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“Verification and Utility in the Arabic Commentaries on the *Canon of Medicine*: Examples from the Works of Fakhr al-Dīn al-Rāzī (d. 1210) and Ibn al-Nafīs (d. 1288)”

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### ABSTRACT

Although over two dozen Arabic commentaries on the Canon of Medicine were composed between the twelfth and fourteenth centuries, historians of medicine have paid scant attention to them. Instead, these commentaries have often been dismissed as being uncritical expositions that further entrenched the dogma of Galenic/Avicennan medical theory. In this article, I shall show that in fact the opposite was the case for at least a subset of the Canon commentaries from this period. Fakhr al-Dīn al-Rāzī developed a new style of verification commentary across his philosophical corpus that he also deployed in his Canon commentary. Even though Fakhr al-Dīn largely adhered to Galenic/Avicennan medical theory, his commitment to verification (*tahqīq*) led him to challenge and critically assess many facets of medical theory based on systematic, philosophical investigations. Ibn al-Nafīs, following in Fakhr al-Dīn’s footsteps, undertook a similar, systematic investigation into medical theory in his own Commentary on the Canon. However, in this case, verification led Ibn al-Nafīs to challenge and modify several facets of medical theory. Moreover, as a trained, practicing physician, Ibn al-Nafīs also wanted to ensure that his commentary was useful for other practicing physicians. His commentary thus shows how a post-classical physician committed to the principles of verification and utility could employ philosophical argumentation, empirical observations and even occasional experiments to modify key aspects of Galenic/Avicennan medical theory and practice.

**KEYWORDS:** Islamic medicine, Avicenna, Ibn al-Nafīs, Commentaries, Canon of Medicine, Galenic medicine, Philosophy

It is no secret that a substantial portion of medical literature produced after 1200 CE is in the form of commentaries and abridgments rather than large compendia.<sup>1</sup> For an earlier

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<sup>1</sup> Specialized tracts in specific fields, such as fevers, ophthalmology, pharmacology, etc., continued to be produced throughout; see Emilie Savage-Smith, “Medicine in Medieval Islam,”

generation of historians of medicine, this shift to commentaries characterized the onset of “decline” in Islamic medicine.<sup>2</sup> Max Meyerhof, for example, claimed that the “twelfth century mark[ed] a standstill,” after which works by earlier authors were “reproduced, summarized, [and] commented on, but outstanding and independent works” became “rare.”<sup>3</sup> Manfred Ullmann believed that the goal of these commentaries was merely to explain and interpret the tradition without elaborating anything new. This is why he claimed that novel medical claims, such as Ibn al-Nafīs’s (d. 1288) correction of Galenic cardiovascular anatomy, were ignored by later tradition, preventing the overthrow of Galenic medical theory.<sup>4</sup> In fact, in his 2016 book on *Medical Life and Thought in the Arabic Middle Ages (Ärztliches Leben und Denken im arabischen Mittelalter)*, J. C. Bürgel continues to maintain that medical thought declined in the post-1200 period due to a decrease in the number of new books and the turn to commentaries on select canonical texts.<sup>5</sup>

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in *The Cambridge History of Science, Vol. 2: Medieval Science*, eds. David Lindberg and Michael Shank (Cambridge: Cambridge University Press, 2013), 139–167, 148.

<sup>2</sup> For a critique of the use of this category of “decline” for Islamic science generally, see Sonja Brentjes, “The Prison of Categories—‘Decline’ and its Company,” in *Islamic Philosophy, Science, Religion and Culture: Studies in Honor of Dimitri Gutas*, eds. Felicita Opwis and David Reisman (Leiden: Brill, 2012), 131–156.

<sup>3</sup> Max Meyerhof, “Science and Medicine,” in *The Legacy of Islam*, eds. Sir Thomas Arnold and Alfred Guillaume (Oxford: Clarendon Press, 1931), 311–355, 338.

<sup>4</sup> Manfred Ullmann, *Islamic Medicine* (Edinburgh: Edinburgh University Press, 1978), 71.

<sup>5</sup> J. C. Bürgel, *Ärztliches Leben und Denken im arabischen Mittelalter*, ed. Fabian Käs (Leiden: Brill, 2016), 447–448.

Although other contemporary historians of medicine in pre-modern Islamic societies would reject such blanket dismissals of post-1200 commentaries, the judgment of these eminent historians, unfortunately, continues to inform general histories of medicine. For example, in his survey on Islamic medicine for the most recent *Oxford Handbook of the History of Medicine*, Hormoz Ebrahimnejad first dismisses the commentary tradition on Ibn Sīnā's (d. 1037, *lat.* Avicenna) *al-Qānūn fī al-ṭibb* (Canon of Medicine) as “a style and method of writing rather than a method for providing critical work.” Later in the chapter, he even asserts that “[t]he strength of learned ‘Islamic medicine’ remains less in its innovations than in its pedagogical capacity.”<sup>6</sup> The preponderance of medical commentaries is thus seen by Ebrahimnejad as a sign of “decline.”

Medical historians, of course, were not unique in dismissing the intellectual worth of commentaries. As Matthew Ingalls records, major twentieth century scholars of Islamic thought dismissed the originality, ingenuity and intellectual worth of commentaries, viewing them as a symptom of the “decline of Muslim scholarship” and as marking “the advent of a post-classical stagnation in Muslim intellectual life.”<sup>7</sup> However, over the last two decades, there has been a veritable explosion in the interest and examination of Arabic commentaries produced during the post-classical period (1100–1900 CE) across all fields of Islamic sciences: ranging from poetry

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<sup>6</sup> Hormoz Ebrahimnejad, “Medicine in Islam and Islamic Medicine,” in *The Oxford Handbook of the History of Medicine*, ed. Mark Jackson (Oxford: Oxford University Press, 2011), 169–189, 174–175, 184.

<sup>7</sup> Matthew B. Ingalls, “Zakariyyā al-Anṣārī and the Study of Muslim Commentaries from the Later Islamic Middle Period,” *Religion Compass* 10/5 (2016): 118–30, 118–9.

to logic to law to medicine.<sup>8</sup> These examinations have shown that far from being derivative and uncritical, the post-classical commentaries on scientific and philosophical works were guided by the principle of *tahqīq* (verification). The spectrum of verification was quite broad, ranging from verifying meanings of technical terms to evaluating key arguments. As such, the commentarial practice of verification could and *did* lead authors to not only correct or modify earlier scientific and philosophical claims, but even transform underlying theories occasionally.<sup>9</sup> Verification also came to occupy a central place in teaching and learning in Islamic societies.<sup>10</sup>

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<sup>8</sup> See Robert Wisnovsky, “The Nature and Scope of Arabic Philosophical Commentary in Post-Classical (ca 1100–1900 AD) Islamic Intellectual History: Some Preliminary Observations,” *Bulletin of the Institute of Classical Studies* (University of London) 47 (2004): 149–191; Khaled El-Rouayheb, *Relational Syllogisms and the History of Arabic Logic, 900–1900* (Leiden: Brill, 2010); and idem, *Islamic Intellectual History in the Seventeenth Century* (Cambridge: Cambridge University Press, 2015). Also see the articles in the special issue of *Oriens* 41/3–4 (2013) entitled, *The Ḥāshiya and Islamic Intellectual History*, eds. Asad Q. Ahmed and Margaret Larkin. Commentaries on the astronomical sciences are the exception. Historians of astronomy (e.g. Ahmad Dallal, David King, Robert G. Morrison, Jamil Ragep and George Saliba, amongst others) have been highlighting the intellectual depth and worth of astronomical commentaries for over three decades; see George Saliba, “The Role of the *Almagest* Commentaries,” *Archives internationales d’histoire des sciences* (1987): 3–20; and idem, “Writing the History of Arabic Astronomy: Problems and Differing Perspectives,” *Journal of the American Oriental Society* 116 (1996): 709–718.

<sup>9</sup> See Khaled El-Rouayheb, “Opening the Gate of Verification: The Forgotten Arab-Islamic Florescence of the 17<sup>th</sup> Century,” *International Journal of Middle East Studies* 38 (2006): 263–

Recent work has also revealed that verification played an important role in medical commentaries, particularly after 1200 CE. According to Kamran Karimullah, the pre-1200 commentaries on the *Aphorisms* were deeply indebted to Galen’s commentary for both style and content. In his brief remarks on the method for composing commentaries scattered across his corpus, Galen makes it abundantly clear that the goal of a commentary is merely to make clear “that which is unclear.”<sup>11</sup> The goal is decidedly not to demonstrate (*burhān*) the validity of each and every claim found in the source text, though this may be permitted “in moderation” to correct the most egregious errors introduced by subsequent commentators.<sup>12</sup> Pre-1200 Arabic commentaries on the *Aphorisms* adhered to this Galenic principle for composing their interpretive commentaries. Even Ibn Abī Šādiq (d. after 1067), whose commentary otherwise marks a watershed moment in the Arabic corpus of commentaries on the *Aphorisms* in going

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281; idem, *Relational Syllogisms*; and idem, *Islamic Intellectual History*; and Asad Q. Ahmed, “Post-Classical Philosophical Commentaries/Glosses: Innovation in the Margins,” *Oriens* 41 (2013): 317–348.

<sup>10</sup> Sonja Brentjes, *Teaching and Learning the Sciences in Islamicate Societies (800–1700)* (Turnhout: Brepols, 2018), 166–185.

<sup>11</sup> Rebecca Flemming, “Commentary,” in *The Cambridge Companion to Galen*, ed. Richard J. Hankinson (Cambridge: Cambridge University Press, 2006), 323–354, 337.

<sup>12</sup> Flemming, “Commentary,” 337. The various passages from Galen are provided in Greek, Arabic and English translation in Kamran Karimullah, “The Emergence of Verification (*taḥqīq*) in Islamic Medicine: The Exegetical Legacy of Faḥr al-Dīn al-Rāzī’s (d. 1210) Commentary on Avicenna’s (d. 1037) *Canon of Medicine*,” *Oriens* 47 (2019): 1–113, 33–43.

beyond the *content* of Galen's commentary, still adopts Galen's commentarial *style*.<sup>13</sup> After 1200 CE, we see a distinct shift away from Galen textual authority in the Arabic *Aphorisms'* commentaries, both in terms of style and content. Ibn al-Nafis's *Commentary on the Aphorisms* explicitly seeks to verify each and every claim found in the source text.<sup>14</sup> Ibn al-Quff al-Masīhī's (d. 1286) commentary on the *Aphorisms* goes a step further by employing a specific style of verification commentary developed by Fakhr al-Dīn al-Rāzī (d. 1210), which the latter deployed across his medical, philosophical and theological commentaries.<sup>15</sup> The post-1200 commentators on the *Canon* and its abridgment, *al-Mūjaz* (The Epitome), were even more explicit in their commitment to verification, a process that often led these commentators to modify aspects of Galenic/Avicennan medical theory and Aristotelian physics.<sup>16</sup>

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<sup>13</sup> Kamran Karimullah, "Transformation of Galen's Textual Legacy from Classical to Post-Classical Islamic Medicine: Commentaries on the Hippocratic *Aphorisms*," *Intellectual History of the Islamicate World* 5 (2017): 311–358, 341.

<sup>14</sup> Ibn al-Nafis, *Sharḥ Fuṣūl Abuqrāt*, ed. Yusuf Zaydan (Cairo: al-Dār al-miṣriyya al-lubnāniyya, 1991), 94; and Nahyan Fancy, "Medical Commentaries: A Preliminary Examination of Ibn al-Nafis's *Shurūḥ*, the *Mūjaz* and Subsequent Commentaries on the *Mūjaz*," *Oriens* 41 (2013): 525–545, 529. For examples of verification from Ibn al-Nafis's *Commentary on the Aphorisms*, see Nahyan Fancy, "Womb Heat versus Sperm Heat: Hippocrates against Galen and Ibn Sīnā in Ibn al-Nafis's Commentaries," *Oriens* 45 (2017): 150–175.

<sup>15</sup> Karimullah, "Emergence of Verification."

<sup>16</sup> Fancy, "Medical Commentaries"; and idem, "Post-Avicennan Physics in the Medical Commentaries of the Mamluk Period," *Intellectual History of the Islamicate World* 6 (2018): 55–81.

My goal in this article is to further examine the role played by verification in the popular, multi-volume *Sharḥ al-Qānūn* (Commentary on the Canon) by Ibn al-Nafīs. In particular, I shall show that Ibn al-Nafīs adopted the specific style of verification commentary championed by Fakhr al-Dīn in his philosophical, theological *and* medical corpus. In adopting this style and following in Fakhr al-Dīn’s footsteps of critically assessing theoretical claims in medicine within his commentary, Ibn al-Nafīs (and subsequent *Canon* and *Epitome* commentators) went directly against Ibn Sīnā. In the *Canon of Medicine*, Ibn Sīnā had explicitly stated that the fundamental theoretical principles of medicine, such as humors, elements and temperaments, were off-limits to physicians *qua* physicians and so should be accepted as truths derived from natural science (*al-‘ilm al-ṭabī‘iyya*)—a discipline that fell under the purview of the philosopher.<sup>17</sup> Physicians who engaged in verifying these principles within their medical commentaries not only challenged Ibn Sīnā’s authority but also rejected his epistemological ordering of the sciences in

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<sup>17</sup> Ibn Sīnā, *al-Qānūn fī al-ṭibb*, ed. Muhammad Amin al-Ḍinnawi, 3 vols (Beirut: Dār al-Kutub al-‘Ilmiyya, 1999), vol. 1, 15: “Were a physician to begin discussing the proof of temperament, the elements, etc.—all of these things being posited for him in Physics—he would be making a double error because, first, he would be introducing into medicine something which does not belong to it, and second, he would be thinking that he is explaining something while [in reality] he will not have explained it at all”; translated by Dimitri Gutas in “Medical Theory and Scientific Method in the Age of Avicenna,” in *Before and After Avicenna: Proceedings of the First Conference of the Avicenna Study Group*, ed. David Reisman with the assistance of Ahmed H. al-Rahim (Leiden: Brill, 2003), 145–163, 150.



which theoretical principles were “declared off-limits to the physician.”<sup>18</sup> Moreover, the fact that these medical commentators debated natural scientific concepts while adopting a commentarial style that was honed, developed and used extensively in philosophical and theological treatises reveals starkly that physicians during the Mamluk era (1260–1516 CE) were still sufficiently trained in logic and philosophy, contrary to what earlier scholars have claimed.<sup>19</sup>

Finally, although Fakhr al-Dīn’s new style of verification commentary plays a central role in Ibn al-Nafīs’s *Commentary on the Canon*, Ibn al-Nafīs does not rely on it exclusively. Unlike Fakhr al-Dīn and many of his students, Ibn al-Nafīs was a practicing physician whose training included mastering the classic Hippocratic works and their commentaries, including those composed by Galen.<sup>20</sup> In addition to making clear “that which is unclear” in the source

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<sup>18</sup> Gutas, “Medical Theory,” 151. For other physicians who rejected this Avicennan principle, see Emma Gannagé, “Médecine et philosophie à Damas à laube du XIII<sup>ème</sup> siècle: un tournant post-avicennien?” *Oriens* 39 (2011), pp. 227–256

<sup>19</sup> Doris Behrens-Abouseif, “The Image of the Physician in Arab Biographies of the post-classical Age,” *Der Islam* 66 (1989): 331–343, 341–342.

<sup>20</sup> We don’t know many specifics about Ibn al-Nafīs’s education. However, if he indeed learned medicine from the famous Damascene physician, Muḥadhdhab al-Dīn al-Dakhwār (d. 628/1230), as some biographers claim, then we can gauge from Ibn Abī Uṣaybi’a’s (d. 1270) *History of Physicians* that he would have read classic Hippocratic works and Galen’s commentaries upon them, such as the *Aphorisms*, *Prognostics*, *Epidemics*, and *On the Nature of Man*; Ibn Abī Uṣaybi’a, *Uyūn al-anbā’ fī ṭabaqāt al-aṭibbā’*, 2 vols, ed. E. Müller (Farnborough: Gregg International Publishers, 1972), vol. 2, 239ff. Additionally, he would have been exposed to the works of prominent medical authorities, such as Ḥunayn ibn Ishāq, Abū Bakr al-Rāzī, and al-

text, Galen's commentarial practice was guided by the principle of "utility." He argued that "the principal criterion of selection [of a passage for commentary] should be usefulness for the practitioner of medicine."<sup>21</sup> As a practicing physician, Ibn al-Nafīs recognized the value of this Galenic principle. In what follows, we shall see how Ibn al-Nafīs's commentary brings the principle of utility to bear upon a commentary tradition primarily concerned with (philosophical) verification. This is borne out by how he evaluates general rules and principles based on personal experience. The paper thus shows that the principles of observation and testing were indeed used by practicing physicians such as Ibn al-Nafīs to reconsider aspects of medical theory and its application, contrary to what Gutas has claimed.<sup>22</sup>

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Majūsī, all of whose works were constantly engaging with Galen's commentaries. In fact, Ibn al-Nafīs's commentaries on the four aforementioned works of Hippocrates and Hunayn's *Questions on Medicine* are still extant; see Joseph Schacht and Max Meyerhof, *The Theologus Autodidactus of Ibn al-Nafīs, edited with an introduction, translation and notes* (Oxford: Clarendon Press, 1968), 22–24.

<sup>21</sup> Heinrich von Staden, "'A Woman Does Not Become Ambidextrous': Galen and the Culture of Scientific Commentary," in *The Classical Commentary: Histories, Practices, Theory*, eds. Roy Gibson and Christina Shuttleworth Kraus (Leiden: Brill, 2002), 109–139, 134. Galen highlighted this principle to assert that he will not be bogged down in discussing superfluous materials, such as the proper identification of individuals mentioned in the *Epidemics*, for example, and focus instead on what is useful for the medical practitioner to know with regards to the conditions of diseases, treatments, rules, etc. Of course, he violated this principle often in his actual commentarial practice; see Flemming, "Commentary," 336–340.

<sup>22</sup> Gutas, "Medical Theory," 157.

## Verification and Fakhr al-Dīn's Commentarial Style

Verification (*taḥqīq*, or sometimes *taḥṣīl*) was a central component of Ibn Sīnā's philosophical program.<sup>23</sup> Unsurprisingly, it came to play a prominent role in post-Avicennan philosophy, theology and many of the rational sciences, including astronomy and medicine.<sup>24</sup>

Robert Wisnovsky has stated that the "spectrum of *taḥqīq*" in philosophical commentaries could run the gamut from: philological analysis of the text (e.g. alternative readings, definitions, etc.) to a thorough philosophical analysis that could include providing new proofs, correcting older proofs and/or rejecting earlier theories and providing new ones in their stead.<sup>25</sup>

A key figure in the early development of this practice of verification in the philosophical sciences is Fakhr al-Dīn al-Rāzī. His impact on thirteenth and fourteenth century philosophy and theology across Islamic societies is now well-established. His commentary on Ibn Sīnā's epitome of philosophy, *al-Ishārāt wa-l-tanbīhāt* (Pointers and Admonitions), along with his stand-alone philosophical and theological works, played a central role in disseminating and promoting Avicennan philosophical discourse.<sup>26</sup> As Gerhard Endress states, "It is Fakhr al-Dīn al-Rāzī who

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<sup>23</sup> Dimitri Gutas, *Avicenna and the Aristotelian Tradition: Introduction to Reading Avicenna's Philosophical Works* (Leiden: Brill, 1988), 213–217; and Brentjes, *Teaching and Learning*, 174.

<sup>24</sup> Brentjes, *Teaching and Learning*, 174ff.

<sup>25</sup> Robert Wisnovsky, "Avicennism and Exegetical Practice in the Early Commentaries on the *Ishārāt*," *Oriens* 41 (2013): 349–378, 354–357.

<sup>26</sup> Ayman Shihadeh, "From al-Ghazālī to al-Rāzī: 6<sup>th</sup>/12<sup>th</sup> Century Developments in Muslim Philosophical Theology," *Arabic Sciences and Philosophy* 15/1 (2005): 141–179; idem, "Fakhr al-Dīn al-Rāzī's Response to Sharaf al-Dīn al-Mas'ūdī's Critical Commentary on the *Ishārāt*,"

is held mainly responsible for making jurists and theologians read, comment, refute and defend the works of Ibn Sīnā.<sup>27</sup> Even critics, such as Ibn Khaldūn (d. 1406), blamed Fakhr al-Dīn for mixing Avicennan philosophy (physics and metaphysics) with theology so thoroughly that it was difficult to tell them apart subsequently.<sup>28</sup>

As Ayman Shihadeh, Tariq Jaffer and others have shown, Fakhr al-Dīn developed a distinct method of composing commentaries in his philosophical corpus that he applied in other domains, such as medicine and Qur'anic exegesis.<sup>29</sup> Fundamentally, Fakhr al-Dīn brought together two distinct genres of commentary from the earlier period: the *aporetic* and the *exegetical*. In an aporetic commentary, as Shihadeh explains, “an insider to the discipline, the commentator [who is] unsatisfied with elements, minor or major, of the authoritative target

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*The Muslim World* 104 (2014): 1–61; idem, “Al-Rāzī’s (d. 1210) Commentary on Avicenna’s *Pointers*: The Confluence of Exegesis and Aporetics,” in *The Oxford Handbook of Islamic Philosophy*, eds. Khaled El-Rouayheb and Sabine Schmidtke (New York: Oxford University Press, 2017), 296–325; and Robert Wisnovsky, “Towards a Genealogy of Avicennism,” *Oriens* 42 (2014): 323–363.

<sup>27</sup> Gerhard Endress, “Reading Avicenna in the Madrasa: Intellectual Genealogies and Chains of Transmission of Philosophy and the Sciences in the Islamic East,” in *Arabic Theology, Arabic Philosophy: From the Many to the One, Essays in Celebration of Richard M. Frank*, ed. James Montgomery (Leuven: Peeters, 2006), 371–422, 397.

<sup>28</sup> Ibn Khaldun, *Muqaddima*, quoted in Shihadeh, “From al-Ghazālī to al-Rāzī,” 175.

<sup>29</sup> Tariq Jaffer, *Rāzī: Master of Qur’anic Interpretation and Theological Reasoning* (New York: Oxford University Press, 2015); Shihadeh, “Al-Rāzī’s Commentary on Avicenna’s *Pointers*”; and Karimullah, “The Emergence of Verification.”

system ... will critique these elements by raising ‘aporias’ (*shukūk*) [i.e. doubts] or ‘objections’ (*i ‘tirāḍāt*) ....”<sup>30</sup> A famous example of an aporetic medical commentary is Abu Bakr al-Rāzī’s (d. 313/925, *lat.* Rhazes) *al-Shukūk ‘alā kalām fāḍil al-aṭibbā’ Jālīnūs fī l-kutub allatī nusibat ilayhi* (Doubts Raised Against the Views of Galen, the Most Eminent of Physicians, in the Books Attributed to Him). An exegetical commentary, on the other hand, expounds upon the text, “either fully or in part,” though it may also “include the development and reformulation of the contents of the main text, sometimes in response to criticisms to which they have been subjected, or are susceptible.”<sup>31</sup> Galen’s many commentaries are very much exegetical commentaries. An excellent example of an Arabic exegetical, medical commentary is Ibn Abī Ṣādiq al-Nīsābūrī’s (d. after 1067) *Sharḥ Fuṣūl Abuqrāṭ* (Commentary on the Hippocratic *Aphorisms*) since it develops and reformulates the “contents of the main text,” often in response to the aforementioned *aporetic* commentary of Rhazes.<sup>32</sup>

Fakhr al-Dīn’s goal in composing verification commentaries is to engage in a systematic inquiry that leads the reader towards “real knowledge” rather than merely defeating the argument of an opponent (or validating that of an authority).<sup>33</sup> In doing so, he brings together these two distinct genres of commentary writing. In many of his commentaries, Fakhr al-Dīn describes the

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<sup>30</sup> Shihadeh, “Al-Rāzī’s Commentary on Avicenna’s *Pointers*,” 302.

<sup>31</sup> *Ibid*, 303.

<sup>32</sup> See Karimullah, “Transformation of Galen’s Textual Legacy,” 329–337. Also see, Fancy, “Womb Heat,” 159–160; and Rosalind M. Batten, “The Arabic Commentaries on the Hippocratic *Aphorisms*: Arabic Learned Medical Discourse on Women’s Bodies (9<sup>th</sup>–15<sup>th</sup> cent.)” (PhD Diss., University of Manchester, 2018).

<sup>33</sup> Shihadeh, “Al-Rāzī’s Commentary,” 300.

procedures for conducting sound investigations (*baḥth*). The commentator engaging in such an investigation should first glean (*taḥsīl*) the pith (*lubāb*) of each topic in the original text from earlier sources, determining what is worthy of consideration and argumentation while “leaving aside the ‘husk’ (*qishr*).” “This gleaning ... process involves reformulating [the] views and arguments,” often from different schools of thought, placing them next to one another, perhaps rearranging the order of the arguments, all to address a philosophical and/or theological problem. Once this has been done, the commentator should proceed to undertake a

... ‘critical investigation’ (*taḥqīq*), ... [or] ‘painstaking investigation’ (*istiḡṣā*) and ‘in-depth probing’ (*ta‘ammuq, taghalghul*). This involves the comprehensive criticism of all [gleaned] theses by systematically accessing all *possible* arguments for and against each, including arguments actually advanced by their proponents, counterarguments advanced by their opponents, and further, sometimes superior, arguments and counterarguments thought up by [Fakhr al-Dīn] al-Rāzī himself .... The goal of this critical investigation ... is ... to arrive at knowledge through a robust process of systematical elimination and corroboration.<sup>34</sup>

In short, Fakhr al-Dīn believes that one can arrive at the truth about a philosophical or theological problem “only after all objections (*shukūk*) and counterarguments are taken into consideration and solved (*ḥall*).”<sup>35</sup>

Fakhr al-Dīn deployed this new procedure of verification in commentaries productively in his major philosophical works, especially his much-read, much-acclaimed (and derided by

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<sup>34</sup> Ibid, 301.

<sup>35</sup> Fakhr al-Dīn al-Rāzī, *Nihāyat al-‘uqūl fī dirāyat al-uṣūl*, as quoted in Shihadeh, “Al-Rāzī’s Commentary,” 301.

Avicennan supporters), *Sharḥ al-Ishārāt wa-l-tanbīhāt* (Commentary on the Pointers and Admonitions), and in his massive Qur’anic commentary, *Mafātīḥ al-ghayb* (Keys to the Unseen). And, as Karimullah has shown, Fakhr al-Dīn also employs these procedures of verification in his *Canon* commentary which, Karimullah claims, marked a “watershed moment in the history of Islamic medical discourse.”<sup>36</sup> Fakhr al-Dīn’s commentary on the definition of pulse from the *Canon* showcases well how he deployed his method of verification in the *Canon* commentary.

Ibn Sīnā discusses pulse in the third teaching (*ta’līm*) of the second part (*fann*) of book one. His statement (*jumla*) on pulse is itself divided into nineteen chapters (*faṣl*), the first of which is entitled, “A Universal Statement on Pulse.” This first chapter begins with a succinct definition of pulse, “We say: pulse is a movement (*ḥaraka*) composed of expansion and contraction of the receptacles of the spirit (*rūḥ*, Gr. *pneuma*) in order to regulate the spirit with fresh air.”<sup>37</sup> Like his commentary on other sections of the book, Fakhr al-Dīn divides his commentary on this chapter into shorter passages, i.e. lemmas (*fuṣūl*), and investigations (*mabāḥith*), providing an additional organizational layer to the highly structured Avicennan text. Fakhr al-Dīn treats the brief Avicennan definition of pulse as the first lemma and divides his commentary on this lemma into five further investigations (see Table 1).

In the first investigation, Fakhr al-Dīn explains each term in the definition (movement, receptacles of the spirit, expansion, contraction, spirit, and so forth). He draws upon other Avicennan works, especially Ibn Sīnā’s philosophical summa, *al-Shifā’* (The Healing), to provide definitions for concepts such as motion and spirit. He also devotes considerable time explaining why Ibn Sīnā places, for example, expansion before contraction, and why he does not

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<sup>36</sup> Karimullah, “The Emergence of Verification,” 49.

<sup>37</sup> Ibn Sīnā, *al-Qānūn fī al-ṭibb*, vol. 1, 68.

use the term “cool” (*tabrīd*) for the action of fresh air but rather regulate (*tadbīr*). In the latter case, Fakhr al-Dīn explains that even though pulse cools the spirit, it also expels the smoky vapors which is an important function that would not be captured properly if the definition used merely the term “cool.”<sup>38</sup> We thus see that his verification style required him to provide explanations and arguments for the appropriateness of terms in Ibn Sīnā’s definition even though they are not found, strictly speaking, in the *Canon*’s original discussion.

In investigations two and three, Fakhr al-Dīn raises doubts and concerns regarding the Avicennan definition, namely that the definition does not indicate the species of movement. According to the Ibn Sīnā’s *Healing: The Physics*, there are four categories of motion (qualitative, quantitative, place and position), but the *Canon* definition of pulse does not list the category to which it belongs, thus resulting in a deficient definition. The pulse definition also does not provide the motive cause of the pulse. Fakhr al-Dīn entertains possible arguments to support Avicennan’s exclusion of these elements from his definition, but ultimately finds these arguments deficient. Thus, he proceeds to establish a full definition of pulse that does not violate the principles laid out in Ibn Sīnā’s logical works, stating, “Pulse is a movement [belonging to the category] of place (*ḥaraka makāniyya*) of the receptacles of spirit, issued from their vital faculties, composed of expansion and contraction, in order to regulate the spirit with fresh air.”<sup>39</sup> Verification in these investigations leads Fakhr al-Dīn to strengthen the Avicennan position but by virtue of systematically examining the components and arguments for that position. This is

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<sup>38</sup> Fakhr al-Dīn al-Rāzī, *Sharḥ Kulliyāt al-Qānūn*, Oxford, Bodleian Library, MS Arch. Seld. A64, fols. 156b–157a.

<sup>39</sup> *Ibid*, fol. 158a. For more details on the discussion of the categories of motion as they relate to the pulse, see Fancy, “Post-Avicennan Physics.”



precisely the kind of philosophical investigation into medical theory that Ibn Sīnā himself had deemed off-limits to the physician. Its presence in a medical commentary, albeit composed by a philosopher, strengthened the hands of subsequent medical commentators, such as Ibn al-Nafīs, to conduct their own investigations of Avicennan theoretical claims.

In the fourth investigation, Fakhr al-Dīn uses the works of Galen to present four other possible teachings on the pulse, including the notion that the arterial pulse is a movement caused by the movement of the heart resulting in the arteries contracting when the heart expands and vice-versa. He then offers both counterarguments from Galen and some of his own to reject these possibilities, concluding that the heart and arteries must pulse synchronously due to the vital faculty. Finally, he raises a possible objection against this view, questioning how is it possible for the same vital faculty to give rise to two contrary motions, expansion and contraction. He responds that every motive cause has a goal (*ghāya*, Gr. *télos*) such that when it is met it leads to rest. In this case, during expansion, the vital faculty has the goal of letting in fresh air and, once that is accomplished, the artery/heart rests after which the vital faculty contracts the artery/heart in order to expel the vapors.<sup>40</sup>

From this brief overview, we see that all components of Fakhr al-Dīn's style of verification commentary (gleaning, elucidating, rearranging arguments, raising doubts and counterarguments, and resolving doubts) are present in his commentary on the section of pulse. Where needed, Fakhr al-Dīn brings in additional material from Ibn Sīnā's philosophical summa, *The Healing*, though he is not averse to bringing in materials from Galen or other medical authorities. All of this is done in the name of verification or critical investigation (*taḥqīq*), even though he ultimately sides with the original Avicennan understanding of pulse. Further

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<sup>40</sup> Fakhr al-Dīn, *Sharḥ Kulliyāt*, fols. 150a–150b.

examples, of course, could be provided from other parts of his commentary on the *Canon*. Yet, despite his siding with Ibn Sīnā on many issues, just by virtue of engaging in deep, systematic inquiries into the *Canon*'s medical theory, Fakhr al-Dīn set the precedent for subsequent commentators to extensively discuss and debate theoretical topics such as pulse, humors, faculties, etc., contrary to Ibn Sīnā's injunction against doing so. Fakhr al-Dīn's own students, such as Quṭb al-Dīn al-Miṣrī (d. 1221) and Afḍal al-Dīn al-Khūnajī (d. 1249), composed their commentaries on the first book of the *Canon* in response to Fakhr al-Dīn, relying freely on their teacher's commentary for both *style* and *content*. Subsequently, physicians from Muhadhhab al-Dīn al-Dakhwār's (d. 1230) circle in Damascus responded to and discussed the commentaries of Fakhr al-Dīn and his students, such as Najm al-Dīn ibn al-Minfākh (d. 1254), Ya'qūb al-Sāmīrī (d. 1282) and Ibn al-Nafīs.<sup>41</sup> Verification (*taḥqīq*) thus came to play a major role in the medical commentaries on the *Canon* produced during the thirteenth century.<sup>42</sup>

### **Fakhr al-Dīn's Method of Verification in Ibn al-Nafīs's *Commentary***

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<sup>41</sup> al-Sāmīrī explains in the introduction to his commentary on the *Canon* that in unveiling the secrets of the *Canon* and in explaining its difficulties he will "follow the model of ... Fakhr al-Dīn al-Rāzī ... followed by" the works of his students, such as al-Khūnajī, and then respond to the criticisms raised by "the skillful physician, Najm al-Dīn ibn al-Minfākh"; *Sharḥ Kulliyāt al-Qānūn*, Oxford, Bodleian Library, MS Marsh 464, 1.

<sup>42</sup> The commentaries on the *Aphorisms* of Ibn al-Nafīs and Ibn al-Quff from the thirteenth century were also committed to verification; see Fancy, "Womb Heat"; and Karimullah, "Emergence of Verification."

Ibn al-Nafis's commitment to verification is clearly discernible in the introduction of his *Commentary on the Canon*, where he states,

We shall proceed to make clear the entire meaning and explain each school, except the worn out, anomalous opinion. We shall organize the investigations (*mabāḥith*) and speak on them according to verified reasoning (*al-naẓar al-muḥaqqaq*), to aid the truth and raise its towers, and denounce the false and hide its traces, except those that contain in them some truth.<sup>43</sup>

The introduction clearly goes against Galen's commentarial practice as Ibn al-Nafis explicitly states that he will verify and investigate all opinions and teachings on a topic in order to ascertain the truth. Moreover, he refers to Fakhr al-Dīn's style of verification commentary, with his emphasis on organizing investigations, clarifying the meaning of the text and explaining the positions and arguments of each school on a topic. In fact, this sentence merely reiterates the preceding sentence in which he states that he will concisely explain and cover all other views on the obscurities and difficulties found in the *Canon*, without extending the investigations such that they take him away from the confines of the art of medicine (*ghayra muṭawwalīn bi-mabāḥith*

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<sup>43</sup> Ibn al-Nafis, *Sharḥ al-Qānūn*, London, Wellcome Library, MS Or. 51, fol. 1b; Istanbul, Süleymaniye Library, MS Ayasofya 3648, fol. 1b; and Istanbul, Süleymaniye Library, MS Fazil Ahmed Paşa 969, fol. 0b. I have used all three manuscripts for this study. Most of the citations below are from the Wellcome Library manuscript because it is available digitally (<https://wellcomelibrary.org/item/b20294979>); however, when there are discrepancies among the manuscripts, or the Wellcome Library manuscript contains noticeable errors, I have used the Süleymaniye Library manuscripts.

*yukhrijnā ‘an ṣanā‘atinā hādhihi*).<sup>44</sup> This latter sentiment could be seen as an allusion to Galenic commentarial practice, so let us turn to his commentary on the definition of pulse to see how Ibn al-Nafīs resolves the tension of undertaking critical investigations (*taḥqīq*) without straying into non-medical discussions that have little to no utility for practicing physicians.<sup>45</sup>

Like Fakhr al-Dīn, Ibn al-Nafīs adds another layer of organization to the *Canon*. He breaks the first chapter on the pulse, which includes the definition, into a total of twenty-three investigations. The first five investigations correspond roughly to the five investigations from the first lemma of Fakhr al-Dīn’s commentary on the same chapter (see Table 1). Ibn al-Nafīs’s first investigation is devoted entirely to the definition of pulse where he defines each of the technical terms found in the Avicennan definition, much like Fakhr al-Dīn. He thus defines motion using a definition found in Ibn Sīnā’s *Healing: Physics* II.1.<sup>46</sup> He then highlights the central problem

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<sup>44</sup> Ibn al-Nafīs, *Sharḥ al-Qānūn*, MS Or. 51, fol. 1b; MS Ayasofya 3648, fol. 1b; MS Fazil Ahmed Paşa 969, fol. 0b.

<sup>45</sup> Another excellent example of how he investigates matters to uncover the truth without veering too far away from medicine is his discussion over the vital faculty and chief organs. There, he provides brief arguments against his opponents and in support of his new understanding of faculties and chief organs, but directs the reader to his philosophical books (*kutub al-ḥikmiyya*) for a thorough investigation on faculties and the soul-body relationship; see Nahyan Fancy, *Science and Religion in Mamluk Egypt: Ibn al-Nafīs, Pulmonary Transit and Bodily Resurrection* (New York: Routledge, 2013), 14, 90–94.

<sup>46</sup> Though both Ibn al-Nafīs and Fakhr al-Dīn use Ibn Sīnā’s *Healing: Physics* to define motion, Ibn al-Nafīs chooses the technical definition of motion as the “first perfection of that which is in potentiality,” whereas Fakhr al-Dīn relies on the Avicennan explanation of this definition which

identified by Fakhr al-Dīn with the Avicennan definition, namely that the category of motion to which pulse belongs is not included. After explaining the four categories of motion, Ibn al-Nafīs objects to the placement of pulse under the category of place, as was done so by Fakhr al-Dīn. Yet, Ibn al-Nafīs does not assign this view to him or anyone else in particular, but rather states that this is the common opinion (*kamā huwa fī al-mashhūr*), suggesting that this may have become prevalent amongst Fakhr al-Dīn’s students and commentators. He provides a key argument against this common opinion by relying on the Avicennan definition of place as found in *Healing: Physics* II.9, in which motion with respect to place requires the moving object to be *displaced*, i.e. that the surfaces with which the moving object is contiguous are different while it is in motion. Yet, this is not the case for the artery which continues to touch the parts surrounding it throughout its expansion and contraction. He thus claims that pulse is rather a kind of positional motion (such as the rotation of the sphere), providing two arguments for his claim, both of which engage heavily with concepts delineated in Ibn Sīnā’s *Healing: Physics*. He concludes this investigation into the proper category of motion by raising a possible objection to placing pulse in the category of positional motion before resolving that objection.<sup>47</sup>

The commentary on the definition, including the analysis of the categories of motion, clearly reflects Ibn al-Nafīs’s commitment to Fakhr al-Dīn’s verification commentarial style. He brings in material from Ibn Sīnā’s philosophical corpus, provides arguments in support of his new claim, and even raises and responds to potential counter-arguments against his position. Yet,

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is that “motion designates something being in a condition such that its state in every posited instant differs from its state before and after.” For the reasons behind this difference, see Fancy, “Post-Avicennan Physics,” 59–60.

<sup>47</sup> For details, see Fancy, “Post-Avicennan Physics,” 66–68.

the category of motion to which pulse belongs is not relevant for a medical understanding of pulse, and has little utility for the practicing physician. Ibn al-Nafīs seems to know and appreciate that since, true to his stated goal in the introduction, he does not linger on this discussion of categories of motion. He provides a very quick overview of the definitions, then provides very succinct arguments to support and verify his claim before moving on. Of course, subsequent commentators, who had different aims, did discuss his novel claim further within their medical commentaries, which ultimately led them to wrestle with issues in natural science related to accidental and innate motion, as well as real and metaphorical place/space.<sup>48</sup> This shows that even though this investigation into the categories of motion is irrelevant to the practicing physician, medical commentators still engaged in it because they considered themselves to be a part of a culture of verification prevalent amongst philosophers and theologians of their time. They felt that their students and readers, whether physicians or otherwise, needed to learn how to assess the validity of claims, how to raise doubts, and how to argue for and against positions, and this practice of verification while reading or commenting upon a scientific or medical work was an important goal in its own right.

Of course, Ibn al-Nafīs also applied Fakhr al-Dīn’s style of verification to topics directly relevant to medicine (either theory or practice). Ibn al-Nafīs’s second investigation on the first chapter on pulse is entirely devoted to the various teachings of pulse—something that falls under Gutas’s rubric of “theory of medicine,” and which Gutas feels was accepted by physicians on the authority of ancient authors.<sup>49</sup> Yet, what we see in Ibn al-Nafīs’s commentary is a serious commitment to verifying this aspect of medical theory. He first categorizes the various teachings

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<sup>48</sup> Ibid, 69–77.

<sup>49</sup> Gutas, “Medical Theory,” 153, 160–161.

of pulse based on the nature of the motion (expansion or rising), the motive cause of the motion (natural, vital or volitional faculty), whether or not the motion of the arteries is caused by the motion of the heart, etc. He systematically works through the arguments for each teaching (including those of Galen and his predecessors) and then provides counter-arguments against the positions he rejects. Many arguments and counter-arguments are gleaned from other medical works, including those of Galen and Ibn Sīnā, while some are reformulated to ensure they are the strongest arguments that can be put forth in defense of these views. In short, Ibn al-Nafīs follows precisely the strategy employed and explained by Fakhr al-Dīn in his various commentaries. By systematically working through all earlier teachings on pulse, Ibn al-Nafīs whittles his way down to his new, non-Galenic, non-Avicennan account of pulse which he states succinctly at the end: “Know that the meaning of the word ‘pulse’ in our time is the movement of the arteries only without the movement of the heart. The movement of pulse is a positional motion composed of a forced contraction and a natural expansion for the tempering of the spirit with fresh air.”<sup>50</sup>

Ibn al-Nafīs then devotes two further investigations to fully explicate his new account of pulse (see Table 1). His key claims are: a) the heart undergoes a kind of volitional motion (one he calls natural volitional); and b) the forced motion of the arteries is their contraction (systole) due to the heart’s expansion (diastole) which causes the unused, leftover spirit found in the arteries to be sucked back into the heart. In investigation three, Ibn al-Nafīs raises eight objections (*shukūk*) against his new account and then responds to each one of them in order to prove its validity. In the next investigation, he provides four implications of his new account.<sup>51</sup>

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<sup>50</sup> Ibn al-Nafīs, *Sharḥ al-Qānūn*, MS Or. 51, fol. 104b–106a.

<sup>51</sup> *Ibid*, fols. 107b–108b. Also see, Fancy, *Science and Religion*, 105–108.

Let me highlight one point from these discussions to emphasize the role played by reasoning and observation in Ibn al-Nafīs’s revision of this key facet of medical theory.

The sixth objection of investigation three runs as follows. If the arteries expand by receiving spirit from the heart’s contraction, and contract by being emptied of spirit by the heart’s expansion, then there should be a noticeable difference between when the parts of the arteries that are closer to the heart contract and/or expand versus those farther from the heart. This is because the parts closer to the heart will naturally begin to fill first as they receive the spirit from the heart during arterial diastole, and they will empty out last as the spirit passes through the parts closest en route to the heart. However, such a difference is not observed, which means that Ibn al-Nafīs’s teaching must be wrong. Ibn al-Nafīs responds by “accepting that the parts of the arteries closer to the heart expand before those farther away, and contract after those farther away in like manner; however, it is not necessary that this (difference) be perceived.” This is so, Ibn al-Nafīs argues, because “the duration of expansion and contraction by itself is very short” which makes it impossible to “perceive the difference in duration between the parts.” He buttresses this explanation by alluding to the speed at which the brain communicates using the spirit with the various muscles. And since the spirit of the heart is finer (and thus travels faster), “it is not possible to be cognizant of the difference between (the spirit’s) first entering [the arteries] from its last, and for that reason that some arteries expand and contract before others is not apparent.” This point is then repeated by Ibn al-Nafīs in investigation four as a consequence of his new account.<sup>52</sup>

Ibn al-Nafīs, thus, directly applied the principles of verification to this key component of medical theory (pulse teaching), leading him to an entirely new position—a position whose

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<sup>52</sup> Ibn al-Nafīs, *Sharḥ al-Qānūn*, MS Or. 51, fols. 106a–106b, 107a.



merits were debated by subsequent commentators.<sup>53</sup> The new account of pulse is both medically relevant and shows a distinct move away from Galenic/Avicennan medical theory. Ibn al-Nafīs

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<sup>53</sup> See Nahyan Fancy, “Galen and Ibn al-Nafīs” in *Brill’s Companion to the Reception of Galen*, eds Petros Bouras-Vallianatos and Barbara Zipser (Leiden: Brill, 2019), 263–278, 268–270. Ibn al-Nafīs’s new account of pulse is found in the most popular medical commentaries of the post-classical period, such as Quṭb al-Dīn al-Shīrāzī’s (d. 1311) *Tuḥfa al-Sa’diyya* (Gift to Sa’d), Sadīd al-Dīn al-Kāzarūnī’s (d. after 1369) *al-Mughnī fī sharḥ al-Mūjaz* (The Ultimate Commentary on the Epitome), Nafīs ibn ‘Iwaḍ al-Kirmānī’s (d. after 1439) *Kitāb al-Nafīsī* (The Book of Nafīs) and Hakīm Shāh ibn al-Mubārak al-Qazwīnī’s (d. 1521) *Sharḥ al-Mūjaz* (Commentary on the Epitome). Al-Shīrāzī’s commentary, in fact, reproduces Ibn al-Nafīs’s entire argument for his new account *verbatim*; see Quṭb al-Dīn al-Shīrāzī, *Tuḥfa al-Sa’diyya*, Istanbul, Süleymaniye Library, MS Ayasofya 3649, 3651–3656, MS 3654, fols. 19b–. al-Shīrāzī’s discussion was translated into Latin by Andrea Alpago and published posthumously in 1547 CE, right in the midst of the Paduan pulse debates that resulted in Realdo Colombo putting forward his modification of pulse theory; see C. D. O’Malley, “A Latin Translation of Ibn Nafīs (1547) Related to the Problem of the Circulation of the Blood,” *Journal of the History of Medicine and Allied Sciences*, 1957, 12: 248–253; Jerome Bylebyl, “Disputation and Description in the Renaissance Pulse Controversy,” in *The Medical Renaissance of the Sixteenth Century*, eds Andrew Wear, Roger French and Iain Lonie (Cambridge: Cambridge University Press, 1985), 223–245; and Allen Shotwell, “The Revival of Vivisection in the Sixteenth Century,” *Journal of the History of Biology* 46 (2013): 171–197. I will address the impact of Ibn al-Nafīs and his successors’ *Canon* commentaries on Renaissance understandings of pulse, humoral theory and generation in a future publication.

was also aware that the definitive proof for this account could only be offered by vivisection, revealing that he had no reservations in applying the principles of empirical observation and testing to medical theory.<sup>54</sup> However, he is not known to have performed this (or any) vivisection.

To sum up, this commitment to verification, in line with Fakhr al-Dīn's commentarial practice, pushed Ibn al-Nafīs to: a) engage with and bring Avicennan natural scientific definitions, concepts and arguments, as found in the latter's philosophical works, directly into his medical commentary; b) evaluate the substance of theoretical claims within the medical commentary—precisely the kind of investigation that Ibn Sīnā wanted to exclude from medical texts; and c) propose new theories that were in turn debated by subsequent commentators leading them to reconsider, modify and transform aspects of Avicennan natural science and medical theory—precisely what Gutas and earlier historians think did not take place in post-classical

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<sup>54</sup> In the introduction to his commentary on the anatomical section of the *Canon*, Ibn al-Nafīs states bluntly, “As for the dissection of the heart and arteries and diaphragm and lungs, etc., one [must] be informed about the manner of their movements and whether the motion of the arteries is synchronous with the movement of the heart or is different ... It is a given fact that it can be learned only through dissection of the living, but that is difficult because of the disturbance of the living due to its feeling of pain”; Ibn al-Nafīs, *Sharḥ tashrīḥ al-Qānūn*, eds. Salman Qataya and Paul Ghalioungui (Cairo: al-Hay'at al-miṣriyya al-‘amma li-l-kitāb, 1988), 30. Translation by Savage-Smith, “Attitudes Toward Dissection,” 101. This vivisection is performed by Colombo to prove that the heart expands when the aorta contracts, and vice versa; see Shotwell, “Revival of Vivisection,” 191.

Islamic medical literature.<sup>55</sup> Moreover, in the case of pulse, we can see that Ibn al-Nafīs engaged in verification to ascertain truths that are both relevant (pulse teaching) and not relevant (categories of motion) to the discipline of medicine. And even in the case of his new teaching of pulse, it is not entirely clear how it would have impacted or modified medical *practice*. In order to see how Ibn al-Nafīs employed verification (both empirical and rational) to investigate matters that were useful for practicing physicians, let us turn to some other examples from his *Commentary on the Canon*.

### **Verification and Utility in Ibn al-Nafīs’s *Canon* commentary**

In the second teaching of part two of the *Canon*, Ibn Sīnā has a chapter on the “Characteristics of the Seasons,” wherein he covers the basic differences between the astronomers’ use of seasons versus that of the physicians. He then proceeds to explain the various natures of each of the seasons with regards to their propensity for moisture/dryness and cold/heat. Ibn Sīnā claims that the Spring air is closest to balanced between moistness and dryness, and between cold and heat, whereas one experiences more extremes in Autumn. Similarly, although the Autumn night tends to be much cooler than the day, this is not the case during Spring.<sup>56</sup> In his commentary on this chapter, Fakhr al-Dīn elucidates some of the terms and explains key concepts, including providing a primer on astronomy to explain why the seasons have the specific natures that they do. He also subjects Ibn Sīnā’s explanations for the

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<sup>55</sup> For examples from generation, see Nahyan Fancy, “Generation in Medieval Islamic Medicine,” in *Reproduction: From Antiquity to the Present*, eds. Nick Hopwood, Rebecca Flemming and Lauren Kassell (Cambridge: Cambridge University Press, 2018), 129–140.

<sup>56</sup> Ibn Sīnā, *al-Qānūn fī al-ṭibb*, vol. 1, 114–117.

temperateness of Spring and Autumn to his standard verification process.<sup>57</sup> At no point, however, does Fakhr al-Dīn appeal to his personal experience with the seasons while putting the articulated principles to the test.

Ibn al-Nafīs, on the other hand, concludes his commentary on this chapter with the following query:

For that reason, the night of Spring is not too far (in warmth) from its day. The rest of this chapter is clear.<sup>58</sup> However, here a question (*su'āl*) (arises), which is that in Damascus one finds in Spring an immense difference in heat and cold, such that some days are very balanced while others are very cold. But that is not the case in Autumn where one does not find such a noticeable difference. However, according to what you have mentioned, the case should be the opposite. The response to that is this is not caused by the nature of Spring *per se* but rather because Damascus is near snowy mountains that have a lot of snow on them (still) in Spring. Thus, the day when the wind blows toward (Damascus) from the direction of these mountains, that day is very cold. But when that does not occur, it follows the nature of Spring and is temperate, and this is not the case in Autumn.<sup>59</sup>

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<sup>57</sup> Fakhr al-Dīn, *Sharḥ Kulliyāt*, fol. 114b–120b.

<sup>58</sup> The Ayasofya manuscript copy of Ibn al-Nafīs's text ends the section here; Ibn al-Nafīs, *Sharḥ al-Qānūn fī al-ṭibb*, MS Ayasofya 3648, fol. 148b. However, this passage is also found in the following manuscript: MS Fazil Ahmed Paşa 969, fol. 55b.

<sup>59</sup> Ibn al-Nafīs, *Sharḥ al-Qānūn*, MS Or. 51, fol. 72a. Al-Shīrāzī also quotes this passage from Ibn al-Nafīs in his commentary; *Tuḥfa al-Sa'diyya*, MS Ayasofya 3652, fol. 35a.

Ibn al-Nafis may well be referring to his personal experience with the region here since he resided in Damascus for some time.<sup>60</sup> The Qalamūn mountains, which are part of the Anti-Lebanon mountain range, are located just north of the city and receive a significant amount of snow during the winter months. Ibn al-Nafis thus recognizes that the general theoretical principle that Spring days and nights are more temperate than those of Autumn does not hold true for the city of Damascus in particular. How should we read this correction?

As we shall see below, Ibn al-Nafis does not disagree with the general principles underlying the natures of each season. The correction is meant to clarify that the weather of any particular city is determined by more factors than just the seasons. As such, it is meant to teach the individual physician that he should pay attention to the city's geography, its proximity to mountains, seas, etc., before determining the nature of its weather over the course of the year. The implication is that this knowledge is necessary in order to assess better the kinds of diseases that may prevail seasonally in a region, and how the bodies of patients will likely respond to them and to their treatments. As Galen states in *Method of Medicine*, "... [I]t is particularly necessary for those learning to be practiced in various specific examples, because the methods in general are not enough for precise knowledge."<sup>61</sup> Ibn al-Nafis's insertion of this practical knowledge thus follows this Galenic method and, as with Galen, promotes Ibn al-Nafis's own authority as a medical practitioner—an authority that is grounded as much in his mastery over medical theory and the recorded experiences of past masters as his own practice and experience.

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<sup>60</sup> Albert Z. Iskandar, "Ibn al-Nafis," *Dictionary of scientific biography*, ed. C. Gillespie (New York, 1970–1990), 9: 602–606; and Fancy, "Womb Heat," 171.

<sup>61</sup> Galen, *Method of Medicine*, ed. and trans. Ian Johnston and G. H. R. Horsley, Loeb ed. (Cambridge, MA: Harvard University Press, 2011), IX.4, 608K.

Ibn al-Nafīs also highlights the importance of practical experience to limit the application of certain general principles. For example, while discussing the six non-naturals in the same teaching and part of the book, Ibn Sīnā dedicates chapter eleven to the “Effects of Regions.” He reminds the reader that he has discussed these characteristics partly in an earlier chapter on weather changes, but in this chapter he will provide a summary discourse on the effects of specific kinds of regions. He also reminds the reader that regions can affect the body in various ways based on their latitudes, topographies, soils, and so forth. Ibn Sīnā then provides general rules with respect to how the body is affected in regions that are hot, cold, humid, dry, at high or low elevations, etc. “Hot regions,” he states, “darken (the bodies), curl the hair and weaken digestion. Since there is a great increase in dissolution in these regions and a lack of moisture, its people age quicker.” He provides the example of *al-ḥabasha* (Ḥabash)—a region that for Ibn Sīnā included not only Ethiopia but the entire coastal region of the horn of Africa, including the modern countries of Somalia, Eritrea and Djibouti—as a place that is hot and whose inhabitants look old by the time they are thirty.<sup>62</sup>

Fakhr al-Dīn does not deem this passage worthy of any comments.<sup>63</sup> He certainly agreed with the general principles. And since these principles are also stated earlier in the *Canon* in passages on which Fakhr al-Dīn had already commented, and since he was neither a practicing physician nor seems to have visited or known much about Ethiopia that was different from what Ibn Sīnā had conveyed, he perhaps felt no need to add anything more. Ibn al-Nafīs, on the other

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<sup>62</sup> Ibn Sīnā, *al-Qānūn fī al-ṭibb*, vol. 1, 127.

<sup>63</sup> Fakhr al-Dīn lumps up his comments on chapters six through nineteen in a few lines that address primarily the difference between thick and turbid; *Sharḥ Kulliyāt*, fol. 121b–122a.

hand, raises significant issues with this section based on personal experience and observations, either his own or those of people he trusts. The commentary is worth quoting in full:

Warm habitats darken the skin by burning them, curl the hair by bringing them together since the excessive heat breaks down the moisture, (and) weaken digestion through excessive dissolution due to the innate heat. Their people have softer bodies since the moisture is drawn away from their bodies towards their skin on account of the heat. I say: For places, the color of the skin and hair does not follow the effect of the heat of the air.<sup>64</sup> For if that were not so, then the people of Egypt would not be more brown than the people of Baghdad, since for many the heat of Baghdad is much more intense. (Similarly), if that were not so then the people of Ḥabash would not be more brown than both (i.e. people of Egypt and Baghdad), since their region is close to temperate. Nor would the hair of the people of India be long and lank, and the hair of the people of Ḥabash curly since the heat of the region of India is much stronger. Yekmiz (?) and Ṭalālash (?) in the region of Ḥabash are comparable in latitudes and in the quality of the air, and the distance between them is the width of the Nile only, which over there is very narrow. Yekmiz is on the west of the Nile and Ṭalālash is on the east. Yet, the wheat and chick-pea of Yekmiz are white and its people are less brown, while the wheat and chick pea of Ṭalālash are black and its people are much more brown. (Ibn Sīnā) says: Since there is a great increase in dissolution in these regions and a lack of moisture, its people age quicker, as is the case in (the land of) Ḥabash for its people look old by the time they are thirty. We asked a large group of old Ḥabashī servants about that and they rejected it.

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<sup>64</sup> al-Shīrāzī adds here, “but rather the soil of the places”; *Tuḥfa al-Sa’diyya*, MS Ayasofya 3652, fol. 123b.

They all concurred that their region is very close to temperate. It is very mountainous filled with trees, waters, rain and fruits. This jurist, my companion, Shams al-Dīn Makkī resided there for some time and he reported that its heat is less than that of Egypt, so much so that he said it is comparable to Damascus in being close to temperate.<sup>65</sup>

This passage is an excellent example of how Ibn al-Nafīs both corrects aspects of theory and assesses the limits of general rules using practical experiences and observations. The first half of this commentary challenges the theoretical claim itself, i.e. that the color of the body and the curliness of hair is solely dependent on the heat of the air. Here, by systematically verifying the content of the *Canon*, Ibn al-Nafīs points out the fact that some regions that are cooler have people who have darker skin and curlier hair than those from warmer regions. His first set of examples is from regions well-known to his audience, such as Baghdad, Egypt and India. Only after he has defended his critique of Ibn Sīnā using well-known examples does he turn to the issue of Ethiopia/Ḥabash. It is worth highlighting that Ibn al-Nafīs seems very well-informed about inner Ethiopia or the highland plateau, unlike earlier generations of Islamic scholars and geographers. As has been noted by historians, knowledge of this region prior to 1200 tended to be restricted to “the lowlands on the western shore of the Red Sea. This is why so many Arab

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<sup>65</sup> Ibn al-Nafīs, *Sharḥ al-Qānūn*, MS Or. 51, fols. 78a–b; MS Ayasofya 3648, fol. 162b; MS Fazil Ahmed Paşa 969, fols. 64b–65a; and al-Shīrāzī, *Tuḥfa al-Sa‘diyya*, MS Ayasofya 3652, fols. 123b–124a. I have tried to correct the text using all four manuscripts. The underlined text is from the *Canon*, though not indicated as such in the manuscripts. I have not been able to identify the specific towns mentioned by Ibn al-Nafīs in Ethiopia.



descriptions emphasize the extreme heat and aridity of Abyssinia [i.e. Ḥabash].”<sup>66</sup> Ibn al-Nafīs, on the other hand, states (correctly) that inland Ethiopia is much more temperate than Baghdad and Egypt, yet its people are darker and have curlier hair, disproving Avicenna’s theoretical claim. He then concludes his critique of this theoretical claim by referencing two specific towns in inland Ethiopia either side of the narrow (Blue) Nile where the people and vegetation on one side are darker than on the other, even though the heat and latitudes are identical in both towns. This is a fine example of critiquing the actual theoretical claim based on observations, precisely the kind of theoretical correction that Ibn Sīnā (and following him Gutas) had denied to physicians.

The next half of this section’s commentary accepts the general theoretical claim, i.e. that people living in warmer regions age quicker; however, he rejects Ibn Sīnā’s specific application of this theory to (inland) Ethiopia. Ibn Sīnā claims matter-of-factly that all of Ḥabash—the entire region east and southeast of Egypt—is hot. Ibn Sīnā’s geographic imaginary of this region is based on the coast, which is the only region Muslim travelers and geographers were familiar with prior to the thirteenth century. In fact, most of the detailed, written accounts of the inner highland plateau only emerged in the writings of fourteenth and fifteenth century geographers and scholars, such as al-‘Umarī (d. 1384) and al-Maqrīzī (d. 1442), after the inception of the “war of attrition between the central Christian highlands and the Muslim sultanates, entrenched along the eastern and southern fringes of the Abyssinian plateau.”<sup>67</sup> Ibn al-Nafīs, by contrast, correctly

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<sup>66</sup> *The Encyclopaedia of Islam*, New edition (Leiden: Brill, 1954–2003), s.v. “Ḥabash” (by E. Ullendorf), subentry, “iii. al-Ḥabash in Muslim Geographical Works” (by C. F. Beckingham).

<sup>67</sup> *Ibid.*

describes the climate of the highland plateau on the authority of the personal experiences of Ethiopian servants and a fellow Muslim scholar around 1242 CE.<sup>68</sup>

The tone of the passage where he deploys these witnesses to counter Ibn Sīnā's specific claim (i.e., that Ethiopia is a hot and arid region where people age quickly) also suggests that Ibn al-Nafīs recognizes that much misinformation about Ethiopia prevails amongst his thirteenth century Syrian and Egyptian readers. His matter-of-fact references to the heat of Baghdad, Egypt and even India suggests that he expected his thirteenth century audience to know about these regions. In the case of the Ethiopian highlands, he produces eye witness testimony to challenge the reigning assumptions about their climate. Moreover, the testimony he produces is that of witnesses from a lower social class in order to challenge *the* leading Islamic thinker of the classical period. This use of folk knowledge to supplant personal experience and textual knowledge is something else that he shares with Galen.<sup>69</sup> Of course, he also attempts to verify folk claims before accepting them, either by judging them based on the claims of other authorities, such as his jurist friend Shams al-Dīn in this case, or by subjecting their claims to the full process of verification, as he does so in the case of snowy water.

### **Verifying Folk Knowledge and Rejecting Medical Lore**

The *Canon* contains a general discussion of the characteristics of the various types of water (chapter sixteen) while covering the six non-naturals in the second teaching of part two.

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<sup>68</sup> For the dating of book one of the *Commentary on the Canon*, see Fancy, *Science and Religion*, 13.

<sup>69</sup> See Susan Mattern, *The Prince of Medicine: Galen in the Roman Empire* (Oxford: Oxford University Press, 2013).

Ibn al-Nafīs divides this chapter into numerous investigations, the tenth of which is dedicated to Ibn Sīnā’s passage on the characteristics of frozen and snowy water. After briefly discussing the difference between frozen and snowy water, Ibn al-Nafīs cites and then explains the following Hippocratic saying: “water generated from ice and snow is bad.”<sup>70</sup> He then pits the claims of the common folk directly against those of the physicians regarding the inherent nature of snow and ice, “Know that many from amongst the masses (*akthar al-duhamā’ min al-nās*) concur that even though snow is extremely cold, when it enters the body it warms it, which results in one feeling thirsty. The physicians of our time laugh and make fun of this saying.”<sup>71</sup> After attacking the physicians for not providing any solid proof against this opinion, Ibn al-Nafīs adds:

The action of snow in the body is like the action of a warm medicine when it is cold to such an extent that it becomes actually cold, yet when it loses its accidental coldness, it returns (to its natural state) and warms the body. Similarly, snow is cold in actuality but warm *in potentia* and this can be proven in the following ways. First, if we were to place in two containers, identical in substance, quantity and so forth, identical waters taken from one water (source); then place both containers in a cold location till they both attain the limit of coldness possible for water; then we put them in a place that does not cool and put in one of them lots of snow and not put anything in the other, then the water in which we had placed snow would be very cold necessarily. If we then leave them for some time after the snow has dissolved and we touch both of them we shall find that the water that had snow in it will be warmer than the other water. We have tried (*jarrabnā*) this many times and always found this to be the case. It is (thus) known that if there was

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<sup>70</sup> Ibn al-Nafīs, *Sharḥ al-Qānūn*, MS Or. 51, fol. 86a.

<sup>71</sup> Ibid.

no heat in snow then such would not be the case. It is also known (from this) that heat (produced) by mixing with snow, which is such that can warm water that is extremely cold in itself, must necessarily be strong enough to warm the body of a human, which is moderate (in temperament).<sup>72</sup>

Ibn al-Nafīs provides three further reasons why snow is warm *in potentia* before turning to various possible objections (*li-qā'il an yaqūl*) that could be raised against each of his proofs. He then completes this scholastic argument in favor of his view (and that of the masses) by responding to each of these objections. In short, Ibn al-Nafīs lends the full weight of commentarial verification and his own *experimental observations* to support the veracity of this folk knowledge against received medical opinion. The use of *jarrabnā* (we have tried) is quite telling since Ibn al-Nafīs here models for medical practitioners not only the importance of observations, but even testing claims about the latent potencies of substances using well-thought out experiments that have controls and can be repeated.<sup>73</sup>

The challenge to the reigning medical understanding here is far more substantial. Determining the correct potency of a substance is essential for proper treatment. As it turns out, Ibn al-Nafīs is directly rejecting Galen who had believed that snow merely has the potency to cool things, as can be seen in the passage where he discusses using snow to administer a cooling

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<sup>72</sup> Ibid, fols. 86a–b. The passage is also quoted in full by al-Shīrāzī, *Tuhfa al-Sa'diyya*, Ayasofya 3652, fol. 225bff.

<sup>73</sup> Historians of science have long recognized the importance of such testing for pharmacology, including Gutas; see “Medical Theory and the Scientific Method,” 157–158.

treatment to a patient.<sup>74</sup> If snow is indeed warm in its potency, this could have major implications for how it is used in treatments. Quṭb al-Dīn al-Shīrāzī, in his subsequent commentary on the same passage in the *Canon*, recognizes this and thus examines Ibn al-Nafīs’s claim very closely. Al-Shīrāzī wonders if indeed snow is potentially warm then why is it not (successfully) used for treating cold diseases such as paralyses. He ultimately rejects Ibn al-Nafīs’s arguments for snow being potentially warm, calling the entire discourse “strange in the extreme.”<sup>75</sup> Nonetheless, al-Shīrāzī accepts Ibn al-Nafīs’s empirical claim that snow induces thirst when consumed, for which he then provides an alternative argument that does not rely on assigning it a warm potency. Nothing in the text suggests that al-Shīrāzī tried to repeat Ibn al-Nafīs’s carefully laid out experiment.

## Conclusion

It is true that Ibn Sīnā had sought to limit the physician’s capacity to challenge medical theory, which he saw as properly belonging to the domain of natural science and so outside the scope of medical investigation. He also practiced what he preached since Ibn Sīnā abstained from providing the detailed philosophical arguments in the *Canon* against many of Galen’s positions. Nonetheless, by subjecting book one of the *Canon*—the part of the work that is dedicated primarily to medical theory—to systemic verification, Fakhr al-Dīn rejected this Avicennan principle and broke new ground in composing Arabic medical commentaries. Prior to

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<sup>74</sup> Galen, *Method of Medicine*, VII.4, 468K.

<sup>75</sup> al-Shīrāzī, *Tuhfa al-Sa’diyya*, MS Ayasofya 3652, fol. 218b.

Fakhr al-Dīn, Arabic medical commentaries had followed Galen's model by restricting themselves to clarifying the content of the source text and abstaining from verifying every single claim found therein. Fakhr al-Dīn, on the other hand, proceeded to do just that: verifying medical theory by engaging in philosophical argumentation and bringing materials from Ibn Sīnā's philosophical works into his *Canon* commentary, even if (for the most part) Fakhr al-Dīn agreed with the underlying theoretical claims. Subsequent medical commentators who used Fakhr al-Dīn's commentary and adopted his verification style, such as Ibn al-Nafīs, proceeded to undertake their own systematic investigations into medical theory against Ibn Sīnā's injunction. Thus, far from signaling a "decline," the post-classical medical commentaries that were committed to verification reveal the vibrancy of medical scholarship during this period, since even when the texts adhere to Galenic/Avicennan theoretical claims, such as Fakhr al-Dīn's acceptance of the Avicennan account of pulse, they do so only by establishing those claims on firmer grounds, whether by buttressing existing arguments, by providing new, stronger arguments in favor of a claim, or by raising and then responding to new counterarguments.

Occasionally, the commitment to verification led some commentators to challenge aspects of the reigning medical theory. Ibn al-Nafīs's modification of many theoretical aspects, such as the Galenic/Avicennan account of vital faculties, chief organs, pulse and generation—all stem from his systematic investigations into these topics in his *Canon* commentary in order to ascertain the truth of these matters. However, as shown above, this commitment to a (predominantly) philosophical style of verification did not deter Ibn al-Nafīs from considering seriously the needs of a medical practitioner and what, in a Galenic sense, would count as "useful" for medical practice. Instead, he showed how to bring both of these concerns together to advance medical theory and practice beyond both Galen and Avicenna. Ibn al-Nafīs also

highlighted the importance of empirical verification, including observations *and* experiments, for a physician to become more precise in his craft. Little wonder then that Ibn al-Nafīs’s *Commentary on the Canon* became the stand-out medical commentary of the post-classical period, not only cited frequently but really infusing the most widely read medical works of the post-classical period—works that were meant for both students and practicing physicians.<sup>76</sup> The impact this infusion had on the development of medical theory and practice in Western Eurasia after 1300 CE is a story for another day.

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<sup>76</sup> Savage-Smith, “Medicine in Medieval Islam,” 151; Fancy, “Medical Commentaries”; idem, “Post-Avicennan Physics”; idem, “Generation in Medieval Islamic Medicine”; and Deborah Schlein, “Medicine without Borders: *Tibb* and the *Asbāb* Tradition in Mughal and Colonial India” (PhD Diss., Princeton University, 2019), ch. 4.