ἐστὶν μέγα ἐξ οὗ λεγομένη κεδρία συνάγεται. καρπὸν | δὲ ἔχει ὥσπὲρ κυπαρίσσου· μακρότερον μέντοι παρα πολυ| γενεται [γεννᾶται] δὲ καὶ ἄλλη κέδρος μικρὰ ἀκανθώδης ὥσπερ ἄρ|κευθος φέρουσα μέγεθος μύρτου περιφερή. [...]

[32] The Greek *kedros* (κέδρος) can apply not only to several different junipers, but also to cedars. *LSJ*, s.v. κέδρος.

[33] *MM* 1.77: κέδρος δένδρον ἐστὶ μέγα, ἐξ οὗ ἡ λεγομένη κεδρία συνάγεται. καρπὸν δὲ ἔχει ὥσπερ κυπάρισσος, μικρότερον μέντοι παρὰ πολύ. γεννᾶται δὲ καὶ ἄλλη κέδρος μικρά, ἀκανθώδης, καρπὸν δὲ ὥσπερ ἄρκευθος φέρουσα, μέγεθος μύρτου, περιφερῆ. τῆς δὲ κεδρίας ἀρίστη ἡ παχεῖα καὶ διαυγής, εὔτονος, βαρεῖα τῇ ὀσμῇ, ἀποχεομένη τε κατὰ σταλαγμοὺς ἐπιδιαμένουσα καὶ μὴ διαχεομένη.

cypress.[34] The manuscript's makers clearly understood the big *kedros* to be cedar, in both the text and picture, while the small, thorny *kedros* on the right is likely a juniper, possibly more narrowly identifiable as *Juniperus phoenicea* L., due to its yellow fruit.[35]

The above examples demonstrate the complex relationship between the edition of the text and the compilation of illustrations. Both the text and the pictures were used to expand and, at times, clarify the text, sometimes leading the makers to identify plants that were different from what Dioscorides himself had in mind. As a result, the number of plants covered by the text probably tended to grow over time. Occasional mistakes, such as the mislabeling of *kedrides* as *daphnē hetera*, were identified and rectified. This complex process of copying, reworking, and editing reflect the makers' attempt to create an edition of the work as informative and as encompassing of the natural world as possible.

The D2 Group

A second group of illustrations, D2, contains more extant illustrations in Book IV (n=26).[36] D2 group pictures tend to show trees more proportionally with a greater emphasis on the trunk and its modeling. The roots, though not always represented, are typically tangled, short and wavy. The D2 depictions of trees vary in their approach to foliage. Some of pictures, such as that of the small *kedros* (fig. 4.24), show denser foliage with darker colors blocking out the background in a

[34] The beginning of the text (first five lines of the main text, excluding the rubric title) on f. 251 can be transcribed as follows: κέδρος | δένδρον ἐστὶν μέγα ἐξ οὗ λεγομένη κεδρία συνάγεται. καρπὸν | δὲ ἔχει ὥσπὲρ κυπαρίσσου· μακρότερον μέντοι παρα πολυ| γενεται [γεννᾶται] δὲ καὶ ἄλλη κέδρος μικρὰ ἀκανθώδης ὥσπερ ἄρ|κευθος φέρουσα μέγεθος μύρτου περιφερή.

[35] Cp. Lily Beck's translation, which identifies the smaller *kedros* as *Juniperus communis* L., Dioscorides, *De materia medica*, trans. Beck, 60. Dioscorides does not in fact mention the color of this juniper's fruit, but rather compares them to the berries of a myrtle (*myrtos*, μύρτος, i.e., *Myrtus communis* L.), and to those of another juniper called *arkeuthos* (ἀρκευθος). The beginning of the text (first five lines of the main text, excluding the rubric title) on f. 251 can be transcribed as follows: κέδρος | δένδρον ἐστὶν μέγα ἐξ οὗ λεγομένη κεδρία συνάγεται. καρπὸν | δὲ ἔχει ὥσπὲρ κυπαρίσσου· μακρότερον μέντοι παρα πολυ| γενεται [γεννᾶται] δὲ καὶ ἄλλη κέδρος μικρὰ ἀκανθώδης ὥσπερ ἄρ|κευθος φέρουσα μέγεθος μύρτου περιφερή. [...] Dioscorides elsewhere describes the *arkeuthos* as having yellow fruit, and it seems possible that the depiction here is influenced by that comparison or was meant to actually depict the *arkeuthos* (*MM* 1.75).

[36] *ebenos* (ἔβενος, ἔβανος in title, ebony or persimmon, *Diospyrus* spp., f. 264), *krania* (κρανία, cornelian cherry, *Cornus mas*, f. 249r), *kedros* (κέδρος, cedar and juniper, likely *Cedrus libani* and *Juniperus phoenicea*, f. 251v), *kynosbaton* (κυνόσβατον in title, i.e., κυνόσβατος, evergreen rose, *Rosa sempervirens*, f. 252v, *MM 1.94*), *kyprion dendron* (κύπριον δένδρον, i.e., κύπρος, henna, *Lawsonia inermis*, f. 252v), *kerataia* (κεραταία, carob, *Ceratonia siliqua* L., f. 253v), *kokkymēlea* (κοκκυμηλέα, plum tree, *Prunus domestica*, f. 254r, *MM* 1.121), *komaros* (κόμαρος, strawberry-tree, *Arbutus unedo*, f. 254r, *MM* 1.122), *lykion* (λύκιον, Dyer's Buckthorn, *Rhamnus* spp., f. 255v, *MM* 1.100), *lōtos* (λωτός, nettle tree, *Celtis australis* L., f. 256v, *MM* 1.117), *melia* (μελία, manna or flowering ash, *Fraxinus ornus*, f. 257r, *MM* 1.80), *myrikē* (μυρίκη, tamarisk, *Tamarix tetrandra*, f. 257r, *MM* 1.87), *melimela* (μελίμελα, jenneting or summer apple, *Pyrus praecox* or *Malus praecox*, or apple grafted on quince [s.v. μελίμελα, *LSJ*, 1097], f. 257r, *MM* 1.115), *mespēlaia* (μεσπηλαία, i.e., μέσπλιον, medlar, *Mespilus germanicus* L., f. 259v, *MM* 1.118), *mēlakydōnia* (μηλακυδωνία, i.e., μηλοκυδώνια, quince, *Cydonia oblonga*, f. 260r, *MM* 1.115), *oxyakantha* (ὀξυάκανθα, firethorn, *Cotoneaster pyracantha* (*LSJ*), or *Pyracantha coccinea*, f. 261r, *MM* 1.93), *paliouros* (παλίουρος, Christ's thorn, *Paliurus australis* or *P. spina-christi*, f. 262r, *MM* 1.92), *persika mēla* (περσικὰ μήλα, peach, *Prunus persica*, f. 262v, *MM* 1.115), *pitys* (πίτυς, some kind of pine, *Pinus* spp., f. 263v), *rhous dendron* (ῥοῦς δένδρον, sumac, *Rhus coriaria* L., f. 264v), *sykomorea* (συκομορέα, sycamore fig, *Ficus sycamorus* L., f. 266r, *MM* 1.127), *schinos* (σχῖνος, mastic, *Pistacia lentiscus*, f. 266v, *MM* 1.70), *terebinthos* (τερέβινθος, i.e., τέρμινθος, terebinth, *Pistacia terebinthus*, f. 267v, *MM* 1.71), *phillyrea* (φιλλυρέα, i.e., φιλυρέα, mock privet, *Phillyrea medi*, f. 268r, *MM* 1.96), *phoinix ho aigyptios* (φοίνιξ ὁ αἰγυπτιος, "Egyptian" date palm, *Phoenix dactylifera*, f. 268v, *MM* 1.109), *phoinix thibaikos* (φοίνιξ θιβαικός, "Theban" date palm, *Phoenix dactylifera,* f. 269r, *MM* 1.109)

circular or elliptical area. Branches and leaves are indicated in lighter colors, and further defined with highlights and dark outlines. Other pictures, including that of the big *kedros* allow the viewer to see through the foliage to the blank ground. These "openwork" trees might also indicate denser foliage with a small background, as in the illustration of *terebinthos* (τερέβινθος, i.e., terebinth, *Pistacia terebinthus* L., f. 267v, fig. 4.25).

Members of the D2 group often share compositional similarities that speak to a similar approach originating with a rough sketch of a tree. The small *kedros* (f. 254r), *kynosbaton* (f. 254r, fig. 4.26), and *lykion* (f. 255v, fig. 4.27) are all similarly composed. In them, the painter likely first sketched a trunk with three divisions leading up to a dense ball of vegetation. He or she then blocked in the main areas and added details to the picture. This approach to depicting trees in the D2 group is similar to those used for trees in the roughly contemporary manuscript of the Paris Gregory (e.g., Paris, Bibliothèque nationale de France, gr. 510, f. 87v, fig. 4.28). We can suppose that the artist first made a basic sketch, blocked in masses with darker colors, and then added lighter colors and modeling. Although the trees are stylistically distinct, especially in their treatment of the foliage, the basic approach is similar to that used in the D2 group.

The D2 group has clear parallels with representations of trees in late antique art. The trees with denser foliage find clear antecedents in the trees depicted in the mid-sixth century conch mosaic from Sant'Apollinare in Classe (fig. 4.29) or an early fifth century mosaic from the villa of Dominus Iulius near Carthage (fig. 4.30). "Openwork" trees parallel the depiction of trees in the late fifth- or early sixth-century mosaic pavement from the narthex of the large basilica at Heraclea Lyncestis (fig. 4.31) near present-day Bitola in the Republic of North Macedonia.[37] That these approaches to depicting trees follow late antique precedents does not, however, necessarily mean that the D2 group goes back to late antique models. Such representations of trees, rooted in late antique artistic traditions, may have been fairly common in Middle Byzantine Constantinople. For example, the continuation of the Theophanes chronicle records that the emperor Theophilus (r. 829-842) had the so-called Kamilas pavilion at the Great Palace decorated with golden mosaics showing greenery and trees.[38] Elsewhere, the historian adds that the "the upper part has gold mosaic representing figures picking fruit."[39] The Kamilas pavilion mosaics may have resembled those of the early eighth-century at the Great Mosque of Damascus (fig. 4.32).

Some depictions in the D2 group appear to be fairly accurate. The depictions of *kerataia* (κεραταία, carob, *Ceratonia siliqua* L., f. 253v, fig. 4.33), *lōtos* (λωτός, the nettle tree, *Celtis australis* L., f. 256v), *mespēlaia* (μεσπηλαία, i.e., μέσπιλον, medlar, *Mespilus germanica* L., f. 259v, fig. 4.34), *mēlokydōnia* (μηλοκυδώνια, quince*, Cydonia oblonga* Mill., f. 260r), *persika mēla* (περσικὰ μήλα, peach, *Prunus persica* Stokes, f. 262v), and *kokkymēlea* (κοκκυμηλέα, plum, *Prunus domestica* L., f. 254r) accurately portray the fruit, leaf shape, and occasionally the clustering of leaves (e.g., f. 259v, fig. 4.34). The most accurate depictions in the D2 group are of trees that would have been more familiar to contemporaries in and around ninth- and tenth-

[37] On the mosaic, Gordana Cvetoković Tomašević, *Heraclea III*: *Mosaic Pavement in the Narthex of the Large Basilica at Heraclea Lyncestis* (Bitola: Novi Dani, 1967).

[38] Trans. by Cyril Mango, *The Art of the Byzantine Empire, 312-1453: Sources and Documents* (Toronto: University of Toronto Press, 1986), 164; *Theophanes Continuatus* 145.16-18, ed. Bekker: τὸν μὲν ἀέρα ἐκ χρυσοειδῶν ψηφίδων ὅλως κατηγλαϊσμένον φέρον, δένδρα δέ τινα καὶ ποικίλματα ἐκ πρασίνων ἔχοντα τὸ λεῖπον ψηφίδων ἀναπληρούμενον.

[39] Mango, *Art of the Byzantine*, 163; *Theophanes Continuatus,* 145.2-3, ed. Bekker: τὰ δ' ἄνω ἐκ χρυσοαυγῶν ψηφίδων ἀγάλματά τινα τρυγῶντα καρπούς.

century Constantinople.[40] A notable exception, however, is the carob tree, *kerataia* (κεραταία, i.e., κεράτια [=κερατωνία], *Ceratonia siliqua* L., f. 253v, fig. 4.33), which, although commonly found in southern Anatolia and in the Near East, is less suited to the cooler climate of Constantinople.[41] While the depiction of carob is accurate in capturing the shape of its pods, the rest of the plant appears fairly generic. It is possible that carob bean pods were available at markets in Constantinople, although the plant itself does not grow there.

Other illustrations in the D2 group appear to be based entirely on the description of the plant given by the text. The picture of the evergreen rose, *kynosbaton* (κυνόσβατον, i.e., κύνοσβατος, *Rosa sempervirens,* f. 252v, fig. 4.26) shows what should be a shrubby, climbing rose as a thorny tree with a wide trunk. The miniscule white flowers and thorns were probably supplied by the text.[42] Similarly, the depiction of the sumac tree, *rhous dendron* (ῥοῦς δένδρον, *Rhus coriaria* L., f. 264v, fig. 4.35) shows its fruit hanging down at the bottom like grapes, whereas the actual tree has its fruit at the top of the plant. The text gives a detailed description of the fruit—" fruit is like grape clusters, close-packed, corresponding in size to the fruit of the terebinth tree, and somewhat flat"—, but does not specify where on the tree the fruit is found.[43] In both the depiction of the *rhous* and *kynosbaton*, it seems likely that the painter based the picture off the description of the plant in Dioscorides.

The D3 Group

A third group of pictures, D3, accounts for about one fifth of the pictures (n=14) in the fourth book.[44] The D3 group tends to emphasize the depiction of leaves and fruits, at various stages of

[40] Although I have not found evidence of the nettle tree (*lōtos*) in Byzantium in Byzantine times, it does grow in the region. Demetrios Kydones sent the empress Helena Kantakouzene Palaiologina medlar fruits from his garden (letter dated ca. 1374-1375), see Demetrios Kydones, *Démétrius Cydonès, Correspondance*, ed. R.-J. Loenertz, 2 vols., *Studi e Testi* 186 and 208 (Vatican City, 1956–60), letter 143; English translation by Frances Kianka, "The Letters of Demetrius Kydones to the Empress Helena Kantakouzene Palaiologina," *Dumbarton Oaks Papers* 46 (1992): 155-164, here 160. Quince (*mēlokydōnia*) and peach (*persika mēla*) both appear in the *Porikologos*. Plums (*kokkymēlea*) also grow in the region.

[41] Güven Şahin and Nuran Taşlıgil, "Agricultural Geography Analysis of Carob Tree (*Ceratonia siliqua* L.) from Turkey," *Turkish Journal of Agriculture: Food Science and Technology* 12, n. 4 (2016): 1192-1200. On carob trees in Near Eastern monasteries, see See Alice-Mary Talbot, "Byzantine Monastic Horticulture: The Textual Evidence" in *Byzantine Garden Culture*, ed. Antony Littlewood, Henry Maguire, and Joachim Wolschke-Bulmahn (Washington, DC: Dumbarton Oaks, 2002), 37-67, at 52.

[42] The text in the Morgan Dioscorides is similar to Wellmann's edition (*MM* 1.94). The text on f. 252v reads: κυνόσβατον οἰδὲ ὀξοιάκανθον καλοῦσιν θάμνος ἐστι | βάτου πολλῶ μείζον, δενδρώδης. φύλλα φέρων πλατύ-| τερα μυρσίνης· ἀκανθα στε(?) περὶ ταῖς ράβδοις | ἰσχυρᾶς, ἄνθος λευκὸν, καρπὸν ἐπιμηκη πυριας εοικό-| τα ἐν τῶ παπένεσθαι πυρρὸν τὰ δὲ ἐντὸς ἐριώδη· ἵστη-| σιν δὲ κοιλίαν ὁ καρπὸς ξηρός δίχα τοῦ ἐν αυτῶ ἐριω-| δους κακοτικὸν γὰρ τῆς ἀρτηρίας τοῦτο ἀποζεννύμε-| νον ἐν οἴνω καὶ πινόμενον. Wellmann's edition: κυνόσβατος· οἱ δὲ ὀξυάκανθαν καλοῦσι. θάμνος ἐστὶ βάτου πολλῷ μείζων, δενδρώδης. φύλλα φέρει πλατύτερα μυρσίνης, ἄκανθαν δὲ περὶ ταῖς ῥάβδοις ἰσχυράν, ἄνθος λευκόν, καρπὸν ἐπιμήκη, πυρῆνι ἐλαίας ἐοικότα, ἐν τῷ πεπαίνεσθαι πυρράν, τὰ δὲ ἐντὸς ἐριώδη. ἵστησι δὲ κοιλίαν ὁ καρπὸς ξηρὸς δίχα τοῦ ἐν αὐτῷ ἐριώδους—κακωτικὸν γὰρ τῆς ἀρτηρίας τοῦτο—ἐν οἴνῳ ἀποζεννύμενος καὶ πινόμενος.

[43] The relevant text from f. 264v the Morgan Dioscorides reads: ἐστὶν δὲ δενδρυφιον, φυόμενον ἐμπέτραις, ὡς | δίπηχυ, ἐφ' οὗ φύλλα ἐπιμηκὴ, ὑπέρυθρα, τὴν περιφέριαν | ἐντετμημένα πριονοειδῶς· καρπὸς δὲ βοτρυδίοις ἐοικώς, πυκνός, κατὰ μέγεθος τερμίνθου, ὑπόπλατυς, ὡς τὸ περικείμενον φλοῶδές ἐστιν εὔχρηστον. The text is similar to Wellmann's edition (*MM* 1.108): ἔστι δὲ δενδρύφιον, φυόμενον ἐπὶ πέτραις, ὡς δίπηχυ, ἐφ' οὗ φύλλα ἐπιμήκη, ὑπέρυθρα, τὴν περιφέρειαν ἐντετμημένα πριονοειδῶς· καρπὸς δὲ βοτρυδίοις ἐοικώς, πυκνός, κατὰ μέγεθος τερμίνθου, ὑπόπλατυς, οὗ τὸ περικείμενον φλοιῶδές ἐστιν εὔχρηστον.

[44] *Amygdalis pikra* (ἀμύγδαλις πικρά, bitter almond, *Prunus amygdalus* (L.) Batsch or *Prunus dulcis* var. *amara* DC, f. 243v), *daphnē* (δάφνη, bay laurel, *Laurus nobilis* L., f. 245v), *eitea* (εἰτέα, willow, *Salix alba*, f. 246v), *elaia agria*

development, as in the depiction of cherry (*kerasea,* κερασέα, *Prunus avium* L., f. 253v, fig. 4.36), hazelnut (*karya pontika,* κάρυα ποντικά, *Corylus avellana* L., f. 255r, fig. 4.37), or mulberry (*morea*, μορέα, *Morus nigra* L., or *M. alba* L., f. 259v, fig. 4.38). While most leaves appear flattened out to show the upper side and the leaf shape, a few leaves appear to curve or twist, revealing their undersides. The main trunk and the branches of the plant are often relatively thin. The roots are typically lighter in color, long, sinuous, and thick when compared to the trunk, with an occasional dark line defining the outer contour. There is more modeling of the leaves, trunk and branches, and the palette is more expansive than in the E group. In general, the leaves and fruit appear as though they were applied to a schematic frame, and adjusted as necessary to match basic features of the plant's anatomy.[45] The depiction for *strobylea* (στροβυλέα, probably stone or umbrella pine, *Pinus pinea* L., f. 269v, fig. 4.39) is particularly detailed: it shows the pine's needles growing in sheathed pairs, and indicates three different strobili (cones): small pollen-bearing male strobili at the end of the branches, immature female strobili, and the large woody mature cones.[46]

The emphasis on the roots, fruits and leaves in the D3 group may reflect how contemporaries thought about plants. The fruit was regarded as a plant's *telos*, its aim or purpose. In *On the Generation of Animals*, Aristotle claims that plants existed only to produce seeds.[47] His successor, Theophrastus, although less teleological in his thinking, still devoted considerable attention to the maturation and development of fruit.[48] On the other hand, roots and leaves played an important role in identification. Dioscorides, in his descriptions of plants, typically emphasizes the leaves and roots of the plants, but not their flowers.[49] By ignoring flowers and other identifying features such as bark, while emphasizing leaves and fruits, the D3 group emphasizes the distinguishing details that contemporaries regarded as necessary for the identification and understanding of the tree in question.

Despite the schematic or diagrammatic quality of the D3 group illustrations, their depictions of the leaves and fruits of the trees are fairly accurate. The accuracy of the pictures in the D3 might provide evidence of depiction based on the direct observation of nature. The chapters accompanying the D3 group could not have supplied most of the details depicted. None

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(ἐλαία ἀγρία, oleaster, *Olea europaea* L., var. *sylvestris,* or *Olea oleaster* f. 247r), which may have been repaired at a later point, *kerasea* (κερασέα, cherry, *Prunus avium* L., f. 253v), *karya basileika* (κάρυα βασιλεικά, walnut, *Juglans regia* L., f. 254v), *karya pontika* (κάρυα ποντικά, hazelnut, *Corylus avellana* L., f. 255r), *leukē* (λεύκη, white poplar, *Populus alba*, f. 255r), *mēlea* (μηλέα, apple, *Malus* spp., f. 257v), *myrsinē* (μυρσίνη, myrtle, *Myrtus communis* L., f. 258v), *morea* (μορέα, mulberry, *Morus nigra* L., or *Morus alba* L., f. 259v).

[45] Several illustrations in D3 group, nevertheless, depart from the other pictures in that group. The chapter on cypress (κυπάρισσος, *Cypressus sempervirens* L., f. 251v) gives two different illustrations: the one on the left appears to indicate the dense foliage of the plant by blocking in a darker background, this approach is more common among the D2 group (see below). The unusually thick trunk of *ptelea*, i.e., elm (πτελέα, *Ulmus glabra*, f. 261v), contrasts with the relatively thin trunks of the other trees depicted in this group. The *pistakea* (πιστακέα, pistachio, *Pistacia vera*, f. 263r) and the *platanos* (πλατάνος, plane tree, *Platanus orientalis* L., f. 261v) are both badly worn, so it is hard to say if they belong to the D3 group.

[46] There may have been some interchangeability between the term *strobilos* and *pitys*. In the *Suda*, *strobilea* is listed as an alternate name for *pitys*. *Suda*, s.v. πίτυς. The roundness of the cones in the depiction from the Morgan Dioscorides could indicate the plant is *P. pinea*, which was widely introduced throughout the Mediterranean and is today the main source for pine nuts. That Dioscorides compares the nut of the pistachio to that of the *strobilos* pine (see *MM* 1.124) most likely means he was referring to *P. pinea*. Although also edible, the seeds of *P. halepensis*, the zgou zgou of Tunisian cuisine, are smaller than those of *P. pinea*.

[47] Aristotle, *De generatione animalium,* 1.23, 731a25-26.

[48] See Totelin and Hardy, *Ancient Botany*, 147; Theophrastus, *De causis*, 1.21.1.

[49] Totelin and Hardy, *Ancient Botany*, 110-111; Touwaide, "Art and Science," 42.

of the texts associated with the D3 group pictures include substantial descriptions of the leaves and fruits of the plants.[50] The chapters on both willow and mulberry even add that they are "known to all."[51] We can be reasonably certain that most of the D3 group plants would have been familiar to contemporary Constantinopolitans.[52] Many of the plants were widely cultivated and available as foodstuffs in the local diet and regional economy of Constantinople: apple (*mēlea*, f. 257v), mulberry (*morea*, f. 259v), walnuts (*karya basileika,* f. 254v), hazelnuts (*karya pontika*, f. 255r), cherries (*kerasea*, f. 253v), and, perhaps less common pistachio (*pistakea*, f. 263r) and bitter almond (*amygdalis pikra*, f. 243v).[53] Oleaster or wild olive (*elaia agria*, f. 247r) may have also been familiar.[54] Laurel (*daphnē*, f. 245v), myrtle (*myrsinē,* f. 258v), and cypress (*kyparissos*, f. 251r) were commonly planted as ornamentals.[55] Myrtle berries were also apparently eaten.[56] Cypress, ubiquitous throughout the Mediterranean basin, was commonly used to form hedge walls and barriers.[57] Willow (*eitea*, i.e., *itea*, f. 246v), white poplar (*leukē*, f. 255r), elm (*ptelea*, f. 261v), and *strobilos* pines (*strobylea,* f. 269v, likely stone or umbrella

[50] The closest a text associated with a D3 picture gets to a description is the chapter on laurel, which distinguishes between two varieties: one with narrow leaves, another with wide leaves. See f. 245v: ἡ μέν τις ἐστιν λεπτόφυλλος ἡδὲ πλατυτέρα.

[51] For willow, see f. 246v, in the first line: Δένδρον ἐστὶν πᾶσιν γνώριμον; for mulberry, see f. 259v, in the first line: Μορέα ἡ συκάμινος δένδρον ἐστὶν πᾶσιν γνώριμον.

[52] Although the climate and varied terrain of Constantinople is amenable a large number of plant species, it is difficult to determine what plants would have actually been familiar to locals at that time. There are limited archaeological and palynological studies related to Constantinople itself. Contemporary sources can be unreliable because they sometimes follow earlier textual sources written with other cities and regions in mind. For USDA plant hardiness zone maps and plant heat zone maps of Turkey, see Osman Yalçın Yılmaz and Doğanay Tolunay, "Distribution of the Major Forest Tree Species in Turkey within Spatially Interpolated Plant Heat and Hardiness Zone Maps," *iForest* 5 (2012): 83-92.

[53] *mēlea* (μηλέα, apple, *Malus* spp., f. 257v), *amygdalis pikra* (ἀμύγδαλις πικρά, bitter almond, *Prunus amygdalus* (L.) Batsch or *Prunus dulcis* var. *amara* DC, f. 243v), *morea* (μορέα, mulberry, *Morus nigra* L., or *Morus alba* L., f. 259v), *karya basileika* (κάρυα βασιλεικά, walnut, *Juglans regia* L., f. 254v), *karya pontika* (κάρυα ποντικά, hazelnut, *Corylus avellana* L., f. 255r), *kerasea* (κερασέα, cherry, *Prunus avium* L., f. 253v). Monasteries in Greece frequently planted apples, mulberries, and cherries. See Talbot, "Byzantine Monastic Horticulture," 37-67. Walnut is considered an anthropogenic indicator in palynological studies of the Balkans and Anatolia, see Adam Izdebski, Grzegorz Koloch, and Tymon Słoczýnski, "Exploring Byzantine and Ottoman Economic History with the Use of Palynological Data: A Quantitative Approach," *Jahrbuch der österreichischen Byzantinistik* 65 (2015): 67-109, esp. 83, 86. On Byzantine moriculture and sericulture, see Anna Muthesius, "From Seed to Samite: Aspects of Byzantine Silk Production," *Textile History* 20, no. 2 (1989): 135-149; eadem, "Crossing Traditional Boundaries: Grub to Glamour in Byzantine Silk Weaving," *Byzantine and Modern Greek Studies* 15, no. 1 (1991): 326-365; George C. Maniatis, "Organization, Market Structure, and Modus Operandi of the Private Silk Industry in Tenth-Century Byzantium," *Dumbarton Oaks Papers* 53 (1999): 263-332.

[54] *elaia agria* (ἐλαία ἀγρία, oleaster, *Olea europaea* L., var. *sylvestris,* or *Olea oleaster* f. 247r). The peculiarly rounded leaves of the *elaia agria* could accurately reflect the fact that some oleasters can have round leaves. The roots of the *elaia agria* are unusually thick and clumsily rendered, and may be the result of a later repair. Constantinople itself is just beyond the zone of olive cultivation. See B. Geyer, "Physical Factors in the Evolution of the Landscape and Land Use," in *Economic History of Byzantium: From the Seventh through the Fifteenth Century,* ed. Angeliki E. Laiou (Washington, DC: Dumbarton Oaks, 2002), 1: 31-45.

[55] *Daphnē* (δάφνη, bay laurel, *Laurus nobilis* L., f. 245v), *myrsinē* (μυρσίνη, myrtle, *Myrtus communis* L., f. 258v), *kyparissos* (κυπάρισσος, cypress, *Cupressus sempervirens* L., f. 251r). For evidence of plantings of these plants in gardens from later literature, see Mary-Lyon Dolezal and Maria Mavroudi, "Theodore Hyrtakenos' *Description of the Garden of St. Anna* and the Ekphrasis of Gardens," in *Byzantine Garden Culture*, Ed. by Antony Littlewood, Henry Maguire, and Joachim Wolschke-Bulmahn (Washington, DC: Dumbarton Oaks Research Library and Collection, 2002), 105-158, here: 117.

[56] *De cibis* 13.

[57] See *Geoponika* 11.5.4, see also Dolezal and Mavroudi, "Theodore Hyrtakenos," 117.

pines) could have also been found in the environs of Constantinople.[58] Depending on the identification of the *strobilos* pine, it may have been cultivated for its resin, which was used for waterproofing and making retsina (today Aleppo pine, *Pinus halepensis*), or, more likely, for its edible nuts (e.g., stone pine, *P. pinea*).[59]

The relative accuracy of the D3 group, the terseness of the texts associated with D3, and the availability of the trees together suggest the pictures in the D3 group were based at least in part on the direct observation of nature. The illustrations may have even been created *ex novo* for the Morgan Dioscorides itself. Their peculiar proportions, large leaves and thin trunks would have made them unsuitable for depicting plants in other media and genres. And, as noted above, there is no evidence to suggest the trees were illustrated in ancient versions of the text.

The D3 group, in fact, bears some resemblance to the depiction of plants in the late-thirteenth *Tractatus de herbis* (London, British Library, MS Egerton 747), which researchers have "repeatedly…singled out as a demonstration of precocious descriptive art, c. 1280-1300."[60] Both the D3 group and the *Tractatus de herbis* have a flattened and diagrammatic quality that emphasizes leaf shape and margin. The two manuscripts are unrelated. Any resemblance between them signals similar priorities and working methods, chiefly a concern with what Givens calls "descriptive" depiction. Yet the D3 group follows many of the conventions of the Alphabetical Dioscorides not observed in the *Tractatus de herbis*, including attention to the roots, stages of growth, the maturation of fruit, as well as the modeling and three dimensionality of the plant. The D3 group represents an entirely Byzantine "descriptive" representation of nature, based on the tradition of the Alphabetical Dioscorides.

Working Methods

The depictions of trees, tree products, and non-trees in Book IV were based on earlier manuscript illustrations, readings of the text, or through observation of actual plants. The painter(s) responsible for the E group may have copied the pictures from an earlier manuscript source such as Ma or simply created them *ex novo*, even *ad libitum* using fairly generic or "stock" imagery. It seems unlikely that D2 and D3 groups could be linked to Cronier's Mc source. If D2 and D3 were copied from the same manuscript source, we would expect them to be more homogeneous, as we see with the E group. Instead, D2 and D3 appear to come from separate sources or were more likely based on actual plants or through a reading of the text.

In both the D3 and D2 groups more familiar species tend to be more accurately depicted. While this finding seems at first glance obvious, it contrasts with the usual view of Byzantine nature depiction. Scholars tend to characterize the bulk of Middle Byzantine nature depiction as

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[58] *Eitea* (εἰτέα, willow, *Salix alba*, f. 246v) and *leukē* (λεύκη, white poplar, *Populus alba*, f. 255r), *ptelea* (πτελέα, elm, *Ulmus glabra* Huds., f. 261v), *strobylea* (στροβυλέα, perhaps stone pine, *Pinus pinea* L., f. 269v). Willow is used for grafting in the *Geoponika* (*Geoponika* 10.76). Dioscorides notes that the tender leaves of the elm could be prepared as a side dish (*MM* 1.84) According to Dioscorides the wood of poplar, both white and black, can be used to grow mushrooms (*MM* 1.181). White poplar appears in the *Geoponika* for rind-grafting mulberry trees (*Geoponika* 10.76), and is recommended for tree-trained vines (*Geoponika* 4.1). *Strobilos* is used for flavoring wine (*Geoponika* 7.20).

[59] On retsina, see Andrew Dalby, *Tastes of Byzantium: The Cuisine of a Legendary Empire* (London: I.B. Taurus, 2003), 88-89. Michael Choniates (ca. 1140-1220) famously complains about having to drink retsina in Athens, see Apostolos Karpozelos, "Realia in Byzantine Epistolography X-XIIc," *Byzantinische Zeitschrift* 77, no. 1 (1984): 20-37, here: 26. On various modern ethnobotanical uses of different members of the *Pinus* genus in Turkey, see Çağla Kızılarslan and Ece Sevg, "Ethnobotanical uses of genus *Pinus* L. (Pinaceae) in Turkey," *Indian Journal of Traditional Knowledge* 12, no. 2 (2013): 209-220.

[60] Givens, *Observation and Image-Making*, 90, see also 82-105, and Collins, *Medieval Herbals*, 239-265.

heavily stylized and imaginative, or as slavishly copied from ancient exemplars.[61] But the depictions of trees in Book IV would suggest that Byzantine painters occasionally depicted nature from observation.

Accepting that the D3 group illustrations were based (at least in part) on the observation of actual plants raises the question of the artist's working methods. The emphasis on leaves and fruit in D3 could suggest that the painter need only have seen parts of the plant, such as a branch. It seems possible that some of the illustrations were based not on entire plants, but perhaps on parts or pieces of plants as encountered, for example, in a market, or collected from a remote site. In other cases, however, the fact that multiple stages of fruit maturation are depicted could suggest the artists' experience with living plants, as encountered in an orchard or garden. The continuation of the chronicle by Theophanes notes that Basil I (r. 867-886) had a garden planted, called the *mesokēpion* (μεσοκήπιον) that abounded "in every kind of plant."[62] While it is unclear what plants were grown there, a variety of different fruit trees would not have been out of place.[63] We also find numerous fruit trees in Nicholas Mesarites' (1164-1216) description of the Church of the Holy Apostles, written ca. 1198-1203.[64] Although his description draws heavily from Libanius's *Oration in Praise of Antioch*, it remains possible that stands of fruit trees might have once surrounded the church.[65]

Although the direct observation of nature played a role in the accurate depiction of some of the trees in the D3 and D2 groups, it is also true that these accurately delineated features were applied to an underlying frame or schema. The artists responsible for the D3 and D2 groups worked by creating and modifying basic schemata, adapting and adding features so that the picture would match the plant in its essential characteristics, either as determined by the text or perhaps by observation and personal experience. Such working methods do not require the existence of a separate manuscript source. It is entirely conceivable that while one artist was tasked with depicting trees that were well known or available, another was tasked with illustrating less familiar ones on the basis of the text alone. The former emulated conventions in the depictions of plants from the Alphabetical Dioscorides. He or she emphasized the fruits, roots, and leaves. The latter, by contrast, appears to have adopted conventions for depicting trees from regular manuscript painting and monumental decorative art.

The D groups may have been executed at more or less the same time during the initial illustration of the manuscript. The E group may have been copied first as it is linked to Ma texts and because it is concentrated in the first gathering. In contrast, the D groups are distributed throughout the gatherings. The artists responsible for the D groups appear to have worked closely together. They may have even imitated each other at times. For example, a D3 painter clearly imitated the D2 painter's use of darker colors to block in dense foliage in the illustration of cypress, while a D2 painter imitated the openwork manner and relatively large leaves and fruit

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[61] See, for example, Maguire, *Nectar and Illusion*, 106-134.

[62] *Theophanes Continuatus*, ed. Bonn, 328.23-329.2: "Παράδεισον ... παντοῖς κομῶντα φυτοῖς,"; trans. Mango, *Art of the Byzantine Empire*, 195.

[63] It may be useful to distinguish large suburban parks for horse riding and hunting from small, enclosed gardens. See Henry Maguire, "Gardens and Parks in Constantinople," *Dumbarton Oaks Papers* 54 (2000): 251-264. On what an enclosed garden might have looked like, see Dolezal and Mavroudi, "Theodore Hyrtakenos' *Description*," 113-121.

[64] See Glanville Downey, "Nikolaos Mesarites: Description of the Church of the Holy Apostles at Constantinople," *Transactions of the American Philosophical Society* 47, no. 6 (1957): 855-924.

[65] Antony R. Littlewood, "Gardens of Byzantium," *The Journal of Garden History* 12, no. 2 (1992): 126-153.

of the D3 group in the illustration of the medlar tree. Several illustrations in Book IV may have also been added later.[66]

Elaboration and Correction

The Morgan Dioscorides also bears evidence of later users changing, perhaps even correcting, earlier plant depictions. For example, several leaves on the sides of the depiction of *elelisphakon* (ἐλελίσφακον, sage, fol. 50r, fig. 4.40) were modified to have lighter, silvery sides, evidently so as to make the leaves match some varieties of common sage that have whitish, silvery undersides.[67] The fact that the later painter did not overpaint all of the leaves could suggest that he or she wanted the illustration to refer to several different kinds of sage, an approach that was later used in the sixteenth century by Leonhart Fuchs for the illustration of several different kinds of deadnettle (*Lamium spp.*, fig. 4.41).[68]

In some cases, later users enlarged and added plant parts. For example, in the depiction of the *geranion* (γεράνιον, a geranium, perhaps *Geranium tuberosum* L., f. 30v, fig. 4.42), someone added an entirely new seedpod, evidently so as to further clarify the bract, pod, pedicel, and persisting sepals. Another leaf was also added with a distinct leaf margin and shape that visibly contrasts with the other leaves. This stalked pinnate leaf with deeper sinuses and obtuse lobes could refer to the leaves of another geranium entirely, such as *G. robertianum* L. a widespread, weedy plant.[69] Such modifications could suggest that a later user attempted to "correct" the earlier illustration or make it encompass more varieties of geranium. Similarly, in the depiction of "another geranium" (*geranion heteron,* γεράνιον ἕτερον, another geranium, f. 31r, fig. 4.43) someone painted over all of the leaves, enlarging and giving them deeper sinuses throughout. This person also added two entirely new leaves. These additions are not clearly related to the text; rather, it seems possible that they reflect an attempt to make the miniature resemble the actual leaves of some geraniums.

In other cases, sometimes parts of an illustration were later removed. In the depiction of *bounion* (βούνιον, earthnut?, f. 16r, fig. 4.44), a later user painted over or "whited out" hairs or thorns evidently so that the stem would appear to be smooth.[70] The earlier depiction of *chamaiaktē* (χαμαιάκτη, probably elder, *Sambucus ebulus* L., f. 195v, fig. 4.45) appears to have been deemed so unacceptable that it was washed off entirely and repainted. Here subsequent

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[66] E.g., *kedrides*, juniper. The position of the laurel illustration and the title beside it suggest that both preceded the *kedrides* illustration. The *kedrides* picture does not stylistically match other illustrations in Book IV, although it has some things in common with the D3 group.

[67] I thank Dominic Olariu for this insight.

[68] Leonhart Fuchs, *De historia stirpium commentarii insignes* (Basel, 1542), 469.

[69] *G. robertianum* has documented medicinal usages going back to the thirteenth century, see Geoffrey Grigson, *An Englishman's Flora* (London: Phoenix House, 1955); Peter F. Yeo, *Hardy Geraniums*, 2nd ed. (Portland, Ore.: Timber Press, 2002 [2001]), 9; and H. Gams, "Geraniaceae," in G. Hegi, *Illustrierte Flora von Mittel-Europa*, 1st ed., *IV* (3) (Munich: Carl Hanser, 1923/1924), 1656-1725. For modern ethnobotanical uses of the herb (for treating male sterility), see Sulejman S. Redzić, "The Ecological Aspect of Ethnobotanny and Ethnopharmacology of Population in Bosnia and Herzegovina," *Collegium Antropologicum* 31, no. 3 (2007): 869-890, at 887. On its anti-inflammatory properties, see Marcelo D. Catarino, Artur M.S. Silva, Maria Teresa Cruz, and Susana M. Cardoso, "Antioxidant and Anti-Inflammatory Activities of *Geranium robertianum* L. decoctions," *Food & Function* 8, no. 9 (2017): 3355-3365.

[70] *LSJ* gives *bounion* (s.v. βουνιον) as *Bunium ferulaceum* Sibth. & Sm., Mazal gives it as *Bunium pumilum* Sm., now synonymous with *Geocaryum pumilum* Nyman. But both of these plants are in the Apiaceae family with prominent umbels, which do not match the picture in the Alpahbetical Dioscorides. The Alphabetical Dioscorides lists *scopa regia* as a Latin synonym, also in *NH* 21.15, and which Sprengel identifies with *Chenopodium scoparia.*

artists or users of the codex "corrected" illustrations. These subsequent modifications and "corrections" are restricted to pictures visually similar to those of the Alphabetical Dioscorides. In other words, the later users of the Morgan Dioscorides did bother correcting E group pictures. So while subsequent users continued to critically engage with the A and D groups, they generally ignored the E group.

The Morgan Dioscorides in Context

These practices of compilation, correction and expansion in the Morgan Dioscorides may have been ongoing since antiquity. Indeed the compilation of pictures in the Ma source suggests that patterns of pictorial compilation observed in the Morgan Dioscorides had earlier antecedents. That the Naples Dioscorides was produced in the seventh century, and the Old Paris Dioscorides in the eighth speaks to the ongoing production of medical texts and illustrated herbals at a high level in the midst of a period often characterized by its relatively low literary output.[71] The late ninth-century may have seen an intensification of such activities in relation to a larger movement alternately described by Paul Lemerle as "encyclopédisme" and by Paolo Odorico as "cultura della *syllogē*."[72] At the same time, we should not confuse textual with pictorial compilation. In the Morgan Dioscorides, pictures were used to expand, elaborate, and define the botanical tradition. Pictures operate as a source of visual knowledge that stands partly outside of the text. In addition to this broader intellectual movement within Byzantium, a number of other cultural, social and intellectual shifts in the ninth century may have also contributed to the production of a deluxe illustrated manuscript such as the Morgan Dioscorides.

The relative calm of the ninth century enabled regional development and stabilization. Such conditions would have been favorable to the increasingly diversified and specialized cultivation of plants in the environs of Constantinople. Basil I's planting of the *mesokēpion* may be emblematic of imperial support for the intensive cultivation of a wide variety of plants. While the phrase "abounding in every kind of plant" (παντοῖς κομῶντα φυτοῖς) used in the continuation of Theophanes Chronicle to describe the garden should be taken with a grain of salt, it is entirely possible that a large variety of plants were grown there. Basil I's *mesokēpion* may have been a Byzantine response to the garden estates of the Islamic world. In 756, for example, the Umayyad emir of al-Andalus ʿAbd al-Raḥmān I (r. 756-788) had the Munya al-Ruṣāfa planted outside of Córdoba. He had this large garden estate filled with rare and exotic plants.[73] Similar gardens were also planted in Abbasid Baghdad and Samarra. Botanical knowledge and gardening go hand in hand. By the mid-tenth century we find the compilation of the *Geoponica* farming manual.[74]

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[71] See the discussion in Maria Mavroudi, "The Naples Dioscorides," in *Byzantium and Islam. Age of Transition. Catalogue of the Exhibition at the Metropolitan Museum of Art*, ed. Helen Evans and Brandie Ratliff (New Haven: Yale University Press, 2012), 22-26.

[72] Paul Lemerle, *Le premier humanisme byzantin. Notes et remarques sur enseignement et culture à Byzance des origines au Xe siècle* (Paris: Presses universitaires de France, 1971), 266. Translated into English: *Byzantine Humanism: The First Phase. Notes and Remarks on Education and Culture in Byzantium from Its Origins to the 10th Century*, trans. by Helen Lindsay and Ann Moffatt (Canberra: Australian Association for Byzantine Studies, 1986), and criticism: Paolo Odorico, "La cultura della Συλλογή," *Byzantinische Zeitschrift* 83 (1990): 1-21.

[73] D. Fairchild Ruggles, *Gardens, Landscape, and Vision in the Palaces of Islamic Spain* (University Park, Penn.: Pennsylvania State University Press, 2000), 42-45.

[74] See Andrew Dalby, trans. *Geoponica. Farm Work. A Modern Translation of the Roman and Byzantine Farming Handbook* (Totnes, Devon: Prospect Books, 2011). See also Robert Rodgers, "Κηποποϊα: Garden Making and Garden Culture in the *Geoponika*," 159-176, in Antony Littlewood, Henry Maguire, and Joachim Wolschke-

Interest in Dioscorides may have also grown in response to the Greek-Arabic Translation Movement. Dioscorides was one of the Greek scientific works translated into Arabic under the auspices of the Abbasids as part of a broader project of appropriating (pagan) Greek sciences.[75] Illustrated copies of Dioscorides' *De materia medica* may have played a role in the back and forth between the Byzantine, Abbasid, and Umayyad courts in laying claim over these sciences. In his *History of Physicians*, Ibn Abī Uṣaybiʿa quotes Ibn Juljul's report that a Byzantine emperor named Armāniyūs / Mārinūs, perhaps Romanos I Lekapenos (r. 920-944) or Romanos II (r. 959-963), sent an illustrated Dioscorides to the Umayyad ruler ʿAbd al-Raḥman III (r. 929-961). No one was evidently available in Córdoba to make sense of the book, so Romanos sent a monk named Nicholas (Niqōlā) to aid with the identification of the plants.[76] At that time, the Isṭifān-Ḥunayn translation of Dioscorides, patronized by the Abbasids, would have been the main Arabic translation available. Yvette Hunt suggests that ʿAbd al-Raḥmān III's request may have been intended to show the insufficiency of the Abbasid translation of Dioscorides.[77] At the same time we should not rule out the possible sincerity of the request. Maria Mavroudi points out that the main difficulty with Dioscorides in this period would have been the identification of plants according to their ancient names, so we can suppose then that Nicholas would have also had considerable pharmacological expertise.[78] The correct identification of plants apparently often stumped even experienced Byzantine physicians. In a brief letter by the Patriarch Photios to Zacharias, metropolitan of Chalcedon, the patriarch complains about contemporary physicians' erroneous identifications of plant.[79] The epistle gives a window into the kinds of concerns that could have motivated the creation of the Morgan Dioscorides.[80] The difficulty of matching

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Bulmahn, eds., *Byzantine Garden Culture* (Washington DC: Dumbarton Oaks Research Library and Collection, 2002).

[75] Dimitri Gutas, *Greek Thought, Arabic Culture: The Graeco-Arabic Translation Movement in Baghdad and Early Abbasid Society, 2nd-4th/8th-10th Centuries* (New York: Routledge, 1998). On Byzantine reactions, see Ibid, 175-186. On the translation of Dioscorides into Arabic, see Saliba and Komaroff, "Illustrated Books," 6-65; and Manfred Ullmann, *Untersuchungen zur arabischen Überlieferung der Materia medica des Dioskurides* (Wiesbaden: Harrassowitz, 2009).

[76] See Franz Rosenthal, *The Classical Heritage of Islam* (Berkeley: University of California Press, 1975), 194-197; and Maria Mavroudi, *A Byzantine Book on Dream Interpretation: The Oneirocriticon of Achmet and Its Arabic Source* (Leiden: Brill, 2002), 415-417; on the difficulty identifying the Byzantine ruler involved in the exchange, see Mavroudi, *A Byzantine Book*, 416.

[77] Yvette Hunt, "Bang For His Buck: Dioscorides as a Gift of the Tenth-Century Byzantine Court," in *Byzantine Culture in Translation*, ed. Amelia Robertson Brown and Bronwen Neil (Leiden: Brill, 2017), 73-94, at 80.

[78] Mavroudi, *A Byzantine Book*, 416.

[79] Photios, *Epistulae et Amphilochia*, *ep*. 223, Ζαχαρίᾳ μητροπολίτῃ Χαλκηδόνος, ed. V. Laourdas and L.G. Westerink: Εὖρον, οἶμαι, τὴν τοῦ αἵματος ἀφαίρεσιν καὶ θερίας οὔσης τῇ τοῦ σώματός σου διαθέσει συμφέρουσαν. εἰ δὲ παρὰ δόξαν ἐστὶν τῶν νῦν ἐπιπολαζόντων ἰατρῶν, παράδοξον οὐδέν· οἷς γάρ, ἵνα μὴ νῦν τὰς ἄλλας αὐτῶν περὶ τὴν τέχνην ἁμαρτάδας, οἴμοι, λέγω, ἀλλ' ἵππουρις μὲν νομίζεται τὸ πολύγονον, σέσελις δὲ τὸ Ἡράκλειον πάνακες, καὶ οἷα δὴ βατράχιον τὸ μικρὸν κρίνεται χελιδόνιον, καὶ ἀντὶ μὲν πεπλίου τιθύμαλλος, ὡς ποταμογείτων δὲ τὸ λειμώνιον, καὶ ὁ μὲν μέλας χαμαιλέων ὡς λευκὸς παραλαμβάνεται, ἀντὶ δὲ τῆς ἀνεμώνης ἡ ἀργεμώνη, καὶ μυρίων ἄλλων φύσεις βοτανῶν ξένοις ὑπηρετοῦσι καὶ καιροῖς καὶ χρείαις καὶ ὀνόμασι (ταῦτα δή, ταῦτα τὰ πρόχειρα, καὶ ἃ μηδὲ τοῖς ἐν προθύροις ἰατρικῆς προσῆκον ἦν ἐν ἀμφισβητήσει καθίστασθαι), τί θαυμαστὸν κἂν ἡ φλεβοτομία, χρειώδης οὖσά σοι, τούτοις νομισθείη ξενίζουσα; αὐτὸς δὲ τὴν συμβουλὴν δεχόμενος, σὺν θεῷ σωτῆρι φάναι, καὶ τὸν ἔλεγχον ἐκείνων τῇ πείρᾳ καὶ τὸ σὸν εὑρήσεις κέρδος.

[80] Most of the confusions over plant names that Photios lists occur between plants that appear near each other in the Original Five Book Dioscorides. As that version is arranged by drug affinities, Photios's complaints might then refer to substitutions. Cf. Riddle, *Dioscorides*, 168-176, who says that Dioscorides' system of drug affinities was abandoned in the wake of Galen. Photios's enthusiasm for bloodletting echoes evidence for bloodletting practices in the Latin West, as evident, for example, in bloodletting house in the St Gall plan (St. Gall, MS 1092). On

names to actual plants may have placed greater weight on pictures in illustrated Dioscorides, especially when used to translate botanical knowledge from one language to another. It is worth noting in this context that the Illustrated Original Five Book version of Dioscorides, as exemplified by the Old Paris Dioscorides, apparently served as the main source for illustrations in the Arabic Dioscorides.[81] It seems possible then that Romanos may have offered ʿAbd al-Raḥmān III a different illustrated version of Dioscorides, perhaps more closely related to the Morgan Dioscorides, so as to undermine confidence in the Isṭifān-Ḥunayn translation.

Contemporaries may have also regarded the visual knowledge provided by pictures as extending beyond identification and the study of plant morphology. A roughly contemporary (early tenth-century) account from Ibn Waḥshiyya's *Nabataean Agriculture* describes how pictures of plants from a pre-Islamic Nabataean book could be studied in order to learn various useful things such as how to cultivate them.[82] Although likely apocryphal, Ibn Waḥshiyya may have had in mind illustrations such as those in the Old Paris Dioscorides (see ch. 2) or the Athos Dioscorides showing the harvesting or collection of medicinal products. Anecdotes such as these might have contributed to the prestige or perceived necessity of illustrated versions of Dioscorides, which might also explain Romanos's choice of gift for ʿAbd al-Raḥmān III.

The Triumph of Orthodoxy in 843, marking the end of the Second Iconoclasm (ca. 814-842), may have also increased Byzantine intellectuals' confidence in pictures as a basis for knowledge. Iconophile authors emphasized the role of vision as a means for gaining knowledge about the world. In his first oration on images, John of Damascus notes,

> If, therefore, the Word of God, in providing for our every need, always presents to us what is intangible by clothing it with form, does it not accomplish this by making an image using what is common to nature and so brings within our reach that for which we long but are unable to see? A certain perception takes place in the brain, prompted by the bodily senses, which is then transmitted to the faculties of discernment, and adds to the treasury of knowledge something that was not there before.[83]

A little later, Theodore the Studite (d. 826) added that all representative thought necessarily occurred through images.[84] The mind needs images. As a result, iconophiles put sight on the

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connections between Byzantine and Latin medicine, see Gerhard Baader, "Early Medieval Latin Adaptations of Byzantine Medicine in Western Europe." *Dumbarton Oaks Papers* 38 (1984): 251-259; on bloodletting in Western Europe, see Linda Voigts and Michael McVaugh, "A Latin Technical Phlebotomy and Its Middle English Translation," *Transactions of the American Philosophical Society* 74, no. 2 (1984): 1-69. Photios's appeal to evidence in support of his recommendations seems relevant to the role that observation played in the D3 group of the Morgan Dioscorides.

[81] See Weitzmann, "Greek Sources," 244-266.

[82] *Nabatean Agriculture*, p. 1127, trans. Jaako Hämeen-Antilla, *The Last Pagans of Iraq: Ibn Waḥshiyya and his Nabatean Agriculture* (Leiden: Brill, 2006), 255-256.

[83] John of Damascus, *Orationes de imaginibus tres*, 1.11, ed. P.B. Kotter: Εἰ τοίνυν τῆς ἡμῶν προνοῶν ἀναλογίας ὁ θεῖος λόγος πάντοθεν τὸ ἀνατατικὸν ἡμῖν ποριζόμενος καὶ τοῖς ἁπλοῖς καὶ ἀτυπώτοις τύπους τινὰς περιτίθησι, πῶς μὴ εἰκονίσει τὰ σχήμασι μεμορφωμένα κατὰ τὴν οἰκείαν φύσιν καὶ ποθούμενα μέν, διὰ δὲ τὸ μὴ παρεῖναι ὁρᾶσθαι μὴ δυνάμενα; Διὰ γὰρ τῆς αἰσθήσεως φαντασία τις συνίσταται ἐν τῇ ἐμπροσθίῳ κοιλίᾳ τοῦ ἐγκεφάλου καὶ οὕτω τῷ κριτικῷ παραπέμπεται καὶ τῇ μνήμῃ ἐνθησαυρίζεται. Here, trans. by David Anderson, *On the Divine Images: Three Apologies Against Those Who Attack the Divine Images* (Crestwood, N.Y.: St. Vladimir's Seminary Press, 1980), 20.

[84] Theodore says that both imagination (φαντασία) and images are representations (ινδάλματα) in the mind. See Paul J. Alexander, *The Patriarch Nicephorus of Constantinople; Ecclesiastical policy and image worship in the Byzantine Empire* (Oxford: Clarendon Press, 1958), 196. Theodore later lumps imagination with perception

same level as, or even above hearing. Photios does just this in a homily delivered in Hagia Sophia on March 29, 867. After describing how spoken words travel into the ear and imprint themselves onto the mind and memory, he adds,

> No less – indeed much greater – is the power of sight. For surely, having somehow through the outpouring and effluence of the optical rays touched and encompassed the object, it too sends the appearance [i.e., form, εἶδος] of the thing seen on to the mind, letting it be conveyed from there to the memory for the concentration of unfailing knowledge. Has the mind seen? Has it grasped? Has it visualized? Then it has effortlessly transmitted the forms to memory.[85]

Photios stresses the process by which a visible form is transferred and fixed in the mind. While researchers have made much of his apparent espousal of the emission theory of vision, Photios emphasizes here the fixing of visible forms within the mind.[86]

It is worth noting that the approach to depicting plants in the D3 group is analogous to contemporary approaches for depicting saints. Henry Maguire has shown that after Iconoclasm, Byzantine people equated "accuracy of definition" and not illusionism with lifelikeness.[87] Saints were visually categorized according to their generic type (e.g., kings, prophets, soldiers, bishops or ascetics). Then, if possible, artists visually distinguished individual saints within each classification. Standard portrait types emerged for well known, i.e., more familiar saints. As with some of the pictures of trees, Byzantine painters made illustrations of saints from verbal descriptions.[88] Less common saints that lacked standard portraits were defined mainly through their generic classification and through the inclusion of a label. Maguire's concept of "definition" centers on distinguishing between different categories and the individuals within them. It is also analogous in some ways to Nelson Goodman's understanding of depiction as proceeding through labeling, i.e., classifying objects, as well as Aristotelian practices of definition through *differentiae*. Maguire has also noted, however, that as portrayals of saints became more differentiated and detailed in the period after Iconoclasm, depictions of plants become less so.[89] The Morgan Dioscorides indicates, however, that in some contexts the same approaches to the depiction of saints in religious artwork could be elsewhere applied to depictions of the natural world.

(αἴσθησις) in his *Parva Catechesis*, perhaps on the grounds that both imagination and perception are representations in the mind, see Gervase Mathew, *Byzantine Aesthetics* (London: J. Murray, 1963), 118.

[85] Trans. Cyril Mango, *The Homilies of Photius, Patriarch of Constantinople* (Cambridge, Mass.: Harvard University Press, 1958), 294, with modification. Photios, *Homilia* 17, ed. V. Laourdas, 170-171: Οὐδὲν τούτων ἔλαττον, εἰ μὴ καὶ πολὺ μᾶλλον, κρατεῖ τὰ τῆς ὄψεως· καὶ γὰρ καὶ αὐτή γε δήπου τῇ προχύσει καὶ ἀπορροῇ τῶν ὀπτικῶν ἀκτίνων τὸ ὁρατὸν οἱονεί πως ἐπαφωμένη καὶ περιέπουσα τὸ εἶδος τοῦ ὁραθέντος τῷ ἡγεμονικῷ παραπέμπεται, ἐκεῖθεν διαπορθμευθῆναι διδοῦσα τῇ μνήμῃ πρὸς ἐπιστήμης ἀπλανεστάτης συνάθροισιν. Εἶδεν ὁ νοῦς, ἀντελάβετο, ἐφαντάσθη, τοὺς τύπους ἀκόπως ἐν τῇ μνήμῃ παρεπέμψατο.

[86] On emission theory in Byzantium and in Photios' homily, see Robert S. Nelson, "To Say and to See: Ekphrasis and Vision in Byzantium," in *Visuality Before and Beyond the Renaissance*, ed. Robert S. Nelson (Cambridge: Cambridge University Press, 2000), 143-168.

[87] Henry Maguire, *The Icons of Their Bodies: Saints and Their Images in Byzantium* (Princeton: Princeton University Press, 1996), 5-47, esp. 16.

[88] Maguire, *Icons of Their Bodies,* 22-25.

[89] Idem, *Nectar and Illusion*, 114-115.

Conclusions

This study of the botanical illustrations in the Morgan Dioscorides permits several conclusions and invites speculation regarding the practice of botany in Middle Byzantine period. The evidence of multiple pictorial sources confirms that there were a number of different, illustrated versions of Dioscorides in circulation by the end of the ninth century. In Book I, we can distinguish at least three different pictorial sources (A1, A2, A3) ultimately connected to the Alphabetical Dioscorides. A1 was the most closely related to the Alphabetical Dioscorides, and was likely more closely related to the Vienna Dioscorides, although it rectifies errors associated with that text. A2 and A3 groups either represent other branches of the Alphabetical Dioscorides, or were perhaps directly related to the A1 group but modified to be more accurate. The manuscript source for the A3 group likely had an indented or subscribed layout. The multiplicity of pictorial sources related to the Alphabetical Dioscorides complicates our understanding of the connection between textual and pictorial transmission. Cronier has identified only one textual source (Mb) connected to the Alphabetical Herbarium, yet there may have been at least three different pictorial sources in the same tradition of the Alphabetical Herbarium. Alternatively, we may regard A2 and A3 as *ex novo* creations, entirely based on Byzantine observations of plants.

Throughout the Morgan Dioscorides, there is also another group of pictures, the E group. This group is often connected to Cronier's Ma texts. The Ma manuscript source may have contained a compilation of pictures from multiple sources that were unconnected to the Alphabetical Dioscorides. These illustrations may stem from an illustrated version of the Original Five Book Dioscorides, distinct from the Old Paris Dioscorides (and the Arabic Dioscorides by extension). The Yerevan fragment preserves the closest example to the branch type pictures of plants in the E group. Although the E group tends not to provide the viewer with much information about the plant, it does bear witness to a several important firsts in the history of botanical illustration: namely, the first hints of dissection, and with it, the break down of the paradigmatic unitary point of view on the single specimen. While these illustrations do not reflect actual dissections, they do hint at a desire to understand the internal anatomy and component parts of the plant depicted.

In Book IV, we find two other groups of illustrations (D2 and D3). These illustrations should be connected to Cronier's Mc manuscript source, but the differences between them suggest that they came from separate sources, or were, more likely, created *ex novo* for the Morgan Dioscorides itself. The D2 group was more accurately proportioned and stylistically related to depictions of trees in late antique art. In some cases the D2 illustrator(s) based their depictions on actual trees or their familiarity with them. In other cases, the illustrations were clearly based on a reading of the text. The D3 group appears to have been based entirely on the direct observation of plants in nature. The D3 group adapted pictorial conventions from the Alphabetical Dioscorides but is distinct from that group due to the schematic or diagrammatic quality of the D3 pictures. It is also clear from the illustration of *kedrides* that new illustrations based on the conventions of the Alphabetical Dioscorides were added later. This fact suggests the emergence and continuation of a distinct tradition of Byzantine botanical illustration rooted ultimately in the Alphabetical Dioscorides. Subsequent modification to earlier illustrations also demonstrates that contemporaries engaged more critically and extensively with pictures of this tradition than those of the E group.

These different but coexisting modes of representation and the evidence of their collation and subsequent use paint a vivid picture of the role of pictures in the Byzantine botanical tradition at the end of the ninth century. In the Morgan Dioscorides we see contemporaries

expanding the botanical tradition through two different ways. First, contemporaries appear to have compiled multiple illustrated manuscript sources and compared pictures between the manuscripts. Although differences between the pictures might have originally emerged through chance errors in copying and transmission, those same differences could nevertheless be recognized as indications of different varieties of plants. In doing so, contemporaries enlarged the botanical tradition by adding new plant varieties and species that did not belong to Dioscorides' original *De materia medica*. Sometimes random change in manuscript transmission can be intellectually productive. The second way that contemporaries enlarged the botanical tradition was through independent observations of nature, both in creating new illustrations for the codex (D3 group) and in editing and modifying previous illustrations to reflect more or different information about the plant depicted.

While there is little in the way of written marginalia in the codex, the numerous additions and modifications of illustrations suggest that the volume was frequently used but more for its pictures than its text. In the thirteenth and fourteenth centuries, the pictures in the Morgan Dioscorides were copied into other manuscripts. Nevertheless, when we compare the Morgan Dioscorides to the few other Middle Byzantine botanical texts that survive, we find that such practices may not have been especially widespread. They may have been highly localized and rather limited in scope, perhaps to a single monastery or circle of scholars. Another Middle Byzantine illustrated Dioscorides, the Athos Dioscorides (Athos, Library of the Great Lavra, Ω 75, s. x-xi), does not contain much evidence of extensive pictorial compilation from multiple source and later editing.[90] The pictures of the Athos Dioscorides represent a completely different tradition of botanical illustration than is evident in the Morgan Dioscorides, as well as the manuscripts of the Alphabetical Dioscorides, the Old Paris Dioscorides, and the Yerevan fragment. It includes but a single illustration connected to Alphabetical Dioscorides.[91] Nor is there much surviving evidence to suggest that the pictures in it were copied into many other codices. Over the centuries, the enduring focus of the Byzantine botanical tradition is the Alphabetical Dioscorides and its modes of representation. The proliferation and transmission of its illustrations in the fourteenth and fifteenth centuries, the focus of the next chapter, represent the culmination of this focus within the Byzantine botanical tradition.

[90] With the exception of the illustrations on f. 8v, the illustrations in the Athos Dioscorides tend to be stylistically uniform. On this manuscript, see Geōrgios A. Christodoulou, *Σύμμικτα Κριτικά* (Athens: n.d., 1986), 131-192.
[91] This is the illustration of *abrotonon* on f. 8v. See Collins, *Medieval Herbals*, 72.

Chapter Five
The Dissemination of Byzantine Botanical Illustration in the Later Middle Ages

This chapter considers how visual botanical knowledge circulated in the Late Byzantine period, that is, from the invasion of Constantinople by Latin Crusaders in 1204 to the city's fall to the Ottomans in 1453 (1204-1453). Despite the many tribulations of this era, the Byzantine tradition of botanical illustration based in the Alphabetical Dioscorides continued and even flourished. The thirteenth century provides some of the clearest evidence for the spread of the Byzantine botanical illustration into the Latinate and Arabic botanical traditions. Over the fourteenth and fifteenth centuries, we find evidence for intensive renewal of this tradition at the monastery of St John the Forerunner in Petra, Constantinople. From the thirteenth to the late fifteenth century, this Byzantine tradition of botanical illustration thrived. Byzantine scholars and physicians as well as their Latin- and Arabic-speaking colleagues clearly made use of the illustrations from the Alphabetical Dioscorides in their medical and botanical practice. They used, reproduced, and disseminated these illustrations throughout the Mediterranean.

The primarily goal of this chapter is to survey evidence for the development and dissemination of this tradition in the Late Byzantine period. This chapter falls in three parts: first, I consider how Latin and Arabic scholars incorporated and adapted Byzantine traditions of botanical illustrations in the thirteenth century by, in the case of the former, examining their annotations to earlier Byzantine manuscripts, their copying of them, and, in the case of the latter, their development of similar forms of illustration. Second, I show that Late Byzantine scholars continued to develop the illustrated Dioscorides by elaborating upon earlier illustrations. They also sketched ancient illustrations into the margins of notebooks. These likely functioned as memory aids to recall images of plants already known to the users, suggesting, in turn, that Late Byzantine medical experts studied plants in the older manuscripts. Third, the chapter examines how pictures circulated independently of texts in botanical atlases, which may have acted as separate reference works, perhaps used in conjunction with unillustrated versions of Dioscorides and other texts such as botanical lexica. The chapter finally considers how Byzantine traditions of botanical illustration ultimately interacted with the emergent forms of botanical illustration and nature study in early modern Western Europe.

Latin Reception of the Illustrated Alphabetical Dioscorides

In 1204, crusaders captured Constantinople and established the Latin Empire of Constantinople (1204-1261).[1] The Fourth Crusade devastated the capital. Countless medieval and ancient works of art and literature were lost. Aristocratic Byzantine families fled and established rival states—the Empires of Trebizond and Nicaea and the Despotate of Epiros. How the Byzantine tradition of botanical illustration was immediately impacted by these events remains unclear. What is clear, however, is that this century bears witness to the wider reception of the Byzantine botanical illustration beyond the Byzantine Empire.

[1] The bibliography on this topic is immense. See Donald E. Queller and Thomas F. Madden, *The Fourth Crusade: The Conquest of Constantinople* (Philadelphia: University of Pennsylvania Press, 1997, 2000); Michael Angold, *The Fourth Crusade: Event and Context* (Abingdon, Oxon: Routledge, 2003); Alfred J. Andrea and Brett E. Whale, *Contemporary Sources for the Fourth Crusade* (Leiden: Brill, 2008). On Latin intentions, see Filip Van Tricht, *The Latin Renovatio of Byzantium: The Empire of Constantinople (1204-1228)*, trans. by Peter Longbottom (Leiden: Brill, 2011).

The thirteenth century provides evidence for renewed and sustained reception of the illustrated Alphabetical Dioscorides in the Latin West. While the Naples Dioscorides had already been in Italy for centuries, it does not seem to have excited much interest in the form of subsequent copies—the many late medieval Latin annotations in it, notwithstanding.[2] But there may have been some (perhaps geographically limited) instances of reception, as indicated by an illustrated Latin translation of Dioscorides preserved in a tenth-century manuscript now in Munich (Bayerische Staatsbibliothek, Clm. 337).[3] In general, these occasions of reception did not result in any sustained influence of the Byzantine tradition of botanical illustration on the Latin world until the thirteenth century.[4] This general picture holds despite the translation of Arabic and Greek medical texts into Latin in the eleventh and twelfth centuries, famously at the so-called school of Salerno, and later at Montpellier and Toledo.[5] A full translation of Dioscorides into Latin, however, would not appear until the late fifteenth century.[6]

Latin artists and scholars appear to have had more sustained access to Byzantine manuscripts of the Alphabetical Dioscorides only in the thirteenth century.[7] Marginal notes in a Southern Gothic *rotunda* script appear in the Vienna Dioscorides during the thirteenth century.[8] Scholars tend to assume that these notes were added after 1204.[9] But Latin scholars could have written the notes after the Byzantine retaking of the city in 1261, when Byzantine monks and Latin mendicants spearheaded a number of translation initiatives from Greek into Latin and vice versa.[10] Many of these translation efforts focused on Greek philosophical and scientific texts. William of Moerbeke (ca. 1215-1286), for example, translated the works of Greek authors

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[2] Collins, *Medieval Herbals*, 52. See also Salvatore Lilla, "Studio del Codice: A Study of the Manuscript," in *Dioscurides Neapolitanus: Biblioteca Nazionale di Napoli Codex ex Vindobonensis Graecus 1*, Commentarium, ed. by Carlo Bertelli, Salvatore Lilla, and Giulia Orofino (Rome: Salerno Editrice, 1992), 49-82, esp. 72-74, on Latin hands, and 76-79, on later provenance.

[3] Collins, *Medieval Herbals*, 149-154.

[4] Collins, *Medieval Herbals*, 168-179, and Grape-Albers, *Spätantike Bilder*, 7-14.

[5] On Salerno, see Paul Oskar Kristeller, *Studi sulla Scuola medica salernitana* (Naples: Istituto italiano per gli studi filosofici, 1986); Andrea Cuna, *Per una bibliografia della Scuola medica Salernitana (secoli XI–XIII)* (Milan: Guerini, 1993). More recently, see the contributions in *La Scuola Medica Salernitana: Gli autori e i testi: Convegno internazionale, Università degli studi di Salerno, 3-5 novembre 2004*, ed. Danielle Jacquart and Agostino Paravicini Bagliani (Florence: Sismel, 2007) and *Salerno nel XII secolo. Istituzioni, società, cultura*, *Atti del Convegno internazionale (Raito di Vietri sul Mare, 16-20 giugno 1999)*, ed. Paolo Delogu and Paolo Peduto (Salerno: Centro Studi salernitani "Raffaele Guariglia," 2004).

[6] See Alain Touwaide, "Botany and Humanism in the Renaissance: Background, Interaction, Contradictions," *Studies in the History of Art*, 69, Symposium Papers XLVI: *The Art of Natural History: Illustrated Treatises and Botanical Paintings, 1400-1850* (2008): 32-61.

[7] Hans Gerstinger, *Dioscurides. Codex Vindobonensis Med. Gr. 1 der Österreichischen Nationalbibliothek. Kommmentarband zu der Faksimileausgabe* (Graz: Akademische Druk-u. Verlagsanstalt, 1970), 3, and Otto Mazal, *Der Wiener Dioskurides. Codex medicus graecus 1 der Österreichischen Nationalbibliothek, Teil 1: Kommentar* (Graz: Akademische Druck-u. Verlagsanstalt, 1998), 1: 10.

[8] Early Southern Gothic *rotunda* Latin inscriptions occur in at least two hands on ff. 13r-v, 14, 15, 16v, 17v, 18v, 20, 20v, 21v, 22v, 23v, 24v, 26v, 27v. Moreover, John Chortasmenos and his helpers occasionally added Latin transliterations of some of the Latin synonyms.

[9] Anton von Premerstein, *et al*. *De codicis Dioscuridei Aniciae Iulianae, nunc Vindobonensis Med. Gr. 1* (Leiden: A.W. Sijthoff, 1906), 54; Gerstinger, *Dioscurides*, 3, and Mazal, *Wiener Dioskurides*, 1: 10.

[10] Minta Collins reasonably suggests that the manuscript need not have fallen into crusader hands in order for it to acquire Latin annotations. See Collins, *Medieval Herbals*, 97, n. 73. On this wave of Byzantine-Latin interaction, see Elizabeth Fisher, "Monks, Monasteries and the Latin Language in Constantinople," in *Change in the Byzantine World in the Twelfth and Thirteenth Centuries,* ed. Ayla Ödekan, Engin Akyürek, and Nevra Necipoglu (Istanbul: Vehbi Koç Foundation, 2010), 390-395.

including Archimedes, Aristotle, Galen, Hero, Plato, Proclus, and commentaries on Artistole by Simplicius, Themistius, and Alexander of Aphrodisias.[11] He notes in a colophon that he translated Alexander of Aphrodisias' *Commentary on Aristotle's Meteorology* on 24 April 1260 in the Byzantine city of Nicaea.[12] The Dominican Simon of Constantinople writes in a letter to the Byzantine monk and scholar Sophonias that he had seen a letter of St. Basil in an ancient book in the Greek monastery of Kyr Meletios in Attica.[13] These examples demonstrate that Latin scholars could clearly obtain access to ancient manuscripts in Greek institutions and in areas under Byzantine control.

Latin and Greek scholars may have also occasionally worked together closely. Manuel Holobolos (ca. 1245-1310/14) notes in his preface to ps.-Aristotle's *De plantis* that a Latin scholar "from someplace or another" had given to him a manuscript copy of the Latin text, presumably translated from Arabic.[14] The art historian Francesco Lovino has suggested that in the late thirteenth century a Latinate scribe named Andreas Telountas from Nauplion worked "side by side" with a Thessalonican painter of the Astrapas family in order to create the Marciana Ptolemy (Venice, Biblioteca Marciana, gr. Z 516 [=904]).[15] Latin scholars continued to have access to Byzantine manuscripts and to interact with Greek scholars even after 1283, when Andronikos II (r. 1282-1328) expelled the mendicant orders from Constantinople.[16] For example, the Italian scholar Pietro d'Abano (1250-1316) noted that during his stay in Constantinople from 1293 to 1303 he encountered alphabetically arranged copies of Dioscorides' *De materia medica*.[17] These examples all demonstrate that it was possible for Latin scholars to see Greek manuscripts in Constantinople after 1261. In the following centuries, they continued to travel there to buy manuscripts and learn Greek.[18] In 1422 or 1423, Giovanni Aurispa wrote to Ambrogio Traversari that he had seen a codex "mirae antiquitatis in quo depictae sunt et herbae

[11] See "William of Moerbeke," in *The Oxford Dictionary of the Christian Church*, ed. Elizabeth A. Livingstone and Frank Leslie Cross (Oxford: Oxford University Press, 2005), http://www.oxfordreference.com/ (accessed 7 January 2019). For a list of translations and editions, see *Guillaume de Moerbeke: Recueil d'Études à l'occasion du 700e anniversaire de sa mort (1286)*, ed. Jozef Brams and Willy Vanhamel (Leuven: University Press, 1989), 301-383.
[12] Marshall Clagett, "William of Moerbeke: Translator of Archimedes," *Proceedings of the American Philosophical Soceity* 126, no. 5 (1982): 356-366, here: 359. See also Martin Grabmann, *Guglielmo di Moerbeke, O.P., il traduttore delle opere di Aristotele*. Miscellanea Historiae Pontificiae, vol. 11, Collectionis totius, n. 20 (Rome: Pontificia Università Gregoriana, 1946).
[13] Fisher, "Monks," 393; Marie-Hélène Congourdeau, "Note sur les Dominicains de Constantinople au début du 14e siècle," *Revue des études byzantines* 45 (1987): 175-181; and eadem, "Frère Simon le Constantinopolitain, O.P. (1235?-1325?)," *Revue des études byzantines* 45 (1987): 165-174, at 167-169.
[14] Fisher, "Monks," 394, and eadem, "Manuel Holobolos, Alfred Sareshal, and the Greek Translator of ps-Aristotle's *De plantis*," *Classica et Mediaevalia* 57 (2006): 189-211.
[15] Francesco Lovino, "Un miniature nella bottega deglio Astrapas? Alcune osservazioni attorno alle immagini del Tolomeo Marciano gr. Z. 516 (904)," *Hortus Artium Medievalium* 22 (2016): 384-398, at 397.
[16] According to the Dominican Willam Adam, Andronikos II did so because the mendicants had been so successful in proselytizing. See William of Adam [Guillelmus Adae], *Recueil des historiens des croisades*, vol. 2, *Documents arméniens: documents latins et français relatifs à l'Arménie* (Paris: Imprimerie nationale, 1906).
[17] Sante Ferrari, "Per la biografia e per gli scritti di Pietro d'Abano," *Atti della Reale Accademia dei Lincei, anno CCCXII* 15 (1915): 629-725; Leo Norpoth, "Zur Bio-Bibliographie und Wissenschaftslehre des Pietro d'Abano, Mediziners, Philosophen, und Astronomen in Padua," *Kyklos* 3 (1930): 291-353; Lynn Thorndike, "Manuscripts of the Writings of Peter of Abano," *Bulletin of the History of Medicine* 15 (1944): 201-219.
[18] Annaclara Cataldi Palau, "Learning Greek in Fifteenth-Century Constaninople," in *Studies in Greek Manuscripts* (Spoleto: Centro Italiano di Studi Sull'Alto Medioevo, 2008), 1: 219-234.

et radices et quaedam animalia" in the monastery of St. John Prodromos.[19] And, again, between 1435 and 1438, Giovanni Tortelli also wrote about having seen the Morgan or Vienna Dioscorides.[20]

Copenhagen, Kongelige Bibliotek, MS Thott 190 4°

At the end of the thirteenth century, we also find Latin copies of the illustrations from the Vienna and Morgan Dioscorides in a manuscript now in Copenhagen (Kongelige Bibliotek, MS Thott 190 4°).[21] The codex seems to have been illustrated entirely by a western-trained illustrator. Alain Touwaide notes that the plant illustrations were executed prior the text.[22] Text occurs only sporadically after f. 78. The ruling of the outer margins, moreover, overlaps or stops just short of the plant pictures (see, for example, f. 14v, fig. 5.1).[23] Although the ruling was largely carried out after illustration, the ampleness of the margins could suggest that the codex was always intended to receive a text.

The Copenhagen codex may have been copied from an earlier archetype, which was perhaps also a picture book with minimal textual contents.[24] Touwaide has suggested that this archetype was produced during the Latin Empire, under the assumption that Latin scholars would not have had access to the manuscripts after 1261.[25] But, as noted above, there is ample evidence for Latins having had access to Greek manuscripts after 1261. Moreover, while Western-trained painters likely illustrated the Copenhagen codex, we have no evidence as to whether they also illustrated the archetype for MS Thott 190 4°. Even if we suppose that they did, it remains possible that they did so after 1261. Whichever way the illustrations of the Vienna and Morgan Dioscorides became available to Latin scholars, the result is clear enough: by the end of the thirteenth century Latin scholars had had access to and even copied the illustrations in the Morgan and Vienna Dioscorides. The active transmission of Byzantine botanical illustrations into Western Europe in the thirteenth and fourteenth centuries may have provided a further impetus for the development and experimentation with new forms of botanical illustration there. These efforts—already underway as demonstrated by the emergence of new illustrated cycles for the *Circa Instans* and *Tractatus de herbis* in the thirteenth and fourteenth centuries—culminated further yet with the appearance of early modern forms of botanical illustration, exemplified by the late fourteenth- or early fifteenth-century Carrara Herbal (London, British Library, MS

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[19] *Ambrosii Traversarii generalis Camaldulensium aliorumque ad ipsum epistulas*, ed. L. Mehus (Florence: Ex typographio Caesareo, 1759), lib. 24, ep. 58, col. 1033. Giovanni Aurispa, *Carteggio di Giovanni Aurispa*, ed. Remigio Sabbadini (Rome: Tipografia del Senato, 1931), 67-68.

[20] See *Giovanni Tortelli, "Della medicina e die medici". Gian Giacomo Bartolotti, "Dell'antica medicina". Due storie della medicina del XV secolo*, ed. and trans. Luigi Belloni and Dorothy M. Schullian (Milan: Industrie grafiche italiane stucchi, 1954), 14: Vidi ego Constantinopoli eiusdem auctoris (i.e., Dioscoridis) codicem litteris graecis antiquissimisque exaratum, in quo non solum herbarum effigies, sed volatilium, quadruapedum et reptilium tanto artificio et proprietate effictae erant, quanto natura ipsa, ut puto, producere potuit. And trans., ibid., 85: "saw at Constantinople a manuscript of this author (i.e., Dioscorides) written in very old Greek letters, and in it pictures not only of herbs but also of birds and beasts and reptiles were drawn with as much artifice and detail as nature herself, in my opinion, could have produced."

[21] On this manuscript as containing Latin copies of the illustrations in the Vienna and Morgan Dioscorides, see Alain Touwaide, "Latin Crusaders, Byzantine Herbals," in *Visualizing Medieval Medicine and Natural History, 1200-1550*, ed. Jean A. Givens, Karen M. Reeds, Alain Touwaide (New York: Routledge, 2016), 25-50.

[22] Touwaide, "Latin Crusaders," 28.

[23] Ibid., 30-31.

[24] On the codex's emergence, see ibid., 44, 49.

[25] Ibid., 27 and 45.

Egerton 2020).[26] We will return to the question of the interface between Byzantine and Latin botanical illustration at the end of this chapter.

Arabic Reception of Byzantine Botanical Illustration

Unlike the late reception of Byzantine Botanical Illustration in the Latin West, the Arabic-speaking world maintained from the seventh and eighth centuries much closer and more sustained links with Byzantine traditions of botanical practice (see chapter 4). The illustrated Original Five Book version of Dioscorides, as first witnessed by the Old Paris Dioscorides, was likely among the main sources for the illustrated Arabic Dioscorides.[27] Evidence for a direct Arabic reception of the Illustrated Alphabetical Dioscorides, however, begins to appear in the thirteenth century.

The Topkapi Dioscorides (Istanbul, Topkapi Library, Sultanahmet III 2127)

The earliest surviving indications for the emulation of the Illustrated Alphabetical Dioscorides in the Arabic world date to the thirteenth century. Byzantine (or Byzantinizing) pictures appear in an illustrated Arabic Dioscorides now in Istanbul (Istanbul, Topkapi, Sultanahmet III 2127), originally completed in January 1228.[28] The manuscript was copied for a ruler from northern Mesopotamia and Syria named Shams al-Dīn Abu 'l-Fadā'il Muhammad, who remains otherwise unidentified.[29] Abu Yusuf Bihnam b. Musa b. Yusuf al-Mawsili (i.e., from Mosul), the scribe responsible for the manuscript notes that he was educated in medicine.[30] The "Western" orientation of this scribe has been deduced by his inclusion of a date based on the death of Alexander the Great and a Syriac blessing at the end of the colophon.[31] The manuscript's frontispieces have a Byzantine appearance (e.g., f. 1v-2v, fig. 5.2).[32] They recall Middle Byzantine author portraits, as well as the frontispieces of the Vienna Dioscorides (see ch. 6).[33] All of these features suggest either the presence of Byzantine artists or at least awareness and emulation of Byzantine traditions of illustration.

Although clearly inspired by Byzantine or late antique illustrations, the Topkapi frontispieces also refer to specifically Arabic traditions of author portraiture. They show, for example, the transmission of knowledge from master to pupil, whereas the Vienna Dioscorides frontispieces emphasize the historical development of pharmacology by way of the symposia

[26] On the Carrara herbal, most recently, see Sarah R. Kyle, *Medicine and Humanism in Late Medieval Italy: The Carrara Herbal in Padua* (Abingdon, Oxon: Routledge, 2017).
[27] Kurt Weitzmann, "Greek Sources," 244-266.
[28] Sergio Toresella, "Il dioscoride di istanbul e le prime figurazioni naturalistiche botaniche," *Atti e memorie deii'Accademia italiana di storia della farmacia* 13 (1995/1996): 21-40, esp. 36-37.
[29] See Richard Ettinghausen, *Arab Painting* (Geneva: Skira, 1962), 67.
[30] Mahmoud Sadek reports the colophon as, "The five maqalat of the book of Dioscorides have been transcribed by the weak slave desiring the mercy of the kind God, Abu Yusuf Bihnam ibn Musa al-Mawsili, educated in the profession of medicine. This work was completed on the evening of Thursday the 27th of the Safar in the year 626 A.H. that is to say, the 25th day of the Kanun Thani, in the year 1540 after Alexander and thanks to the almighty God." See Sadek, *Arabic Materia Medica*, 47. See also Ettinghausen, *Arab Painting*, 67-74.
[31] Ettinghausen, *Arab Painting*, 67.
[32] Toresella, "Il dioscoride," 29, and Ettinghausen, *Arab Painting*, 67-74.
[33] Richard Ettinghausen, "Interaction and Integration in Islamic Art," in *Unity and Variety in Muslim Civilization*, ed. Gustave Edmund von Grünebaum (Chicago: University of Chicago Press, 1955), 107-131 at 119-120, and Eva R. Hoffmann, "The Author Portrait in Thirteenth-Century Arabic Manuscripts: A New Islamic Context for A Late Antique Tradition," *Muqarnas* 10 (1993): 6-17, esp. 8, 12.

scenes (see ch. 6).[34] I add here that the Topkapi illustration shows Dioscorides and his student each holding different herbs, as though discussing their relative merits. This scene evokes an anecdote recorded in Ibn Waḥshiyya's *Nabataean Agriculture* (*al-Filaḥā al-nabāṭiyya*), in which the marsh mallow plant (*khiṭmī*) requests Shabāhā al-Jarmaqānī to ask the magicians of Bābil (i.e., Babylon) whether she or mandrake (*al-yabrūḥ*) is deserving of higher station. Although the magicians side with the mandrake due to his strength, marsh mallow replies that in doing so they ruled in her favor, as they had done so only in fear. This shows the mandrake's evil. She, by contrast, is good and therefore better.[35] In the Topkapi frontispiece we find that it is the student who holds the mandrake. Dioscorides holds another plant. Although badly flaked, it may have once shown a plant like marsh mallow. The lesson conveyed by the frontispiece is clear: although the mandrake is powerful, it is less useful than other, perhaps more humble, herbs. The lesson here qualifies our understanding of artistic and intellectual exchange. Arabic scholars adapted Byzantine botanical traditions to suit their own intellectual traditions and contexts.

Other Byzantinizing qualities of the manuscript include a naturalistic depiction of a vine (f. 252v, fig. 5.3). Richard Ettinghausen has gone so far as to say: "It is a faithful copy of a classical type of illustration, so faithful indeed that if it were not painted on paper one would be inclined to regard it as a Greek 'original' inserted into the Arabic volume."[36] This particular illustration, however, need not have been copied from a Byzantine manuscript source, as the vine was a common decorative motif in Byzantine art.[37] The manuscript also contains the earliest surviving examples of nature printing in a scientific treatise (f. 143v and 144v, fig. 5.4). Sergio Toresella has also identified an illustration of garlic in the codex (f. 96v), depicted from multiple angles of view, as the earliest depiction of a plant executed from life. We now know, however, that the Morgan Dioscorides has earlier examples of from life depiction (see ch. 4). The different views of the Topkapi garlic recall the sea urchin tests in the Morgan Dioscorides (see ch. 4), and could then suggest some degree of reception. Most of the illustrations in the manuscript, however, more closely resemble earlier Arabic illustrated Dioscorides. It is hard to know if any of the painters of the Topkapi codex were in fact Byzantine or if they merely adapted styles that we now call Byzantine as they drew upon a wide variety of different sources available to them.

By the thirteenth century, we also find textual evidence for depicting plants from life in the Arabic tradition of botanical illustration. Ibn Abī Uṣaybiʿah (1203-1270) records that the physician Rashīd al-Dīn al-Ṣūrī (1177-1242) employed a painter to depict plants from life:

> "The Book of Simple Drugs." He started writing it in the days of al-Malik al-Mu'azzam, whose name he used in its title. He gave in it a full account of all simples, including some which he himself had discovered and tried out and which had not been mentioned by his predecessors. He secured the cooperation of a painter, who had at his disposal all kinds and shades of color. He made it his habit to visit places grown with plants, such as Mount Lebanon, each of which was distinguished by a specific flora. After inspecting the plants, he showed them to the painter, who, after contemplating their color and examining their leaves, branches and roots, reproduced their likeness accordingly and to the best of his

[34] For more on contrasting elements, see also Hoffmann, "Author Portrait," 12.
[35] See, Ibn Waḥshiyya, *Nabatean Agriculture*, 155-157, trans. Hämeen-Antilla, *Last Pagans*, 222-224.
[36] Ettinghausen, *Arab Painting*, 70.
[37] It has obvious religious connotations relating to the Eucharist. In the fifteenth century, *Christ the Vine* became a popular subject in religious icons, see Apostolos Mantas, "The Iconographical Subject 'Christ the Vine' in Byzantine and Post-byzantine Art," *Deltion tēs Christianikēs Archaiologikēs Hetaireias* 24 (2003): 347-360.

> ability. Moreover, Rashīd al-Dīn employed a very useful method of representing plants. He showed them to the painter at three stages: sprouting and tender; full-grown and seeding; and withering and drying up. The artist then painted them at these stages, and so the user of the book, seeing them in all the conditions in which he was liable to encounter them in nature, was in a position to obtain more perfect knowledge and clearer notions.[38]

Ibn Abī Uṣaybiʿah notes here that Rashīd al-Dīn al-Ṣūrī was concerned not only with the accurate depiction of plants from nature, but also with showing them at various stages of growth. Rashīd al-Dīn al-Ṣūrī here shares some of the concerns that we saw in both Pliny the Elder and some illustrations in the Alphabetical Dioscorides. Given these shared concerns and the fact that Rashīd al-Dīn al-Ṣūrī worked in the Levant, it seems possible that he was familiar with more recent Byzantine traditions of botanical illustration. Although Rashīd al-Dīn al-Ṣūrī's book of simples does not survive, it seems possible that similar motivations might also underlie some of the illustrations in the Topkapi Dioscorides.

These few pieces of evidence of thirteenth-century botanical illustration in Latin and Arabic contexts suggest that over the course of the thirteenth century, Byzantine traditions of botanical illustration circulated beyond the Empire and were available to and emulated within Latin and Arabic traditions of botany. The transformations of both Arabic and Latin botany at this time and their complex relationships with Byzantium warrant further study. This chapter, however, now turns to botanical illustrations in Late Byzantine Constantinople.

Botany at the Monastery of St. John Prodromos in Petra

In the fourteenth and fifteenth centuries, the Morgan and Vienna Dioscorides both appear to have been in the monastery of St. John the Forerunner in the Petra district of Constantinople. Scholars have attributed the current fifteenth-century bindings of the Morgan Dioscorides to the monastery.[39] The Vienna Dioscorides was repaired and rebound at about the same time. A note on the f. 1r records this restoration:

> John Chortasmenos restored this book of Dioscorides, having become quite old and in danger of falling completely into ruin, at the behest and cost of the venerable monk, Lord Nathanael, then nurse (nosokomos) in the hospital of the Kral in the year 6914 [i.e., 1406], of the 14th indiction.[40]

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[38] This English translation is based on a transcription of a typescript of an incomplete translation of Ibn Abī Uṣaybiʿah's *History of the Physicians*. The typescript was found posthumously in the office of Lothar Kopf and transferred to the US National Library of Medicine in 1971. It was uploaded to the internet by a science blogger, Roger Pearse, see "Preface to the online edition," http://www.tertullian.org/fathers/ibn_abi_usaibia_00_eintro.htm (accessed 31 August 2018). This quotation is taken from ch. 15, "On the Classes of Famous Syrian Physicians," pp. 885-886, available at http://www.tertullian.org/fathers/ibn_abi_usaibia_03.htm#CHAPTER_XV (accessed 31 August 2018). See also Lucien Leclerc, *Histoire de la médecine Arabe*, 2 vols. (Paris: E. Leroux, 1876), 2: 228. A new edition and translation is currently underway at the University of Oxford and the University of Warwick.

[39] See Nadezhda Kavrus-Hoffmann, "Catalogue of Greek Medieval and Renaissance Manuscripts in the Collections of the United States of America, Part IV.2: The Morgan Library and Museum," *Manuscripta* 52, no. 2(2008): 207-324, esp. 212-230, here: 225-226; Annaclara Cataldi Palau, "Legature costantinopolitane del monastero di Prodromo Petra tra i manoscritti di Giovanni di Ragusa (t 1443)," *Codices manuscripti* 37/38 (2001): 11-50.

[40] Chortasmenos recorded this information on a note that he added to f.1r: Τὸ παρὸν βιβλίον τὸν Διοσκουρίδην παντάπασι παλαιωθέντα καὶ | κινδυνεύοντα τελείως διαφθαρῆναι ἐστάχωσεν ὁ Χορτασμένος Ἰωάννης | προτροπῆ καὶ ἐξόδω τοῦ τιμιωτάτου ἐν μοναχοῖς κυροῦ Ναθαναὴλ νοσοκ|όμου τηνικαῦτα τυγχάνοντος ἐν τῷ ξενῶνι τοῦ Κράλη ἔτους ˏζοῦ ϡ′οῦ ιδ'ου | ἰν[δικτιῶν]ος ιδη

This note indicates that the Vienna Dioscorides was also in the library of the Petra monastery, and was perhaps used by the neighboring Serbian Royal Hospital. In addition to rebinding the codex and transliterating its uncial text into minuscules, Chortasmenos and his team went through the codex and rematched pictures and text, noting instances where no picture was available. (In Chortasmenos's usage, he typically refers to the pictures as "plants", a shorthand that suggests a conceptual elision between the picture and the actual plant that it purports to represent.) Additional repairs may have also been made at this time. For example, a thirteenth-century paper gathering was added to make up for a missing entry on mandrake.[41] These modifications and repairs could speak to the fact that the Vienna Dioscorides was heavily used during this period.

Critical Work with the Morgan and Vienna Dioscorides at the Petra Monastery

During this period, we find traces of contemporaries' critical engagement with both the Morgan and Vienna Dioscorides. In the Morgan Dioscorides, we find, for example, a brief paraphrase in a late fourteenth- or fifteenth-century hand of a passage from the neighboring text noting that the plant *krambē thalassia* (κράμβη θαλάσσια, likely sea bindweed, *Convolvulus soldanella* L., *MM* 2.122) has leaves like *aristolochia strongylē* (ἀριστολοχία στρογγύλη, likely birthwort, perhaps *Aristolochia pallida* Walld., or *Aristolochia rotunda* L., *MM* 3.4). This is clearly not true of the plant in the illustration (f. 79v, fig. 5.5).[42] When placed beside the illustration, this note highlights a discrepancy between the picture and the text. Indeed, it seems that the picture and text were mismatched in the original collation of the Alphabetical Dioscorides, as the picture may be of rock samphire (*Crithmum maritimum* L.).[43]

In some cases, Late Byzantine users also added sketches to earlier manuscripts in order to add information not included in the earlier illustrations. Christian Gastgeber has recognized the hand of the monk Neophytos Prodromenos, active between 1329/39 and 1377, and maybe as late as 1395, in a note that was added to the Vienna Dioscorides beneath the chapter on *spartos* (σπάρτος, Spanish broom, *Spartium junceum* L.) on f. 328r (fig. 5.6).[44] (I am skeptical of the identification of the hand given the similarities among early fourteenth-century hands. But even if Neophytos did not author the note and sketch, the similarity of the hand points to the same milieu in which he operated.) Although the sketch appears rough, it gives a more detailed account of the plant's seedpods and pea-like flowers than the sixth-century illustration on the opposite folio (f. 327v, fig. 5.7). The note beside the sketch confirms as much, as it zeroes in on the flowers and seeds: "The *spartos* has this shape. Its flower is similar to the *phasiolos* bean or

[41] ff. 287r-289v, see Otto Mazal, *Der Wiener Dioskurides. Codex medicus graecus 1 der Österreichischen Bibliothek* (Graz: Akademische Druck-u. Verlagsanstalt, 1998), 2: 18.

[42] ἔχει τὰ φύλλα ὅμοια ἀριστολοχι[ᾶ] στρογγύλη

[43] See Mazal, *Der Wiener Dioskurides*, 1: 74.

[44] See Christian Gastgeber, 'Dioskuridiana. Miscellanea zum Wiener Dioskurides Codex Med. Gr. 1,' in *More Modoque*. *Die Wurzeln der europäischen Kultur und deren Rezeption im Oreint und Okzident. Festschrift für Miklós Maróth zum siebzigsten Geburtstag*, ed. P. Fodor, Gy. Mayer, M. Monostori, K. Szovák, L. Takács (Budapest: Forschungszentrum für Humanwissenschaften der Ungarischen Akademie der Wissenschaften, 2013), 127-143.The commentary notes that it is an obvious correction of the main illustration: "Unter dem Texte dunkelbraune Federzeichnung, z.T. hellbraun laviert, mit anders geformten Blüten und Früchten, offenbar eine Korrektur der Figur fol. 327v von einer Hand des XIV Jahrhunderts." (25). Commentary also notes corrections to the main (6th-c.) figure: "An den Stengeln Blattkorrekturen in Federzeichnung von einer Hand des XIII-XIV Jahrhunderts." (25)

the *kyamos* bean except yellow. Its seed [resembles] vetch or lentil."[45] Both the note and sketch are suggestive of comparative practices in Late Byzantine botany. The introduction of this "new" illustration into the Vienna Dioscorides suggests contemporaries were interested in improving illustrations in earlier treatises by introducing new imagery into them.

Some of the works of the monk Neophytos Prodromenos testify to the botanical research that took place at the Petra monastery.[46] In a manuscript now in Paris (Bibliothèque nationale de France, gr. 2286), copied entirely in his hand, we find his botanical lexicon (ff. 83r-88v) and a large number of individual entries on specific plants copied from Dioscorides.[47] At the end of this alphabetical catalog of plants, Neophytos included a lengthy entry on mandrakes (ff. 52r-v, and 53v, which should precede f. 52). Here he added three different sketches of mandrake (f. 52v, fig. 5.8). In sketching these figures into his notebook, Neophytos continues the practice of collating illustrations that we saw in the Morgan Dioscorides. His notebook is then suggestive of a link between practices of compilation in the Morgan Dioscorides and the wider dissemination of the plant pictures through sketches of them in the margins of notebooks and handbooks.

Padua, Biblioteca del Seminario cod. 194

The sketch of the *spartos* in the Vienna Dioscorides was later copied into an illustrated paper codex now in Padua (Biblioteca del Seminario Arcivescovile, cod. 194, fig. 5.9) and including pictures from both the Morgan and Vienna Dioscorides.[48] Elpidio Mioni has dated the creation of the codex to between 1339 and 1406, with a preference for ca. 1350.[49] While Mioni identified

[45] I thank Maria Mavroudi for her help with reading this inscription. The last part of the inscription is unclear, and has been reconstructed here. Τοιοῦτον σχῆμα | ἔχει ὁ σπάρτος τὸ ἄνθος ἀυτοῦ ὅμοιον | φασιόλου ἢ κύαμου | πλὴν ξανθὸν κίτρινον | τὸ σπέρμα αὐτοῦ μιά[ζει] (=μοιάζει?) | βίκον ἢ φακήν). *Phasiolos* appears to be φάσηλος or calavance (*Vigna sinensis*), *kyamos,* κύαμος, another bean (likely *Vicia faba*), βίκον i.e., βικίον (*Vicia sativa*); *phakēn*, φακήν, *Ervum lens* L., i.e., *Lens culinaris* Medik.

[46] Neophytos wrote on a variety of topics, especially philosophy, theology and medicine. Herbert Hunger, *Hochsprachliche profane Literatur* (Munich: Beck, 1978), 308-309; E. D. Kakoulidē, "Ἡ βιβλιοθήκη τῆς μονῆς Προδρόμου-Πέτρας στὴν Κωνσταντινουπόλη," *Ἑλληνικά* 21 (1968): 3-39, esp. 24-26; John Duffy, "Michael Psellos, Neophytos Prodromenos, and Memory Words for Logic," in *Gonimos: Neoplatonic and Byzantine Studies Presented to L.G. Westerink*, ed. J. Duffy and J. Peradotto (Buffalo: Arethusa, 1988): 207-216; Michel Cacouros, "Néophytos Prodromènos copiste et responsable (?) de l'édition *quadrivium-corpus aristotelicum* du 14e siècle," *Revue des études byzantines* 56 (1998): 193-212. Idem,"Jean Chortasménos katholikos didaskalos, annotateur du Corpus logicum dû à Néophytos Prodromènos," *Bollettino della Badia greca di Grottaferrata*, 52 (1998): 185-225; Brigitte Mondrain, "La constitution de corpus d'Aristote et de ses commentateurs aux XIIIe-XIVe siècles," *Codices Manuscripti* 29 (2000): 11-33. See also Charles Barber, "Neophytus Prodromenus on Epigraphy," in *Legitimation des Bildes: Festschrift Martin Büchsel* (Berlin: Mann Verlag, 2015), 211-225.

[47] See Annaclara Cataldi Palau, "The Manuscript Production in the Monastery of Prodromos Petra (twelfth-fifteenth centuries)," in *Studies in Greek Manuscripts* (Spoleto: Fondazione Centro Italiano di Studi sull'alto Medioevo, 2008), 197-208, at 203, see also 203-206, and Michel Cacouros, "Marginalia de Chortasménos dans un opuscule logique dû à Prodromènos (Vatican gr. 1018)," *Revue des études byzantines* 53 (1995): 271-278, at 274.

[48] The manuscript is 200 ff. and 382 x 281 mm. Elpidio Mioni, "Un ignoto Dioscoride miniatio," in *Libri e Stampatori in Padova. Miscellanea di Studi Storici in Onore di Mons. G. Bellini* (Padua: Tipografia Antoniana, 1959), 345-376.

[49] Mioni, "Un ignoto Dioscoride miniato," 348-350. While the watermarks set the *terminus post quem*, Mioni based his *terminus ante quem* on the restoration of the Vienna codex in 1406, by which time some of the plants missing in the Vienna codex still present in the Padua codex, were certainly lost. The watermark consists of two circles bisected by a line surmounted by a cross, similar to Briquet 3165. Charles-Moïse Briquet, *Les Filigranes. Dictionnaire historique des marques du papier dès leur apparition vers 1282 jusqu'en 1600* (Geneva: A. Jullien, 1907; repr. New York: Hacker Art Books, 1966).

the scribe as Neophytos Prodromenos, this attribution is now widely doubted.[50] Still, the similarity of the hands could speak to its having been created in the same milieu. That the *spartos* sketch was copied into the Padua codex suggests that contemporaries considered it worthy of copying, perhaps recognizing how it contributes additional information absent in the original painting in the Vienna Dioscorides.[51] We will return to the *spartos* later in this chapter.

The Padua codex also provides important evidence for the use of both the Morgan and Vienna Dioscorides as early as the mid-fourteenth century. The codex contains two series of pictures: a first group of 384 miniatures (ff. 1-145) from the Vienna Dioscorides, and a second group of 84 miniatures (ff. 180-200) from the Morgan Dioscorides. As Mioni has already observed, the execution of the pictures in both series seems to have preceded the copying of the text.[52] Throughout the manuscript, the text closely follows the contours and outer edges of the miniatures. Occasionally the text even overlaps the miniatures (e.g., f. 150). Some plant pictures lack accompanying texts, while some even lack titles (ff. 74v, 75v, 155, 159, 185v, 190, 197, 199v). In several cases, the scribe mismatched text and picture. For example, in the first series, on f. 23, the figure is labeled *anchousa* (ἄγχουσα), though it appears on f. 60v in the Vienna codex as *akantha leukē* (ἄκανθα λευκή).[53] In the second series the picture on f. 187 is labeled *symphyton petraion* (σύμφυτον πετραῖον) but corresponds to *ēryngion* (ἠρύγγιον) on f. 57 of the Morgan codex.[54] These kinds of discrepancies may have been prone to occur whenever bookmakers adopted the picture-first mode of illustration. (Alternatively, these "mislabelings" could be the result of an attempt at new identifications.) Some differences between the Padua, Vienna and Morgan Dioscorides do reflect copyists' critical reorganization of the contents. For example, on f. 188r (fig. 5.10), the copyist combined under the single heading *thlaspis* (θλάσπις, i.e, shepherd's purse, *Capsella bursa-pastoris* L. Medikus) pictures of *thlaspis* and *thlaspis hetera* (θλάσπις ἑτέρα, "a different" *thlaspis*), both from separate chapters in the Morgan codex (f. 61 r-v, respectively).[55] The makers of the Padua Dioscorides similarly assembled into one chapter on *mandragoras* (μανδραγόρας, mandrake, *Mandragora sp.*) on ff. 190r-v (fig. 5.11 and 5.12), multiple pictures of mandrake from different entries in the Morgan codex (ff. 104v, 103v, and 314).

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[50] See Marco d'Agostino, "Dioscoride, Erbario miniato," in *Splendori di Bisanzio: Testimonianze e riflessi d'arte e cultura bizantina nelle chiese d'Italia*, ed. Giovanni Morello (Milan: Fabbri, 1990), 240.

[51] Padua, Biblioteca del Seminario, cod. 194, f. 155r.

[52] Mioni, "Un ignoto Dioscoride miniato," 340.

[53] Ibid., 361. See Mioni's list for more examples of mismatches in the first series, 360-367.

[54] Mioni did not have a copy of the Morgan Dioscorides at his disposal when he made his description of Padua cod. 194, though he rightly suspected that the second series were derived from that codex (see Mioni, "Un ignoto Dioscoride miniato," 370). As a result, he subsequently missed some instances of mismatching in the second series, though he did correctly identify n. 425 (υκε΄) on f. 183r, which is unlabeled, as βαγχάρις (see Mioni, "Un ignoto," 371). In my observations of the second series, I have noticed eight additional discrepancies between the Morgan and Padua codices. I omit here spelling variants, arising from iotacism [e.g., f. 186v, n. 466 (υξς΄), ἰσόπυρον for εἰσόπυρον on f. 52r in the Morgan codex], minor spelling mistakes and simple transcriptional errors [for example, υ→μ, at f. 186v, n. 465 (υξε΄), ἔμπετρον for εὔπετρον on f. 52r in the Morgan codex]: f. 184v, n. 434 (υλδ΄), γάλλιον for γλαυξ on f. 35r of the Morgan codex; f.185r, n. 452 (υνβ΄), δίκταμνος ἑτέρα, for ψευδοδίκταμνον on f. 41r of the Morgan codex; f. 185v, n. 454 (υνδ΄) unlabeled for ἔγειρος on f. 42r in the Morgan codex; f. 187r, n. 441 (υμα΄), σύμφυτον πετραῖον for ἠρυγγιον on f. 57r in the Morgan codex; f. 188r, n. 444 (υμδ΄), two pictures under θλάσπις correspond to θλάσπις (f. 61r) and θλάσπις ἑτέρα (f. 61v) in the Morgan codex; f. 190v, n. 497 (υρζ΄), does not match μυαγρίον on f. 104v of the Morgan codex; f. 191r, n. 483 (υπγ΄), ἐπίθυμον matches ὄρνιθογαλον on f. 119v in the Morgan codex; f. 194r, n. 421 (υκα΄), πολύγονον θῆλυ for πολύγονον ἄρρην on f. 130r, in the Morgan codex; f. 197r, n. 439 (υλθ΄), unlabeled for σύμφυτον ἕτερον on f. 145v in the Morgan codex.

[55] N.B. The text matches the entry for θλάσπι, and not θλάσπι ἑτέρα.

The pictures in the Padua codex are also numbered. That the numbers do not run sequentially, while the order of the pictures still generally follows the order of plants in both the Vienna and Morgan codices, could suggest they correspond to entries in another, perhaps unillustrated codex, which could in turn hint at the impetus behind the development of botanical atlases without text, discussed later in this chapter.

Into the Margins

Botanical Sketches in a Notebook and a Handbook

As we have already seen, marginal annotations and sketches laid the ground for the further development of the Byzantine botanical tradition. The replication of images in the margins also enabled its dissemination beyond its traditional center in Constantinople to new centers in the wider Mediterranean. Marginal sketches of plants from the Alphabetical Dioscorides appear in two fourteenth-century manuscripts: one is now in the Ambrosiana library in Milan (MS A 95 sup); the other, in the Marciana library in Venice (cod. gr. XI, 21; coll. 453). The former likely served as the model for the latter. Both contain texts that would have been useful to a physician of the time.[56] The largest sections in both codices are lengthy excerpts from the Alphabetical Dioscorides accompanied by simple ink drawings of plants and animals in its margins. The drawings are executed in the same ink as the main text and were probably drawn by the same scribe who executed the text.

At around 5.6 x 3.9 inches (142 x 100 mm) with 166 extant folios, the Marciana codex is a small even hand-sized, cleaned-up copy of the Ambrosiana codex, which, at about 9.2 x 6 inches (233 x 153 mm) is roughly two times larger and fourteen folios longer (180 ff. total).[57] Though larger, and probably the model for the Marciana codex, the Ambrosiana codex is likely a notebook: it is codicologically heterogeneous, with irregular formatting, different inks, at least six different papers (based on watermarks), some of it clearly reused.[58] The sections related to Dioscorides were copied at different times and fall into codicologically distinct units, with different formatting and different rubrics. In contrast, the Marciana codex is homogeneous. It has consistent formatting and rubrication, headpieces, and initials throughout. So while the Ambrosiana codex is a composite notebook that developed organically in stages, the Marciana codex is a miscellany handbook produced in a single process.[59]

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[56] These include an astrological text, a brief works on weights and measures, a text on prognostics, a botanical lexicon, various prescriptions and remedies, a work on food and nutrition, antidotes, a lapidary, and excerpts of medical authors, Paul of Aegina, and Hippocrates, as well as Gregory Nyssa's *De opificio hominis*.

[57] It has the bookplate of Bernardo Nani (1712-1761). On the Nani, see Odile Cavalier, "La collection Nani d'antiquités," 83-95 in *L'anticomanie. La collection d'antiquités aux XVIIIe et XIXe siècles*, ed. Annie-France Laurens and Krzysztof Pomian (Paris: Éditions de l'École des Hautes Études en Sciences Sociales, 1992).

[58] Formatting varies greatly. Some sections are rubricated, others not. Some text was scratched out. Some of the paper was even reused (e.g., f. 87v, where the scribe continues the text from the previous folio and merely draws a line to separate it from earlier text). Later notes are peppered throughout the manuscript. The original order and complete contents of the Ambrosian codex is hard to determine—its contents were evidently scrambled at different points in its history. Dioscorides, for example, appears on ff. 17v-49v, 92r-95r, 104v-110r, 126v-164v. While some of these irregularities are due to later mishaps, many of them may reflect the codex's original state. Touwaide also calls the codex a notebook, see Alain Touwaide, "Development," 196.

[59] See Peter Gumbert, "Codicological Units. Towards a terminology for the stratigraphy of the non-homogeneous codex," in *Il codice miscellaneo. Tipologie e funzioni. Atti del Convegno internazionale, Cassino 14-17 maggio 2003*, ed. Edoardo Crisci and Oronzo Pecere, *Segno e testo,* 2 (2004): 17-42, here: 18.

The Ambrosiana and the Marciana codices have only recently begun to attract scholarly attention.[60] Marie Cronier and Patrick Gautier Dalché have recently reconstructed some of the movements of the Ambrosiana notebook.[61] After being copied in Constantinople in the first half of the fourteenth century, the codex's owner and copyist, likely a physician, took the codex with him to Cyprus, via Miletos, the main seaport for the emirate of Menteşe in the 1330s, where he was asked to cure Selman Pasha's son.[62] In 1345 or 1346, he notes a debt owed by the physician Iōannēs (Ἰώαννης ὁ ἰατρός) indicated in *grossa*, a Venetian currency.[63] He also mentions another individual, "*maistro* Gianni" (μαϊστρο τζιαννε), a name that could, according to Cronier and Dalché, be from a Cypriot Italian dialect.[64] Another note records the birth of *maistro* Gianni's son, Nicola (Νικολα), on the 22 December.[65] The last folio bears a map of the island of Cyprus.[66] That the Marciana codex was copied on un-watermarked oriental papers leads Cronier and Dalché to suggest that it was copied on Cyprus, where oriental papers were commonly used.[67] All of this evidence suggests that the Ambrosiana codex was taken to Cyprus, where it was copied as a smaller miscellany handbook.

The Dioscorides illustrations in both codices go back to the Morgan Dioscorides, or, perhaps, an intermediary source based on it.[68] The pictures of plants in the two codices are notably smaller, sketchier, and displaced from the center of the page to its periphery. Through this process of miniaturization and marginalization, the pictures change considerably in how they depict plants. While the text, layout and formatting are neater and more consistent in the Marciana codex, its pictures are considerably smaller, simplified and even sketchier, when compared to those in the Ambrosiana codex.[69]

The sketches in the Ambrosiana notebook and Marciana miscellany tend to emphasize the general shape and arrangement of plant parts, with little attention to distinguishing features, such as leaf shape. In doing so, the plants typically appear as outlines that isolate or mark off distinct plant structures, while not delineating them in great detail. Occasionally, the entire figure was blacked-in, as occurs in the sketches of two sempervivums and an aloe in the Ambrosiana notebook (*aeizōon to mikron,* ἀείζωον τὸ μίκρον, *aeizōon to leptophyllon,* ἀείζωον τὸ λεπτοφύλλον, *allon,* ἄλλον [sic], f. 19v, fig. 5.13). Though infrequent, these blacked-in areas tend to indicate fleshy tissues such as thick roots or the leaves of succulents. The size and shape of the illustrations sometimes appear to be connected to the plant's use or properties. In the Ambrosiana codex, for example, poison hemlock (*kōneion*, κώνειον, *Conium maculatum* L., f.

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[60] See Marie Cronier and Patrick Gautier Dalché, "A Map of Cyprus in Two Fourteenth-Century Byzantine Manuscripts," *Imago Mundi* 69, no. 2 (2017): 176-187. On the Ambrosiana codex, see Emilio Martini and Domenico Bassi, *Catalogus codicum Graecorum Bibliothecae Ambrosianae* (Milan: Hoepli, 1906), 1: 23-28 (n. 24). On the Marciana codex, see Elpidio Mioni, *Bibliothecae Divi Marci Venetiarum codices Graeci manuscripti*. Volumen III: *Codices qui in classes IX, X, XI inclusos et supplementa duo continens* (Rome: Istituto poligrafo dello stato, 1972), 112-115. See also Alain Touwaide, "Un recueil grec de pharmacologie du Xe siècle illustré au XIVe siècle, le Vaticanus gr. 284," *Scriptorium* 39, no. 2 (1985): 13-56, here: 46, 52; and Collins, *Medieval Herbals*, 75.
[61] See Cronier and Gautier Dalché, " Map of Cyprus," 176-187.
[62] This note appears on f. 50r
[63] Also on f. 50r.
[64] This note appears on f. 179v.
[65] Cronier and Gautier Dalché, "A Map of Cyprus," 185, n. 8.
[66] Ibid., 176-187.
[67] Ibid., 180.
[68] Cronier and Gautier Dalché think an intermediary unlikely. Ibid., 177.
[69] There is more space in the Ambrosiana codex. The pictures are larger, and often intrude into the text column. Text and pictures were likely copied in succession.

37r, fig. 5.14) has an unusually prominent place, taking up the whole upper half of the page, likely because it was easily confused with some kinds of parsley, hence the common English name: fool's parsley. These different ways of depicting plants suggest that there was especial attention to articulating structure at the level of the general organization of the whole plant rather than the local relations between specific parts. This concern is apparent in the way the scribe tends to close off the outlines and isolate structures. This works in two ways: first, it hints at the process by which the pictures were copied, that is, how the scribe understood them, and, second, it impacts how the pictures refer to or depict their subject matter for later viewers.

That the ink could not convey plant coloration led the scribe use descriptive color labels in the Ambrosiana codex. While this strategy only occurs in a few sketches at the beginning of the text, most of these color notes were again copied into the Marciana codex. For example, the note in the Ambrosiana codex accompanying a picture of *artemisia hetera polyklonos* (ἀρτεμισία ἑτέρα πολύκλονος, wormwood) reads a "(leek)green-(geranium)blue and (wine)purple root" (f. 21r).[70] Although conventional, these color names, nevertheless, invite comparison to the color of leeks, geraniums, or wine. A few notes use similes. An inscription beside aloe (ἄλλον, *allon,* i.e., ἀλόη, *aloē*) in the Ambrosiana codex reads: "(leek)green-colored up to the… roots…" and by the roots "a wine-colored root like lees of wine" (f. 19v).[71] This longer note was abbreviated when copied into the Marciana codex (f. 95v).[72] Both codices use a simile to describe the color of birthwort root: "(wine)purple like mustard [seed]" (Ambrosiana, f. 20r; Marciana, f. 95v).[73]

Few pictures in either codex bear much resemblance to actual plants. In fact, without labels, text, and a preexisting knowledge of what the actual plants look like, most of the pictures would have been botanically useless. The pictures are spatially ambiguous: foreground, middle ground, and background bleed into each other. As a result, the sketches collapse the plant's dimensionality and, crucially, its patterns of growth. Specific morphological features such as leaf margins or venation either dissolve into the fluid strokes of the pen, or were omitted altogether. Discernable structures and anatomical differences, such as leaves, branches, buds, fruits, and flowers evaporate. Instead the sketches give the overall shape, or *Gestalt* of a given plant. By trimming out or abstracting details, they emphasize general composition and configuration. In doing so, they more readily cue the pictures on which they are based, although they are less accurate renditions of actual plants. Like a thumbnail or computer icon, the sketches orient their viewers to their source images. As concise memory-aids, the drawings are also preeminently suited to function as finding aids, akin to chapter headings or tabs. Curiously, these cursory illustrations were perhaps *more* likely to have been used in the field than the Morgan Dioscorides, given their smaller size and clear evidence of use. By contrast, the Morgan Dioscorides was more likely studied and consulted indoors within a scholarly context, perhaps in conjunction with other texts such as botanical lexica and other medical texts.

Dioscorides for Galen? — Vatican, Biblioteca Apostolica Vaticana, gr. 284

The need to match botanical illustrations to other medical texts resulted in another method of marginal illustration, in which miniaturized but still detailed illustrations were added to the

[70] Milan, Biblioteca Ambrosiana, A 95 sup., f. 21r: ἀρτεμισία ἑτέρα πολύκλωνος: πρασϊνο ερά[νο]| ἡδὲ ῥῖζα ὀξό|χρους

[71] Milan, Biblioteca Ambrosiana, A 95 sup., f. 95v: πρασινόχρουν μέχρι τῆς ῥιζ[ης] π..., [ὸ]ξόχρουν ἡ ρί|ζα ὥσ|περ τρυ|γία | οἴνου

[72] Venice, Biblioteca Nazionale Marciana XI.21 (coll. 453), f. 95v: Πρασινό… τῆς ῥιζης π...

[73] Both Milan, Biblioteca Ambrosiana, A 95 sup., f. 20r; and Venice, Biblioteca Nazionale Marciana XI.21 (coll. 453), f. 95v: μέλανα | ὀξεία | ὥσπερ | σϊνα|πῖδϊα

margins of texts that were originally unillustrated. Small marginal illustrations such as these represent a middle ground between the large illustrations of the Morgan Dioscorides and the marginal sketches of the Ambrosiana and Marciana codices. In a tenth-century manuscript now in the Vatican library (Biblioteca Apostolica Vaticana, gr. 284; 288 ff.; 279 x 216 mm) we find pictures from the Morgan Dioscorides were copied into the margins of a synthesis and textual adaptation of Dioscorides' *De materia medica* to Galen's *De simplicium medicamentorum temperamentis ac facultatibus* (e.g., f. 150r, fig. 5.15).[74] The text has been dated to the late tenth century and associated with the Ephrem scriptorium in Constantinople.[75] The pictures were clearly executed after the copying of text and were based, as Alain Touwaide shows, on the Morgan Dioscorides.[76] He dates the illustrations to the fourteenth century on the basis of the marginal titles accompanying them.[77] Minta Collins has, however, is skeptical about this hypothesis due to the pictures' aged appearance relative to the "fresher" look of the inscriptions and the striking contrast between the high quality of the miniatures and the "untidy titles."[78] Collins instead suggests that the pictures could have been executed shortly after the completion of the text and marginal notes.

The titles were generally done after the copying of the pictures as they tend to be above the pictures, often far away from corresponding text. As a result, it would seem the pictures were copied and then the titles were added. Because the Morgan Dioscorides and Vatican gr. 284 contain different texts, the illustrators would have needed to match the pictures in the Morgan Dioscorides to the corresponding chapters in Vatican gr. 284. Sometimes the titles above the pictures give the name of the plant as it is in the Morgan Dioscorides and not as it is in the main titles for the text of Vatican gr. 284, perhaps suggesting the scribe had at hand the Morgan Dioscorides or a related codex, while labeling the pictures.[79] In these cases the marginal titles give the name in the Morgan Dioscorides first, followed by the name as given in the main title of the text. That these alternate names from Morgan typically appear among the list of synonyms in the text of Vatican gr. 284, suggests that synonymy was used to connect pictures to texts whenever the names differed. Both actions could have occurred in the fourteenth century, as suggested by Touwaide. Alternately, in line with Collins's thinking, the pictures could have been retroactively labeled, perhaps as a result of later readers' having trouble connecting them to the relevant text.

Regardless of whether the marginal illustrations were executed in the tenth or fourteenth century, they nevertheless demonstrate that pictures from the Alphabetical Dioscorides circulated independently of the text of Dioscorides. In this way, they indicate the ways that the pictures in the Morgan and Vienna Dioscorides were used in conjunction with other medical and pharmacological texts. By copying them into the margins of Vatican gr. 284, the illustrator made the scholarly act of checking a pictorial reference permanent.

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[74] Alain Touwaide, "Un recueil grec de pharmacologie du Xe siècle illustré au XIV^{e} siècle, le Vaticanus Gr. 284," *Scriptorium* 45 (1985): 13-56.
[75] Jean Irigoin, "Pour une étude de centres de copie byzantins, II. Quelques groupes de manuscrits," *Scriptorium* 13 (1959): 177-209, at 190-195.
[76] Touwaide, "Un recueil grec," 13-56.
[77] Ibid., 46-56.
[78] Collins, *Medieval Herbals*, 70-71.
[79] E.g., on f. 9r, the picture has a label above it: χρυσανθον, and not the title heading of the chapter which reads περὶ ἐλιχρύσου, and on f. 60r the title reads υπερικόν ὁιδὲ κόρεως, whereas the text is titled περὶ κόρεως.

Paris, Bibliothèque nationale, cod. gr. 2183

The same phenomenon of marginal illustrations again appears in a fourteenth-century codex now in Paris (Paris, Bibliothèque nationale de France, gr. 2183) that would eventually serve as a model for a number of post-Byzantine illustrated Dioscorides.[80] It contains an originally unillustrated interpolated version of Dioscorides' *De materia medica*, written in an elegant bookhand with few abbreviations.[81] As with Vatican gr. 284, the illustrations crammed into the margins of Paris gr. 2183 may be later than the execution of the text, with the pictures coming from a variety of sources, some of which are clearly based on illustrations in the tradition of the Vienna and Naples Dioscorides (e.g., the iris depicted in the bottom corner on f. 2r, fig. 5.16). On the whole, however, most of the illustrations in Paris gr. 2183 cannot be sourced to a specific codex, although many of them clearly go back to the Alphabetical Dioscorides. As with Vatican gr. 284, Paris gr. 2183 does not appear to have been planned with illustrations in mind. The stylistic variety of its pictures suggests they were added over time perhaps as different users encountered or sought them out in other sources. [82] Here we again find evidence for the concretization of the scholarly act of checking a pictorial reference internally within the manuscript, just as we saw in Vatican gr. 284.

Botanical Atlases

The movement of illustrations into the margins of notebooks, handbooks, and other texts speaks to the ability of botanical pictures to circulate independently of specific texts. This independence becomes particularly manifest in the production of botanical atlases, traces of which are already suggested by the Copenhagen and Padua codices. But both of these manuscripts eventually had texts added to them. The addition of text may have always been intended. Another group of botanical manuscripts from this period, however, is completely devoid of texts. I designate these manuscripts as "atlases" in order to highlight the absence of text, and to differentiate them from albums, which are sometimes narrowly defined as volumes composed of loose leaves or heterogeneous quires. In contrast, Byzantine botanical atlases were planned as complete works and are codicologically homogeneous. In this section, I ask two basic questions: first, how did this tradition emerge? And, second, how does it develop?

While all surviving examples of botanical atlases date to the Palaiologan period, the elimination of text follows a long trend in the history of herbal illustration. Papyrus fragments of

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[80] Marie Cronier, "Comment Dioscoride est-il arrivé en Occident? A propos d'un manuscrit byzantin, de Constantinople à Fontainebleau," *Νέα Ῥώμη* 10 (2013): 185-209, esp. 188-192. On its copies, see Brigitte Mondrain, "Lettrés et copistes à Corfou au xve et au xvie siècle," *Puer Apuliae. Mélanges offerts à Jean-Marie Martin*, ed. E. Cuozzo, V. Déroche, A. Peters-Cutot and V. Prigent (Paris: Centre de recherche d'histoire et civilisation de Byzance, 2008), 463-476; Brigitte Mondrain, "Les manuscrits grecs de médecine," in *Colloque: La médecine grecque antique. Actes*, Cahiers de la villa Kérylos 15, ed. J. Jouanna (Paris, De Boccard, 2004), 267-285. Teresa Martínez Manzano, "De Corfú a Venecia: el itinerario primero del Dioscórides de Salamanca," *Medioevo greco*, 12 (2012): 133-154, esp. 140; Alain Touwaide, "The Salamanca Dioscorides (Salamanca, University Library, 2659)." *Erytheia* 24 (2003): 125-158, at 128. Teresa Martínez Manzano argues against Touwaide's hypothesis that the Salamanca Dioscorides was produced in Venice.

[81] Cronier and Touwaide suggest that the text of Paris gr. 2183 was copied from a manuscript (Venice, Biblioteca Marciana, Z gr. 217, =coll. 727), once owned by Bessarion, and based on Florence, Biblioteca Medicea Laurenziana, 74.23 and Athos, Great Lavra, Ω 75. Cronier, "Comment," 190. This edition has been attributed to a fourteenth-century physician named George Chrysokokkes, see Brigitte Mondrain and Marie Cronier, "Georges Chrysococcès, copiste et éditeur de textes médicaux au XIVe siècle. L'exemple de Dioscoride," in *VII Colloquio internazionale sull'Ecdotica dei testi medici greci (Procida 11-13 giugno 2013*), ed. by A. Roselli. Forthcoming.

[82] See Cronier, "Comment," 191.

the late fourth- or early fifth-century Antinoopolis codex already show a tendency to abridge texts, presumably in order to make room for pictures (see ch. 2 and 3).[83] This trend occurs in both the later Greek and Arabic Dioscorides.[84] A note in an Arabic Dioscorides from 1219 tells its reader that while it is unillustrated, a separate volume of illustrations with short texts was prepared should the reader require it.[85]

Suggestive evidence for botanical illustration without textual accompaniment in Byzantium can be found as early as the late ninth or early tenth century in the Morgan Dioscorides. In a folio that was added to the beginning of the codex, we find a picture of *melissophyllon* (μελισσόφυλλον, balm, *Melissa officinalis* L., *MM* 3.104, f. 1v, fig. 4.4) without text. As I note in chapter four, the folio was probably included so as to complement the main entry. While its addition reflects practices of pictorial compilation evident elsewhere in the codex, it might also signal contemporaries' comfort with having botanical illustrations not being directly or immediately connected to a specific text.

A Deluxe Botanical Atlas—Vatican, Biblioteca Apostolica Vaticana, Chigi F.VII.159

In the first half of the fifteenth century, the pictures from the Morgan and Vienna Dioscorides, and perhaps another codex that has since gone missing, were copied entirely independently of text into a deluxe parchment codex now in the Vatican.[86] The manuscript contains illustrations from the Morgan Dioscorides that have since gone missing.[87] The Chigi codex contains more miniatures than the Padua codex, but lacks text except for titles and later notes, largely in Latin. It was likely copied in the first half of the fifteenth-century, after 1406. [88]

Isidore of Kiev (c.1390–1463), the metropolitan of Kiev and all of Russia (1436-1439) and later Latin Patriarch of Constantinople (1459-1463), appears to have directed the copying of the Chigi codex, as his hand appears in tiny inscriptions at the top edge of the folios (ff. 13-219), as well as the small red titles for the Greek names of animals (ff. 221-233).[89] Another scribe

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[83] Leith, " Antinoopolis Illustrated Herbal," 150-154.

[84] On this phenomenon in Arabic Dioscorides, see Saliba and Komaroff, "Illustrated Books," 6-65.

[85] Trans. and cit. in Saliba and Komaroff, "Illustrated Books," 21: "This book contains the book of Dioscorides of ʻAinzarba, without the pictures of plants, trees, animals, and minerals, for all of those were recorded in a separate book all by themselves, in order to facilitate access to them for those who wish to do so. Whoever needs to know something of that sort should refer to that other book which includes all the pictures of plants, [trees], animals, and minerals, and where next to each picture there was a brief and succinct mention of the name of the plant, its strength, and some of its effects."

[86] Vatican, Biblioteca Apostolica Vaticana, Chigi F.VII.159; 239 ff.; 283 x 205 mm. On this codex see, Miguel Ángel González Manjarrés and María Cruz Herrero Ingelmo, *El Dioscórides Grecolatino del Papa Alejandro VII. Manuscrito Vat. Chigi 53 (F. VII 159)* (Madrid: Testimonio, 2001), and Collins, *Medieval Herbals*, 77-82. The following illustrations do not appear in the Vienna and Morgan Dioscorides, and, for stylistic reasons, may be derived from another source (also see discussion below): ἀρτεμίστρα (f. 95r), κράμβη νέα (f. 99r), κράμβη μεγάλη (f. 100r), κάρδαμον (f. 100v), λίβανωτεις ἑτέρα (f. 108r), νυμφαία (f. 120r), νυμφαία ἑτέρα and νυμφαία ἑτέρα (f. 120v), σεύτλον ἥμερον λεύκον (f. 148r), σεῦτλον κόκκεινον ἄγριον (f. 148v), *cotilidon cimbalaria* (f. 150, Greek name is missing), τὸ φαγεδαικόν (f. 172v), ὥκιμον ἕτερον (f. 183v), σίκυος πέπων and σίκυος (f. 203v), ἑτέρος σίκυος πεπων and σίκυος κολοκύνθι (f. 204r), καρπίν (f. 209r), and κύνοσβατος (f. 214v).

[87] For example, we can assume that the depictions of an oak (δρῦς) on f. 211v, and of συκῆ ἀγρία and ῥόα δένδρον on f. 218v, where based on illustrations that once belonged to the Morgan Dioscorides, but have since gone missing.

[88] Anton von Premerstein suggested that the codex was copied after 1406, because it reflects John Chortasmenos's rearrangement of the Vienna codex. Anton von Premerstein, Carl Wessely, and Josef Mantuani, *De codicis Dioscuridei Aniciae Iulianae, nunc Vindobonensis Med. Gr. 1* (Leiden: Sijthoff, 1906), 171-172. See González Manjarrés and Herrero Ingelmo, *El Dioscórides Grecolatino*, 46-53.

[89] Giovanni Mercati, *Scritti d'Isidoro il cardinal Ruteno*, *Studi e testi* 46 (Rome: Biblioteca Apostolica Vaticana, 1926), 93. Three other hands are associated with Latin inscriptions. On the sequence of production, see González

wrote the Greek plant names in larger letters closer to the illustrations. These inscriptions often contain spelling errors that probably derive from the second scribe's attempts to make sense of Isidore's tiny, and frequently abbreviated inscriptions. This suggests in turn that the Vienna and Morgan Dioscorides were no longer present when these titles were written. Isidore's unceremonious inscriptions (ff. 13-219) could suggest he took a prominent role in planning the codex, perhaps signaling to the painter what pictures to copy. He may have even intended cropping these notes following the addition of ornamental red titles.

It is difficult to know exactly when the codex was produced. Isidore probably studied in Constantinople in the first decade of the 1400s.[90] In the 1420s, he was likely in the Morea, and he may have joined the monastery of St Demetrios in Constantinople, ca. 1430, becoming *hegoumenos* in 1433. He left Constantinople in 1434 to attend the Council at Basel. He was confirmed as the Metropolitan of Kiev in 1437, and attended the Council of Ferrara-Florence the same year. He returned to Moscow in 1441, was quickly imprisoned for his Unionist agenda, and escaped back to Rome shortly thereafter. He was in Constantinople in 1450 and in 1452-53. He eventually settled in Italy after 1453. Isidore could have been involved in the production of the manuscript in the 1430s, while he was *hegoumenos* of the monastery of St Demetrios in Constantinople, or perhaps during a later stay in the city, such as in 1450 or 1452-53. That Isidore also owned an unillustrated Dioscorides has led Minta Collins to suggest that he might have had the Chigi Dioscorides made in order to accompany it.[91] It remains possible, too, that the book was used in conjunction with other medical works.

The pictures from the Vienna Dioscorides are generally at full folio, while those from the Morgan Dioscorides tend to be smaller. The copyists did not reproduce illustrations from the Morgan Dioscorides that also appear in the Vienna Dioscorides, except in cases where the two illustrations were different enough to suggest they indicated another plant. For example, the smaller lighter eryngo from the Morgan Dioscorides (f. 57r, fig. ch 4.7) was copied into the Chigi codex, while the larger, blue eryngo from the same codex was not, presumably because the matching eryngo from the Vienna Dioscorides had already been copied. Significantly, the two eryngos in the Chigi codex are labeled differently. The smaller eryngo on f. 191v is called "the narrow-leaved eryngo" (ἤριγγιον τὸ λεπτοφυλλον, perhaps *Eryngium campestre* L., fig. 5.17), while the larger eryngo on f. 68v is "the big eryngo" (ἠρύγγιον τὸ μέγα, likely *Eryngium maritimum* L., fig. 5.18). The naming confirms that the doubled pictures in the Morgan Dioscorides were understood to represent different subtypes. As a result, we can see that the Chigi codex may bear witness to the continuation of the same botanical practices evident in the Morgan Dioscorides (see ch. 4).

Manjarrés and Herrero Ingelmo, *El Dioscórides Grecolatino,* 51. See also, von Premerstein, *et al.*, *De codicis Dioscuridei*, 1: 11, 89.

[90] See Joseph Gill, *Personalities of the Council of Florence* (New York: Barnes and Noble, 1964), 65–78, and more recently, Marios Philippides, and Walter K. Hanak, *Cardinal Isidore, c. 1390-1462. A Late Byzantine Scholar, Warlord, and Prelate* (Abingdon, Oxon: Routledge, 2008). In favor of a later date of ca. 1450 for Vatican Chigi F.VII.159, Isidore owned a manuscript copy of Church Councils copied in two parts in 1445 and 1446 by the scribe Athanasios (Munich, Bayerische Staatsbibliothek, cod. gr. 186). On f. 298v, Isidore notes that the second part of this codex was copied from an exemplar in the library of the Prodromos monastery, also the location of the exemplars used for Vatican Chigi F.VII.159. See *Katalog der griechischen Handschriften der Bayerischen Staatsbibliothek München,* 4: *Codices graeci Monacenses 181-265*, ed. Kerstin Hajdú (Wiesbaden: Harrassowitz, 2012), 4: 53. On Isidore's copying of manuscripts, see Mercati, *Scritti*, and Philippides and Hanak, *Cardinal Isidore,* 250.

[91] Collins, *Medieval Herbals*, 82. The unillustrated Dioscorides is Vatican, Biblioteca Apostolica Vaticana, gr. 289. See also, Touwaide, "Un recueil," 49.

And just as later users of the Morgan Dioscorides modified some of its pictures to show new or more accurate properties of the plant, so too did the makers of the Chigi codex "correct" or elaborate upon some pictures when they copied them into the codex. For example, we find the illustration of *knikos* (κνίκος, likely safflower, *Carthamus tinctorius* L., f. 105v, fig. 5.19) from the Chigi codex has flowerheads that are more accurately rendered than in the Vienna Dioscorides (f. 198v). In other cases, the copyists added details excluded in the original illustrations. In the picture of *pentaphyllon* (πεντάφυλλον, likely creeping cinquefoil, *Potentilla reptans* L., f. 135r, fig. 5.20), the copyist added orange and red fruit that do not appear in the Vienna Dioscorides (f. 273r), the Naples Dioscorides (f. 118r) and the Morgan Dioscorides (f. 126r). The fact that the copyist included fruits of different colors, suggests she or he was interested in showing multiple stages in the development of the fruit, an aspect of some other botanical illustrations in the Alphabetical Dioscorides (ch. 2). The fact the copyist responsible for the Chigi codex added these details when copying the earlier illustrations begs that we rethink our general understanding of how descriptive details are affected by copying. Rather than copying leading to a loss of details, sometimes it can lead to new details being added to an image. This process of gradual addition and correction is especially evident in the Chigi illustration of the *spartos* Spanish broom (*spartos*, σπάρτος, *Spartium iunceum* L., f. 157r, fig. 5.21). In it we encounter neither the original illustration (f. 327v), nor the sketch (f. 328r) from the Vienna Dioscorides, but rather a hybrid of the two: it is as though the painter copied out the original sixth-century illustration (on f. 327v, fig. 5.7) and then added the seed pods conspicuously absent in the original but supplied by the sketch (f. 328r, fig. 5.6).[92]

In some cases, however, the illustrations from the Morgan Dioscorides were not copied, but were rather substituted by other pictures. For example, the *kynosbatos* (κύνοσβατος, likely evergreen rose or a dog rose, *Rosa sempervirens* L., or *Rosa canina* L.) from the Morgan Dioscorides was not copied at all into the Chigi codex. Instead, we find a completely different illustration much closer in appearance to the actual plant referred to by the text (f. 214v, fig. 5.22). Typically, scholars might explain such an illustration as a rare copy of a now lost antique source. But this explanation is unsatisfying given that there does not appear to have been an antique illustration of *kynosbatos*, at least in the Alphabetical Dioscorides (see ch. 4). Moreover, every other illustration on the same folio is clearly taken from the Morgan Dioscorides. The Chigi *kynosbatos* was likely then a later creation, perhaps Late Byzantine or even *ex novo*, and perhaps substituted for the less accurate illustration in the Morgan Dioscorides.

The likelihood that the *kynosbatos* is a Late Byzantine invention raises the possibility that other pictures in the Chigi codex are as well, and were perhaps even invented by the makers of the Chigi codex. As noted earlier, a number of illustrations in the Chigi codex do not appear in either the Morgan or the Vienna Dioscorides. For example, the Chigi codex includes two varieties of non-heading cabbage not present in the Vienna, Naples or the Morgan Dioscorides: *krambē nea* (κράμβη νεα, i.e., the "new cabbage," a kind of collards, f. 99v, fig. 5.23), and *krambē megalē* (κράμβη μεγάλη, or "big cabbage," which, allowing for some inaccuracies, could be kohlrabi, f. 100r). The name "new cabbage" would seem to speak to its being a novelty of the Late Byzantine world, and not a descendent of some lost antique source. Similarly, the Chigi codex includes two different beets that do not appear in the same earlier codices: *seutlon hēmeron leukon* (σεύτλον ἥμερον λεύκον, the " cultivated white beet," f. 148r), and *seutlon*

[92] That the Chigi illustration includes the idiosyncratic loops that were added to the stem of the plant in the Vienna Dioscorides confirms that the illustrator was not using another source, as other versions of the picture lack those loops, cp. Naples Dioscorides (f. 150r).

kokkeinon agrion (σεῦτλον κόκκεινον ἄγριον, the "wild red beet," f. 148v, fig. 5.24). The illustration of garden cress, *kardamon* (κάρδαμον, *Lepidium sativum* L., f. 100v), is more accurate and clearly distinct from the illustration in the Vienna Dioscorides (f. 186v). Another picture, curiously labeled *artemistra* (ἀρτεμίστρα) on f. 95r, perhaps a misspelling for *artemisia* (ἀρτεμισία), can likewise not be identified in earlier codices (fig. 5.25). The picture is of a feverfew or chamomile plant (*Tanacetum parthenium* L.), an identification also made by a later Latin hand that inscribed the picture as *matricaria*.

These instances of invention, correction, and replacement tend to suggest the existence of a critical tradition copying, as opposed to the "passive" or "mechanical" copying that supposedly characterizes Late Byzantine image-making in general, and their botanical illustrations in particular. Many of these plants that were corrected or added would have been common, and were cultivated (e.g., the cabbages, the beets, the garden cress, the safflower), or were (and still are) used medicinally (e.g., the cinquefoil, the chamomile). It makes sense that the pictures most likely to be corrected and added were those that Byzantine people would have been more familiar with. These observations here correspond with what I observed regarding the more accurately depicted trees in the Morgan Dioscorides (ch. 4). That the same pattern appears several centuries later in the Chigi codex is evidence for the continuity of botanical practices based ultimately in how Byzantine people made sense of the world around them.

A Botanical Atlas for a Physician—Bologna, Biblioteca Universitaria di Bologna, *MS 3632*

Written in the same century as the Chigi codex is a paper codex now in Bologna. Among many other medical and magical texts, the codex includes a section of plant illustrations (ff. 386-417), lacking text except for numbers, names, and occasionally synonyms.[93] The Bologna pictures are of varying quality and were apparently derived from different sources—not just the Vienna Dioscorides.[94] For the most part, the illustrator, likely the scribe and recipient of the codex, a figure identified in one note as John of Aro(n), rapidly executed the pen and ink sketches, which he later colored with washes.[95] He appears to have done the coloring of the illustrations at a different time, as he inscribed the names of the colors in certain parts of the plants. For example, in the illustration of *chrysanthemon* or *helichryson*, the illustrator wrote κ, κυτ, κυτρ, κυτρι, all abbreviations of κίτρινο or "citron" yellow, as though to avoid confusing them with leaves when

[93] Bologna, Biblioteca Universitaria, MS 3632; 475 ff.; 296 x 219 mm. On this manuscript, see Kasia Ingalis and Adriano Pandimiglio, "Il restauro del manoscritto 3632," in *BUB. Ricerche e cataloghi sui fondi della Biblioteca Universitaria di Bologna* (Bologna: Minerva, 2010), 64-72; Francesca Marchetti, "Un manoscritto 'senza pari': le illustrazioni," in *BUB. Ricerche e cataloghi sui fondi della Biblioteca Universitaria di Bologna* (Bologna: Minerva, 2010), 41-63; Angelo Bernasconi, "Un gruppo di codici greci bolognesi provenienti dalla biblioteca del sultano Mustafà I," *Scriptorium* 60 (2006): 254-268; idem, "Il sapere di un medico bizantino quando i turchi entravano a Costantinopoli: la testimonianza del codice 3632," in *BUB. Ricerche e cataloghi sui fondi della Biblioteca Universitaria di Bologna* (Bologna: Minerva, 2010), 15-39. The manuscript's contents range from excerpts by medical authorities such as Hippocrates, Galen, Paul of Aegina, Aetius of Amida, Blemmydes Nikephoros, and Theophilos Protospatharios, to works on the properties of stones, astrology, demonology, and divination.

[94] As with Paris gr. 2183, the variable quality of the miniatures precludes sourcing them. See also, Francesca Marchetti, "La trasmissione delle illustrazioni del Dioscoride di Vienna negli anni intorno alla caduta di Constantinopli (Cod. Banks Coll. Dio. 1, Natural History Museum, London; Ee. V. 7, Cambridge University Library, Cambridge; e C 102 sup., Biblioteca Ambrosiana, Milano)," *Jahrbuch der Österreichischen Byzantinistik* 66 (2016): 153-178, at 167.

[95] See Bernasconi, "Il sapere," esp. 30. See also Chester Charlton McCown, *The Testament of Solon edited from Manuscripts at Mount Athos, Bologna, Holkham Hall, Jerusalem, London, Milan, Paris and Vienna* (Leipzig: Hinrichs'sche Buchhandlung, 1922), 22-24.

later coloring the illustration (f. 417r, fig. 5.26). These color inscriptions speak to the copyist's interest in and attempt at preserving the accuracy of the illustrations.[96]

Over time, additional plants, many with vernacular names, were also sketched into the codex (e.g., f. 416v, fig. 5.26, and f. 390r, fig. 5.27). These illustrations resemble in some ways the marginal sketches in the Ambrosiana and Marciana codices. In general, the order of the pictures, according to their numbering, does not closely follow that of the plants in the Vienna or Morgan codices. They seem to have been copied in a haphazard, *ad hoc* way, or perhaps according to an order prescribed by another codex as yet unknown.

Elsewhere we find lists of synonyms, as, for example, beside a picture of *onobrychis* (ὀνοβρυχίς, perhaps sainfoin, *Onobrychis spp.* Mill., f. 417r, fig. 5.26). It is unclear if, like the Chigi codex, the pictures in the Bologna codex were used at any point to accompany an unillustrated text. The list of synonyms, and the fact that the pictures were copied from multiple sources could indicate that they might have served a more general role as a reference work, perhaps used in tandem with lexica in order to clarify the identity of particular plants.

A Byzantine Botanical Atlas for a Latin Scholar—The Banks Dioscorides

The production of Byzantine botanical atlases and botanical illustrations continued up to and after 1453. Although most of these manuscripts fall outside of the scope of the present dissertation, it is important to emphasize that the tradition of Byzantine botanical illustration survived well into the sixteenth century and even later in both the Latin West and the Ottoman Empire.[97] One of these late manuscripts is a lavishly illustrated paper codex now in the Natural History Museum, London.[98] Francesca Marchetti has dated this manuscript to just before the fall of Constantinople in 1453, but more conservatively its watermarks could date it to anytime between the late 1450s and the early 1480s.[99] As a result, the production of the manuscript could have occurred either in the last years of Byzantine Constantinople or the early years of the Ottoman capital.

Except for the Greek plant names, the manuscript was originally without text. In the seventeenth or eighteenth century, someone also labeled the plants using pre-Linnaean polynomials. The codex has a handful of bilingual notes in Latin and Greek. On note unequivocally identifies the scribe as a Latin: "On this, see Pliny, in the twentieth book, where concerning the drugs [made] of the *strychnon* he calls [it] *alikakavon* and *alikallion*, but we [call it] *vesicarium*"[100] A second note switches between Greek and Latin mid-sentence.[101] In both of

[96] See Francesca Marchetti, "Un manoscritto," 52-59, on color notes, see esp. 58.

[97] These include: Paris, Bibliothèque nationale de France, gr. 2180; Salamanca, University Library, MS 2659; Cambridge, University Library, MS E.e. 5.7; Milan, Biblioteca Ambrosiana, C 102 sup.; and Vienna, Österreichische Nationalbibliothek, cod. 2277. On these manuscripts, see Marchetti, "La trasmissione," 153-178; See also, Collins, *Medieval Herbals*, 82-84; Otto Pächt, "Die früheste abendländische Kopie," 201-214; Mondrain, "Lettrés et copistes à Corfou"; Alain Touwaide, "Une note sur la thériaque attribuée à Galien," *Byzantion* 67 (1997): 439-482; and idem, "Salamanca Dioscorides"; and Martínez Manzano, "De Corfú a Venecia."

[98] London, Natural History Museum, Banks Coll. Dio. 1; 418 ff.; c.300 x 215 mm.

[99] Marchetti, "La trasmissioni," 155. She compares the watermark to Harlfinger Ciseaux 30. In a letter now pasted to the codex's inside cover, however, Robert Farquharson Sharp dates the watermarks anywhere from 1458 to 1477.

[100] f. 25v: περὶ τούτου παρὰ πλυνίω ἐν τῶ Κ ὅπου περὶ στρύχνου φαρμάκων ἁλικάκαβον ὀνομάζει καὶ ἁλικάλλιον. ἡμεῖς δὲ vesicariam.

[101] f. 391v: καμαιδαφνην πλυνη[ος] vincampervincam nominat ἥ φανεται ἄλλη τις εἶναι: ἐν τῷ Κ. The word καμαιδαφνην is normally spelled χαμαιδάφνην. That a *kappa* is used instead of a *chi* could indicate the notes' author is a speaker of a language lacking the /χ/ sound. I thank Maria Mavroudi for pointing this out to me.

these bilingual notes, the scribe refers to plant names in Pliny's *Natural History*.[102] In the second half of the 15th century, there were no reliable, eadily available Latin translations of Dioscorides. Latin scholars and physicians would have used Pliny to translate Dioscoridean plant names. The humanist hand of these bilingual notes is similar to that responsible for the Greek plant names. It would appear, therefore, that the commissioner and principal recipient of the codex was a Latin scholar. But while the scribe was a Latin scholar, the painters responsible for the codex clearly worked within a Byzantine tradition of painting.[103]

While most of the pictures in the Banks are faithful copies of those in the Vienna Dioscorides, the first folio (f. 1r) bears a picture of a plant labeled *aeizōon to amaranton* (ἀείζωον τὸ ἀμάραντον, fig. 5.28).[104] This plant entirely absent from the Vienna Dioscorides, and does not appear in any of its copies.[105] Like other pictures in the codex, it appears to be the work of a Byzantine painter. [106] The linear, flattened modeling of the leaf clusters, their angular leaves, and the dark outlines that define their margins recall the treatment of drapery in contemporary icon paintings. The dark parallel hatching at the base of the plant and the use of two or three short wedge-like strokes to designate leaf scarring on the lower stalks both recall Late Byzantine habits of painting.[107] The artist responsible for the illustration appears to have adapted techniques from Late Byzantine icon painting to a looser naturalistic composition in the manner of a Northern Italian nature study.

The plant appears to be either *Sedum rupestre* L. or *Sedum sediforme* (Jacq.) Pau.[108] The name means the "unfading ἀείζωον" or the "unfading, always-living [plant]." The picture literally illustrates its name: although the desiccated flowers suggest our sedum is in winter, its leaves are still green. The picture likely does not go back to a now lost antique model, as the name *aeizōon to amaranton* only appears in Late Byzantine botanical lexica.[109] In these cases,

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[102] E.g., ff. 25v, 344v, 370v, 385v, 391v

[103] This training is especially evident in the sinewy figure of Poseidon reclining beside a coral (f. 399r). This figure was painted a dark mid-tone with highlighted areas hatched over it, that is, an approach to modeling figures found in contemporary icon painting.

[104] For more on this illustration, see Andrew Griebeler, "A Late Byzantine Nature Study," *Convivium* (forthcoming, estimated 2019)

[105] Another important difference is that the Banks Dioscorides omits the anthropomorphic root in the picture of eryngo (f. 124r), see Marchetti, "La trasmissione," 156. The artist apparently made the picture match what he or she thought the plant should look like, perhaps, according to some principal of pictorial naturalism.

[106] I thank Henrike Lange and Jean C. Campbell for our conversations about the illustration.

[107] On these approaches to Late Byzantine painting technique, see Kalypsō Milanou, *et al.*, *Icons by the Hand of Angelos. The Painting Method of a Fifteenth-Century Cretan Painter* (Athens: Benaki Museum, 2008), 42-53.

[108] I thank Andrew S. Doran and Dean G. Kelch at the University & Jepson Herbaria at the University of California, Berkeley for their help in identifying this picture. On sedums in the Mediterranean, generally, see Henk 't Hart, *Sedums of Europe—Stonecrops and Wallpeppers*, Urs Eggli, ed. (Lisse: A.A. Balkema, 2003).

[109] On Greek botanical lexica, see Armand Delatte, "Glossaires de botanique", in *Anecdota Atheniensia et alia*, vol. 2 (Paris: Les belles lettres, 1939), 277-454, and Margaret H. Thomson, *Textes grecs inédits relatifs aux plantes* (Paris: Les belles lettres, 1955), esp., 125-177. More recently, see Alain Touwaide, "Lexica medico-botanica byzantina. Prolégomènes à une etude", *Tēs filíēs dōra, Miscelánea léxica en memoria de Conchita Serrano*, (Madrid: Instituto de Filología, 1999), 211-228. See also Jerry Stannard, "Byzantine Botanical Lexicography", *Episteme* 5 (1971): 168-187. Ἀείζωον and ἀμάραντον appear together in the following lexica, all citations are to Delatte, "Glossaires de botanique" (n. 42): ἀείζωον τὸ σύμφυτον καὶ τὸ ἀμάραντον· εἰσὶ δὲ τρία γένη (the lexicon of Neophytos Prodromenos, Delatte n. 1, p. 279, ll. 14-15), ἀίδιον ἀείζωον ἀμάραντον (the lexicon of Nicomedes, Delatte n. 2, p. 304, ll. 5-6), ἀείζωον ἀμάραντον· λέγεται δὲ καὶ ἀπίνη (the lexicon in Paris suppl. 637, Delatte n. 3, p. 320, l. 1), ἀείζωόν ἐστι τὸ ἀμάραντον (*Ἑρμηνεία κατὰ λέξιν τῶν βοτάνων κατὰ ἀλφάβητον*, Delatte n. 5, p. 341, l. 18), Ἀείζωον τὸ ἀμάραντον (the lexicon in Paris gr. 2224, Delatte n. 6, p. 361, l. 11), Ἀείζωον τὸ ἀμάραντον (*Ἐκ τοῦ λεξικοῦ τῶν βοτανῶν κατὰ στοιχεῖον*, Delatte n. 7, p. 367, l. 2), ἀείζωον τὸ ἀμάραντον (*Λεξικὸν τῆς τῶν βοτανῶν*

amaranton typically appears as a synonym for *aeizōon*, presumably because both words seemed to mean the same thing. Indeed, *amarando* is a Modern Greek name for several succulents in the sedum and sempervivum genera.

The illustration may represent a Late Byzantine nature study.[110] The painter attended closely to the idiosyncratic features of the plant, such as the directions of the individual leaf points and the sagging and overlapping of the stalks. Although some ambiguities appear in the rendering of the roots, the picture may have been based on a plant (or a sketch of one) that had not been uprooted or that was lacking most of its roots. Small fibrous rootlets such as those depicted are more readily exposed and broken than the larger taproots that firmly anchor the plant to the substrate. The level of detail and the absence of major misunderstandings in anatomy, along with the fact that the plant appears at a specific stage in its yearly cycle, and that it is unattested elsewhere all tend to suggest the picture was executed from life, or was not far removed from such a rendering.

The picture of *aeizōon to amaranton* belongs to the first quire of the manuscript and was not therefore a later addition. But why include it in the codex in the first place?[111] Byzantine botanical lexica might hint at an underlying motivation. Some lexica list this plant at the beginning of the text.[112] Such a position within a lexicon may have given the entry an especial prominence that might explain why it appears on the first folio of the Banks Dioscorides. The connection between the Banks codex and lexica might also indicate its intended function as a pictorial lexicon or reference work. The bilingual annotations comparing Latin and Greek plant names certainly suggest that the work was used in this way. As a frontispiece, the picture of *aeizōon to amaranton* may have also been intended to foreground the artist's skills of observation and nature depiction, especially as an artist working between Byzantine and Italianate modes of painting.

The Banks Dioscorides represents the convergence of Byzantine and Latin traditions of botanical inquiry. The depiction of *aeizōon to amaranton* is similarly a combination of different approaches to botanical illustration. The plant name derives from Late Byzantine botanical terminology and study, rather than from a lost ancient source. It vividly demonstrates how the Latin Renaissance inherited knowledge of the ancient sciences through living Byzantine traditions. At the same time, the illustration of *aeizōon to amaranton* is a Late Byzantine interpretation of early modern modes of botanical illustration and nature study. The movement of people, images and knowledge evident in the Banks codex and its copies speaks to a Renaissance rooted in collaboration between Greek and Latin speakers across the Mediterranean region, extending beyond the shores of the Italian peninsula.

ἑρμηνείας κατὰ στοιχεῖον, Delatte n. 8, p. 373, l. 20), ἀείζωον ἤτοι τὸ ἀμάραντον λεγόμενον (Ps.-Galien, *Λέξεις βοτανῶν ἑρμηνεῖαι κατὰ ἀλφάβητον τοῦ σοφωτάτου Γαληνοῦ*, Delatte, n. 11, p. 387, l. 1), ἄγος τὸ ἀμάραντον ὃ καὶ ἀείζωον Λ (=λατινικά) ἕρμπα βίβουλα (*Διάλεκτος εἰδῶν τε καὶ βοτάνων κατὰ ἀλφάβητον*, Delatte n. 13, p. 418, l. 4), and ἀείζωον τὸ ἀμάραντον (*Περὶ ἀντωνυμιῶν βοτάνων ἰατρικῶν*, n. 15, p. 451, l. 12).

[110] Griebeler, "A Late Byzantine Nature Study."

[111] Alternatively, the word *amaranton* may have resonated with the commissioner or recipient of the book. It appears in a Marian epithet and icon-type *to rhodon to amaranton* (τὸ ῥόδον τὸ ἀμάραντον), ultimately descended from the epithets given in the Akathist hymn. See Dīmītrios Pallas, "Theotókos ródon to amáranton," *Archaiologikón Deltíon* 26 (1971): 225-238. I thank Anna Kartsonis for this recommendation.

[112] E.g., Paris, Bibliothèque nationale de France, gr. 2224, ff. 70-71.

Conclusions

This chapter outlines how the Byzantine tradition of botanical illustration was disseminated throughout the late medieval Mediterranean. It identified three mechanisms for the spread of botanical visual knowledge: illustrated texts, botanical atlases, and finally, the memory of individual scholars and physicians. It also connected these different kinds of dissemination and picturing to patterns of Late Byzantine botanical inquiry. Byzantine scholars and physicians used botanical illustrations alongside other texts, and compared pictorial and textual sources in order to verify and construct botanical knowledge. The act of referring to and comparing pictures finds its fullest realization in the marginal illustration of texts that were not originally illustrated (e.g., Vatican gr. 284 and Paris gr. 2183), and in the creation of botanical atlases that appear to have acted as pictorial reference works that were used with other texts. The atlases in the Bologna and Banks codices may have been used in conjunction with botanical lexica.

Contrary to standard views of Byzantine scholarship and artistic practice, the creation and use of these works was hardly an uncritical process of copying. Throughout this period, we encounter copyists and users who sought to expand, elaborate upon, and to improve the visual corpus of the Byzantine botanical tradition. Inaccurate pictures were identified and improved or replaced. And, if needed, they even invented new illustrations *ex novo*, often through direct observation. All of these critical practices represent a continuation of many of the practices of critical compilation, comparison, modification, and invention that I identified in the Morgan Dioscorides (see ch. 4). In recognizing the continuation of earlier practices, we can speak of a continuous Byzantine botanical tradition rooted in the critical compilation and comparison of sources with each other and with actual plants in the world.

On the other hand, the marginal illustrations in the Ambrosiana notebook and Marciana handbook point to other forms of depiction and use that raise important questions about the ways in which the Byzantine botanical tradition spread throughout the late medieval Mediterranean. The fact that the marginal illustrations in them could have only functioned as memory aids, suggests that the earlier Dioscorides were closely studied, and may have even been part of the medical curriculum at the Petra monastery. The Ambrosiana and Marciana codices thereby also hint at the central role that memory played in the transmission of visual knowledge.

The time period covered in this chapter is bookended by the Fourth Crusade in 1204 and the Ottoman conquest of Constantinople in 1453. While both events were traumatic, neither put an end to the tradition of Byzantine botanical illustration and the practice of Byzantine botany. In many ways, 1204 and 1453 may have spurred the wider dissemination of Byzantine botanical traditions throughout the Mediterranean, while the gathering of manuscripts at the Petra monastery in the fourteenth and fifteenth centuries allowed for a highly localized and intensified critical practice of Byzantine botany. The dissemination and concentration of the Byzantine botanical tradition both underscored the gradual expansion of the tradition, even while following many of the same patterns of scholarly practice already evident in the Middle Byzantine period (see ch. 4). Throughout this period, these patterns of botanical scholarship and image-making were increasingly shared between Latin, Arabic, and Byzantine traditions of botany.

Chapter Six
The Frontispiece Cycle of the Vienna Dioscorides and Its Changing Narratives

Vienna Dioscorides (Vienna, Nationalbibliotek, med. gr. 1) is the oldest known surviving manuscript copy of the illustrated Alphabetical version of Dioscorides' *De materia medica*.[1] Upon opening the massive codex—nearly 38 x 33 cm and about fourteen pounds—, the reader finds the first folio covered with notes (f. 1r, fig. 6.1).[2] The other side of this folio bears a large illustration of a peacock, now badly flaked (f. 1v, fig. 6.2). Verso the next folio, we find seven famous physicians on a gold ground (f. 2v, fig. 6.3). A second gathering of seven different physicians, similar to the first, again on gold ground, appears on the verso of the next folio (f. 3v, fig. 6.4). The illustration on the fourth verso portrays Dioscorides sitting in a chair, while Discovery (*heuresis,* εὕρεσις) personified presents an uprooted mandrake plant to him (f. 4v, fig. 6.5). On the next verso, we find Dioscorides in his study joined by an assistant, who paints a mandrake held by a personification of Invention (*epinoia,* ἐπίνοια, f. 5v, fig. 6.6). The final illustration in this cycle depicts an early Byzantine princess, Anicia Juliana—her name ΙΟΥΛΙΑΝΑ appears in the elaborate frame—, surrounded by personifications of the virtues Magnanimity (*megalopsychia*, μεγαλοψυχία) and Prudence (*phronēsis*, φρόνησις) and the "Gratitude of the Arts" (*eucharstia technōn,* εὐχαριστία τεχνῶν). In a show of generosity, Anicia Juliana throws coins into an open codex held up by a small child or Eros labeled, "Desire for she who loves to build" (*pothos tēs philoktistou,* πόθος τῆς φιλοκτίστου, f. 6v, fig. 6.7).[3] The next verso bears an ornate title (f. 7v, fig. 6.8): "within [is] Pedanios Dioscorides of Anazarbos's *On herbs and roots and juices and seeds as well as leaves and drugs*. We begin thus now from the letter alpha."[4]

This chapter considers the frontispieces of the Vienna Dioscorides as a lens for examining how Byzantine people conceptualized the illustrated Dioscorides. The frontispieces introduce and frame the codex's contents. They thereby guide the readers of the codex in how they approach and understand the text. Moreover, as later users repaired and modified the frontispieces over time, they left behind evidence of shifts in how they conceived of the illustrated herbal's contents. By identifying these modifications, the chapter demonstrates three different shifts in how users conceptualized the manuscript: first, they originally viewed it as a useful pharmacological text, which was adapted as a gift to thank Anicia Juliana for her patronage. Second, a later user, perhaps Anicia Juliana herself, had the peacock folio (f. 1v) added to the front of the volume to signal the expansion of the codex into a wider, more general collection on natural history. Third, in the early fifteenth century, another user had the personifications and Anicia Juliana relabeled as Sophia or Wisdom. These modifications adapted

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[1] There is currently an embargo on opening the codex. All of the research that I have conducted on this codex has been done with facsimiles. Although useful, these facsimiles cannot be used to examine the skins, the gilded and metallic surfaces, overpainting, flaking, repair and modification. I hope that further research on the codex will one day be possible, including thorough technical examination of the illustrations. Pending such an analysis, some of the findings reported here must remain tentative.

[2] On the size of the codex and its weight, see Brubaker, " Vienna Dioskorides," 191.

[3] On this gesture, see Diliana Angelova, *Sacred Founders: Women, Men, and Gods in the Discourse of Imperial Founding, Rome through Early Byzantium* (Berkeley: University of California Press, 2015), 227-229.

[4] ΤΑΔΕ ΕΝΕ|ΣΤΙΝ ΠΕΔΑΝΙΟΥ| ΔΙΟΣΚΟΥΡΙΔΟΥ ΑΝΑ|ΖΑΡΒΕΩΣ ΠΕΡΙ ΒΟΤΑ|ΝΩΝ ΚΑΙ ΡΙΖΩΝ | ΚΑΙ ΧΥΛΙ|ΣΜΑΤΩΝ | ΚΑΙ ΣΠΕΡΜΑΤΩ[Ν]| ΣΥΝ ΦΥΛΛΩΝ ΤΕ ΚΑΙ ΦΑΡ|ΜΑΚΩΝ ΑΡΞΩΜΕ|ΘΑ ΤΟΙΝΥΝ ΑΚΟΛΟΥ|ΘΩΣ ΑΠΟ ΤΟΥ| ΑΛΦΑ. I.e., Τάδε ἔνεστιν Πεδανίου Διοσκουρίδου Ἀναζαρβέως περὶ βοτανῶν καὶ ῥιζῶν καὶ χυλισμάτων καὶ σπερμάτων σὺν φύλλων τε καὶ φαρμάκων. Ἀρξομεθα τοίνυν ἀκολούθως ἀπὸ τοῦ Ἄλφα.

the frontispieces into a new narrative about the revelation of knowledge about the world as revealed through Divine agency. This final change reflects a reconceptualization of the codex in terms of a broader system of divinely sanctioned knowledge about the natural world.

The illustrations form a thematically interconnected sequence that enable the reader to create narratives about the content of the Vienna codex and the historical conditions for its creation. These narratives are cyclic, that is, separated into distinct scenes, as though each illustration were a single frame within a comic strip.[5] But because such narratives are open-ended and undefined by verbal or textual narratives, earlier approaches to the study of pictorial narrative in Late Antique and Byzantine art are less useful analytically.[6] Instead structural and formal elements guide the user by creating the conditions for the determination of continuity between the illustrations. These elements inspire readers' desire to turn pages, to create connections with previous illustrations in the sequence, and to engage with the contents of the codex at large.[7]

Date and Context

Anton von Premerstein long ago linked the codex to the year 512 on the basis of two facts: first, the connection of the manuscript to Anicia Juliana's construction of the Theotokos church in the Honoratae district of Constantinople, and, second, the association of that church with the year 512 in Theophanes' *Chronographia*, which was written in the early ninth century.[8] The codex can be conclusively connected to Anicia Juliana's construction of the church of the Theotokos in Honoratae, on the Asian side of the Bosphoros due to an acrostic inscription in the dedicatory miniature on fol. 6v (fig. 6.7). The inscription is today barely legible within a black octagonal band running on the inner sides of a frame formed by an eight-pointed knotted rope interlace. Anton von Premerstein painstakingly reconstructed the inscription.[9] Ioannis Spatharakis later revised Premerstein's transcription, translated as follows:

> Hail, oh princess, Honoratae extols and glories you with all fine praises; for Magnanimity (Megalopsychia) allows you to be mentioned over the entire world. You belong to the family of the Anicii, and you have built a temple of the Lord, raised high and beautiful.[10]

The inscription indicates that the codex presented to Juliana Anicia was a token of gratitude for her construction of a church in Honoratae.[11] Scholars assume then that the codex must not be

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[5] On cyclic pictorial narrative, see Weizmann, *Illustrations in Roll,* 17-18.

[6] E.g., ibid.

[7] My approach here draws some inspiration from Peter Brooks's work on plot and narrative, in which reading is described in Freudian terms of *eros* and *thanatos*, as the desire for forward movement inevitably brings the reader closer to the end of the text. See Peter Brooks, *Reading for the Plot: Design and Intention in Narrative* (Cambridge, Mass.: Harvard University Press, 1992), esp. 3-61, 90-112.

[8] Anton von Premerstein, "Anicia Juliana im Wiener Dioskorides-Kodex," *Jahrbuch der kunsthistorischen Sammlungen des allerhöchsten Kaiserhauses* 24 (1903): 105-124.

[9] von Premerstein, "Anicia Iuliana," 111: Ἰοῦ· δόξαισι[ν ἄνασσα?] | [Ὀν]ωρᾶτ[αι σ'] ἀ[γα]θ[αῖ]ς π[ά]σ[αις] | Ὑμνοῦσιν κ(αὶ) δο[ξάζουσιν].| Λαλῖσαι (=λαλῆσαι) γὰρ εἰς πᾶσα[ν] γῆν | [Ἴ]ησ' ἡ μεγαλο[ψ]υχία | Ἀνικήω[ν], ὧν γένο[ς] πέλεις·| Ναὸν [γὰρ] κ[υρ]ίου ἤγιρας (=ἤγειρας) | Ἄνω [προεκβ]άντα καὶ καλῶς

[10] Ioannis Spatharakis, *The Portrait in Byzantine Illuminated Manuscripts* (Leiden: Brill, 1976), 147: ΙΟΥ ΔΟΞΑΙCΙ[Ν ΑΝΑΣΣΑ?] | [ΟΝ]ΩΡΑΤ(ΑΙ Σ') Α(ΓΑ)Θ(ΑΙ)Σ Π(Α)Σ(ΑΙΣ) | ΥΜΝΟΥΣΙΝ Κ(ΑΙ) ΔΟ(ΞΑΖΟΥΣΙΝ) | ΛΑΛΑΙΣΑΙ ΓΑΡ ΕΙΣ ΠΑΣΑ(Ν) | (Ι)ΗΣ' Η ΜΕΓΑΛΟ(Ψ)ΥΧΙΑ | ΑΝΙΚΗΩΡΩΝ ΓΕΝΟ(Σ) ΠΕΛΕΙΣ | ΝΑΟΝ (ΔΕ) Κ(ΥΡ)ΙΟΥ ΗΓΙΡΑΣ | ΑΝΩ (ΠΡΟΕΚΒ)ΑΝΤΑ ΚΑΙ ΚΑΛΩΣ

much older than the construction of the church itself, though we can more cautiously also imagine that the codex may have been presented to Juliana at a much later date in order to commemorate her earlier construction of the church. Even if we assume that the manuscript was given shortly after the construction of the church, it is not immediately clear if that means the church's founding, dedication, or opening. It is therefore difficult to assign the codex a specific date of one or two years on this basis alone.

While the dedicatory miniature on fol. 6v indubitably links the manuscript to Anicia Juliana's construction of the Theotokos Church in Honoratae, Andreas Müller has questioned the use of Theophanes' *Chronographia* to date the codex to the year 512. The entry for 512 begins by mentioning Vitalian's revolt and the persecution of Chalcedonian Christians by Anastasios I (r. 491-518) and Timothy I (e. 511-518). It then adds,

> The most noble Juliana, who founded the sacred church of the Mother of God at Honoratae, was so firm in her support of the Synod of Chalcedon that even the emperor [Anastasios], who devised many traps for her, was unable to persuade her to be in communion with Timothy. [12]

Anton von Premerstein, Otto Mazal, and others who see 512 as a *terminus ante quem* argue that because the church is mentioned in an entry for 512, the church had already been built by then.[13] Yet Müller counters that the entry makes no specific claims about the date of the church's building. Mention of the Theotokos Church could, he suggests, merely function as an *epitheton ornans*. He compares the entry in the Theophanes Chronicle to a fictional chronicle entry mentioning Johannes Gutenberg in the year 1438: "Johannes Gutenberg, the inventor of movable type, was among the faithful." It cannot follow from this entry that Johannes Gutenberg invented movable type in the year 1438. For Müller the Theotokos Church would, therefore, principally identify Anicia Juliana and orient the reader.

Müller adds, however, that the significance of this passage in Theophanes' *Chronographia* may lie in the fact that the chronicle mentions the Theotokos Church and not the more famous St. Polyeuktos.[14] The large, ornately decorated church was centrally located along the Mēsē, the main thoroughfare in Constantinople, and not far from the Church of the Holy Apostles. Müller speculates that this omission might then suggest that St. Polyeuktos was built after the Theotokos Church and that the source that the writer of the Theophanes Chronicle consulted was written before the construction of St. Polyeuktos.[15] While Müller entirely rejects the possibility of using Theophanes' *Chronographia* to establish a *terminus ante quem* for the Vienna Dioscorides, his musings do raise the possibility of a new *terminus ante quem* of 527 based on the construction of St. Polyeuktos, which is estimated to have been built between 524 and 527 on basis of the indiction years recorded in brick-stamps excavated from the building's

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[11] On Anicia Juliana as a patron, see Diliana Angelova, *Sacred Founders: Women, Men, and Gods in the Discourse of Imperial Founding, Rome through Early Byzantium* (Berkeley: University of California Press, 2015), 225-233.
[12] Theophanes, *Chronographia,* ed. C. de Boor, 1: 157, l. 134. Trans. by Cyril Mango and Roger Scott, *The Chronicle of Theophanes Confessor*, (Oxford: Clarendon Press, 1997), 239. Ἰουλιάνα δὲ ἡ περιφανεστάτη, ἡ κτίσασα τὸν ἱερὸν ναὸν τῆς θεοτόκου ἐν τοῖς Ὀνωράτοις, ἀντεποιεῖτο σφόδρα τῆς ἐν Χαλκηδόνι συνόδου, ὡς καὶ τὸν βασιλέα πολλὰς αὐτῇ διαστροφὰς ἐφευρόντα μὴ πεῖσαι κοινωνῆσαι τῷ Τιμοθέῳ.
[13] von Premerstein, "Anicia Juliana," 113; Mazal, *Der Wiener Dioskurides*, 1:4.
[14] Müller, "Ein vermeintlich fester Anker," 108-109.
[15] Ibid.

remains.[16] We can, however, imagine other reasons why the Theophanes' source would have mentioned the Theotokos Church rather than St. Polyeuktos. For example, the source might have had a particular audience, perhaps more familiar with Honoratae, in mind. Regardless of the reason why the author mentions the Theotokos Church, we can assume an even more conservative *terminus ante quem* of 530, by which time Anicia Juliana had died.[17]

Contents, Structure and the Early Development of the Vienna Codex

As the frontispieces to the Vienna Dioscorides act as a preface or proemium for the rest of the codex, we need to consider their relationship to the whole. In addition to the Dioscoridean Alphabetical Herbarium (ff. 12v-387r), the codex contains the *Carmen de viribus herbarum* (ff. 388r-392r), a paraphrase of Nicander's *Theriaca* and *Alexipharmaca* (ff. 393r-437v and ff. 438v-459v), and a paraphrase of Oppian's *Halieutika* (ff. 460r-473r) and Dionysius of Philadelphia's *Ornithiaka* (ff. 474r-485v). Matching textual divisions to the quire structure gives us six distinct codicological units:

1. The peacock folio (f. 1), a single leaf,
2. The frontispiece cycle (ff. 2v-7v), i.e., a single ternio gathering,
3. And the table of contents (ff. 8r-11r), i.e., a single binio gathering,
4. The Alphabetical Herbarium (ff. 12v-387r),
5. The *Carmen de viribus herbarum* (ff. 388r-392r), Nicander's *Theriaca* and *Alexipharmaca* (ff. 393r-437v and ff. 438v-459v) and Oppian' *Halieutika* (ff. 460r-473r),
6. And the paraphrase of Dionysius of Philadelphia's *Ornithiaka* (ff. 474r-485v).

The prefatory material consists of a single leaf, followed by a ternio and a binio gathering. The end of the Alphabetical Herbarium corresponds with that of the fifty-second gathering. The *Carmen,* and the paraphrases of Nicander and Oppian begin and end in the same gatherings. The paraphrase of the *Ornithiaka* begins in its own gathering. Researchers have tended to assume that the peacock miniature originally belonged to the *Ornithiaka* paraphrase and was once between ff. 473 and 474, but was added to the front of the codex when it was rebound in 1406.[18] If so, then we can suppose that there are five codicological units. The division of the remaining prefatory material into two gatherings suggests two distinct stages of production. If the table of contents and frontispieces had been composed at the same time, the bookmakers could have simply used a single quinternio gathering. The binio gathering that follows consists of an incomplete alphabetical index of plants. Notably, neither this table of contents nor the title page on fol. 7v make any reference to the paraphrases included at the back of the Vienna Dioscorides. The bookmakers might have also separated the two because of practical reasons, or for the sake of a conceptual or conventional division.[19] As it is, the frontispieces, table of contents, and

[16] See Cyril Mango and Ihor Sevcenko, "Remains of the Church of St. Polyeuktos at Constantinople," *Dumbarton Oaks Papers* 15 (1961): 243-247; R. M. Harrison, *Excavations at Saraçhane in Istanbul* (Princeton, N.J.: Princeton University Press, 1986), 1: 405–20; idem, *A Temple for Byzantium: The Discovery and Excavation of Anicia Juliana's Palace-church in Istanbul* (Austin: University of Texas Press, 1989), esp. 33.

[17] Her death is often put between 527 and 529. On these dates, see Carmelo Capizzi, "Anicia Juliana (462 ca - 530 ca): Ricerche sulla sua famiglia e la sua vita," *Rivista di studi bizantini e neoellenici* n.s. 5 (1968): 191-226, here: 225.

[18] For the opinion that John Chortasmenos moved fol. 1, see Mazal, *Der Wiener Dioskurides*, 1: 16.

[19] There may have been a convention for keeping prefatory and dedicatory material in gatherings separate from the main text. For example, the prefatory and dedicatory frontispieces of the Paris Gregory (Paris, Bibliothèque

Herbarium could have all been planned and executed separately. Finally, while the *Carmen* and the paraphrases of Nicander and Oppian were created together, the paraphrase of *Ornithiaka* could have been prepared separately. However, the fact that both the end of the *Halieutika* paraphrase and the beginning of the *Ornithiaka* paraphrase are missing, could suggest that the latter seamlessly followed the former.[20] If this is the case, then there would be four stages: the preparation of the Herbarium, the table of contents, the frontispieces, and then the *Carmen* and paraphrases.

The codex's material supports and colors support this four-fold codicological division of the manuscript. In his interim report on the restoration of the codex, Franz Unterkircher noted three different types of animal skin: goatskin, calfskin, and so-called "uterine parchment" ("Jungfernpergament"), a controversial designation that Unterkircher puts in quotes.[21] The prefatory frontispieces (ff. 2-7) and list of contents (ff. 8-11) are on goatskin. The majority of the herbarium (ff. 12-387) is on calfskin, although there are occasional inserts of goatskin (Unterkircher does not mention where). The remainder of the codex (f. 1, 388 ff.) is on a very fine ("uterine") parchment. Unterkircher does not indicate how he determined animal species.[22] The animal sources of the parchment, therefore, correspond to three main units: the ternio and binio gatherings at the beginning of the codex (ff. 2-11) are on goatskin parchment; the Herbarium (ff. 12-387) is mainly on calfskin; and, finally, the rest of the codex—the *Carmen de viribus herbarum* (ff. 382-392)*,* the Nicander paraphrases (ff. 393-459), the *Halieutika* paraphrase (ff. 460-473), and the *Ornithiaka* paraphrase (ff. 1, 474-485)—are on very fine ("uterine") parchment. The differences in animal source could reflect distinct stages in production, or merely the sheer scale of production and the vagaries of parchment availability.

A recent spectroscopic study of the manuscript's colors by Maurizio Aceto *et al.* also supports the codicological units outlined above. There is a notable shift in palettes between the herbarium section (ff. 12-387), and the rest of the codex. The hues in the herbarium are predominantly cool, as opposed to the chromatically vivid and warm palettes found in the miniatures at the beginning and end of the codex.[23] Valuable pigments such as cinnabar, extracted from mines in Italy, Spain or the Balkans, and ultramarine blue, made from pulverized lapis lazuli imported from Afghanistan, appear only in the initial gatherings (ff. 1-7).[24] In

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nationale de France, gr. 510, ff. A-C) appear in their own gathering, separate from the main body of text. As with the peacock folio in the Vienna Dioscorides, the first folio (f. A) of the Paris Gregory is a single leaf.

[20] A folio is missing before f. 472, and after f. 473. Two folios are missing before f. 474, and two are missing before f. 475. In its current condition, the text of the *Halieutika* ends on f. 473r, while that of the *Ornithiaka* begins on f. 474r. See Mazal, *Der Wiener Dioskurides*, 2: 79-81.

[21] Franz Unterkircher, "Die Restaurierung des Wiener Dioskurides. Ein Zwischenbericht," *Jahrbuch der österreichischen Byzantinischen Gesellschaft,* 10 (1961): 10 [9-20]. On "uterine parchment," see Christopher De Hamel, *Scribes and Illuminators* (Toronto: University of Toronto Press, 1992), 15-16. More recently, Sarah Fiddyment, Bruce Holsinger, Chiara Ruzzier, *et al.*, "Animal origin of 13th-Century Uterine Vellum Revealed Using Noninvasive Peptide Fingerprinting," *Proceeding of the National Academy of Sciences of the United States of America* 112, no. 49 (2015): 15066-15071.

[22] It can be difficult to distinguish between goat- and sheepskin parchment: R. Reed, *Ancient Skins, Parchments, and Leathers* (London: Seminar Press, 1972), 41-44. Nevertheless, it was sufficiently different from calfskin and the finer uterine parchment for Unterkircher to notice it.

[23] M. Aceto, A. Agostino, G. Fenoglio, *et al.*, "First Analytical Evidences of Precious Colourants on Mediterranean Illuminated Manuscripts," *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy* 95 (2012): 235-245.

[24] Ibid., 243.

contrast, less valuable vegetable colorants such as madder and indigo predominate in the miniatures in the Herbarium.

From these observations, we can suggest the following sequence of production: The Dioscoridean Herbarium (ff. 12-387) was prepared first, perhaps having a separate existence prior to its incorporation into the present codex. At some point, a table of contents was also prepared for it. Once the citizenry of Honoratae decided that it would be given as a gift to Anicia Juliana, they had prefatory frontispieces (ff. 2-7) prepared and added to the codex. (We can hypothesize that any inserts on goatskin into the herbarium may date to this stage and could represent an attempt to repair or expand the herbarium.) At another point, a set of briefer texts (ff. 1, 382-485)—the *Carmen de viribus herbarum* with its illustration of coral, the illustrated Nicander paraphrases, the unillustrated *Halieutika* paraphrase, and the illustrated *Ornithiaka* paraphrase—were prepared and added to the codex. The peacock folio belonged to this stage of the codex's history, and was either originally part of the *Ornithiaka* that later migrated to the front, or, as I suggest below, was added to the front of the codex in an attempt to account for the change in the codex's contents.

Sequence, Frame and Ground/ The Devices of Wonder

Turning the prefatory folios of the Vienna Dioscorides, the reader finds two scenes of symposia, two author portraits, and a dedication scene. The cycle forms two conceptual pairs: two medical group portraits and two author portraits of Dioscorides. Each pair is conceptually linked to the group that follows: the portrait of Dioscorides in the second medical group portrait (f. 3v) links it to the author portrait on f. 4v, while the codex into which Dioscorides writes in the second author portrait (f. 5v) relates to the codex presented to Anicia Juliana on f. 6v. Each prefatory miniature appears verso and faces a blank recto. The effect is that each miniature in the cycle can only be viewed one at a time. No pair of miniatures can be viewed simultaneously. This arrangement is probably due to practical considerations to minimize abrasion between the folios. By dividing the prefatory cycle into linked pairs, however, the planners playfully structure the unfolding of the frontispiece cycle and its narratives. Each miniature is doubled: They are *duplices* or *diptychoi*, like a pair of tablets, *tabulae*, *pinakes*, or even writing tablets, *deltoi.* (Diptychs were often presented as accompaniments to other, more valuable gifts. In this case, the doubled structure of the frontispieces may participate within the formal rituals of gift giving.) Each pair and repetition of formal elements—square frames, figures, ground—establishes the reader's expectations for what will follow. But within each pair, the painters introduce variety. Candy-striped garlands in the frame on f. 2v (fig. 6.3) give way to interlocking red and blue rosettes (f. 3v, fig. 6.4), followed by a tessellated gradients of pink, blue, and gold on f. 4v (fig. 6.5), and scrolling acanthus garlands over a deep red ground (f. 5v, fig. 6.6). By the time the reader turns the page to see the fifth miniature, he or she may well expect another square frame, only to find an elaborate rope interlace (f. 6v, fig. 6.7) that encompasses scenes of erotes at work, the name ΙΟΥΛΙΑΝΑ, and an acrostic poem dedicated to Anicia Juliana. Red and blue bands framing the border on fol. 2v reverse positions on fol. 3v. The dazzling gold ground for the miniatures on fols. 2 and 3, give way to landscape and architectural backgrounds on ff. 4v and 5v. The move from the context-less and seemingly timeless quality of gold ground to the greater detail and specificity of the dark landscape and studio scenes on ff. 4v and 5v suggests a move towards historical specificity that is thwarted by the final tableau with its personifications and ultramarine blue ground on f. 6v. The prefatory cycle plays on repetition and variation by building and then subtly upsetting the readers' expectations. This sequence—AABBC, as it were—emphasizes the fifth miniature, the

presentation and dedication of the codex to Anicia Juliana, because it breaks the visual paradigm to which the previous four miniatures adhere.

The attention to the variation of the frames and figures in the frontispiece cycle reflects positive aesthetic valuations of *varietas* or *poikilia*. *Poikilia* evokes in the viewer a kind of wonder (*admiratio*, θαύμα). Procopius' *ekphrasis* on the lush décor of Hagia Sophia, roughly contemporary to the Vienna codex by a few decades, demonstrates how *poikilia* was connected to inducing wonder:

> All these details, … produce a single and most extraordinary harmony in the work, and yet do not permit spectators to linger much over the study of any one of them, but each detail attracts the eye irresistibly to itself. So the vision constantly shifts suddenly, for the beholder is utterly unable to select which particular detail he should admire more than all the others. No matter how much they concentrate their attention on this side and that, and examine everything with contracted eyebrows, they are unable to understand the craftsmanship and always depart from there amazed by the perplexing spectacle. [25]

Variety and variegation effect wonder and bewilderment in the beholder. As his eyes dart back and forth, there is a constant change in his field of vision (ἡ τῆς θέας μεταβολὴ). The eye is drawn in all directions, and, as result, never rests on any one detail. As beholders experience the modulations of structure and ornament, they become perceptually embodied within the human sensorium. Ornament and structure reverberate as restless saccades that push and pull consciousness, leaving viewers unable to discern the architectural workings of their surroundings. Wonder (*admiratio*, θαύμα) follows. Bewildered, percipients must, in the end, leave the building awe*struck* (καταπεπληγμένοι).

Unlike Procopius' Hagia Sophia, which the viewer leaves in a state of extreme wonder, the Vienna codex frontispieces have more modest aims. Placed at the beginning of the codex, the frontispieces prepare readers for what lie ahead. The awakening of wonder here instills in the reader a desire for knowledge contained within the codex. Both Plato and Aristotle saw wonder as a primary motivation for philosophy. A well-known passage in the first book of Aristotle's *Metaphysics* is emblematic in laying out this dynamic:

> It is through wondering (τὸ θαυμάζειν) that men now begin and originally began to philosophize; wondering in the first place at obvious perplexities, and then by gradual progression raising questions about the greater matters too, e.g. about the changes of the moon and of the sun, about the stars and about the origin of the universe. Now he who wonders and is perplexed feels that he is ignorant (thus the myth-lover is in a sense a philosopher, since myths are composed of wonders); therefore if it was to escape ignorance that men studied philosophy, it is obvious that they pursued science for the sake of knowledge, and not for any practical utility. The actual course of events bears witness to this; for speculation of this kind began with a view to recreation and pastime,

[25] Procopius, *De aedificiis*, 1.1.47-49, ed. G. Wirth: ταῦτα δὲ πάντα … μίαν μὲν ἁρμονίαν ἐκπρεπεστάτην τοῦ ἔργου ποιοῦνται, οὐ παρέχονται δὲ τοῖς θεωμένοις αὐτῶν τινι ἐμφιλοχωρεῖν ἐπὶ πολὺ τὴν ὄψιν, ἀλλὰ μεθέλκει τὸν ὀφθαλμὸν ἕκαστον, καὶ μεταβιβάζει ῥᾷστα ἐφ' ἑαυτό. ἀγχίστροφός τε ἡ τῆς θέας μεταβολὴ ἐς ἀεὶ γίγνεται, ἀπολέξασθαι τοῦ ἐσορῶντος οὐδαμῆ ἔχοντος ὅ τι ἄν ποτε ἀγασθείη μᾶλλον τῶν ἄλλων ἁπάντων. ἀλλὰ καὶ ὡς ἀποσκοποῦντες πανταχόσε τὸν νοῦν, τάς τε ὀφρῦς ἐπὶ πᾶσι συννενευκότες, οὐχ οἷοί τέ εἰσι ξυνεῖναι τῆς τέχνης, ἀλλ' ἀπαλλάσσονται ἀεὶ ἐνθένδε καταπεπληγμένοι τῇ ἐς τὴν ὄψιν ἀμηχανίᾳ.

> at a time when practically all the necessities of life were already supplied. Clearly then it is for no extrinsic advantage that we seek this knowledge; for just as we call a man independent who exists for himself and not for another, so we call this the only independent science, since it alone exists for itself. [26]

Wonder is a prerequisite for the acquisition of knowledge. For Aristotle, however, wonder cannot be an end in itself. It is merely a precondition for knowledge. That Aristotle separates the acquisition of knowledge from practical utility may be informative for thinking about the structure and function of the Vienna codex. On the one hand, the codex enables a kind of recreational learning. The general purpose of the book would be to instill a sense of wonder at the world, which would, in turn, motivate learning as a form of leisure. On the other hand, the older Herbarium, its alphabetical arrangement, and the table of contents, suggest concrete utility as a reference work that is designed to resolve specific, practical questions. These two ends ultimately require radically different ways of navigating the text. As a result, the frontispieces stage a tension between two forms of reading and learning: piecemeal reference directed to practical ends, and the more leisurely cultivation of wonder as a vehicle for theoretical speculations.

The Symposia Scenes and Ancient Pharmacology

Groups of famous ancient physicians appear on ff. 2v and 3v. Each group consists of seven individuals, with three figures sitting on each side and a seventh on top and center, as though presiding over the assembly. The first group shows the mythical centaur Chiron (*cheirōn,* χείρων, labelled here: χείρων ὁ ἱπποκένταυρος) grinding a mortar and pestle, while (counterclockwise from top left) Machaon (*machaōn*, μαχάων), Pamphilus (*pamphilos,* πάμφιλος), Xenocrates (*xenokratēs,* ξενοκράτης), Heraclides (*hērakleidēs*, ἡρακλείδης), Mantias (*mantias,* μαντίας), and Sextius Niger (here: *nigros,* νιγρος) sit around him, holding scrolls and making various speech gestures. The second scene depicts a similar arrangement with Galen top and center, surrounded by (counterclockwise from top left) Krateuas (*krateuas,*κρατεύας), Apollonios (*apollōnios,* ἀπολλώνιος), Andreas (*andreas,* ἀνδρέας), Rufus (*rouphos,* ῥοῦφος), Nicander (*nikandros,* νίκανδρος) and Dioscorides (*dioskouridēs,* διοσκουρίδης).

Some scholars have suggested that these physicians, especially Nicander and Rufus (the supposed author of the *Carmen de viribus herbarum*), were intended to reflect the specific contents of the codex.[27] But with the exception of the Dioscorides, it is extremely difficult to determine the contents of the codex on the basis of the prefatory miniatures alone. Pamphilos, Krateuas, and Galen appear in the codex only as excerpted quotations that were inserted into the Herbarium. Their presence in the prefatory miniatures does not suggest that any of their works were ever included in the codex as complete texts. And while versions of works attributed to

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[26] Aristotle, *Metaphysica*, 1.982b, ed. W.D. Ross: διὰ γὰρ τὸ θαυμάζειν οἱ ἄνθρωποι καὶ νῦν καὶ τὸ πρῶτον ἤρξαντο φιλοσοφεῖν, ἐξ ἀρχῆς μὲν τὰ πρόχειρα τῶν ἀτόπων θαυμάσαντες, εἶτα κατὰ μικρὸν οὕτω προϊόντες καὶ περὶ τῶν μειζόνων διαπορήσαντες, οἷον περί τε τῶν τῆς σελήνης παθημάτων καὶ τῶν περὶ τὸν ἥλιον καὶ ἄστρα καὶ περὶ τῆς τοῦ παντὸς γενέσεως. ὁ δ' ἀπορῶν καὶ θαυμάζων οἴεται ἀγνοεῖν (διὸ καὶ ὁ φιλόμυθος φιλόσοφός πώς ἐστιν· ὁ γὰρ μῦθος σύγκειται ἐκ θαυμασίων)· ὥστ' εἴπερ διὰ τὸ φεύγειν τὴν ἄγνοιαν ἐφιλοσόφησαν, φανερὸν ὅτι διὰ τὸ εἰδέναι τὸ ἐπίστασθαι ἐδίωκον καὶ οὐ χρήσεώς τινος ἕνεκεν. μαρτυρεῖ δὲ αὐτὸ τὸ συμβεβηκός· σχεδὸν γὰρ πάντων ὑπαρχόντων τῶν ἀναγκαίων καὶ πρὸς ῥᾳστώνην καὶ διαγωγὴν ἡ τοιαύτη φρόνησις ἤρξατο ζητεῖσθαι. δῆλον οὖν ὡς δι'οὐδεμίαν αὐτὴν ζητοῦμεν χρείαν ἑτέραν, ἀλλ' ὥσπερ ἄνθρωπος, φαμέν, ἐλεύθερος ὁ αὐτοῦ ἕνεκα καὶ μὴ ἄλλου ὤν, οὕτω καὶ αὐτὴν ὡς μόνην οὖσαν ἐλευθέραν τῶν ἐπιστημῶν· μόνη γὰρ αὕτη αὐτῆς ἕνεκέν ἐστιν.

[27] See Collins, *Medieval Herbals*, 42.

Nicander and Rufus are in the codex, there is no evidence that the codex ever included texts by Apollonius or Andreas (f. 3v), let alone the centaur Chiron, Xenocrates, Quintus Sextius Niger, Heraclides, and Mantias (f. 2v). At the same time, neither Dionysius nor Oppianus, the original authors of the *Ornithiaka* and the *Halieutika*, respectively, appear in either of the groups. Their exclusion, together with the absence of texts by Apollonius, Andreas, Xenocrates, Quintus Sextius Niger, Heraclides, and Mantias, casts doubt on the claim that the group portraits on ff. 2v and 3v were specifically meant to reflect the specific contents of the codex.[28]

The specific contents of the Vienna Dioscorides probably did not motivate the selection of physicians on ff. 2v and 3v. Peter Lambeck long ago observed in his *Commentariorum de Augustissima Bibliotheca Caesarea Vindobonensi liber ii* (1669) that many of the figures in the symposia scenes appear in the introduction to Book VI of Galen's *De simplicium medicamentorum temperamentis ac facultatibus*: Pamphilus, Xenocrates of Aphrodisias, Dioscorides, Heraclides of Tarentum, Krateuas, Mantias, Apollonius, Andreas, Rufus of Ephesus and Sextius Niger.[29] Subsequent authors, including Buberl, Gerstinger, and Collins, have echoed this observation.[30] They have suggested that the group portraits may have been originally conceived or copied from a work by Galen, a theory that is especially attractive given by his prominent position on f. 3v.

The only authors that Galen does not mention, but who appear in the Vienna codex, are Machaon, Chiron, Nicander, and Galen himself. Machaon and Chiron were probably included on the grounds that they represent the mythical origins of herbal medicine. Both Chiron and Galen are given the most prominent position in their respective groups as though they were symposiarchs.[31] So if Galen represents the zenith of ancient pharmacology, then Chiron is its founder. The addition of Nicander may have been intended to make the group seven in number so as to allude to the Seven Sages, a traditional grouping of seven wise men going back to the sixth century BCE.[32] Such a reference would not have been lost on contemporaries of the Vienna codex.[33] Galen only mentions ten authorities, and does not include himself. In order to reach seven, the planners could have eliminated three authorities, or added four. With fourteen figures, the image-makers could create parallel scenes that would function as diptychs.

The two symposia scenes illustrate the development of pharmacology over time from its obscure, mythical origins to its zenith, as embodied in the figures of Chiron and Galen

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[28] Cp. Collins, *Medieval Herbals*, 42. See also, Gerstinger, *Kommentar*, 30.

[29] Already in 1669, Peter Lambeck pointed this out, see Peter Lambeck, *Commentariorvm de avgvstissima bibliotheca caesarea vindobonensi*, v. 2, (Vienna: Typis Matthaei Cosmerovii, 1669), 528: Qui quidem Galeni locus etsi satis sit prolixus, quoniam tamen ibi praeter Pamphilum mentio quoque fit, Xenocratis Aphrodisiensis, et Sextii Nigri, et Heraclidae Tarentini, et Crateuae, et Manitae, et Apollonii, et Rufi Ephesii, et Andreae, et ipsius Dioscoridis, quorum omnium imaginibus vetustissimus Augustissimae Bibliothecae Caesareae Codex MStus Dioscoridianus, de quo in praesens agitur, exornatus est, ideo totum hic in medio ponam, ut quotiescunque idem deinceps a me allegabitur, ipsaque ejus inspectio erit necessaria, facilis inventu is, et statim ad manum sit.

[30] Paul Buberl, "Die Antiken Grundlagen der Miniaturen des Wiener Dioskurideskodex," *Jahrbuch des Deutschen Archäologischen Instituts* 51 (1936): 114-136, at 118; Paul Buberl and Hans Gerstinger, *Die byzantinischen Handschriften* 1 1 (Leipzig: Hiersemann, 1937), esp. 21; Gerstinger, *Kommentar*, 30; and Collins, *Medieval Herbals*, 42-43.

[31] Gerstinger saw the fact that the authors seem to be participants in a symposium as arguing against Weitzmann's supposition that the individual author portraits were mechanically copied from no longer extant author portraits. See Gerstinger, *Kommentar,* 57 n. 46.

[32] Gerstinger, *Kommentar*, 29.

[33] The Seven Sages is a relatively popular theme in late antique floor mosaics. See David Knipp, "Medieval Visual Images of Plato," in *The Platonic Tradition in the Middle Ages,* ed. Stephen Gersh and Maarten J.F.M. Hoenen (Berlin: Walter de Gruyter, 2002), 373-416, esp. 382-388.

respectively. In grasping a mortar and pestle, Chiron refers to the practical origins of medicine. He does not grasp a roll like the other figures, but rather teaches through doing and showing. Galen's gesture of speech and the red codex tucked under his arm, however, indicate theoretical medicine. Contrary to the rolls carried by the other figures, Galen's codex refers to a more recent technology for the storage of information. The fact that Galen reports seeing parchment codices containing medical recipes might also lead us to see the red codex on f. 3v as a reference to a specific historical reality, perhaps preserved in the tradition of his portraiture.[34] The distinctions between mortar and pestle, roll and codex in the frontispieces visualize the historical development of pharmacology. Pharmacology first emerged as a form of practical knowledge communicated orally (Chiron), then through writing on rolls, finally culminating in compendious codices such as the one held by Galen, or the one in the hands of the reader. The symposia scenes then relate to the contents of the Vienna Dioscorides not by indicating the specific authors contained therein, but rather the mythical origins and historical development of the field of knowledge manifest in the codex itself.

Dioscorides: Discovery and Invention

The frontispieces position Dioscorides and Galen as the fullest expressions of pharmacology. In doing so, the scenes lay the ground for the two author portraits of Dioscorides, which, in turn, form a similar conceptual frame by relating the mythical origins for Dioscorides' text (f. 4v, fig. 6.5) and his hard work as an author (f. 5v, fig. 6.6). The inclusion of Dioscorides on f. 3v links the author portraits to the group portraits, while Galen's appearance on f. 3v points to the broader relevance of Dioscorides as the foundation for Galen's theoretical pharmacology. That Galen turns to and gestures towards (i.e., speaks with) Dioscorides underlines this point. As a narrative structure, the representation of Dioscorides in conversation with Galen directs the viewer's attention to Dioscorides' specific contribution, which is the subject matter of frontispieces on ff. 4v and 5v.

On f. 4v we see Dioscorides seated in front of a shady building at night with his feet on a small stool. He gestures towards a anthropomorphic root grasped by a female figure, labeled as a personification of Discovery (*heuresis,* εὕρεσις). *Heuresis* here refers simply to a discovery or a finding, and is related to the verb *heuriskein* (εὑρίσκειν), to find, to discover, or to invent. With her left hand she points to a dog doubled back in agony, which relates to a myth about the extraction of the mandrake root now preserved in the herbarium of Ps-Apuleius Platonicus, dated to the fourth or fifth century CE, although this method of extraction can also be found in Josephus's account of the *baaras* plant (βαάρας) in *De bello judaico* and in Aelian's account of a plant called *aglaophotis* (ἀγλαόφωτις) in his *De natura animalium*.[35] In these accounts, we find

[34] Galen, *De compositione medicamentorum*, ed. Kuhn, 11: 423, τοῦτο τὸ φάρμακον οὕτο γεγραμμένον εὗρε Κλαυδιανὸς ὁ ἑταῖρος ἡμῶν ἐν πυκτίδι διφθέρᾳ, τοῦ χρωμένου αὐτῷ ἀποθάνοντος. On this passage in connection to the history of the parchment codex, see Roberts and Skeat, *Birth of the Codex*, 22. See also Nicholls, "Parchment Codices," esp. 381-383.

[35] For a full discussion of mandrakes in religion and mythology, see James Frazer, *Folklore in the Old Testament: Studies in Comparative Religion* (London: Macmillan, 1918), 2: 372-397. Josephus, *De bello Judaico*, 7.180-5. Aelian, *De natura animalium*, 14.27. While Dioscorides gave the name *aglaophotis* as a synonym for peonies (*MM* 3.140), this does not mean Aelian's plant is a peony. *Aglaophotis* simply refers to the luminous quality of the plant. Ps.-Apuleius Platonicus, *Herbarium*, cap. 131, ed. Howald and Sigerist, 122:

> Quam sic colligi oportet, quia magna est uisio ac beneficia eius; ad quam cum perueneris, ita eam intellegis: nocte tamquam lucerna sic lucet caput eius; cum uideris, cito circumducis eam ferro, ne tibi fugiat; talis ac tanta est uirtus eius, ut uenientem ad se hominem inmundum, cito ante eum fugit, ideo circumducis eam ferro et ita circa eam effodies, ne eam de ferro tangas, et diligentissime de palo eburneo

an elusive, even evasive flame-like plant that is deadly to the touch. Those wishing to harvest the plant can do so by tying a dog to it and having the dog uproot the plant. The dog immediately dies as a result, its life having been given in exchange.[36] The plant can thereafter be handled freely, and used medicinally.[37] Attempts to identify the plants described in these accounts only go so far. *Aglaophotis* and *baaras* are obscure and wondrous. Flame-like and luminescent, they require the giving of a life for their own. The logic in these myths is sacrificial (*do ut des*, i.e., "I give, so that you might give [in return]"). In the Vienna Dioscorides, we can see that this myth has been applied to the mandrake (*Mandragora officinarum* L.), perhaps on account of its hallucinogenic and soporific effects and its occasional anthropomorphism. As the root that Leah gave to Rachel in order to sleep with Jacob, Mandrake also has a biblical pedigree.[38] While such references may have helped to enshrine the mandrake as an herb of particular significance, the mandrake above all embodies the concept of the *pharmakon*, a powerful substance that can be beneficial or deleterious.

The next illustration in the cycle shows Dioscorides with an amanuensis and a personification of *epinoia* in his study. In Chapter 3 of this dissertation, I note that Dioscorides is shown writing into a book that already has illustrations in it. This could suggest that pictures act as a kind of internal reference that is prior to, and serves as—even substitutes for—an actual specimen of the plant. The scene seems at first glance to suggest that painters ideally worked from a single model or specimen, from life, as though they merely mechanically reproduced a retinal image.[39] But the female figure is a personification of *epinoia* (ἐπίνοια). As the literal "thinking on" a thing, *epinoia* encompasses intelligence, thought, invention, design or purpose, even afterthought or second thought.[40] The term has a long history and a broad semantic range.[41]

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amoues ante eam terram, et cum uideris pedes eius herbae mandragorae et manus eius, tunc demum et herbam adligabis de fune nouo, et postquam adligasti herbam, tunc et cani adligabis in collo, antequam canem esurientem facis et mitte paulo longius illi escam canis, quo tendens possit herbam euellere.

Quod si nolueris canem decipere, quia tantam fertur ipsa herba habere diuinitatem, ut qui eam euellet, eodem momento illum decipiat - ideo que ergo, ut superius dixi, si canem nolueris decipere, facies uice manganum: si uelis perticam figere grandem, cui ligabis in cacumine funem nouum, de quo herba ligata est, ita ut se incurbet; facies quasi muscipuli genus de longe, tunc demum uirtute sua pertica erigens se statim herbam mandragoram euellet.

[36] Josephus calls the dog ἀντιδοθεὶς (*De bello Judaico*, 7.184), literally something given in exchange for something else. Aelian, *De natura animalium*, 14.27, ed. García Valdés *et al.*, adds that "secret ceremonies" are performed "honoring the dead body of the dog as having died for them" (καί τινας δράσαντες ἀπορρήτους ἱερουργίας καὶ τιμήσαντες τοῦ κυνὸς τὸν νεκρὸν ὡς ὑπὲρ αὐτῶν τεθνεῶτος).

[37] Aelian recommends the *aglaophotis* plant for cataracts and epilepsy (τῆς σελήνης νόσον, lit. disease of the moon). Aelian, *De natura animalium*, 14.27, ed. García Valdés *et al.*: ἐν δὲ τοῖς καὶ τὴν ἐκ τῆς σελήνης νόσον ἐνσκήπτειν τοῖς ἀνθρώποις λεγομένην ἰᾶσθαί φασιν αὐτήν, καὶ τῶν ὀφθαλμῶν τὸ πάθος, ὅπερ οὖν ὑγροῦ ἐπικλύσαντος καὶ ῥαγέντος ἀφαιρεῖ τὴν ὄψιν αὐτοῖς. In a similar way, Josephus adds that the *baaras* root can be used to expel demons from possessed people, probably in reference to epilepsy and other conditions associated with demonic possession. Josephus, *De bello Judaico*, 7.180-5, ed. Niese: τὰ γὰρ καλούμενα δαιμόνια, ταῦτα δὲ πονηρῶν ἐστιν ἀνθρώπων πνεύματα τοῖς ζῶσιν εἰσδυόμενα καὶ κτείνοντα τοὺς βοηθείας μὴ τυγχάνοντας, αὕτη ταχέως ἐξελαύνει, κἂν προσενεχθῇ μόνον τοῖς νοσοῦσι.

[38] Genesis 30:14-16.

[39] See, for example, Anthony Cutler, "The Right Hand's Cunning: Craftsmanship and the Demand for Art in Late Antiquity and the Early Middle Ages," *Speculum* 72, no. 4 (1997): 971-994, at 979.

[40] E.C.E. Owen, "Επινοέω, ἐπίνοια and Allied Words," *The Journal of Theological Studies* 35 (1934): 368-376; Antonio Orbe, *La Epinoia: Algunos preliminares históricos de la distinción κατ' ἐπίνοιαν* (Rome: Pontificia Universitas Gregoriana, 1955); Richard Vaggione, *Eunomius of Cyzicus and the Nicene Revolution* (Oxford: Oxford

In some philosophical accounts it designates the conceptual existence of a thing, in contrast to its concrete reality.[42] In his discussion of the theological meaning of the term, Lewis Ayres glosses *epinoia* simply as "the activity of reflecting on and identifying the distinct qualities or properties of something."[43] Also writing on the theological sense of the word, E.C.E Owen writes, "it denotes not direct perception or conception, but reflexion on a percept or concept already formed. In the case of a science or art it takes a percept given to it by sensation, 'refines on it', explains, and analyses it."[44] These different senses of the term ἐπίνοια undercut our understanding of the scene as portraying an artist closely copying a specific model directly from life. Our artist and writer do not then attend to an actual or specific mandrake, but rather the mandrake as a class.

The niche and architectural surround, which Weitzmann compares to the *scenae frons* of an ancient theater, also recalls the façade of an ancient library overladen with columns and niches housing the statues of abstract personifications.[45] A neutral backdrop, it nevertheless alludes in the first case to the public presentation of dramas and spectacles, and, in the second case, to centuries of accumulated knowledge. Dioscorides and his assistant create new knowledge; they make it accessible to us. And they belong to the broader history of accumulating, improving, and inventing knowledge. Within the broader structure of the frontispiece cycle, the scene of *epinoia* and *heuresis* repeats the mythistorical frame of the previous couplet: the move from obscure origins, rooted in practice and discovery, towards a more concrete, contemporary practice linked to contemporary institutional contexts, such as libraries, and means of storing knowledge, such as the codex.

The scenes of Dioscorides' discovery and study of the mandrake plant also reiterate Aristotle's conception of the formation of scientific knowledge: the movement from wonder (*thauma*) and the recognition of ignorance to the study of philosophy. Aristotle had posited both myth and ignorance as motivations for philosophy. The myth-lover (φιλόμυθος) is for him a kind of philosopher because "myths are composed of wonders" (ὁ γὰρ μῦθος σύγκειται ἐκ θαυμασίων).[46] Myths, such as that of Machaon, Chiron, and the discovery of the mandrake (or the *baaras*, or the *aglaophotis* plants), play an important role in generating the reader's interest in the study of pharmacology, a desire to continue turning the pages of the codex. Again we find here that the frontispieces instill a sense of wonder in order to encourage reader engagement and appreciation for the codex's contents.

Although not the image of the wide-eyed Medea harvesting *thapsia*, naked and shrieking in a dark wood, the author portraits of Dioscorides in the Vienna Dioscorides nevertheless have an occult, even subversive quality.[47] Among Christians of the Late Roman world, herbal

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University Press, 2000), 241-246; Lewis Ayres, *Nicaea and its Legacy: An Approach to Fourth-Century Trinitarian Theology* (Oxford: Oxford University Press, 2004), 191-195.

[41] Christian thinkers varied widely in their usage of the term. The terms ἐπινοέω, ἐπίνοια figured significantly in the debate between the Arian Eunomius and the Cappodocians Basil and Gregory of Nyssa. See Owen, "*Ἐπινοέω, ἐπίνοια*," 374-376; Vaggione, *Eunomius*, 241-246; Ayres, *Nicaea and its Legacy*, 191-195.

[42] E.g., "It denotes our idea or conception of a thing in contrast to the thing itself," Arch Robertson ap. Wall and Schaff, *Library of Nicene Fathers, new series* iv note p. 368, as cited in Owen, "*Ἐπινοέω, ἐπίνοια*," 372.

[43] Ayres, *Nicaea and its Legacy*, 191.

[44] Owen, "*Ἐπινοέω, ἐπίνοια*," 376.

[45] Kurt Weitzmann, *Late Antique and Early Christian Book Illumination* (New York: George Braziller, 1977), 65.

[46] Aristotle, *Metaphysica*, 1.982b, ed. W.D. Ross: ὁ δ' ἀπορῶν καὶ θαυμάζων οἴεται ἀγνοεῖν (διὸ καὶ ὁ φιλόμυθος φιλόσοφός πώς ἐστιν· ὁ γὰρ μῦθος σύγκειται ἐκ θαυμασίων.

[47] On Medea collecting herbs, see Macrobius's *Saturnalia*, 5.19.7. For a discussion of this passage as it relates to *rhizotomoi*, see John Scarborough, "The Pharmacology of Sacred Plants, Herbs, and Roots," in C.A. Faraone and D.

medicine might sometimes have the taint of pagan and occult practices. Christian literature sometimes condemns knowledge of herbs.[48] The dying dog in the scene of *heuresis*, while illustrating the ambivalence of *pharmaka*, as well as the ingenuity and the costs of scientific discovery, might also bring to mind practices of dog sacrifice.[49] Moreover, the pair *epinoia* and *heuresis* often appear in Christian literature in connection to idolatry, largely going back to the Book of Wisdom (14:12): "for the design (ἐπίνοια) of idols was the beginning of fornication, and the discovery (εὕρεσις) of them was the corruption of life."[50]

While the frontispiece cycle of the Vienna Dioscorides might have aroused the suspicions of some viewers, we can assume it was an entirely acceptable gift for the pious Anicia Juliana. Christian attitudes to rational medicine and to the classical sciences, in general, may have relaxed in the sixth century, as the uneasy coexistence (and largely unenforced imperial bans) of the fourth and fifth centuries gave way to an increasingly (and forcibly) Christianized society in the sixth century.[51] The decline of pagan intellectual culture coupled with the emergence of cults of medical saints and the relocation of medical teaching to Christian establishments would have normalized medical practice for Christians.[52] At the same time, it might have been taken for granted that knowledge of herbal medicine would involve some form of pre-Christian and occult learning, but that any spiritual danger therein was more the result of an improper application of that knowledge. We might also regard the Vienna frontispieces as reflective of the broader "gradual transmutation of belief in the gods into a reverence for a cultural heritage."[53]

Be that as it may, concerns over magic and paganism did not die out in the sixth century. There were still adherents to the ancient Roman and Greek religion among the elite in the high bureaucracy.[54] With more reflection, we can detect a balancing act at play in the illustrations in the Vienna Dioscorides. They significantly do not portray major medical deities such as Asclepius and Hygeia—deities that may have still had active adherents in the sixth century—, but rather the relatively minor figures Chiron, Machaon (the son of Asclepius) and the personifications of *epinoia* and *heuresis*. In a similar way, the depiction of coral in the *Carmen de viribus herbarum* shows a female figure, likely a personification of the sea, Thalassa, and not Poseidon, the deity to whom the hymn on the facing folio is directed. (Alternatively, the appearance of Thalassa here may simply be the result of the illustrators having referred to a

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Obblink, eds., *Magika Hiera: Ancient Greek Magic and Religion* (New York: Oxford University Press, 1991), 138-174, here: 144.

[48] See, for example, Cyprian, *Confession* 2.10-14, ed. and trans. Ryan Bailey, *The* Confession *of Cyprian of Antioch: Introduction, Text, and Translation* (Thesis, McGill University, 2009), 36-37: λίαν γὰρ οἱ ἐμοὶ γονεῖς ἔσπευδόν με ἐπιγνῶναι τὰ γῆς ἀέρος καὶ θαλάσσης, οὐ μόνον τὰ κατὰ φύσιν φθορᾶς καὶ γενέσεως ποῶν καὶ πρέμνων καὶ σωμάτων, ἀλλὰ καὶ τὰς πᾶσιν αὐτοῖς ἐνεργείας, ἅς ὁ ἄρχων τοῦ αἰῶνος τούτου ἐτύπωσεν ἐναντιούμενος πρὸς τὴν τοῦ θεοῦ διατύπωσιν. ("...for my parents were eager that I discover the things of the earth, air, and sea, not only what relates to the nature of the destruction and generation of herbs and trees, but also the energies which the ruler of this age, who was opposed to the configuration of God, imprinted in all of them.")

[49] On dag sacrifice in Greece, see Manolis G. Sergis, "Dog Sacrifice in Ancient and Modern Greece: From the Sacrifice Ritual to Dog Torture (kynomartyrion)," *Folklore: Electronic Journal of Folklore*, 45 (2010): 61-88.

[50] Sapientia Salomonis 14.12: ἀρχὴ γὰρ πορνείας ἐπίνοια εἰδώλων, εὕρεσις δὲ αὐτῶν φθορὰ ζωῆς. Also, Athanasius, *Contra gentes*, sec. 7, ll. 28-32.

[51] See K.W. Harl, "Sacrifice and Pagan Belief in Fifth- and Sixth-Century Byzantium," *Part and Present* 128 (1990): 7-27.

[52] Early Christians often practiced and presented themselves as physicians. See Giovanni Battista Bazzana, "Early Christian Missionaries as Physicians Healing and its Cultural Value in the Greco-Roman Context," *Novum Testamentum* 51, n. 3 (2009): 232-251.

[53] Harl, "Sacrifice and Pagan Belief," 16.

[54] Ibid., 22-26.

different source for the illustrations.) The fact that mandrake has a biblical pedigree might have even licensed its appearance in the frontispiece cycle.[55] In the Vienna Dioscorides, pre-Christian and seeming occult elements constitute the historical reality, as much as the mythical basis and conceptual frame for the ancient science of pharmacology. But those realities did not determine the content and contemporary practice of pharmacology. Rather the images of Dioscorides with *epinoia* and *heuresis* may have served to evoke and instill in the reader a sense of wonder at the properties of herbs, their potency, and the knowledge needed to extract and use them.

The Gift for Anicia Juliana

The fifth scene forms the climax of the prefatory cycle: the presentation of the codex to the enthroned Byzantine princess Anicia Juliana (fig. 6.7). In it we find Anicia Juliana, flanked by personifications of *megalopsychia* (μεγαλοψυχία) with a heap of coin in her arms, and *phronēsis* (φρόνησις), who holds and points to a roll in her left hand. The term *phronēsis* entails purpose, thought and judgment as well as practical wisdom or prudence.[56] *Megalopsyschia* refers to magnanimity and generosity.[57] Juliana is nobly dressed and seated on a *sella curulis* with griffon protomes. With her right hand she pours coins into an open codex held aloft by an eros inscribed, "Desire for she who loves to build" (*pothos tēs philoktistou,* πόθος τῆς φιλοκτίστου).[58] Juliana's gesture is visually related to the iconography for the distribution of largesse by emperors and consuls, an activity that was strictly controlled by imperial statutes.[59] In front of the eros, a veiled female figure, labeled "gratitude of the arts" (*eucharstia technōn,* εὐχαριστία τεχνῶν), bows down to kiss Juliana's red-shoed foot. An acrostic poem buried in the black octagonal inner border of the elaborate frame, quoted above, notes that the codex is the gift of the people of Honoratae to Juliana for her patronage of a church there. The elaborate rope frame could recall the use of ropes in construction and would then also speak to Juliana's "love of building."[60] The miniature clearly shows that the codex is itself a token of gratitude, a means of reciprocating one gift for another.

The illustration and acrostic clearly place Anicia Juliana in an elevated position, as though she were an *augusta* or empress. Researchers point to Anicia Juliana's pearly diadem-like headdress, the *proskynesis* of the "gratitude of the arts," the purple elements of her dress, and her exceptional gesture of largesse.[61] Bente Kiilerich suggests that the personifications

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[55] *Genesis* 30:15, εἶπεν δὲ Λεια Οὐχ ἱκανόν σοι ὅτι ἔλαβες τὸν ἄνδρα μου; μὴ καὶ τοὺς μανδραγόρας τοῦ υἱοῦ μου λήμψῃ; εἶπεν δὲ Ραχηλ Οὐχ οὕτως· κοιμηθήτω μετὰ σοῦ τὴν νύκτα ταύτην ἀντὶ τῶν μανδραγορῶν τοῦ υἱοῦ σου. Mandrakes also appear in *Song of Solomon* 7:30.

[56] *LSJ* 1956, s.v. φρόνησις.

[57] *LSJ* 1088, s.v. μεγαλοψυχία.

[58] As Julius Jüthner, Diliana Angelova, and Ivan Drpić have pointed out, τῆς φιλοκτίστου is an objective genitive and refers to the desire of the people of Honoratae for Juliana ("she who loves building") and not Juliana's desire for the love of building. See Julius Jüthner, Review of Anton von Premerstein, *Anicia Iuliana im Wiener Dioskorides-Codex*, *Zeitschrift für die Österreichischen Gymnasien* 55 (1904): 314-15; Angelova, *Sacred Founders*, 227; and Ivan Drpić, *Epigram, Art and Devotion in Later Byzantium* (Cambridge: Cambridge University Press, 2016), 316-317.

[59] Angelova, *Sacred Founders*, 195-7, 227. See also Bente Kiilerich, "The Image of Anicia in the Vienna Dioscurides: Flattery or Appropriation of Imperial Imagery," *Symbolae Osloenses* 76, n. 1 (2001): 169-190, here: 175-176. Angelova notes, however, that Juliana was herself of consular rank through her husband. See Angelova, *Sacred Founders*, 353, n. 63.

[60] Angelova, *Sacred Founders*, 229, and caveat—ropes in building practices are only attested after the seventh century—, 353, n. 61.

[61] Kiilerich, "The Image of Anicia," 178; Angelova, *Sacred Founders*, 227.

accompanying Juliana were especially appropriate to imperial figures.[62] Diliana Angelova also notes that the term *anassa* in the reconstruction of the acrostic poem, a Homeric word for a queen, appears in other contexts linked specifically to imperial figures.[63] She adds that *philoktistēs* may have also been specifically linked to imperial patronage as Justinian stamped *philoktistēs* on his bricks.[64] These elements suggest the illustration and inscription aims to elevate Anicia Juliana to being like an *augusta*, and may therefore also speak to broader imperial ambitions underlying her patronage activities.[65]

At first glance an illustrated herbal may seem an odd gift for the citizens of Honoratae to give to Anicia Juliana. In his commentaries for the Imperial Library in Vienna, Peter Lambeck supposes that the book may have been intended for a hospital founded by Juliana.[66] In contrast, Franz Xaver Krauss, citing one of Jerome's misogynistic tirades, sees the illustrated codex as a fashionable object for a wealthy, well-bred woman.[67] Anton von Premerstein follows Krauss, but adds that the codex indicates not only Juliana's bibliophilia but also her medical dilettantism, as would be fitting for the mistress of a large household.[68] Hans Gerstinger largely follows Premerstein, though he suggests that the author portraits on fols. 4v and 5v may indicate Juliana had a personal interest in mandrake.[69] In contrast to earlier researchers who tend to emphasize the codex's value as a display object, Otto Mazal has asserted that it was used for pharmacology.[70]

Leslie Brubaker has suggested that the gift was ideal for a late Roman aristocratic matron charged with the well being of her household.[71] The codex would then be a "luxurious but potentially practical medical compendium for domestic use."[72] But what might that entail?[73] A Roman aristocrat such as Anicia Juliana would have had access to a number of highly trained physicians and health providers.[74] The empress Livia (58 BCE-29 CE) employed at her *domus* a number of medical personnel, both enslaved and free, including a medical superintendent, at least five physicians, as well as specialists such as a surgeon and eye-doctor, midwives,

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[62] Kiilerich, "The Image of Anicia," 173-4.
[63] Angelova, *Sacred Founders*, 227.
[64] Angelova, *Sacred Founders*, 229.
[65] See Angelova, *Sacred Founders*, 229.
[66] Lambeck, Peter. *Commentariorum de augustissima bibliotheca Caesarea Vindobonensi liber 1-4.* (Vienna: Typis Matthaei Cosmerovii, 1665-1671), 590; see also ed. by Adam F. Kollár, *Petri Lambecii Hamburgensis Commentariorum de Augustissima Bibliotheca Caesarea Vindobonensi.* Vienna, 1766-1782, c. 252.
[67] Franz Xaver Krauss, *Geschichte der christliche Kunst*, 2 vols. (Freiburg im Breisgau: Herder'sche Verlagshandlung, 1896), 1: 447, "Dass vornehme und reiche Frauen dergleichen schön geschmückte Handschriften bald als Modesache für sich in Anspruch nahmen, bestätigt uns der Tadel des hl. Hieronymus. Wie lange die Mode anhielt, zeigt uns noch der um 500 für Iuliana Anicia geschriebene und ausgemalte Dioskorides."
[68] Anton von Premerstein, "Anicia Juliana," 124, reproduces Franz Xaver Krauss's words almost exactly, but adds, "Zu der Bücherliebhaberei, die auch durch das Buch in der Hand der Phronesis angedeutet zu sein scheint, mag in diesem Falle ein gegenständliches Interesse an dem Kräuterbuche des Dioskorides hinzugekommen sein. Wie soviele vornehme Damen jener Zeit, wird Iuliana ebenfalls Neigung für medizinischen Dilettantismus besessen haben, welche sie als Herrin eines ausgedehnten Haushaltes mit reichem Gesinde auch praktisch betätigen konnte."
[69] Gerstinger, *Kommentar*, 2.
[70] Mazal, *Kommentar* 1/2, 10: "Der für Juliana Anikia gestiftete Codex war mit Sicherheit stets als pharmakologisches Handbuch in Gebrauch und diente nicht bloß als bibliophiles Schauobjekt."
[71] Brubaker, "The Vienna Dioskorides," 211-213.
[72] Ibid., 213.
[73] For a portrait of what medical care within a domestic context look like in Galen's time, see Susan P. Mattern, *Galen and the Rhetoric of Healing* (Baltimore: John Hopkins University Press, 2008), 88-92.
[74] See Susan P. Mattern, "Physicians and the Roman Imperial Aristocracy: the Patronage of Therapuetics," *Bulletin of the History of Medicine* 73, no. 1(1999): 1-18, here: 9-10.

wetnurses, and male and female orderlies that ran a sickbay for staff.[75] While, for serious illnesses, the head of the household might seek out a free-lance physician, most healthcare matters were probably entrusted to resident medics, enslaved or free, who may have relied more on simple remedies such as the herbs depicted in the Vienna Dioscorides. And if an aristocratic patient consulted multiple physicians, he or she would invariably need to choose which recommendations to take.[76] The need to arbitrate between different physicians' recommendations could provide a further practical justification for elite consumption of a codex such as the Vienna Dioscorides. That the Vienna Dioscorides concerns simple medications and not compounds might have provided another form of practical justification for elite possession of it. Physicians and pharmacists often recommended compound drugs for their patients. Their recipes were closely guarded, so that patients had to go to them and only them for medication. In contrast, Dioscorides' *De materia medica* provided information on simples. As a result, elite patients could consult it and assume more direct agency over their health and thereby circumvent some of the more questionable monopolizing practices of contemporary professional health providers.

All of these possibilities raise another explanation for the gift of the Vienna Dioscorides to Anicia Juliana, namely, her own health concerns. We cannot know exactly what health concerns Juliana might have had, or how public they would have been. In any case, accepting that the Vienna Dioscorides was given to Anicia Juliana in the early sixth century, Juliana, born in 461 or 463 and deceased in 527 or 529, would have been between thirty-seven and sixty-eight years' old upon receipt of the Vienna Dioscorides. (With the traditional dating of the codex to ca. 512, Anicia Juliana would have been between from around forty-one to forty-nine years' old.) Besides providing Juliana with information on medicinal simples, the numerous plant depictions could have been considered aids to healthy eyesight, as green objects had long been supposed to refresh and help eyesight.[77] In these cases, the gift of the Vienna Dioscorides would have constituted a kind of "well wish" for continued health and prosperity by the people of Honoratae.

In a different vein, Diliana Angelova has suggested that the Vienna Dioscorides may belong to a long tradition of elite Roman women publically cultivating their interest in healthcare.[78] Female imperial benefactors sometimes emphasized such associations by visiting healing hot springs, distributing largesse on the way, and by constructing or refurbishing bathhouses.[79] Such associations may go back to earlier times. The empress Livia funded the restoration of the temple of Bona Dea Subsaxana on the Aventine Hill, a healing sanctuary that had a staff of apothecary priests on site.[80] Livia was celebrated as the originator of medicinal

[75] Susan Treggiari, "Jobs in the Household of Livia," *Papers of the British School at Rome* 43 (1975): 48-77, here: 56.
[76] Galen gives us vivid recollections of arguments between physicians at patients' bedsides. See Mattern, *Galen and the Rhetoric*, 71-80. See also H.F.J. Horstmanshoff, "Galen and His Patients," in *Ancient Medicine in its Socio-Cultural Context*. *Papers Read at the Congress Held at Leiden University*, *13-15 April 1992*, ed. Ph.J. van der Eijk, H.F.J. Horstmanshoff, P.H. Scrijvers (Amsterdam: Rodopi, 1995), 1: 83-99.
[77] Pliny, *NH* 37.62-3; Pliny the Younger, *Epistulae* 3.24.
[78] Angelova, *Sacred Founders*, 177.
[79] Angelova, *Sacred Founders*, 173-8, esp. 177
[80] See Ovid, *Fasti*, 5.149-158; Macrobius, *Saturnalia*, 1.12.26. On Livia's restoration of the temple of Bona Dea, see Angelova, *Sacred Founders*, 72, and Hendrik Hubert Jan Brouwer, *Bona Dea: The Sources and a Description of the Cult.* Études Préliminaires aux Religions Orientales dans l'Empire Romain 110 (Leiden: Brill, 1989), 323-72.

recipes for laxatives, sore throat, as well as chills and nervous tension.[81] She was also interested in gardening, and cultivated laurels and a variety of fig named *liviana* in her honor.[82]

Within Roman society more broadly, healthcare was deemed an appropriate profession and pursuit for women.[83] Livy's account of a mass poisoning in ca. 330 BCE that implicated 190 women suggests that Roman women were believed to have knowledge of preparing herbs and poisons.[84] Medicine may have also provided elite Roman women with a niche that was largely unavailable to elite Roman men. As Angelova notes, imperial women were more strongly associated with healthcare than were imperial men.[85] This may be due not only to social constructions of traditional gender roles dictating what were appropriate professions and interests for women but also because of constructions of cultural difference between elite Roman men and elite Greek men. Hellenistic kings and queens, particularly the Ptolemies, as well as Attalus III and Mithridates VI, actively and publicly studied medicine, especially toxicology.[86] By contrast, Roman authors cast suspicion on those interests.[87] Close association with the study of medicinal herbs could fuel suspicions of poisoning and sorcery.[88] Elite Roman women with medical expertise were at risk of inviting such associations. Charges of poisoning followed Livia both during and after her lifetime.[89] But the accusations of poisoning against Livia here do not begin with her medical expertise, but rather her political ambition and reputation as an "oppressive stepmother" (*noverca gravis*). It would seem that the problem for Tacitus and Dio was not Livia's medical knowledge but rather her demeanor. Regardless of the veracity of these accusations, they nevertheless reflect a world in which elite women were expected to know something about medicinal herbs.

In contrast to these assessments, Minta Collins has concluded that the codex was more "likely to have been conceived as a volume of antiquarian, literary and even sentimental interest than as a purely medical book."[90] Minta Collins argues that the selection of texts is more likely to

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[81] Angelova, *Sacred Founders,* 300, n. 45. For Livia's laxative, see *NH* 19.92; for her remedy for sore throat, Marcellus Empiricus, *De medicamentis* 15.6, and for chills, idem, 35.6.

[82] Angelova, *Sacred Founders*, 72. On her figs, see Pliny, *NH* 15.70, and, on her laurels, idem, 15.136-7, and Cassius Dio, *Historia Romana*, 48.52.3-4.63.29.3.

[83] Vivian Nutton, "Healers in the Medical Marketplace: towards a social history of Graeco-Roman medicine," in *Medicine in Society: Historical Essays*, ed. Andrew Wear (Cambridge: Cambridge University Press, 1992), 15-52. See also Sarah Pomeroy, "Technikai kai Mousikai. The Education of Women in the Fourth Century and the Hellenistic Period," *American Journal of Ancient History* 2 (1977): 51-68; and Mati Meyer, *An Obscure Portrait: Imaging Women's Reality in Byzantine Art* (London: Pindar Press, 2009), 116-127. On female medical practice in medieval Western Europe, along with a discussion of methodological concerns, see Monica Green, "Women's Medical Practice and Health Care in Medieval Europe," *Signs* 14, n. 2 (1989): 434-473. Interestingly, in Galen's few noted interactions with female health providers, he does not doubt their diagnoses or recommendations, see Mattern, *Galen*, 73-74.

[84] Livy, *Ab urbe condita,* 8.18. See Cristina Gardino Calhoon, *Livia the Poisoner: Genesis of an Historical Myth* (PhD Dissertation, University of California, Irvine. 1994), 331-332.

[85] Angelova, *Sacred Founders*, 177.

[86] See Stephanie J. Winder, "'The Hands of Gods': Poison in the Hellenistic Court," 373-408, in *The Hellenistic Court: Monarchic Power and Elite Society from Alexander to Cleopatra*, ed. Andrew Erskine, Lloyd Llewellyn-Jones, and Shane Wallace (Swansea: Classical Press of Wales, 2017).

[87] See Totelin, "Botanizing Rulers," 122-144.

[88] For a discussion of poison in ancient Rome, see David B. Kaufman, "Posions and Poisoning among the Romans," *Classical Philology* 27, n. 2 (1932): 156-167; and more recently, L. Cilliers and F.P. Retief, "Posions, Poisoning and the Drug Trade in Ancient Rome," *Akroterion* 45 (2000): 88-100, esp. a list of poisonings, 96-97.

[89] See Calhoon, *Livia the Poisoner*, esp. 281-291, 331-334. See also Nicholas Purcell, "Livia and Womanhood of Rome," *Proceedings of the Cambridge Philological Society*, New Series, 212 n. 32 (1986): 78-105.

[90] Collins, *Medieval Herbals*, 46.

reflect Juliana's literary and intellectual pretensions, especially as a member of the *gens* Anicii. She sees the selection of texts in the Vienna codex as a conscious attempt to replicate a collection of texts that once belonged to Anicia Juliana's great-grandfather, Theodosius II (r. 408-450).[91] Collins cites Sozomen's (ca. 425) address to Theodosius II, in which the author acclaims the emperor's wisdom. He explicitly mentions the emperor's familiarity with the properties of stones, roots, and cures, and even makes direct references to Oppian's poetry.[92] Sozomen's praise of Theodosius II's learning here indicates that medical knowledge was not strictly gendered among elites. It may as a result be difficult to discern sharp divisions between gendered and general knowledge, though Sozomen says nothing of Theodosius mixing substances and making drugs. There may have been a big difference between having medical knowledge and applying it. Either way, the selection of texts in the Vienna codex would have been a clear attempt by the citizens of Honoratae to construct a flattering image of Juliana as the learned scion of the Anicii *gens*. The selection of texts would then echo and reinforce Juliana's cultivation of filial *pietas* as well as her public image as a true heir to the Theodosian emperors. Collins' hypothesis would also explain why the paraphrase of Oppian's *Halieutika* and Dionysios' *Ornithiaka* were included in the Vienna codex.

Sozomen's speech further indicates how the cultivation of wide-ranging knowledge could be related to an elite's duties and public image. Such knowledge and virtue reinforced the construction of the ruler's persona and public image. Theodosius's intellectual pretensions are counted alongside his virtues, particularly his ability to rule the "passions of the soul and of the body" (τῶν παθῶν τῆς ψυχῆς καὶ τοῦ σώματος).[93] Sozomen here conjures the traditional image of the Roman elite who practices philosophy.[94] He explicitly distinguishes between Theodosius' active life by day, and his contemplative life at night:

> During the day it is said you exercise your body and your skill at arms, and manage the affairs of state by passing judgments, noting what is necessary, and carefully considering both publically and privately what should be done; but at night you busy yourself with books. [95]

While Theodosius II spends his days busy with public affairs and active exercise, he spends his nights studying books. (Justinian similarly cultivated a reputation for insomnia, but busied himself with the affairs of state.[96]) Sozomen even mentions that Theodosius uses a special mechanical lamp that automatically directs oil into the wick so that his late night studies do not cause his servants to lose sleep.[97] This passage paints an idealized picture of the kind of domestic context into which we might situate a deluxe scientific manuscript such as the Vienna codex:

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[91] Collins, *Medieval Herbals*, 45.
[92] See Sozomen, *Historia ecclesiastica*, Praef., 1.1.
[93] Sozomen, *Historia ecclesiastica*, Pref., 1.12, ed. J. Bidez and G.C. Hansen.
[94] See Paul Zanker, *The Mask of Socrates: The Image of the Intellectual in Antiquity*, trans. by Alan Shapiro (Berkeley, Calif.: University of California Press, 1995).
[95] Sozomen, *Historia ecclesiastica*, Pref., 1.8, ed. Bidez and Hansen: φασὶ δέ σε μεθ' ἡμέραν μὲν τὰ περὶ τὰ ὅπλα καὶ τὸ σῶμα ἀσκεῖν καὶ τὰ τῶν ἀρχομένων διατάττειν πράγματα, δικάζοντά τε καὶ ἃ χρὴ γράφοντα, ἰδίᾳ τε καὶ κοινῇ τὰ πρακτέα διασκοποῦντα· νύκτωρ δὲ τὰς βίβλους περιέπειν.
[96] See Brian Croke, "Justinian the 'Sleepless Emperor,'" in *Basileia: Essays on Imperium and Culture: In Honour of E.M. and M.J. Jeffreys,* edited by Jeffrey Nathan and Linda Garland (Leiden: Brill, 2017), 103-108.
[97] Sozomen, *Historia ecclesiastica*, Pref., ch. 1, sec. 8-9.

Reading late into night, Theodosius pores over volumes. Not even his servants are present. His only company, his books and a ingenious mechanical lamp.

Theodosius II's and Anicia Juliana's cultivation of a wide-range of knowledge has its roots in a long tradition of intellectual display and conversation among Roman elites. Ann Kuttner has linked the emergence of illustrated herbals in Rome to the development of greater botanical specificity in the garden frescoes in the 20s and 30s BCE.[98] She specifically links the garden room at Primaporta (fig. 6.9), purportedly Livia's villa, to Krateuas's illustrated herbal. The Primaporta Garden Room would have shown off Livia's taste and erudition, especially her knowledge of plants and interest in horticulture and agriculture. Gardens—and interiors with painted emulations of them—provided Roman elites with spaces for reflection (*cogitatio*). They also served as backdrops for convivial conversation. Athenaeus's *Deipnosophistae*, "the learned banqueters," written in the early third century CE, gives us a vivid, if exhausting, picture of what such conversations might have looked like. The last surviving book reports the banqueters' discussions on various topics, including the identities and uses of plants.[99] The interlocutors cite and quote learned treatises by great authorities, including philosophers, lexicographers and physicians. Even if idealized, the *Deipnosophistae* illustrates elite conversation as the exchange of quotations and displays of erudition. From Sozomen's speech and the Vienna Dioscorides we can suppose that such ideals survived among the Roman aristocracy into the sixth century.

While Collins's suggestion that the Vienna Dioscorides was meant to evoke the intellectual pretensions of the Anicii is attractive, it runs into difficulty by supposing that the paraphrases were a part of the original gift to Anicia Juliana. As I have already noted above, however, neither the frontispieces nor codicology supports this conclusion. Moreover, that most of the texts in the codex were either incomplete (the codex's copy of Dioscorides' *De materia medica* never contained the entirety of his text), or were paraphrased, casts doubt on Collins's suggestion that the collection was intended to have "literary" or "antiquarian" value. It is entirely possible that Anicia Juliana had the codex expanded with the addition of the paraphrases and the peacock folio after receiving it as a gift. She may have even sought to remodel the codex into a more "encyclopedic" work on natural history in general that would place her in line with her noble ancestors, her grandfather Theodosios II, in particular. This hypothesis raises the possibility that Anicia Juliana or her heirs added the peacock folio to the frontispiece cycle in order to adapt the codex from a pharmacological work into a more comprehensive work on natural history.

The Meadow and the Peacock's Tail

The current first folio of Vienna Dioscorides shows a peacock on its verso (fig. 6.2). Most researchers tend to assume that the peacock miniature was added to the front of the codex when it was rebound in 1406, and that its prominent location at the front of the book is of little significance.[100] Yet the fact that f. 1 was repaired in 1406 (the note dating the rebinding occurs on a section of repaired parchment on fol. 1r), and that its damages match those along the top corners of the other prefatory folios could suggest that the peacock miniature had been part of the prefatory cycle well before the rebinding in 1406. In contrast to the damages to the opening folios, the damages belonging to the folios at the beginning of the *Ornithiaka* occur at the bottom

[98] Ann Kuttner, "Looking Outside Inside: Ancient Roman Garden Rooms," *Studies in the History of Gardens and Designed Landscapes* 19, n. 1(1999): 7-35, here: 29.
[99] Athenaeus, *Deipnosophistae,* book 15.
[100] For the opinion that John Chortasmenos moved fol. 1, see Mazal, *Der Wiener Dioskurides*, 1:16.

corners. That none of the other paraphrases preserves a frontispiece further supports the idea that the peacock folio was not originally a frontispiece for the *Ornithiaka*. On the same kind of parchment as the added paraphrases, the peacock folio may have been added to the front of the codex at the same time that the paraphrases were added to the back of the codex. In this section, I suggest that the addition of the peacock folio was intended to signal the transformation of the codex from a pharmacological book into a broader, "encyclopedic" work on natural history.

Peter Lambeck saw the peacock as a representation of the apotheosis or *consecratio* of Anicia Juliana, whom he believed was symbolized by the bird. Citing a passage from Pliny's *Historia naturalis,* Lambeck also related the peacock to blossoming trees, and viewed it as a bridge between the codex's botanical content and its relation to its recipient. Bernard de Montfaucon (d. 1741) instead chose to see the bird as relating to the medical contents of the codex, that is, as a medical bird.[101] He quotes the *Souda*, a tenth-century Byzantine lexicon, in glossing the peacock, μηδικός ὄρνις as *Medica avis*, a technically incorrect translation that could have resulted from the false cognate μηδικός, Median, being confused with the Latin *medica*. Such a reading could nevertheless have operated as a pun among the Latin-Greek bilingual elites in sixth-century Constantinople, Juliana doubtless among them. Lambeck and Montfaucon early on identified two main ways to understand the peacock's prominence: either as a reference to the contents of the codex, or to its recipient, Anicia Juliana. We might add that in Christian art, the peacock stands for the beauty of God's creation and often refers to the resurrection due to the regeneration of his feathers in spring, and the supposed incorruptibility of his flesh.[102] The large sculpted peacocks that once adorned Anicia Juliana's church of St. Polyeuktos (fig. 6.10) may have once conveyed such meanings and may even suggest that she was personally fond of, or identified with the bird. Peacocks were also with high status and aristocracy, due in part to their exotic origins and brilliant plumage.

Without discounting any of these interpretations, we might also wonder how the peacock illustration works specifically as a frontispiece. Marching forward with one leg raised mid-step, the peacock proceeds towards the gutter, into the bindings of the codex itself. Yet, he cranes his head backwards to gaze upon his tail feathers. Gregory of Nazianzus (d. ca. 390) tells us the peacock spreads his tail because he "is conscious of his own beauty" (καὶ γὰρ αἰσθάνεται τοῦ οἰκείου κάλλους).[103] It is for his love of praise and beauty (φιλόκαλος καὶ φιλότιμος) that the peacock makes "a show before his hens, raising his neck and spreading his tail in circle around him, glittering like gold and studded with stars, he makes a spectacle of his beauty to his lovers with pompous strides."[104] The peacock puts on a show (θεατρίζει), as though on a stage, and induces wonder (θαῦμα) in his audience. The peacock's beauty and vanity are further eroticized in recognition of the tail's role in courtship. By raising his tail, the peacock makes himself into a spectacle for his lovers (τοῖς ἐρασταῖς). In doing so, the peacock becomes the passive object of their love. He is the beloved (ἐρώμενος). The tail, metaphorically likened to a meadow, *leimōn* (λειμών), could also refer obliquely to female genitalia.[105] The peacock's tail transfixes the gazes of those around it, including that of the peacock himself. By being seen and admired by all, it

[101] Bernard de Montfaucon, *Palaeographia graeca* (Paris: L. Guérin, J. Boudot et C. Robustel, 1708), 196-197.
[102] Henry Maguire, *Earth and Ocean: The Terrestrial World in Early Byzantine Art* (University Park: Pennsylvania State University Press, 1987), 61.
[103] Gregory Nazianzus, Second Theological Oration, *Oratio 28*, ed. Migne, *PG* 44: 121.
[104] Ibid., ὅταν ἴδῃ τινὰ πλησιάζοντα, ἢ ταῖς θηλείαις, ὥς φασι, καλλωπίζηται, τὸν αὐχένα διάρας, καὶ τὸ πτερὸν κυκλοτερῶς περιστήσας τὸ χρυσαυγὲς καὶ κατάστερον, θεατρίζει τὸ κάλλος τοῖς ἐρασταῖς μετὰ σοβαροῦ τοῦ βαδίσματος;
[105] *LSJ,* 1035. See, for example, Euripides, *Cyclops*, 171.

inverts the dead outward gaze of its many false, star-like eyes, which Hera had culled from the remains of the giant Argos Panoptes (all-seeing). Argos had a hundred flashing eyes with which he could look in all directions simultaneously. Hera had him watch over her priestess Io, but Hermes lulled him to sleep and hacked him to pieces. Hera salvaged the gem-like eyes and preserved them in the plumage of her favorite bird. Removed to the peacock's tail, the dead eyes of the all-seeing became adornment for the bird seen-by-all.[106] It was perhaps from admiration for these dead eyes, that a later user of the codex sketched a peacock tail feather in the lower margin.

In many ways, the peacock folio is about the peacock's tail. Looking back to preen or admire his tail feathers, the peacock directs us to marvel at the saturated sapphire blues interwoven with gold and gem-like eyes. The evocation of wonder combined with the direction of the peacock's movement into the book generates the viewer's interest in the rest of the codex. The tail may also refer obliquely to the codex's contents. The word *leimōn*, a metaphoric term for the peacock's tail, was a common title for works with diverse contents. Pliny lists the name among the attractive titles that the Greeks gave to their books:

> There is a marvellous neatness in the titles given to books among the Greeks. One they called Κηρίον, meaning *honeycomb*; others called their work Κέρας Ἀμαλθείας, i.e., *Horn of Amaltheia* (so that you can hope to find a draught of hen's milk in the volume), and again ἴα (Violets), Μοῦσαι (Muses), πανδέκται ('hold-all'), ἐγχειρίδια (handbook), λειμών (Meadow), πίναξ (Tablet), σχέδιον (Impromptu)—titles that might tempt a main to forfeit his bail. But when you get inside them, good heavens, what a void you will find between the covers![107]

Pliny's low opinion notwithstanding, flowery titles flourished in his time and persisted long after. In his *Attic Nights* (another work that testifies to practices of nighttime reading), Aulus Gellius notes that such titles were descriptive of their varied contents: "For since [their authors] had laboriously gathered varied, manifold, and as it were indiscriminate learning, they therefore invented ingenious titles also, to correspond with that idea."[108] Gellius goes on to list a variety of such titles in Latin and Greek, including *Leimōn*.[109] Cicero is known to have titled an early work, perhaps a catalog or miscellany of judgments about poets, *Limon*.[110] Roughly contemporary to

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[106] Ovid, *Metamorphosis*, book I, ll.722-723.

[107] Pliny, *NH*, praef. 24, ed. L. Ian/C. Mayhoff, here, trans. by H. Rackham with modification: Inscriptionis apud Graecos mira felicitas: κηρίον inscripsere, quod volebant intellegi favum, alii κέρας Ἀμαλθείας, quod copiae cornu, ut vel lactis gallinacei sperare possis in volumine haustum; iam ἴα, Μοῦσαι, πανδέκται, ἐγχειρίδια, λειμών, πίναξ, σχεδίων: inscriptiones, propter quas vadimonium deseri possit; at cum intraveris, di deae que, quam nihil in medio invenies!

[108] Aulus Gellius, *Noctes atticae, praef.* 5-6, trans. Rolfe (in text), and here ed. C. Hosius: Nam quia variam et miscellam et quasi confusaneam doctrinam conquisiverant, eo titulos quoque ad eam sententiam exquisitissimos indiderunt.

[109] Aulus Gellius, *Noctes atticae*, *praef.* 6-8, ed. C.Hosius: Namque alii Musarum inscripserunt, alii silvarum, ille πέπλον, hic Ἀμαλθείας κέρας, alius κηρία, partim λειμῶνας, quidam lectionis suae, alius antiquarum lectionum atque alius ἀνθηρῶν et item alius εὑρημάτων. Sunt etiam, qui λύχνους inscripserint, sunt item, qui στρωματεῖς, sunt adeo, qui πανδέκτας et Ἑλικῶνα et προβλήματα et ἐγχειρίδια et παραξιφίδας. Est qui memoriales titulum fecerit, est qui πραγματικὰ et πάρεργα et διδασκαλικά, est item qui historiae naturalis, est παντοδαπῆς ἱστορίας, est praeterea qui pratum, est itidem qui πάγκαρπον, est qui τόπων scripserit;

[110] Jean Soubiran, ed., *Cicéron: Aratea, Fragments poétiques* (Paris: Belles Lettres, 1972), 5-27, esp. 21-27, and Edward Courtney, *The Fragmentary Latin Poets* (Oxford: Oxford University Press, 2003), 149, 152-156.

Pliny's *Naturalis Historiae,* Pamphilos of Alexandria (fl. second half of the first century CE) is known to have written works under the name *Meadow* (λειμὼν), or *Meadow of Names and Languages* (λειμὼν περὶ ὀνομάτων καὶ γλωσσῶν).[111] Similarly, Suetonius (fl. c. 100 CE) authored a work in Latin on curiosities with the title *A 'Meadow' of Various Things* (*Pratum de rebus variis*). In the sixth century, the monk John Moschos (ca. 540/50-619 or 634) named his collection of hagiographic vignettes the *Spiritual Meadow* (*leimōn* or *leimōnarion*, λειμωνάριον, or *neos paradeisos,* νέος παράδεισος).[112] Educated contemporaries would have recognized such titles and associated them with anthologies and florilegia, works with diverse contents.

In the Vienna Dioscorides, it is possible that the peacock folio was meant to be an elliptical reference to a *leimōn*. If so it would have reframed the contents of the codex less as a book just on pharmacology and more as encyclopedic work on natural history. As such the work would have been understood to cultivate encyclopedic knowledge (πολυμάθεια) and be a general aid in the display of erudition among elites. Such an attempt to reframe the contents of the codex would make sense in light of the addition of the paraphrases to the back of the codex. These paraphrases expanded the codex so that it was no longer just on herbs, but also on birds, fishes and various venomous animals. The abbreviated and paraphrased nature of these texts might have also gone hand in hand with the reconceptualization of the codex as a "meadow."

The reframing of the contents of the Vienna Dioscorides is suggestive of the broader significance that Dioscorides would assume in the Middle and Late Byzantine periods. In the ninth century, Photios recommended reading Dioscorides "not only for medical practice (ἰατρικὴν φιλοπονίαν) but also for speculations in philosophy (ἐμφιλόσοφον) and natural science (φυσικὴν θεωρίαν)."[113] The breadth of subjects included in the Vienna Dioscorides and the later Morgan Dioscorides tend to suggest that Photius's understanding of Dioscorides as a tool for broader philosophical and natural historical speculation was widely shared.

Wisdom Builds Her House

Changes made to the frontispieces of the Vienna Dioscorides in the Late Byzantine period provide further testimony to elevation of Dioscorides as a fount of wisdom for wider knowledge. In 1406, the notary and scholar John Chortasmenos was contracted by a monk named Nathaniel at the Royal Serbian hospital at the monastery of St. John the Forerunner in the Petra district of Constantinople to rebind and restore the Vienna Dioscorides.[114] Chortasmenos and his assistants exhaustively transliterated the uncial text of the codex into the then more readable minuscule script. They also examined the pictures and text, noting any that seemed to be misplaced or missing. Recognizing the inaccuracies of the original table of contents, John Chortasmenos recorded on the blank rectos of ff. 4-7 a new and, as his title states, "most accurate table of the plants which the present book contains" (πίναξ ὀρθώτατος τῶν βοτάνων, ἅπερ ἔχει τὸ παρὸν

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[111] *Souda*, π 142.

[112] On Moschos, see Henry Chadwick, "John Moschus and his Friend Sophronius the Sophist," *Journal of Theological Studies* 25 (1974): 41-74.

[113] Photios, *Bibliotheca*, cod. 178, ll. 23-25, ed. R. Henry: χρήσιμον δὲ τὸ βιβλίον οὐ πρὸς ἰατρικὴν φιλοπονίαν μόνον, ἀλλὰ καὶ πρὸς ἐμφιλόσοφον καὶ φυσικὴν θεωρίαν.

[114] Chortasmenos recorded this information on a note that he added to f.1r: "John Chortasmenos (re)bound this book of Dioscorides, having become quite old and in danger of falling completely into ruin, at the behest and cost of the reverend/venerable monk, Lord Nathanael, then nurse (nosokomos) in the imperial hospital in the year 6914, of the 14th indiction." Τὸ παρὸν βιβλίον τὸν Διοσκουρίδην παντάπασι παλαιωθέντα καὶ | κινδυνεύοντα τελείως διαφθαρῆναι ἐστάχωσεν ὁ Χορτασμένος Ἰωάννης | προτροπῆ καὶ ἐξόδω τοῦ τιμιωτάτου ἐν μοναχοῖς κυροῦ Ναθαναὴλ νοσοκ|όμου τηνικαῦτα τυγχάνοντος ἐν τῶ ξενῶνι τοῦ Κράλη ἔτους ˏζοῦ ϡ′οῦ ιδ'ου | ἰν[δικτιῶν]ος ιδη

βιβλίον, ἐνταυθα). Throughout the frontispiece cycle, he transcribed the uncial labels of the figures into minuscule and added explanatory notes. For example, below the dying dog he wrote (fig. 6.5): "a dog pulling up the mandrake, then dying" (κύων ἀνασπῶν τὸν μανδράγοραν ἔπειτα ἀποθνήσκων).

Most strikingly, he relabeled a number of figures throughout the sequence. The personifications of *Heuresis*, *Epinoia,* and Anicia Juliana herself were all relabeled as a single figure: Wisdom or Sophia (ἡ σοφία). As a result, the frontispieces were effectively recast as a narrative about Wisdom. In this reworking, it is Wisdom, and not Discovery that reveals the mandrake to Dioscorides. And it is Wisdom who enables him and his artist to record their findings. Finally it is Wisdom who appears as an empress enthroned, flanked by the personified virtues *Megalopsychia* and *Phronesis*, while below an Eros now labeled "Desire for Wisdom" (πόθος τῆς σοφίας) holds open the book to receive Wisdom's largesse.

Sophia could refer to different kinds of wisdoms. The term appears in Paul's first letter to the Corinthians both in connection to pagan learning— "The Greeks seek wisdom" (Ἕλληνες σοφίαν ζητοῦσιν, 1 Corinthians 1:22)—as well as Christ, "wisdom from God" (σοφία ἀπὸ Θεοῦ, 1 Corinthians 1:30). Consequently, as John Meyendorff notes, we find *sophia* in connection to the "natural wisdom of the universe, which preoccupied Greek philosophers, and the personalized and 'true' Wisdom revealed in Christ."[115] Christians could then claim the figure of Wisdom in the Old Testament (particularly Proverbs 9:1-5) as references to Christ, the Wisdom of God. It is the former "natural" kind of wisdom that would seem at first glance to make the most sense for the Vienna frontispieces. But the scene of Wisdom enthroned undermines this understanding of Sophia. Rather the scene suggests a synthetic form of Wisdom blurring distinctions between knowledge of the natural world and Divine Wisdom. The relabeling of *Heuresis* and *Epinoia* as *Sophia*, moreover, removes any ambivalence or negative associations with idolatry that those terms might have once suggested.

Within the broader, Late Byzantine cultural context, the main narrative depictions of Wisdom personified appear in ecclesiastical contexts in representations of Proverbs 9:1-5:

> 1: Wisdom has built her house, and set up seven pillars, 2: she has slaughtered her animals, she has mixed her wine in a *kratēr*, and prepared her table, 3: she has sent her servants calling out with a loud proclamation to the drinking feast [lit. to the *kratēr*], saying 4: "Whoever is foolish (ἄφρων), have him visit me!" To those in need of understanding (ἐνδεέσι φρενῶν), she said, 5: "Come eat of my bread and drink the wine that I mixed for you."[116]

In the Late Byzantine period, this passage was celebrated as an Old Testament prefiguration of the Eucharist and the Incarnation of Christ. It was mentioned in the hymns for Holy Thursday, the day commemorating the Last Supper.[117] For these reasons, the image of Wisdom building her house and preparing her table began to appear in monumental church decorations of the late

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[115] John Meyendorff, "Wisdom–Sophia: Contrasting Approaches to a Complex Theme," *Dumbarton Oaks Papers* 41 (1987): 391-401, at 391.

[116] Proverbs 9:1-5, 1, ed. Rahlfs: Ἡ σοφία ᾠκοδόμησεν ἑαυτῇ οἶκον | καὶ ὑπήρεισεν στύλους ἑπτά· | 2: ἔσφαξεν τὰ ἑαυτῆς θύματα, | ἐκέρασεν εἰς κρατῆρα τὸν ἑαυτῆς οἶνον | καὶ ἡτοιμάσατο τὴν ἑαυτῆς τράπεζαν· | 3: ἀπέστειλεν τοὺς ἑαυτῆς δούλους | συγκαλοῦσα μετὰ ὑψηλοῦ κηρύγματος ἐπὶ κρατῆρα λέγουσα | 4: Ὅς ἐστιν ἄφρων, ἐκκλινάτω πρός με· | καὶ τοῖς ἐνδεέσι φρενῶν εἶπεν | 5: Ἔλθατε φάγετε τῶν ἐμῶν ἄρτων | καὶ πίετε οἶνον, ὃν ἐκέρασα ὑμῖν·

[117] Meyendorff, "Wisdom-Sophia," 393.

Byzantine period, as, for example, in the frescoes of the narthex to St Clement in Ohrid, dated to 1295 (fig. 6.11).

It seems unlikely that the relabeling of the figures in the Vienna Dioscorides was intended to carry any significance in reference to the Eucharist or the Incarnation. It may simply be the case that the frontispieces made more sense to Late Byzantine viewers if *epinoia, heuresis* and Juliana were all understood to be Wisdom. Still, general parallels between Proverbs 9:1-5 and the relabeled frontispiece cycle are striking: Wisdom slaughters her animals, appears in a building with pillars, acts generously, and calls on those who need and desire her (πόθος τῆς σοφίας). In this way, the relabeled frontispiece cycle invites readers to partake of the knowledge in the book, as though they were Wisdom's invitees—the foolish and those in need of understanding—from the book of Proverbs.

There may have been little reason for contemporary Byzantine audiences to make a clear distinction between scientific and divine knowledge, especially as God was viewed as the ultimate source of the natural world and knowledge of it. Informative in this regard are the verses surrounding a pair of frontispiece illustrations, completed sometime between 1341 and 1345, for a copy of the Hippocratic Corpus now in Paris (Paris, Bibliothèque nationale de France, gr. 2144, ff. 10v-11r, fig. 6.12). The verses form a dialog between Hippocrates and the codex's recipient, Alexios Apokaukos. Medicine is named in the verses as "the most powerful of the sciences" (ἰατρικῆς μὲν τῆς κρατίστης ἐν τέχναις).[118] Apokaukos explains that he undertook to study medicine to "learn the plans of God" (μαθεῖν πάρεστιν ἐνθέους λόγους).[119] He claims to have had a great longing to find Hippocrates' writings, "as if for God's own craft working in us, He who explains the secret dispositions implanted within us, setting great hopes upon them, as they would provide a clear knowledge of the wonders of God, and the finest among all sciences."[120] As Joseph Munitiz notes, "the science or *techne* of medicine is presented as the most powerful of them all, but clearly its scope is envisaged as a very broad one, almost as if it was a synonym for philosophy – embracing all creation and theology."[121] Reminiscent of the relabeled Eros of *pothos* standing before Sophia in the Vienna Dioscorides, Apokaukos's longing for Hippocrates' writings is expressed here as *pothos* (πολὺν μὲν ἔσχον ἐντυχεῖν τούτοις πόθον). The verses in the Apokaukos frontispieces show that knowlegde of the natural world, in particular medicine, could be expressed in a lofty, religious language that blurred hard distinctions between divine Wisdom and secular science.

This blurring of a hard distinction between scientific and divine Wisdom also occurs in an illustration of Jubal (ὁ ἰουβάλ) in the Marciana Ptolemy (Venice, Biblioteca Nazionale Marciana, gr. Z. 516 = coll. 904, f. 140v, fig. 6.13). Jubal, mentioned in Genesis 4:21 as the "inventor/discoverer of harp and lyre" (ὁ καταδείξας ψαλτήριον καὶ κιθάραν), is depicted here with Sophia beside a diagram demonstrating the harmonic properties of sound. This way of thinking also appears in the frontispieces to the *Dynameron* of Nicholas of Myrepsos now in

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[118] Paris, Bibliothèque nationale de France, gr. 2144, f. 10v, l. 1, in Joseph A. Munitiz, "Dedicating a Volume: Apokaukos and Hippocrates (Paris. gr. 2144)," in *Φιλέλλην, Studies in Honour of Robert Browning*, Istituto Ellenico di Studi Bizantini e Postbizantini di Venezia. Bibliotheke 17, ed. Costas N. Constantinides, Nikolaos M. Panagiotakis, Elizabeth Jeffreys, and Athanasios D. Angelou (Venice: Istituto Ellenico, 1996), 267-280, at 268.
[119] Paris, Bibliothèque nationale de France, gr. 2144, f. 11r, l. 4, Munitiz, "Dedicating," 270.
[120] Paris, Bibliothèque nationale de France, gr. 2144, f. 11r, ll. 11-16. Munitiz, "Dedicating," 271: ὡς τῆς ἐν ἡμῖν τοῦ Θεοῦ τεχνουργίας, | τοὺς μυστικοὺς τρανοῦντος ἐμφύτους λόγους, | πολὺν μὲν ἔσχον ἐντυχεῖν τούτοις πόθον, | λαμπραῖς ἐπ' αὐτοῖς ἐντρυφῶν ταῖς ἐλπίσι, | γνῶσίν τε τρανὴν τοῦ Θεοῦ τεραστίων, καὶ τὴν ἀρίστην προξενοῦσιν ἐν τέχναις.
[121] Munitiz, "Dedicating," 278.

Paris (Paris, Bibliothèque nationale, f. 10v, fig. 6.14). Here we find the scene of a physician enthroned in his office with patients, assistants and an apothecary. The illustration visually subordinates the scene of medical practice and knowledge to the deësis scene above, featuring Christ enthroned with John the Baptist, the Virgin, archangels and the Ghost of the Holy Spirit, as though to clarify that it is only by God's will and grace that anything should happen.

These three examples—the Paris *Dynameron*, Sophia with Jubal, and the Apokaukos frontispieces—suggest that it would have been entirely possible for late Byzantine viewers to consider the contents of the Vienna Dioscorides as an extension of Divine Wisdom. Of course, aspects of the earlier forms of the frontispiece cycle remain: they still evoke wonder for the natural world and illustrate the mythical and historical emergence of pharmacology. But the insertion of Wisdom as a central protagonist, especially as she appears enthroned at the climax of the cycle, frames the contents in broader and more general terms. The frontispiece cycle is no longer just about pharmacology, or reciprocation of Anicia Juliana's generosity, or about the wonders and variety of the natural world, but also about the revelation of divinely sanctioned Wisdom about God's plans and workings. The inscription of the Wisdom narrative actually erases Anicia Juliana as well as the original context and purpose for assembling the Vienna Dioscorides. It retains, however, the narratives about the emergence of Dioscorides' *De materia medica*, and interweaves this earlier narrative with the Wisdom narrative. Ultimately, it subordinates the Dioscorides and pharmacology narratives to the Wisdom narrative, just as the Paris *Dynameron* frontispieces placed the physician scene beneath the deësis.

It is the Late Byzantine reworking of the frontispieces that was ultimately transmitted in subsequent copies of the Vienna Dioscorides. Until the revelation of Juliana's identity by Peter Lambeck at the Imperial Library in Vienna in the seventeenth century, the frontispieces of the Vienna Dioscorides were primarily understood and transmitted as an allegory of Wisdom, and her workings through the natural world and the study of it.[122] This allegorical narrative about Wisdom appears in a fifteenth-century botanical picture book now in the Vatican (Vatican, Biblioteca Apostolica Vaticana, Chigi F VII 159, ff. 234v and 236v, fig. 6.15-16), at the end of the late-fifteenth-century Banks codex (London, Library of the Natural History Museum, MSS Banks Coll. Dio., ff. 402r and 403r, fig. 6.17-18), and much changed in an early-fifteenth-century codex now in Bologna (Bologna, Biblioteca Universitaria di Bologna, MS 3632, ff. 378v and 379r, fig. 6.19-20). In all of these copies, we find *Sophia* and not the original cast of *Epinoia, Heuresis*, and Anicia Juliana. All of these copies of the Vienna Dioscorides ended up in (or passed through) Italy. Like many of his contemporaries, John Chortasmenos was mindful of the shifting fortunes and circumstances of the Byzantine, and Greek-speaking world.[123] In a letter to Demetrios Pepagomenos, a Constantinopolitan scholar and physician working at that time in the Peloponnese, Chortasmenos writes that Wisdom and Fortune, having long abandoned Attica, have passed over to Italy and dwell there.[124] As deluxe copies of the Vienna Dioscorides made

[122] Peter Lambeck, *Commentariorvm de avgvstissima bibliotheca caesarea vindobonensi* (Vienna: Typis Matthaei Cosmerovii, 1669), 2: 528

[123] See Ihor Ševčenko, "The Decline of Byzantium Seen Through the Eyes of Its Intellectuals," *Dumbarton Oaks Papers* 15 (1961): 167-186.

[124] John Chortasmenos, *Epist*. 44, Δημητρίῳ τῷ Πεπαγωμένῳ ἐν Πελοποννήσῳ διατρίβοντι, ed. H. Hunger, 115-116: ἡ γάρτοι Σοφία μετὰ τῆς Τύχης, ἣν οὐκ ἂν ἁμάρτοι τις τροφὸν ἀποκαλέσας τῆς πόλεως, ἐκ μακροῦ τὴν Ἀττικὴν ἀφεῖσα τοῦ χρόνου πρὸς Ἰταλίαν μετέβη καὶ ταῖς ἐκείνων πόλεσιν, ὡς ἀκούομεν, ἐμφιλοχωρεῖ. On Pepagomenos, see Aubrey Diller, "Demetrius Pepagomenus," *Byzantion* 48 (1978): 35-42. On Chortasmenos's correspondence, see Herbert Hunger, *Johannes Chortasmenos (ca. 1370-ca. 1436/37). Briefe, Gedichte und kleine Schriften*, Wiener Byzantinistische Studien 7 (Graz: Böhlau, 1969).

their way to Italy—with their allegorical depictions of Wisdom at work and enthroned—, along with scholars and other precious manuscripts, Chortasmenos certainly spoke from experience.

Conclusion

Over its history, the frontispiece cycle marks several shifts in how contemporaries conceptualized the contents of the Vienna Dioscorides. Originally the frontispiece cycle referred simply to the contents and production of a pharmacological book and its presentation to Anicia Juliana to reciprocate for her patronage of a church. There is no firm evidence to suggest that this gift included the peacock folio, the *Carmen* and paraphrases (ff. 1, 388-455). It would seem then that the gift of the people of Honoratae to Anicia Juliana was rather more limited than the present form of the codex. This fact is borne out by the frontispieces, which celebrate the history of pharmacology and Dioscorides' authorship, as well as Anicia Juliana's magnanimity, but which leave out the paraphrases. Even though the subject of the codex appears to have been initially limited to the Dioscoridian Herbarium, the frontispieces nevertheless stress its links to a wider range of authors. Structurally, the frontispieces play on the doubled repetition and variation to inspire wonder in the reader. They establish a kind of narrative sequence that climaxes with the presentation of the codex to Anicia Juliana. In this way, it would seem that the codex may have been initially intended for Anicia Juliana as a practical medical guide for her to make healthcare decisions for her and household, and as a way to celebrate her medical knowledge and interests.

The subsequent addition of the peacock folio to the front of the cycle shortly thereafter marked the codex as an "encyclopedic" work on natural history. It seems possible that Anicia Juliana and her heirs were responsible for this modification of the codex, perhaps so as to commemorate the breadth of her erudition or that of her family generally, particularly her grandfather, Theodosios II, whom Sozomen had lauded specifically for his vast knowledge on the natural world. The illustration of the peacock, in which we see the peacock admiring his meadowy tail, emblematizes the range and diversity of the codex's new form, especially as the word "meadow" applied both to the peacock's tail as well as to the works with diverse and variegated contents. In this way, the peacock folio may have contributed to the way the frontispiece cycle inspires the reader's wonder and admiration for the work.

That this modification of the codex probably occurred shortly after its presentation to Anicia Juliana, could suggest that these two ways of understanding the codex's contents—as pharmacology and as natural history—were roughly contemporary and coexisted with each other. Indeed, these two understandings of medicinal botany likely persisted throughout the Byzantine period, as is suggested by Photios' sentiment that Dioscorides was "useful not only for medical practice (ἰατρικὴν φιλοπονίαν) but also for speculations in philosophy (ἐμφιλόσοφον) and natural science (φυσικὴν θεωρίαν)."[125]

While these two ways of understanding the illustrated Dioscorides seem to have coexisted with each other, the relabeling of the figures in the fifteenth century marks a very different conceptualization of the codex's contents. The relabeling of *Heuresis, Epinoia,* and Anicia Juliana as Wisdom (*Sophia*) created a new narrative about the bestowal of knowledge by divine Wisdom within the frontispiece cycle. Instead of the cycle culminating in the presentation of the codex to Anicia Juliana, it is now Wisdom who receives book, just as it is Wisdom who drives its creation. This cycle could have been essentially understood as a kind of allegory for the Divine Wisdom of Christ, as essentially expressed in the text of Proverbs 9:1-5. While the earlier

[125] Photios, *Bibliotheca*, cod. 178, ll. 23-25, Ed. R. Henry: χρήσιμον δὲ τὸ βιβλίον οὐ πρὸς ἰατρικὴν φιλοπονίαν μόνον, ἀλλὰ καὶ πρὸς ἐμφιλόσοφον καὶ φυσικὴν θεωρίαν.

cycle had been at best ambivalent about the pagan origins of the codex's contents, this new narrative allegorizes the development of pharmacology and realigns it with the revelation of God's working through the world. This same move can be seen in other medical frontispieces from roughly the same time period, notably the Paris *Dynameron* and the Apokaukos codex.

While these shifts concern the general position of Dioscorides and medicine, they nevertheless tell us about the place of botanical illustration within the sciences more broadly. All of these narratives essentially focus on the contents of an illustrated book. All of them still involve the painter in Dioscorides' studio. Originally, the painter appeared depicting a mandrake held by *Epinoia*, that is, by observing and noting its salient properties. That Dioscorides is shown writing into a book that is already illustrated, suggests that the painter is essential part of his authorial process. In the fifteenth-century relabeling of the illustration, however, the painter works directly from a specimen held by Wisdom, as though to say that painters, too, have access to a transcendent, if not divine, Wisdom.

Conclusion

This dissertation traces the history of botanical illustration in the Alphabetical Dioscorides from its origins in the illustrated *rhizotomika* of the Hellenistic period to its integration with emergent traditions of early modern botanical illustration. This study permits several conclusions on the relationship between depiction and botanical practice, the question of the autonomy of visual knowledge, the relative roles of tradition and innovation within Byzantine botanical illustration, and the place of naturalism and nature within Byzantine scientific culture.

Botanical illustration afforded visual knowledge of plants. Visual knowledge was in some ways independent of knowledge gained through texts or first hand (e.g., tactile) experience. The special emphasis on the visual and its relative autonomy is especially evident in the picture-first mode of illustration, which privileged the transfer of visual- over verbal-based knowledge. The peculiar autonomy of illustrations was also apparent by the fact that the illustrations often referred to information not included in the text. Illustrations that were based on a reading of the text, and those that began to reflect non-morphological aspects of the plant, such as its medicinal properties or name, represent a notable exception to the general trend towards autonomy in illustrations. This impression of the independence between illustration and text does not, however, suggest there was complete isolation between word and image. Rather, illustrations, texts, and actual plants were likely used in conjunction with each other in order to create botanical knowledge. In the Late Byzantine period, we find, for example, an especially close relationship between lexicography and botanical illustration. Together these different ways of knowing and learning constituted a broader system of botanical reference that appeared as early as the Hellenistic period, if not prior.

Throughout this dissertation, I focus on how ancient and medieval botanical illustrations select distinguishing properties (selectivity) and how they present those properties visually (aspectivity). I relate this process of pictorial selection and display to the Aristotelian practice of definition by *differentiae*, and the basic methods of Dioscoridean identification through attention to comparative morphology (especially leaves and growth habit). While approaches varied when it came to determining what distinguishing properties were worthy of depiction, ancient and medieval botanical illustrations generally stress leaf morphology, especially shape, and the development of fruit. Notably, ancient and medieval botanical illustrations tend to be vague about floral structure, because floral structure and function were not well understood, were regarded as unimportant, or were typically unavailable for the purposes of identification. The concern with fruits, especially evident in the depiction of trees in the Morgan Dioscorides, seems to have been due to the emphasis placed on fruit as the purpose or aim (*telos*) of the plant, and because fruits were of typically of greater practical and economic utility.

When it came to the depiction of a plant's spatial properties, illustrations demonstrate a marked tension between the rendering of the fully articulated, individual plant as though it were a three dimensional object in space or an object flattened out against the surface of the papyrus, parchment, or paper support. This tension revolves around the question of what to show and how legible to make it. "Flattened" plant illustrations privilege certain kinds of information such as leaf shape, while obscuring details such as growth habit. In general, throughout the Middle Ages, there is a strong tendency towards flattening, or rather, minimizing pictorial depth and complexity, perhaps because of concerns over the comprehensibility of the figure.

Modifications to illustrations along with the introduction of new "from life" illustrations in Middle and Late Byzantine botanical manuscripts (e.g., Morgan Dioscorides and the Chigi

Dioscorides) further point to practices of observation in Byzantine botany. Botanical observation primarily attended to leaf shape and the development of fruit. The observation of nature went hand in hand with careful study of variants across multiple manuscripts. In the Morgan Dioscorides we find multiple pictures side-by-side that were recognized as different subtypes of the same plant. These findings suggest that Byzantine botanical illustration was not a process of uncritical and mechanical copying that could only result in the deleterious loss of content. On the contrary, the Byzantine tradition of botanical illustration was dynamic and critical. Its practitioners frequently updated it to reflect their changing views of the natural world and of the tradition itself. The recognition of errors allowed them to expand the tradition either by encouraging the recognition of variants as yet more subtypes, or by creating the opportunity for rectification.

In contrast to these detailed "documentary" illustrations, certain botanical illustrations functioned mainly as memory aids, that is, as a way to recall plants already known to the viewer. We see this approach possibly in the Tebtunis roll, and certainly in the Ambrosiana notebook, Marciana handbook, and Bologna 3632. These illustrations tend to be pen and ink line drawings or sketches, of varying skill level. They generally attend to the overall shape, while neglecting the distinguishing detail of other, more detailed botanical illustrations. These sketches often involve a local logic of attending to plant morphology, for example, by breaking the plant into component parts, by using solid ink fills to signal fleshy tissue, or red color to indicate red flowers and fruit. A handful of these illustrations also include inscriptions noting the plants' coloration. Such inscriptions allow for the sketch to serve a broader role in eliciting imaginative reconstruction of the plant in the mind's eye.

Byzantine botanical illustrations circulated in the wider Mediterranean in the form of such memory aids and as more visually replete painted pictures, as early as the thirteenth century, if not before. Pictures travelled independently of texts in the form of botanical atlases. During the late medieval period, the botanical traditions of the Mediterranean come to demonstrate similar forms, and appear to come together in many ways. For example, text-less botanical atlases appear in the Byzantine, Latin, and Islamic worlds all within a century of each other. More research into the connections between these traditions may show that we should begin to regard them as convergent traditions, or even a single tradition between different languages. The Banks Dioscorides certainly points to the existence of an Italo-Byzantine botanical tradition towards the end of the fifteenth century.

The final chapter shows the place of the Byzantine botanical tradition within its larger intellectual context, from late antiquity to the late Byzantine period, as traced through modifications and annotations to the frontispiece cycle of the Vienna Dioscorides. These changes indicate shifts in how the Byzantine people thought of the volume's contents. Originally, the codex was simply thought to contain a text on pharmacology. It was then expanded into a more general work on natural history, in which medical knowledge was predominant. This knowledge was initially localized in the exercise of individual faculties of observation and generalization (*Epinoia*). Eventually, with the relabeling of several figures as *Sophia*, we find that medical knowledge was broadly reconstrued in relation to transcendent, even divine, Wisdom. In this way, medicine—including medical botany and pharmacology—becomes perhaps the highest, and most encompassing field of knowledge in the Late Byzantine period. The frontispieces integrate botanical illustration as visual knowledge within this broader conceptualization of medicine as the highest art.

Although scholars have emphasized the limited presence of nature and naturalism in Byzantine art, especially following Iconoclasm, this study demonstrates that it is not entirely true that Byzantine artists were totally unconcerned with the study and accurate visualization of the natural world. I instead show that there were diverse practices attending to the observation and visualization of the natural world. Juxtaposed with the broader visual culture, these traditions appear as though they belonged to what we might call a scholarly subculture. Yet this impression is a consequence of the biases of the material record and traditional art historical narratives that are largely based on monumental, religious, and political art. While the secular arts have also been studied and collected, this was until recently more often for the testimony they might provide on classical antiquity than for anything they might tell us about Byzantium. Such narratives and material biases inevitably leave gaps in our understanding of what were larger, and more complex cultures. It would, for example, seem that scholars failed to recognize innovations in the Morgan and Chigi Dioscorides, because of the prevailing assumption that Byzantine people simply could not and did not innovate. But if there is a moral to be found in this dissertation, it is that cultures are borne of complexity. They abide in it. There is no single ancient, Byzantine, or medieval "mind" or way of thinking. Ancient and medieval peoples tried to make sense of the world around them with the tools they had at hand. While they preserved and honored traditions, they also tinkered, experimented, and innovated. It was through the slow progress of centuries that the sciences of the modern world took shape.

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Abbreviations (for citations to translations and editions, see Sources below)
HP Theophrastus, *Historia plantarum*
MM Dioscorides, *De materia medica*
NH Pliny the Elder, *Naturalis historia*

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Figures

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