

Galen in Byzantine Medical Literature

Petros Bouras-Vallianatos

Studying Galen's influence on Byzantine medical literature is a complex task. The main obstacles are the lack of modern critical editions for the majority of the texts and sometimes the complete unavailability of any edition, especially as regards works produced in the late Byzantine period. In addition, Byzantine medical texts have only rarely been subjected to critical examination by modern scholars. Despite the large number of commentaries and summaries of Galenic works produced in Alexandria between the fifth and seventh centuries,¹ this trend did not continue into the later centuries. On the other hand, one sees that medical handbooks for contemporary physicians – such as projects similar to those by Aetios of Amida and Paul of Aegina² – were being produced throughout the entire Byzantine era. In addition to handbooks, the era evidenced the production of monographs on various medical topics, including anatomy, physiology, diagnostics (pulse and urines), dietetics, and pharmacology. This chapter explores the various ways in which Galen was revived in the works of Byzantine medical authors by concentrating on literary output from the seventh/eighth century to the fall of Constantinople to the Ottoman Turks in 1453. It is divided into three sections. The first focuses on texts dealing with Christian anthropology; next is the section that groups texts offering practical instructions in diagnostics and therapeutics; the last section deals with three exceptional cases deemed worthy of being treated separately.

1 Galen and Christian Anthropology

In the late fourth century, the Christian bishop Nemesios of Emesa authored *On the Nature of Man*, which played an important role in the adaptation of the Greek medical tradition by Christian authors in subsequent centuries.³ His work, which was excerpted by authors such as Maximos the Confessor

1 See Garofalo (Chapter 3) in this volume. All translations are mine, unless otherwise stated.

2 On Galen in late antique medical handbooks, see Bouras-Vallianatos (Chapter 2) in this volume.

3 On the reception of Galen by the church fathers, in particular, see Ieraci Bio (2007; 2010).

(580–662), John of Damascus (c. 675–c. 753/4), Anastasios of Sinai (d. after 700), Meletios the monk (ninth[?] century) and Michael Glykas (1125–1204[?]), not only had widespread reception in the Byzantine world,⁴ but it was also translated into Syriac, Armenian, Arabic, Georgian, and Latin.⁵ It consists of forty-three chapters in which the author deals with the nature of human beings, the physiological functions of the various parts of the body, and the relationship between the body and the soul.⁶ According to Nemesios, a human being consists of the incorporeal, intellectual soul and the body, which is made of perishable matter. Nemesios makes occasional use of biblical quotations, but his work is characterised by the extensive and highly eclectic use of earlier pagan sources, for example, adopting either Plato or Aristotle according to his needs. Galen too is among his most common sources.⁷ For the Christian Nemesios – for whom ‘God is shown to be the Creator of everything and to have made everything out of nothing’⁸ – the most attractive Galenic view was the teleological perspective vis-à-vis the structure and function of the human body and its parts by a creative power, a skilful craftsman (*ho dēmiourgos*); a perspective especially developed in the *On the Function of the Parts of the Body*.⁹

Nemesios calls the Pergamene physician the ‘marvellous physician’ and cites him by name six times.¹⁰ Among the explicit mentions of Galenic works, there is a reference to his theory of nine mixtures as outlined in *On Mixtures*,¹¹ with further direct references to *On the Capacities of Simple Drugs*, *On the Function of the Parts of the Body*, and *On the Doctrines of Hippocrates and Plato*. A notable Galenic foundation is indeed traceable throughout the entire treatise.¹²

4 See Morani (1981: 101–51).

5 See Morani (1981: 3–49, 180–98).

6 On Nemesios’ anthropology, see Siclari (1974). See also Sharples and van der Eijk (2008: 7–17) with references to earlier studies.

7 Galen himself was critical of Christian views on miracles, but he was interested in Christian moral values. See Gero (1990); and van der Eijk (2014: 349–60). On Galen as one of Nemesios’ sources, see Sharples and van der Eijk (2008: 20–1).

8 Nemesios, *On the Nature of Man*, 5, ed. Morani (1987) 53.18–19. Tr. by Sharples and van der Eijk (2008: 98).

9 For an introduction, see Flemming (2009).

10 Nemesios, *On the Nature of Man*, 2, 2, 7, 13, 21, 25, ed. Morani (1987) 23.24, 37.10, 58.14, 70.13, 82.7, 86.22.

11 Nemesios, *On the Nature of Man*, 2, ed. Morani (1987) 24.14–17. Galen, *Temp.*, 1.8, ed. Kühn (1821) 1.559.2–9 = ed. Helmreich (1904) 31.27–32.4. According to Galen, there is one kind of mixture, the ideal one, which corresponds to *eukrasia*, and eight kinds of *dyskrasiai* or bad mixtures.

12 Morani (1987: 139–40) identified seventy Galenic passages. See also Sharples and van der Eijk (2008: 242–6).

Interestingly, Nemesios was the first author to describe the localisation of the three mental functions in the ventricles of the brain (sensation and imagination in the anterior cavities, intellectual thought in the central cavity, and memory in the posterior cavity of the brain),¹³ based on the Galenic physiological precept that the brain constitutes the instrument for the activities of the soul, thus presenting a spatial elaboration of Galen's theory. Nevertheless, Nemesios' use of Galenic material is not totally uncritical. For example, in line with his Christian background, he appears eager to reject Galen's materialistic views on the soul, as developed in his treatise *The Capacities of the Soul Depend on the Mixtures of the Body*.¹⁴

Having taken a quick look at the early appropriation of the Galenic material in a Christian context by Nemesios, I will now turn to Byzantine works on the constitution of the human body, such as those by Theophilus and Meletios the monk. Unlike Nemesios' text, these works deal mostly with the anatomical and physiological description of the human body and its parts, without significant philosophical elaborations. The precise dating of works by Theophilus and Meletios is uncertain. Theophilus (seventh or ninth century),¹⁵ can probably be identified as the author who wrote other medical works, including *On Urines* and *On the Pulse* (see Section 2, below). His *On the Constitution of Man* is heavily based on the teleological explanations of the human body Galen gave in his long work *On the Function of the Parts of the Body*, and is constantly elaborated by references to the Christian God (*dēmiourgos theos*), who structured the human body with wisdom (*sophia*) and providence (*pronoia*).¹⁶ Book 1 deals with the limbs, book 2 with nutrition, book 3 with respiration, book 4 with the head, brain, and the sensory organs, and book 5 with the spine and the reproductive organs. Each book corresponds with particular sections of the 'wise physician's' (i.e. Galen's) *On the Function of the Parts of the Body* (= *UP*),¹⁷ in the form of either direct quotations or brief summaries (book 1: *UP* 1–3;

13 See Manzoni (1998: 142–4); and recently van der Eijk (2008). A close parallel to this theory is found on a fragment by Posidonius of Byzantium (fl. end of the fourth century AD), which survives in the work of Aetios of Amida, *Tetrabiblos*, 6.2, ed. Olivieri (1950) II.125.16–20; see Rocca (2003: 246).

14 Nemesios, *On the Nature of Man*, 2, ed. Morani (1987) 23.24–26.9. On this, see Boudon-Millot (2005: 75–6).

15 For a recent summary of the *status quaestionis*, see Grimm-Stadelmann (2008: 36–42).

16 Among the many references, see, for example, Theophilus, *On the Constitution of Man*, 1.13, 3.14, 4.22, ed. Grimm-Stadelmann (2008) 133.25, 176.14, 159.6. On Theophilus' work, I refer to the recent critical edition by Grimm-Stadelmann. Before this, the work was accessible through the outdated edition by Greenhill (1842).

17 Theophilus, *On the Constitution of Man*, 4.15, ed. Grimm-Stadelmann (2008) 172.11.

book 2: *UP* 4–5; book 3: *UP* 6–7; book 4: *UP* 8–11; and book 5: *UP* 12–15; nothing directly corresponds to book 16 of the Galenic text in Theophilus' work).¹⁸ Isabel Grimm-Stadelmann has shown that throughout the treatise, some chapters echo other works by Galen, most notably *On the Natural Capacities*, and also Nemesios' *On the Nature of Man*, while biblical quotations are rare.¹⁹ Interestingly, there are also many direct quotations from the Hippocratic corpus, including, for example, *On Generation*,²⁰ and *On the Nature of the Child*.²¹

More fascinating in terms of the assembled material is certainly Meletios' (ninth[?] century)²² *On the Constitution of Man*. This work on human anatomy and physiology follows an *a capite ad calcem* structure over thirty-three chapters. It was exceptionally widely disseminated, attested by approximately sixty witnesses dated to the late Byzantine and post-Byzantine periods (i.e. the thirteenth to the eighteenth century).²³ What is known of the author comes from his preface, in which Meletios appears to be a monk at the monastery of the Holy Trinity in the Phrygian city of Tiberiopolis,²⁴ a man with some medical knowledge and the ability to practise, including performing venesections and cauterisation.²⁵ Unlike the works of Nemesios and Theophilus, Meletios' text is clearly written for the non-expert, someone with very limited knowledge of philosophy and medicine. He refers to his medical sources in his introduction naming Hippocrates, Galen, and an otherwise unknown Socrates, the source of the etymologies of the parts of the human body,²⁶ which seems to be a corrupted version of the name of the famous ancient Methodist physician Soranus (second half of the first century/early second century AD), who

18 See Grimm-Stadelmann (2008: 42–7). It is worth noting that Theophilus' text, in the form of Greenhill's edition (1842), is listed in Helmreich's (1907: I.xi) sigla in his critical edition of Galen's *On the Function of the Parts of the Body*. Galen's *On the Function of the Parts of the Body* met also a considerable reception in the medieval Islamic world; see Wakelnig (2018).

19 See Grimm-Stadelmann's *apparatus fontium* (2008: 205–76) *passim*.

20 E.g. Theophilus, *On the Constitution of Man*, 5.30, ed. Grimm-Stadelmann (2008) 197.25–198.13; [Hippocrates], *On Generation (De Gen.)*, 6–8, ed. Littré (1851) VII.478.1–11 and 478.16–480.9 = ed. Potter (2012) 14.21–16.8 and 16.14–18.9.

21 E.g. Theophilus, *On the Constitution of Man*, 5.30, ed. Grimm-Stadelmann (2008) 200.18–23; [Hippocrates], *On the Nature of the Child (Nat. Puer.)*, 30, ed. Littré (1851) VII.530.20–532.1 = 19, ed. Potter (2012) 80.23–82.5.

22 See Holman (2008: 79–82), who provides the most recent overview on Meletios' dating.

23 See the most recent list at Pinakes <http://pinakes.irht.cnrs.fr/notices/oeuvre/3275/> (accessed 17 March 2018), including both complete and excerpting manuscripts of the work.

24 Meletios, *On the Constitution of Man*, pr., ed. Cramer (1836) 1.5–8.

25 Meletios, *On the Constitution of Man*, 33, ed. Cramer (1836) 155.6–11.

26 Meletios, *On the Constitution of Man*, pr., ed. Cramer (1836) 1.15–22.

wrote a lost work on medical etymologies.²⁷ The Galenic work most often directly cited is *On Bones for Beginners*, followed by the pseudo-Galenic *Medical Definitions*.²⁸ He also made use of *On the Function of the Parts of the Body* and *On Mixtures*,²⁹ although these works mostly seem to have been cited through *On the Nature of Man* by Nemesios,³⁰ whose work is cited considerably,³¹ but this is not explicitly acknowledged in Meletios' preface. There is very limited use of quotations from Hippocrates, and what there are come mainly from *On Nutrition*.³² Meletios also refers to his Christian sources in his introduction, including Basil the Great (c. 329–379), Gregory of Nyssa (335/40–d. after 394), John Chrysostom (340/50–d. 407), and Cyril of Alexandria (378–444).³³ Robert Renehan has also detected to a lesser degree the influence of Maximos the Confessor and Gregory of Nazianzos (329/30–c. 390) on Meletios.³⁴

In terms of associations with Meletios, one must also consider a brief work by Leo the Physician, *Epitome on the Nature of Men*, which is actually an abridged version of Meletios' text, amounting to about one-sixth the length of Meletios' work.³⁵ There is no extant information about Leo's (ninth [?] century) life and career, apart from the fact that he was also the author of the brief *Synopsis of Medicine* (see Section 2, below).³⁶ In a recent study of Meletios' *On the Constitution of Man* and Leo's *Epitome on the Nature of Men*, Erika Gielen has shown that these two authors should not be considered mere compilers of previous material, because they had each carefully selected their sources to fit their respective audiences.³⁷ In brief, Meletios often combined Galenic or pseudo-Galenic excerpts with quotations from the Christian fathers to suit the taste of his contemporary Christian audience, while Leo substantially abridged Meletios' account, eliminated most of the Christian references, and turned his

27 See Renehan (1984: 160–1); and Gielen (2018: 157). On Soranus' lost work, see Hanson and Green (1994: 1021–4).

28 Jutta Kollersch (1973: 60–6) dates this pseudo-Galenic treatise to the late first century AD.

29 Helmreich (1918).

30 Grimm-Stadelmann (2008: 60–1).

31 Morani (1981: 132–50).

32 See Ieraci Bio (2005: 35), who discusses Meletios' references to the *On Nutrition* (*De alimento*) with reference to his compiling techniques. For the influence on Meletios of Alexandrian commentaries on Hippocrates and Galen, see Ieraci Bio (2003).

33 Meletios, *On the Constitution of Man*, pr., ed. Cramer (1836) 1.22–6. Robert Renehan (1984: 161, n.15) was not able to detect a passage from Cyril.

34 Renehan (1984: 161). On Gregory of Nazianzos as one of Meletios' sources, see also Gielen (2018: 155). Holman (2008: 88–90) suggests that Paul of Aegina or Oribasios might also be among his sources for some passages.

35 Renehan (1969).

36 On Leo, see Ieraci Bio (2006: 787–91, 794–9) with references to earlier studies.

37 Gielen (2018).

text into the popular didactic form of *erotapokrisis* (question and answer) in an attempt to address, most probably, an audience of beginners in medicine.³⁸ In one of the most interesting cases examined by Gielen, Meletios, in chapter 1, discussing cranial sutures, introduced a quotation from Galen's *On Bones for Beginners*, a text self-evidently intended for those at the beginning of their medical education. Meletios abridged the Galenic passage, including only the most essential information, namely mentioning only two of the four kinds of skulls in the original Galenic account. He then drew a distinction between the cranial sutures of men and women, which was not mentioned in Galen, and introduces a passage from Aristotle's *History of Animals* to support his statement. Finally, in his attempt to impart Christian connotations to the description of the sutures, he explained that the three sutures of the male head are connected to the three figures of the Holy Trinity, while the one circular suture of the female head is connected to the 'circular' universe and the 'infinity' of the one 'divine power'. Although the source of this last passage has not been identified, it is clear that Meletios was attempting to make the Galenic anatomical account familiar to his non-expert Christian audience. Leo, on the other hand, abridged Meletios' account, thus keeping only some basic terms from Galen's initial description and removing any theological connotations. Most interestingly, he added extra anatomical information in the form of a brief phrase, thus revising Meletios' text to serve his intended readers, who were presumably interested in receiving purely medical details in an easily memorable form. The actual re-use and further re-working of the Galenic excerpt on Leo's part is proof of the conciseness and also the flexibility of the Galenic account, especially when dealing with merely descriptive material, as in the case of human anatomy.

2 Galen in Byzantine Diagnostics and Therapeutics

In the absence of modern microscopic techniques, Byzantine physicians mainly based their diagnosing and prognosticating of disease on the examination of the pulse and urines.³⁹ Both topics were treated in a large number of specialised treatises by Byzantine physicians. Theophilus, in the preface of his extremely influential treatise *On the Pulse*, makes special mention of the 'most marvellous physician', Galen, and his sphygmological treatises (i.e. *On the Different Kinds of the Pulse*, *On Diagnosis by the Pulse*, *On the Causes of the*

38 On Byzantine cases of instruction by question and answer, see Papadoyannakis (2006).

39 For an overview, see Bouras-Vallianatos (2015a: 109–12).

Pulse, On Prognosis by the Pulse, On the Pulse for Beginners).⁴⁰ Galen made the first notable codification of the ancient knowledge on the subject, informed by his rich clinical experience.⁴¹ The reception of Galenic knowledge on the subject by Theophilus and other Byzantine authors is not always as straightforward as it might seem. For example, Galen, in his *On the Different Kinds of the Pulse*, distinguished among five main categories (*pente genē*) of the pulse.⁴² On the other hand, Theophilus refers explicitly to ten categories (*genē ... eisi deka*),⁴³ a distinction not found in any genuine work by Galen. The vast majority of the terms that are used by Theophilus are also found in Galen's account, but the latter often does not take a straightforward position on whether the identification of other characteristics represents an additional category.⁴⁴ The distinction of the ten categories is also found in the work of the late sixth-/early seventh-century medical author Paul of Aegina.⁴⁵ It also appears later on in the works of Byzantine authors, such as Michael Psellos (1018–c. 1076),⁴⁶ and in various brief works on the pulse ascribed to Galen that should clearly be dated to the late Byzantine period.⁴⁷ Yet, it is not obvious from which ancient work this distinction was derived. For example, it was already found in an early pseudo-Galenic treatise on the topic, namely *On the Pulse, to Antonius*,⁴⁸ and

40 Theophilus, *On the Pulse*, ed. Ermerins (1840) 9.11–11.9.

41 On Galen's pulse theory, see Harris (1974: 397–431).

42 Galen, *Diff. Puls.*, 1.3–9, ed. Kühn (1824) VIII.500.6–522.18. According to Harris' interpretation (1974: 401), the variations of the pulse in Galen's account can be classified in five classes according to the size, strength, speed of every single movement of diastole or systole, frequency, and hardness or softness.

43 Theophilus, *On the Pulse*, ed. Ermerins (1840) 11.14–33.12.

44 See, for example, the case of full (*plērēs*) and empty (*kenos*) pulse, *Diff. Puls.*, 1.5, ed. Kühn (1824) VIII.508.6–509.17, which is a separate category in Theophilus' account.

45 Paul of Aegina, *Epitome*, 2.11, ed. Heiberg (1921) 1.82.4–88.18.

46 Michael Psellos, *On Medicine*, 9.283–421, ed. Westerink (1992) 200–4.

47 I am publishing a group of these texts, mainly found in fifteenth-century manuscripts, including a study on the development of different kinds of the pulse in Byzantium in a forthcoming study: Bouras-Vallianatos (forthcoming, a). According to a brief treatise preserved in Laurentianus Plut. 75.7 (twelfth century) and ascribed to Rufus, *On the Pulse*, 8, ed. Daremberg and Ruelle (1879) 231.14–232.5, the theory of ten classes goes back to Archigenes, although this is not confirmed by Galen or any other author. Apart from pseudo-Galenic texts on the pulse, we also find a considerable number of brief texts on urines ascribed to Galen in late Byzantine manuscripts; see, for example, Moraux (1985) and Bouras-Vallianatos (forthcoming, a).

48 Ps.-Galen, *Puls. Ant.*, ed. Kühn (1830) XIX.634.2–637.8. On this text, see Lutz (1940). A condensed version of this treatise, which also contains some diagrams similar to those by Theophilus, appears under the name of the otherwise unknown Philaretos: *On the Pulse*, ed. Pithis (1983).

in the pseudo-Galenic *Medical Definitions*,⁴⁹ although the latter does not provide an explicit numerical reference to the ten categories.

Even more interesting is the engagement of Byzantine authors with the Galenic material on uroscopy.⁵⁰ Theophilos, in his *On Urines* (consisting of twenty-six chapters), acknowledged the importance of Hippocrates and Galen (with a special mention of the latter's *On Crises*) in the development of the examination of urines, but he found the treatment by these ancient physicians incomplete (*ellipē*) and vague (*asaphē*).⁵¹ In fact, examination of urines in the interpretation of a patient's clinical condition never played a central role in the ancient world. In the Hippocratic texts, various characteristics of urine, such as the colour and the presence of sediment (*hypostasis*), are considered. The presence of suspended (*enaiōrēma*) particles and clouds (*nefele*) is also noted, but no clear distinction is made between them.⁵² Galen never wrote a single treatise on the topic, but in his works we can see a definite connection between the production of urine and the digestion (*pepsis*) of food.⁵³ Colour gradually became the index of digestive power and thus an important element in the diagnosis of humoral excess. Theophilos, using Galenic developments on the subject and on the recent work of Magnos (c. fourth/fifth century AD),⁵⁴ extended the spectrum of urinary colours to a total of nineteen, providing considerable detail in terms of variation as, for example, in the case of white. In addition to crystal white (*leukon*) there are three more kinds: milk-white (*galaktōdes*), grey-white (*glaukon*), and greyish-white or grey (*charopon*).⁵⁵

Later on, the late Byzantine physician John Zacharias Aktouarios (c. 1275–c. 1330) took a stance similar to Theophilos', in his own *On Urines*, the most

49 Ps.-Galen, *Def. Med.*, ed. Kühn (1830) XIX.404.1–412.15.

50 On Byzantine uroscopy, see Dimitriadis (1971).

51 Theophilos, *On Urines*, pr. ed. Ideler (1841) I.261.9–18.

52 The most important references are found in the *Aphorisms*, *Prognostic*, and *Epidemics*. For a survey of Hippocratic uroscopy, see Marketos (1994).

53 On Galen's theories about digestion and nutrition, see Cirenei (1961: 29–37) and Debru (2008: 273–5). One of the most detailed treatments of the subject is made in Galen's *Nat. Fac.*, 3.13, ed. Kühn (1821) II.200.6–202.17 = ed. Helmreich (1893) III.246.10–248.7.

54 The work survives today in two different revisions, one edited by Kühn and ascribed to Galen [XIX.574–601; Bussemaker (1847) argues that only chapters 1–28 and 30–36 of this treatise contain the work of Magnos] and an anonymous one edited by Ideler (1842) II.307–16. Magnos is credited with introducing the term *chyma* to describe the urinary liquid, and he refers to a clear spectrum of urine colours (*chroia*) on a scale from white (*leukon*), corresponding to indigestion (*apepsia*), to black (*melan*), related to over-digestion (*hyperoptōsis*).

55 Theophilos, *On Urines*, 7.1, ed. Ideler (1841) I.268.7–8. On the colours *glaukon* and *charopon* in the ancient and late antique literature, see the special study by Maxwell-Stuart (1981), which has a section on Theophilos (1981: I.175–6, II.72–3).

extensive medieval treatise on the subject in seven books, and did not hesitate in the introduction to criticise Hippocrates and Galen for having dealt too briefly with the examination of urines: 'In fact, Hippocrates, the most wise (*sophōtatos*), having said a little of this subject here and there, left the theory [on uroscopy] unfinished (*atelē*). On the other hand, the skilful Galen paid only a little attention to these [i.e. uroscopic theories]'.⁵⁶ This programmatic statement of the inadequacy of the Hippocratic and Galenic contributions is mainly made in order to emphasise John's own treatment of the subject. John made important innovations concerning the examination of urines in his work, for example, the introduction of a graduated urine vial divided into eleven areas, an innovation that was widely taken up in late Byzantium and the West.⁵⁷ He was an erudite Byzantine physician with a deep knowledge of both Hippocrates and Galen, the latter referred to as a 'wise' (*sophos*) physician throughout John's work.⁵⁸ Galen's influence on his treatise is obvious in various parts. For example, John provides acknowledged references to Galen's *On Crises* and *On Critical Days*.⁵⁹ Furthermore, having been influenced by Galen's theories on human digestion, he introduced a more detailed theory, involving four phases compared to the three in the Galenic scheme. John places more emphasis on the role of the liver, thus splitting Galen's second phase into two, one phase taking place in the concave section of the organ and the other in the convex part, respectively.⁶⁰ Thus, Byzantine physicians not only systematised Galenic contributions to the examination of the pulse and urines, they also developed further earlier theories based on their own clinical experience.

Most interestingly, in his *On Urines* John revives the genre of case histories for the first time in the Greek-speaking world since Galen, including eleven examples involving twelve patients. These constitute a distinct element of discourse in his work, in which John describes his experience in dealing with contemporary patients. The use of certain terminology in his accounts often echoes that of Galen. Furthermore, in line with his master, these clinical

56 John Zacharias Aktouarios, *On Urines*, 1.2, ed. Ideler (1842) II.4.31–4. On John, see Kourousis (1984/8), Hohlweg (1983), and the most recent study on his medical corpus in Bouras-Vallianatos (2015c).

57 John Zacharias Aktouarios, *On Urines*, 1.13, ed. Ideler (1842) II.20–2. On John's urine vial, see Bouras-Vallianatos (2015a: 111–12; 2015c: 103–8).

58 John Zacharias Aktouarios, *On Urines*, 6.10, 7.2, ed. Ideler (1842) II.158.23, II.175.1.

59 John Zacharias Aktouarios, *On Urines*, 6.10, ed. Ideler (1842) II.158.22–3; 7.2, II.174.36–175.4; 7.16, 187.20–4; 7.16, 188.8–10.

60 John Zacharias Aktouarios, *On Urines*, 1.5, ed. Ideler (1842) II.8.1–9.12. On this, see Bouras-Vallianatos (2015c: 90–4).

accounts aim to serve a didactic role, in supporting John's theoretical details, as well as to promote John as a most capable physician to his contemporaries.⁶¹

Another issue that we must consider and which also gives us the opportunity to discuss Galen's presence in Byzantine therapeutics is the indirect citation of the Galenic corpus through late antique medical handbooks, such as those by Oribasios, Aetios of Amida, and Paul of Aegina. In particular, Aetios' and Paul's works remained extremely popular throughout the Byzantine period, attested by the large number of surviving copies.⁶² Paul of Nicaea (c. ninth/tenth century),⁶³ Theophanes Chrysobalantes (c. tenth century),⁶⁴ Leo the Physician, and John Zacharias Aktouarios were inevitably influenced by these authors in writing their own medical handbooks. In other words, the way in which the Galenic corpus had been abridged and became available in Late Antiquity regulated access to it in later centuries.

Paul of Nicaea composed his medical handbook in the form of *erotapokrisis* in 137 brief chapters, in which a strong Galenic foundation is noticeable throughout. Some parts may derive directly from Galen's works (*Therapeutics to Glaucón* and *On the Composition of Drugs According to Places*), but the Galenic corpus is mostly cited through the mediation of Oribasios and Paul of Aegina,⁶⁵ two of the most important sources. There are quotations from the Hippocratic *Aphorisms* and *Epidemics*, although in some cases these are most probably derived from the relevant Galenic commentaries.⁶⁶ As Anna

61 On Galen's and John's case histories, see Mattern (2008) and Bouras-Vallianatos (2016) respectively.

62 Mondrain (2012: 621) reports seventy-five and sixty-six complete or partial witnesses to Aetios' and Paul's handbooks respectively.

63 See the discussion on dating by Ieraci Bio (1996: 15–17). The earliest codex dates to the fourteenth century. I find a date after the eleventh century improbable, since the work lacks systematic references to oriental *materia medica* or the use of sugar in the preparation of liquid dosage forms, which became common from the late eleventh/early twelfth century onward.

64 In a large number of manuscripts, the work is dedicated to a certain Constantine Porphyrogenetos, most probably Constantine VII. See Sonderkamp's (1984) discussion of this.

65 See, for example, the chapter on hectic fevers in Paul of Nicaea, *De re medica*, 3, ed. Ieraci Bio (1996) 56.16–43, which derives either from Paul of Aegina's, *Epitome*, 2.31, ed. Heiberg (1921) 105.14–106.8, or the relevant parts of Oribasios', *Synopsis for Eustathios*, 6.21, ed. Raeder (1926) 196.2–26. Paul of Aegina himself most probably based his particular chapter on Oribasios, who in his turn used excerpts from two Galenic works, *On the Anomalous Dyskrasia* and *On the Different Kinds of Fevers*. For more examples, see Ieraci Bio (1992: 135–44).

66 See, for example, Ieraci Bio (1992: 127). Of note, the Hippocratic corpus was being copied up to the late Byzantine period; see Mondrain (2014).

Maria Ieraci Bio has also shown, interestingly, in some parts of Paul of Nicaea's work, he seems to break up Galen's 'monopoly' by using excerpts from Rufus' (second half of the first century AD) *Medical Questions* and *On Satyriasis and Gonorrhoea*, and even the Anonymus Parisinus, either directly or through Philumenus (second/third century AD).⁶⁷

Leo the Physician, presumably writing for his pupil George,⁶⁸ composed the so-called *Synopsis of Medicine*, an epitome in often-aphoristic form in seven books. As Lawrence Bliquez has convincingly argued, the information provided by the author is often insufficient for practising medicine without consulting other works on the topic, presumably the late antique handbooks by Aetios or Paul of Aegina.⁶⁹ Throughout the treatise, there are several named references to specific Galenic works (e.g. *Therapeutic Method*, *Therapeutics to Glaucou*, *On the Different Kinds of Fevers*, *On Affected Parts*) accompanied by a brief summary of some Galenic therapeutic recommendations.⁷⁰ Leo's strong Galenic background is often combined in his work with references to Hippocrates, including the *Aphorisms* and *Epidemics*.⁷¹ One named reference to Archigenes most probably derives from Galen or Aetios of Amida.⁷² His occasional references to invasive surgery, unparalleled in any medical handbook written from the eighth century onwards, do not appear to come from Galen, since he never completed a work on the subject, but from either Aetios of Amida or Paul of Aegina, whose own works were mostly based on such authors as Leonides (c. first century AD) and Antyllus (c. first half of the second century AD).⁷³ The next author, Theophanes Chrysobalantes, wrote his *Synopsis* in an *a capite ad calcem* structure, and it was disseminated extensively throughout the Byzantine and post-Byzantine era. In it, he often cites Galen second-hand, through Paul of Aegina.⁷⁴ Moreover, Paul of Aegina's medical handbook was one of the main

67 On Paul of Nicaea's sources, see Ieraci Bio (1992) and the *apparatus fontium* of Ieraci Bio's edition (1996: 49–231) *passim*.

68 Leo the Physician, *Synopsis of Medicine*, pr., ed. Ermerins (1840) 89.1–4.

69 Bliquez (1999).

70 E.g. Leo the Physician, *Synopsis of Medicine*, 1.5, 1.11, 1.16, 2.2, ed. Ermerins (1840) 95.1–2, 99.21–3, 105.7–8, 111.6–7.

71 E.g. Leo the Physician, *Synopsis of Medicine*, 2.5, 2.6, ed. Ermerins (1840) 115.1–3, 115.11–13.

72 Leo the Physician, *Synopsis of Medicine*, 2.15, ed. Ermerins (1840) 121.14–16; cf. Aetios of Amida, *Tetrabiblos*, 3.180, ed. Olivieri (1935) I.351.3ff.

73 See Bouras-Vallianatos (Chapter 2) in this volume.

74 It survives in more than fifty codices; see Sonderkamp (1987). The text is only available through an outdated edition by Bernard (1794–5). For a preliminary study on the various versions of the text, see Zipser (2017). For some preliminary comments on his sources, see Sonderkamp (1984).

sources, together with Theophilus' *On Urines*, for Michael Psellos' long poem *On Medicine*, intended for the non-expert.⁷⁵

John Zacharias Aktouarios wrote his *Medical Epitome* for Alexios Apokaukos (the commander of the Byzantine fleet), who had a strong interest in medicine. The work was primarily addressed to *philiatroi* (friends of medicine or amateur physicians).⁷⁶ 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. He sometimes excerpted directly from Galenic works, including *On the Pulse for Beginners* and *On Crises*, while at other times he preferred the abridged versions of Galenic works (for example *Therapeutics to Glaucōn*) through Paul of Aegina.⁷⁷ The last two books, i.e. 5 and 6, concentrate solely on the composition of drugs (approximately 350 recipes) and are arranged according to the form and place of administration, respectively. John offers a dynamic assemblage of recently introduced Arabic pharmacological material in Greek translation, including Ibn al-Jazzār's (d. c. 980) *Viaticum* (*Zād al-musāfir wa-qūt al-hādir*/Gr. *Ephodia tou Apodēmoutos*) among his sources,⁷⁸ in combination with traditional Greek and late antique sources, such as Aetios of Amida, Paul of Aegina, and a substantial number of cited excerpts taken directly from Galen's *On the Composition of Drugs According to Places*.⁷⁹

The late Byzantine period also evidenced the gradual replacement of traditional Greek pharmaceutical dosage forms with new ones, as, for example, in the case of replacing honey-based potions with sugar-based ones in line with Arabic innovations in the field. The impact of the transmission of

75 Hohlweg (1988: 45). The most recent critical edition is Westerink (1992: 190–233). See also Stathakopoulos (Chapter 7) in this volume. On Psellos' medical corpus, see Volk (1990).

76 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; on this, see Bouras-Vallianatos (2015c: 338–650). The first two books have been published by Ideler (1842: II.353–463). The last four books remain unedited and are only available through the most recent Latin translation of the entire work by Mathys (1556).

77 Bouras-Vallianatos (2015c: 160–206).

78 On the Greek translation of Ibn al-Jazzār's work, which was made in a southern Italian environment before the first quarter of the twelfth century, see the most recent survey by Miguet (2017). Arabic pharmacological lore, based on Galen, supplied the Greek cabinet with new animal and vegetal substances (such as musk, ambergris, various kinds of myrobalan, and sandalwood). It gradually became available in Byzantium through translations from Arabic into Greek from the early twelfth century onwards. On Arabo-Greek medical translations in Byzantium, see Touwaide (2002; 2016).

79 Bouras-Vallianatos (2015c: 207–50).

medical knowledge from the Islamic world to Byzantium is even reflected in the elaboration of works consistently transmitted under the name of Galen, as in the case of *On Procurable Remedies*, in which one finds reference to a julep (*julāb*),⁸⁰ a late Byzantine addition to the text. It is important to note the vast number of references to Galen's name in Byzantine recipe books,⁸¹ and scattered recipes and brief scholia in manuscripts,⁸² which although in most cases were not drafted directly from a Galenic work, clearly belong to the Galenic medical tradition through various stages of mediation.

3 Three Exceptional Cases: Symeon Seth, John Zacharias Aktouarios, and John Argyropoulos

In this section, I will discuss three Byzantine authors whose engagement with Galen is remarkable for different reasons in each case. The first is Symeon Seth, who was active in the second half of the eleventh century in Constantinople.⁸³ He probably came from Antioch and is mostly known for two works: his *Treatise on the Capacities of Foodstuffs*, written for Emperor Michael VII Doukas (r. 1071–78), and his translation into Greek of the Arabic version of a collection of ancient Indian animal fables, *Kalīla wa-Dimna*, done at the behest of the Emperor Alexios I Komnenos (r. 1081–1118). He is also the author of two didactic works on natural philosophy and astronomy – *Synopsis of Inquiries on Nature* and *On the Utility of the Heavenly Bodies* – and the unique, brief *Refutation of Galen*. There is no evidence that Symeon ever practised medicine himself and it seems that he worked as a court astrologer in the reign of Emperor Alexios I.

In his *Treatise on the Capacities of Foodstuffs*, an alphabetical collection listing the properties of 183 different kinds of aliments, Symeon – as he admits in his proem – drafts his material from Greek but also foreign sources, including Persian (*Persōn*), Hagarene (*Agarēnōn*)⁸⁴ – a term used in Byzantine literature to denote Arabs or more generally Muslims – and Indian (*Indōn*).⁸⁵ Among his Greek sources, Galen, Hippocrates, and Dioscorides are referenced by name.

80 Ps.-Galen, *Rem. Parab.*, 3, ed. Kühn (1827) XIV.563.12–564.11.

81 On Galen in Byzantine recipe books, see Zipser (Chapter 5) in this volume.

82 See, for example, two scholia ascribed to Galen in an eleventh-century manuscript of Dioscorides on Mount Athos (Lavra, Ω 75), which was once studied by Christodoulou (1986: 158–9).

83 On Symeon Seth and his works, see Bouras-Vallianatos (2015b: 436–42).

84 See also, Symeon Seth, *Treatise on the Capacities of Foodstuffs*, ed. Langkavel (1868) 61.5.

85 Symeon Seth, *Treatise on the Capacities of Foodstuffs*, ed. Langkavel (1868) 1.1–3.

He often combines Greek with foreign knowledge on specific substances, and he provides descriptions for ingredients that had never before been described in detail in any Greek or Byzantine treatises, for example ambergris and musk.⁸⁶ Unlike his references to Hippocrates and Dioscorides, where he does not question their advice, Symeon displays a critical attitude towards Galen, at least in two cases. He is particularly ironic in one of them, in which he disputes Galen's pronouncement on the taste of small mullets in the *On the Capacities of Foodstuffs*.⁸⁷

Symeon's *Refutation of Galen* is a brief work, belonging to the genre of *antirrhēsis* (refutation), in which Symeon focuses on Galen's theories on human physiology. He makes explicit mentions of Galen's *On the Natural Capacities*, while at times he seems also to have been influenced by particular passages in *On the Function of the Parts of the Body* and *On Semen*. There are seven broad areas in which Symeon criticises Galen's theories, either citing quotations verbatim or paraphrasing Galen. Symeon was either basing himself on Aristotelian views to refute Galen's concepts on the generation of various bodily parts,⁸⁸ or more commonly, he found contradictions throughout the Galenic corpus (as in the cases of the theories on reproduction and conception, and the number of the tunics of the bladder),⁸⁹ although the contradictions might sometimes originate from Galen's insufficient treatment of a certain theoretical statement (as in the cases of the movements of gastrointestinal organs and the causes of nausea).⁹⁰

As I have shown, Symeon's criticism of Galen's theories is not derived from practical experimentation or scientific observation, but is based instead on a close reading of certain Galenic passages.⁹¹ Even when Symeon found

86 Harig (1967).

87 Symeon Seth, *Treatise on the Capacities of Foodstuffs*, ed. Langkavel (1868) 106.15–19: 'I am astonished at Galen, who marvels at those buying large mullets because he thinks that smaller mullets have flesh that is sweeter and easier to digest. Smaller mullets are indeed easier to digest, but not in any way sweeter'. Galen, *Alim. Fac.*, 3.27, ed. Kühn (1823) VI.717.1–6 = ed. Wilkins (2013) 228.3–8. In another striking case, in *On the Utility of the Heavenly Bodies*, Symeon does not even hesitate to call a Galenic statement in *On the Function of the Parts of the Body* an 'untruth': Symeon Seth, *On the Utility of the Heavenly Bodies*, ed. Delatte (1939) II.119.21–120.5; and Galen, *UP*, 3.10, ed. Kühn (1822) III.241.1–242.8 = ed. Helmreich (1907) I.176.21–177.23.

88 Symeon Seth, *Refutation of Galen*, 2, ed. Bouras-Vallianatos and Xenophontos (2015b) 459.21–461.59.

89 Symeon Seth, *Refutation of Galen*, 3, 4, 5, ed. Bouras-Vallianatos and Xenophontos (2015b) 461.60–462.86.

90 Symeon Seth, *Refutation of Galen*, 6, 7, 8, ed. Bouras-Vallianatos and Xenophontos (2015b) 462.87–463.123.

91 Bouras-Vallianatos (2015b: 442–57).

contradictions in the Galenic corpus, he was unable to suggest new theories. He might have been inspired by cases of criticism in the Islamic world, such as for example, Muḥammad ibn Zakarīyā' al-Rāzī's (d. c. 925) *Doubts About Galen*.⁹² His critique is not comparable to that of Alexander of Tralles, who attempted to demonstrate Galen's inadequacy as regards certain therapeutic recommendations, criticism that was always informed by his clinical experience.⁹³ Symeon addresses a contemporary group of Galen's admirers, including Byzantine physicians and intellectuals, who in Symeon's own words considered Galen 'infallible' and a 'divine creature'.⁹⁴ His text is often pervaded by irony, a literary tool to undermine Galen's authority, accusing him, for example, of having a poor memory.⁹⁵ Symeon's overall intention is to challenge Galen's otherwise virtually unchallenged authority in Byzantium and thus perhaps cause a strong reaction among his contemporaries in an attempt to establish himself as an intellectual authority in the capital. His example was not followed by any other Byzantine physician, and his *Refutation of Galen*, which survives in only one manuscript in contrast to the extremely popular *Treatise on the Capacities of Foodstuffs*, remained rather uninfluential.

The next case concerns the late Byzantine practising physician and medical author John Zacharias Aktouarios, whose works were widely disseminated in late Byzantium. Apart from his *On Urines* and *Medical Epitome*, discussed above, he wrote an extensive treatise dealing with *pneuma* ('air'), *On the Activities and Affections of the Psychic Pneuma and the Corresponding Regimen*, consisting of two books.⁹⁶ The first book provides an introduction to the soul and its capacities and its connection to the body through the *pneuma*, the soul's carrier (*ochēma*), sections in which John follows Neoplatonic philosophical theories on the subject.⁹⁷ These are followed by a detailed discussion of the production

92 Temkin (1973: 118–19) was the first to relate Symeon to al-Rāzī. This suggestion was then contextualised in the framework of Symeon's *Refutation of Galen* by Bouras-Vallianatos (2015b: 447–8). It was also later proposed by Gutas et al. (2017: 96); and discussed with further evidence by Pietrobelli in Cronier et al. (2015: 91–3). Cf. Nutton (2007: 175). On Galen's reception by al-Rāzī, see Koetschet (Chapter 10) in this volume.

93 See Bouras-Vallianatos (Chapter 2) in this volume; and Guardasole (2004).

94 Symeon Seth, *Refutation of Galen*, 9, 1, ed. Bouras-Vallianatos and Xenophontos (2015b) 463.126–8, 459.3–4.

95 Symeon Seth, *Refutation of Galen*, 5, 6, ed. Bouras-Vallianatos and Xenophontos (2015b) 461.83–4, 462.102.

96 The text is available through the rather outdated edition by Ideler (1841: 1.312–86). See also Kakavelaki (2016), who proposed some useful new readings of corrupted passages in Ideler's edition.

97 See Kourousis (1984/8: 416–76) and Hohlweg (1996), who present John's work only from a philosophical point of view, attempting to relate his theories to the writings of some

of the different kinds of *pneumata*. The main focus is on the psychic *pneuma*, which was responsible for consciousness, sensation, and voluntary movement. Here John has often been influenced by Galen's *On the Doctrines of Hippocrates and Plato*. The second book provides a detailed discussion of how adjusting one's daily regimen can help avoid the creation of harmful mixtures, thus ensuring physical and spiritual health. It mainly focuses on diet and includes a long list of foodstuffs and their qualities.

John builds upon Galen, but there are three notable elements that result in a significant departure from Galenic medical theories on the topic. First, John considers not only two or three,⁹⁸ but four distinct kinds of *pneumata*, produced in the stomach, liver, heart, and brain, respectively.⁹⁹ Second, the production of *pneuma* is directly connected to the process of digestion. Moreover, each *pneuma* is assigned two primary qualities (unnamed, 'gastric' *pneuma*: cold and moist; natural *pneuma*: warm and moist; vital *pneuma*: warm and dry; psychic *pneuma*: cold and dry), which allows John to easily correlate various kinds of *pneumata* with the mixtures (*kraseis*) of each part and of the body as a whole. Galen refers rarely to the alteration of *pneuma* (*pneumatōs alloiōsis*) due to harmful humours, without ascribing any particular qualities to the *pneuma* or providing any further details. In John's model, certain elements of one's daily regimen, such as diet, bathing, and sleep, may lead to keeping the *pneuma* in good quality and flow. The systematic classification of qualitative change of the psychic *pneuma* as the object of treatment is John's own innovation. The psychic *pneuma*, for example, which is originally dry and cold, should be kept as fine as possible through the regulation of dryness and coldness in the brain, otherwise its subsequent improper flow can result in sensory impairment.¹⁰⁰

The last case to be examined is that of the late Byzantine intellectual John Argyropoulos (c. 1393/4 or c. 1415–1487) and his circle of students. John Argyropoulos seems to have been a teacher in the Byzantine capital before he went to study philosophy and medicine at the University of Padua from 1441 to 1444. He then returned to Constantinople, but after the fall of the city in 1453, he resided in Florence, teaching Greek philosophy, especially Aristotle. Later on, having converted to Catholicism, he moved to Rome and joined the curia of

Neoplatonic philosophers and the church fathers, and thereby omitting John's medical contributions.

- 98 Galen accepts the existence of psychic and vital *pneuma*, but he is very reluctant to accept that of the natural *pneuma*; see Rocca (2012).
- 99 John Zacharias Aktouarios, *On the Activities and Affections of the Psychic Pneuma and the Corresponding Diet*, 1.6, ed. Ideler (1841) I.321.26–325.8.
- 100 For a detailed study of John's treatise on *pneuma*, see Bouras-Vallianatos (forthcoming, b).

Pope Sixtus IV (1471–84).¹⁰¹ He is particularly well known for his Latin translations of Aristotle's *Nicomachean Ethics*, Porphyry, and Basil the Great. He wrote in both Greek and Latin, including letters, orations, treatises on theology, and twelve brief *erotapokriseis* (questions and answers).

Among the *erotapokriseis*, four concentrated on human physiology.¹⁰² For them, John Argyropoulos drew his material (especially for nos. 9 and 12) from Galen's *Art of Medicine* and from *On Fevers*, by ps.-Alexander of Aphrodisias.¹⁰³ John Argyropoulos was giving medical lectures to a circle of students, including Anthony Pyropoulos, Manuel Pyropoulos, Demetrios Angelos, John Panaretos, and Andronikos Eparchos, at the *Katholikon Mouseion* of the *Kral xenon*, annexed to the monastery of St. John the Baptist in Constantinople.¹⁰⁴ Some of these students were also involved in the transmission of Galenic treatises, being responsible for the copying of manuscripts,¹⁰⁵ including the famous Codex no. 14 of the library of the Vlatadon monastery in Thessaloniki, preserving *inter alia* the otherwise lost *Avoiding Distress*.¹⁰⁶ John Argyropoulos' teaching was influenced by interpretations of Galenic theories by late-antique Alexandrian scholars.¹⁰⁷ It is remarkable, however, that he seems to have introduced into Byzantium the interpretations of fourteenth- and fifteenth-century Italian scholars, perhaps due to his studies in Padua, as attested, for example, in his use of particular diagrams representing the notion of the range of health (*hygieias platos*) in the *Art of Medicine*,¹⁰⁸ a Galenic text that played a central role in his lectures. Lastly, as Ieraci Bio has shown, awareness of the Italian influences on his work has been further heightened by evidence in an unpublished short commentary on the prologue of Galen's *Art of Medicine* preserved in Vaticanus gr. 285, a codex connected with members of John Argyropoulos'

101 On John Argyropoulos' career, see Geanakoplos (1974). See also Ganchou (2008).

102 The title could be translated as *Solution to Some Questions and Inquiries Requested by One of the Cypriot Philosophers-cum-Physicians*. The medical answers are found in nos. 9–12, ed. Lampros (1910) 162.6–174.8. For a brief, introductory study, see Touwaide (1999).

103 Ieraci Bio (2009; 2013: 788–92).

104 Mondrain (2000).

105 Mondrain (2003; 2010); see also Degni (Chapter 6) in this volume.

106 Pietrobelli (2010).

107 Ieraci Bio (2013: 793–5).

108 Galen, *Ars. Med.*, 4, ed. Kühn (1821) 1.316–17 = ed. Boudon (2000) 284–5. See Ieraci Bio (2013: 795–8) with references to the earliest studies on this. Pietrobelli (2010: 104) argues that variations in the diagram in different manuscripts are not due to variations caused by copying from an original model, but bear witness to the actual notes taken by different students during the lectures of the same course.

circle, in which the commentator seems to be aware of contemporary debates in Italian university circles.¹⁰⁹

4 Conclusion

Byzantine medical literature was profoundly influenced by Galenic material. Depending on the subject matter, certain Galenic works – including, for example, *On the Functions of the Parts of the Body*, *Therapeutics to Glaucón*, and the Galenic pharmacological works on composite drugs – remained particularly popular throughout the Byzantine era, as attested to by their widespread use in Byzantine works on human physiology and in Byzantine therapeutic manuals. An important point that has emerged from this examination is the significance of the selections made from, and abridgments of, the Galenic corpus by late antique authors, including Aetios of Amida and Paul of Aegina, since it was through these authors' medical handbooks that Galen was often cited second-hand by Byzantine authors. The Hippocratic corpus was mostly cited through Galen, rarely directly,¹¹⁰ and in most cases Hippocrates' name was used to give authority to the works of Byzantine medical authors. Furthermore, some scattered citations to other ancient authors in most cases derived from late antique medical handbooks. From the twelfth century onward, however, Greek translations of Arabic works became available in Byzantium, supplementing the Byzantine (Galenic) pharmacology with new forms of drugs and substances from Asia.

The Byzantine era also provides evidence of the adaptation of Galen to a Christian context. Unlike with late antique authors, who abridged the Galenic account and combined it with excerpts from other medical authors in a variety of ways, in the cases of Theophilus and most notably Meletios the monk, one finds an extra level of re-working, a reconfiguration of Galen's text, to make it part of an emerging Christian tradition on human anthropology. Galen continued to be considered a 'divine' figure throughout the Byzantine period, with only one notable case of his idealised portrait being challenged, by Symeon Seth, although this independent approach was not marked by the introduction of any new concepts. Beyond the simple re-working or adaptation of the Galenic material, Byzantine authors who based themselves for the most part on Galenic knowledge, sometimes also developed their own theories, as in the case of John Zacharias Aktouarios, whose contributions in the field

109 Ieraci Bio (2010b); Ieraci Bio (2013: 798–802).

110 For some scattered examples, see Ieraci Bio (2014).

of uroscopy and human physiology complemented and extended the corresponding Galenic theories. Lastly, John Argyropoulos' systematic efforts to revive Galenic medical teaching in the fifteenth century were accompanied by an extraordinary level of cross-fertilisation between Italian and Byzantine medical knowledge.

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