

PREMODERN PHARMACOLOGY BETWEEN THEORY AND PRACTICE

PETROS BOURAS-VALLIANATOS

The study of pharmacology in premodern Eurasia reveals a rich and intricate tapestry of interwoven knowledge systems, practices, and materials. Far from being static or isolated, pharmacological knowledge—from Greco-Roman Antiquity to Ancient China and India, and from the medieval Islamic world to the broader Mediterranean and European contexts—was dynamic, experiential, and profoundly interconnected across both time and space. This special issue explores the complex interplay between theory and practice in premodern pharmacology, illuminating how drugs were conceptualized, transmitted, prepared, and applied within diverse healing traditions from Antiquity through the later medieval period.

Premodern pharmacology was shaped by both theoretical frameworks and practical experience.¹ The relationship between materia medica and the broader intellectual and cultural systems that informed their use was both complementary and at times contested. Physicians and other practitioners often navigated the tensions between inherited theoretical models and the demands of practical application, engaging in experimentation with ingredients, methods of preparation, and therapeutic strategies. At the same time, the circulation of medicinal substances and texts across Eurasia contributed to the development of hybrid pharmacopoeias and

1. On the role of theory and practice in medieval medicine with a focus on pharmacology, see John M. Riddle, "Theory and Practice in Medieval Medicine," *Viator* 5 (1974): 157–84, at 167–76.

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facilitated the transmission of medical knowledge across linguistic, religious, and political boundaries.

This issue brings together a series of contributions that critically engage with these themes across diverse cultural and chronological contexts. Central to our inquiry is the recognition that pharmacological practice was not merely a subsidiary component of medicine but a central site of medical innovation, experimentation, intellectual engagement, and cross-cultural exchange. Through close readings of Greek, Latin, Byzantine, Arabic, and Chinese medical texts; analysis of pharmacological recipes; and consideration of the material culture of medicine, the articles in this issue illuminate how premodern pharmacology operated on both theoretical and practical levels.

Theoretical Foundations and Practical Realities

In the Greco-Roman tradition, pharmacology was closely integrated into broader conceptions of the human body, particularly through the theory of balance and imbalance among the fundamental qualities. While this framework predominated, deviations and alternative approaches were not uncommon. Influential authors such as Dioscorides (fl. second half of the first century CE) and Galen (ca. 129–216/17 CE) emphasized the specific qualities of drugs—hot, cold, wet, and dry—and their effects on the body’s humoral balance. However, these theoretical principles were continually tested, challenged, and reshaped through practical application. Galen himself, despite his strong commitment to the theoretical foundations of rationalist medicine, underscored the centrality of experience (*peira*) in determining the properties and therapeutic effects of substances.² In his treatises on compound drugs, he frequently recounted his own involvement in preparing recipes or drew upon the expertise of other practitioners and professionals.

This dual nature of pharmacology as theoretical and practical was also reflected in Islamicate medical literature. From the ninth century onward, scholars not only translated and expanded upon Greek medical texts, but also incorporated knowledge from Chinese, Persian, Indian, and presumably local Arabian traditions. The works of al-Kindī (d. after 870), al-Rāzī (d. ca. 925), Ibn Sīnā (d. 1037), and later al-Bīrūnī (d. ca. 1051) and Ibn al-Bayṭār (d. 1248) exemplify an enduring experiential engagement with *materia medica*.³ Ibn al-Bayṭār’s *al-Jāmi‘ li-mufradāt*

2. Philip van der Eijk, “Galen’s Use of the Concept of ‘Qualified Experience’ in His Dietetic and Pharmacological Works,” in *Galen on Pharmacology*, ed. Armelle Debru (Brill, 1997), 35–57.

3. Peter Pormann, “The Formation of the Arabic Pharmacology between Tradition and Innovation,” *Annals of Science* 68 (2011): 493–515.

al-adwiyah wa-l-aghdhiyah (*Collector of simple drugs and foodstuffs*) drew upon more than 150 ancient and medieval sources while also incorporating observations from his own extensive travels and empirical investigations. Through this treatise, Ibn al-Bayṭār highlighted the significance of direct, firsthand encounters with medicinal substances—over 1,400 simples of vegetal, animal, and mineral origin—thus affirming the central role of experiential knowledge in pharmaceutical practice.

Maximilian Haars, “Theory and Praxis: Pharmaco-botanical Aspects in Galen’s *Method of Medicine*,” explores the pharmaco-botanical dimensions of Galen of Pergamon’s *Method of Medicine*, with particular attention to the relationship between theoretical and practical pharmacology. Galen’s pharmacological legacy is most often associated with his theoretical treatises, such as *On the Capacities of Simple Drugs*, and his collections of compound drugs. However, in *Method of Medicine*, Galen reveals a more personal and practice-oriented dimension of pharmacotherapy. Haars elucidates Galen’s practical preferences and his experiential engagement with medicinal plants by combining statistical analysis with close textual examination. A core objective of this article is to quantify and qualify the botanical content of *Method of Medicine* in relation to the broader Galenic corpus. A database of medicinal plants was constructed, cataloging phytonyms and their frequency across Galen’s authentic works. This statistical approach reveals that although *Method of Medicine* contains fewer references to plant substances than Galen’s dedicated pharmacological treatises, it still features nearly 1,000 instances of plant names—demonstrating that practical pharmacotherapy remained central to his clinical writings. Interestingly, while the most frequently cited plants in *Method of Medicine* align broadly with those found in Galen’s wider pharmacological oeuvre, some notable absences and variances suggest conscious selection based on therapeutic relevance, accessibility, and social context.

The article further delves into Galen’s direct observations and practical knowledge of flora, with specific examples drawn from *Method of Medicine*. Galen’s descriptions of plants near his villa in Campania and his insistence that physicians should recognize medicinal herbs in the wild illustrate his commitment to empirical engagement. His discussion of plants like *kalaminthē* (catmint) and *anadendromalachē* (hollyhock) demonstrated his skill as a field botanist while also raising philological questions about plant identification in ancient texts. Moreover, the article examines the implicit and explicit cross-references within Galen’s pharmacological and therapeutic works. In particular, it evaluates how *Method of Medicine* relates to treatises such as *On the Capacities of Simple Drugs* and *On the Composition of Drugs According to Places*, reconstructing a complex

web of textual interconnections. Galen's selective citation patterns indicate a thoughtful integration of theory and practice, grounded in both inherited authority and personal experimentation. Ultimately, this study contributes to our understanding of Galen not merely as a compiler of classical pharmacology but as a practitioner deeply engaged in empirical observation. By highlighting the practical realities behind Galen's theoretical models, Haars offers a nuanced portrait of pharmacological knowledge in the Roman imperial context and affirms the central role of botany and experience in ancient medical epistemology.⁴

Closely related to the question of practical input to ancient pharmacology is Laurence Totelin's article, "The 'Second Order': Interactions between Physicians, Painters, and Stone Engravers in the Roman World." It examines the largely understudied relationships between Roman physicians and two categories of artisans, painters and stone engravers, within the broader landscape of ancient crafts and medical practice. While recent scholarship has significantly advanced our understanding of the so-called ancient "medical marketplace," attention has generally focused on competition and collaboration among various healing professionals, such as physicians, drug sellers, root cutters, and midwives.⁵ In contrast, this study shifts the analytical focus toward nonmedical craftspeople whose materials, tools, and technical knowledge intersected with pharmacological and therapeutic practices.

Drawing from Greek and Latin medical texts, including works by Dioscorides, Galen, Scribonius Largus (ca. 1–50 CE), Oribasios (fl. fourth century CE), and Aetios of Amida (fl. sixth century CE), Totelin demonstrates that physicians and artisans frequently operated within a shared "ecosystem." Painters and pharmacologists often used the same substances, such as pigments, glues, and even certain metals, for their respective crafts, occasionally sourcing them from the same *pigmentarii* (pigment vendors). Medical texts frequently allude to cinnabar, soot, Melian earth, and Armenian blue (blue stone)—pigments used both in wall painting and in the preparation of therapeutic compounds, particularly eye remedies (*kollyria*). The article highlights concerns about adulteration and fraudulent substitutes, a problem affecting both artistic and medical domains. Scribonius Largus, for instance, warns against pigment sellers diluting opium-based remedies

4. On Galen's epistemology with a focus on therapeutics, see R. J. Hankinson, "Discovery, Method, and Justification: Galen and the Determination of Therapy," in *Galen's Epistemology: Experience, Reason, and Method in Ancient Medicine*, ed. R. J. Hankinson and Matyáš Havrda (Cambridge University Press, 2022), 79–115.

5. See Vivian Nutton, "Healers in the Medical Market Place: Towards a Social History of Graeco-Roman Medicine," in *Medicine in Society: Historical Essays*, ed. Andrew Wear (Cambridge University Press, 2010), 15–58.

with inferior ingredients for profit, thus pointing to shared vulnerabilities within artisanal commerce.

Totelin further explores the presence of stone engravers within the material world of Roman medicine. While less explicitly addressed in the sources, their role emerges in connection with two significant artifactual traditions: engraved medical amulets and *kollyrion* stamps. Ancient physicians were ambivalent toward amulets, often dismissing them as “irrational” or magical, yet nonetheless recorded their therapeutic properties and occasionally prescribed them.⁶ Several medical writers, including Dioscorides and Galen, mention stones such as jasper, serpentine, and selenite as protective amulets or active ingredients to be ingested or applied. The essay contends that physicians likely procured such stones from gem engravers, who also produced engraved eye-stamp seals bearing the names of remedies, ailments, and occasionally the identities of healer-practitioners.

Importantly, Totelin interrogates the boundaries between varying approaches in premodern therapeutics by examining shared symbolic and practical dimensions between engraved amulets and medical implements. Some *kollyrion* stamps display iconography and motifs drawn from magical traditions—for example, radiated serpents or astronomical symbols—while broken fragments of such objects may have been ground into powder for pharmacological use. The blurring of roles between engravers, artisans, and healers is also evident in the archaeological record, which includes containers of pigments or metallic compounds that have been variably identified as artists’ kits or medical chests, and emphasizes the need for taking into consideration various premodern artifacts that were related to medical practice and have received very little attention so far.⁷ In conclusion, the article argues that Roman healers operated not in isolation but as part of a complex artisanal ecosystem. Their interactions with painters and stone engravers reveal overlapping material cultures, reciprocal knowledge exchange, and shared anxieties over authenticity and efficacy. These relationships challenge simplistic hierarchies of intellectual and manual labor and invite a reappraisal of the social positioning of physicians within the broader world of ancient craft.

Cross-Cultural Exchange and the Movement of Substances

A major theme in this issue is the circulation of pharmacological knowledge and substances across cultures. Premodern Eurasia was crisscrossed by trade routes,

6. Jacques Jouanna, “Médecine rationnelle et magie: Le statut des amulettes et des incantations chez Galien,” *Revue des Études Grecques* 124 no. 1 (2011): 47–77.

7. See the microhistory of an artifact originating from a tomb excavated near Thessaloniki in northern Greece dated to the fourth century BCE: Despina Ignatiadou, “The Warrior Priest in Derveni Grave B Was a Healer Too,” *Histoire, médecine et santé* 8 (2016): 89–113.

overland and maritime, that facilitated not only the movement of commodities such as silk and precious stones, but also of medicinal substances. As a result, pharmacological texts in one tradition often included ingredients of distant origin, interpreted and adapted to fit local theories of disease and healing. Asian ingredients such as cinnamon, ginger, camphor, ambergris, and musk found their way into ancient and medieval European pharmacological texts, sometimes retaining their original names and sometimes acquiring new ones. These substances were often surrounded by an aura of exoticism and potency, believed to be particularly effective due to their rarity and distant provenance. Ancient and medieval authors frequently commented on the quality and authenticity of such ingredients, and the issue of adulteration was also a persistent concern.

Authors in the medieval Islamic world, acting as both transmitters and innovators, played a crucial role in mediating between East and West. Persian and Arabic translations of Greek, Indian, and Chinese pharmacological works, combined with indigenous knowledge and experimentation, produced a cosmopolitan pharmacology that was exported to Europe via medieval Latin, Greek, and Hebrew translations.⁸ The movement of knowledge was not unidirectional. Several examples illustrate this phenomenon, such as the notable openness during the Tang period in China (seventh–ninth centuries CE), when drugs from diverse regions across Eurasia were incorporated into Chinese pharmacology. These included recipes for complex cure-all compounds, such as Byzantine theriac, as well as various simples originating from Arabia, Persia, and India.⁹ Most notably, Ronit Yoeli-Tlalim has recently demonstrated through her study of myrobalan, a medieval Eurasian panacea, the importance of examining various recurring linguistic pathways to understand better the transmission of both terms and substances.¹⁰

In “Drugs from Afar: The Introduction and Circulation of ‘New’ Pharmaceutical Knowledge in the Early Medieval Latin West,” Claire Burrige investigates the introduction and diffusion of previously unrecorded pharmaceutical substances in the Latin West between ca. 750 and 1000 CE. Building upon previous studies of scholars such as John Riddle and Michael McCormick, the article significantly expands the corpus of early medieval medical texts under consideration

8. See the example of medieval Mediterranean pharmacology examined by Petros Bouras-Vallianatos, “Medieval Mediterranean Pharmacology,” in *Drugs in the Medieval Mediterranean: Transmission and Circulation of Pharmacological Knowledge*, ed. P. Bouras-Vallianatos and D. Stathakopoulos (Cambridge University Press, 2023), 1–34.

9. Edward H. Schafer, *The Golden Peaches of Samarkand: A Study of Tang Exotics* (University of California Press, 1963), 176–94.

10. Ronit Yoeli-Tlalim, *ReOrienting Histories of Medicine: Encounters along the Silk Roads* (Bloomsbury Academic, 2021), 63–84.

by examining both published and previously unedited recipe collections, as well as medical additions to nonmedical manuscripts. The analysis focuses on the occurrence of seven particularly rare ingredients—ambergis, camphor, confitum, cozumber, galangal, musk, and zedoary—which were not attested in Classical or Late Antique Latin pharmaceutical writings but appear sporadically in early medieval recipes. These substances, many of which originate in Southeast Asia or the Middle East, represent tangible evidence of Eastern pharmaceutical knowledge permeating the Latin West during the early Middle Ages.

Two principal patterns emerge from the manuscript evidence. First, these newly recorded ingredients tend to cluster together within recipes, particularly within two recurring constellations: a family of incense recipes centered on a core group of ingredients (including camphor, confitum, cozumber, and musk) and a frequent pairing of galangal and zedoary. Second, there is a discernible chronological trend: the majority of recipes containing these substances date from the second half of the ninth century or later, indicating an increasing integration of new pharmaceutical knowledge over time. The study emphasizes that the incorporation of these ingredients was not limited to the wholesale adoption of new recipes but extended to the gradual modification of pre-existing traditions. Recipes such as those for *Emplastrum apostolicum* and *Unguentum marciatum*, which were already circulating widely, were updated with the inclusion of one or more of these rare substances, suggesting a broader cultural process of adaptation and experimentation. Furthermore, manuscript case studies, such as the incense recipes in a single folio of Parisinus lat. 11219, reveal how medical knowledge developed incrementally, thus documenting evolving pharmaceutical practices across generations of scribes. These case studies emphasize how daily medical practice often advanced in ways that formal, learned medical texts did not always capture, highlighting a dynamic and practical approach to medicine that was continuously shaped through experience.

Beyond the textual analysis, Burrige draws on nonmedical sources, including epistolary records, royal annals, and market inventories, to argue that the movement of new materia medica into the Latin West was facilitated by a combination of elite gift-giving, diplomatic exchange, and commercial trade.¹¹ Although the quantities involved were likely limited and access restricted to privileged groups, the presence of these substances reveals the interconnectedness of early medieval

11. On this, see the detailed study by Koray Durak, "Healing Gifts: The Role of Diplomatic Gift Exchange in the Movement of *Materia Medica* between the Byzantine and Islamicate Worlds," in *Drugs in the Medieval Mediterranean: Transmission and Circulation of Pharmacological Knowledge*, ed. P. Bouras-Vallianatos and D. Stathakopoulos (Cambridge University Press, 2023), 388–415.

Western Europe with broader Eurasian networks. Ultimately, Burridge argues that this early incorporation of nonlocal pharmaceutical knowledge helped prepare the ground for the more substantial wave of medical transformation that occurred with the translation of Arabic texts into Latin in the later eleventh century. The early medieval engagement with Asian materia medica, although modest in scale, played a foundational role in shaping the trajectory of Latin medicine in the later Middle Ages.

Petros Bouras-Vallianatos's article, "Pharmacological Substances from Asia in Late Antique Medical Works: Myths and Facts," examines the multifaceted role of Asian pharmacological substances in Greco-Roman and Late Antique medicine, exploring the intersection of material culture, trade, and medical theory. It also investigates the use, classification, and cultural perceptions of various exotic medicinal ingredients sourced from Southeast Asia and the Far East, as reflected in key medical texts of the period, especially those of Galen, Dioscorides, Aetios of Amida, and Paul of Aegina. The article aims to shed light on the broader historical and sociocultural dynamics surrounding the integration of Asian materia medica into Mediterranean medical traditions.

Through an in-depth textual analysis, the study argues that pharmacological knowledge in Antiquity was shaped not only by clinical observation but also by socioeconomic hierarchies and cross-cultural interactions. Galen, for instance, explicitly demarcated drugs intended for the wealthy from those for the poor, framing many Asian imports, such as *malabathron* and Indian spikenard, as "luxury medicines." These substances were often expensive, rare, and imbued with exoticism, signaling not just therapeutic value but also status. Such demarcations raise enduring questions regarding accessibility and inequality in ancient medical practice. The article identifies three chronological turning points in the assimilation of Asian pharmacological substances into Mediterranean medicine: the first–second century CE, the fifth–sixth century CE, and the ninth–tenth century CE. Particular emphasis is placed on the second phase, which witnessed a surge in textual references to previously very little mentioned or unknown ingredients, such as cloves, barbarian rhubarb, and musk. The proliferation of these references suggests both a deepening integration of foreign substances and an expanding medical lexicon shaped by intercultural trade and textual transmission.

The article further challenges the assumption that textual mentions equate to widespread availability. By juxtaposing literary sources with merchant accounts, archaeological data, and papyrological evidence, the article demonstrates that some ingredients, though frequently cited, were rarely used in everyday medical practice due to cost or limited supply. Moreover, Bouras-Vallianatos discusses

the epistemological challenges of identifying ancient plant names with modern botanical classifications, noting the limitations and uncertainties inherent in retrospective identifications. The article further demonstrates that the currently available editions of Greek and Late Antique medical texts should not always be accepted uncritically. For instance, in the case of Aetios of Amida's *Tetrabiblos*, several recipes in the first book printed in the edition by Alessandro Olivieri,¹² which include various Asian ingredients, are clearly later additions. This observation opens new avenues for the evaluation and analysis of Byzantine medical texts within their broader social and cultural contexts. Finally, the article argues that the study of Asian substances in premodern medicine offers valuable insights into wider global historical processes, including the early transfer of scientific knowledge and the "commodification" of natural resources.

In "The Meanings of Medical Sugar: Technologies of Rock Candy, Syrup, and Granulated Cures on the Silk Roads," Amanda Respass explores the transformation of sugar from a regional botanical into a widely circulated medical commodity across the premodern Afro-Eurasian and Indian Ocean worlds. Focusing on the refinement technologies that produced diverse sugar forms, such as rock candy, syrup, and granulated sugar, the article considers how these commodified variants became embedded within differing medical, cultural, and cosmological frameworks. Drawing upon written sources and archaeological evidence, Respass traces the long-distance movement of sugar and its shifting therapeutic meanings within Indian, Islamicate, and Chinese medical traditions. She argues that sugar's ontological and medicinal status was inseparable from the material processes of its transformation and that its perceived efficacy derived as much from these processes as from its intrinsic properties.

In South Asia, early Ayurvedic texts such as the *Suśruta Saṃhitā* (*Compendium of Suśruta*) conceptualized sugar as an inherently cooling substance, particularly as it underwent further refinement. Here the refinement process intensified its elemental association with water, rendering it increasingly frigorific and suitable for treating heat-related imbalances in the body. Conversely, in the Islamicate medical tradition, sugar came to be regarded as a heating substance. Physicians such as Ibn Māsawayh (d. 857) and al-Rāzī argued that the boiling and evaporative processes that removed water from sugarcane juice and transformed it into crystalline forms endowed it with elemental heat. The article further considers the archaeological record of sugar production, particularly within the medieval Islamicate world, where extensive refinery sites in regions such as the

12. Alessandro Olivieri, *Aetii Amideni Libri medicinales*, vol. 1 (Akademie Verlag, 1935).

Levant, Persia, and the Mediterranean reveal the large-scale technological infrastructures built to support sugar's transformation into a commodity. The material remains of kilns, boiling cauldrons, and sugar molds substantiate the role of heat and labor in sugar's transformation—factors that were integral to its medical ontology in Islamicate texts. In China, sugar's incorporation into medical theory reflects both indigenous understandings and the influence of foreign sources. Initially viewed as cooling in Tang dynasty materia medica, refined sugars such as *shí mì* (stone honey) and *shātáng* (granulated sugar) were joined in subsequent centuries by other sugar commodities and syrups described as heating in sources influenced by Islamicate practices. The convergence of these views within Chinese medical texts highlights the pluralistic nature of pharmacological knowledge in medieval China, shaped by maritime trade and the circulation of substances and ideas.

Through a comparative analysis of textual, archaeological, and linguistic evidence, Respass shows how sugar's medical identity was coproduced by cultural systems of knowledge and the technologies of its refinement. She argues that sugar's portability, durability, and commercialization enhanced not only its trade value but also its therapeutic appeal.¹³ Ultimately, sugar's journey from cane to crystal became a process of cultural inscription, in which the meanings attributed to its material form were shaped by regional epistemologies, religious cosmologies, and the technological means by which it was made legible as medicine.

All in all, the various contributions in this issue approach questions of theory and practice from multiple angles, demonstrating that the history of premodern pharmacology cannot be reduced to a linear progression of ideas. Rather, it is a history of negotiation, adaptation, and creativity, a field rooted in practical experimentation and shaped by encounters across cultures and centuries.

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13. For a further example of “commercializing” medicine through the development of pharmaceutical institutions in Song China, see Asaf Goldschmidt, “Commercializing Medicine or Benefiting the People—The First Public Pharmacy in China,” *Science in Context* 21 (2008): 311–50.

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