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# Cross-cultural Transfer of Medical Knowledge in the Medieval Mediterranean: The Introduction and Dissemination of Sugar-based Potions from the Islamic World to Byzantium

By Petros Bouras-Vallianatos

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## *Abstract:*

This article aims to challenge the traditional narrative about the progression of medical knowledge from Arabic to Latin by including the role of the Byzantine world in that process. It examines critically the steady diffusion of Arabic medical knowledge throughout Byzantium by focusing on the introduction and dissemination of sugar-based potions. By studying for the first time a substantial body of mostly unedited translations of Arabic medical texts into Greek and works by Byzantine medical authors, this article argues that Byzantine literature and culture were more lively than they are given credit for and that—by medieval standards—Byzantine authors were quite open to outside influence. Moreover, it emphasizes that the subsequent use of sugar in Byzantine daily medical practice constituted a significant investment in health, especially bearing in mind the high cost involved in the cultivation, production, and transportation of sugar. Finally, it points to the regular use of sugar in medical practice from the late eleventh/early twelfth century onward, at least, in Constantinople, which suggests constant importing of the commodity, despite the fact that the first source confirming the trading of sugar in the Byzantine capital dates to the first half of the fourteenth century.

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The entire area of the Mediterranean experienced extensive cross-cultural transfers of knowledge in the Middle Ages.<sup>1</sup> A significant dimension in this historical context was the constant interaction between the European Christian and Islamic

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<sup>1</sup> All translations from Greek are mine, unless otherwise stated. All transcriptions from Greek and Latin retain the same spelling (including accents) and punctuation as the relevant codex. Dates of manuscripts are from the most recent published catalogue in each case, unless a more accurate dating is given in a recent study, which is cited accordingly.

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worlds.<sup>2</sup> War and conquest created vast areas in which the two cultures often met and clashed.<sup>3</sup> In another sphere, that of commerce and trade, there was interaction between different Mediterranean regions in periods of both war and peace. Byzantine, Italian, Jewish, and Muslim traders established various networks in the wider Mediterranean between Europe, Africa, and the Middle East, allowing a constant flow of goods and ideas.<sup>4</sup>

The field of science, e.g., astronomy and medicine, provides prominent examples of medieval cross-cultural transfers. Over the last few decades scholars have focused on the transmission of knowledge from Greek into Arabic, especially between the seventh and ninth centuries, which played a pivotal role in the formation and development of medieval Islamic civilization,<sup>5</sup> and from Arabic into Latin from the eleventh to the thirteenth centuries, together with the impact this had on the Christian West.<sup>6</sup> Of the various instances of knowledge transfer in the medieval Mediterranean, the least well known and most often neglected is the gradual diffusion of Arabic and Persian knowledge in Byzantium.<sup>7</sup> Taking, for example, cases of transfer through the medium of translation, one could highlight the translation of the Quran into Greek by the early ninth century.<sup>8</sup> In the fields of astronomy,<sup>9</sup>

<sup>2</sup> For a general introduction with a broad historical perspective, see Peregrine Horden and Nicholas Purcell, *The Corrupting Sea: A Study of Mediterranean History* (Oxford, 2000), 153–60. See also David Abulafia, *The Great Sea: A Human History of the Mediterranean* (Oxford, 2011), 241–369.

<sup>3</sup> On Arabs in the Mediterranean, see Christophe Picard, *La mer des califes: Une histoire de la Méditerranée musulmane (VIIe–XIIIe siècle)* (Paris, 2015).

<sup>4</sup> See, for example, David Jacoby, *Commercial Exchange across the Mediterranean: Byzantium, The Crusader Levant, Egypt and Italy*, Variorum Collected Studies 836 (Aldershot, 2005). In particular, on the role of Jewish communities and the evidence from the unique Cairo Geniza collection of documents, see Jessica L. Goldberg, *Trade and Institutions in the Medieval Mediterranean: The Geniza Merchants and Their Business World* (Cambridge, UK, 2012).

<sup>5</sup> See the seminal study by Dimitri Gutas, *Greek Thought, Arabic Culture: The Graeco-Arabic Translation Movement in Baghdad and Early 'Abbāsīd Society (2nd–4th/8th–10th Centuries)* (London, 1998).

<sup>6</sup> For an introduction, see Charles Burnett, “Translation and Transmission of Greek and Islamic Science to Latin Christendom,” in *The Cambridge History of Science*, vol. 2, *Medieval Science*, ed. David C. Lindberg and Michael H. Shank (Cambridge, UK, 2013), 341–64, and the literature cited therein.

<sup>7</sup> See Maria Mavroudi, *A Byzantine Book on Dream Interpretation: The “Oneirocriticon” of Achmet and Its Arabic Sources*, *Medieval Mediterranean* 36 (Leiden, 2002), 392–429, and Charalampos Messis, “Traduction de l’arabe au grec,” in *Encyclopédie de l’humanisme méditerranéen*, ed. Houari Touati (2014), <http://www.encyclopedie-humanisme.com/?Traduction-de-l-arabe-au-grec> (last accessed 20 April 2020). See also Dimitri Gutas, “Arabic into Byzantine Greek: Introducing a Survey of the Translations,” in *Knotenpunkt Byzanz: Wissensformen und kulturelle Wechselbeziehungen*, ed. Andreas Speer and Philipp Steinkrüger, *Miscellanea Mediaevalia* 36 (Berlin, 2012), 246–64, at 252–54, and Anthony Kaldellis’s online catalogue of translations from Arabic into Greek at [https://www.academia.edu/36711128/Kaldellis\\_Catalogue\\_of\\_Translations\\_into\\_Byzantine\\_Greek\\_version\\_III\\_](https://www.academia.edu/36711128/Kaldellis_Catalogue_of_Translations_into_Byzantine_Greek_version_III_) (last accessed 20 April 2020).

<sup>8</sup> On the influence of the Quran in Byzantium, see the detailed case study on Sura 112.2 by Christos Simelidis, “The Byzantine Understanding of the Qur’anic Term *al-Ṣamad* and the Greek Translation of the Qur’an,” *Speculum* 86/4 (2011): 887–913.

<sup>9</sup> Anne Tihon, “Les textes astronomiques arabes importés à Byzance aux XIe et XIIe siècles,” in *Occident et Proche-Orient: Contacts scientifiques au temps des Croisades. Actes du colloque de Louvain-la-Neuve, 24 et 25 mars 1997*, ed. Isabelle Draelants, Anne Tihon, and Baudouin van den Abeele, *Réminiscences* 5 (Turnhout, 2000), 313–24, and Maria Mavroudi, “Exchanges with Arabic

astrology,<sup>10</sup> medicine,<sup>11</sup> or even literary fiction,<sup>12</sup> we can also see a considerable number of translations from the eleventh to the fifteenth century, which invariably influenced the way Byzantine authors were thinking and writing.

In this article I will concentrate on medicine and examine the steady diffusion of Arabic medical knowledge throughout Byzantium by looking for the first time at a substantial corpus of mostly unedited translations of Arabic medical texts into Greek and works by Byzantine medical authors. The unpublished state of a substantial proportion of Byzantine medical literature and the consequent lack of translations into modern languages is perhaps one of the main reasons that the Byzantine material remains largely unexplored and rarely is part of the study of the medieval Mediterranean medicine.<sup>13</sup> This article aims to challenge the traditional narrative about the progression of medical knowledge from Arabic to Latin by including the role of the Byzantine world in this process. I would also like to show that Byzantine medicine and culture were more lively than they are given credit for and that—by medieval standards—Byzantine authors were quite open to outside influence.<sup>14</sup> For this study also aims to familiarize medievalists with Byzantine medical literature and evidence about the functioning of Byzantine medical institutions that can offer important insights for the study of the history of the medieval Mediterranean.

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Writers during the Late Byzantine Period,” in *Byzantium: Faith and Power (1261–1557): Perspectives on Late Byzantine Art and Culture*, ed. Sarah T. Brooks (New Haven, 2006), 62–75, at 65–71.

<sup>10</sup> David Pingree, “From Alexandria to Baghdād to Byzantium: The Transmission of Astrology,” *International Journal of the Classical Tradition* 8 (2001): 3–37.

<sup>11</sup> For a critical overview of Arabo/Persian-Byzantine medical translations, see Alain Touwaide, “Agents and Agencies? The Many Facets of Translation in Byzantine Medicine,” in *Medieval Textual Cultures: Agents of Transmission, Translation and Transformation*, ed. Faith Wallis and Robert Wisnovsky, Judaism, Christianity, and Islam—Tension, Transmission, Transformation 6 (Berlin, 2016), 13–38. Cf. Evangelia A. Varela, “Orientalische Elemente in der byzantinischen Heilkunde,” *Medicina nei Secoli* 7 (1995): 29–40.

<sup>12</sup> Hans-Georg Beck, *Geschichte der byzantinischen Volksliteratur*, Handbuch der Altertumswissenschaft 12 (Munich, 1971), 35–48, and George Kehayióglou, “Translations of Eastern ‘Novels’ and Their Influence on Late Byzantine and Modern Greek Fiction (11th–18th Centuries),” in *The Greek Novel AD 1–1985*, ed. Roderick Beaton (London, 1988), 156–66.

<sup>13</sup> It could be argued that the corpus of Byzantine medical literature is smaller than that in medieval Latin and Arabic. However, in the absence of an accurate survey of Byzantine medical literature, it is impossible to make a fair judgment and comparison with other medieval Mediterranean traditions. In the last ten years I have personally consulted more than four hundred Byzantine medical manuscripts and I can confirm that there are a substantial number of, often anonymous, late Byzantine diagnostic and therapeutic unpublished texts.

<sup>14</sup> Generally there is an ingrained prejudice among scholars against Byzantine medical authors, who tend to be regarded as important only for the preservation and transmission of ancient Greek medical knowledge. See, for example, Gotthard Strohmaier, “Reception and Tradition: Medicine in the Byzantine and Arab World,” in *Western Medical Thought from Antiquity to the Middle Ages*, ed. Mirko D. Grmek, coord. Bernardino Fantini, and trans. Antony Shugaar (Cambridge, MA, 1998), 139–69, at 154, 169, who states: “medical thought in the Byzantine world had no truly new features,” and “the chief claim to credit of Byzantine science—which had developed even fewer ideas than Arabic science—was that it had preserved the original Galenic texts.” Originally published in German: “Die Rezeption und die Vermittlung: Die Medizin in der byzantinischen und in der arabischen Welt,” in *Die Geschichte des medizinischen Denkens: Antike und Mittelalter*, ed. Mirko D. Grmek (Munich, 1996), 151–81, at 165, 181.

Looking beyond the well-recognized, long-term interactions between the Byzantine and Islamic worlds in terms of conflict, war, and trade, this study aims to emphasize that the two cultures often met and interacted on other levels, something which—whether consciously or unconsciously—had a significant impact on everyday life. In fact, Arabic medical lore penetrated Byzantine medical works at a relatively early stage, and had a considerable impact on Byzantine authors and medical practice. Beyond the strictly literary assessment of this transfer, it is worth bearing in mind that certain improvements in the treatment of disease had a direct impact on the daily lives of a large number of people, not just emperors and aristocrats, but ordinary citizens, too.

By looking at the transfer of medical knowledge, I shall not only focus on particular translations from Arabic into Byzantine Greek or a specific group of textual medical sources, but shall be considering a wider framework in the process of contextualization by studying the impact of this transfer at other levels in the society. In this I have been influenced by the recent study of Sonja Brentjes, Alexander Fidora, and Matthias M. Tischler, who consider the cross-cultural exchange of knowledge as “a way of life, not merely a linear act of translating.”<sup>15</sup> For example, pharmacological ingredients and composite drugs were also important commercial goods. Thus, in addition to medical texts, I use a nexus of non-medical sources such as epistolography and merchants’ accounts in order to examine this transfer of knowledge in the light of the contemporary social and cultural environment. Furthermore, the impact of this transfer is examined in a variety of locations, and also places of medical practice. Thus, I show the importance of discussing evidence from areas outside Byzantium proper, such as southern Italy and Sicily, which were at the forefront of medieval cross-cultural interactions. Additionally, a systematic attempt is made to embrace evidence from daily practice, including the examination of recipe books connected with practicing physicians as well as the foundation charters of Byzantine places of healing, in order to emphasize the multi-layered character of transfer.

The branch of Byzantine medicine that saw the most intense cross-cultural influence was pharmacology.<sup>16</sup> New forms of composite drugs, in association with a large number of recently introduced ingredients from the Middle and Far East, gradually became available to the Byzantines.<sup>17</sup> Of all the various ingredients and pharmaceutical

<sup>15</sup> Sonja Brentjes, Alexander Fidora, and Matthias M. Tischler, “Towards a New Approach to Medieval Cross-Cultural Exchanges,” *Journal of Transcultural Medieval Studies* 1 (2014): 9–50, at 30–33. Cf. the long critical survey by Maria Mavroudi, “Translations from Greek into Latin and Arabic during the Middle Ages: Searching for the Classical Tradition,” *Speculum* 90/1 (2015): 28–59, at 28–33.

<sup>16</sup> There is some evidence of transfer in the field of diagnostics: there are, for example, some brief treatises focusing on uroscopy and pulse attributed to Arab or Persian authors, but the current level of research does not allow us to ascribe them with any degree of certainty to any known medical authority from the Islamic world. For a brief survey, see Alain Touwaide, “Arabic Urology in Byzantium,” *Journal of Nephrology* 17 (2004): 583–89. The longest of these treatises is ascribed to the Persian physician and polymath Ibn Sīnā (d. 1037). On this, see Giovanni Attuario, *L’Eccellente trattato sulle urine di Avicenna*, ed. and trans. Mario Lamagna, Ediciones Criticas Textos Médicos 21; Ediciones Criticas de la Escuela de Traductores de Toledo 2 (Cuenca, 2017), 11–12.

<sup>17</sup> On the introduction of oriental substances into medieval Mediterranean medicine in general, see Zohar Amar and Efraim Lev, *Arabian Drugs in Early Medieval Mediterranean Medicine* (Edinburgh, 2017), 82–227.

dosage forms, I have chosen to focus on the sugar-based composite drugs, such as juleps and syrups. I consider them to be an exceptional case, since unlike other recipes, where some ingredients could appear in a great variety of forms (a certain plant-substance, for example, could refer to more than one species), the Greek terms used both for sugar and also for these potions are consistent throughout. On another level, I aim with this article to contribute to the history of trade in the medieval Mediterranean and, in particular, as regards the importing of sugar to Byzantium. Cultivation and exploitation of sugarcane were never practiced on a large scale in Byzantine territory. Lastly, by offering a new set of data on the role of sugar in Byzantine medical practice, this study will provide material for and, I hope, inspire future studies on other kinds of transfer related to sugar, including the cultivation of sugarcane and the associated industry of sugar production in the Mediterranean.

This article is divided into three sections. In order to provide context for the main part of the paper, I will first give some historical background on ancient and early medieval knowledge of sugar and sugar-based potions in the Mediterranean. The second section deals with the gradual introduction of sugar-based potions in Byzantium from the tenth to the twelfth century, and the third focuses on the dissemination of the new forms of composite drugs in the period from the thirteenth century to the fall of Constantinople to the Ottoman Turks in 1453.

## 1. ANCIENT SWEET POTIONS AND THE INTRODUCTION OF SUGAR-BASED POTIONS IN THE MIDDLE AGES

### 1.1. *The Graeco-Roman World*

Before the introduction of sugar, honey was used as a sweetener and preservative in composite drugs.<sup>18</sup> Honey or various mixtures of honey with water (ὕδρουμελι/*hydromeli* and μελικρά[η]τον, *melikra[lē]ton*), vinegar (ὄξύμελι/*oxymeli*), wine (οἰνόμελι/*oinomeli*), and less often with roses (ῥοδόμελι/*rhodomeli*), sour grapes (ὄμφακόμελι/*omphakomeli*), or apple juice (μελίμηλον/*melimēlon*),<sup>19</sup> could be

<sup>18</sup> On the medicinal uses of honey in the ancient world, see Claire Balandier, “Production et usages du miel dans l’antiquité Gréco-Romaine,” in *Des hommes et des plantes: Plantes méditerranéennes, vocabulaire et usages anciens. Table ronde, Aix-en-Provence, mai 1992*, ed. Marie-Claire Amouretti and Georges Comet, *Cahier d’Histoire des Techniques* 2 (Aix-en-Provence, 1993), 93–125, at 107–11. Honey was also known for its cleansing effect. For its use as a simple drug, see the descriptions by Dioscorides, *De materia medica* 2.82, ed. Max Wellmann, *Pedanii Dioscuridis Anazarbei De materia medica libri quinque*, 3 vols. (Berlin, 1907–14), 1:165, line 16, to 1:167, line 9; Pliny the Elder, *The Natural History* 22.107–16, ed. and trans. Jacques André, *Pliny l’Ancien: Histoire naturelle, livre XXII* (Paris, 1970), 60, line 4, to 63, line 17; and Galen, *On the Capacities of Simple Drugs* 7.9, ed. Karl G. Kühn, *Claudii Galeni opera omnia*, 20 vols. in 22 (Leipzig, 1821–33), 12:70, line 13, to 12:71, line 9.

<sup>19</sup> On these and other less common mixtures, such as ἀπόμελι (*apomeli*, another mixture of honey and water), θαλασσόμελι (*thalassomeli*, a mixture of honey with sea water), or μελιτίτης (*melititēs*, a mixture of honey with wine), see, for example, Dioscorides, *De materia medica* 5.7–27, ed. Wellmann, 3:11, line 15, to 3:22, line 8, and Galen, *On the Preservation of Health* 4.6, ed. Kühn, *Claudii Galeni*, 6:271, line 17, to 6:279, line 8 = Konrad Koch, ed., *Galenus De Sanitate Tuenda*, *Corpus Medicorum Graecorum* 5.4.2 (Leipzig, 1923), 120, line 1, to 123, line 16. For liquid dosage forms based on honey mixtures, see, for example, Galen, *On the Composition of Drugs According to Places* 8.8 and 9.1, ed. Kühn, *Claudii Galeni*, 13:206, lines 5–11, and 13:240, line 17, to 241, line 7. See also μελίμηλον and ὕδροροσάτον (*hydrososaton*, a mixture of rose juice with water and honey), which appears in Oribasios, *Medical Collections* 5.29 and 5.33, ed. Hans Raeder, *Collectionum medicarum reliquiae*,



administered alone or used as a base for the preparation of composite drugs. The Greeks seem first to have come into contact with sugarcane juice during the campaign of Alexander the Great in India.<sup>20</sup> Medical authors such as Dioscorides (fl. middle of the first century AD), Pliny the Elder (AD 23/24–79), and Galen (AD 129–c. 216/217) refer to σάκχαρ[ον] (*sakchar[on]*) in Greek or *sacc[h]aron* in Latin, which is perhaps the first dated reference in history to granulated sugar.<sup>21</sup> However, they show very little familiarity with this ingredient, which is described as a less sweet version of honey with laxative properties.<sup>22</sup> Galen's references were uncritically reproduced in the works of Oribasios (AD c. 325–after 395/6) and Paul of Aegina (late sixth

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2 vols. in 4, *Corpus Medicorum Graecorum* 6.1.1–2.2 (Leipzig, 1928–33), 1/1:147, line 8 and 1/1:152, lines 5–9; Aetios of Amida, *Tetrabiblos* 5.140, ed. Alexander Olivieri, *Aetii Amideni Libri medicinales*, 2 vols., *Corpus Medicorum Graecorum* 8.1–2 (Leipzig, 1935–50), 2:116, lines 13–23; and Paul of Aegina, *Epitome* 7.15, ed. Johan Ludvig Heiberg, *Paulus Aegineta*, 2 vols., *Corpus Medicorum Graecorum* 9.1–2 (Leipzig, 1921–24), 2:332, lines 17–18.

<sup>20</sup> The first-century BC Greek geographer Strabo, *Geography* 15.1.20, ed. Stefan L. Radt, *Strabons Geographika*, vol. 4, *Buch XIV–XVII: Text und Übersetzung* (Göttingen, 2005), 160, lines 6–24, provides the first description of cane sugar based on an earlier, now lost, Hellenistic account, without, however, naming it.

<sup>21</sup> On sugar in Greek and Latin medical authors, see Andrew Dalby, *Food in the Ancient World, from A to Z* (London, 2003), 314–15. The Greek and Latin term is derived from the Sanskrit शर्करा (*śarkarā*); cf. H. G. Liddell and R. Scott, eds., *A Greek-English Lexicon*, 9th ed. (Oxford, 1996), 1581, s.v. σάκχαρ, and Peter G. W. Glare, *The Oxford Latin Dictionary*, 2nd ed. (Oxford, 2012), s.v. *sacc(h)aron*. The first-century AD anonymous author of the *Periplus of the Red Sea* 14, ed. Lionel Casson, *The Periplus Maris Erythraei: Text with Introduction, Translation, and Commentary* (Princeton, 1989), 58, lines 7–16, most probably an Egyptian Greek merchant, who recounts his experiences in an attempt to provide a guide for traders, refers to *sakchari* (σάκχαρι) as an export from the Indian port of Barygaza (modern Bharuch) to the Arabian Peninsula, although it is not clear whether he is referring to cane sugar or granulated sugar; cf. E. H. Warmington, *The Commerce between the Roman Empire and India*, 2nd ed. (London, 1974), 208–10. On maritime trade routes from Asia to Europe in the early centuries AD, see the most recent study by Matthew Adam Cobb, *Rome and the Indian Ocean Trade from Augustus to the Early Third Century CE*, *Mnemosyne Bibliotheca Classica Batava Supplementum* 418 (Leiden, 2018), 127–48.

<sup>22</sup> Dioscorides, *De materia medica* 2.82, ed. Wellmann, 1:167, lines 4–9: “there is a kind of solidified (πεπηγότος/*pepēgotos*) honey in India and Arabia Felix, that is called sugar (σάκχαρον/*sakcharon*), and is found in reeds, like in consistency to salt and brittle when broken between the teeth, as salt is”; Pliny the Elder, *The Natural History* 12.32, ed. Alfred Ernout, *Pline l’Ancien: Histoire Naturelle, Livre XII* (Paris, 1949), 29, lines 16–20; Galen, *Therapeutic Method* 9.4, ed. Kühn, *Claudii Galeni*, 10:568, line 1; and Galen, *On the Capacities of Simple Drugs* 7.9, ed. Kühn, *Claudii Galeni*, 12:71, lines 2–9. Cf. Varro (116–27 BC), as cited by Isidore of Seville (d. AD 636), *Etymologies* 17.7.58, ed. and trans. Jacques André, *Étymologies: Livre XVII, De l’agriculture* (Paris, 1981), 127, line 11–129, line 5. See also the brief reference in a similar vein in Pseudo-Alexander of Aphrodisias (first/second century AD), *Problemata*, ed. Sophia Kapetanaki and Robert W. Sharples, *Pseudo-Aristoteles (Pseudo-Alexander), “Supplementa Problematorum”: A New Edition of the Greek Text with Introduction and Annotated Translation*, *Peripatoi* 20 (Berlin, 2006), 92, lines 6–7, and cf. Josephus (first century AD), *Judean Antiquities* 3.172, ed. Benedikt Niese, *Flavii Iosephi Opera*, vol. 1, *Antiquitatum iudaicarum et vita* (Berlin, 1887), 193, line 7. On the debatable nature of Greek and Roman accounts of sugar, see Mohamed Ouerfelli, *Le Sucre: Production, commercialisation et usages dans la Méditerranée médiévale*, *Medieval Mediterranean* 71 (Leiden, 2008), 15–19, and Tsugitaka Sato, *Sugar in the Social Life of Medieval Islam*, *Islamic Area Studies* 1 (Leiden, 2015), 16–17. Cf. Jacques André, *L’Alimentation et la cuisine à Rome*, 2nd ed. (Paris, 1981), 186 n. 2, and Jacques André and Jean Filliozat, *L’Inde vue de Rome: Textes latins de l’antiquité relatifs à l’Inde* (Paris, 1986), 339 n. 3, and 360–61 n. 160, who argue that the early use of the word in Greek and Roman authors refers to what is usually called *tabasheer*, a white silicon accretion collected from the nodal joints of some species of bamboo.

century; d. after AD 642), while Alexander of Tralles (AD c. 525–c. 605), who gives evidence of a great deal of clinical experience in his pharmacological recommendations, does not refer to the substance.<sup>23</sup> There is no attested use of sugar in cooking, which—given the limited references to it in medical writings—implies that this item was in extremely restricted circulation in the ancient and early medieval Mediterranean.<sup>24</sup> This is also in line with the absence of sugar from Diocletian's (r. 284–305) edict on prices (301),<sup>25</sup> and with the list of ingredients subjected to import duties in Justinian's (r. 527–65) *Digest*,<sup>26</sup> although there is mention of other oriental<sup>27</sup> spices, such as cassia, ginger, myrrh, and pepper, in both of them. Furthermore, the substance is not mentioned by Kosmas Indikopleustes (fl. first half of the sixth century), the famous Alexandrian merchant, who wrote a work containing some valuable information about Byzantine trade with Africa and Asia, including new material about recently introduced ingredients (e.g. musk).<sup>28</sup> Lastly, it should be mentioned that sugar (σάχαρ/*sachar*) is listed among the luxury commodities and oriental spices, such as silk, aloe, pepper, and ginger, that were found by the army of Emperor Heraklios (r. 610–41) at Khosrow II's (r. 590–628) palace in Dastagard, during the former's expedition to Persia in early 628,<sup>29</sup> which confirms that sugar

<sup>23</sup> Oribasios, *Medical Collections* 15.1, ed. Raeder, 1/2:264, lines 18–22, and Paul of Aegina, *Epitome* 7.3, and cf. 2.53, ed. Heiberg, 2:241, lines 3–6, and cf. 1:122, lines 1–4. It is worth noting that in Byzantine sources the term is mostly attested as σάχαρ (*sachar*), following the ancient Greek σάκχαρ[ον] deriving from Sanskrit (see note 21, above), but reflecting the vernacular pronunciation after the simplification of the consonant cluster (κχ/kch) to a single consonant (χ/ch). On Alexander of Tralles's original contributions to pharmacology, see Petros Bouras-Vallianatos, "Clinical Experience in Late Antiquity: Alexander of Tralles and the Therapy of Epilepsy," *Medical History* 58 (2014): 337–53, at 344–48.

<sup>24</sup> It is notable, for example, that we have plenty of evidence for the use of other oriental ingredients, such as cinnamon from south or southeastern Asia, a substance which Galen himself used very often and which he was eager to admit to storing large quantities of; see Galen, *Avoiding Distress* 6, ed. and trans. Véronique Boudon-Millot, Jacques Jouanna, and Antoine Pietrobelli, *Galien*, vol. 4, *Ne pas se chagriner*, Collection des Universités de France Série Greque 459 (Paris, 2010), 4, lines 2–5 = 2, edited in Paraskevi Kotzia and Panagiotis Sotiroudis, "Γαληνοῦ Περὶ Ἀλοπίας," *Ἑλληνικά* 60 (2010): 63–150, at 67, lines 25–28. Cf. Manfred G. Raschke, "New Studies in Roman Commerce with the East," *Aufstieg und Niedergang der römischen Welt* 9/2 (1978): 604–1378, at 652–55.

<sup>25</sup> Michael H. Crawford and Joyce M. Reynolds, "The Aezani Copy of the Prices Edict," *Zeitschrift für Papyrologie und Epigraphik* 34 (1979): 163–210, at 181–84.

<sup>26</sup> *Digest* 39.4.16.7, ed. Paul Krueger and Theodor Mommsen, *Corpus Iuris Civilis*, vol. 1 (Berlin, 1872), 606.

<sup>27</sup> I prefer to use the term *oriental* to denote substances originating from India and the Far East, rather than *exotic*, which might refer more generally to something foreign or tropical. The term has been used with reference to the import of spices from Asia to the Mediterranean by David Jacoby. See, for example, Jacoby, "Byzantine Trade with Egypt from the Mid-Tenth Century to the Fourth Crusade," *Θησαυρίσματα* 30 (2000): 25–77, at 30, and David Jacoby, "Constantinople as Commercial Transit Center, Tenth to Mid-Fifteenth Century," in *Trade in Byzantium: Papers from the Third International Sevgi Gönül Byzantine Studies Symposium*, ed. Paul Magdalino, Nevra Necipoğlu, and Ivana Jevtić (Istanbul, 2016), 193–210, at 196.

<sup>28</sup> Kosmas Indikopleustes, *Christian Topography* 11.6, ed. and trans. Wanda Wolska-Conus, *Cosmas Indicopleustès: Topographie chrétienne*, vol. 2, *Livre V*, Sources chrétiennes 159 (Paris, 1970), 324–25. On Kosmas's work and its dissemination in Byzantium, see Maja Kominko, *The World of Kosmas: Illustrated Byzantine Codices of the Christian Topography* (Cambridge, UK, 2013).

<sup>29</sup> Theophanes Confessor, *Chronicle*, ed. Carl G. De Boor, *Theophanis Chronographia*, vol. 1, *Textum graecum continens* (Leipzig, 1883), 322, lines 1–6. See also Walter Emil Kaegi, *Heraclius, Emperor of Byzantium* (Cambridge, UK, 2003), 172–73.



was—at least to some extent—in circulation in the Sasanian Empire in the seventh century.

### 1.2. *The Islamic World*

Sugarcane was introduced from India to Persia and its cultivation gradually spread throughout the Islamic East, especially from the seventh/eighth century onward, a period in which the advancement of new refining techniques made granulated sugar more widely available.<sup>30</sup> Granulated white sugar was a manufactured product and, compared to other vegetal substances such as ginger or violets, its production involved a substantial investment in capital and labor. To summarize the process, cut sugarcane stalks were pressed under a millstone, usually turned by oxen and in later periods by horses, until the juice had been collected in a vessel. The boiled juice was then filtrated to remove non-sugar impurities. Pouring water on the surface of the boiled juice helped to separate the denser mass of molasses (a viscous by-product), thus producing a cone-shaped solid of raw (also called red) sugar (قند/*qand* or سكر أحمر/*sukkar aḥmar*). White sugar (سكر أبيض/*sukkar abyad*) and solid white sugar (سكر طبرزد/*sukkar ṭabarzad*) were produced by further refinement and the addition of clarifying agents, such as milk.<sup>31</sup>

In the medieval Islamic world, sugar was reserved mainly for medicinal purposes. Its culinary use was restricted to special events or festivals and to the aristocratic elites who were able to afford it.<sup>32</sup> But why did they prefer to use sugar in daily medical practice rather than honey, which was available in abundance and cost less? Why did they invest so much in the processing from plantation to manufacture? The answer to this question is not straightforward, and our evidence nowadays is limited to a few accounts by medical authors. Sugar seems to have been introduced into medicine by Indian physicians.<sup>33</sup> Knowledge of its use for medicinal purposes was made known to the Islamic world through translations of Sanskrit medical works into Arabic.<sup>34</sup> It is described by Yūḥannā ibn Māsawayh (d. 857) as a hot and moist

<sup>30</sup> Andrew M. Watson, *Agricultural Innovation in the Early Islamic World: The Diffusion of Crops and Farming Techniques, 700–1100* (Cambridge, UK, 1983), 24–30; Ouerfelli, *Sucre*, 19–24; and Sato, *Sugar*, 18–21. The sugarcane plant was most probably domesticated in an area between New Guinea and Indonesia before its introduction into India and South China at some unknown point before the common era; see Sato, *Sugar*, 15–16, who provides an overview of the available theories on this development.

<sup>31</sup> On the production of the various kinds of sugar and its by-products, see Sato, *Sugar*, 33–50.

<sup>32</sup> Ouerfelli, in his massive study *Sucre* (659–60, 666–67), states that sugar was first and foremost used in medicine and pharmacopoeia and that in both the medieval Islamic and Christian worlds only the princely courts and the richest social strata integrated sugar into their cuisine. It was not until the eighteenth century that sugar became cheap and a staple ingredient, according to Sidney W. Mintz, *Sweetness and Power: The Place of Sugar in Modern History* (New York, 1985), 45.

<sup>33</sup> See Lallanji Gopal, “Sugar-Making in Ancient India,” *Journal of the Economic and Social History of the Orient* 7 (1964): 57–72, at 60, who provides references from the compendiums (*Samhitā*) of Caraka and Suśruta.

<sup>34</sup> Ouerfelli, *Sucre*, 503–8. It is worth noting that in his comprehensive analysis of the Sanskrit sources in Abū Bakr al-Rāzī’s *Comprehensive Book* [*Kitāb al-ḥāwī*], Oliver Kahl has shown that some sugar-based composite drugs originate in Caraka’s *Samhitā*; see, for example, Oliver Kahl, *The Sanskrit, Syriac and Persian Sources in the Comprehensive Book of Rhazes*, Islamic Philosophy, Theology and Science: Texts and Studies 93 (Leiden, 2015), 91–92, no. 10.

substance that is effective for stomach complaints, especially for those suffering from an excess of yellow bile.<sup>35</sup> In a similar manner, Abū Bakr al-Rāzī (d. c. 925) emphasizes its important dietetic value in restoring the qualitative balance in the patient's body.<sup>36</sup> Mohamed Ouerfelli, having critically examined a large corpus of Arabic medical texts dating from the eighth to the thirteenth century, has shown that the popularity of sugar for dietetic purposes gradually increased from the eighth century onward, especially as an agent for restoring appetite used in dishes prepared for the sick and the elderly.<sup>37</sup> Furthermore, sugar has a higher glycemic index than honey, meaning that it raises blood sugar levels more quickly. Sugar was also recommended as a particularly effective simple drug to relieve pain in the chest, lungs, and kidneys, and for inflammation of the eyelid.<sup>38</sup>

It became equally popular as an excipient in liquid pharmaceutical dosage forms in the Arabic medical tradition,<sup>39</sup> used as a sweetener in order to alleviate the bitter taste of other ingredients and as a preservative.<sup>40</sup> Sugar is also less susceptible to changes in temperature, and ensures greater homogeneity and better fluidity in the final product. It also travels better and was available all year round, unlike honey, which easily becomes thick and congeals at lower temperatures in winter.

Sugar-based composite drugs can be found in Arabic hospital formularies dated as early as the ninth century.<sup>41</sup> Among the most popular forms were juleps and syrups. The Arabic word جلاب (*julāb*) comes from the Persian گل (*gul*, rose) and

<sup>35</sup> This reference survives in Ibn al-Bayṭār's (d. 1248), *Comprehensive Book of Simple Drugs and Aliments* [*al-Jāmi' li-mufradāt al-adwiyah wa-al-aghdhīyah*], 4 vols. (Būlāq, 1874; repr. Baghdad, n.d.), 3:22.

<sup>36</sup> Al-Rāzī, *Book on the Benefits of Aliments* [*Kitāb manāfi' al-aghdhīyah*], ed. 'Āṣim 'Aytānī (Beirut, 1985), 226. I am indebted to Ouerfelli, *Sucre*, 542 n. 212, for this reference.

<sup>37</sup> Ouerfelli, *Sucre*, 541–45.

<sup>38</sup> See the account of Ibn al-Bayṭār, *Comprehensive Book of Simple Drugs and Aliments* [*al-Jāmi' li-mufradāt al-adwiyah wa-al-aghdhīyah*], 3:22–23, which provides a long description of the use of sugar as a simple, including the views of several notable earlier physicians from the ninth to the thirteenth centuries. On the use of sugar as a simple drug in the Arabic medical tradition, see also further primary sources provided by Ouerfelli, *Sucre*, 546–49; Efraim Lev and Zohar Amar, *Practical "Materia Medica" of the Medieval Eastern Mediterranean According to the Cairo Geniza*, Brill Academic Publishers 7 (Leiden, 2008), 294–97; and Sato, *Sugar*, 91–103. Cf. Ibn Zuhr (d. 1131), who wrote a special *Epistle on the Preference of Honey over Sugar* [*Risālah fī tafḍīl al-'asal 'alā al-sukkar*], ed. Muḥammad al-'Arabī al-Khattābī, *al-Tibb wa-al-atībbā' fī al-Andalus al-Islāmīyah*, vol. 1 (Beirut, 1988), 310–11.

<sup>39</sup> For an introduction to sugar-based potions in the Arabic medical tradition, see Martin Levey, *Early Arabic Pharmacology: An Introduction Based on Ancient and Medieval Sources* (Leiden, 1973), 75–78, and Ouerfelli, *Sucre*, 549–67.

<sup>40</sup> The preservative action of sugar is emphasized by, for example, al-Kūhīn al-'Aṭṭār (fl. second half of the thirteenth century), *The Management of the (Pharmacist's) Shop* [*Minhāj al-dukkān*], ed. Ḥasan al-'Āṣī (Beirut, 1992), 60, 270, 300–1. The microbial cells of bacteria die in sugar solutions due to plasmolysis. On plasmolysis, see Wilhelm Ruhland, *Handbuch der Pflanzenphysiologie*, vol. 1 (Berlin, 1955), 383–84. Sugar is still used nowadays for the preservation of jams and jellies.

<sup>41</sup> See, for example, the recipes in the *Small Dispensatory* [*al-Aqrābādīn al-ṣaghīr*] of Sābūr ibn Sahl (d. 869), (the earliest manuscript, i.e., Berlin, Staatsbibliothek, MS or. oct. 1839, dates to c. 912), 213, 319, 321, 326, 335, published as Sābūr ibn Sahl, *Dispensatorium parvum* [*al-Aqrābādīn al-ṣaghīr*], ed. Oliver Kahl, *Islamic Philosophy, Theology, and Science* 16 (Leiden, 1994), 136, 178, 179, 181, 182. See also the recipes in al-Kindī's (d. shortly after 870) *Dispensatory* [*Aqrābādīn*], 9, 77, 91, 99, photocopy of Arabic text and translation in Martin Levey, trans., *The "Medical Formulary," or, "Aqrābādīn" of Al-Kindī* (Madison, WI, 1966), 38–41, 94–97, 106–7, 110–11.

آب (*āb*, water).<sup>42</sup> According to Ibn Sīnā (d. 1037),<sup>43</sup> the original julep was made of sugar, water, and rosewater.<sup>44</sup> The julep itself could be used as a basic ingredient for the preparation of syrups or other liquid composite drugs.<sup>45</sup> An equally popular sugar-based potion of higher viscosity was syrup (شراب */sharāb*), which contains more sugar (or occasionally honey, if sugar was not readily available),<sup>46</sup> mixed with water and one or more kinds of fruit juices or extracts of flowers.<sup>47</sup> It is worth noting that evidence from the next few centuries shows that in areas in which there was large-scale production of sugar, such as Egypt, sugar almost entirely replaced honey in the preparation of potions. This is reported by al-Kūhīn al-‘Aṭṭār (fl. second half of the thirteenth century), who aptly described pharmacy as “the craft of perfume and syrups.”<sup>48</sup> Lastly, there is also evidence of other liquid dosage forms containing sugar, such as the rob (رَبّ */rubb*) and the lohoch (لَعُوق */la‘ūq*), while sugar could also be used in enemas, suppositories, pills, and pastilles.<sup>49</sup>

<sup>42</sup> Irene Fellmann, “Das *Aqrābādīn al-Qalānisi*: Quellenkritische und begriffsanalytische Untersuchungen zur arabisch-pharmazeutischen Literatur, Beirut Texts and Studies 35 (Beirut, 1986), 201.

<sup>43</sup> See the julep recipe by Ibn Sīnā, *Canon of Medicine [Kitāb al-qānūn fī al-ṭibb]*, 3 vols. (Būlāq, 1877), 3:366, which consists of 1 *mann* (~816g) of sugar and 4 fluid ounces of water which are heated over a fire with the addition of 2 fluid ounces of rosewater.

<sup>44</sup> Rosewater was obtained by the distillation of roses. See Ahmad Y. al-Hassan and Donald R. Hill, *Islamic Technology: An Illustrated History* (Cambridge, UK, 1992), 141–44, and Floréal Sanagustin, “Mā’ al-Ward,” in *Encyclopedia of Islam*, ed. Peri J. Bearman et al., 2nd ed. (Leiden, 2012), at [https://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/\\*-SIM\\_8797](https://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/*-SIM_8797) (last accessed 20 April 2020).

<sup>45</sup> See, for example, the sugar-based potions with a julep base in Ibn al-Tilmīdh’s (b. c. 1074) *Dispensatory [Aqrābādīn]* 154, 231, 244, ed. and trans. Oliver Kahl, *The Dispensatory of Ibn al-Tilmīdh: Arabic Text, English Translation, Study and Glossaries*, Islamic Philosophy, Theology, and Science 70 (Leiden, 2007), 95, 119, 123–24. See also the examples from recipes of syrups with a julep base in the Genizah collection, edited in Efraim Lev and Leigh Chipman, *Medical Prescriptions in the Cambridge Genizah Collections: Practical Medicine and Pharmacology in Medieval Egypt*, Études sur le judaïsme médiéval 55; Cambridge Genizah Studies 4 (Leiden, 2012), 40, 64, 94.

<sup>46</sup> Ouerfelli, *Sucre*, 553–54 n. 275 (and cf. 558 n. 301). It seems that sometimes a small quantity of honey or lemon juice could also be added to sugar-based potions in order to stop recrystallization of the sugar; see examples of such recipes in Leigh Chipman, *The World of Pharmacy and Pharmacists in Mamlūk Cairo*, Sir Henry Wellcome Asian 8 (Leiden, 2009), 105–7, and Leigh N. Chipman and Efraim Lev, “Syrups from the Apothecary’s Shop: A Genizah Fragment Containing One of the Earliest Manuscripts of *Minhāj al-dukkān*,” *Journal of Semitic Studies* 51 (2006): 137–68, at 147–48.

<sup>47</sup> On syrups, see Fellmann, *Das Aqrābādīn*, 269–71. See also the account in Ibn Sīnā, *Canon of Medicine [Kitāb al-qānūn fī al-ṭibb]*, 3:367ff. In the later sources, see also the special chapter on syrups and robs in al-Samarqandī’s (d. 1222), *Dispensatory [Aqrābādīn]*, 2, photocopy of Arabic text and English translation in Martin Levey and Noury al-Khaledy, *The Medical Formulary of Al-Samarqandī and the Relation of Early Arabic Simples to Those Found in the Indigenous Medicine of the Near East and India* (Philadelphia, 1967), 61–68, 283–90, and the long list of 144 examples of syrups in al-Kūhīn al-‘Aṭṭār’s *The Management of the (Pharmacist’s) Shop [Minhāj al-dukkān]*, ed. al-‘Āṣī, 17ff.

<sup>48</sup> Mohamed Ouerfelli, “Les usages du sucre dans le manuel de pharmacie de Cohen al-‘Aṭṭār, médecin juif du Caire au XIIIe siècle,” *Anuario de Estudios Medievales* 43/1 (2013): 243–58.

<sup>49</sup> See, for example, the recipes in al-Tilmīdh’s *Dispensatory [Aqrābādīn]* 35, 49, 66, 163, 169, 178, ed. and trans. Kahl, *The Dispensatory of Ibn al-Tilmīdh*, 59, 62, 67, 98, 99, 101 and 190, 193, 198, 231, 232, 234.

2. INTRODUCTION OF SUGAR-BASED COMPOSITE DRUGS  
TO BYZANTIUM (TENTH–TWELFTH CENTURIES)

2.1. *Some Thoughts on Interactions in the Periphery: Syro-Palestine and Egypt*

One area that was a major point of contact between Muslims and Christians was Syro-Palestine, where the cultivation of sugarcane is attested to by the tenth century.<sup>50</sup> Traders from this area, who might have been introduced to the use of sugar in medicine, are known to have regularly visited Constantinople and been in contact with local merchants. For example, according to the *Book of the Prefect* there were so-called Syrians in late ninth-/early tenth-century Constantinople,<sup>51</sup> traders from “Syria” (ἀπὸ Συρίας, Σύρου/απο Συρίας, *Syroi*), who were restricted to a particular place, known as the *mitaton*, and limited to visits of no more than three months,<sup>52</sup> while the same source also reports a category of more permanently established Syrians who had spent more than ten years in the city.<sup>53</sup> These Syrians were presumably Muslims, although the group might have included some Arab Christians.<sup>54</sup> The *Book of the Prefect* confirms that they also supplied the so-called μυρεψοί (*myrepsoi*, perfumers) in Constantinople, but the exact names of the commodities are not given in this case.<sup>55</sup>

<sup>50</sup> Ouerfelli, *Sucre*, 31–46. It is also worth mentioning that the Byzantines captured Antioch in 969 and reestablished the Byzantine province of Syria.

<sup>51</sup> See Johannes Koder, “The Authority of the Eparchos in the Marks of Constantinople (according to the Book of the Eparch),” in *Authority in Byzantium*, ed. Pamela Armstrong, Centre for Hellenic Studies King’s College London Publications 14 (Farnham, UK, 2013), 83–108, at 85, who states that this decree was probably promulgated in AD 886. The *Book of the Prefect* mentions twenty-two guilds.

<sup>52</sup> *Book of the Prefect* 5.4–5, ed. Johannes Koder, *Das Eparchenbuch Leons des Weisen*, Corpus Fontium Historiae Byzantinae 33 (Vienna, 1991), 94, line 282, to 96, line 294. On Syrian merchants in Constantinople as represented in the *Book of the Prefect*, see the useful discussion by Stephen W. Reinert, “The Muslim Presence in Constantinople, 9th–15th Centuries: Some Preliminary Observations,” in *Studies on the Internal Diaspora of the Byzantine Empire*, ed. Hélène Ahrweiler and Angeliki E. Laiou (Washington, DC, 1998), 125–50, at 131–35.

<sup>53</sup> *Book of the Prefect* 5.2, ed. Koder, *Das Eparchenbuch*, 94, lines 274–75.

<sup>54</sup> Reinert, “The Muslim Presence,” 132 n. 24. By the tenth century, a mosque was functioning in Constantinople, but it need not necessarily have been connected with these merchants. For a recent study on the mosque, and its potential connections with the Syrian merchants, see Glair D. Anderson, “Islamic Spaces and Diplomacy in Constantinople (Tenth to Thirteenth Centuries C.E.),” *Medieval Encounters* 15 (2009): 86–113.

<sup>55</sup> *Book of the Prefect* 5.4, ed. Koder, *Das Eparchenbuch*, 94, line 284. It is worth noting that in the chapter devoted to the *myrepsoi*, Trebizond and the Chaldea (the general area of the Byzantine Theme of Chaldea in Northeastern Asia Minor or perhaps even Persia) are also mentioned as the source of supply for their products, and there is a vague reference to “some other places” (καὶ ἐξ ἄλλων τινῶν τόπων); see *Book of the Prefect* 10.2, ed. Koder, 110, lines 470–72. Sugar is not included among the named spices, such as pepper, frankincense, cinnamon, ambergris, and musk, sold by *myrepsoi* (*Book of the Prefect* 10, ed. Koder, 110, line 456, to 112, line 493), or the products sold by grocers (σαλδαμάριοι/*saldamarioi*), such as cheese, honey, dried and liquid pitch, hemp, cade oil, and linseed (*Book of the Prefect* 13, ed. Koder, 118, line 559, to 120, line 387). The *myrepsoi* were sellers of spices sold by weight and they were located in the Portico of Achilles between the Million and the Chalke Gate. On *myrepsoi* and *saldamarioi* and their commercial activity in tenth-century Constantinople, see Marlia Mundell Mango, “The Commercial Map of Constantinople,” *Dumbarton Oaks Papers* 54 (2000): 189–207, at 199–201.

A thriving industry in the cultivation of sugarcane for the production of sugar, which encouraged a more widespread use of the product in medicine in the Islamic Mediterranean world, is also attested by the tenth century in Egypt.<sup>56</sup> The Byzantines had strong diplomatic connections, including trade agreements, with Egypt in the tenth and eleventh centuries.<sup>57</sup> During this period Egypt was also a major supplier of oriental commodities in the Mediterranean, including spices and aromatics, coming from Southern and Eastern Asia.<sup>58</sup> The extensive sea trade, in particular between Byzantium and the Fatimid Caliphate (969–1171), only declined after the late eleventh/early twelfth century, when the Italians took over these routes to a large extent.<sup>59</sup> We are aware that medicinal substances from Egypt, which constituted a recognized category of commodities, had often reached Byzantium,<sup>60</sup> although we have little information about the specific names of spices.

## 2.2. *The Oneirokritikon of Achmet: The Earliest Textual Source?*

What is perhaps the earliest reference to a liquid concoction involving sugar is found in a non-medical Byzantine text, the so-called *Oneirokritikon* ascribed to Achmet. This is a dream book which was put together by a Greek compiler at some point after 843 and before the middle of the eleventh century, but most probably in the tenth century.<sup>61</sup> In her comprehensive study of the work, Maria Mavroudi has shown that a substantial part of its contents must derive from Arabic sources; consequently, the Greek compiler would have been involved in a process of Christianizing the Muslim material to suit the sensibilities of a contemporary Byzantine Christian audience, which is why he mostly identified these sources as “Indian.”<sup>62</sup> The sole reference to a “julep” in the text is found in a chapter entitled “From the Indians on wine and beverages” and reads as follows: “If someone dreams that he drank wine made of sugar (σαχάριτος/*sacharitos*), the so-called

<sup>56</sup> Ouerfelli, *Sucre*, 67–102.

<sup>57</sup> Reinert, “The Muslim Presence,” 135–40, and Jacoby, “Byzantine Trade with Egypt,” 30–47.

<sup>58</sup> Jacoby, “Byzantine Trade with Egypt,” 30–31. Cf. David Jacoby, “Byzantine Maritime Trade, 1025–1118,” *Travaux et Mémoires* 21/2 (2017): 627–48, at 639–40.

<sup>59</sup> Jacoby, “Byzantine Trade with Egypt,” 47–61, 75–77.

<sup>60</sup> See, for example, a mention of Egyptian drugs (τῶν αἰγυπτίων ἐκεῖνων φαρμάκων) in a letter written by Symeon *prōtasēkrētis* (c. tenth century), 87, published in Jean Darrouzès, ed., *Épistoliers byzantins du Xe siècle*, Archives de l’Orient Chrétien 6 (Paris, 1960), 148, lines 7–8. On the date of the collection, see Darrouzès, ed., *Épistoliers*, 33–38, and cf. Alexander Kazhdan, “Symeon Logothete,” in *Oxford Dictionary of Byzantium*, ed. Alexander Kazhdan, 3 vols. (Oxford, 1991), 3:1982–83.

<sup>61</sup> Mavroudi, *Byzantine Book on Dream*, 1–5.

<sup>62</sup> Mavroudi, *Byzantine Book on Dream*, 41–59. It is noteworthy that the *Oneirokritikon* has some similar interpretations to the well-known Greek dream book, the so-called *Oneirokritika*, written by Artemidoros (second century AD). Mavroudi, *Byzantine Book on Dream*, 168–236, has convincingly argued that the Greek author of the *Oneirokritikon* did not use Artemidoros’s Greek text directly, but that some similarities were derived from Arabic sources that had borrowed elements from the Arabic translation of Artemidoros’s text, whereas Steven M. Oberhelman, *The Oneirocriticon of Achmet: A Medieval Greek and Arabic Treatise on the Interpretation of Dreams* (Lubbock, 1991), 18–19, 289–95, had previously argued for a direct influence from Artemidoros’s Greek text on the *Oneirokritikon*.



julep (ζουλάπιν/*zoulapin*),<sup>63</sup> if he got drunk, he will find wealth and power through toil because of the fire.”<sup>64</sup>

The potion called “julep” here is a simple mixture of sugar<sup>65</sup> with wine, which recalls the popular later Byzantine potion *oxosachar*, made of vinegar and sugar, which will be discussed below. Furthermore, there is no mention of rosewater or any other reference that could imply a process of distillation.<sup>66</sup> Mavroudi states that “the presence of this word [i.e., julep] in the *Oneirocriticon* which, on the basis of its manuscript tradition, was undoubtedly put together before the middle of the 11th century, indicates that *zoulapi* was introduced to Byzantine medicine even earlier, especially because its Hellenized form is already stable and because in the *Oneirocriticon* it is talked about as if it is a well-known item that requires no

<sup>63</sup> Other variants included in the *apparatus criticus* of Franz Drexl’s edition, *Achmetis Oneirocriticon* (Leipzig, 1925), 150, read ζουλάπι (*zoulapi*) and ζουλάπιον (*zoulapion*). The earliest Greek manuscript, i.e., Paris, Bibliothèque nationale de France, MS suppl. gr. 690, which is dated according to Gabriel Rochefort, “Une anthologie grecque du XIe siècle: le *Parisinus suppl. gr. 690*,” *Scriptorium* 4 (1950): 3–17, to between 1075 and 1085 on the basis of palaeographical evidence, contains an abridged text, which does not include the chapter referring to julep (see Daria Gigli, “Gli onirocritici del cod. Paris. Suppl. gr. 690,” *Prometheus* 4 [1978]: 65–86, 173–88, at 80 n. 57. Cf. Mavroudi, *Byzantine Book on Dream*, 431–44). The dating of BnF suppl. gr. 690 has been questioned by some scholars who have suggested a twelfth-century dating; see Marc D. Lauxtermann, *Byzantine Poetry from Pisides to Geometres: Texts and Contexts*, 2 vols., Wiener Byzantinistische Studien 24 (Vienna, 2003–19), 1:329–33, with relevant bibliographical references. The next earliest surviving manuscript, which is also the first Greek manuscript to retain the chapter referring to juleps, is Vienna, Österreichischen Nationalbibliothek, MS philol. et philol. gr. 111 (thirteenth century), while the vast majority of witnesses date to the fourteenth and fifteenth centuries. Moreover, mention should be made of the existence of two medieval translations of the text from Greek into Latin (see Mavroudi, *Byzantine Book on Dream*, 111–19); perhaps the oldest surviving witness is Oxford, Bodleian Library, MS Digby 103 (late twelfth century), which includes the twelfth-century Latin translation of the work by Leo Tuscus and predates all but one of the Greek manuscripts. It is worth noting that Oxford, Bodleian Library, MS Digby 103, chapter 107, fol. 102r, retains the term *siropus* and the reference to sugar in the relevant chapter: “Si quis videat se bibere vinum de sachare, quod dicitur siropus, si inebriatus fuerit, inveniet divicias cum labore propter ignem; si non sit inebriatus, ad divicias tantum refertur.” I thank Roberta Giubilini for kindly making this transcription. Leo Tuscus’s translation is addressed to his brother Hugo Eterianus and both were twelfth-century Pisan intellectuals active in the court of the Byzantine emperor Manuel I Komnenos (r. 1143–80). Charles H. Haskins, “Leo Tuscus,” *Byzantinische Zeitschrift* 24 (1923–24): 43–47, dates the translation to around 1176.

<sup>64</sup> Anonymus, *Oneirokritikon of Achmet* 195, ed. Drexl, *Achmetis Oneirocriticon*, 150, lines 21–23: “Εἰ δὲ ἴδῃ τις, ὅτι ἐπιεν οἶνον ἀπὸ σαχάριτος τὸ λεγόμενον ζουλάπιν, εἰ μὲν ἐμεθύσθη, εὐρήσει πλοῦτον καὶ ἐξουσίαν μετὰ κόπου διὰ τὸ πῦρ.” A brief dream interpretation on julep also survives as part of a collection in a fourteenth-century codex, Oxford, Bodleian Library, MS Clarke gr. 16 (fols. 107v–120r), attributed to Patriarch Nikephoros I (806–15), ed. Giulio Guidorizzi, *Libro dei Sogni* (Naples, 1980), 76, line 42.

<sup>65</sup> Sugar (σάχαρ/*sachar*) itself appears in three more chapters of the *Oneirokritikon of Achmet* 196, 241, 249, ed. Drexl, *Achmetis Oneirocriticon*, 152, lines 19–20; 197, line 7; and 206, lines 9, 16, and 18.

<sup>66</sup> Mavroudi, *Byzantine Book on Dream*, 346, supplements her translation of the relevant passage by referring to “fire <of the distillation>.” I think that the reference to “fire” (πῦρ/*pyr*) could simply be interpreted as some sort of boiling process to accelerate the dissolving of the sugar. Cf. Oberhelman’s translation, *Oneirocriticon of Achmet*, 184: “If someone dreams that he drank wine made with sugar, that is, julep, if he became drunk, he will find power and wealth, but with pain and toil because of the fire.”

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further explanation.”<sup>67</sup> This is indeed a possibility, although we have no information as to whether the *julep* was prepared in Byzantium or was transported there. If we take the reference at face value, it confirms that there was awareness of sugar-based potions in Byzantium by the mid-eleventh century at the latest. Nevertheless, it is impossible to assess to what degree this dream book reflects Byzantine reality, since a large part of its contents derive from earlier, mostly Arabic, sources.<sup>68</sup>

### 2.3. *The Macedonian Court*

Meanwhile, some sort of knowledge of the preparation of sugar-based potions seems to have been acquired in Byzantine imperial circles through direct contact with the Arabs, at least during the tenth century. Several embassies were exchanged between the Byzantines and the Islamic rulers of the Abbasid (Baghdad), Fatimid (North Africa and Egypt), and Umayyad (Córdoba) Caliphates.<sup>69</sup> Embassies involved the exchange of gifts, often including valuable oriental spices.<sup>70</sup> A surviving Greek translation of a letter from the son of the Fatimid Caliph to Romanos (later Romanos II, sole r. 959–63), son of Constantine VII (sole r. 945–59), connected with the frequent embassies between the two states in the late 950s, provides a unique testimony to Arab-Byzantine pharmaceutical diplomacy. The letter was accompanied by a gift in the form of a precious substance, an invaluable sort of panacea drug, the rare mineral called *μουμιέ* (*moumie*) in Greek,<sup>71</sup> known in Arabic as *موميا* (*mūmiyā*).<sup>72</sup> Romanos II's particular interest in pharmacology is also attested by

<sup>67</sup> Mavroudi, *Byzantine Book on Dream*, 406 n. 54, and cf. 77–78 n. 64.

<sup>68</sup> It should be noted that neither the term *julep* nor any similar mixture including sugar is mentioned in the Arabic sources cited by Mavroudi, *Byzantine Book on Dream*, 347–52, in her analysis in this particular chapter.

<sup>69</sup> On Byzantine-Arab embassies see Nicholas Drocourt, “Christian-Muslim Diplomatic Relations: An Overview of the Main Sources and Themes of Encounter (600–1000),” in *Christian-Muslim Relations: A Bibliographical History*, vol. 2, (900–1050), ed. David Thomas and Alex Mallett, History of Christian-Muslim Relations 14 (Leiden, 2010), 29–72.

<sup>70</sup> On diplomatic gifts exchanged between Islam and Byzantium, see Anthony Cutler, “Gifts and Gift Exchange as Aspects of the Byzantine, Arab, and Related Economies,” *Dumbarton Oaks Papers* 55 (2001): 247–78. On spices, see Koray Durak, “Dioscorides and Beyond: Imported Medicinal Plants in the Byzantine Empire,” in *Life Is Short, Art Long: The Art of Healing in Byzantium*, ed. Brigitte Pitarakis, Publications 73 (Istanbul, 2015), 152–60, at 154. For a list of relevant primary sources, see Maria Vaiou, trans., *Diplomacy in the Early Islamic World: A Tenth-Century Treatise on Arab-Byzantine Relations. The Book of Messengers of Kings (Kitāb Rusul al-Mulūk) of Ibn al-Farrā'*, Library of Middle East History 17 (London, 2015), 184–85 n. 186, and 214–16 n. 448.

<sup>71</sup> For an edition, English translation, and brief commentary of this letter, see Paul Magdalino, “Pharmaceutical Diplomacy: A New Document on Fatimid-Byzantine Gift Exchange,” in *Myriobiblos: Essays on Byzantine Literature and Culture*, ed. Theodora F. Antonopoulou, Sofia Kotzabassi, and Marina Loukaki, Byzantinisches Archiv 29 (Berlin, 2015), 245–51. The letter includes details on preparation and use of the mineral substance, which *inter alia* is extremely effective on any kind of fracture in humans and animals. On diplomatic relations between the Fatimid Caliphate and Byzantium in the tenth century, see Yaacov Lev, “The Fatimids and Byzantines, 10th–12th Centuries,” *Graeco-Arabica* 6 (1995): 190–208, at 192–203.

<sup>72</sup> On *mūmiyā* (bitumen or asphalt), see Michael Camille, “The Corpse in the Garden: Mumia in Medieval Herbal Illustrations,” in *Il cadavere / The Corpse*, ed. Catherine Chêne, Micrologus Library 7 (Florence, 1999), 297–318 and Miguel Ángel González Manjarrés, “Presencia de mumia en la medicina medieval (siglos XI–XIV),” in *Terapie e guarigioni: Convegno internazionale, Ariano Irpino, 5–7 ottobre*

the fact that he sent an illustrated Greek manuscript of Dioscorides's monumental work *De materia medica* to the Umayyad Caliph of Córdoba, 'Abd al-Raḥmān III (r. 929–61), in 948/9.<sup>73</sup> Most important, sugar (σάχαρ/*sachar*) is included in the appendix to the *Book of Ceremonies*, ascribed to Constantine VII Porphyrogenetos, among expensive spices, such as frankincense, cinnamon, musk,<sup>74</sup> and ambergris,<sup>75</sup> that the emperor should have with him when he goes on campaign along with rosewater (ρόδόσταγμα/*rhodostagma*).<sup>76</sup> This reference confirms that both sugar and rosewater, an important ingredient in the preparation of the original julep, had reached Byzantium by the tenth century; both are considered luxury items and are—at this stage—available, at least for imperial consumption. This is the earliest available, safely dated, written source that confirms the importing of sugar to Byzantium. Whether the rosewater, which involved a complicated and costly distillation technique,<sup>77</sup> was produced locally or imported remains unconfirmed.

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2008, ed. Agostino Paravicini Bagliani, Edizione Nazionale La Scuola Medica 6 (Florence, 2010), 163–97. I have recently discovered and am currently preparing an edition of an unedited Greek opuscle on this ingredient in Vatican City, Biblioteca Apostolica Vaticana, MS Vat. gr. 282 (fifteenth century), fol. 444v, lines 7–20: “Περὶ τῆς τοῦ μωμίου ἐνεργείας” [On the capacity of the *mōmion*].

<sup>73</sup> This information is provided by the Arab physician Ibn Abī Uṣaybī'ah (d. 1270), in his *Sources of Information on the Classes of Physicians* [*Uyūn al-ambā' fi ṭabaqāt al-aṭibbā'*] 13.36.2.2, ed. Emilie Savage-Smith, Simon Swain, and Geert Jan van Gelder, *A Literary History of Medicine Online* (Leiden, 2020), at <https://dh.brill.com/scholarlyeditions/library/urn:cts:arabicLit:0668IbnAbiUsaibia/> (last accessed 25 November 2020). On this embassy, see the discussion by Juan Signes Codoñer, “Bizancio y al-Ándalus en los siglos IX y X,” in *Bizancio y la península ibérica: De la antigüedad tardía a la edad moderna*, ed. Inmaculada Pérez Martín and Pedro Bádenas de la Peña, Nueva Roma 24 (Madrid, 2004), 177–245, at 218–244. See also the detailed entry in Franz Dölger, and Andreas Müller, and Alexander E. Beihammer, *Regesten der Kaiserurkunden des oströmischen Reiches von 565–1453*, vol. 1/2, *Regesten von 867–1025* (Munich, 2003), 89–90, no. 657.

<sup>74</sup> On this important animal substance, see note 93, below.

<sup>75</sup> Constantine VII Porphyrogenetos, *What should be observed when the great and high emperor of the Romans goes on campaign*, ed. and trans. John F. Haldon, *Constantine Porphyrogenitus: Three Treatises on Imperial Military Expeditions*, Corpus Fontium Historiae Byzantinae 28 (Vienna, 1990), 108, lines 219–22: “ἀλειπτά, καπνίσματα διάφορα, θυμιάμα, μαστίχην, λίβανον, σάχαρ, κρόκον, μόσχον, ἄμπαρ, ξυλαλοῖν ὕγρῶν καὶ ξηρῶν, κιννάμωμον ἀληθινὸν πρῶτον καὶ δεύτερον, καὶ ξυλοκιννάμωμον, μωρίσματα λοιπά.” Haldon, ed., *Three Treatises*, 214, considers that the text refers to *tabasbeer* not to sugar, relying on Jacques André's view; see note 22, above. According to Haldon, ed., *Three Treatises*, 54–61, some sections of this treatise seem to be derived from earlier material. On the complicated textual tradition of this text, see Michael Featherstone, “Further Remarks on the *De Cerimoniis*,” *Byzantinische Zeitschrift* 97 (2004): 113–21.

<sup>76</sup> Constantine VII Porphyrogenetos, *What should be observed when the great and high emperor of the Romans goes on campaign*, ed. Haldon, *Three Treatises* 106, lines 191–92.

<sup>77</sup> On the production of rosewater in the Islamic world, see note 44, above. A good introduction to the medieval West is provided by Michael Rogers McVaugh, “Chemical Medicine in the Medical Writings of Arnau de Vilanova,” *Arxiu de Textos Catalans Antics* 23/24 (2005): 239–67. There is no reliable study on the introduction of distillation techniques to Byzantine medicine and/or alchemy. There seems to be no knowledge of distillation in a medical context in the ancient Greek and early Byzantine world. See Mehrnaz Katouzian-Safadi, “La cornue et l'alambic: Instrument d'analyse et de preuve dans *Les doutes sur Galien* de Rāzī,” in *De Zénon d'Élée à Poincaré: Recueil d'études en hommage à Roshdi Rashed*, ed. Régis Morelon and Ahmad Hasnawi, Cahiers du Mideo 1 (Louvain, 2004), 377–89, who discusses al-Rāzī's criticism of Galen, who did not make use of distillation to detect the composition of vinegar. The frequent references in ancient Greek medical authors to ρόδινον ἔλαιον (*rhodinon elaion*, oil of roses), ροδίτης (*rhoditēs*, wine with roses), and ὕδροροσάτον (*hydorrosaton*, water with honey and roses) refer to the process of decoction not to distillation; see

One more reference in a medical text related to the revival of knowledge in the tenth-century Macedonian court helps us to better contextualize the use of sugar. The earliest reference to a sugar-based potion in a medical context in Byzantine literature is found in a manual on horse medicine, called the *Hippiatrica*. The recipe reads as follows: “Summertime drench. Two *hexagia*<sup>78</sup> of saffron; one ounce each of tragacanth, hyssop, marjoram, myrrh, frankincense, and sugar (σάχαρος/*sacharos*); steep these in rosewater (ρόδοστάγματι/*rhodostagmati*) and give it as a drink at the third part of the day [i.e. in the middle of the night].”<sup>79</sup> There are three other similar recipes in this chapter, in which honey is used as a sweetener,<sup>80</sup> but only in the recipe above do we see also the inclusion of rosewater.<sup>81</sup> I think this is not coincidental since there are no other mentions of these two ingredients in this recension. The recipe belongs to recension B of the *Hippiatrica*, whose earliest witness, Berlin, Staatsbibliothek, MS gr. 134 (Phillippicus 1538), dates to the tenth century and is connected with the imperial scriptorium of Constantine VII.<sup>82</sup> Anne McCabe has shown that, although the compilation was most probably first written down in late antiquity, the tenth-century re-edition includes notable mentions of oriental *materia medica*, such as ambergris and galangal, which are not found in earlier medical texts.<sup>83</sup> Thus, the surviving written

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the brief comment by R. J. Forbes, *Short History of the Art of Distillation: From the Beginnings Up to the Death of Cellier Blumenthal* (Leiden, 1948), 28. For examples of these decoctions, see Dioscorides, *De materia medica* 1.99, 5.27, ed. Wellmann, 1:90, line 1, to 91, line 10, and 3:21, line 18, to 22, line 5, and Paul of Aegina, *Epitome* 7.20, ed. Heiberg, 2:382, lines 9–15. Rosewater (ρόδοστάγματος/*rhodostagmatos*) is also mentioned once in the tenth-century practical medical handbook by Theophanes Chrysobalantes, although there is no mention of sugar in any of the recipes in the edited version. Theophanes Chrysobalantes, *Medical Epitome*, ed. Johannes S. Bernard, *Theophanis Nommi Epitome de curatione morborum Graece et Latine*, vol. 1 (Gotha, 1794), 316, line 1. In a large number of manuscripts, the work is dedicated to a certain Constantine Porphyrogenetos, most probably Constantine VII. See the relevant discussion on this by Joseph A. M. Sonderkamp, “Theophanes Nonnus: Medicine in the Circle of Constantine Porphyrogenitus,” *Dumbarton Oaks Papers* 38 (1984): 29–41. In correspondence, Barbara Zipser, who is currently working on a new edition of this text, confirmed that no references to sugar are found in any of the manuscripts.

<sup>78</sup> A *hexagon* is a unit of weight. According to Erich Schilbach, *Byzantinische Metrologie*, *Byzantinisches Handbuch* 4 (Munich, 1970), 183, 276, 1 *hexagon* is equal to 4.444 g.

<sup>79</sup> *Hippiatrica Berolinensia* 129.8, ed. Eugenius Oder and Karl Hoppe, *Corpus Hippocraticorum Graecorum*, 2 vols. (Leipzig, 1924–27), 1:386, lines 15–17: “Ἐγχυματισμὸς κάλοκαρινός. Κρόκου ἐξάγια δύο, τραγακάνθης, ὑσώπου, σαμνύχου, σμύρνης, λιβάνου, σάχαρος ἀνὰ γο α΄, ταῦτα ἐμβρέξας ἐν ρόδοστάγματι πότιζε τρίτον.” Cf. *Hippiatrica Lugdunensia* 5, ed. Oder and Hoppe, *Corpus Hippocraticorum*, 2:273, lines 24–27: “σάχαρ.”

<sup>80</sup> *Hippiatrica Berolinensia* 129.4–5, 129.9, ed. Oder and Hoppe, 1:386, lines 3–7 and 18–20.

<sup>81</sup> Cf. recipes nos. 371 and 374 in the Latin veterinary manual by Pelagonius (fl. late fourth century), in which there is reference to “rosato” and “oleum rosacium” respectively, Klaus-Dietrich Fischer, ed., *Pelagonii Ars veterinaria* (Leipzig, 1980), 63, lines 23–28, and 64, lines 19–24. Recipe no. 371 survives only in the late-fifteenth-century Florence, Biblioteca Riccardiana, MS lat. 1179, while no. 374 is also found in the earliest surviving witness of the text, i.e., Einsiedeln, Stiftsbibliothek, MS 304 (eighth/ninth century). I thank Klaus-Dietrich Fischer for this reference.

<sup>82</sup> On the association of Berlin, Staatsbibliothek, MS gr. 134 (Phillippicus 1538) with the tenth-century imperial scriptorium, see Jean Irigoien, “Pour une étude des centres de copie byzantins (suite),” *Scriptorium* 13 (1959): 177–209, at 177–81, and Anne Elena McCabe, *A Byzantine Encyclopaedia of Horse Medicine: The Sources, Compilation, and Transmission of the Hippiatrica* (Oxford, 2007), 23–27.

<sup>83</sup> McCabe, *A Byzantine Encyclopaedia*, 271–72, and Anne McCabe, “Imported *materia medica*, 4th–12th centuries, and Byzantine Pharmacology,” in *Byzantine Trade, 4th–12th Centuries: The Archaeology of Local, Regional and International Exchange. Papers of the Thirty-Eight Spring*

sources attest that Arabic pharmacological lore had reached Byzantium by the tenth century in the form of a sugar-based potion through the importation of a scattering of recipes employing new ingredients. Sugar was available—at least within imperial circles—by that time.

#### 2.4. Eleventh-Century Constantinople: The Case of Symeon Seth

The first Byzantine work to give a significant account of the role of sugar as a medicinal substance and its use in potions is the *Treatise on the Capacities of Foodstuffs* by Symeon Seth, which, although written for the Emperor Michael VII Doukas (r. 1071–78), was clearly intended for a broader audience interested in foodstuffs and their properties.<sup>84</sup> Symeon is a rather intriguing figure from the second half of the eleventh century.<sup>85</sup> He most probably came from Antioch (a city not captured by the Seljuk Turks until 1084), since this is recorded as his place of origin in the majority of the surviving manuscripts of his works,<sup>86</sup> and he translated into Greek the Arabic version of a collection of ancient Indian animal fables, *Kalilah wa-Dimnah*, at the behest of the Emperor Alexios I Komnenos (r. 1081–1118).<sup>87</sup> Apart from the *Treatise on the Capacities of Foodstuffs*, he is also the author of two didactic

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*Symposium of Byzantine Studies, St John's College, University of Oxford, March 2004*, ed. Marlia Mundell Mango, Society for the Promotion of Byzantine Studies Publications 14 (Farnham, UK, 2009), 273–92, at 288–90. These mentions are mainly included in Appendix 7, which corresponds to the last folia of the Berlin, Staatsbibliothek, MS gr. 134 (Phillippicus 1538), i.e., fols. 393v–394v, Oder and Hoppe, eds., *Corpus Hippiatricorum*, 1:446, line 10, to 1:448, line 4. Some early references to ambergris and galangal in editions of Aetios of Amida's *Tetrabiblos* 1.131 and 11.13, ed. Olivieri, *Aetii Amideni*, 1:66, lines 13–25, and Charles Daremberg and Charles-Émile Ruelle, eds., *Oeuvres de Rufus d'Éphèse: Texte collationné sur les manuscrits, traduit pour la première fois en français, avec une introduction* (Paris, 1879), 575, lines 31–36, are probably the result of the contaminated textual tradition of this text. On this, see also the examples given by Antonio Garzya, “Problèmes relatifs à l'édition des livres IX–XVI du Tétrabiblon d'Aétios d'Amida,” *Revue des Études Anciennes* 86 (1984): 245–57, at 255, and cf. Koray Durak, “From the Indian Ocean to the Markets of Constantinople: Ambergris in the Byzantine World,” in *Life Is Short, Art Long: The Art of Healing in Byzantium. New Perspectives*, ed. Brigitte Pitarakis and Gülru Tanman, İstanbul Araştırmaları Enstitüsü kitapları 38 (İstanbul, 2018), 201–25, at 215–16.

<sup>84</sup> Symeon Seth, *Treatise on the Capacities of Foodstuffs*, ed. Bernard Langkavel, *Simeonis Sethi Syntagma de alimentorum facultatibus* (Leipzig, 1868), 1, lines 11–15: “τοῖς κοινωτέροις καὶ γνωριμωτέροις τῶν ὀνομάτων χρήσομαι διὰ τὸ πᾶσι δῆλα τυγχάνειν.” (“I shall use the most common and well-known terms [i.e., for foodstuffs] because these terms are clear to everyone.”) The edition is rather outdated and does not consider all the available manuscripts of the work. For a study of the textual tradition, see Georg Helmreich, *Handschriftliche Studien zu Symeon Seth* (Ansbach, 1913).

<sup>85</sup> On Symeon Seth's biography and his literary output, see Petros Bouras-Vallianatos, “Galen's Reception in Byzantium: Symeon Seth and His Refutation of Galenic Theories on Human Physiology,” *Greek, Roman, and Byzantine Studies* 55 (2015): 431–69, at 436–42 and n. 16. See also Ilias Nesseris, *Η παιδεία στην Κωνσταντινούπολη κατά τον 12ο αιώνα*, vol. 2 (Ioannina, 2014), 485–88.

<sup>86</sup> Symeon Seth, *Treatise on the Capacities of Foodstuffs*, ed. Langkavel, *Simeonis Sethi*, 18, lines 2–3, and Symeon Seth, *Refutation of Galen*, ed. Bouras-Vallianatos and Xenophontos, “Galen's Reception in Byzantium,” 459, line 1. On Antioch's intellectual environment, see the recent study by Alexandre Roberts, *Reason and Revelation in Byzantine Antioch: The Christian Translation Program of Abdallah ibn al-Fadl* (Berkeley, 2020).

<sup>87</sup> Hélène Condylis-Bassoukos, *Stéphanitès kai Ichnélètès, traduction grecque (XIe siècle) du livre Kalila wa-Dimna d'Ibn al-Muqaffa' (VIIIe siècle): Étude lexicologique et littéraire*, Fonds René Draguet 11 (Leuven, 1997).



works on natural philosophy and astronomy,<sup>88</sup> a unique Byzantine example of refutation of Galen,<sup>89</sup> and a brief, unedited opusculum on the preservation of health.<sup>90</sup> There is no evidence that Symeon ever practiced medicine himself, and it seems that he worked as a court astrologer under Emperor Alexios I.<sup>91</sup>

Symeon's *Treatise on the Capacities of Foodstuffs* is an alphabetical collection listing the properties of 183 different kinds of aliments and is based on earlier Greek and foreign sources, as he admits in his proem when he refers to Persian (Περσῶν/*Persōn*), Hagarene (Ἀγαρηνῶν/*Agarēnōn*)—a term used in Byzantine literature to denote Arabs or more generally Muslims<sup>92</sup>—and Indian<sup>93</sup> (Ἰνδῶν/*Indōn*) sources.<sup>94</sup> We can see a systematic attempt being made by Symeon to introduce new data and codify in Greek Arabic pharmacological knowledge, which, as noted above, had been slowly infiltrating Byzantine society since the tenth century. For example, in this treatise one finds the first surviving Byzantine accounts of the origins and other characteristics, such as the degree of qualitative intensity (hot, cold, wet, dry), of ingredients which had never before been described in detail in any Byzantine treatise, e.g., ambergris (ἄμπαρ/*ampar*), camphor (καφουρά/*kaphoura*), and musk (μόσχος/*moschos*).<sup>95</sup> In the only available study of the text, Georg Harig showed that a large number of the details that are not found in earlier Greek or early Byzantine medical literature originated from the medieval Arabic medical literature.<sup>96</sup>

Sugar (σάχαρ/*sachar*) is presented in a separate chapter as a hot and moist agent in the first degree of intensity and is considered better than honey, as it does not

<sup>88</sup> Symeon Seth, *Synopsis of Physics and On the Utility of Heavenly Bodies*, ed. Armand Delatte, *Anecdota Atheniensia et alia*, vol. 2, *Textes grecs relatifs à l'histoire de sciences*, Bibliothèque de la Faculté de Philosophie et lettres de l'Université de Liège 88 (Paris, 1939), 17–89 and 91–126.

<sup>89</sup> Symeon Seth, *Refutation of Galen*, ed. Bouras-Vallianatos and Xenophontos, “Galen’s Reception in Byzantium,” 458–63. Cf. Marie Cronier, Alessia Guardasole, Caroline Madgelaine, and Antoine Pietroboli, “Galien en procès à Byzance: L’Antirrhétique de Syméon Seth,” *Galenos* 9 (2015): 71–121, at 109–21.

<sup>90</sup> This work survives complete or in part in three manuscripts: Venice, Biblioteca Marciana, MS gr. Z. 297 (col. 633) (fourteenth century), fol. 199r–v; Bologna, Biblioteca Universitaria, MS 3636 (fourteenth century), fols. 122r–125r; and Oxford, Bodleian Library, MS Barocci 224 (c. AD 1460–71), fols. 29v–30v. The title in MS Barocci 224, fol. 29v, lines 31–32, reads: “Συμεὼν μαγίστρου φιλοσόφου τοῦ Σηθὸς περὶ ὑγιεινῆς πραγματείας διὰ τῆς τῶν ἕξ αἰτίων συμμετρίας.”

<sup>91</sup> This is confirmed by the account in Anna Komnene’s (1083–c. 1153/4) *Alexiad* 6.7.1–4, ed. Diether R. Reinsch and Athanasios Kambylis, *Annae Comnenae Alexias*, 2 vols., *Corpus Fontium Historiae Byzantinae* 40 (Berlin, 2001), 1:181, line 94, to 1:182, line 39.

<sup>92</sup> See Irfan Arif Shahid, Alexander Kazhdan, and Anthony Cutler, “Arabs,” in *Oxford Dictionary of Byzantium*, 1:149–51, at 149.

<sup>93</sup> Among the various references, for example, to India, as the place of origin of Symeon’s ingredients, see the mention of musk (*Treatise on the Capacities of Foodstuffs*, ed. Langkavel, *Simeonis Sethi*, 66, line 23: “ἀπὸ τῆς Ἰνδίας μετακομιζόμενος,” “brought from India”), a primarily aromatic and also medicinal substance from the anal glands of male musk deer native to Siberia, Tibet, and the Korean Peninsula. On musk, see the recent comprehensive study by Anya H. King, *Scent from the Garden of Paradise: Musk and the Medieval Islamic World*, *Islamic History and Civilization* 140 (Leiden, 2017).

<sup>94</sup> Symeon Seth, *Treatise on the Capacities of Foodstuffs*, ed. Langkavel, *Simeonis Sethi*, 1, lines 1–3.

<sup>95</sup> Symeon Seth, *Treatise on the Capacities of Foodstuffs*, ed. Langkavel, *Simeonis Sethi*, 26, lines 1–14; 58, line 19, to 59, line 9; and 66, line 20, to 67, line 20.

<sup>96</sup> Georg Harig, “Von den arabischen Quellen des Simeon Seth,” *Medizinhistorisches Journal* 2 (1967): 248–68.

make the patient feel thirsty and is easy to digest.<sup>97</sup> As regards its quality, i.e., hot and moist,<sup>98</sup> Symeon follows in general the classification of the Arab authors, although they differ among themselves as to the degrees of hotness/wetness.<sup>99</sup> Symeon also insisted that a simple mixture of sugar and cold water could help cool the body, reflecting the dietetic value of sugar as restorative agent in the Arabic medical tradition.<sup>100</sup> A special chapter is also devoted to julep (ζουλάπιον/*zoulapion*), which is characterized as “symmetrical” as regards its mixture (*krasis*), although it is closer to the cold quality, and thus could be used in the treatment of fevers. In the text there are no details on its preparation, and it is treated as something that will be familiar to the reader.<sup>101</sup>

Symeon refers to the administration of bugloss (βουγλώσσου . . . ζουλάπιον/*bouglōssou* . . . *zoulapion*), balm (μελιοσσοφύλλου . . . ζουλάπιον/*melissophyllou* . . . *zoulapion*), water lily (νυμφαιοζούλαπον/*nymphaiozoulapon*), and violet (ιούζούλαπον/*iozoulapon*) in the form of a julep in the chapters dealing with these vegetal substances, without providing any details about the preparation of these potions;<sup>102</sup> violet could also be administered in a form called ιούσαχαρον (*iosacharon*), which perhaps denotes a lighter, less dense version of the violet julep.<sup>103</sup> All the above-mentioned ingredients derive from Mediterranean native plants and can be considered ordinary substances that were readily available, thus attesting to the integration of sugar in the preparation of potions alongside traditional Greek and Byzantine *materia medica*. Interestingly, the text also provides the first known mention in Byzantine literature of a simple mixture of vinegar and sugar (όξοσάχαρ/*oxosachar*),<sup>104</sup> which is the sugar-based equivalent of the potion known as όξόμελι (*oxymeli*, vinegar with honey), which is well known in Greek and Byzantine medical literature.<sup>105</sup> Lastly, consumption of rice (όρυζα/*orhyza*) with milk and sugar is recommended for maintaining a healthy body.<sup>106</sup>

<sup>97</sup> Symeon Seth, *Treatise on the Capacities of Foodstuffs*, ed. Langkavel, *Simeonis Sethi*, 96, lines 17–20.

<sup>98</sup> Symeon Seth, *Treatise on the Capacities of Foodstuffs*, ed. Langkavel, *Simeonis Sethi*, 96, lines 15–16.

<sup>99</sup> Harig, “Von den arabischen,” 257.

<sup>100</sup> Symeon Seth, *Treatise on the Capacities of Foodstuffs*, ed. Langkavel, *Simeonis Sethi*, 97, lines 1–2.

<sup>101</sup> Symeon Seth, *Treatise on the Capacities of Foodstuffs*, ed. Langkavel, *Simeonis Sethi*, 41, lines 5–13.

<sup>102</sup> Symeon Seth, *Treatise on the Capacities of Foodstuffs*, ed. Langkavel, *Simeonis Sethi*, 30, line 7; 66, lines 17–19; 73, lines 8–11; and 48, lines 1–3.

<sup>103</sup> Symeon Seth, *Treatise on the Capacities of Foodstuffs*, ed. Langkavel, *Simeonis Sethi*, 48, line 1. I prefer ιούσαχαρ to Langkavel’s ιούσακχαρ, as the former is also the spelling used in two of the earliest surviving witnesses of the text, i.e., Paris, Bibliothèque nationale de France, MS gr. 2301 (in correspondence, Georgi Parpulov described the handwriting as an archaizing hand of the late thirteenth century), fol. 36v, line 10, and Munich, Bayerische Staatsbibliothek, MS gr. 633 (thirteenth century), fol. 31v, line 7. Langkavel’s edition is not consistent in the spelling of the term σάχαρ. See “σάχαρ” (ed. Langkavel, *Simeonis Sethi*, 96, line 15), but “όξοσάκχαρ” (ed. Langkavel, *Simeonis Sethi*, 46, line 3, cf. BnF, MS gr. 2301, fol. 34v, lines 11–12: “όξοσάκχαρ”; and Munich, MS gr. 633, fol. 30r, line 1: “όξοσάκχαρ”) and “σακχάρω” (ed. Langkavel, *Simeonis Sethi*, 75, line 14, cf. BnF, MS gr. 2301, fol. 68v, l.17–fol. 69r, line 1: “σάχαρ,” and Munich, MS gr. 633, fol. 55v, line 5: “σάχαρι”).

<sup>104</sup> Symeon Seth, *Treatise on the Capacities of Foodstuffs*, ed. Langkavel, *Simeonis Sethi*, 46, lines 2–4: “όξοσάκχαρ” (*oxysakchar*). I prefer “όξοσάχαρ”, which is the most usual version of the term in Byzantine texts (see also note 199, below). It is also retained in BnF, MS gr. 2301.

<sup>105</sup> See note 19, above.

<sup>106</sup> Symeon Seth, *Treatise on the Capacities of Foodstuffs*, ed. Langkavel, *Simeonis Sethi*, 75, lines 13–15.

We are unable to judge the immediate reception of Symeon's treatise since we lack early manuscripts of the work or references to Symeon's work by contemporaries.<sup>107</sup> The treatise was dedicated to Michael VII, a well-educated emperor, but it was clearly designed for a wider audience of mostly Byzantine medical professionals, who were interested in the latest Arabic pharmacological lore and medicinal substances from Asia that were gradually becoming available in the Mediterranean.

### 2.5. *The Paradigm of Southern Italy and Sicily*

Perhaps the most significant gateway to Arabic medical knowledge in the wider Byzantine world was the region of southern Italy and Sicily.<sup>108</sup> The Byzantines lost control of Sicily in the 960s—despite briefly reconquering it partially from the Arabs under the generalship of George Maniakes (d. 1043) in the late 1030s/early 1040s, while Calabria and Apulia fell to the Normans in 1060 and 1071 respectively.<sup>109</sup> Greek communities, however, remained in this region for many centuries and interacted with the Italo-Romance-, Hebrew-, and Arabic-speaking communities.<sup>110</sup>

The famous scholar Constantine the African (d. before 1098/99), based in the monastery of Monte Cassino, translated a considerable number of Arabic medical works into Latin, thus initiating and contributing substantially to the decisive

<sup>107</sup> There are a large number of surviving manuscripts of the work dating from the thirteenth century onward. See the most recent list on *Pinakes: Textes et manuscrits grecs*, which mentions eighty-five codices, including also excerpting manuscripts, at <https://pinakes.irht.cnrs.fr/notices/oeuvre/12757/> (last accessed 20 April 2020).

<sup>108</sup> On Arabo-Greek interaction and transfer of knowledge in the field of medicine in the light of surviving manuscripts from southern Italy and Sicily, see Peter E. Pormann, "The Parisinus Graecus 2293 as a Document of Scientific Activity in Swabian Sicily," *Arabic Sciences and Philosophy* 13 (2003): 137–61; Barbara Zipser, "Griechische Schrift, arabische Sprache und graeco-arabische Medizin: Ein neues Fragment aus dem mittelalterlichen Sizilien," *Mediterranean Language Review* 15 (2003/4): 154–66; and Maria Mavroudi, "Arabic Words in Greek Letters: The Violet Fragment and More," in *Moyen arabe et variétés mixtes de l'arabe à travers l'histoire: Actes du premier colloque international (Louvain-la-Neuve, 10–14 mai 2004)*, ed. Jérôme Lentin and Jacques Grand'Henry, Publications de l'Institut Orientaliste de Louvain 58 (Louvain-la-Neuve, 2008), 321–54, at 329–41.

<sup>109</sup> On the Byzantine presence in Italy, see Jean-Marie Martin, "Hellénisme et présence byzantine en Italie méridionale (viie–xiiiie siècle)," in *O Ιταλιώτης Ελληρισμός από τον Ζ' στον ΙΒ' αιώνα: Μνήμη Νίκου Παναγιωτάκη*, ed. Nikos Oikonomides (Athens, 2001), 181–202. Cf. Kenneth M. Setton, "The Byzantine Background to the Italian Renaissance," *Proceedings of the American Philosophical Society* 100/1 (1956): 1–76, at 1–21. On the fall of the Byzantine provinces in Italy, see Stylianos Lampakis, "Η Τελευταία Εκατονταετία," in *Βυζαντινά Στρατεύματα στη Δύση (5ος–11ος Αιώνας)*, ed. Vassiliki Vlysidou et al. (Athens, 2008), 393–451. It is worth mentioning the comprehensive volume on Byzantine Italy, Salvatore Cosentino, ed., *A Companion to Byzantine Italy* (Leiden, 2021), which was published after the submission of the final version of this article.

<sup>110</sup> See, for example, the recent study by Petros Bouras-Vallianatos, "Enrichment of the Medical Vocabulary in the Greek-Speaking Medieval Communities of Southern Italy: The Lexica of Plant Names," in *The Art of Healing in Byzantium: New Perspectives*, ed. Pitarakis and Tanman, 155–84, on plant lexica from the area, which shows how the Greek medical vocabulary was expanded with terms from Arabic and medieval Italo-Romance languages. It is worth mentioning that between the tenth and the twelfth century, Arabs in southern Italy were restricted to a small, temporary presence in Calabria and Basilicata, perhaps also including some merchants in port cities, by contrast with the long-standing established Arab communities of Sicily. See Alexander Metcalfe, *The Muslims of Medieval Italy* (Edinburgh, 2009), 44–159.

dissemination of Arabic medical lore in the medieval Latin-speaking European world.<sup>111</sup> Among Constantine's translations is the so-called *Viaticum*, the Latin version of Ibn al-Jazzār's (fl. tenth century) *Provisions for the Traveller and Nourishment for the Sedentary* [*Zād al-musāfir wa qūt al-hādir*]. The work is divided into seven books and provides an *a capite ad calcem* (from head to toe) list of diseases, with great emphasis on therapeutic recommendations and pharmacology.<sup>112</sup> A Greek translation of this Arabic work, most commonly entitled *Ephodia tou Apodēmountos*, was also circulated in the wider area of southern Italy and Sicily by the early twelfth century.<sup>113</sup> The *Ephodia* is extremely important in the present case, as it was the first substantial medical manual to provide consistent references to the use of sugar in medical preparations in the Greek language and it contributed a great deal to promoting the Arabic pharmacological tradition, including the regular use of sugar, in Byzantium in subsequent centuries.<sup>114</sup>

<sup>111</sup> On Constantine, see now Erik Kwakkel and Francis Newton (with an introduction by Eliza Glaze), *Medicine at Monte Cassino: Constantine the African and the Oldest Manuscript of his Pantegni* (Turnhout, 2019). Another valuable new source of up-to-date information on Constantine is the blog of Monica Green and Brian Long: "Constantinus redivivus: Reclaiming a Forgotten Cultural Translator," *Constantinus Africanus* (blog), December 22, 2018, <https://constantinusaffricanus.com/> (last accessed 20 April 2020).

<sup>112</sup> Although the title of the work refers to a traveler's manual or a *vade mecum*, it is, in fact, a lengthy, comprehensive medical work; see Gerrit Bos, "Ibn al-Jazzār on Women's Diseases and their Treatment," *Medical History* 37 (1993): 296–312, at 296–97, and Gerrit Bos, *Ibn al-Jazzār's Zād al-musāfir wa-qūt al-hādir, Provisions for the Traveller and Nourishment for the Sedentary, Book 7 (7–30)*, Sir Henry Wellcome Asian 13 (Leiden, 2015), 1–2. See also Thibault Miguet, "Premiers jalons pour une étude complète de l'histoire du texte grec du *Viaticum du Voyageur* (Ἐφώδια τοῦ ἀποδημοῦντος) d'Ibn al-Ġazzār," *Revue d'Histoire des Textes* 12 (2017): 59–105, at 59–74, 76–77.

<sup>113</sup> We do not know exactly where this translation was made. The earliest surviving manuscripts originate in southern Italy or Sicily (see notes 117–19, below). In the vast majority of the manuscripts the translation is attributed to a certain *prōtasēkrētis* or *asēkrētis* Constantine of Reggio; see G.-A. Costomiris, "Études sur les écrits inédits des anciens médecins grecs," *Revue des Études Grecques* 4 (1891): 97–110, at 101–4. Cf. Charles Daremberg, *Notices et extraits des manuscrits médicaux grecs, latins, et français, des principaux bibliothèques de l'Europe*, vol. 1, (Paris, 1853), 77–82, and Anna Maria Ieraci Bio, "La trasmissione della letteratura medica greca nell'Italia meridionale fra X e XV secolo," in *Contributi alla cultura greca nell'Italia meridionale*, ed. Antonio Garzya, Hellenica et Byzantina Neapolitana 13 (Naples, 1989), 133–255, at 222. The use of the term *prōtasēkrētis* is problematic, since it is not found in the earliest surviving manuscript, Vatican City, Biblioteca Apostolica Vaticana, MS Vat. gr. 300 (=Vaticanus gr. 300), while the beginning of Paris, Bibliothèque nationale de France, MS gr. 2311 is missing, and we should not exclude the possibility that it might be a later addition. The title *prōtasēkrētis* was used by the chief of the Byzantine imperial chancery in Constantinople; see Alexander Kazhdan, "Protasekretis," in *Oxford Dictionary of Byzantium*, 3:1742. Furthermore, there is no attested use of term in the context of the Byzantine administration in Italy; see Vera von Falkenhausen, *Untersuchungen über die byzantinische Herrschaft in Süditalien vom 9. bis ins 11. Jahrhundert*, Schriften zur Geistesgeschichte des Östlichen Europa 1 (Wiesbaden, 1967), 103–31, at 114–15. Earlier scholarship identified Constantine of Reggio with Constantine the African, but there is no evidence for this apart from the synonymy; see the recent convincing argument by Miguet, "Premiers," 87–92.

<sup>114</sup> Apart from the mentions in *Ephodia*, it is noteworthy that in the Latin *Antidotarium magnum*, an extensive collection of recipes that was put together by the late eleventh century in southern Italy, there is regular use of sugar in recipes for medicinal potions. However, it is not currently possible to detect any direct connections between the *Antidotarium magnum* and the Greek medical communities in southern Italy (cf. note 179, below). On the *Antidotarium magnum*, see now the brief fresh summary by Monica Green, "The *Antidotarium magnum*: A Short Description," at [https://www.academia.edu/4611623/Monica\\_H.\\_Green\\_and\\_Kathleen\\_Walker-Meikle\\_Antidotarium\\_magnum\\_-\\_An\\_Online](https://www.academia.edu/4611623/Monica_H._Green_and_Kathleen_Walker-Meikle_Antidotarium_magnum_-_An_Online)

The textual transmission of the Greek translation of Ibn al-Jazzār's treatise is complicated and has been very little studied, while the text remains unedited.<sup>115</sup> The earliest surviving copy of the *Ephodia* is Vatican City, Biblioteca Apostolica Vaticana, MS Vat. gr. 300 (henceforth Vaticanus gr. 300).<sup>116</sup> According to Santo Lucà, who provides the most detailed recent palaeographical examination of this manuscript, taking into consideration all earlier scholarly views, the codex was copied, most probably in the area of Messina, around 1130/40,<sup>117</sup> which constitutes the *terminus ante quem* for the Greek translation of the work itself. There is another early manuscript, Paris, Bibliothèque nationale de France, MS gr. 2311 (henceforth Parisinus gr. 2311), which, according to Paul Canart, was copied in a southern Italian environment not later than the twelfth/thirteenth century.<sup>118</sup> Interestingly,

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Edition (last accessed 20 April 2020), with references to earlier relevant bibliography. I thank Kathleen Walker-Meikle for sharing her transcription of the first half of the *Antidotarium magnum* from London, Wellcome Library, MS.MSL.138 dated to the early twelfth century. As an indication, between fol. 1r and fol. 51r of the Wellcome codex, there are approximately thirty references to sugar (*zachara*) as an ingredient in composite drugs. It is worth noting that there is evidence suggesting that Salernitan physicians were experienced in the use of sugar and introduced their own recipes. See, for example, Florence Eliza Glaze, "Salerno's Lombard Prince: Johannes 'Abbas de Curte' as Medical Practitioner," *Early Science and Medicine* 23 (2018): 177–216, at 210, 214, who has shown that sugar is included among the ingredients of a recipe by Johannes Abbas de Curte (active between c. 1070 and 1106), which was recorded in the *Antidotarium Nicolai* (c. 1120–30). On the presence of Greeks in Salerno, see Stefano Palmieri, "Mobilità etnica e mobilità sociale nel Mezzogiorno longobardo," *Archivio Storico per le Province Napoletane*, 3rd ser., 20 (1981): 31–104, at 78–82, and cf. Robert Browning, "Greek Influence on the Salerno School of Medicine," in *Byzantium and Europe: First International Byzantine Conference, Delphi, 20–24 July 1985* (Athens, 1987), 189–94.

<sup>115</sup> Some chapters were published by Daremberg and Ruelle, eds., *Oeuvres de Rufus*, 582–96. The first eight chapters of book 7, on fevers, were also published by Johann Stephan Bernard, ed., *Synesius, De febris, quem nunc primum ex codice MS. Bibliothecae* (Amsterdam, 1749), 1–306. For an introduction to the Greek translation, see Alain Touwaide, "Medicina Bizantina e Araba alla Corte di Palermo," in *Medicina, scienza e politica al tempo di Federico II: Atti del convegno (Palermo, 4–5 ottobre 2007)*, ed. Natale G. de Santo and Guido Bellinghieri (Naples, 2008), 39–55, and Marie-Hélène Congourdeau, "La médecine byzantine à la croisée de l'Orient et de l'Occident," in *Knotenpunkt Byzanz*, ed. Speer and Steinkrüger, 223–31, at 226–30. For some observations on the textual transmission of the Greek translation, see Daremberg, *Notices et extraits*, 65–76 and Giuseppe Gabrieli, "Il 'Zād al Musāfir' di Ibn al Gazzār in un ms. Greco Corsiniano," *Rendiconti della Reale Accademie dei Lincei: Classe di scienze morali, storiche e filologiche* 6th ser., 14 (1905): 29–50. See also the recent useful case studies on particular sections of the Greek translation by Miguet "Premiers," 92–104, who, however, does not take into consideration the only earlier brief studies on the Greek translation by Alain Touwaide, "Medicina Bizantina," and "Translation. A Case Study in Byzantine Science," *Medievalia* 16 (2013): 165–70.

<sup>116</sup> For preliminary notes on the relationship between the Greek version of the text in Vaticanus gr. 300 and other surviving manuscripts, see John M. Duffy, ed., *Ioannis Alexandrini in Hippocratis Epidemiarum librum VI commentarii fragmenta*, *Corpus Medicorum Graecorum* 11 (Berlin, 1997), 15 nn. 1–3. See also Ieraci Bio, "La trasmissione," 221–28; Santo Lucà, "Testi medici e tecnico-scientifici del Mezzogiorno greco," in *La produzione scritta tecnica scientifica nel Medioevo: Libro e documento tra scuole e professioni. Atti del convegno internazionale di studio dell'Associazione Fisciano, Salerno, 28–30 settembre 2009*, ed. Giuseppe De Gregorio and Maria Galante, *Studi e Ricerche* 5 (Spoleto, 2012), 551–605, at 579–84; and Miguet "Premiers," 85–87.

<sup>117</sup> Santo Lucà, "I Normanni e la 'Rinascita' del sec. XII," *Archivio Storico per la Calabria e la Lucanica* 60 (1993): 1–91, at 36–63.

<sup>118</sup> Paul Canart, "Le livre grec en Italie méridionale sous les règnes normand et souabe: Aspects matériels et sociaux," *Scrittura e Civiltà* 2 (1978): 103–62, at 146.



the next large group of surviving manuscripts dates to the fourteenth century and the work continued to be copied up to the eighteenth century, resulting in a total of forty-four surviving manuscripts, including excerpting ones, according to the most recent estimation by Thibault Miguët.<sup>119</sup>

My discussion will mainly include examples from books 6 and 7 (on sexual diseases and on fevers, respectively), since they have been critically edited in Arabic.<sup>120</sup> For example, we can see at least twenty-eight references to the use of sugar as an ingredient in composite drugs. There are mentions of sugar (سكر /*sukkar*), ṭabarzad sugar (سكر طبرزد /*sukkar ṭabarzad*), Sulaymān sugar (سكر سليمان /*sukkar sulaymānī*), red sugar (سكر أحمر /*sukkar aḥmar*), and pulverized white sugar (سكر أبيض مسحوق /*sukkar abyad mashūq*).<sup>121</sup> In the two early manuscripts the different names for varieties of sugar were rendered in Greek in most cases as σά[κ]χαρ (*sa[k]char*, sugar), σά[κ]χαρ ταβέ[α]ρζουδ (*sa[k]char tabe[la]rζoud*, ṭabarzad sugar), σά[κ]χαρ σα[ο]λομό[ω]νιον (*sa[k]char sa[o]lomo[ō]nion*, Sulaymān sugar), σά[κ]χαρ ἐρυθρόν (*sa[k]char erythron*, red sugar), and σά[κ]χαρ λευκὸν τετριμμένον (*sa[k]char leukon tetrimmenon*, pulverized white sugar);<sup>122</sup> sometimes ṭabarzad

<sup>119</sup> Miguët, “Premiers,” 85. See also Costomiris, “Études,” 97–110, but he does not provide a detailed list; see also the list on *Pinakes: Textes et manuscrits grecs*, at <https://pinakes.irht.cnrs.fr/notices/oeuvre/13334/> (last accessed 20 April 2020).

<sup>120</sup> Book 6: Gerrit Bos, ed. and trans., *Ibn al-Jazzār on Sexual Diseases and their Treatment: A Critical Edition of Zād al-musāfir wa-qūt al-hādir. Provisions for the Traveller and Nourishment for the Sedentary, Book 6* (London, 1997). Book 7, chapters 1–6: Gerrit Bos, ed. and trans., *Ibn Al-Jazzār on Fevers: A Critical Edition of Zād al-musāfir wa-qūt al-hādir = Provisions for the Traveller and Nourishment for the Sedentary. Bk. 7, chs. 1–6* (London, 2000). Book 7, chapters 7–30: Gerrit Bos, ed. and trans., *Ibn al-Jazzār’s Zād al-musāfir wa-qūt al-hādir: Provisions for the Traveller and Nourishment for the Sedentary. Book 7 (7–30), Critical Edition of the Arabic Text with English Translation, and Critical Edition of Moses ibn Tibbon’s Hebrew Translation (Ṣedat ha-derakhim)*, Sir Henry Wellcome Asian 13 (Leiden, 2015). There is a complete edition of the Arabic by Muḥammad Suwayṣī et al., *Zād al-musāfir wa-qūt al-hādir*, 2 vols. (Tunis, 1999), based on a nineteenth-century copy of the text (Paris, Bibliothèque nationale de France, MS ar. 2884) of Dresden, Sächsische Landesbibliothek, MS 209 (AD 1680), which according to Bos, *Ibn al-Jazzār’s Zād* (2015), 3, is “unsatisfactory.” Intriguingly, the earliest surviving copy of the original Arabic version was copied in AD 1337 (Oxford, Bodleian Library, MS Huntington 302), thus two centuries after Vaticanus gr. 300.

<sup>121</sup> Ibn al-Jazzār *Zād al-musāfir wa-qūt al-hādir* 6, ed. and trans. Bos (1997), سكر طبرزد (*sukkar ṭabarzad*): 85, line 120; 186, line 1030; and 187, line 1039; 7.1–6, ed. and trans. Bos (2000), سكر (*sukkar*): 37, line 145; 60, line 425; 70, line 553; and 83, line 704; سكر طبرزد (*sukkar ṭabarzad*): 34, line 113; 34, line 115; 37, line 148; 41, line 180; 48, line 262; 49, lines 274–75; 52, line 314; 53, line 326; 58, line 402; 61, lines 439–40; 71, line 568; and 73, line 595; سكر سليمان (*sukkar sulaymānī*): 48, line 269; 58, line 395; 59, line 420; and 90, line 782, سكر أحمر (*sukkar aḥmar*): 60, line 422; 7.7–30, ed. and trans. Bos (2015), سكر طبرزد (*sukkar ṭabarzad*): 23, line 14; 24, line 8; and 66, line 9; and سكر أبيض مسحوق (*sukkar abyad mashūq*): 24, line 18, to 25, line 1. *Sukkar ṭabarzad* refers to solid white sugar; *sukkar sulaymānī* is the white sugar made in Sulaymān in southwestern Iran; *sukkar aḥmar* is the red sugar; and *sukkar abyad* the white sugar obtained from repeated refining. On the names of sugar varieties mentioned in Arabic sources, see the glossary in the most recent study by Sato, *Sugar*, 188 (and note 31, above). On sugar varieties, see also the comprehensive discussion in Ouerfelli, *Sucre*, 313–24.

<sup>122</sup> See, for example, Ibn al-Jazzār, *Ephodia tou Apodēmountos* 7.1, Vaticanus gr. 300, fol. 210v, line 12: “σάκχαρ” (BnF MS gr. 2311, fol. 169v, line 28: “σάχαρος”); 6.15, Vat. gr. 300, fol. 191v, lines 10, 22: “σάκχαρ ταβέρζουδ” (BnF MS gr. 2311, fol. 159r, line 24: “σάχαρ ταβαρζουδη”; fol. 159v, line 6: “σάχαρ ταβαρζουδ”); 7.2, Vat. gr. 300, fol. 213v, line 10, and 7.3, fol. 216v, line 12: “σάχαρ σαλομόνιον” (BnF MS gr. 2311, fol. 172v, lines 5–6: “σάχαρ σ[.]λομόνιον,” fol. 175v, lines 21–22:

sugar is rendered simply as σά[κ]χαρ (*sa[k]char*).<sup>123</sup> In the *Ephodia*, in addition to direct references to sugar, we also find numerous references to named sugar-based potions such as ζουλάβι[ο]ν (*zoulabi[o]n*) and σεράβι[ο]ν (*serabi[o]n*) involving some special ingredient, for example, violet *zoulabion* or pomegranate *serabion*, and also to ὄξυσά[κ]χαρον (*oxysa[k]charon*). These may be used as composite drugs on their own or as a base for the administration of other ingredients.<sup>124</sup>

Ibn al-Jazzār's work was a conduit in the transfer of Arabic pharmacological knowledge into Greek. This conclusion is endorsed by additional evidence in Vaticanus gr. 300, a manuscript whose contents, including practical diagnostic and therapeutic texts, such as excerpts from Theophilos's *On Urines*, Galen's *On Critical Days*, the Greek translation of Yūḥannā ibn Māsawayh *On Purgative*

“σάχαρ σολ[... ]νιον”), but 7.3, Vat. gr. 300, fol. 217r, line 15: “σαλομώνιον σάχαρ” (BnF MS gr. 2311, fol. 175r, lines 20–21: “σάχαρ σολομώνιον”); 7.3, Vat. gr. 300, fol. 217r, line 18: “σάχαρ ἐρυθρόν” (BnF MS gr. 2311, fol. 175v, line 25: “σάχαρ ἐρυθρόν”); and 7.8, Vat. gr. 300, fol. 228r, line 10: “σάχαρ λευκὸν τετριμμένον” (BnF MS gr. 2311, fol. 186v, line 21: “σάχαρ λευκὸν τετριμμένον”).

<sup>123</sup> See, for example, Ibn al-Jazzār, *Ephodia tou Apodēountos* 7.1, Vaticanus gr. 300, fol. 211v, line 7: “σάχαρ” (BnF MS gr. 2311, fol. 170v, line 15: “σάχαρ”) for السكر الطيرزد (*al-sukkar al-ṭabarzad*) in ed. and trans. Bos (2000), 41, line 180; 7.4, Vat. gr. 300, fol. 221r, line 24: “σάχαρ” (BnF MS gr. 2311, fol. 179v, line 11: “σάχαρ”) for سكر طيرزد (*sukkar ṭabarzad*) in ed. and trans. Bos (2000), 73, line 595; and 7.8, Vat. gr. 300, fol. 227v, line 15: “σάχαρ” (BnF MS gr. 2311, fol. 186r, line 26: “σάχαρ”) for سكر طيرزد (*sukkar ṭabarzad*) in ed. and trans. Bos (2015), 24, line 8.

<sup>124</sup> First of all, we can see several references simply to julep, i.e., *zoulabion* (in all cases the term appears as “ζουλάβι[ο]ν” rather than “ζουλάπι[ο]ν”, altering the tenue, non-fricative labial pi “π” into its medial fricative version, beta “β”), which most probably refers to the original julep, a mixture of rosewater and sugar: e.g., *Ephodia tou Apodēountos* 5.2, Vaticanus gr. 300, fol. 157r, lines 12–17, “καὶ τὸ ἔψημα τοῦ καπνοῦ τῆς γῆς· καὶ τὸ τῶν ριζῶν τὸ κενωτικὸν καὶ τὰ ὁμοία τούτων· συχνασάτω τοῦ χρᾶσθαι τὸ ὕδωρ τὸ ἰνδύβον καὶ τοῦ μαλάθρου· ἐψημένα καὶ διυλισμένα ἡμισυ λίτρας μετὰ τοῦ ὄξυσάκχαρ· ἢ ζουλαβίου· ἢ σάκχαρ ταβάρζουδ ἐν ἡμέραις” (BnF MS gr. 2311, fol. 142r, line 26–fol. 142v, line 1: “καὶ τὸ ἔψημα τοῦ καπνοῦ . . . ὄξυσάκχαρ”: line 1 of fol. 142v is barely legible). There are also references to the so-called *rhodosachar*, perhaps a simple mixture of rose juice and sugar, without the use of distilled water: e.g., 7.8, Vat. gr. 300, fol. 227v, line 1: “ρόδοσάχαρ” (BnF MS gr. 2311, fol. 186r, line 8: “ρόδοσάχαρ”). For references to *zoulabia* and *serabia* featuring a special ingredient, see for example, 7.1, Vat. gr. 300, fol. 211r, lines 6–7, “μετὰ τοῦ ζουλαβίου τῶν ἴων ἢ τῶν δαμασκήνων, ἢ τὸ ζουλάβιν” (BnF MS gr. 2311, fol. 170r, lines 18–19: “μετὰ τὸ σεράβιν τῶν ἴων· ἢ τῶν δαμασκήνων· ἢ τὸ ζουλάβιν” 7.4, Vat. gr. 300, fol. 220v, line 25–fol. 221r, line 1: “καὶ πιέτω τὸ σεράβιν τῶν ῥο[ι]ῶν ἢ ζουλάβιν καφοράτον” (BnF MS gr. 2311, fol. 179r, line 20: “πιέτω τὸ σεράβιν τῶν ῥοιῶν· ἦτοι ζουλάβιν:”), and 7.8, Vat. gr. 300, fol. 228r, lines 19–20: “πίνειν τὸ σεράβιν τῆς μυρσίνης καὶ τῶν κυδωνίων” (BnF MS gr. 2311, fol. 187r, lines 2–3: “πίνειν τὸ σεράβιν τῆς μυρσίνης καὶ τῶν κηδονίων”). *Zoulabion* is also sometimes used with reference to other sugar-based potions as a sort of indication of the required density of the final product, which was supposed to be similar to that of the julep: e.g., 5.2, Vat. gr. 300, fol. 156v, line 11–fol. 157r, line 4, “Καταπότιον συντιθέμενον εἰς τοὺς θερμινομένους . . . λαβὼν τὸν φλοιὸν τοῦ ὄχρου μυροβαλάνου· καὶ ἀνθη ἴων· καὶ ἀπνιθίαν Ῥωμαϊκὴν· καὶ σπέρμα κεσοῦθε . . . ταῦτα ἴνα μαλακθῶσιν ἀκριβῶς εἰς τὸ ἀποσυρωθῆν ἀπόζεμα· καὶ διυλίσασ, ἀναβίβασεν αὐθις ἐπὶ τοῦ πυρὸς σὺν δυσὶ λίτρας σάκχαρ σολομώνιον· καὶ ἔψησον μετὰ μαλακοῦ πυρὸς ἕως οὗ γένηται εἰς σύστασιν τοῦ ζουλαβίου.” (BnF MS gr. 2311, fol. 141v, line 27–fol. 142r, line 16: “Καταπότιον σύνθετον εἰς . . . σάχαρ σολομώνιον· καὶ ἔψησον ἐν μαλακῶ πυρὶ· ἕως οὗ γένηται εἰς σύστασιν τοῦ ζουλαβίου.”). It should be noted that in the Greek translation the term ζουλάβιον can sometimes also refer to a honey-based recipe, e.g., 6.1, Vat. gr. 300, fol. 169r, line 21–fol. 169v, line 9: “Σύνθεσις ζουλαβίου . . . λαβὼν μαλαθρόσπερμον· καὶ ἄνισον· καὶ σπέρμα ἀγριοδαύκου . . . μετὰ μέλιτος τὸ ἴσον.” (this recipe is not retained in BnF MS gr. 2311).

*Drugs* (attributed here to Saint John of Damascus),<sup>125</sup> and also several anonymous ones,<sup>126</sup> seem to reflect contemporary medical practice. This codex also contains a large number of marginal annotations. From among the four hands of the marginalia, Lucà has convincingly argued for the identification of hand *d* with that of the most likely commissioner of the codex, a physician from Reggio, one Philip Xeros.<sup>127</sup> Philip often addresses his son Nicholas, presumably a physician himself, in an attempt to provide practical instructions, throughout the *Ephodia* and other texts and also sometimes in the form of marginal annotations.<sup>128</sup> In fact, this is a distinctive copy of the *Ephodia*, often elaborated with additional material, showing the involvement of Philip Xeros himself.<sup>129</sup> One particular intervention by Philip in the recipe for a sugar-based potion with bugloss, which appears among some additional recipes found in the last folia of the codex, provides us with an interesting testimony as to the use of the new substance: “since this is beneficial . . . for the melancholic diseases and for those with heart affections, as the physician Philip Xeros, who is also your father, says, oh my son Nicholas, do not add the ingredients and the sugar (σάκχαρ/sakchar) to the prepared juice when very hot nor when very cold, but when there is a moderate [temperature] in both directions.”<sup>130</sup>

<sup>125</sup> Vaticanus gr. 300, fol. 273v, lines 1–2: “Τοῦτο σύγγραμμα ὁ διέθετο ὁ ἐν ἀγίοις Ἰωάννης ὁ δαμασκηνός, περὶ τῶν κενούτων φαρμάκων.” The author is mostly known by the Latinized version of his name, Mesue. The work had widespread reception in Byzantium and in the Latin West, where the author is also often identified with Saint John of Damascus. See Paula De Vos, “The ‘Prince of Medicine’: Yūhannā ibn Māsawayh and the Foundations of the Western Pharmaceutical Tradition,” *Isis* 104/4 (2013): 667–712, at 683, 702–6, who provides the most recent study of the reception of the work in the medieval West. Vaticanus gr. 300 is the earliest surviving manuscript of the Greek translation of this work.

<sup>126</sup> See the corresponding detailed catalogue entry by Giovanni Mercati and Franchi de’ Cavalieri, *Codices Vaticani Graeci*, vol. 1, *Codices 1–329* (Vatican City, 1923), 430–37.

<sup>127</sup> Lucà, “I Normanni,” 50–56.

<sup>128</sup> Giovanni Mercati, “Filippo Xeros Reggino, Giovanni Alessandrino iatrosofista e altri nel codice Vaticano degli ‘Ephodia,’” in idem, *Notizie varie di antica letteratura medica e di bibliografia*, Studi e Testi 31 (Rome, 1917), 9–41, at 10–17, who offers transcriptions of these interventions; on the Xeros family and their medical activities, see Anna Maria Ieraci Bio, “La medicina greca dello Stretto (Filippo Xeros ed Eufemio Siculo),” in *La cultura scientifica e tecnica nell’Italia meridionale bizantina: Atti della sesta Giornata di studi bizantini, Arcavacata di Rende, 8–9 febbraio 2000*, ed. Filippo Burgarella and Anna Maria Ieraci Bio, Studi di Filologia Antica e Moderna 13 (Soveria Mannelli, 2006), 109–23.

<sup>129</sup> For example, see the following three recipes in the text of the *Ephodia tou Apodēmoutos* 3.13, Vaticanus gr. 300, fol. 90r, lines 12–22, “Ἐκθεσις στήλης ἦτοι ἐκλήγματος ὡς ἀπὸ τοῦ Γαληνοῦ· τοῦ διὰ μαργαριτῶν ἐσύναψα τοῦτο κάγω Φίλιππος ὁ ἐλάχιστος τῶν ἱητρῶν ὁ Ῥηγινός καθὼς εὔρον καὶ ἔλαβον καὶ ἐγνω . . . ἐδοκίμασα δὲ τοῦτο πλειστάκις καὶ εὐχαρίστησα,” fol. 90v, line 16–91r, line 16, “Οὕτω γενέσθω τὸ καταπότιον τῶν χλωρῶν βουγλώσσω· λαβὼν τὸν χυλὸν αὐτῶν, ἐξάφρησον κατὰ μικρὸν ἐν μαλθακῷ πυρὶ . . . καθὼς λέγει τέκνον Φίλιππος ὁ ἱητρὸς καὶ σὸς πατὴρ ὁ Ξηρός,” and 7.9, fol. 230v, lines 23–25, “εἶρηκα καὶ ἐγὼ ὁ ταπεινός καὶ ἐλάχιστος Φίλιππος ἀντίδοτον προφυλακτὴν πρὸς τοὺς πιδῶνας δηλητηρίων καὶ ἀποκτενόντων φαρμάκων.” On these recipes, see Mercati, “Filippo Xeros,” 12–13 and Ieraci Bio, “La medicina,” 112–13. These recipes are not found in the relevant parts of BnF MS gr. 2311, i.e., fols. 111r–v, 188v–189r, and should most probably be considered additional material in light of Philip Xeros’s acknowledged practical experience.

<sup>130</sup> Vaticanus gr. 300, fol. 300v, lines 22–26: “ἐπεὶ ὠφέλιμός ἐστι . . . πρὸς τὰς μελαγχολικὰς ἄρρωστίας· καὶ πρὸς τὰς καρδιακὰς διαθέσεις· καθὼς λέγει τέκνον Νικόλαε· Φίλιππος ὁ ἱητρὸς ὁ Ξηρός καὶ σὸς πατὴρ· μὴ θέσης τὰ εἶδη ὄντος τοῦ χυλοῦ καὶ τὸ σάκχαρ κατὰ πολὺ θερμὸν· μῆτε ὅταν ψυχρανθῆ, ἀλλὰ μέσον ἀμφοτέρωιν.”

Even more remarkable is a surviving collection of recipes, put together by Philip Xeros and an otherwise unknown physician, Euphemios of Sicily,<sup>131</sup> which lists a substantial number of sugar-based potions and strengthens the evidence for their regular use in ordinary medical practice in this period, albeit not in Byzantium proper.<sup>132</sup> Unlike in Constantinople and the other great cities of the Byzantine Empire, in southern Italy and Sicily sugar was readily available, due to the fact that the plant had been cultivated in Sicily and sugar produced there from as early as the tenth century.<sup>133</sup>

Unfortunately, there are no surviving manuscripts of the *Ephodia* dated to the twelfth century originating in Constantinople or Byzantine territory, which—combined with the absence of any demonstrable influence of the text on medical works written by Byzantine authors before the early fourteenth century—makes it virtually impossible to argue that the *Ephodia* had any impact on medicine in the territories of the Byzantine state in that early period. The paradigm of the multicultural southern Italian and Sicilian milieu could, however, be used as a predictor of the impact that the introduction of Arabic pharmacology to Byzantium proper would have later on.

## 2.6. Twelfth Century: Sugar in Byzantine Medicalized Hospitals

Meanwhile, it seems that sugar was becoming more and more widely available, at least in Constantinople, from the early twelfth century onward. The crusaders had established themselves in the Holy Land by the very last years of the eleventh century. The Venetians, in particular, through their control of estates in the rich sugar-producing region of Tyre, played an important role not only in the cultivation of sugarcane but also in the wider exportation of sugar to Europe in the twelfth century.<sup>134</sup> The Venetians had already secured a decree issued by the Byzantine emperor

<sup>131</sup> Paris, Bibliothèque nationale de France, MS gr. 2194 (fifteenth century), fols. 454r–464v. The title reads as follows: “Βιβλίον περιέχον συνθέσεις συναχθὲν καὶ πειραθὲν παρὰ Εὐφημίου Σικελοῦ τοῦ θαυμασιωτάτου καὶ Φιλίππου Ξηροῦ τοῦ Ῥηγινού, τῶν θαυμασιῶν ἰατρῶν.” (“Book containing recipes compiled and tested by the most marvelous Euphemios of Sicily and Philip Xeros of Reggio, both among the marvelous physicians.”) For some preliminary comments on this collection, see Ieraci Bio, “La medicina greca,” 116–23. On BnF gr. 2194, see B. Mondrain, “Démétrios Angelos et la médecine: Contribution nouvelle au dossier,” in *Storia della tradizione e edizione dei medici greci*, ed. A. Roselli (Naples, 2010), 293–322, at 306–8.

<sup>132</sup> Among the several mentions of sugar-based potions, see, for example, the following recipes in BnF gr. 2194, fol. 456v, lines 16–23, “Τὸ καταπότιον . . . λαβὼν ἀπόζεμα κυδωνίων..καὶ σάχαρ . . . ῥοδόσταγμα . . . καὶ ἔψησον ἕως οὗ γένηται εἰς σύστασιν σεραπίου,” fol. 459v, line 26–fol. 460r, line 3, “Ἐτερον τοῦ σποδίου . . . λαβὼν σπόδιον στυ. δ΄ . . . μακροπέπερ στυ. β΄ σάχαρ ταβάρζ.”

<sup>133</sup> Ouerfelli, *Sucre*, 149–79.

<sup>134</sup> On the role of Venetians in the economic activity of the area with occasional remarks on the cultivation of sugarcane, see David Jacoby, “The Economic Function of the Crusader States of the Levant: A New Approach,” in *Relazioni economiche tra Europa e mondo islamico secc. XIII–XVIII: Atti della “trentottesima settimana di studi” 1–5 maggio 2006 / Europe’s Economic Relations with the Islamic World, 13th–18th Centuries*, ed. Simonetta Cavaciocchi, 2 vols., Serie II Atti delle Settimane di Studi e Altri Convegni 38 (Grassano, 2007), 1:159–91. The trade in sugar should have been increased in the wider European world, especially after the substantial corpus of Latin translations of Arabic medical works from the eleventh century onward, thanks to the significant efforts of Constantine the African. For a

Alexios I Komnenos in 1082, granting them several privileges, including tariff-free trade with the empire and the concession of a special quarter in which to live and work in Constantinople.<sup>135</sup> The strong Venetian presence in Constantinople and the tax exemptions they were granted must have facilitated the trade in foreign commodities, including sugar.

By at least the late eleventh/early twelfth century simple sugar-based potions had become available in Byzantium. The first confirmation, in this case for the use of ὀξυσάκχαρον (*oxysakcharon*, a mixture of vinegar and sugar), comes from a letter of Theophylact (d. after 1126), archbishop of Ohrid in southwestern Macedonia from 1088/9 to c. 1108, in which he discusses the treatment of his brother, who suffered from loss of appetite and headache and whose stomach was full of humors. This particular description of the patient's clinical condition recalls the significant use of sugar, found in the Arabic medical tradition discussed above, to restore the appetite and redress qualitative bodily imbalance. Whether the sugar was purchased locally or was sent to them from Constantinople or elsewhere is not specified in the text.<sup>136</sup> *Oxysakcharon* appears here as an ordinary medicament, which confirms that by that time sugar had become readily available.

Potentially the most important references attesting to the regular use of sugar in a medical context are connected with two twelfth-century Byzantine charitable institutions. The first reference comes from the most illustrious example of a Byzantine medicalized hospital, the *xenōn* belonging to the Monastery of Pantokrator in Constantinople, established by John II Komnenos (r. 1118–43) in 1136. The foundation charter (*Typikon*) refers to fifty beds in regular use and a large number of medical personnel, including several doctors, nurses, and four pharmacists (πημεντάριοι/*pēmentarioi*).<sup>137</sup> The overall evidence suggests that the *xenōn* was short-lived, not surviving beyond 1150, which was perhaps due to difficulties in sustaining such a

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brief introduction to the gradual circulation of Arabic pharmacopeia in the Latin West from the late eleventh century onward, see the ingenious post by Monica Green, “A Fantasy Pharmacy: The Arabic Pharmacopeia Arrives in the Latin West,” *Constantinus Africanus* (blog), <https://constantinus-africanus.com/2018/09/22/a-fantasy-pharmacy-the-arabic-pharmacopeia-arrives-in-the-latin-west/> (last accessed 20 April 2020).

<sup>135</sup> On this golden bull, see the traditional study by Horatio F. Brown, “The Venetians and the Venetian Quarter in Constantinople to the Close of the Twelfth Century,” *The Journal of Hellenic Studies* 40 (1920): 68–88, at 71–72, and Donald M. Nicol, *Byzantium and Venice: A Study in Diplomatic and Cultural Relations* (Cambridge, UK, 1988), 59–64. Cf. Peter Frankopan, “Byzantine Trade Privileges to Venice in the Eleventh Century: The Chrysobull of 1092,” *Journal of Medieval History* 30 (2004): 135–60. On Italian activity in Constantinople in the twelfth century, see Savvas Neocleous, “Greeks and Italians in Twelfth-Century Constantinople: *Convivencia* or Conflict?,” in *Negotiating Co-Existence: Communities, Cultures and Convivencia in Byzantine Society*, ed. Barbara Crostini and Sergio La Porta, Bochumer Altertumswissenschaftliches Colloquium 96 (Trier, 2013), 221–50.

<sup>136</sup> Theophylact of Ohrid, *Epistle* 113, ed. and trans. Paul Gautier, *Théophylacte d'Achrida lettres*, 2 vols. (Thessaloniki, 1980–86), 2:539, lines 9–16, and commentary on pp. 57–60. Theophylact very often uses expert medical vocabulary in describing sickness, which presupposes advanced theoretical medical knowledge; on this, see Margaret Mullett, *Theophylact of Ochrid: Reading the Letters of a Byzantine Archbishop*, Birmingham Byzantine and Ottoman Monographs 2 (Aldershot, 1997), 102–11.

<sup>137</sup> *Typikon of the Pantokrator* 904–1006, ed. Paul Gautier, “Le typikon du Christ Sauveur Pantocrator,” *Revue des Études Byzantines* 32 (1974): 1–145, at 83–89.



large staff.<sup>138</sup> The most interesting part in relation to medical preparations is found in the sections discussing the *xenōn*'s supplies, which can be divided into three parts according to their thematic content.<sup>139</sup>

The first section gives the allotment of supplies for the *nosokomos* (νοσοκόμος), who is in charge of the management of the *xenōn*; the next refers to the relevant supplies for the *meizoteros* (μειζότερος), who takes care of the cellar; and the last is related to various other miscellaneous dispositions.<sup>140</sup> The first two lists provide references to ingredients related to medical practice. However, there is often no clear distinction between goods that could be used for the preparation of medicines and those for other needs. This applies, for example, to the honey on the list for the *nosokomos*, where the 50 maritime measures (μέτρα θαλάσσια/*metra thalassia*) of honey could have been used for the preparation of potions such as ὄξύμελι (*oxymeli*, a mixture of vinegar and honey) and ὀμφακόμελι (*omphakomeli*, a mixture of honey and juice of sour grapes), and also, for example, for some sweet beverages or juices (χυλαρίσις/*chylariois*) to be offered at the feast of the Savior (August) and the feast of the Saints Anargyroi (November).<sup>141</sup> In addition to this, another 50 maritime measures of honey are allocated to the *meizoteros* for juices, poultices (καταπλάσμάτων/*kataplasmātōn*), and electuaries (ἐλιγμάτων/*eligmatōn*).<sup>142</sup> In a similar vein, 66 maritime measures of olive oil were expected to be used by the *nosokomos* for both the preparation of medicaments, such as ointments (ἀλοιφῶν/*aloiophōn*) and plasters (ἐμπλάστρον/*emplastrōn*), and for lamps in the church, wards, and other rooms of the *xenōn*;<sup>143</sup> an additional quantity of 36 maritime measures of oil was given to the *meizoteros* for the seasoning of the patients' two daily meals and also for clysters (κλυστήρων/*klystērōn*) and fomentations (πυριῶν/*pyriōn*).<sup>144</sup> In the *Typikon*, there is no specification as to how often these particular goods were supplied, although in other cases there is mention of a certain quantity supplied either daily or monthly or annually. Given that, for example, the honey allocated to the *nosokomos* also had to be used for two feasts in August and November respectively, it most probably refers to annual quantities. Further on in the text, there is a reference to some more supplies, including sugar:

<sup>138</sup> See Peregrine Horden, "How Medicalised Were Byzantine Hospitals," *Medicina e Storia* 5 (2005): 45–74, who offers the most recent critical study on the medicalization of Byzantine hospitals. For the Pantokrator, in particular, see Horden, "How Medicalised," 51–60. See also Timothy S. Miller, *The Birth of the Hospital in the Byzantine Empire*, 2nd ed., Henry E. Sigerist Supplements to the Bulletin of the History of Medicine, New Series 10 (Baltimore, 1997), 12–29, who presents a rather optimistic view about its actual function. The brief existence of the Pantokrator *xenōn* has also been discussed by Ewald Kislinger, "Der Pantokrator-Xenon, ein trügerisches Ideal?," *Jahrbuch der Österreichischen Byzantinistik* 37 (1987): 173–79.

<sup>139</sup> *Typikon of the Pantokrator*, 1074–119, 1120–51, 1152–75, ed. Gautier, "Le typikon," 93–99.

<sup>140</sup> Robert Jordan, in his translation of the *Typikon*, uses "infirmarian" for *nosokomos* and "superintendent" for *meizoteros*: Robert Jordan, trans., "Pantokrator: *Typikon* of Emperor John II Komnenos for the Monastery of Christ Pantokrator in Constantinople," in *Byzantine Monastic Foundation Documents: A Complete Translation of the Surviving Founders' Typika and Testaments*, ed. John Thomas and Angela Constantinides Hero, 5 vols., Dumbarton Oaks Studies 35 (Washington, DC, 2000), 2:725–81.

<sup>141</sup> *Typikon of the Pantokrator* 1092–98, ed. Gautier, "Le typikon," 95.

<sup>142</sup> *Typikon of the Pantokrator* 1124–26, ed. Gautier, "Le typikon," 97.

<sup>143</sup> *Typikon of the Pantokrator* 1082–85, ed. Gautier, "Le typikon," 93.

<sup>144</sup> *Typikon of the Pantokrator* 1120–24, ed. Gautier, "Le typikon," 97.

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Each month he [i.e., the *nosokomos*] will receive five monastic *modioi* of fine wheat flour, one hundred weighed *litrai* of sugar (σάκχαρος/*sakcharos*) for the whole year, three barrels of grapes, two barrels of pomegranates, four barrels of wild grape juice for must, four maritime *modioi* of barley for juice for each of the two feasts, and one loaf each day for *artomeli* [i.e., made of bread and honey] and leavened bread.<sup>145</sup>

Sugar must have been used in the diet of sick and elderly people for its nutritional value and potentially for the preparation of sugar-based potions. As we will see below, sugar-based potions are occasionally mentioned in surviving recipe books from other twelfth-century Constantinopolitan *xenōnes*. Bearing in mind that medicinal and non-medicinal uses of ingredients, as in the case of olives and honey above, are often conflated in the text, it is also tempting to suggest that some small quantity of sugar might have been used for *kollyba* (a ritual dish distributed to the congregation at commemorations),<sup>146</sup> although the expensiveness of sugar must have restricted its use for non-medicinal purposes. There are no surviving commercial documents or other sources from this period that record exact sugar prices. However, the luxury status of sugar for culinary purposes is also evident from a reference in a near contemporary poem that criticizes monastic life in Constantinople and is addressed to Emperor Manuel I Komnenos (r. 1143–80); here something called σαχαρόθερμον (*sacharothermon*, most probably a hot beverage of wine and sugar) and sweets made of sugar (σαχαράτα/*sacharata*) are clearly destined for the rich abbot, not for the ordinary monk.<sup>147</sup>

<sup>145</sup> *Typikon of the Pantokrator* 1106–11, ed. Gautier, “Le typikon,” 95: “ὕπερ σεμιδάλεως λήψεται ἑκάστῳ μηνὶ μοναστηριακοῦς μοδίους πέντε, σάκχαρος τῷ ὅλῳ χρόνῳ λίτρας ζυγικὰς ἑκατὸν, σταφυλῶν βουτία τρία, ῥοιῶν βουτία δύο καὶ λόγῳ σταφυλοζώμου ἀγριοσταφυλῶν βουτία τέσσαρα, ὑπὲρ τοῦ χυλοῦ τῶν δύο ἑορτῶν ἀνά κριθῆς μοδίους θαλασσίους τέσσαρα, λόγῳ τοῦ ἀρτομέλιτος καὶ τοῦ διὰ ζύμης ἑκάστη ἡμέρᾳ ψωμίον ἓν.” English translation by Jordan, “*Pantokrator*,” 761, slightly modified.

<sup>146</sup> *Kollyba* originally consisted of boiled wheat and was the food of monks. It was later used as offerings in commemorating the dead, and the boiled wheat was then also mixed with dried raisins, pomegranate seeds, almonds, and herbs. See Phaidon Koukoules, *Βυζαντινῶν Βίος καὶ Πολιτισμὸς*, vol. 4 (Athens, 1951), 209; Demetrios J. Constantelos, “Byzantine Religiosity and Ancient Greek Religiosity,” in *The “Past” in Medieval and Modern Greek Culture*, ed. Speros Vryonīs, Jr, Byzantina Kai Metabyzantina 1 (Malibu, 1978), 135–51, at 145 and n. 42; and Béatrice Caseau, *Nourritures terrestres, nourritures célestes: la culture alimentaire à Byzance* (Paris, 2015), 87–97. According to Louis Petit, “La grande controverse des Colybes,” *Échos d’Orient* 2 (1899): 321–31; Antonio Scordino, “I Coliva nel Typicon di Messina,” *Studi Meridionali* 3 (1970): 271–75; and Frank R. Trombley and Alexander Kazhdan, “Kollyba,” in *Oxford Dictionary of Byzantium*, 2:1137–38, sugar was also one of the ingredients of *kollyba*. However, they take for granted the use of sugar in *kollyba*, mostly based on post-Byzantine sources, and without considering its lack of availability in the early period. I have not been able to identify any reference to Byzantine sources on the use of sugar in the preparation of *kollyba*.

<sup>147</sup> *Ptochoprodromika* 4.330, 4.576, ed. Hans Eideneier, *Ptochoprodromos: Einführung, kritische Ausgabe, deutsche Übersetzung, Glossar*, Neograeca Medii Aevi 5 (Cologne, 1991), 157, 170. On this poem in the context of contemporary monasticism in the capital, see Michael Angold, “Monastic Satire and the Evergetine Monastic Tradition in the Twelfth Century,” in *The Theotokos Evergetis and Eleventh-Century Monasticism*, ed. Margaret Mullett and Anthony Kirby, Belfast Byzantine Texts and Translations 6/1 (Belfast, 1994), 86–102. Another reference from the second half of the twelfth century connects the consumption of “sweet cane” (γλυκὺς . . . κάλαμος/*glykys . . . kalamos*), presumably sugar, with water as a sort of refreshment for the Emperor Manuel I Komnenos. This is found in Eustathios of Thessaloniki’s funeral oration for the emperor, Theophil Lucas Frider Tafel, ed.,

To return to the *Typikon*, the overall structure of the list of supplies does not allow us to draw conclusions as to what recipes were used for the sugar-based potions they made, since there is no exhaustive list of the various ingredients required for the preparation of composite drugs, apart from some references to, for example, mastic, myrrh, gum ammoniac, and various kinds of animal fat.<sup>148</sup> Various other ingredients are most probably included under budget entries such as medical supplies (ἰατρικῶν εἰδῶν/*iatrikōneidōn*), medicaments (βοηθημάτων/*boēthematōn*) or other preparations (λοιπῶν σκευασιῶν/*loiṛōn skeuasiōn*), and a special allowance is given to the chief pharmacist every year for the purchase of herbs (λόγῳ τοῦ βοτανολογίου/*logō tou botanologiou*), which are not individually specified.<sup>149</sup> Although the quantities of honey (100 maritime measures, or about 1,000 modern liters) and sugar (100 *litrai*, which is approximately 32 kg) available,<sup>150</sup> as mentioned in the supplies, cannot be directly compared because honey is liquid and has greater volume, the quantity of sugar would be quite significant by medieval standards. This, in turn, shows that the Byzantines put a good deal of store by the role of sugar in health care.

That sugar was used for medical purposes in a Byzantine charitable institution is supported by evidence from another foundation charter, this time a smaller establishment (for the care of thirty-six elderly patients attended by only one doctor) attached to the monastery of the Virgin Mary Kosmosoteira (Savior of the World), founded by John's brother, Isaac Komnenos, in 1151/2 in the Thracian city of Bera (mod. Ferres). In the paragraph discussing the medical personnel and the relevant supplies, the charter states: "The *proestōs* [i.e., person in charge of the management] is responsible for bringing in medical supplies and storing them every year in the monastery whenever the time is right, in addition to almonds, sugar (σάκχαρος/*sakcharos*), and other things benefiting the sick."<sup>151</sup> This charter does not specify

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*Eustathii metropolitae Thessalonicensis opuscula: Accedunt Trapezuntinae historiae scriptores Panaretus et Eugenicus* (Frankfurt am Main, 1832), 209, lines 65–69. One more reference in the *Chiliads* by the twelfth-century Byzantine poet John Tzetzes (c. 1110–after 1160) confirms the increasing popularity of sugar. In referring to some sort of sweet cakes (πλακοῦντες/*plakountes*), he states that they may be made either with honey (μέλιτος/*melitos*) or sugar (σάκχαρος/*sakcharos*): John Tzetzes, *Chiliads* 13.480, ed. Pietro L. Leone, *Ioannis Tzetzae Historiae* (Naples, 1968), 526, line 318. In his *Scholia* on his own *Chiliads* 6.702, ed. Leone, *Historiae*, 581, John Tzetzes states that sugar (ζάχαρι/*zacharin*) is produced from the "sweet cane" (γλυκοκάλαμον/*glykokalamon*), referring to sugarcane. The term γλυκοκάλαμον in reference to sugarcane also appears in an earlier hagiographical text, the *Life of St. Basil the Younger* 48, ed. Denis F. Sullivan, Alice-Mary Talbot, and Stamatina McGrath, *The Life of Saint Basil the Younger: Critical Edition and Annotated Translation of the Moscow Version* (Washington, DC, 2014), 262, line 15, which seems to have been composed in the late tenth century, according to the introduction to the most recent edition, which is mostly based on a late sixteenth-century manuscript (Moscow, Gosudarstvennyj Istoričeskij Musej, MS Synodalis gr. 249).

<sup>148</sup> *Typikon of the Pantokrator* 1131–32, 1143–44, ed. Gautier, "Le typikon," 97.

<sup>149</sup> *Typikon of the Pantokrator* 1114–15, 1131–32, 1209–10, ed. Gautier, "Le typikon," 95, 97, 101.

<sup>150</sup> One Byzantine maritime measure for oil and wine is equal to 8.52 and 10.25 liters respectively. There is no specification in the text as to what kind of maritime measure was used for honey. Either way the total quantity must have been around 1,000 liters. The total weight of sugar is calculated on the assumption that one Byzantine *litra* is approximately 320 g. On these units, see Schilbach, *Byzantinische Metrologie*, 56–81, 112–19, 277–78.

<sup>151</sup> *Typikon of Kosmosoteira* 1120–22, ed. Georgios K. Papazoglou, *Τυπικόν Ισαακίου Αλέξιου Κομνηνού Της Μονῆς Θεοτόκου της Κοσμοσωτεϊρας* (Thessaloniki, 2014), 93: "τῶν ἰατρικῶν εἰδῶν ἐξωνουμένων παρὰ τοῦ προεστῶτος καὶ ἀποτιθεμένων κατ' ἐνιαυτὸν τῇ μονῇ, ὅτε καιρὸς ἐπιτήδειος.

the quantity of sugar, but it is clearly distinguished from generic medical supplies. The reference to sugar together with almonds, in particular, is striking and could presumably be connected with their importance to the patients' diet. Almonds and sugar are reported as the two ingredients added to the Byzantine *katastaton*, a thick boiled-grain dish (frumenty), in an anonymous Byzantine dietary manual in which this particular recipe is recommended for stomach ailments.<sup>152</sup> Taking into consideration the highlighting of these two ingredients in the *Typikon* account, this particular dish could have been used on a regular basis for feeding patients, which aligns with the importance of sugar for dietetic purposes in the Islamic world. Interestingly, the charter does not mention honey among the named supplies.

Some evidence of sugar-based potions in Byzantine *xenōnes* is also offered by a collection of recipes associated with the Mangana *xenōn* in Constantinople. Although we cannot provide a secure date for the Mangana collection, it should perhaps be assigned to the period before the fall of Constantinople to the Franks in 1204, since there is no evidence for the restoration of the Mangana *xenōn* in the Palaiologan period.<sup>153</sup> Rosewater with sugar (ρόδοσάκχαρ/*rodosakchar*) is mentioned in two cases, and julep (ζυλάπιν/*zylapin*) in another, as ingredients in composite drugs, and once more sugar (σάκχαρ/*sakchar*) is recommended for sweetening barley-water (κριθόχυλον/*krithochylon*).<sup>154</sup> On the other hand, we can see roughly fourteen mentions of the use of honey.<sup>155</sup> It is intriguing that the sole mention of julep comes as part of the advice provided by a physician called Abram the Saracen (Ἀβράμ τοῦ Σαρακηνοῦ/*Abram tou Sarakēnou*), most probably an Arab physician practicing in Constantinople.<sup>156</sup> These examples are in line with the appearance of sugar in the main medical supplies listed in the twelfth-century Byzantine foundation charters of charitable institutions, but these occurrences are still not comparable to the extensive references to the newly disseminated sugar-based medicaments in the almost contemporary southern Italian/Sicilian examples. Apart from the recipes from the

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Πρὸς δὲ καὶ ἄμυγδάλων καὶ σάκχαρος καὶ ἐτέρων τῶν συντελούντων τοῖς κάμνουσι.” English translation by Nancy Patterson Ševčenko, “*Kosmosoteira: Typikon of the Sebastokrator Isaac Komnenos for the Monastery of the Mother of God Kosmosoteira near Bera*,” in *Byzantine Monastic Foundation Documents*, ed. Thomas and Hero, 782–858, at 825.

<sup>152</sup> Anonymus, *On Foodstuffs*, ed. F. Z. Ermerins, *Anecdota medica graeca* (Leiden, 1840), 233, lines 8–11. It is worth noting that in the *Typikon of the Pantokrator*, the *meizoteros* is supplied with three *modioi* of *katastaton* annually for consumption by the patients, although no details are given about its ingredients. See *Typikon of the Pantokrator* 1133–34, ed. Paul Gautier, “Le typikon,” 97.

<sup>153</sup> See David Bennett, *Medicine and Pharmacy in Byzantine Hospitals: A Study of the Extant Formularies* (London, 2017), 111–17.

<sup>154</sup> Bennett, *Medicine and Pharmacy*, 204, lines 12–14; 205, lines 12–13; and 203, lines 14–15. The sole surviving codex of this collection (Vatican City, Biblioteca Apostolica Vaticana, MS Vat. gr. 299) is dated to the fourteenth century. A considerable number of recipes for sugar-based potions are found in two unedited collections, which seem to have been connected with Byzantine *xenōnes* and are preserved in BnF gr. 2194 (fifteenth century), fols. 441r–450v. Fol. 441r, line 7 and fol. 448r, line 1: “Δυναμερὸν ξενωνικὸν διὰ πείρας” (“*Dynameron, xenōnikon* based on experience”) and “Ξενωνικά” (“*Xenōnika*”). The large number of references to oriental *materia medica*, usually common in late Byzantine works, clearly suggests a fourteenth-/fifteenth-century date for the *xenōnika* in BnF gr. 2194. A commentary on some points of interest in these texts is available in Bennett, *Medicine and Pharmacy*, 121–39.

<sup>155</sup> Bennett, *Medicine and Pharmacy*, 200–7 passim.

<sup>156</sup> Bennett, *Medicine and Pharmacy*, 204–5.

Mangana *xenōn*, the only surviving medical recipe book known to date to this early period is one attributed to a certain John Archiatros (i.e., chief physician) and it provides only two references to the use of sugar, by contrast to the abundant references to honey.<sup>157</sup> Thus, we can conclude that, although the sources record the steady introduction of sugar-based potions to Byzantine medical practice from the late eleventh/early twelfth century onward, the high cost of sugar alluded to above precluded its widespread use.

Lastly, it should be noted that at roughly the same period, sugar-based potions took on particular importance in Latin medical institutions, too, confirming the prominent use of sugar in Mediterranean health care. What is perhaps the first surviving evidence comes from a Latin establishment dated to 1182, when the Master of the Hospitalers, Roger des Moulins (1177–87), promulgated a number of decrees at the chapter-general of the order, including the requirement that the Frankish bailiff of Tiberias and the prior of Tripoli should send sugar to the hospital of the order in Jerusalem for syrups and other medicaments for sick patients.<sup>158</sup>

### 3. DISSEMINATION OF SUGAR-BASED COMPOSITE DRUGS IN LATE BYZANTIUM (THIRTEENTH–FIFTEENTH CENTURIES)

The sack of Constantinople in 1204 by the crusaders and the subsequent fragmentation of the Byzantine Empire had a number of repercussions. The establishment of Westerners in lands previously held by the Byzantine Empire promoted further exchange of knowledge in the decades that followed, especially between Latins and Greeks. Most notable are the various translations of Latin philosophical and theological texts into Greek and of similar Greek texts into Latin made by the end of the thirteenth century.<sup>159</sup> The trade in goods including spices must have become more stable in the Latin-controlled Aegean Sea, increasing the availability

<sup>157</sup> John Archiatros, *Iatrosophion* 115, 117, ed. Barbara Zipser, *John the Physician's Therapeutics: A Medical Handbook in Vernacular Greek*, Studies in Ancient Medicine 37 (Leiden, 2009), 126, line 19, and 128, line 11: "σάχαρ." Cf. Barbara Zipser, "Substitutes in John Archiatros's *Therapeutics*," in *The Art of Healing in Byzantium. New Perspectives*, ed. Pitarakis and Tanman, 187–98, at 191–94. The text survives into two versions (Ⲙ and ω); Zipser, *John the Physician's*, 33–37, has suggested a *terminus post quem* to mid thirteenth century for both versions. See also Dionysios Stathakopoulos, "Review of Barbara Zipser, *John the Physician's Therapeutics: A Medical Handbook in Vernacular Greek*," *Medical History* 55 (2011): 120–21, who provides more evidence in favor of a date before 1200 for the earlier (Ⲙ) version of the text.

<sup>158</sup> *Cartulary of the Order of St John in Jerusalem* 627 (14 March 1182), ed. J. Delaville Le Roulx, *Cartulaire général de l'Ordre des Hospitaliers de S. Jean de Jérusalem, (1100–1310)*, vol. 1 (Paris, 1894), 427, lines 27–32: "Prior Montispellerini mitat in Jerusalem duo quintalia cucari pro conficiendis lectuariis, sirupis et aliis medicinis ad opera infirmorum. Et totidem etiam quintalia cucari mitat baylivus de Tabarie." On the establishment and development of the hospital of the Order of Saint John in Jerusalem, see Piers D. Mitchell, *Medicine in the Crusades: Warfare, Wounds and the Medieval Surgeon* (Cambridge, UK, 2004), 61–85.

<sup>159</sup> Latin–Greek translations, especially of theological works, were also made on a smaller scale in the Komnenian period in the twelfth century. For an overview, see Dimitrios Z. Nikitas, "Traduzioni greche di opera latine," in *I Greci: Storia, cultura, arte, società*, vol. 3, *I Greci oltre la Grecia*, ed. Salvatore Settis (Turin, 2001), 1035–51.



of sugar, too. The first piece of evidence which confirms that sugar-based recipes outnumbered those based on honey in Byzantine pharmacopoeia is connected with one of the three Byzantine successor states, that of Nicaea (chiefly western Asia Minor, including areas of Macedonia and Thrace from the late 1240s)<sup>160</sup> and, in particular, in the writings of the polymath and renowned intellectual Nikephoros Blemmydes (1197–c. 1269).

Nikephoros Blemmydes wrote on a variety of subjects from theology to philosophy. He took monastic vows and around 1237 was appointed abbot of the monastery of Gregory the Wonderworker in Ephesus. He is also well known as a teacher; among his students was the emperor and scholar Theodore II Laskaris (r. 1254–58). Most importantly, he was the son of a physician and spent seven years in Smyrna, studying and subsequently practicing medicine.<sup>161</sup> He is the author of two short medical hymns written in the form of ecclesiastical canons; these texts focus on the examination of urine and venesected blood.<sup>162</sup> The very basic nature of the details contained in these texts, together with the fact that they were written in the form of ecclesiastical hymns—stichera and canon combining mnemonic techniques—suggests that they were used in a general way to instruct the contemporary intellectual elite, although this need not preclude their being used by medical students, too.<sup>163</sup> In the uroscopic canon, sugar appears seven times as an ingredient of composite drugs, including juleps, as opposed to just one mention of honey.<sup>164</sup>

<sup>160</sup> The other two were Epiros (mainly western Greece) and Trebizond (the eponymous city on the southeastern coast of the Black Sea and its hinterland). The main aim of all these states was the re-establishment of the Byzantine Empire through the recapture of Constantinople.

<sup>161</sup> According to his *Partial Account* 1.3–5, ed. Joseph A. Munitiz, *Nicephori Blemmydae Autobiographia sive Curriculum Vitae necnon Epistula Universalior*, CCSG 13 (Turnhout, 1984), 4, line 12, to 5, line 30, it seems that he spent four years on his studies followed by three years in practice. For his role in contemporary education, see C. N. Constantinides, *Higher Education in Byzantium in the Thirteenth and Early Fourteenth Centuries, 1204–ca. 1310*, Texts and Studies of the History of Cyprus 11 (Nicosia, 1982), 7–27.

<sup>162</sup> The uroscopic text, in the form of a canon and stichera, has been edited by Iulius Ludovicus Ideler, ed., *Physici et medici Graeci minores*, 2 vols. (Berlin, 1841–42), 2:318–22, and by Aristotelis P. Kousis, “Les oeuvres médicales de Nicéphoros Blémmydès selon les manuscrits existants,” *Πρακτικὰ Ἀκαδημίας Ἀθηνῶν* 19 (1944): 56–75, at 60–63; the text on the venesection of blood, in the form of stichera, was edited by Kousis, “Les oeuvres médicales,” 59–60. The uroscopic text, in particular, was extremely popular in the late Byzantine period, surviving in about 40 manuscripts; a preliminary list is available on *Pinakes: Textes et manuscrits grecs*, at <https://pinakes.irht.cnrs.fr/notices/oeuvre/9630/> (last accessed 20 April 2020). It is notable that in some manuscripts authorship is ascribed to Maximos Planoudes, a well-known early Palaiologan teacher in Constantinople, who was perhaps responsible for a revised edition of the text. On these texts in the context of Byzantine hymnography, see Kariophyllis Mitsakis, “Byzantine and Modern Greek Parahymnography,” in *Studies in Eastern Chant*, ed. Dimitri Conomos, vol. 5 (Crestwood, NY, 1990), 9–76, at 47–52. I am currently preparing a critical edition, English translation, and commentary of these texts in collaboration with Dimitrios Skrekas.

<sup>163</sup> This poem makes an interesting parallel with the 352-line Latin poem *On Urines* composed by French physician Gilles de Corbeil (c. 1140–c. first quarter of the thirteenth century), who studied at Salerno. See Peter Kliegel, *Die Harnverse des Gilles de Corbeil* (Bonn, 1972), who provides the text, a German translation, and detailed commentary.

<sup>164</sup> Nikephoros Blemmydes, *Stichera and Canon on Distinguishing between the Thirteen Kinds of Urine Vial [According to Colour]*, ed. Kousis, “Les oeuvres médicales,” sugar (σά[κ]χαρ, ἰσάχαρ/*sa [k]char, isachar*): 60, lines 29–30; 61, lines 13, 15, and 35; 62, line 1; 62, lines 21–25, and 63, line 3; honey (μέλι/*meli*): 63, line 4; julep (ζουλάπιον/*zoulapion*): 60, line 29, and 62, lines 21–22.

Although this text is not extensive, it seems to reflect a notable dissemination of sugar-based potions by the first half of the thirteenth century. A similar dependence on sugar is also found in a collection of remedies ascribed to Nikephoros Blemmydes in Vienna, Österreichische Nationalbibliothek, MS med. gr 45 (second half of the fourteenth century), although the authenticity of this collection is questionable.<sup>165</sup> A further reference to the consumption of a julep made of apple juice (μιλοζούλαπον/*milozoulapon*) in a glass container (ύαλίν/*hyalin*) for someone suffering from evacuations (κένωμα/*kenōma*) in the Latin-ruled island of Cyprus in the late thirteenth century confirms the further distribution of the new form in the Greek-speaking eastern Mediterranean world.<sup>166</sup> It is worth noting that both textual and archaeological evidence suggest that sugarcane was cultivated and sugar produced in Cyprus by the late thirteenth century,<sup>167</sup> an activity that was significantly expanded after the fall of the crusader states in the Holy Land in 1291.

In what follows I show that by the late thirteenth/early fourteenth century, Byzantine authors of long pharmacological manuals were for the first time making a particular effort to include a large number of sugar-based composite drugs in their works, thus reflecting a contemporary need for the provision of recipes using sugar on a regular basis. I discuss three works, since they all share common elements, but each of them is also a distinctive example of different cultural interactions in medicine in that period.

### 3.1. *Three Late Byzantine Pharmacological Manuals: By Nicholas Myrepsos, George Choniades, and John Zacharias Aktouarios*

The first is the *Dynameron* by a certain Nicholas Myrepsos,<sup>168</sup> traditionally identified with Nicholas, a court physician of John III Doukas Vatatzes (r. 1222–54) in

<sup>165</sup> The text (fols. 35r–83v) is divided into 230 chapters and remains unedited. The vast majority of its contents consist of instructions for the use and preparation of composite drugs. There are also prayers (e.g., fol. 39v) in the usual trinitarian form, i.e., “in the name of the Father, and of the Son, and of the Holy Spirit”; on the other hand, we can see details about the use of spells and amulets, including the inscription of characters of a clearly superstitious nature (e.g., fol. 40r). The chapter titles have been edited by Kousis, “Les oeuvres médicales,” 64–71. Its title is as follows, Vienna, Österreichische Nationalbibliothek, MS med. gr. 45, fol. 35r: “Ἐτερον τοῦ αὐτοῦ Βλεμμίδου· περὶ ἰατρικῆς διδασκαλίας” [Another Medical Work by Blemmydes: On Medical Instruction]. I am currently preparing a critical edition and commentary of this text, which will be published by Routledge. The text is preceded by Nikephoros’s hymns on blood and urines, and a short opusculum on weights and measurements, fols. 29r–35r. The title on fol. 29r reads as follows: “τοῦ σοφοτάτου καὶ λογιωτάτου κυροῦ Νικηφόρου τοῦ Βλεμμίδου· εἰδησις τῶν ἰατρικῶν μέτρων· καὶ κανῶν εἰς τὰς κρίσεις τῶν αἱμάτων τῆς φλεβοτομίας τῶν ἀσθενῶν· καὶ κανῶν εἰς τὰς κρίσεις τῶν ὑελίων τῶν δεκατριῶν, τῶν θεωρουμένων ἐπὶ ταῖς τῶν ἀνθρώπων ἀσθενείαις· ἀλλὰ δὴ καὶ εἰς τὰς διαγνώσεις καὶ θεραπείας αὐτῶν, πάνυ ἀναγκαϊότατα.”

<sup>166</sup> The reference is found in a letter addressed to Constantine, a high-ranking official of the Lusignan court of Cyprus during the reign of Henry II (1285–1324). It is preserved in Vatican City, Biblioteca Apostolica Vaticana, MS Palat. gr. 367, fol. 116r–v, and has been recently re-edited by Alexander Beihammer, *Griechische Briefe und Urkunden aus dem Zypern der Kreuzfahrerzeit: Die Formularsammlung eines königlichen Sekretärs im Vaticanus palatinus graecus 367*, Texts and Studies of the History of Cyprus 57 (Nicosia, 2007), 188–89.

<sup>167</sup> See Ouerfelli, *Sucre*, 105–6.

<sup>168</sup> The text has been recently edited by Ilias Valiakos, *Das Dynameron des Nikolaos Myrepsos* (Heidelberg, 2019). It is also available through an early Latin translation by Leonhart Fuchs, *Nicolai Myrepsi Medicamentorum opus* (Basel, 1549).

1241, who also held the office of *aktouarios*.<sup>169</sup> However, there is not sufficient evidence to confirm this assumption.<sup>170</sup> The manuscripts either refer to the author as Nicholas Myrepsos<sup>171</sup> or Nicholas the physician and *myrepsos*,<sup>172</sup> or they give no name at all for the author,<sup>173</sup> thus his identity remains obscure. The work lacks a proem, although sometimes the compiler intervenes, providing a brief narration in the first person at the beginning of some groups of recipes.<sup>174</sup> The oldest surviving manuscript, Paris, Bibliothèque nationale de France, MS gr. 2243, dated to 1339, presents the text arranged alphabetically in twenty-four classes according to the various kinds of drugs and consists of around 2,650 recipes, making it the most

<sup>169</sup> George Akropolites, *Chronicle* 39, ed. Augustus Heisenberg, *Georgii Acropolitae opera*, vol. 1, *Continens Historiam, Breviarum historiae, Theodori Scutariotae additamenta* (Leipzig, 1903), 63, lines 12–16: “When the discussion became protracted, the physician (ἰατρός/iatros) Nicholas contradicted what was being said. He was a man who partook minimally of philosophy but was consummate in his own profession and especially that which is known through experience. The empress was very fond of him; he held the dignity of *aktouarios*,” translation from Ruth Macrides, trans., *George Akropolites: The History* (Oxford, 2007), 210. The office of *aktouarios* existed in early Byzantium, when it was related to the finances of the empire. It was given to physicians, at least, from the twelfth century onward. On this office, see Petros Bouras-Vallianatos, *Innovation in Byzantine Medicine: The Writings of John Zacharias Aktouarios (c. 1275–c. 1330)* (Oxford, 2020), 25–28.

<sup>170</sup> See Herbert Hunger, *Die hochsprachliche profane Literatur der Byzantiner*, vol. 2, *Philologie, Profandichtung, Musik, Mathematik und Astronomie Naturwissenschaften, Medizin, Kriegswissenschaft, Rechtsliteratur* (Munich, 1978), 312, with references to earlier studies. Cf. the recent articles by Valiakos, in which he presents somewhat differing views on the identification of the author. In the first article (Elias Valiakos et al., “Ethnopharmacological Approach to the Herbal Medicine of the ‘Antidotes’ in Nikolaos Myrepsos’ *Dynameron*,” *Journal of Ethnopharmacology* 163 (2015): 68–82, at 69), Valiakos is convinced that Nicholas is to be identified with the physician at the Nicaean court, while in the second case (Ilias Valiakos, “Το *Δυναμερόν* του Νικολάου Μυρεψού,” *Βυζαντικά* 32 (2015): 241–55, at 241–42), he thinks that this identification is somewhat uncertain. Valliakos did not take into consideration the most important study of the text, by Anna Maria Ieraci Bio, “Testi ginecologi tra Oriente ed Occidente. 1. *Metrodora* ed il *Dynameron* di Nicola Mirepso. 2. Una testimonianza italo-greca su una *Quaestio medicinalis* salernitana,” in *La Scuola Medica Salernitana: Gli autori e i testi. Convegno internazionale, Università degli studi di Salerno, 3–5 novembre 2004*, ed. Danielle Jacquart and Agostino Paravicini-Bagliani, Edizione Nazionale La Scuola Medica Salernitana 1 (Florence, 2007), 283–314.

<sup>171</sup> For example, BnF gr. 2243 (AD 1339), fol. 11v: “Ἀρχὴ σὺν θεῷ ἁγίῳ τοῦ δυναμεροῦ τοῦ πρώτου στοιχείου τοῦ ἄλφα ποίημα νικολάου μυρεψοῦ,” and Paris, Bibliothèque nationale de France, MS gr. 2238 (fifteenth century), fol. 9r, lines 1–2: “νικολάου μυρεψοῦ.”

<sup>172</sup> E.g., Oxford, Bodleian Library, Barocci MS 171 (fifteenth/sixteenth century), fol. 8r, lines 1–2: “Νικολάου ἱατροῦ τοῦ καὶ μυρεψοῦ ἱατρικὸν βιβλίον κατὰ στοιχεῖον,” and Real Biblioteca del Monasterio de San Lorenzo de El Escorial, MS Σ.Π.3 (sixteenth century), fol. 12r, lines 1–2: “Νικολάου ἱατροῦ τοῦ καὶ μυρεψοῦ λεγομένου ἱατρικὸν βιβλίον κατὰ στοιχεῖον.” In late Byzantium, the term *myrepsos* was applied to those who owned perfume workshops (μυρεψικὰ ἐργαστήρια/*myrepsika ergastēria*), whose work included the preparation of unguents and perhaps dealing in spices; we know of a guild operated by *myrepsoi* in Thessaloniki in 1320. See Ewald Kislinger, “Gewerbe im späten Byzanz,” in *Handwerk und Sachkultur im Spätmittelalter* (Vienna, 1988), 103–26, at 117.

<sup>173</sup> E.g., Paris, Bibliothèque nationale de France, MS gr. 2237 (fourteenth century), fol. 23r: “Ἀρχὴ σὺν θεῷ τῶν ἀντιδότην κεφάλαιον πρῶτον,” and Athens, National Library of Greece, MS 1478 (seventeenth century), in which the text is acephalous starting from the first antidote, fol. 1r, line 1: “Ἀντίδοτος ὥρσια ἀλεξάνδρινα.”

<sup>174</sup> See Anna Maria Ieraci Bio, “La sistemizzazione della farmacologia a Bisanzio: il *Dynameron* di Nicola Mirepso e le fonti ‘occidentali,’” in *Collecting Recipes: Byzantine and Jewish Pharmacology in Dialogue*, ed. Lennart Lehmann and Matteo Martelli, *Science, Technology, and Medicine in Ancient Cultures* 4 (Berlin, 2017), 301–14, at 303–5.

extensive medieval Greek work on the topic.<sup>175</sup> The compiler used earlier Greek sources, such as Galen and Metrodora.<sup>176</sup> There are many words of Latin provenance in transliteration but also various mentions of contemporary Latin language attesting to the considerable influence of the medieval Latin medical tradition.<sup>177</sup> Moreover, one of the sources seems to be the *Antidotarium magnum*,<sup>178</sup> which perhaps suggests the compiler of the *Dynameron* was capable of dealing with Latin sources in their original version.<sup>179</sup> The massive nature of the work discouraged its wide circulation and it survives almost complete in only seven manuscripts,<sup>180</sup> although there are a considerable number of excerpting manuscripts.<sup>181</sup>

The second is a collection of recipes by the scholar and astronomer George (or Gregory) Chioniades (c. 1240/50–c. 1320).<sup>182</sup> He was most probably born in Constantinople. Later on, he traveled to Persia, with the encouragement of the emperor of Trebizond, Alexios II Komnenos (r. 1297–1330), to acquire further

<sup>175</sup> Cf. Ieraci Bio, “Testi ginecologi,” 288–90, who has pointed to some references in the work which might suggest a date close to the end of the thirteenth century.

<sup>176</sup> Ieraci Bio, “Testi ginecologi,” 298–302.

<sup>177</sup> Ieraci Bio, “Testi ginecologi,” 291 and Armin Hohlweg, “Terminologie in byzantinischen medizinischen Texten und Lexikographie,” in *Lexicographica Byzantina: Beiträge zum Symposium zur byzantinischen Lexikographie* (Wien, 1–4. 3. 1989), ed. Wolfram Hörandner and Erich Trapp, Byzantina Vindobonensia 20 (Vienna, 1991), 129–35.

<sup>178</sup> Some examples have been cited by Ieraci Bio, “La sistematizzazione,” 306–7, and Ieraci Bio, “Testi ginecologi,” 292–94. I had the chance to compare the section on antidotes with a partial transcription of the *Antidotarium magnum* (see note 114, above) and I discovered a large number of borrowings.

<sup>179</sup> I am not aware of any individual Greek translation of the *Antidotarium magnum*. It should be noted that I have recently discovered a small collection of recipes which seems to provide some Latin recipes in Greek translation. This survives in Milan, Biblioteca Ambrosiana, MS Q94 sup, fols. 332v–335v. It is entitled: “Εἰσαγωγικὴ μέθοδος ἀντιδότην, τῇ ῥωμαϊκῇ διαλέκτῳ, μετατεθεῖσα εἰς τὴν ἐλλάδα” [Introductory method [on the composition] of antidotes translated from the Roman dialect into Greek]. The first recipe (fol. 332v, line 2: “Ἀντίδοτος ἢ χρυσὴ”) is actually very similar to the first recipe in the *Dynameron* (A.1, ed. Valiakos, *Das Dynameron*, 25, line 1, to 26, line 8: “Ἀντίδοτος, ὠρσία ἀλεξανδρινά”). In the catalogue of manuscripts of the Greek libraries of Constantinople in the sixteenth century, which has survived in Vienna, Österreichische Nationalbibliothek, MS hist. gr. 98, there are references to Latin recipe books that had been translated into Greek. Unfortunately, the relevant manuscripts have not yet been identified. See the relevant discussion, including transcriptions of the titles, by Georgios K. Papazoglou, *Βιβλιοθήκες στὴν Κωνσταντινούπολη τοῦ 15<sup>του</sup> αἰῶνα* (Thessaloniki, 1983), 347, nos. 46 and 48. Some recipes, which seems to originate from Latin pharmacological works into Greek translation, survive in an anonymous collection in Vatican City, Biblioteca Apostolica Vaticana, MS gr. 282 (fifteenth century), fols. 433r–437v. See, for example, fol. 437r, lines 3–11, and fols. 437r, line 23–437v, line 3: “Τροχίσκος εἰς αἵμασσόμενα οὖλα καὶ . . . καὶ σειομένους ὀδόντας . . . ἀπὸ τε λατινικῶν βιβλίων, καὶ ἐλληνικῶν ἐξερανησθεῖς,” and “Τροχίσκος αἵμοστατικὸς θαυμαστός: ὃς δὴ συντέθειται μὲν καὶ αὐτὸς παρ’ ἡμῶν· πλὴν τὰς ἀφορμὰς ἐσχομεν παρὰ τινος τῶν λατίνων ἱατροῦ, Μεσοῦ ἐλεγμένου.”

<sup>180</sup> In addition to the above-mentioned codices (see notes 171–73), an extant version of the text also survives also in Mount Athos, Library of the Monastery of Great Lavra, MS E 192.

<sup>181</sup> An updated list of witnesses is available on *Pinakes: Textes et manuscrits grecs*, at <https://pinakes.irht.cnrs.fr/notices/oeuvre/2265/> (last accessed 20 April 2020). Valiakos, *Das Dynameron*, xiv, lists twenty manuscripts altogether.

<sup>182</sup> On Chioniades, see the well-informed entry by Anne Tihon, “Chioniades, George (or Gregory),” in *New Dictionary of Scientific Biography*, ed. Noretta Koertge, vol. 2 (Detroit, 2008), 120–22. See also Joseph Gerard Leichter, “The Zī as-Sanjārī of Gregory Chioniades: Text, Translation and Greek to Arabic Glossary” (PhD diss., Brown University, 2004), 1–6. Chioniades’s baptismal name was George. He changed his name to Gregory after his appointment as bishop of Tabriz.

knowledge in astronomy. He returned to Trebizond bringing astronomical books, which he translated into Greek.<sup>183</sup> Interestingly, he also had a career as a cleric and was even appointed a Christian bishop by the patriarch of Constantinople, at some time between 1304 and 1305, in the Ilkhanid capital Tabriz, to protect Christians who lived under the Mongols.<sup>184</sup> We know of a profession of Christian faith that he most probably wrote on the occasion of his appointment as a bishop, in which he refuted contemporary accusations of having adopted foreign beliefs due to his long stay among the Persians (Πέρσας/*Persas*), Chaldeans (Χαλδαίους/*Chaldaious*), and Arabs (Ἀραβας/*Arabas*).<sup>185</sup> In this text he identifies himself as an iatrosophist (ἰατροσοφιστοῦ Χιονιάδου/*iatrosophistou Chioniadou*), a term applied to physicians and teachers of medicine,<sup>186</sup> although we have no evidence that he ever practiced. Apart from his astronomical corpus, he is also the author of a long recipe book. The work is unedited; it survives complete in two fourteenth-century manuscripts, while fragments survive in two more manuscripts. It is entitled “Antidotes from Persia, brought and translated into Greek by kyr George Choniades,”<sup>187</sup> and consists

<sup>183</sup> On Choniades’s astronomical enterprises, see David Pingree, “Gregory Choniades and Palaeologan Astronomy,” *Dumbarton Oaks Papers* 18 (1964): 133–60; Anne Tihon, “Les tables astronomiques persanes à Constantinople dans la première moitié du XIV<sup>e</sup> siècle,” *Byzantion* 57 (1987): 471–87; and F. Jamil Ragep, “New Light on Shams: The Islamic Side of Σάμψ Πουχάρης,” in *Politics, Patronage and the Transmission of Knowledge in 13th–15th Century Tabriz*, ed. Judith Pfeiffer, *Iran Studies* 8 (Leiden, 2013), 231–47.

<sup>184</sup> On the Greek Christian community in Tabriz and Choniades’s appointment, see Johannes Preiser-Kapeller, “*Civitas Thauris*: The Significance of Tabriz in the Spatial Frameworks of Christian Merchants and Ecclesiastics in the 13th and 14th Centuries,” in *Politics, Patronage and the Transmission of Knowledge in 13th–15th Century Tabriz*, ed. Judith Pfeiffer (Leiden, 2013), 249–99, at 271–76.

<sup>185</sup> This opusculum has been edited by L. G. Westerink, “La profession de foi de Grégoire Choniadès,” *Revue des Études Byzantines* 38 (1980): 233–45, at 243–45.

<sup>186</sup> On this term, see Frank R. Trombley, “Iatrosophistes,” in *Oxford Dictionary of Byzantium*, 2:970.

<sup>187</sup> Extant manuscripts: Venice, Biblioteca Marciana, MS gr. V.8 (col. 1334) (fourteenth century), fols. 138r–156r: “Ἀντίδοτοι ἐκ Περσίας κομισθεῖσαι καὶ ἐξ ἑλληνησθεῖσαι· παρὰ τοῦ Χιονιάδη κυροῦ Γεωργίου,” and Madrid, Biblioteca nacional de España, MS Vit. 26-1 (fourteenth century), fols. 281v–300v: “Ἀντίδοτοι ἐκ Περσίας κομισθεῖσαι καὶ ἐξ ἑλληνησθεῖσαι· παρὰ τοῦ Χιονιάδη· κυροῦ Γεωργίου.” Fragmentary manuscript: Milan, Biblioteca Ambrosiana, Q94 sup., fols. 336r–347r (fifteenth/sixteenth century), which contains the first 102 recipes and the last thirty recipes or so, and is entitled “Ἀντίδοτοι ἐκ Περσεῖας κομισθηῖσαι καὶ ἐξελληνησθεῖσαι, παρὰ τοῦ φιλοσοφωτάτου καὶ ἰατρικωτάτου κυροῦ Γεωργίου τοῦ Χιονιάδου.” Excerpting manuscript: Real Biblioteca del Monasterio de San Lorenzo de El Escorial, MS T.II.14, fols. 183v–185r (fifteenth century), which contains the first nineteen recipes; title on fol. 183v, line 22: “Ἀντίδοτοι ἐκ Περσίας· κομισθεῖσαι καὶ ἐξελληνησθεῖσαι περὶ τοῦ Χιονιάτη κυροῦ Γεωργίου.” Closely related to Choniades’s collection is the much briefer recipe book (fifty-three recipes), also providing recipes that were brought back from Persia, ascribed to the otherwise unknown physician Constantine Melitiniotes from Constantinople, in which we find recipes for sugar-based electuaries called ‘μαχατζοῦν’ for محجون (*ma’jūn*), passim, edited in Aristotelis Kousis, “Quelques considérations sur les traductions en grec des oeuvres médicales orientales et principalement sur les deux manuscrits de la traduction d’un traité persan par Constantin Melitiniotis,” *Πρακτικὰ Ἀκαδημίας Ἀθηνῶν* 14 (1939): 205–20, at 211–17. It survives in two manuscripts, BnF gr. 2194 (fifteenth century), fols. 400v–404v and Berlin, Staatsbibliothek, MS gr. 158 (Phillippicus 1562) (sixteenth century), fols. 80r–88r. Another interesting collection of Arabic medical works (by Najīb al-Dīn al-Samarqandī, d. 1222, and perhaps ‘Ubayd Allāh Ibn Bukhtīshū, d. after 1058) in Greek translation, including a large number of pharmacological recipes with *inter alia* several entries for sugar-based potions (see, for example, the recipe on fol. 157r, lines 19–24: “ντζαουρσισινουλαούτ . . . καὶ θέρμην δίδει αὐτὸν λεπτήν· βάνουσιν μετὰ μίαν λύτραν



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of around 240 recipes for various composite drugs mainly arranged according to the pharmaceutical forms, such as antidotes, juleps, plasters, and collyria; several Arabic terms of *materia medica* and dosage forms are given in Greek transliteration.<sup>188</sup>

The third work, unedited in Greek, is the pharmacological part of John Zacharias Aktouarios's *Medical Epitome*.<sup>189</sup> John was a well-educated physician who wrote on a variety of subjects, including an extensive uroscopy treatise (*On Urines*) and a specialized work *On Psychic Pneuma*.<sup>190</sup> His *Medical Epitome* was dedicated to Alexios Apokaukos (the commander of the Byzantine fleet), who had a lively interest in medicine.<sup>191</sup> The work is divided into six books and must have been completed around

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σάχαριν . . . καὶ βράσιων . . . βάλλον ἐν αὐτὰ καὶ ζαφαράν· καρμφούλ . . .”), is found in Vienna, Österreichische Nationalbibliothek, MS med. gr. 21 (fourteenth century), which has not yet been examined in detail. On the contents of this manuscript, see Herbert Hunger, *Katalog der griechischen Handschriften der Österreichischen Nationalbibliothek*, vol. 2, *Codices iuridici; Codices medici* (Vienna, 1969), 66–67, and Gutas, “Arabic into Byzantine Greek,” 253–54. On the anatomical diagrams in this codex, see Petros Bouras-Vallianatos, “Diagrams in Greek Medical Manuscripts,” in *The Diagram as Paradigm: Cross-Cultural Approaches*, ed. Jeffrey Hamburger, David Roxburgh, and Linda Safran (Washington, DC, forthcoming). Finally, a work which should be considered in this group, is the Greek translation of al-Rāzī's (d. c. 925) *On Smallpox and Measles* [*Kitāb fī al-Judārī wa-al-ḥaṣbah*], which circulated under the title *Περὶ Λοιμικῆς* [*On Pestilential Disease*]. Here we can see recipes for juleps and *oxosachara*, e.g., 5, 14, edited in Aristotelis Kousis, *Ῥαζὴ Λόγος Περὶ Λοιμικῆς* (Athens, 1909), 9, lines 1–17, and 17, lines 3–10. It was widely circulated in late Byzantium; there are about ten surviving manuscripts, with the earliest ones dated to the fourteenth century (a preliminary list is available on *Pinakes: Textes et manuscrits grecs*, at <https://pinakes.irht.cnrs.fr/notices/oeuvre/3526/> (last accessed 20 April 2020). The translator of this work is not known. Marie-Hélène Congourdeau, “Le traducteur grec du traité de Rhazès sur la variole,” in *Storia e ecdotica dei testi medici greci: Atti del II convegno internazionale, Parigi, 24–26*, ed. Antonio Garzya and Jacques Jouanna, *Collectanea* 10 (Naples, 1996), 99–111, suggested that the work might have been translated by Symeon Seth in the eleventh century, but there is not sufficient evidence to confirm this identification.

<sup>188</sup> Substances, e.g.: “καφοῦρ” (*kaphour*) for كافور (*kāfūr*, camphor), “πασπασῶ” (*paspsa*) for بسباسة (*basbāsah*, mace) “ταπασχήρ” (*tapaschēr*) for طباشير (*tabāshīr*, tabasheer), *passim*. Dosage forms, e.g.: “σοφοῦρ” for سفوف (*safūf*, medicinal powder) and “τζουαρίσιον” or “κουαρίσχ” for جوارشن (*jawārishn*, electuary), *passim*. In one case the Greek term “γλυκύσματα” (*glykysmata*) in the plural is given as a synonym for “τζουαρίσιον” (Venice, Marciana, MS. gr. V.8, fol. 140r, line 22), i.e., mostly honey-based electuaries in this instance. On *jawārishn*, in the Arabic medical tradition, see Fellmann, *DasAqrābādīn*, 198–201.

<sup>189</sup> The work is usually cited in the literature by its Latin title, *De methodo medendi*. I prefer to refer to it as the *Medical Epitome*, since this title corresponds to the title given in the majority of the manuscripts and fits better with its structure and contents. The usual title ascribed in the manuscripts is: “Βιβλίον ἰατρικόν, περιέχον πᾶσαν τέχνην ἐν ἐπιτόμῳ” [Medical Book Containing the Entire Art in an Abridged Version]. On this, see Bouras-Vallianatos, *Innovation in Byzantine Medicine*, 30 n. 193. The first two books have been published by Ideler, ed., *Physici*, 2:353–463. The last four books remain unedited and are only available through a sixteenth-century Latin translation of the entire work by Henry C. Mathys, *Actuarii Ioannis filii Zachariae Opera*, vol. 2 (Paris, 1556). There is also a Latin translation of the last two books by Jean Ruelle, *Actuarius de medicamentorum compositione* (Paris, 1539). Here I provide transcriptions from Vienna, Österreichische Nationalbibliothek, MS med. gr. 17 (first half of the fifteenth century). I have also checked all the relevant passages in Paris, Bibliothèque nationale de France, MS gr. 2306 (fifteenth century) and Real Biblioteca del Monasterio de San Lorenzo de El Escorial, MS Φ.III.12 (AD 1432), which do not provide any notable variant readings.

<sup>190</sup> On John and his corpus, see the recent comprehensive study by Bouras-Vallianatos, *Innovation in Byzantine Medicine*.

<sup>191</sup> Apokaukos was the owner of a huge volume of Hippocrates's work (Paris, Bibliothèque nationale de France, MS gr. 2144), in which he had himself depicted in dialogue with Hippocrates. On this, see Georgios Makris, “Alexios Apokaukos und sein Porträt im Codex Paris. gr. 2144,” in *Geschehenes*

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1330.<sup>192</sup> The first two books focus on diagnosis and the next two on various therapeutic methods. John discusses the diagnosis and therapy of specific diseases following the *a capite ad calcem* tradition. The last two books (the fifth and sixth) concentrate solely on the composition of drugs (approximately seven hundred recipes). There are also special sections on poisonous drugs and venomous animals. His work became extremely popular and was circulated in a great many manuscripts, many more than any other late Byzantine work on the topic.<sup>193</sup>

Having introduced these important late Byzantine medical sources, I can first confirm that sugar was used as an ingredient in a large number of antidotes in the *Dynameron*, although the potential for its substitution with honey is constantly mentioned throughout the recipes,<sup>194</sup> unlike in Chionides and John, who made only limited use of sugar in antidotes and did not suggest substituting sugar with honey.<sup>195</sup> In contrast to the early manuscripts of the Greek translation of the *Ephodia*, sugar is mentioned in all the later sources as simply σά[κ]χαρ (*sa[k]char*),<sup>196</sup> without any indication as to the particular variety of sugar. As regards juleps, the *Dynameron* includes fifteen recipes,<sup>197</sup> while Chionides<sup>198</sup> and John (juleps, syrups, and *oxosachara*)<sup>199</sup> provide

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*und Geschriebenes: Studien zu Ehren von Günther S. Henrich und Klaus-Peter Matschke*, ed. Sebastian Kolditz and Ralf C. Müller (Leipzig, 2005), 157–79.

<sup>192</sup> See Bouras-Vallianatos, *Innovation in Byzantine Medicine*, 28–29.

<sup>193</sup> See Bouras-Vallianatos, *Innovation in Byzantine Medicine*, 235–59. I have identified twenty-six manuscripts of the complete work and thirteen fragmentary and excerpting manuscripts.

<sup>194</sup> E.g., [Nicholas Myrepsos], *Dynameron* A.15, ed. Valiakos, *Das Dynameron*, 34, lines 7–11: “Ἄλλη ἀθανασία ἀρμόζουσα ἐπὶ πάντων, ὡς ἡ πρὸς ταύτης ἔχει κινναμώμου κασία, ἀνὰ ὀγκὰς ζ΄ κρόκου· σμύρνης, ἀνὰ ὀγκὰς δ΄ κόστου, νάρδου Συριακοῦ, ἀκόρου, μίσιου, ἀσάρου πετροσελίνου σπέρμα, πέπερι λευκόν, δαύκου Κρητικοῦ, σίνωνος ἀνὰ ὀγκὰς β΄ μέλιτος Ἀττικοῦ ἢ σάχαρ τὸ ἄρκοῦν.”

<sup>195</sup> Sugar is occasionally used in other forms of drugs in late Byzantine pharmacological works, including non-liquid forms, such as lozenges and collyria.

<sup>196</sup> Only in the *Dynameron* do we find some limited references to “κάντεον” (e.g., A.34, A.92, ed. Valiakos, *Das Dynameron*, 42, line 19, and 64, line 19) from the Arabic قند (*qand*), referring to the raw sugar produced from the first boiling of pressed sugarcane juice.

<sup>197</sup> There are thirteen recipes for juleps and two more for rose-juleps. The names of each julep from the relevant table of contents in [Nicholas Myrepsos], *Dynameron* Z, P, ed. Valiakos, *Das Dynameron*, 593, 977, are as follows: “α΄ ζουλάπιον πολυέγητον· τὸ καλούμενον ὕδροροσάτον· β΄ ζουλαπίου σκευασία, τοῦ ὕδροροσάτου τοῦ ἀπλοῦ· γ΄ ζουλαπίου σκευασία, τοῦ νενοφάρου δόκιμον· δ΄ ζουλάπιον, τὸ διὰ μελισσοβοτάνου, θαυμαστόν· ε΄ ζουλαπίου, τῶν ἴων σκευασία πρὸς πυρετοῦς· στ΄ ζουλαπίου, σκευασία, διὰ τῶν μήλων· δόκιμον· ζ΄ ζουλαπίου τοῦ διὰ μήλων σκευασία, κρεῖττον· η΄ ζουλάπιον, τῶν ῥοιδίων σκευασία, ἐπεινετή· θ΄ ζουλάπιον, τὸ διὰ τῶν μήλων· πρὸς διακαεῖς πυρετοῦς· ι΄ ζουλαπίου σκευασία, τοῦ διὰ ἀκαπίου· ια΄ ζουλαπίου σκευασία, τοῦ δι’ ὄξυφοινίκου· ιβ΄ ζουλαπίου σκευασία, τοῦ διὰ κυδωνίων· καλή· ιγ΄ ζουλαπίου σκευασία, τοῦ διὰ μύρτων· and ‘θ΄· ῥοδοζουλαπίου σκευασία, πᾶν δόκιμος· ι΄· ῥοδοζουλαπίου, καθαρτικοῦ σκευασία.” In one recipe, i.e., no. 7 (ζ’), ed. Valiakos, *Das Dynameron*, 597, lines 7–14, we can see the use of both sugar and honey; cf. note 46, above.

<sup>198</sup> Given the large number of recipes in this case, I cite here only the *incipit* and *desinit*; the work lacks a table of contents. George Chionides, *Antidotes from Persia*, Venice, Marciana, MS gr. V.8, fol. 146v, line 25–fol. 149r, line 6: “Ἀρχὴ τῶν ζουλαπίων καὶ τῶν ὕδροροσάτων καὶ τῶν ἀποζεμάτων· α΄ ζουλάπιον . . . κθ΄ ἕτερον σκαντζιπὶν πρὸς καυσούμενον στόμαχον . . . καὶ διηθήσας . . . σάχαρ τράμ΄ ω΄ καὶ κρόκον τράμ΄ α΄ καὶ ἔψε· καὶ δίδου τράμ΄ κ΄ μεθ’ ὕδατος ψυχροῦ.”

<sup>199</sup> There are three groups of recipes for juleps in John’s account. The first is in the part dealing with drugs for fevers, the second in a group of recipes on juleps and syrups, and the third in the part dealing with composite purgatives. John Zacharias Aktouarios, *Medical Epitome*, Vienna MS med. gr. 17, fol. 113r, line 16–fol. 115v, line 15; fol. 116r, line 26–fol. 118r, line 22; and fol. 149v, line 14–fol. 152v, line 14: “περὶ ἰοζουλαπίου . . . ὁ διὰ τοῦ τῶν ἴων χυλοῦ καὶ τοῦ σάχαρ σκευάζομεν . . .

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the extraordinary number of roughly twenty-nine and thirty-nine recipes respectively. It is worth mentioning that the simple julep mentioned above is itself included as an ingredient of other liquid composite drugs in all three works. Another notable element that I have discovered after transcribing the entire works of both Chioniades and John is that there are almost equal proportions of honey-based liquid drugs to sugar-based ones in Chioniades's work, while in John there are roughly twice as many honey-based liquid drugs as there are sugar-based potions.

In all three of the above-mentioned extensive pharmacological works, we can see an attempt to elaborate Byzantine drug lore with recent developments in pharmacology from the Arabic medical tradition, although in the case of the *Dynameron*, and taking into consideration the above-mentioned traceable influence from medieval Latin pharmacology, this knowledge might have been gained through the intermediary of medieval Latin sources.<sup>200</sup> I think that the extensive references to juleps in Chioniades's recipe collection are not coincidental. Chioniades was aware of the importance of sugar in contemporary pharmacology and was probably attempting to attract the attention of his contemporaries by supplementing the Byzantine medical cabinet with recipes previously alien to it. It is in this light that we should most probably explain the balance between the recipes with honey and those using sugar given by Chioniades, in contrast to John, who attempted to combine earlier Greek and Byzantine sources and others from abroad. John certainly gives the most interesting treatment of the subject. His authorial persona is present throughout the last two books of his work, which allows us to recognize his experimentation with the new forms of sugar-based drugs. For example, in introducing the second group of sugar-based recipes in his work, he states: "here the drugs [i.e., juleps and syrups] are set out, those which have been taken from Greek medical books and those from barbarian works that have been translated into the Greek language. Furthermore, those [drugs] that have been composed by us; and some others that we happened to hear about and which we have tested."<sup>201</sup> It is only to be expected that an active, practicing physician such as John should have personally composed and tested the greater part of the recipes he suggested and personally modified some of them as a result of his many contact hours with patients.<sup>202</sup> The other striking reference in this account is the use of the word *barbarian* to describe foreign sources.<sup>203</sup>

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ἀγουριδοζούλαπον . . . μετὰ τοῦ σαχάρ ἔψοντες μέχρι τινὸς συστάσεως· καὶ τούτου σπῶντες μετὰ ψυχροῦ ὕδατος," "ὄξοσάχαρον . . . ἕτερον εἰς εμφράξεις τὲ καὶ ὄγκους τῶν σπλάγγων . . . σάχαρ," and "ζουλάπιον εἰς κένωσιν χολῆς ξανθῆς ζεούσης . . . ζουλάπιον καθαῖρον χολὴν ξανθὴν καὶ μέλαιναν . . . ἔπειτα βάλε σάχαρ . . . ἢ δόσις οὐγγ. α´· ἢ δύο." A detailed list is provided in Bouras-Vallianatos, *Innovation in Byzantine Medicine*, 168–69.

<sup>200</sup> I have not been able to find the source of these recipes in the *Dynameron*. Cf. note 179, above.

<sup>201</sup> John Zacharias Aktouarios, *Medical Epitome*, Vienna MS med. gr. 17, fol. 116r, lines 21–24: "ἐκτεθήσεται δὲ τὰ φάρμακα τὰ μὲν, ἐξ' ἑλληνίδων ἰατρικῶν βιβλίων· τὰ δ' αὖ ἐκτενεχθεισῶν εἰς ἑλληνίδα γλώτταν βαρβάρων βιβλίων· τὰ δ' αὖ καὶ ὑφ' ἡμῶν αὐτῶν συντεθέντα· ἕνια δὲ καὶ ἐκ τοῦ παρατυχόντος ἀκουσθέντα καὶ δοκιμασθέντα."

<sup>202</sup> An interesting case of a process involving several modifications of a certain recipe, in this case to make it less bitter and thus more easily swallowed by his patient, is reported by John in one of his case histories in *On Urines* 2.19, ed. Ideler, *Physici*, 2:50, line 26, to 52, line 1. On this, see Bouras-Vallianatos, *Innovation in Byzantine Medicine*, 94–96.

<sup>203</sup> I have managed to identify *Ephodia* as one of his Arabic sources (in translation); see Bouras-Vallianatos, *Innovation in Byzantine Medicine*, 152–63. However, I have not been able to identify

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This distinction between Greeks (Ἕλληνες/*Hellenes*) or Byzantine Greeks (Ῥωμαῖοι/*Rhomaioi*) and those living outside the empire, i.e., “barbarians” (βάρβαροι/*barbaroi*), was commonplace among Byzantine authors. Muslims were often designated “barbarians,” while sometimes even Christian Latins or Orthodox Bulgarians could be thus described.<sup>204</sup> John chose to use the generic label *barbarian* to denote that they came from another culture. More explicitly, in another case by introducing the first group of sugar-based potion recipes, he uses the expression βάρβαρος φωνή (*barbaros phōnē*, barbarian language) to refer to Greek terms derived from Arabic, thus confirming the origin of his foreign sources: “we call them syrup and julep in accordance with the barbarian language.”<sup>205</sup> In this way, he does not hesitate to point out the use of Arabic pharmacological lore, confirming his openness to adopting new material and, at the same time, advertising his awareness of advances made in his field in the wider area of the Mediterranean.

The coexistence of sugar-based and honey-based forms in late Byzantine manuals confirms the decisive presence of Arabic drug lore in Byzantine pharmacology.<sup>206</sup> John was the first Byzantine medical author and practicing physician to attain particularly eminent status, as evidenced by his appointment to the office of *aktouarios* by Andronikos II Palaiologos (r. 1282–1328), and, at the same time, to put together a powerful assemblage of data containing traditional Greek and early Byzantine material, as well as newly introduced Arabic pharmacological

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any of his sources with regard to his sugar-based recipes. I have recently found out that a large part of John’s recipes for juleps and syrups are identical to those in a recipe book attributed to one Chariton (otherwise unknown) that has survived in Paris, Bibliothèque nationale de France, MS gr. 2240 (sixteenth century), fols. 1r–39v. On this, see Bouras-Vallianatos, *Innovation in Byzantine Medicine*, 169–71. It is worth noting that in the sixteenth-century catalogue of Greek manuscripts in the libraries of Constantinople (see note 179, above), there are references to Greek translations of Arabic works that have not yet been identified; see Papazoglou, *Βιβλιοθήκες στήν Κωνσταντινούπολη*, 345–47, entry nos. 35–36 and 43.

<sup>204</sup> On the term *barbarian* to describe those living outside the empire in a Byzantine context, see the useful entry by Alexander Kazhdan and Anthony Cutler, “Barbarians,” in the *Oxford Dictionary of Byzantium*, 1:252–53; and the recent discussion by Rustam Shukurov, *The Byzantine Turks, 1204–1461*, Medieval Mediterranean 105 (Leiden, 2016), 28–37. See also Anthony Kaldellis, *Ethnography after Antiquity: Foreign Lands and Peoples in Byzantine Literature* (Philadelphia, 2013), 82–183, who offers further examples from middle and late Byzantine literature in light of wider discussions of Byzantine ethnography.

<sup>205</sup> John Zacharias Aktouarios, *Medical Epitome*, Vienna MS med. gr. 17, fol. 113r, lines 1–2: “καὶ σεράπιον ἢ ζουλάπιν τῆ βαρβάρω φωνῆ καλοῦμεν.” For further cases connected with the Greek version of originally Arabic terms in John’s work, see Bouras-Vallianatos, *Innovation in Byzantine Medicine*, 163 n. 72.

<sup>206</sup> Apart from the medical profession’s appropriation and adaptation of Arabic medical lore, it is worth noting that late Byzantine astronomers were also considerably influenced by Arabic and Persian knowledge on their subject (see Tihon, “Chioniades, George,” 121). See also Shukurov, *The Byzantine Turks*, 308–39, who provides a comprehensive discussion of oriental borrowings, including cases from art and architecture, in the late Byzantine period with reference to relevant bibliography. For a thought-provoking discussion of the cross-cultural exchanges between Byzantium and its Muslim neighbours in the field of art, see Alicia Walker, *The Emperor and the World: Exotic Elements and the Imaging of Middle Byzantine Imperial Power, Ninth to Thirteenth Centuries C.E.* (Cambridge, UK, 2012), 80–107.

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lore.<sup>207</sup> His pharmacological work significantly influenced subsequent generations of Byzantine physicians, as is attested by its widespread dissemination in the fourteenth and fifteenth centuries,<sup>208</sup> unlike, for example, the huge and thus not very user-friendly *Dynameron*.

### 3.2. *Sugar-based Potions in Late Byzantine Medical Practice*

Nevertheless, can the extensive treatment of these new sugar-based forms by Byzantine authors be shown to be connected with their widespread use in daily practice? This is a difficult question to answer in the absence of contemporary accounts by practicing physicians or any substantial corpora of case histories or reports. However, we can see persistent references to the use of sugar in recipe books dated to the fourteenth and fifteenth century, which is in line with their increased popularity in late Byzantium. Notable examples include the recipe book of the physician and medical author Demetrios Pepagomenos, active in the early fifteenth century; here, apart from julep recipes, we can see many recipes for sugar-based γλυκύσματα (*glykysmata*), the equivalent Greek term for the Arabic جوارشن (*jawārishn*).<sup>209</sup> John Kaloeidas, physician and co-owner of a perfumery workshop (μυρεψικὸν ἐργαστήριον/*myrepsikon ergastērion*) in Constantinople in 1400,<sup>210</sup> when giving some dietary advice about the treatment of gout, recommended the use of a mixture of sugar and water (σάχαρ μετὰ ὕδατος/*sachar meta hydatos*) for the treatment of constipation, noting that in cases of excessive evacuation, rose juice with sugar (ῥοδοσάχαρ/*rhodosachar*) should be administered.<sup>211</sup> Another example of the regular use of sugar in the preparation

<sup>207</sup> John's interest in Arabic medical knowledge is also confirmed by his involvement in the re-edition of a uroscopic treatise (see note 16, above) ascribed to Ibn Sīnā. See the recent critical edition of this text by Lamagna: Giovanni Attuario, *L'Eccellente trattato sulle urine*, ed. Lamagna 25–82.

<sup>208</sup> Among the Byzantines who had a copy of John's *Medical Epitome*, we find the *archiatros* Anthony Pyropoulos (fl. 1440–60); he owned Vienna MS med. gr. 17. John's recipes are also found in various fifteenth-century medical recipe books. Some examples are provided by Bouras-Vallianatos, *Innovation in Byzantine Medicine*, 213 n. 15.

<sup>209</sup> On *jawārishn*, see note 188, above. The text survives in a brief and an extended version. See, for example, recipe no. 21, which is found in both versions, published as Demetrio Pepagomeno, *Prontuario medico: Testo edito per la prima volta*, ed. Maria Capone Ciollaro, Hellenica et Byzantina Neapolitana 21 (Naples, 2003), 54, line 23, to 55, line 2. *Glykysmata* can be also made with honey, e.g., recipe no. 32, ed. Capone Ciollaro, *Prontuario medico*, 56, lines 13–17. The extended version provides an almost balanced ratio of sugar- to honey-based medicaments. On Pepagomenos, see Stavros Lazaris, "La production nouvelle en médecine vétérinaire sous les Paléologues et l'œuvre cynégétique de Dēmētrios Pépagōmēnos," in *Philosophie et sciences à Byzance de 1204 à 1453: Les textes, les doctrines et leur transmission. Actes de la table ronde organisée au XXe Congrès international d'études Byzantines, Paris, 2001*, ed. Michel Cacouros and Marie-Hélène Congourdeau, *Orientalia Lovaniensia Analecta* 146 (Leuven, 2006), 225–67, at 251–57.

<sup>210</sup> Erich Trapp, Rainer Walther, and Hans-Veit Beyer, eds., *Prosopographisches Lexikon der Palaiologenzeit*, 12 vols. (Vienna, 1976–96), 5: no. 10563, and Jean Darrouzès, *Les registes des actes du patriarcat de Constantinople*, vol. 1, *Les actes des patriarches, Fasc. 6: Les registes de 1377 à 1410*, Patriarcat Byzantine 1 (Paris, 1979), 359–60, no. 3111. The identification was first proposed by Gudrun Schmalzbauer, "Medizinisch-diätisches über die Podagra aus spätbyzantinischer Zeit," *Jahrbuch der Österreichischen Byzantinistik* 23 (1974), 229–43, at 234–36.

<sup>211</sup> The advice is transmitted in the form of an epistle. The most recent critical edition and discussion of the text is by Aimilios Mavroudis and Sofia Kotzabassi, "Μία βυζαντινή ιατρική επιστολή για τη θεραπεία της ποδάγρας," *Ελληνικά* 57/2 (2007): 271–317. The references to the sugar-based potions



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of medicaments is seen in the fifteenth-century recipe book of a certain Andreiomenos.<sup>212</sup> To these we should add the recurring presence of sugar-based potions in various anonymous collections of recipes<sup>213</sup> and also the large number of scattered recipes found in manuscripts,<sup>214</sup> which in most cases cannot be connected with a specific locus of activity, thus embracing a wider Greek-speaking audience in the eastern Mediterranean. Another very interesting observation is the elaboration of works ascribed to ancient authors, such as Galen, with such sugar-based potions, interventions that most probably took place in the late Byzantine period.<sup>215</sup>

Finally, some comment should be made on the evidence for the importing and availability of sugar in Constantinople originating from non-medical sources. For example, sugar is listed as one of the main commodities imported into fourteenth-century Constantinople according to *La Pratica della Mercatura*, written by Francesco Balducci Pegolotti between 1335 and 1343. The Florentine merchant refers to sugar (*zucchero*) and powdered sugar (*polvere di zucchero*),<sup>216</sup> but he does not give the origin of the product or any details about his clientele. Interestingly, sugar (*σαχάρεως/sachareōs*) is the sole named ingredient, together with plasters (*ἐμπλάστρων/emplastrōn*) and other medicinal items that were hard to procure (*καὶ ἑτέρων εἰδῶν δυσπορίστων/kai heterōn eidōn dysporistōn*),<sup>217</sup> which must have been stocked in the hospital of the Athonite monastery of Great Lavra in 1342, thus confirming sugar's paramount importance in contemporary medical

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are on p. 280, lines 86–88. The *terminus ante quem* for the composition of the text is 1403, i.e., the date of the earliest surviving manuscript, Mount Athos, Library of the Monastery of Great Lavra, MS M 38.

<sup>212</sup> For example, Mount Athos, Library of the Monastery of Iviron, MS 151 (fifteenth century), fol. 233r, lines 12–16: “Γλυκίσματος. . . μοσχοκάρυδον· σχοινάνθη· ἀνακάρδιον ἀνὰ σκρόπουλον σ’· κέρας ἐλάφου· ξυλαλόη ἀνὰ σκρόπουλον α’· κινάμιον· σαφρὰ ἀνὰ σκρόπουλον σ’· . . . σάχαρ λίτραν α’.” Sometimes the sugar might be substituted with honey, as in the case of a julep for epileptics, fol. 233v, lines 5–6: “Ζουλάπιον εἰς ἐπιληπτικούς καθαριστικόν. Ἀψίνθιον . . . μαραθρόσπερμα· ὀρθὴν περιστερὰν· μέλι ἢ σάχαρ.” The titles of the recipes were published by Aristotelis Kousis, “Τὸ ἀνέκδοτον ἐπι ιατρικῶν ἔργων τοῦ Ἀνδρειωμένου,” *Ἐπετηρὶς Ἐταιρείας Βυζαντινῶν Σπουδῶν* 6 (1929): 383–86. I am currently preparing a critical edition, English translation, and commentary of Andreiomenos's text.

<sup>213</sup> Among the edited ones, see, for example, the recipe book preserved in Paris, Bibliothèque nationale de France, MS gr. 2316 (fifteenth century), recipe nos. 164, 268–69, edited in Ioanna Oikonomu-Agorastu, *Kritische Erstausgabe des Rezeptbuchs des Cod. Par. Gr. 2316, f. 348v–374v* (Thessaloniki, 1982), 73, lines 1–6, and 95, line 4, to 96, line 7.

<sup>214</sup> Among the vast corpus of such references, see, for example, the julep recipe in London, British Library, Harley MS 5610 (fourteenth century), fol. 33v, lines 12–17: “ζουλάπιον διουρητικόν: γλυκάνισον. . . μαλαθρόριζον. . . σάχαρ.” See also the short collection of sugar-based potion recipes in Paris, Bibliothèque nationale de France, MS gr. 2419 (fifteenth century), fol. 154v, line 3–fol. 155r, line 35: “Σύνθεσις ζουλαπίων: τὸ ὄξυσάχαρ τὸ ἄπλόν.”

<sup>215</sup> The most remarkable examples are the references to ῥοδοσάκχαρος (*rhodosakcharos*, rose juice with sugar) and ζουλάπιον (*zoulapion*, julep) in book 3 of *On Procurable Remedies*, founded in the version edited by Kühn, *Claudii Galeni*, 14:544, line 5, and 14:563, line 12, to 564, line 11.

<sup>216</sup> Francesco Balducci Pegolotti, *La Pratica della Mercatura*, ed. Allan Evans (Cambridge, MA, 1936), 35, lines 3–5, and 45, lines 34–35. On the economic activity of Western merchants in late Byzantine Constantinople, see Nicolas Oikonomidēs, *Hommes d'affaires grecs et latins à Constantinople: XIIIe–XVe siècles* (Montreal, 1979), 35–52.

<sup>217</sup> John V Palaiologos (r. 1341–76/1379–90/1390–91), *Chrysobull*, 105–6, ed. Paul Lamerle et al., *Actes de Lavra*, vol. 3, *De 1329 a 1500: Text & album* (Paris, 1979), 23–26.

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practice. A century later, Venetian merchant-banker Giacomo Badoer reports in his account book *Libro dei Conti* that he had bought two cantars (~95 kg) of thrice-boiled Cypriot sugar (*zuchari*) for which he had paid 65 hyperpyra per cantar in Constantinople in 1436,<sup>218</sup> compared to just 1/3 hyperpyron for 1 maritime *modios* (~12.8 kg) of wheat.<sup>219</sup> We also learn that Badoer bought a sugar syrup (*zucharo siropo*) and some more medicaments for his assistant, Antonio Bragadin, when he was ill, for 2 hyperpyra and 12 carats; the same price was paid to a barber to bleed him, while a nurse received 1 hyperpyron.<sup>220</sup> Bearing in mind that, according to Badoer, the wage of a woman who gutted fish was approximately 5 hyperpyra per month,<sup>221</sup> sugar-based medicaments must have still been considered a relative luxury for the ordinary citizen.

### 4. CONCLUSION

This article has illustrated the steady diffusion of Arabic pharmacological knowledge in Byzantium from the tenth century onward. We have seen how innovations in the field of medicine in the Islamic world influenced medical practice in the Byzantine and the wider Mediterranean world. Using the example of sugar, we have observed tremendous changes, in particular in the administration of drugs in the middle and late Byzantine periods, thus confirming the openness of Byzantine physicians to accepting Arabic medical lore and familiarizing themselves with it.

By the tenth century sugarcane cultivation had reached Syria, Palestine, and Egypt, gradually expanding to the large Mediterranean islands of Cyprus, Crete, Rhodes,

<sup>218</sup> Giacomo Badoer, *Libro dei Conti*, ed. Umberto Dorini and Tommaso Bertelè, *Il Libro dei Conti di Giacomo Badoer, Costantinopoli 1436–1440*, Il Nuovo Ramusio 3 (Rome, 1956), 86, lines 19–25; see also 87, lines 10–16, and 89, lines 18–24. In addition to this, Badoer, *Libro dei Conti*, ed. Dorini and Bertelè, 604, lines 34–36, purchased rose sugar (*zucharo roxa[do]*) and syrup (*siropi*) that came from Alexandria in 1438. For these references I am indebted to David Jacoby, “Mediterranean Food and Wine for Constantinople: The Long-Distance Trade, Eleventh to Mid-Fifteenth Century,” in *Handelsgüter und Verkehrswege: Aspekte der Warenversorgung im östlichen Mittelmeerraum (4. bis 15. Jahrhundert). Acten des internationalen Symposions Wien, 19.–22. Oktober 2005*, ed. Ewald Kislinger, Johannes Koder, and Andreas Külzer, Veröffentlichungen zur Byzanzforschung 18 (Vienna, 2010), 127–48, at 133–34. Cyprus became the major exporter of sugar in its late Mediterranean phase, especially in the late fourteenth and early fifteenth century; on this, see David Jacoby, “The Venetians in Byzantine and Lusignan Cyprus: Trade, Settlement, and Politics,” in *Η Γαληνοτάτη και η Ευγενεστάτη: Η Βενετία στην Κύπρο και η Κύπρος στην Βενετία / La Serenissima e la Nobilissima: Venice in Cyprus and Cyprus in Venice*, ed. Angel Nicolaou-Konnari (Nicosia, 2009), 59–100, at 81–84.

<sup>219</sup> This is based on the estimation by Cécile Morrisson and Jean-Claude Cheynet, “Prices and Wages in the Byzantine World,” in *The Economic History of Byzantium: From the Seventh through the Fifteenth Century*, vol. 1, *Writing the Economic History of Byzantium*, ed. Angeliki E. Laiou, *Dumbarton Oaks Studies* 39 (Washington, DC, 2002) 815–78, at 828, who cite Badoer, *Libro dei Conti*, ed. Dorini and Bertelè, 103, line 17.

<sup>220</sup> Badoer, *Libro dei Conti*, ed. Dorini and Bertelè, 52, lines 4–6. See also Jacques Lefort, “La brève histoire du jeune Bragadin,” in *ΑΕΤΟΣ: Studies in Honour of Cyril Mango Presented to him on April 14, 1998*, ed. Ihor Ševčenko and Irmgard Hutter (Stuttgart, 1998), 210–19, at 215. On the Byzantine coins mentioned in Badoer’s text, see Cécile Morrisson, “Coin Usage and Exchange Rates in Badoer’s *Libro dei Conti*,” *Dumbarton Oaks Papers* 55 (2001): 217–45, at 220, 224–26.

<sup>221</sup> Badoer, *Libro dei Conti*, ed. Dorini and Bertelè, 116, line 6. The conversion of this wage to a monthly rate has been estimated by Morrisson and Cheynet, “Prices and Wages,” 867.

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and Sicily, and even Andalusia.<sup>222</sup> Sugar-based potions, an innovation which first became widespread in the Arabic medical tradition, started to find a foothold in the other regions of the Mediterranean, including Byzantium and parts of the Latin West. As I have demonstrated, there were various routes and levels of interconnection in the process of knowledge transmission from the Islamic world to Byzantium. We can first witness a piecemeal introduction of sugar and sugar-based potions in texts and redactions of treatises connected with the tenth-century Macedonian court. At this stage there is no evidence of any translation of medical works from Arabic into Greek, and the only available sources are connected with Byzantine imperial circles. This confirms that Arabic pharmacological knowledge had reached Byzantium before the Arabic medical tradition arrived in Europe through the vast corpus of translations of Arabic medical works into Latin in the late eleventh/early twelfth century. By the late eleventh century, Arabic pharmacological knowledge was codified for the first time in Byzantium by Symeon Seth, an exact contemporary of Constantine the African in Monte Cassino, Italy. Although Symeon cannot be directly compared with Constantine in terms of literary output and overall influence, it shows that Byzantium shared certain concerns related to the dissemination of Arabic medical lore with the Latin West, thus making the Byzantine medical tradition a distinct part of the process. Consequently, it has been shown that it is essential to take the Byzantine evidence into consideration in order to create a more rounded—or global—picture, when discussing broad medieval topics, such as the transfer of knowledge in the fields of science and medicine and particular aspects of medical practice in the Mediterranean or wider European world.

The above-mentioned early examples were followed by other references that can be traced directly back to a Greek translation of an Arabic treatise, as in the case of Ibn al-Jazzār's *Provisions for the Traveller and Nourishment for the Sedentary*, produced in the unique multicultural milieu of southern Italy and Sicily by the early twelfth century. At this point, we can see the decisive introduction of Arabic medical knowledge into the Greek-speaking Mediterranean world through the medium of translation. However, the way in which Greek-speaking physicians living and working in southern Italy and Sicily experimented with the new ingredient does not seem to have been replicated at that point in Byzantium proper. Yet in the same period sugar made its first appearance in Byzantine medical practice. The inclusion of this ingredient, in particular, in the supplies of Byzantine health care institutions shows a striking concern to align with contemporary trends elsewhere and to cure disease by all possible means. The use of sugar in daily medical practice constituted a significant investment in health, especially taking into consideration the high cost involved in its cultivation (including the extension of irrigation systems and the construction of aqueducts), production, and transportation. It is also worth stressing that sugar was never cultivated or produced in lands under direct Byzantine control, which would certainly have resulted in increased costs compared to areas in which sugar was locally cultivated and manufactured.

The significant amount of space devoted to sugar-based recipes in their long pharmacological works by late-thirteenth-/early-fourteenth-century authors such as Nicholas Myrepsos, George Choniades, and John Zacharias Aktouarios shows

<sup>222</sup> See Ouerfelli, *Sucre*, 31–140, with reference to earlier studies.

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not only an attempt to systematize pharmacological knowledge but also an enduring interest in conforming with wider global innovations in the field of medicine. John, in particular, as a highly educated Byzantine physician and, at the same time, an esteemed member of the late Byzantine intelligentsia, seems to have been decisive in encouraging the Byzantine appropriation of foreign material by amalgamating the Greek and early Byzantine sources with the recently introduced Arabic lore in his medical writings. In John's works and also in those of later generations of Byzantine physicians, as reflected in named and anonymous recipe books, sugar-based medicaments were eagerly embraced and developed, resulting in this extraordinary case of cross-cultural fertilization.

This article has also pointed to the regular use of sugar in medical practice from the late eleventh/early twelfth century onward, at least, in Constantinople, which suggests constant importing of the commodity, despite the fact that the first source confirming the trading of sugar in the Byzantine capital dates to the first half of the fourteenth century (Pegolotti, *La Pratica della Mercatura*).

The Byzantine medical tradition was never stagnant, but rather a living and constantly reshaped aspect of Byzantine culture. This is nicely encapsulated in the words of Greek poet George Seferis (1900–71) in his Nobel lecture, which he delivered in English: “Perhaps I have used the word ‘tradition’ without pointing out that it does not mean habit. On the contrary, tradition holds us by the ability to break habits, and thus proves its vitality.”<sup>223</sup>

<sup>223</sup> George Seferis, “Some Notes on Modern Greek Tradition” (lecture, The Nobel Prize in Literature, 11 December 1963), <https://www.nobelprize.org/prizes/literature/1963/seferis/lecture/> (last accessed 20 April 2020).