

PHARMACOPOEIAS AND THE TEXTUAL TRADITION IN GALENIC PHARMACY



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IN SEPTEMBER 1775, a Mexico City notary conducted an inventory of the contents of the pharmacy of apothecary Don Jacinto de Herrera y Campos as part of a criminal investigation.¹ The inventory proceeded over several days, revealing a wide array of medicines and equipment in the pharmacy, as well as a collection of books to which Herrera presumably referred in his practice. Among the books were a series of pharmacopoeias, texts meant to standardize the types of medicines stocked in the pharmacy and the ways in which they were to be formulated. Herrera possessed copies of the *Pharmacopoeia Valentina* and the *Pharmacopoeia Augustana*, both produced in the sixteenth and early seventeenth centuries to standardize pharmaceutical practice in and around the cities of Valencia and Augsburg similar to the case of Florence's early pharmacopoeia—the *Ricettario Fiorentino*, as discussed by Emily Beck in chapter 2.² Herrera also possessed a worn copy of Félix Palacios's *Palestra pharmaceutica*, first published in 1706, which went on to serve as the basis for the *Pharmacopoeia Matritensis*, coordinated by the Royal College of Apothecaries in Madrid and published in 1739 as the first standard pharmacopoeia for the entire Spanish Empire, as discussed by Matthew Crawford in chapter 3.³ The *Pharmacopoeia Matritensis* pro-

vided a “fixed and constant method by which the medicines are prepared that are in use in these Kingdoms for the cure of illness,” and apothecaries were to follow it “without departing in any way whatsoever from its rules.”⁴ Its presence in the Herrera pharmacy was presumably no accident, as royal decrees stipulated that apothecaries throughout the Spanish Empire keep a copy of it in their pharmacies, and present it during pharmacy inspections.⁵

The various pharmacopoeias in Herrera’s shop constituted part of the textual basis for Galenic pharmacy, the tradition that dominated pharmaceutical theory and practice in the West from the first century of the Common Era through the early nineteenth century. Galenic pharmacy was named after, and largely founded upon, the teachings of Galen (ca. 130–210 CE), a physician from Pergamon in the Roman Empire whose medical system guided Western medicine for almost two millennia.⁶ Galenic pharmacy was brought to Mexico under the Spanish Empire and remained remarkably intact throughout the colonial period.⁷ The contents of the Herrera pharmacy—its medicines, its equipment, and its books—were typical of the Galenic tradition. The pharmacopoeias it contained serve to indicate the importance of texts within this tradition and the fact that pharmacy from very early on was both a practical and a learned art, a manual craft supported by a substantial tradition of written works as well.⁸ In the Galenic tradition, the pharmacopoeia played a particularly important role, not only in setting professional standards but also as a culmination of a series of different genres of pharmaceutical writing.

Studies of pharmacopoeias tend to emphasize their role in standardizing materials and formulations especially in the context of the nation-state and in this way equate them with the emergence of the modern era, as noted in Stuart Anderson’s discussion in chapter 10 of David Cowen’s definition of the genre. Yet it is crucial to remember that national pharmacopoeias even to the present day rest on the foundations of earlier texts and genres that go back centuries. The purpose of this essay is to trace the long and deep history of the textual tradition in Galenic pharmacy using pharmaceutical texts published in early modern Spain—and used throughout the empire—to delineate the main eras, authors, and areas of its foundations and the different genres of pharmaceutical writing that developed over time. Results indicate that the tradition dates back to antiquity, originating with Greek and Roman authors, expanding under the medieval Islamic Empires, and entering medieval Europe from the south, mainly through translation centers in Spain and Italy.

During these periods, the Galenic textual tradition developed four main genres of pharmaceutical writing that together culminated in the formation of the early modern pharmacopoeia. The first genre treated here consisted of ancient compilations of *materia medica* (medicinal materials). These were texts contain-

ing lists, descriptions, and glossaries of what were called “simples” in Galenic pharmacy—natural substances that derived from plants, animals, and minerals with known healing power. Another genre, that of the formulary, also originated in the ancient period but developed substantially under the Islamic Empires. Formularies, also referred to as antidotaries and receptaries, were compilations of recipes for “compounds,” medicines made up of more than one simple. Two additional genres developed during the medieval and early modern periods: the procedural, which included technical advice and instructed practitioners in pharmaceutical operations and procedures; and the pedagogical, which included several components designed to instruct apothecaries in training. Elements of each of these types of text were brought together in the pharmacopoeia, a culminating genre of pharmaceutical writing in Galenic pharmacy that received increasing emphasis in the early modern period. In tracing this history, this essay aims to document this textual tradition and its genealogy, and to highlight its shared nature as part of Galenic pharmacy, a tradition that spread throughout the ancient and medieval Mediterranean and came to encompass the Atlantic World in the early modern period under the auspices of European imperialism.

TRACING THE TEXTUAL TRADITION

Authors of pharmacy treatises in early modern Spain understood and discussed the learned basis of their art, emphasizing the importance of literacy early on. In his 1632 publication of *Examen de boticarios*, Esteban de Villa declared that apothecaries “must have great knowledge,” not only practical knowledge of plants and remedies but knowledge “of theory, or that which is found in books” as well.⁹ Miguel Martínez de Leache, author of *Discurso pharmaceutico sobre los Canones de Mesue* (1652) emphasized the importance of the intellectual training for apothecaries by critiquing the empirics and charlatans “who apply medicines according to what they see only, without a more fundamental basis.”¹⁰ The practice of learned apothecaries, by contrast, rested upon the classic texts of ancient and medieval authors, through which apothecaries learned the tenets of pharmacy. Martínez de Leache declared that apothecaries must be the “*studiosissimos*”—the most studious—and that “they must be most attached [*aficionadissimos*] to the study of letters because this way they come to grasp their chosen field; because thinking that they can claim to be an apothecary and understand medicine is impossible without having studied words and read books.”¹¹ Knowledge only came, he advised, with long and arduous study, not “in one instant, all of a sudden. . . . No one is born from the womb of his mother already taught.”¹²

These authors thus recognized the importance of a learned tradition in pharmacy and produced a corpus of early modern publications to support it (table 1.1).¹³ These works also provide a means for investigating the earlier basis upon

TABLE 1.1. Corpus of Early Modern Spanish Pharmacy Texts (Sixteenth to Eighteenth Centuries)

AUTHOR	DATE	TITLE	LANGUAGE	USED IN SURVEY?
Saladino/Tudela	1488/ trans. 1515 Salamanca	<i>Compendio de los boticarios</i>	Castilian (trans. from original Latin)	Yes
Benedictus Mattheo, Petrus	1521	<i>Loculentissimi viri. . . Petri B[e]n[e]dicti Mathei. . . Liber in exame[n] apothecariorum q[uam]</i>	Latin	Yes
Sepúlveda, Fernando de	1523	<i>Manipulas Medicinarum</i>	Latin	Yes
Laredo, Bernardino (1482–1545/1540)	1527	<i>Sobre el Mesue e Nicolao: Modus facie[n]di cu[m] ordine medicandi</i>	Castilian	
Navascués	1550	<i>Ioannis Mesuae. . . Liber primus seu Methodus medicamenta purga[n]tia simplicia deligendi & castiga[n]di, theorematis quatuor absolutus</i>	Latin	
Aguilera, Antonio de	1569	<i>Exposicion sobre las preparaciones de Mesue</i>	Castilian	
Laguna, Andreas de	1570	<i>De materia medica</i>	Castilian	
Fragoso, Juan	1572	<i>Discurso de las cosas Aromaticas, arboles y frutales, y de otras muchas medicinas simples que se traen de la India Oriental, y sirven al uso de medicina</i>	Castilian	Yes
Fragoso, Juan	1575	<i>De succedaneis medicamentis</i>	Latin	Yes
Subera, Alonso de	1578	<i>Dechado y reformación de todas las medicinas compuestas usuales</i>	Castilian	Yes
Bravo, Juan	1592	<i>De simplicium medicamentorum delectu & praeparatione libri duo: qui ars pharmacopoea dici possunt</i>	Latin	
Velez de Arciniega, Francisco	1592	<i>De Simpli</i>	Latin	
Castels, Juan Antonio	1592	<i>Theorica y Pratica de boticarios en que se trata de la arte y forma como se han de componer las confecciones ANSI interiores como Exteriores</i>	Castilian	Yes
Oviedo, Luis de	1595	<i>Methodo de la colección y reposicion de las medicinas simples, y de su correccion y preparación</i>	Castilian	Yes

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TABLE 1.1. (continued)

AUTHOR	DATE	TITLE	LANGUAGE	USED IN SURVEY?
Velez de Arciniega, Francisco	1624	<i>Theoriae pharmaceuticae septem sectionem</i>	Latin	
Suárez de Figueroa, Cristóbal	1615	<i>Plaza universal de todas ciencias y artes</i>	Spanish (trans. from original Italian)	Yes
Villa, Esteban de	1632	<i>Examen de Boticarios compuesto por Fray Estevan de Villa Monge de S. Benito . . .</i>	Castilian	Yes
Martínez de Leache, Miguel	1652	<i>Discurso Pharmaceutico sobre los canones de Mesue</i>	Castilian	Yes
Martínez de Leache, Miguel	1662	<i>Tratado de las condiciones que ha de tener el boticario para ser docto en su arte</i>	Castilian	Yes
Fuente Pierola, Jerónimo de la	1683	<i>Tyrocinio pharmaceopeo: método medico y chimico</i>	Castilian	
Martínez de Leache, Miguel	1688	<i>Controversias Pharmacopales a donde se explican las preparaciones y elecciones de Mesue</i>	Castilian	Yes
Palacios, Félix	1706	<i>Palestra Pharmaceutica Chymico-Galenica</i>	Castilian	
Assín y Palacio de Ongoz, José	1712	<i>Florilegio Teórico-Practico</i>	Castilian	
Loeches, Juan de	1728	<i>Tyrocinium pharmaceuticum, theorico-prácticum, galenochymicum</i>	Latin	
	1739	<i>Pharmacopoeia Matritensis</i>	Latin	
Brihuega, Francisco de	1776	<i>Examen farmaceutico galénico-químico, teórico-práctico extractado de las mejores farmacopeas</i>	Castilian	Yes
Vinaburu, Pedro de	1778	<i>Cartilla Pharmaceutica Chimico-Galenica</i>	Castilian	

which they were founded, for they regularly made reference to contemporary authors as well as earlier works in the field.¹⁴ This practice developed out of scholastic and earlier Arabic medical traditions in which authenticity and authority in a text were established by building upon and making explicit reference to a canon of respected works.¹⁵ I used 14 of these texts (the ones most replete with such references) to carry out a quantitative study of author referencing, in which a composite list of 77 different authors referenced in the 14 works was made, and a tally

TABLE 1.2. Major Periods of Pharmaceutical Writings in Galenic Pharmacy in Survey of Early Modern Spanish Pharmacy Texts

PLACE	TIME PERIOD	NUMBER OF AUTHORS (OUT OF 77)	% OF TOTAL AUTHORS	NUMBER OF REFERENCES IN EARLY MODERN WORKS (OUT OF 415)	% OF TOTAL REFERENCES
Greece	400–300 BCE	4	5.2	25	6.02
Rome	0–100 CE	6	7.8	47	11.3
Byzantium	300–600 CE	5	6.5	30	7.2
Islamic Empires	800–1100 CE	8	10.4	47	11.3
Western Europe – Late Medieval	1100–1300 CE	15	19.5	73	17.6
Western Europe – Renaissance	1400–1500 CE	39	50.6	193	46.5
Total		77	100	415	100

kept of how many of the authors were referenced by how many of the 14 books, for a total of 415 references (table 1.2). From this tabulation, I was able to organize authors and references according to place and time and to determine the most widely cited (and presumably the most important and influential) authors over time. These results were then corroborated with book lists provided by several early modern Spanish pharmacy authors who listed “the most necessary works in the pharmacy,” discussed further below.

Preliminary results show a clear pattern of works produced in times and places that corresponded to the foundation and spread of Galenic pharmacy from ancient Greece and the Hellenistic world to the Roman and Byzantine Empires, and from the medieval Islamic world to medieval and early modern Europe. They also indicate that although Galen provided the namesake for the tradition, its foundations began in the classical period and went on to involve many contributors over time. Among the references to earlier authors and texts in the early modern Spanish pharmacy treatises, there were references to 4 authors from classical Greece that were referred to a total of 25 times in the 14 sources, making up a total of 6% of the 415 citations recorded. There were 6 different Greco-Roman authors from the first century CE who were referred to 47 times, making up 11.3% of the citations. Byzantine authors numbered 5, with 7% of the citations (30 of 415). European works were referred to the most, with medieval authors numbering 15 with 73 references for a total of 17.6%, while the 39 Renaissance authors, with 193 references, made up almost half, or 46.5%, of the total citations.

One of the clearest characteristics of the textual tradition in Galenic phar-

TABLE 1.3. Top Ten Most Commonly Cited Authors in Survey of Early Modern Spanish Pharmacy Texts

AUTHOR	PERIOD AND REGION	NUMBER OF WORKS THAT REFER TO AUTHOR/TEXT (OUT OF 14)
Mesue, John, Yuhanna ibn Masawaih ("pseudo-Mesue") (Common Era - dates unknown)	Medieval Islamic Empires/ Medieval Europe	14
Dioscorides, Pedanius (ca. 40–90)	Roman Empire	13
Galen, Claudius (129–200)	Roman Empire	12
Platerius, Mattheus (1120–1161)	Medieval Europe – Salerno	12
Pliny the Elder (23–79)	Roman Empire	11
Matthiolo, Pietro Andreas (1501–1577)	Early Modern Europe – Italy	11
Avicenna, Ibn Sina (980–1037)	Medieval Islamic Empires	10
Juan Serapion, Yahya ibn Sarafyun (9th century)	Medieval Islamic Empires	9
Villanova, Arnald de (ca. 1240/1235–1311)	Medieval Europe – Spain, France	9
Sylvaticus, Mattheus (1285–1342)	Medieval Europe – Salerno	9

macy is that it developed in and around the ancient and medieval Mediterranean, undoubtedly aided by the long history of intense cross-cultural interaction across these waters that has taken place since the development of the first seafaring societies along its shores. Indeed, nine of the top ten authors cited in the survey (tables 1.3 and 1.4) wrote in the ancient or medieval period, including Dioscorides and Pliny, who wrote encyclopedic works on simples; and Galen, who authored a number of pharmaceutical and pharmacological works. They were all widely cited in the early modern texts, as were the medieval authors from the rich Islamic pharmaceutical tradition, including Serapion (Ibn Wafid), Avicenna (Ibn Sina), and possibly John Mesue (the anglicized version of Yuhanna ibn Masawaih). Mesue, in particular, produced three works, a book of simples, a formulary, and a set of theorems or canons regarding the selection and preparation of simples that went on to multiple editions in the age of print.¹⁶ Medieval European authors Arnald de Villanova, Mattheus Platearius, and Mattheus Sylvaticus wrote important antidotaries and books of simples that reflected advancements in pharmaceutical knowledge through the translation of Arabic works into Latin in Toledo and Salerno, and through the establishment of medical schools in the universities of Montpellier, Padua, and Bologna.

The importance of these early works is further highlighted by the fact that

TABLE 1.4. Ancient and Medieval Authors Cited in Early Modern Spanish Pharmacy Texts

PLACE	TIME PERIOD	NUMBER OF AUTHORS	AUTHOR NAMES
Classical Greece	400–300 BCE	4	Hippocrates Theophrastus Aristotle Plato
Roman Empire	0–100 CE	6	Dioscorides Galen Pliny Celsus Themistius Strabo
Byzantine Empire	300–600 CE	5	Paul of Aegina Nicholas Myrepsus Oribasius Aetius of Amida Hesychius of Miletus
Islamic Empires	800–1100 CE	8	Avicenna Mesue (?) Serapion Al-Razi Averroes Haly Abbas Avenzoar Maimonides
Western Europe	1100–1300 CE	15	Nicholas Salernitanus Bernard de Gordon Arnald de Villanova Mundinus de Liuzzi Simon Genuense Juan de Abano Gentiles de Fulgineo Gilberto Anglico (Salerno) Mattheus Platerius (Salerno) Mattheus Sylvaticus (Salerno) Nicolaus Praepositus Albertus Magnus Jean de St. Amand Benardi de Gordonio Guy de Chauliac

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TABLE 1.5. Major Periods of Pharmaceutical Writings as Cited in Early Modern Spanish Pharmacy Texts (Altering Categories to Include Commentaries and Translations while Removing Early Modern Western Europe)

PLACE	TIME PERIOD	NUMBER OF AUTHORS	% OF TOTAL AUTHORS	NUMBER OF REFERENCES IN EARLY MODERN WORKS	% OF TOTAL REFERENCES
Greece	400–300 BCE	4	7.7	25	8.7
Rome	0–100 CE	6	11.5	47	16.4
Commentaries on Dioscorides		5	9.6	29	10.1
Total Roman References (Including Later Commentaries)		11	21.2	76	26.5
Byzantium	300S–600S CE	5	9.6	30	10.5
Commentaries on Nicholas Myrepsus		1	1.9	3	1.0
Commentaries on Paul of Aegina		1	1.9	2	0
Total Byzantine References (Including Later Commentaries)		7	13.6	35	12.1
Arabia	800–1100 CE	8	15.4	47	16.4
Commentaries on Mesue		9	17.3	39	13.6
Total Arabic References (Including Later Commentaries)		17	32	86	29.9
Western Europe – Late Medieval (Without Commentaries)	1100–1300 CE	13	25	65	22.6
Total		52	100	287	100

a number of the early modern authors referenced in the survey had published commentaries of some of these works, including five translations and commentaries of Dioscorides’s *De materia medica* and no less than nine commentaries of Mesue’s works. Indeed, these two authors stand out as two of the most important, foundational authors in Galenic pharmacy, its namesake notwithstanding.¹⁷ Taking these commentaries into account and placing them within the time period of the original author, a picture of the Mediterranean, and particularly Arabic, foundations of Galenic pharmacy’s textual tradition emerges (table 1.5). Classical

Greek authors accounted for 7.7% of the total of 77, with 8.7% of the 415 references; imperial Rome accounted for 21% of authors and 27% of references; Byzantine authors (mainly Oribasius, Aetius of Amida, and Paul of Aegina, whose works were largely encyclopedic compilations of Galen's corpus)¹⁸ accounted for 14% of authors and 12% of the references; and Arabic authors made up 32% of the total authors and 30% of the references. Thus, medieval Arabic texts (counting commentaries as well) made up the largest influence on the Spanish textual tradition and, together with Rome, made up fully half of the authors and references in the survey.

This Galenic tradition entered Western Europe from the south, where the areas of Southern Europe that bordered the Mediterranean stand out as the major producers of pharmaceutical texts, with France producing about one-quarter of the medieval works, Iberia about one-fifth, and the Italian states almost one-half (table 1.6).¹⁹ This trend began to change, however, in the Renaissance and early modern period, which witnessed the gradual growth in northern influence on publishing in pharmacy. Authors of early modern Northern European works in the survey amounted to 8, or 20.5% of the total of 39, while Southern Europeans made up 79.5% of total early modern authors, down from 93% in the medieval period. Of southern works, it is notable that Spanish sources increased substantially, from 2 medieval authors cited to 9, or 23% of authors of early modern works. Thus, despite growing evidence of Northern European influence, Southern Europe continued to dominate in the spread of Galenic pharmacy and its texts.²⁰

Other writings corroborate these findings.²¹ Certain early modern Spanish pharmacy texts listed authors whose works were considered essential reading for apothecaries in the Galenic tradition, essentially setting up a standardized textual canon of core, foundational works for the profession. The Greek, Roman, Arabic, and Southern European texts to which they referred reflect the findings of the survey. According to Saladino da Ascoli's 1488 *Compendium aromatarium*, there were eight books "necessary to any apothecary," including that of Dioscorides from Rome; the Arabic works of Abulcasis (al-Zahrawi), Avicenna (Ibn Sina), and Serapion (Ibn Wafid); and the *Antidotario Nicolao*, Platearius's *Circa Instans*, and the glossary *Libro de Sinonimas*, by Simon of Genoa, all from the medieval Italian medical school of Salerno.²² A few decades later, Pedro Benedicto Mateo's 1521 publication *Liber in Examen Apothecariorum* expanded on this list by including thirty books "which the apothecary must have," including those of Dioscorides, Pliny, and Galen; Avicenna, Mesue, and Serapion; and Arnald de Villanova, Simon of Genoa, Platearius and the *Antidotarium Nicolao*.^{23,24} For Cristobal Suarez de Figueroa in 1615, the "most common" books that the apothecaries needed to consult were those of Dioscorides, Galen, Pliny, Celsus, Nicolao Proposito, Nicholas Mirepsus, and Mesue, along with a host of "modern"

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TABLE 1.6. Medieval and Renaissance Authors (Northern versus Southern Europe) in Early Modern Spanish Pharmacy Texts

PLACE	LATE MEDIEVAL AUTHORS	NUMBER	% OF TOTAL (15)	RENAISSANCE AUTHORS	NUMBER	% OF TOTAL (39)
England	None	0	0	None	0	0
Germany	None	0	0	Bernard von Kronnemburg Sessen Leonard Fuchs Valerius Cordus Juan Placotomo	4	10.2
Low Countries	None	0	0	Quiricus de Augustis Matthaeus Lobelius	2	5.1
Switzerland	None	0	0	Johannes Jacobus Wecker Konrad Gesner	2	5.1
Total Northern/ Central Europe	None	0	0		8	20.5
Italy	Mundino de Liuzzi Simon Genuense Pietro de Abano Gentiles de Fulgineo Gilberto Anglico (Salerno) Mattheus Platerius (Salerno) Mattheus Sylvaticus (Salerno) Nicolaus Praepositus (Salerno)	8	53.3	Saladino da Ascoli Giovanni Manardi Johannes Jacobus Manlius de Bosco Ioannes Costeus Antonio Musa Brasavola Girolamo Savonarola Christophorus de Honestis Paulo Suardo Antonius Guainerius Giovanni Matteo Ferrari da Grado, Hermolao Barbaro Pierio Valeriano	13	33.3
Portugal	Petrus Hispanus, Pope Jon XXI	1	6.7	Rodrigues de Castelo Branco, "Amatus Lusitanis"	1	2.6
Spain	Arnald de Villanova Maimonides	2	13.3	Alonso de Jubera Juan de Vigo Petrus Benedictus Mattheo Antonio Castells Juan Fragoso Juan Navascues Sanguetano Hernando Sepúlveda Andrés de Laguna Bernardino de Laredo	9	23.1

TABLE 1.6. (continued)

PLACE	LATE MEDIEVAL AUTHORS	NUMBER	% OF TOTAL (15)	RENAISSANCE AUTHORS	NUMBER	% OF TOTAL (39)
France	Albertus Magnus Jean de St. Amand Bernard de Gordon Guy de Chauliac	4	26.7	Symphorien Champier Laurent Joubert Guillaume Rondelet Brice Bauderon Ioannes Tagaucius Jean Fernel Jean Ruelle Jacobus Sylvius, Jacques Dubois	8	20.5
Total Southern Europe/ Mediterra- nean		15	100		31	79.5

authors. Finally, Esteban de Villa's *Examen de boticarios* of 1632 listed the books "that are written on this art," choosing "the most curious and useful that I have been able to find by many different authors," dividing them between "Greeks," of which he listed 6, "Arabs" of which there were 7, and "Latins" which included 70 of his fellow Europeans of the medieval and early modern periods.²⁵ Despite the preponderance of the works of Villa's contemporaries, however, they were not the works he would most recommend as being essential to the apothecary. For this he turned to the classics. For "the books that the apothecary must have," Villa stated that "of all the books listed above, it remains to know which ones are very necessary to the apothecary . . . so that the apothecary is not, as they say, without the weapons of his art, having everything pertaining to it."²⁶ These works included the same eight referred to in the *Compendium aromatarium*, with the caveat that practitioners employ an up-to-date commentary of *De materia medica*. Villa also recommended the "famous" work of Luis de Oviedo, a treatise published in 1581 on the selection and processing of simples that was one of the hallmarks of the procedural genre.

MAJOR GENRES OF THE PHARMACEUTICAL TEXTUAL TRADITION

Together, these authors formed the basis for a variety of pharmaceutical genres that evolved over time. The secondary literature on genres of medical writing has generally identified two categories of pharmaceutical writing: books of simple medicines, or "herbals," and books of compound medicines, or formularies.²⁷ There is general agreement that medical and scientific writing changed relatively little over time, particularly before the age of print, largely due to the

Scholastic practices referred to above in which authors relied heavily on their predecessors for themes, discursive style, argument structure, and textual strategies, thus making changes only incrementally.²⁸ The most pronounced changes in genre, it is said, occurred during the Scientific Revolution, when there was a transition from “Scholasticism to empiricism and then to rationalism” in medical writings.²⁹ An examination of early modern Spanish pharmaceutical texts and their antecedents, however, reveals a line of development that appears to have little to do with the Scientific Revolution. Instead, its major developments, as shown previously, correspond to the spread of Galenic pharmacy throughout the Mediterranean and into Europe. It also shows a wider range of genres that culminated in that of the pharmacopoeia. In addition to the herbals and formularies, which go back to antiquity, were glossaries of drug names and substitutes, procedural texts that described pharmaceutical operations and techniques in detail, and pedagogical texts designed for training pharmacists. Whereas glossaries appear in conjunction with the herbals and formularies, the procedural and pedagogical texts largely developed over the medieval and early modern periods, as pharmacy grew into an increasingly specialized medical profession. Elements of these genres then came together to form the early modern pharmacopoeia that eventually entered the Atlantic World.

Books of Simples

Books of simples treated the raw materials and natural resources of Galenic materia medica, or collections of medicinal substances. Simples were made up of plant, animal, and mineral substances, though plants dominated, making up 80–90% of all simples. Presumably this is why treatises on simples came to be known in the medieval and early modern periods as “books of herbs,” or “herbals,” and formed the basis for early botanical studies.³⁰ They were also referred to as dictionaries, particularly when organized alphabetically. Books of simples usually included lists of plant simples with descriptions of their leaves, flowers, or berries as well as their healing powers, or “virtues”—how they worked and the conditions for which they were indicated. In Galenic pharmacy, the simples described in the herbals were often assigned a primary quality (hot, cold, wet, or dry) and a degree of intensity (on a scale of 1 through 3 or 1 through 4) that was part of Galenic humoral theory, which taught that the body was composed of 4 “humors” that each had a dominant characteristic (being hot, cold, wet, or dry). Disease resulted from the imbalance of these humors, with medicines applied of opposite qualities to counteract them and restore balance.

Books of simples had been in use throughout the Mediterranean for centuries, building on the base established largely by the writings of Dioscorides, but with important contributions, as described above, from Galen and Pliny. *De*

materia medica was translated into Arabic under the Abbassids (750–1258 CE), and excerpts of it remained influential in Western Europe after the fall of Rome. Arabic authors also produced books that greatly expanded the number of simples thanks to the widespread reach and cosmopolitan nature of the Islamic Empires, which gave them access to Persian, Babylonian, and Indian medical traditions (among others), in addition to the Greek.³¹

The knowledge imparted from these works reached medieval Europe through the translation movement, and Dioscorides' contribution received renewed impetus in the sixteenth century with the publication of several new translations and annotations of *De materia medica*, including those of Amato Lusitano in Portugal, Andrés de Laguna in Spain, and Pietro Matthiolo in Italy, which was "consulted by scholars from Cambridge to Cracow."³² Investigations of medicines from the Americas and Asia lent new impetus to this tradition beginning in the sixteenth century, with publications of such authors as Garcia d'Orta, Nicholas Monardes, Francisco Hernandez, and Juan Fragoso, describing simples from these areas that were new to the European pharmacopoeia. These works were similar in structure to the earlier books of simples from the ancient and medieval Mediterranean, including botanical descriptions, qualities and degrees, and virtues.

In addition to the traditional herbal were different types of reference works on simples that arose over time and added to the Mediterranean textual tradition. As early as the writing of books of simples were works on drug substitutions, also called *sucedanea*, or lists of "quid pro quo" that itemized possible safe and effective alternatives for the simples called for that might not be locally or readily available, or might be too expensive, as in the case of recipes that called for precious stones.³³ Although Galen is usually identified as the first in the Western medical written tradition to provide a list of drug substitutes, tablets with two-columned lists of drugs have been identified as such in ancient Assyria during the time of King Sardanapalus, 668–626 BCE, and from ancient Egyptian papyri as well.³⁴

Another type of work that developed as early as the first century CE were "synonyms," or glossaries of simples in which a variety of names in different languages were given for the same simple, due to the fact that the identification of simples, and particularly plants, "presented enormous difficulties" in general and especially upon translation.³⁵ The need for such glossaries arose when Roman authors sought to make sense of earlier Greek writings, in which transliteration of the name of the simple would not necessarily be understood, as plants are notorious for having local names.³⁶ Moving into the Middle Ages, as Greek works were translated into Arabic and then Latin, the need for these glossaries continued, with famous synonyms produced in which the name of the simple was given in

Greek, Arabic, and Latin. This medieval subgenre was especially crucial for clearing up confusion and for standardization of terms when transliteration of a local name would not necessarily have any meaning in another language.³⁷ The need for these works was an indication of the extent of trade and exchange among world systems of the early Mediterranean, with the important additions made to the Greek and Roman *materia medica* by Arabic scholars and practitioners. This genre continued to be produced in the early modern period. Juan Fragoso's 1575 *De succedaneis medicamentis*, for example, discussed possible substitutes for 250 different simples, as well as alternate recipes for many compounds.

The Formulary

Next, perhaps the most widely recognized pharmaceutical genre was the formulary, which consisted of recipes for compound medicines with brief instructions as to how to formulate them. In the Arabic world they were referred to as "dispensatories," or *aqrabadhin*, which signified "an antidotary given by the grace of God" and derived from the Greek *graphidion*, meaning "list" or "registry."³⁸ In the Middle Ages, these works were often referred to as antidotaries or receptaries. They were generally encyclopedic in character and were meant to serve as easy-to-use reference works for apothecaries. One of the earliest extant texts specifically devoted to compounding was *On Compounds* (*De Compositiones*) of Scribonius Largus (ca. 1–ca. 50 CE), which included recipes for over two hundred compounds organized in a "head to toe" (*a capite ad calcem*, "from head to foot") arrangement according to the part of the body they treated (though certain sections focused on certain medical preparations).³⁹ Galen followed in the next century with two treatises on compound medicines, *On the Composition of Drugs according to Kinds*, generally arranged by type of remedy, and *On the Composition of Drugs according to Places* (hereafter referred to as *Kinds* and *Places*, respectively), the latter arranged like Scribonius Largus's work, according to the place of the body it healed.⁴⁰ These works are recognized as major milestones in the history of compounding and of the formulary genre. However, subsequent Arabic formularies incorporated and standardized so many new elements that, as I have argued elsewhere, they effectively invented the pharmacopoeia that eventually became the standard in early modern Europe.⁴¹ Whereas Galen's books were mainly organized according to disease, the Arabic formularies were organized by the type of compound, and included several types not used in Hellenistic medicine. Hellenistic medicine, for example, recognized a series of compounds categorized by the way they were applied to the part of the body they were meant to cure (gargles, eye washes, incense, perfumes, sneeze inducers, toothpastes, enemas, pessaries, and suppositories). There were also a series of compounds categorized by their function or overall effect on the body (purga-

tives, emollients, astringents, abstergents, cathartics, and emetics). A third type of compound, “method-based” compounds, could be classified by the materials and methods used to make them. These included, for Galen, the honey-based confections of theriac⁴² and the bitter hieras, as well as ointments, oils, liniments, poultices, pastilles, and plasters.

Arabic formularies went on to add a host of new sugar-based compounds to those already in use, including electuaries and confections, jams, marmalades, and preserves, lambatives (thick, viscous medicines ingested by licking), and various classes of syrups, which were arguably the most important and certainly the most numerous type of compound in Arabic—and later European—pharmacopoeias.⁴³ These additions were certainly important, but it was the structural elements of Arabic pharmacopoeia that effectively formed the foundation of the genre. For the most part, Arabic formularies were divided by chapters, with each chapter representing a different type of compound. Each entry in the various chapters followed a standard structure that included the compound name, ingredients (often with specific measurements), a short set of instructions, indications, and dosage. In addition, pharmacopoeias increasingly emphasized method-based compounds, which made up the majority of their chapters.

Later, European pharmacopoeias followed this same organization and emphasis, and the categories of compound medicines grew increasingly standardized, largely based upon a formulary that appeared in the late thirteenth century in northern Italy and whose significance for European pharmacy is difficult to over-emphasize. That work was the *Grabadin* of John Mesue, which was divided into twelve chapters, all of which fell into the method-based categorization.⁴⁴ This increasing focus on procedure and operation (rather than application or effect) that the focus on method-based compounds indicated reflected the increasing specialization and professionalization of pharmacy in the late medieval period, a trend that continued into the early modern era.⁴⁵ Indeed, European books of compounds tended to follow Mesue’s categorizations, with pharmacopoeias becoming increasingly streamlined over the course of the sixteenth and seventeenth centuries. Spanish pharmaceutical treatises that contained formularies, for example, all followed (with some but little variation) Mesue’s categories of method-based compounds, with very few of the application- or effect-based compounds. In this way, Mesue’s *Grabadin*, which owed its formulation to Arabic precedents, arguably formed the basis for the modern pharmacopoeia.

Procedural Texts

In addition to these genres were two other types of pharmaceutical writing in Galenic pharmacy that developed in the medieval and early modern periods as part of the growth of pharmacy as a separate profession within the field of

medicine. The first, which I have termed “procedural,” was a type of treatise that first appeared in the medieval Arabic world. Procedural texts included instructions as to how to perform the operations needed to prepare both simple and compound medicines, and in their truest form were a collection of general rules and instructions as to the behavior of medicinal matter according to its substance and the ways to prepare medicines. In this way, despite their practical nature, procedural texts were the most theoretical of the pharmaceutical subgenres and led to intimate knowledge and understanding of the natural matter with which the apothecaries worked.⁴⁶

Like the mixing of medicines, technical advice and know-how had certainly been part of the earliest stages of Galenic pharmacy, but it tended to constitute “tacit knowledge” among practitioners and was rarely written down or treated in a systematic way. Thus, the earliest identifiable procedural texts did not appear until the later medieval period, with such works as the *Liber servitoris*, a remarkable Arabic treatise produced around the year 1000 CE that described in detail the processing of minerals, plants, and animals for use as medicines. The treatise was written by Abū al-Qāsim Khalaf ibn al-Abbās al-Zahrāwī (936–1013 CE), Latinized to Abulcasis, a prominent physician in Cordoba. It was the twenty-eighth chapter of a larger pharmaceutical treatise, the *Kitab al-Tasrif*. In it, al-Zahrawi made direct reference to Dioscorides and Galen, showing their influence, but overall the work was highly original, written in clear language with detailed instructions as to procedures, techniques, and materials. According to the author, the overall purpose of the *Liber servitoris* was to explain how to prepare simples for inclusion into compound medicines, there being “many compound medicines, the many simples for which have need of preparation” before being incorporated into them.⁴⁷

The *Liber servitoris* was divided into three parts or chapters, the first having to do with inorganic materials, or “the preparation of stones and minerals only,” the second treating herbs, and the third animals and animal parts. In part one, al-Zahrawi described the various ways to prepare metals, natural salts, and stones for inclusion in pharmaceutical recipes. The main operations employed in their processing included washing, burning, and sublimation (a procedure involving the distillation of solid materials). He described, for example, various ways to make, burn, or wash the “dross,” or ores, of impure metallic compounds like iron, litharge of lead, and gold to be used in ointments. Part one also explained how to sublimate yellow arsenic and mercury and how to make lime by bleaching ash with eggshells, seashells, or white marble.⁴⁸

The second part of the *Liber servitoris* dealt with “roots and plants” and various ways to process them, explaining how best to obtain their juices and mucilaginous parts; how to extract starch from grains; how to peel and core nuts and

seeds; how to prepare purgative herbs; how, when, and where to best collect herbs; and how to make medicinal taffy. Al-Zahrawi also treated several thermochemical processes, including how to distill oils and vinegar, how to prepare distilled medicinal waters, and how to burn branches and other plant parts (roots of trees, seeds, resins, herbs, wine dregs) to obtain ash.⁴⁹ In part three, al-Zahrawi focused on processing animal parts and products, explaining how to obtain blood from live animals, how to whiten beeswax, how to make medicine from infant urine, and how to obtain and preserve bile. As with mineral and plant materials, the *Liber servitoris* also described several thermochemical processes using animal materials—explaining how to burn seashells, oyster shells, eggshells, crabs, scorpions, and snakes, as well as silk and wool.⁵⁰ In this way, the *Liber servitoris* described many basic, necessary processes the apothecaries would use to prepare natural materials, or simples, for inclusion into compound medicines. It was well known to the early modern European medical community, with nine editions of the work published before 1501.⁵¹

The next major procedural text, which had an even wider impact on the development of European pharmacy, was Mesue's *Canons*. The *Canons* were essentially a set of pharmacological rules that provided general directions, or from the title of the work, laws as to how to choose, prepare, and apply simple and compound remedies. The *Canons* were divided into four sections, called "theorems" in later editions, that dealt, respectively, with the selection, preparation, application, and effects of simples. The most valuable sections of the *Canons* for apothecaries were the first two, the first treating the "election," or gathering, storage, and evaluation of simples, and the second giving directions as to their "correction" in order to prepare them for inclusion in a compound medicine and/or application to the human body. In the first two *Canons*, there was virtually no discussion of health or disease; they consist of relatively simple instructions as to how to evaluate and prepare simples and compounds in the most effective way possible. The focus was on pharmaceutical technique, not medical theory: Galenic humoral medicine plays a very minor role, and simples and their properties, or "virtues," were conceived of in materialist terms as substances that could be released or dissipated depending on the pharmaceutical operations applied. In this way the *Canons* were meant for practicing apothecaries who were becoming increasingly professionalized and, as with the *Grabadin*, more and more focused on the methods of formulating medicine.

The first two sections of the *Canons*, in fact, were so important that they were copied, annotated, and explained over and over in edition after edition of pharmaceutical works published throughout Europe in the fifteenth through eighteenth centuries. Early published editions of Mesue's works outpaced those of Dioscorides, Pliny, Avicenna, al-Zahrawi, and Arnald de Villanova (to name a

few), and the information presented in the *Canons* went on to provide much of the basic vocabulary, themes, and organization for subsequent pharmaceutical publication. In the first *Canon*, Mesue provided a general rule or set of rules by which to judge and classify a simple and its powers according to its substance; its qualities and degree; its texture, flavor, odor, and color; the time in which it was harvested and stored; and the place it came from.

The second section, or theorem, of the *Canons* had to do with the “correction” of medicines, or the different operations that a practitioner could perform in order to render a medicine safe and effective. Here, Mesue outlined the basis of pharmaceutical technology by identifying four types of operations that the apothecary could employ in order to enhance or alter a medicine’s virtue.⁵² In Spanish pharmacy, these operations came to represent the main components of the apothecary’s work and served to provide the very definition of pharmacy itself. The four operations of Mesue included decoction, or the act of cooking simples through the application of heat; infusion, or the immersion of a simple in boiling liquid; lavation, or washing, of a simple; and trituration, or the division of a simple into smaller parts usually through grinding or crushing. For Mesue, the preparation of all simples was necessary in order to render them safe and effective for human use. To do so, the practitioner needed to know four main things about the simple to be prepared: the nature of its substance or density; the nature of its virtue, or healing property; whether it was strong or weak; and whether it “worked” or released easily or with difficulty. The nature of these characteristics would determine the vigor with which these operations should take place, with the end result always to produce and preserve from the simple a virtue of optimum strength.

Mesue’s *Canons* arguably had the greatest impact on pharmaceutical concepts and procedures in the early modern era, but another work in the Spanish tradition, Luis de Oviedo’s *Método de la colección y reposición de las medicinas simples y de su corrección y preparación* (1581) stands out in its efforts to elaborate upon these procedures. Part of Oviedo’s purpose was to provide specific information to practitioners as to how to prepare medicines to fill in gaps left in the ancient works. For Oviedo, it was crucial that medicines be prepared properly; otherwise, the very medicines meant to cure an ill would themselves cause more harm, so that “instead of giving health, they remove it, and instead of freeing us from the illnesses that afflict us, they make them worse.”⁵³ Yet the ancients did not leave clear instructions as to how to do so, so it was up to Oviedo to include the detailed information that practitioners needed to know in order to proceed: “It being the case that Galen and Dioscorides and other ancient doctors did not give enough consideration to simple medications; in writing about the manner of their preparation they did not provide a straightforward [method]

which deprives us of knowing [how to prepare] the remedy. For this reason we have found it very necessary to add . . . the way to prepare them, so that those repressed by illness are not left unaided.”⁵⁴ The influence of the *Canons* is ubiquitous throughout the *Método*. Not only does Oviedo refer to Mesue and his commentators, but the procedures he describes that make up the core of the work are the four operations identified in the *Canons*, with the aim at all times to correct and preserve the simple’s virtue in its most optimal, efficacious form. Oviedo’s work was, in this way, of great import to the profession as well. It went through three more editions after its initial 1581 publication (1595, 1522, and 1692), and it was one of only two sixteenth-century works still used in Mexican pharmacies two centuries later.

The Pedagogical Text

The final genre, the “pedagogical” text, arose, as did the procedural, with the increasing professionalization of pharmacy.⁵⁵ These texts were a product of early modern Europe, the first appearing in Italy in the late fifteenth century, the *Compendium aromatarium* by Saladino da Ascoli. They tended to have one or more of several different components that evolved over time and built upon the earlier Arabic tradition: the establishment of a definition of pharmacy and the duties and responsibilities of the apothecary; the increasing use of the vernacular; the arrangement of procedural and theoretical information in the form of an examination or dialogue that became increasingly standardized and formulaic over time; and the inclusion of several different subgenres within one text (i.e., pedagogical elements combined with lists of simples, compounds, synonyms, and drug substitutes; as well as instruction on technique, operations, and procedures). These works were written primarily by apothecaries and intended for apothecaries. Aguilar (1569), for example, stated that his work was meant for “learned apothecaries, the true ministers of the art.”⁵⁶ Similarly, Jubera wrote in 1578 “for the benefit of those of my profession and art of pharmacy.”⁵⁷ Overall, these texts were not concerned with explicating disease nor with humoral theory, beyond the effect a medicine would have on a particular humor. Rather, they were most concerned with enumerating and explicating the responsibilities of the apothecary, giving precise directions as to how to prepare medicines, setting out a canon of works that the pharmacist needed to know, and making sure that their writings were not obscured by arcane language or even by the use of Latin.

The *Buen Boticario*

The first characteristic of the pedagogical genre was its emphasis on the “*buen boticario*,” or the morality and good character of the apothecary so that he would

fulfill his responsibilities in an ethical and conscientious manner, as noted also by Antoine Lentacker (chapter 12) in his chapter in this volume. The *Compendium aromatarium*, for example, included a discussion of the definition and moral attributes of the apothecary that would become a theme of later works, and was based upon Arabic precedents, whose professionalizing trends included emphasis on the morality of the apothecary and the ethical practice of medicine.⁵⁸ In this work, a hypothetical doctor asked an apothecary: “What is the responsibility of the apothecary?”⁵⁹ The apothecary replied that he had two main responsibilities: to know how to “grind, clean, infuse, cook, and distill” substances in order to prepare them well, and once prepared, to know how best to preserve them. The second question that Saladino’s physician would ask, “What must the apothecary be like?”⁶⁰ required an answer that delineated both the moral qualities that an apothecary must demonstrate, and the ethics of his practice. It stipulated that the apothecary be God-fearing, pious, serious, and mature; a practitioner who took care to prepare only the freshest medicine of the best quality, and only those ordered by the physician, without any unauthorized substitutions. The apothecary, as discussed above, was also meant to be learned and to have mastered the corpus of the major ancient and medieval works in the field.

Use of the Vernacular

A second characteristic of the pedagogical text was the use of the vernacular. Although the use of Latin did not become obsolete, the publication in Spain of pharmacy books in Latin diminished over the course of the early modern period. In the sixteenth century, the number of major pharmaceutical texts written in Latin (6) almost equaled those written in Castilian (7). In the seventeenth and eighteenth centuries, however, Latin publications diminished: only one of six major seventeenth-century treatises was written in Latin, and two out of six in the eighteenth century (see table 1.7).⁶¹ Authors of Spanish texts were highly conscious of the reason they wrote in Castilian: to appeal to the professional group of apothecaries who were not (according to the authors) always well versed in Latin, licensing requirements notwithstanding. By writing books accessible to this group, the authors believed themselves to be making the fruits of centuries of knowledge available to the apothecaries, and through the apothecaries to the general public. Several sixteenth-century vernacular works sought to justify the use of Castilian in this way. Alonso de Tudela translated Saladino da Ascoli’s *Compendium aromatarium* in 1515, for example, so that apothecaries could “understand all the things pertaining to their art.” Many had been prevented from doing so “because the majority of the apothecaries of these kingdoms lack [knowledge of] Latin and could not benefit from such a beneficial book, [so] it seemed to me a very useful and even necessary thing to translate it into Castilian so that

TABLE 1.7. Works of Early Modern Spanish Pharmacy

CENTURY	BOOKS IN LATIN	BOOKS IN CASTILIAN	TOTAL
16th	6	7	13
17th	1	5	6
18th	2	4	6
Total	9	16	25

they could realize the fruits of Doctor Saladino's work in composing it."⁶² In 1569, apothecary and author of *Exposicion sobre las preparaciones de Mesue*, Antonio de Aguilera, expressed similar sentiments: realizing the "great lack" of Latin among many of his counterparts, he says, "I was induced by the begging of many of my apothecary friends to bring to light this present work, such a necessary declaration of [pharmaceutical] doctrine, in our clear Castilian romance language."⁶³ In 1578, Alonso de Jubera stated that his book was in Castilian so that "those who have not studied [Latin] can enjoy it more easily."⁶⁴ Similarly, Luis de Oviedo wrote his book in 1581 "so that those who know Latin as well as those who do not (of which there are many) are able to benefit from it."⁶⁵ A few years later, Antonio Castells concurred, stating, "I wished to take on this work for the public good, principally for the apothecaries who do not know Latin well, so that with this brief treatise . . . they can understand the theory as well as the practice that is involved in the method [of making medicines], which will ensure their work and make up for the deficiencies caused by their lack of education."⁶⁶ Such a step was necessary to make their work as effective as possible "in order to benefit the sick, who put their lives in our hands."⁶⁷ As late as 1778, approval for Pedro Vinaburu's *Cartilla Pharmaceutica* derived in part because his understanding of medieval Latin texts allowed him to express and explain it in Castilian "for the well-being and use of all."⁶⁸

The Use of Dialogue

Another noticeable element of the pedagogical genre that developed in the early modern period was the use of dialogue in setting out the most fundamental principles of the profession. Scholars have examined the use of this literary form in works of Renaissance natural philosophy, most notably in those of Galileo, Giordano Bruno, and Leibniz, arguing that it served an important rhetorical and pedagogical purpose.⁶⁹ Not only did it expose the logic of the argument in a clear manner but it allowed the author to anticipate objections and highlight the logical flaws within them. Dialogue also set up a dialectical dynamic in which the

“learner” was essentially coached by the “knower” to arrive at the proper conclusion. Such was the case for the pharmacy writing, in which dialogue served a clear pedagogical purpose: to initiate pharmaceutical neophytes into the fundamental principles and practices of the profession in a way that invited their participation.

The first instance of the dialogue comes in a very rudimentary form in the *Compendium aromatarium* through the questions, discussed above, that the hypothetical physician would ask the apothecary. This pattern was followed closely in the *Examen apothecariorum* of Pedro Benedicto Mateo (1521), who began the work by presenting three questions: “What is an apothecary? . . . What is a [pharmacy] examination? . . . [And what was] most necessary to know” about pharmaceutical theory and practice? The respondent then went on to answer each question beginning with “Dico,” or “I say.”⁷⁰ This literary device grew more common over the sixteenth century, in which the dialogue would continue for several pages and, in some cases, throughout the entire work. The participants in the dialogue, furthermore, were given clear identities and roles that evolved over time, but that always represented a hierarchical pairing of a “knower” who was questioning, coaching, and teaching a “learner.”

In Antonio de Aguilera’s explanations of Mesue’s *Canons* (1569), for example, the dialogue continued throughout the entire work and played an explicit role in the text. As Aguilera explained, he had “put this work together in the form of a dialogue in which the chapters are divided by question and answer so that in this way the doctrine will be clearly understood.”⁷¹ In this way, Aguilera believed that Mesue’s doctrine would be “explained literally and to the letter of the text.”⁷² For the dialogue, Aguilera chose two telling characters, the first being a physician named Apollo, a man of “great knowledge and wisdom” whose name harkened back to the Greek god “who invented medicine and was the first to identify the workings and virtues of herbs.”⁷³ Such a character would have complete knowledge of the doctrine, which would allow him “to propose and ask” the appropriate questions to clarify it.⁷⁴ The other participant in the dialogue was an apothecary named Curio, a name chosen explicitly because “it conjures and means a man who is curious, solicitous, and an expert in his art and office.” And indeed, the text follows the dialogue form faithfully from beginning to end, with a presentation of Mesue’s *Canons* in Latin, to which the two participants respond in Castilian, switching roles within the lines of text.

Another sixteenth-century work presented in the form of a dialogue was Alonso de Jubera’s *Dechado y reformacion de todas las medicinas compuestas usuales* (1578), a work that was meant to standardize the recipes given for compounds. The dialogue also continues throughout the work, and like Aguilera’s, was inserted within the lines of text. It takes place between a father and son, the father

seeking to teach his son the principles of pharmacy and the best way to make certain compounds. The work begins with eight short chapters that explain the main categories of plants and their healing abilities, the different parts of plants used in medicine, and the various operations discussed by Mesue by which to prepare medicines—decoction, infusion, washing, and grinding. In each case, the son asks the father for definitions and explanations, and the father responds largely by quoting ancient and medieval authorities.

Three works in the later seventeenth and eighteenth centuries show a final evolution of the dialogue from physician/apothecary and father/son pairings to the more expressly pedagogical and schematic pairing of teacher and student. These works have many elements in common, indicating an increasing standardization of the form and the larger genre. Fuente Pierola's *Tyrocinio pharmaco-opeo methodo medico y chimico* (1660) and Félix Palacios's *Palestra pharmaceutica* (1706) both use "Pregunta/Respuesta—Question/Answer" (immediately abbreviated to "P" and "R") between, one would assume, a hypothetical teacher and student, while Juan de Loeches's *Tyrocinium pharmaceuticum* (1728) begins with a dialogue between the "Magister" and the "Discipulo" (immediately abbreviated to "M" and "D" in the text). In all three of these works, the dialogue forms only the first part of the text in which the general definition and principles of pharmacy are presented. The characters or markers are not inserted within the text, but are rather justified along the left margin of the page or column and in this way dominate the style of this first section. The questions and answers are more succinct and formulaic, and deal with one aspect of pharmacy at a time, showing that the form and the content have become standardized parts of the text. The dialogue first sets out to define pharmacy, then to define what a medicine is, followed by a series of questions about how to choose, prepare, and compound medicines. Though each work has its own particular characteristics, they all follow this increasingly standardized format.

Pharmacopoeias as Culmination

The final textual genre discussed here, the pharmacopoeia, was in effect the culmination of earlier ones, because it brought together elements from these genres into one comprehensive work. *Pharmacopoeia*, deriving from the Greek "to make drugs," was a term first used by the Greek writer Diogenes Laertius in the second or third century and later adopted by European authors beginning in the sixteenth century.⁷⁵ Different pharmacopoeias included different elements and genres, but they generally included several different sections within the volume. These sections comprised the newer pedagogical elements—dialogue, best practices, and ethics, increasingly written in the vernacular—as well as elements of the older genres, including materia medica (sometimes with botanical infor-

mation, sometimes without), glossaries, recipes for compounds, and information on techniques for selection and processing. Over time, they developed into official, legally enforced regional, national, and imperial standards, and continue to be a genre of great significance to modern pharmacy.⁷⁶

The *Compendium aromatarium* represents an early example of this kind of work. It consisted of seven parts, the first consisting of a dialogue defining and outlining the apothecary's major responsibilities, followed by a commentary on Mesue; a list of the compound medicines from the *Antidotario Nicolao*; a brief treatise on weights and measures; instructions as to how to collect, prepare, and preserve simples; and a final section outlining in detail "the way to organize a pharmacy with the all things in it that it needs."⁷⁷

If the *Compendium aromatarium* constitutes an early example of the early modern pharmacopoeia, then it reached its culmination with Félix Palacios's *Palestra pharmaceutica* (1706), which served as the basis for the standard formulary for the Spanish Empire.⁷⁸ Palacios's work is often identified with the emergence of chemical medicine in the late seventeenth century, but it was firmly an amalgamation of traditional Galenic pharmacy and chemical pharmacy—part of the "chemico-Galenic compromise" typical of many pharmacopoeias of the period.⁷⁹ Indeed, the traditional elements of the work are just as important as the chemical, and the *Palestra* was in many ways the culmination of two thousand years of a developing pharmaceutical literature that resulted from and, in turn, had a major impact upon, the increasing specialization and professionalization of pharmacy. The text begins with the usual dialogue defining pharmacy, followed by a series of questions and answers concerning the selection and preparation of medicines. Next is a series of lists of mineral, animal, and plant simples, each in Latin with a Spanish translation followed by descriptions of how to prepare them according to Mesue's operations. The first part of the book concludes with a description of the different instruments used within the pharmacy and the ways to moderate applied heat. The second part of the book discusses drug substitutions, weights, measures, and chapters describing an array of different compounds—not only the method-based compounds but earlier application-based ones as well, from syrups, plasters, and ointments to gargles, chewables, potions, lotions, eye washes, enemas, suppositories, perfumes, and incense. Each chapter begins with a short treatise describing the compound, its history and etymology, and techniques for preparation, followed by individual recipes that list ingredients and instructions, as well as what they cure and the dose to give. In this way, the *Palestra* combined older genres—lists of simples and compounds as well as glossaries and drug substitutions—with newer elements of the procedural genre, in its detailed discussion of operations, and of the pedagogical genre, in its use of the vernacular and use of dialogue to define and describe pharmacy.

CONCLUSION

In this way, it is possible to see the development of the textual tradition in Galenic pharmacy, from its origins in ancient Greece and Rome, through the evolution of new genres in the medieval Arabic world, to their adoption and expansion in early modern Europe, especially Spain. An overview of this tradition, based upon tabulation of references to authors in early modern Spanish pharmacy texts, reveals the unparalleled influence of Dioscorides and Mesue especially in the incorporation of their methods and materials into later texts. It also serves to identify the range of genres within the textual tradition, including the herbals (books of simples), glossaries, and formularies that developed and grew increasingly standardized from the medieval to the early modern period. In addition to these genres was the introduction of two more types of texts from the late medieval and early modern periods—the procedural text, which outlined and elaborated upon techniques and practice; and the pedagogical text, which brought together several new elements designed to aid the preparation of apothecaries in training. These elements included discussions of the ethics and morality of the apothecary, lists of books the apothecary needed to read and keep in his shop for reference, use of the vernacular, and use of the technique of educational dialogue between expert and neophyte. These various elements came together in the pharmacopoeia, a genre that ran to several parts, beginning with Saladino da Ascoli's *Compendium Aromatarium* in the late fifteenth century and culminating with Félix Palacios's encyclopedic *Palestra pharmaceutica*, published in 1706. In this way, the textual tradition in Galenic pharmacy spread from the ancient Mediterranean to medieval Europe through the Islamic Empires, and then moved on to the Atlantic World, as evident in the pharmacopoeias kept in Herrera's Mexico City shop.