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Title: Womb Heat versus Sperm Heat: Hippocrates against Galen and Ibn Sīnā in Ibn al-Nafīs's Commentaries

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Abstract: Ibn al-Nafīs wrote lemmatic commentaries on Hippocrates' *Aphorisms* and Ibn Sīnā's entire *Canon of Medicine*. While he regularly challenges, critiques and refutes Ibn Sīnā's positions in his *Commentary on the Canon*, Ibn al-Nafīs generally upholds the validity of each aphorism. This already suggests that he considered Hippocrates the supreme authority in medicine over Ibn Sīnā (and even Galen). Through an analysis of his commentary on Aphorisms V.42 and V.48 (on the causes and consequences of bearing male children), and how he deploys them in his commentary on the analogous chapters from the *Canon*, we shall see how Ibn al-Nafīs establishes the validity of these aphorisms using his own understanding of generation. This tight interweaving of the *Aphorisms* and his physiology allowed Ibn al-Nafīs to marshal the authority of Hippocrates to simultaneously undercut the positions of Ibn Sīnā, Galen and other adversaries, and to elevate the authority and validity of Ibn al-Nafīs's own (novel) positions.

In his landmark study of the Hippocratic tradition, Wesley Smith showed how Galen used his commentaries on the Hippocratic corpus to demonstrate the conformity between his views and those of Hippocrates—a conformity Galen had already marshaled rhetorically in his earlier years to champion his own medical theories over and against those of his opponents.¹ Galen’s success in conjoining his medical system to that of Hippocrates is evident in the fact that “his interpretation of Hippocratic thinking ... transmitted itself most effectively down the ages.”² His commentaries on the various Hippocratic works (including his judgments on which works were authentic and which ones spurious) were transmitted into Arabic and guided subsequent medical writers in Islamic societies.³ The Galenic system was so tightly fused with the Hippocratic one that even the author of the most widely-read Arabic commentary on

¹ Wesley Smith, *The Hippocratic Tradition* (Ithaca: Cornell University Press, 1979). For an excellent analysis of how Galen uses his commentary on the *Aphorisms* to align the Hippocratic text with his own thought, see 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.

² Rebecca Flemming, “The Pathology of Pregnancy in Galen’s Commentaries on the *Epidemics*,” in *The Unknown Galen*, ed. Vivian Nutton (London: University of London, 2002), 101–112, 101. Flemming examines the tensions inherent in Galen’s works between Galen as Hippocratic exegete and Galen as distinct medical authority.

³ Manfred Ullmann, *Die Medizin im Islam* (Leiden: Brill, 1970), 35–62.

the *Aphorisms*, Ibn Abī Ṣādiq al-Nīsābūrī (d. 1068),⁴ was a staunch defender of Galen. In addition to following Galen’s lead in his own commentary on the *Aphorisms* (see below), Ibn Abī Ṣādiq wrote a response to Abū Bakr al-Rāzī’s (d. circa 935) *al-Shukūk ‘alā Jālīnūs* (Doubts against Galen), defending Galenic positions.⁵ In fact, historians of medicine have long maintained that the Galenic system only began to be dissociated from Hippocratic writings after Paracelsus (d. 1541).⁶

Although the aforementioned claim may be true for the Latin tradition, Islamic physicians, such as al-Rāzī and Moses Maimonides (d. 1204), had begun to differentiate between Hippocratic and Galenic doctrine well before Paracelsus.⁷ This differentiation

⁴ Ibid, 160. Ullmann refers to him as the “second Hippocrates.” Ibn Abī Uṣaybi‘a (d. 1270), however, does not use this title for Ibn Abī Ṣādiq in his history of physicians, although he cites a verse in which a later Cairene physician, Abū Shākir ibn Abī Sulaymān (d. 1216), is called “the successor (*khalīfa*) of Hippocrates”; Ibn Abī Uṣaybi‘a, *‘Uyūn al-anbā’ fī ṭabaqāt al-aṭibbā’*, ed. Nizar Reza (Beirut: Dār maktabat al-ḥayāh, 1965), 589–590. An online English translation has been made available courtesy *The Tertullian Project*, http://www.tertullian.org/fathers/ibn_abi_usaibia_00_eintro.htm, last accessed October 8, 2015. The text has also been translated into Urdu: *Tārīkh al-aṭibbā’*, trans. Ḥakīm ‘Abd al-Majīd Iṣlāḥī, 2 vols. (Lahore: al-Fayṣal, 1993).

⁵ Ibn Abī Uṣaybi‘a, *‘Uyūn*, 461. This is not meant to suggest that Ibn Abī Ṣādiq followed Galen blindly, nor that he was unoriginal in his defense of Galenic doctrines.

⁶ Smith, *Hippocratic Tradition*, 14ff; and Owsei Temkin, *Galenism: The Rise and Decline of a Medical Philosophy* (Ithaca: Cornell University Press, 1973), 129–130.

⁷ Temkin acknowledges that Maimonides “accused Galen of reading into Hippocrates whatever was true, even if the Hippocratic text did not support it,” even though Maimonides’s aphorisms are “culled from Galen” and the bulk of his work is not hostile to Galen at all; *Galenism*, 123. Al-Rāzī too displays a critical attitude towards Galen while

is perhaps most pronounced in the works of the famous Mamluk-era physician-jurist, Ibn al-Nafis (d. 1288), who was even recognized by his biographers for having done so. The biographical dictionaries explicitly record that Ibn al-Nafis “loathed the style of Galen and described it as weak and profuse with nothing in it,” even though he “esteemed the style of Hippocrates” and commented on all his books, on most of which “he wrote two commentaries, a detailed and a concise one.”⁸ Four of his commentaries on Hippocratic works are extant (*Aphorisms*, *Prognostics*, *Epidemics* and *On the Nature of Man*), including at least two different versions of the commentary on the *Aphorisms*, the earliest of which may have been composed around 1256.⁹ This already makes Ibn al-Nafis one of the most prolific commentators on Hippocrates in the Arabic tradition,

defending the content of a Hippocratic aphorism in his *Doubts*; see Peter Pormann, “The Hippocratic Aphorisms in the Arabic Medical Tradition,” *Aspetar: Sports Medicine Journal* 2 (2013): 412–415, 415.

⁸ Ibn Faḍl Allāh al-ʿUmarī (d. 1349), *Masālik al-abṣār fī mamālik al-amṣār* and Khalīl ibn Aybak al-Ṣafadī (d. 1363), *al-Wāfi bi-l-wafāyāt* as edited and translated in Joseph Schacht and Max Meyerhof, eds, *Theologus Autodidactus of Ibn al-Nafis: edited with an introduction, translation and notes* (Oxford: Clarendon Press, 1968), 13, 16, 143, 145.

⁹ Emilie Savage-Smith, *A New Catalogue of Arabic Manuscripts in the Bodleian Library, University of Oxford*, Volume I: Medicine (Oxford: Oxford University Press, 2012), 18ff. In the preface to his mature commentary on the *Aphorisms*, Ibn al-Nafis states clearly that he had composed earlier commentaries on this Hippocratic work; see his, *Sharḥ Fuṣūl Abuqrāt*, ed. Yusuf Zaydan (Cairo: al-Dār al-Miṣriyya al-Lubnāniyya, 1991).

even in the absence of his commentaries on other Hippocratic works.¹⁰ Yet, the name of Ibn al-Nafis, to the best of my knowledge, has never been conjoined with Hippocrates in the manner that Ibn Abī Ṣādiq’s (or even Galen’s) has.¹¹ He was instead known as the “second Ibn Sīnā” (d. 1037), the first to compose a commentary on all five volumes of *al-Qānūn fī al-ṭibb* (Canon of Medicine), and the one responsible for making the *Canon* into *the* authoritative medical work by referring students exclusively to it.¹²

The introduction of the aforementioned earlier commentary on the *Aphorisms* immediately alerts his readers to the fact that he will be critiquing Galen’s well-known positions, since he requests his readers to refrain from condemning his arguments too quickly without giving them their fair share (*an lā yubādirū fīmā khālaftu fīhi al-mashhūr*

¹⁰ Both Abū al-Faraj ibn al-Ṭayyib (d. 1043) and ‘Abd al-Laṭīf al-Baghdādī (d. 1231) are recorded as having written commentaries on four Hippocratic works, though both also wrote commentaries on Galen’s works unlike Ibn al-Nafis; Ibn Abī Uṣaybi‘a, ‘*Uyūn*, 323–325 and 683–696.

¹¹ This is despite the fact that he was the first person to compose a commentary in Arabic on the *Epidemics*, a widely used Hippocratic work in the Islamic tradition; see Bink Hallum, “The Arabic Reception of Galen’s *Commentary on the Hippocrates’ Epidemics*,” in *Epidemics in Context: Greek Commentaries on Hippocrates in the Arabic Tradition*, ed. Peter Pormann (Berlin: de Gruyter, 2012), 185–210, 207.

¹² Schacht and Meyerhof, *Theologus*, 15–16; and Nahyan Fancy, *Science and Religion in Mamluk Egypt: Ibn al-Nafis, Pulmonary Transit and Bodily Resurrection* (London: Routledge, 2013), 24–25. The most popular abridgment of the *Canon*, *al-Mūjaz* (Epitome), is also ascribed to Ibn al-Nafis, though its exact relationship to both Ibn al-Nafis and the *Canon* is complicated; see Fancy, *Science and Religion*, Appendix; and Nahyan Fancy, “Medical Commentaries: A Preliminary Examination of Ibn al-Nafis’s *Shurūḥ*, the *Mūjaz*, and Commentaries on the *Mūjaz*,” *Oriens* 41 (2013): 525–545.

bi-l-nuṣṣ wa-l-ibṭāl dūn al-murāji‘a).¹³ Ibn al-Nafīs’s critique of Galen (or even Ibn Sīnā) should not surprise modern historians. He has long been recognized as the first person to posit the pulmonary transit of blood over and against Galen’s insistence that blood seeped into the left side of the heart from the right through invisible pores in the septum wall.¹⁴ What may instead surprise them is that Ibn al-Nafīs’s criticism of Galenic (and Avicennan) doctrine in his *Commentary on the Canon* often relies upon the authority of Hippocrates and Hippocratic texts. His use of Hippocratic lemmas, particularly in the sections concerning fetal generation in the *Commentary on the Canon*, is virtually identical to that of Galen, in that Ibn al-Nafīs too reads his own medical system back into the Hippocratic texts to establish his own scientific authority and to undermine the authorities of Galen and Ibn Sīnā. This simultaneous defense of the Hippocratic sayings and critique of Galenic positions shows that Ibn al-Nafīs was intent upon dissociating the two Greek masters in both “‘spirit’ and doctrine” centuries before

¹³ Savage-Smith, *New Catalogue*, 19. In the preface to his *Commentary on the Prognostics*, Ibn al-Nafīs refers to the success of his *Commentary on the Aphorisms* which he claims has encouraged him to compose a commentary on the *Prognostics*. This confirms the humble tone of the preface to the earlier *Commentary on the Aphorisms*. See N. Peter Joosse and Peter Pormann, “‘Abd al-Laṭīf al-Baġdādī’s *Commentary on Hippocrates*’ ‘Prognostic’: A Preliminary Exploration,” in *Epidemics in Context: Greek Commentaries on Hippocrates in the Arabic Tradition*, ed. Peter Pormann (Berlin: de Gruyter, 2012), 251–84, ???.

¹⁴ Charles Gillespie, ed., *Dictionary of Scientific Biography* (New York: Scribner, 1970–1990), s.v. “Ibn al-Nafīs” by Albert Z. Iskandar; and Fancy, *Science and Religion*.

Paracelsus.¹⁵ The reinterpretation of Hippocratic sayings in light of his own medical system is also present in his *Commentary on the Aphorisms*, even though his critique of Galen and Ibn Sīnā in that work is more implicit rather than explicit.

Yet, Ibn al-Nafīs’s defense of the Hippocratic lemmas is not dictated by his understanding of the genre of commentaries at all. As he states in both the introduction of his *Commentary on the Canon* and the introduction of his later *Commentary on the Aphorisms*, the purpose of a commentary is “to support the truth (*naṣrat al-ḥaqq*) and raise its towers, and denounce the false and wipe out its traces,” without any regard for the authority of the source text (*matn*).¹⁶ This is why, over the course of his *Commentary on the Canon*, he often disagrees with what Ibn Sīnā states in the *Canon*. Yet, he almost always agrees with Hippocrates in his *Commentary on the Aphorisms*. This reveals that Ibn al-Nafīs defends the Hippocratic sayings only because he believes them to be true, having arrived at his opinion through a process of verification (*taḥqīq*). This process of verification, which encompasses philological, philosophical and/or empirical analyses, leads Ibn al-Nafīs to understand the

¹⁵ Smith, *Hippocratic Tradition*, 14.

¹⁶ Ibn al-Nafīs, *Sharḥ al-Qānūn*, MS Wellcome Library, London, Oriental MSS, Or. 51, fol. 1b5–6; idem, *Sharḥ Fuṣūl*, 94.

Hippocratic lemmas in light of his own medical system, which he develops and presents fully in his (earlier) *Commentary on the Canon*.¹⁷

Avicenna in Hippocrates, Hippocrates in Avicenna

Amal Abou Aly highlights three important features of Ibn al-Nafīs's commentary on the first book of the *Aphorisms*: 1. Ibn al-Nafīs trusts Ḥunayn ibn Ishāq's (d. 873) Arabic translation of the *Aphorisms*, even when the text seems obscure; 2. apart from Galen, Ibn al-Nafīs does not mention any other authority in his commentary, and; 3. Ibn al-Nafīs's commentary shows "clear independence from Galen's commentary."¹⁸ These

¹⁷ The first book of the *Commentary on the Canon* was completed by 1242 CE. The other books of the *Commentary* were either completed by then, or over the next few years, prior to his other major known works; see Fancy, *Science and Religion*, 13–15. For more on verification, see Robert Wisnovsky, "Avicennism and Exegetical Practice in the Early Commentaries on the *Ishārāt*," *Oriens*, 2013, 41: 349–378; Asad Ahmed, "Post-Classical Philosophical Commentaries/Glosses: Innovation in the Margins," *Oriens* 41 (2013): 317–348; and Fancy, "Medical Commentaries."

¹⁸ Amal Abou Aly, "A Few Notes on Ḥunayn's Translation and Ibn al-Nafīs' Commentary on the First Book of the *Aphorisms*," *Arabic Sciences and Philosophy* 10 (2000): 139–150, 145–146 and 148–149. For example, while Galen understands the first aphorism ("Life is short, the art is long...") to signify the shortness of life in relation to the vast extent of the medical art, Ibn al-Nafīs asserts that a human life *in itself* is short while the medical art *in itself* is vast given the limitless possibilities of change; Franz Rosenthal, "'Life is Short, the Art is Long': Arabic Commentaries on the First Hippocratic Aphorism," *Bulletin of the History of Medicine* 40 (1966): 226–45, 240–241. Ibn al-Nafīs's independence from Galen is also evident in his commentary on the *Epidemics*; see Peter Bachmann, "Quelques remarques sur le commentaire du premier livre des *Épidémies* par Ibn al-

points are also valid for his commentary on book five of the *Aphorisms*, though in the latter case even Galen is not cited. Nevertheless, Ibn al-Nafis engages with Galenic commentators and other medical writers. For example, he states in his commentary on *Aphorisms* V.42,

Hippocrates said: “When the female is pregnant with a male her color is good, and when she is pregnant with a female her color is pale (*ḥāʾilan*).” If one compares two women in their countenance, breasts, and so forth, then the one who is pregnant with a male is better in color, is more energetic, is of clearer complexion, has a proper appetite, and is less susceptible to (negative) symptoms (*wa-akthar nashātan, wa-anqā basharatan, wa-aṣiḥḥ shahwatan, wa-askun aʿrāḍan*) since the male is generated from warmer semen (*manī askhan*), and uses more food, and reduces the wastes of the woman. The case of the (one bearing a) female (child) is contrary (to that).¹⁹

Though not cited, Ibn al-Nafis here quotes Ibn Sīnā’s discussion from the *Canon*. The underlined phrase is lifted directly from the *Canon*’s list of what indicates a woman is pregnant with a male child versus a female child.²⁰ What follows by way of explanation is very Galenic, that men are warmer than women and so are generated and sustained

Nafis,” in *Actas do IV Congresso de Estudos árabes e islâmicos. Coimbra-Lisboa 1 a 8 setembro de 1968* (Leiden, 1971), 301–309; and Hallum, “Arabic Reception.”

¹⁹ Ibn al-Nafis, *Sharḥ Fuṣūl*, 385–386, my emphasis.

²⁰ Ibn Sīnā, *al-Qānūn fī al-ṭibb*, notes by Muḥammad Amīn al-Ḍinnāwī, 3 vols (Beirut: Dār al-Kutub al-ʿIlmiyya), book III, fann 21 (III.21), vol. 2, 768.

by warmer blood. For example, the self-proclaimed follower of Galen, Ibn Abī Ṣādiq, explains the aphorism thus in his own commentary²¹:

The blood that is used to nourish male (fetuses) is warmer than the blood used to nourish females due to the fact that the seed (*al-zarʿ*) from which males are generated is warmer than that from which females are generated. Each one of them is nourished after generation by the blood that is left over from (the blood used to generate) the seed. Since whenever heat is stronger then the ripening (of food) is more complete and the wastes are better expelled. It is evident that the blood of one pregnant with a male is purer and cleaner, and so her color is necessarily better.²²

One may be tempted to suggest that far from distancing Hippocrates (and himself) from Galen (and his followers), Ibn al-Nafīs, at least in his comments on V. 42, rereads the standard Galenic understanding of sex difference back into the Hippocratic text. Yet, two aspects of his brief commentary on this aphorism suggest his (partial) independence from Galen. First, Galen and, following him, Ibn Abī Ṣādiq also discuss how one can improve (or worsen) the color of a pregnant woman by taking care of her. This discussion is absent in Ibn al-Nafīs's commentary. Second, Galen's discussion of

²¹ The manuscript evidence for Ibn Abī Ṣādiq's commentary attests to its popularity in the pre-modern Islamic world. I assume Ibn al-Nafīs knew his works, however, I have not thus far seen any explicit reference to Ibn Abī Ṣādiq in Ibn al-Nafīs's commentaries on the *Aphorisms* and *Canon*. but I do not have any evidence to support it. Consequently, I have used Ibn Abī Ṣādiq's commentary in this paper merely as an example of how commentators faithful to Galen interpreted the *Aphorisms* in order to highlight Ibn al-Nafīs's independence from Galen.

²² Ibn Abī Ṣādiq, *Sharḥ Fuṣūl Abuqrāṭ*, ed. ARABCOMMAPH (forthcoming), V.42. I would like to thank Taro Mimura, and the ARABCOMMAPH team for sharing the text with me.

(misleading) indications of bearing male children, such as the strength of fetal movement, is also absent in Ibn al-Nafis's commentary. It thus seems that Ibn al-Nafis accepts the Galenic explanation for the validity of the aphorism (i.e. male fetuses are warmer and hence reduce the wastes in the mother's body) not on Galen's (or Ibn Sīnā's) authority but rather because he finds the explanation to be valid. This becomes apparent when we turn to the chapter that corresponds to this aphorism in his

Commentary on the Canon:

(Ibn Sīnā's) saying, "The one that bears the male" till the end. This is as Hippocrates said, "when the female is pregnant with a male her color is good"²³. The reason for that is the male *as we have stated* is warmer in temperament, so he necessarily increases the heat of the (mother). That means that her excess residues are broken down more and the fetus is nourished more, and so her body becomes purer. That is why her color is good since the warm blood is finer and moves more to the outside, and when that is combined with it being free of wastes, it has a good effect on the {color. For the color of the body, in most cases, follows the humors}, as was said by Hippocrates, "The color of the body is changed by the humors (*al-lawn min al-badan huwwila min al-akhlāt*)."²⁴

²³ Reading *ḥasanan* instead of *ḥā'ilan*.

²⁴ Ibn al-Nafis, *Sharḥ al-Qānūn*, fol. 458b29–32, my emphasis. Ibn al-Nafis proceeds to explain how warmer blood, and the absence of wastes also causes the complexion to be clearer, the appetite to be proper, and the negative symptoms to be more absent. In another manuscript (Şehid 'Alī Pāşa 2051, Süleymaniye Library, Istanbul, fol. 505a4–5), the second Hippocratic saying is "The color follows the humors (*al-lawn tābi' li-l-akhlāt*)." The rest of the phrase, however, is difficult to follow since a word is missing (*idhā lam yakun* [blank space] *min al-akhlāt*). On the other hand, the text of the Wellcome manuscript contains more errors in the preceding sentence (in curly brackets), and thus I have preferred the reading of the Istanbul manuscript for it.

Unlike his *Commentary on the Aphorisms*, Ibn al-Nafīs cites other authorities in his *Commentary on the Canon*. In this passage, he restricts himself to Hippocrates; nevertheless, his appeal to the aphorism is quite revealing. The phrase, “This is as Hippocrates said,” is meant to subsume Ibn Sīnā’s list of characteristic features of women pregnant with male fetuses under the Hippocratic saying. That is, Ibn Sīnā is shown to merely explicate something already present in the succinct aphorism. Moreover, the aphorism, and in turn Ibn Sīnā’s list, is deemed to be valid because Ibn al-Nafīs (“as we have stated”) has already *verified* earlier in his *Commentary on the Canon* that men are warmer than women, and this difference in innate heat is responsible for their more perfect digestion, reduction of wastes, etc.²⁵ And it is the proper constitution of the mother’s humors when she bears a male child that bestows a good color upon her body, which is how Ibn al-Nafīs interprets the other Hippocratic saying.

A few tentative conclusions can thus be drawn from comparing these passages from Ibn al-Nafīs’s *Commentary on the Canon* and his *Commentary on the Aphorisms*. First, Ibn al-Nafīs gives ultimate authority to Hippocrates over Galen and Ibn Sīnā. Whatever truth there is in the *Canon* is already present, albeit in a much more concise form, in the

²⁵ On the role played by “verification” (*taḥqīq*) in rational scientific commentaries, see Asad Ahmed, “Post-Classical Philosophical Commentaries/Glosses: Innovation in the Margins,” *Oriens* 41 (2013): 317–348; Wisnovsky, “Avicennism and Exegetical Practices”; and Fancy, “Medical Commentaries.”

Hippocratic aphorism, which is why the *Canon* does not need to be cited in the *Commentary on the Aphorisms* but the aphorism is cited in the *Commentary on the Canon*.

Second, like Galen, Ibn al-Nafīs’s “doctrinal amplification” as found in both commentaries serves to legitimate “his own scientific authority.”²⁶ The aphorism is not true because Hippocrates says so but because Ibn al-Nafīs can provide a *physiological*²⁷ explanation for it. Even though this explanation is identical to that found in Galen’s, Ibn Abī Šādiq’s and Ibn Sīnā’s works, this does not take away from Ibn al-Nafīs’s own scientific authority. He has not accepted it on their authority but rather has verified it himself and found it to be true (“as we have stated”). This process of verification is more apparent in cases where he disagrees with other leading authorities, such as in the case of sex differentiation.²⁸

²⁶ von Staden, “‘A Woman Does Not’,” 114.

²⁷ It is important to bear in mind that pre-modern *physiology* or medical theory was primarily a *discourse*—a “thinking and talking discipline.” Although empirical evidence played a role in establishing physiological claims, the dominant mode of argumentation was philosophical; see Andrew Cunningham, “The Pen and the Sword: Recovering the Disciplinary Identity of Physiology and Anatomy before 1800 I: Old physiology—the Pen,” *Studies in History and Philosophy of Biological and Biomedical Sciences*, 2002, 33: 631–665, 645.

²⁸ Modern historians are already familiar with Ibn al-Nafīs’s dismissal of Galen and Ibn Sīnā’s authority in his *Commentary on the Anatomy of the Canon*, when he rejects their cardiovascular anatomy and proposes his own novel theories. He similarly has little patience for Aristotle’s physiological views in other parts of his *Commentary on the Canon*; see Fancy, *Science and Religion*.

Womb Heat or Sperm Heat?

Ibn al-Nafis overturns the Galenic understanding of sex differentiation in his commentary on *Aphorisms* V.48: “When the child is male it is more common for it to be generated on the right side, and when it is female on the left side.” In his commentary on this aphorism, Galen summarizes the key features of his well-known right-left theory of sex differentiation that is spelled out in some detail in his book, *On Semen*, which he cites during the course of his commentary on this aphorism. Galen states that since male fetuses are warmer, they need to be made from warmer seed and sustained in a warmer place during the course of their development. The right side of the womb is warmer than the left due to its proximity to the liver, which is why male fetuses are more often generated on this side. But the male fetuses are also caused by the warmth of female semen, and here Galen explains that each side of the womb receives semen from its corresponding side, i.e. “what is derived from the right (generative organ) (goes) to the right side (of the womb) and what is derived from the left goes to the left side.”²⁹ This is why females are generated on the left since the semen derived from the

²⁹ Galen, *Sharḥ Fuṣūl Abuqrāṭ*, trans. Ḥunayn ibn Ishāq, ed. Taro Mimura (forthcoming), V.48. I would like to thank Taro for sharing the text with me.

left generative organ is “thinner, closer to being watery, and cooler than the semen generated in the right (generative organ).”³⁰

Galen’s right-left theory of sex differentiation was accepted by many Islamic physicians. Unsurprisingly, Ibn Abī Ṣādiq adheres closely to Galen’s theory. In his commentary on this aphorism, Ibn Abī Ṣādiq states that the right side is warmer not only because of its proximity to the liver but also

because the vein that comes to it comes (directly) from the vena cava, and the artery that comes to it comes (directly) from the artery lying along the backbone. Thus the blood and spirit that come to it from these two are purer and warmer. The left side (of the womb) does not have this proximity (to the liver) and the vein and artery that come to it branch off from the vein and artery going to the left kidney. That is why the blood and spirit that it receives are cooler and finer due to watery (residues) mixed with (them).³¹

This additional anatomical evidence that Ibn Abī Ṣādiq provides is also from Galen. In the *Usefulness of the Parts*, a text upon which Ibn Abī Ṣādiq had composed a commentary,³² Galen states, “Of the vessels that pass to the generative parts, however, the ones ... going to the right uterus and right testis start from the great vessels themselves that are along the spine, the vein from the vena cava and the artery from the great artery, but those that reach the left testis in the male or the uterus on that

³⁰ Ibid.

³¹ Ibn Abī Ṣādiq, *Sharḥ Fuṣūl*, V.48.

³² Ibn Abī Uṣaybi‘a, *Uyūn*, 461. The text survives in at least one complete manuscript, MS Arabe 2854, Bibliothèque nationale de France, Paris.

side of the female ... do not start from the great vessels themselves, but from the vessels passing to the kidneys.”³³ Ibn Abī Ṣādiq’s adherence to Galenic doctrines is hardly surprising given that he wrote a response to al-Rāzī’s critique of Galen, a text he cites in the second part of his commentary on the aphorism, which is devoted to refuting al-Rāzī’s views on the causes of masculinity.³⁴

When compared to Ibn Abī Ṣādiq, Ibn al-Nafīs’s commentary on *Aphorism V.48* is relatively brief and starkly anti-Galenic. He accepts the general consensus that the right side of the womb is warmer than the left, which should thus cause more male fetuses to be borne on the right. But then he rejects the specific Galenic distinction between the right and left generative organs, and their role in sex differentiation. His comments are worth quoting in full:

For most people, their right side is stronger and warmer, and such is also the case for the right side of the womb. The semen that descends from the left egg-shaped structure/testicle of the man (*bayḍat al-rajul*)³⁵, at the time of intercourse, faces (*muḥādhiyan*) the right (side) of the womb. As such it is

³³ Galen, *On the Usefulness of the Parts of the Body*, trans. Margaret May, 2 vols (Ithaca: Cornell University Press, 1968), vol. 2, 635.

³⁴ Ibn Abī Ṣādiq, *Sharḥ Fuṣūl*, V.48.

³⁵ The term *bayḍa* is derived from the root “b-y-ḍ” which means to lay eggs or settle down. It was used to refer to both male and female generative organs, along with other words such as *unthayān* and *khuṣyatān*. Since the male organs are specifically indicated here, we may resort to “testicle” to translate the term, but I have provided the very little translation to emphasize the different (gendered) connotation of the Arabic term vis-à-vis the Latin *teste*.

warmer than the semen in the right testicle (*al-bayḍa al-yumnā*), because the left generative organ alone possesses the heat from what faces it. Hence, when the semen settles in the right side of the womb, it generates primarily a male, unless (the semen) is weak or extremely cold. And when it settles in the left side (of the womb), it generates primarily a female, unless (the semen) is hot and strong.³⁶

Although Ibn al-Nafis agrees generally with the Galenic claim that the right side of a person is warmer than the left, he specifically rejects the assertion that the semen in the right testis is warmer than that in the left and thus more conducive to generating males. In doing so, he goes against many, though not all, of his Islamic predecessors. Even Ibn Sīnā, in his chapter on “The cause of male (fetuses) and female (fetuses)” —the chapter preceding the one discussed earlier, agrees with this Galenic explanation of sex differentiation:

The cause of male (fetuses) is the male semen, its heat, its abundance, the concordance of intercourse at the time of her purity³⁷, the flowing of semen from the right (testis), for that is warmer and thicker in structure. Also, (that the material for the semen) is drawn from the right kidney, for that is much warmer and closer to the liver. Likewise, its establishment on the right side of

³⁶ Ibn al-Nafis, *Sharḥ Fuṣūl*, 390–391. Ibn al-Nafis is clearly making certain assumptions about sexual positions. It is unclear whether he intends this comment to be *descriptive* of the most common sexual position, or *prescriptive* for increasing the chances of producing a male child. Legally, there were no restrictions on sexual positions for licit intercourse, but Ibn al-Nafis may have been more prudish than his contemporaries. For example, his only substantial comment on the *Canon*’s section on managing abortions is to highlight the fact that medical necessity does not entail legal permissibility. For the latter, one must consult the appropriate texts; *Sharḥ al-Qānūn*, fol. 461b21ff.

³⁷ Ibn al-Nafis explains that what is meant here is the part of the woman’s monthly cycle immediately following the cessation of menstruation at which point the woman takes a bath to purify herself for religious rituals.

the womb. The same (is true) for the semen of women in its attributes and its directions.³⁸

Moreover, by stating that a male fetus is generated when semen from the *left testicle* of a man arrives in the *right side* of the womb, Ibn al-Nafis rejects a well-known explanation for the generation of intermediate sexes as found in the same chapter of Ibn Sīnā's *Canon*: "Some say that when (semen) flows from his right (testicle) to her right (womb) a male (child is the result), and from the left (of both) a female. And when (semen) flows from his left (testicle) to her right then it is a masculine female (*unthan mudhakkaratan*), and from his right to her left is an effeminate male (*dhakaran mukhannathan*)."³⁹ So what leads Ibn al-Nafis to not only challenge the combined authorities of Galen and Ibn Sīnā on sex differentiation, but also effectively invert the dominant view by asserting that the semen in the left male testis (at the time of

³⁸ Ibn Sīnā, *al-Qānūn*, III.21, vol. 2, 767–768.

³⁹ Ibid, III.21, vol. 2, 768. Kathryn Keuny takes this explanation of sex differences during generation to be the standard dogma of Islamic medical discourse; *Conceiving Identities: Maternity in Medieval Muslim Discourse and Practice* (Albany: SUNY Press, 2013), chapter 2. The fact that Ibn Sīnā distances himself partially from this view (*qāla ba'duhum*), and the fact that his most significant commentator rejects this view entirely, provide sufficient evidence to question Keuny's flattening of the rich diversity of pre-modern Islamic medical views on generation and sex differences; 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, *forthcoming*); and Ahmed Ragab, "One, Two or Many Sexes: Sex Differentiation in Medieval Medical Islamic Thought," *Journal of the History of Sexuality* 24 (2015): 428–454.

intercourse) is warmer than that in the right? To answer this question we need to examine closely how Ibn al-Nafis modifies the physiological *and* anatomical understanding of seminal formation and generation. This will also allow us to gain greater insight into how Ibn al-Nafis interprets and deploys Hippocratic lemmas to buttress his novel accounts while critiquing the positions of Galen and Ibn Sīnā.

Ibn al-Nafis’s commentary on Ibn Sīnā’s chapter on “The Cause of male (fetuses) and female (fetuses)” is an excellent place to begin to understand his new theories on generation. Ibn al-Nafis states,

(Ibn Sīnā’s) saying: “The cause of maleness ...”. He means by it that the cause of maleness is the faculty of the male semen, that is because according to them the faculty that is present in the male semen, one of its actions is to actualize the male form. It is only turned away from that when the female semen does not comply, in which case the female form is actualized, lest the matter separate. All that is in the male is stronger in the faculty of bringing together maleness. *As for the truth, to which we are inclined, this is not the case (amma al-ḥaqq alladhī dhahabnā ilayhi fa-laysa al-amr kadhālik)*. The male semen according to us is also matter, and it does not have in it the faculty of generation. However, it aids in the generation of male through its temperament, consistency [i.e. thick or thin] and the like when they are proper.⁴⁰

Ibn al-Nafis here reminds his readers of something he had already established in book one of his commentary, namely that the generative organs are not the source of any special faculties of generation. Instead, they only possess the natural faculties, like

⁴⁰ Ibn al-Nafis, *Sharḥ al-Qānūn*, fol. 458b5–7.

all other parts, which allow them to nourish themselves and generate semen as a superfluous residue. The active faculties of generation (such as the first transformative and the form-bearing) are not emanated to the male semen from the generative organs. Instead, both the male and female semen are merely passive materials of contrary temperaments, such that when they mix together they produce a mixture whose temperament is suitably balanced to receive a human soul from the Divine. Only after the new human soul is attached to the seminal mixture are the active faculties emanated to it so that the fetus can begin its development and growth.⁴¹ Consequently, there is no male-making faculty in male semen. Rather, the seminal mixture is more suited to generating a male if the temperament of the mixture inclines towards being warmer. The mixture's greater warmth would generally be the result of the male semen being warmer at the time of mixing since Ibn al-Nafis believes that the female semen on the whole inclines towards being cold and moist while the male semen inclines towards being hot and dry. However, the possibility exists that the semen derived from the woman rather than the man is what could make the mixture warmer and so more conducive to generating a male fetus.

⁴¹ Ibn al-Nafis, *Sharḥ al-Qānūn*, fol. 23a8ff. Also see Fancy, *Science and Religion*, 97–101; and Fancy, “Generation.”

How is warmer, male-inclined semen generated according to Ibn al-Nafis's understanding of seminal formation? Ibn al-Nafis explains his new understanding of seminal formation in at least two places in his *Commentary on the Canon*. The first is in the section entitled, "On the anatomy of the generative organs (*unthayayn*)⁴² and the spermatic vessels," which is found in his commentary on the anatomical sections of the *Canon* that he appends to the end of his commentary on book one.⁴³ The other is an extended discussion on semen in his commentary on book three.⁴⁴ In both these discussions, Ibn al-Nafis shows that the generative organs produce semen as a superfluous residue purely based on their innate natural faculties. The reason why other parts do not produce semen as a superfluous residue is due to the different source material used by the generative organs for their nourishment. As he explains in his *Commentary on the Anatomy*,

⁴² I have translated the generic *unthayān* as generative organs because the term "testicles" with its Latin root, *teste*, does not capture the meaning of this Arabic term. The Arabic term is the dual form of *unthā*, which means female and comes from the verb *anutha*, which means to become female/feminine.

⁴³ Ibn al-Nafīs, *Sharḥ tashrīḥ al-Qānūn*, ed. Salman Qataya and Paul Ghalioungi (Cairo: al-Hay'a al-miṣriyya al-‘āmma li-l-kitāb, 1988), 434. In the beginning of this section, Ibn al-Nafīs refers his readers to the discussion in book one, cited earlier, where he refutes the claims of Galen and others that either semen possesses specific generative faculties. He also discusses the generative faculties in his commentary on the section on the natural faculties; Ibn al-Nafīs, *Sharḥ al-Qānūn*, fol. 60bff.

⁴⁴ Ibn Sīnā, *al-Qānūn*, III.20, vol. 2, 726–727; Ibn al-Nafīs, *Sharḥ al-Qānūn*, fol. 447b15ff.

[S]emen is generated from the fluid that is spread out across the members like dew (*tall*). ... [In the absence of vessels to convey this fluid from each part to the generative organs,] how is it possible for (this fluid) to be conveyed there? This is only possible because this fluid is vaporized from every one of the members until it ascends to the highest part of the body, which is the brain. There ... it is cooled and made dense and returns to the consistency it had prior to being vaporized. From there it descends to the generative organs (*al-unthayayn*). As we have mentioned in a different book than this, it descends in the veins that are behind the ears, and enters into the spine in the vein there. The advantage of its descent with the spine is that it preserves what it gained from the brain in terms of (its heat) being tempered, and it is not accidentally vaporized by heat again. From here it descends again till it arrives close to the generative organs. There it meets the veins arriving from the two kidneys (and heading) to the generative organs. These vessels are filled with blood that has been warmed in the kidneys, and it modifies and changes that which has descended from the brain. This is why it is close to being white. Then after that (the cooled descending fluid balanced by the warmed fluid of the kidneys) enters the generative organs where its (final temperamental) balance, whiteness and ripening are completed.⁴⁵

Ibn al-Nafis here reworks the Hippocratic pangenetic account of seminal formation to fit his own understanding of semen as the product of the natural nutritive action of the generative organs. The fluid that is used by the generative organs for their nourishment is derived from the entire body, after it is first cooled by the brain (and its descent along the spine), and then warmed by the warmer, cleaner blood returning from the kidneys. He thus accepts the Hippocratic (anatomical) claim that semen is drawn from the vein descending from the brain, after it is joined by the renal veins. He

⁴⁵ Ibn al-Nafis, *Sharḥ tashrīḥ*, 434.

even defends the Hippocratic claim that cutting the veins behind the ears sterilizes men and women.⁴⁶ In the *Canon*, Ibn Sīnā challenges this Hippocratic assertion by stating that Hippocrates believed incorrectly that all semen is originally derived from the brain.⁴⁷ Ibn al-Nafīs defends Hippocrates by suggesting that what Hippocrates meant was that the brain's component is vital, and its absence does not preclude the production of semen but only of fertile semen.⁴⁸

Of course, Galen and Ibn Sīnā also accepted the main Hippocratic contention that the vessels that carry material for seminal formation to the generative organs branch from the main (descending) vein after the renal veins join with it, i.e. the gonadal veins branch from the inferior vena cava below the renal veins. However, they also claimed that whereas the right gonadal vein branches directly from the inferior vena cava, the left gonadal vein comes directly from the left renal vein.⁴⁹ Similarly, they

⁴⁶ Hippocrates, *Kitāb al-Ajinna li-Buqrāt/On Embryos (On the Sperm and the Nature of the Child)*, ed. and trans. M. C. Lyons and J. N. Mattock (Cambridge: Pembroke Arabic Texts, 1978), 1.

⁴⁷ Ibn Sīnā, *al-Qānūn*, III.20, vol. 2, 726.

⁴⁸ Ibn al-Nafīs, *Sharḥ al-Qānūn*, fol. 449a20ff.

⁴⁹ Galen, *Usefulness of the Parts*, vol. 2, 635; and Ibn Sīnā, *al-Qānūn*, book I, fann 1, thesis 5 (I.1.5), vol. 1, 92. Ibn Sīnā states that the left gonadal vein sometimes also receives a branch directly from the inferior vena cava that joins with the branch coming from the renal vein. Vesalius modified Ibn Sīnā's claim by asserting that this only happens in some people and not in all; Andreas Vesalius, *The Fabric of the Human Body: An Annotated*

claimed that the arteries that come to the right and left generative organs are also not symmetrical; the left gonadal artery comes directly from the left renal artery, whereas the right comes directly from the descending aorta.⁵⁰ They then read back their physiological understanding of sex differentiation into this anatomical difference, as we have seen. The right generative organ is understood to produce warmer semen suited to generating males because the blood and spirits it receives are themselves warmer and thicker, in contrast to the left generative organ which receives cooler and more watery blood and spirits conducive to generating females.

In his commentary on the anatomy of the inferior vena cava, Ibn al-Nafis does not mention any difference between the left gonadal and right gonadal veins:

After the separation of these two renal (veins) from the inferior vena cava, two other veins also separate from it and proceed to the generative organs. [This takes place after the inferior vena cava arrives at the tail bone because that place is closest to the generative organs] ... The reason for that is the watery blood that is conveyed in the renal veins to the kidneys does not completely

Translation of the 1543 and 1555 editions, eds Daniel Garrison and Malcolm Hast, 2 vols (Basel: Karger, 2014), vol. 2, 763.

⁵⁰ Galen, *Usefulness of the Parts*, vol. 2, 634–635; and Ibn Sīnā, *al-Qānūn*, I.1.4, vol. 1, 86. Ibn Sīnā maintains the analogy between the veins and the arteries and suggests that in this case too the left gonadal artery may sometimes receive a piece directly from the descending aorta in addition to the branch from the left renal artery. Vesalius rejects the claim that the left gonadal artery branches from the left renal artery and shows instead that both gonadal arteries branch from the main trunk of the descending aorta; Vesalius, *Fabric of the Human Body*, vol. 2, 796.

cleanse (*laysa yakād yastaṣfā*⁵¹) the blood of the excess water. The excess water that remains in the remaining blood needs to be expelled to a member that requires excess moisture for its nourishment. Such are the generative organs, which is why two veins proceed to them.⁵²

To be clear, if Ibn al-Nafīs truly believed that the left gonadal vein comes directly from the inferior vena cava, then anatomically speaking he was wrong. However, both Galen and Ibn Sīnā, who assert that the left gonadal vein comes from the left renal vein, begin their discussion on the anatomy of the gonadal veins by making the same claim, i.e. that the gonadal veins branch from the inferior vena cava below the renal veins.⁵³ It is thus possible (though unlikely as we shall see shortly) that Ibn al-Nafīs accepted the difference between the left gonadal vein’s precise branching point and that of the right gonadal vein but found it unworthy of comment. Nonetheless, what we know with certainty is that unlike Galen and Ibn Sīnā, Ibn al-Nafīs does not assign any role in sex differentiation to the anatomical asymmetry between the left and right renal and gonadal arteries and veins—something that is evident in his commentary on the earlier section on the descending aorta.

In the section on the descending aorta, Ibn Sīnā states that after the arteries for the liver, spleen and intestines branch off, three arteries come off the main descending

⁵¹ The text states *yastaqṣā* but *yastaṣfā* makes more sense.

⁵² Ibn al-Nafīs, *Sharḥ tashrīḥ*, 328.

⁵³ Galen, *Usefulness of the Parts*, vol. 2, 635; Ibn Sīnā, *al-Qānūn*, I.1.5, vol. 1, 92.

aorta: a small artery for the covering of the left kidney and its surrounding parts, and the two renal arteries. Ibn al-Nafīs accepts the existence of this small artery and explains its necessity thus:

There is a small branch (of the descending aorta) that goes straight to the left kidney to warm it up since it is very cold being surrounded by the spleen. If it remained so [i.e. without receiving an additional artery] the temperament of the right kidney would be drastically different from that of the left.⁵⁴

As mentioned previously, Galen, Ibn Sīnā and Ibn Abī Ṣādiq all maintained that the temperament of the right kidney is warmer than the left, and that in part explains why semen made from matter drawn from the right kidney is warmer and inclines towards generating males. Ibn al-Nafīs, it seems, is more concerned with ensuring that the difference in heat between the two kidneys is small enough so that the material drawn from either can: a) generate fertile semen, and; b) generate warmer, male-inclined semen. His concern with semen's fertility, or suitability for generation, is spelled out explicitly in this discussion on the descending aorta:

(Ibn Sīnā's) saying: "the one that comes to the left of the two (generative organs) is always accompanied by a piece from that which goes to the left kidney." The reason for that is that the left side is much cooler than the right. If the left *bayḍa* did not receive more arteries than the right [*bayḍa*⁵⁵] then the left

⁵⁴ Ibn al-Nafīs, *Sharḥ tashrīḥ*, 306.

⁵⁵ The text states *kulya* (kidney), but the context of the passage suggests that this should be *bayḍa* (ovary/testis), as is clear from the next sentence. The Wellcome manuscript of

bayḍa would be much cooler than the right. If that were the case then the semen that would be derived from it would be very different in temperament than that which would be derived from the right *bayḍa*. If that were the case then the semen extracted from both would not resemble each other in temperament. The abundance of arteries in the left *bayḍa* make its association with the heart greater than the association of the right *bayḍa* with the heart.⁵⁶

Although there are many aspects of this quotation upon which I shall elaborate, it is important to note that the anatomical asymmetry between the right and left gonadal arteries does not play a role in sex differentiation. Ibn al-Nafis's primary concern is to ensure that the semen produced in either generative organ is close enough in temperament so as to be suitable for generation, regardless of the sex of the fetus. He is primarily concerned here with the warmth of the parts, and one should remember that the gonadal arteries do not carry materials for generating semen according to Ibn al-Nafis (or Galen). Rather, they bring innate heat (and spirit) to the generative organs, which apart from warming them also play a role in their physiological activities, such as nutrition. Ibn al-Nafis thus wants to ensure that since the left kidney and left *bayḍa* are cooler than their right counterparts, because they are further away from the (warm) liver, they need to receive more heat from the heart.

That is why he thinks the left kidney receives a small artery in addition to the renal

the *Sharḥ al-Qānūn* which contains the full anatomical commentary contains the same error (also true of the error noted in fn. 49).

⁵⁶ Ibid, 307.

artery, and the left *bayḍa* receives a branch from the left renal artery in addition to the left gonadal artery, which comes directly from the aorta.

As for what the *bayḍa* in this passage implies, I would suggest that Ibn al-Nafis here means exclusively the female generative organ and not the male. It is true that, in the *Commentary on the Aphorisms*, Ibn al-Nafis uses the term *bayḍa* to refer to the male generative organs, but in that passage he refers to them as the man's generative organ (*bayḍat al-rajul*).⁵⁷ He refers to the man's *bayḍa/bayḍatān* in only one discussion in his *Commentary on the Anatomy*—the section on the womb. In that discussion, Ibn al-Nafis contrasts the internal location of the ovaries to the external location of the testes (*al-bayḍatayn fī al-rijāl*).⁵⁸ In all other discussions, Ibn al-Nafis uses the term *unthayān* to refer to generative organs generically, and then uses the qualifiers for male and female as appropriate. Moreover, even in the section on the womb where he discusses the function of the erect male phallus and the need to propel semen towards the womb, Ibn al-Nafis shifts to using the term *unthayān* without any qualifiers. He then returns to using *bayḍatān* to discuss the female organs and the “horns” of the uterus.⁵⁹

⁵⁷ Ibn al-Nafis, *Sharḥ Fuṣūl*, 390.

⁵⁸ Ibn al-Nafis, *Sharḥ tashrīḥ*, 440.

⁵⁹ *Ibid*, 440ff.

If we consider seriously that Ibn al-Nafīs means ovary when he uses the term *bayḍa* unrestrictedly, then the following picture emerges from the passages we have just examined. The ovaries, located as they are inside the body, share in the body’s general asymmetry with regards to heat, i.e. the right ovary would be warmer than the left ovary, as Ibn al-Nafīs says, “as for the reason for the greater preparedness of the semen derived from the right ovary (*al-bayḍa al-yumnā*) to (produce) male (fetuses) it is because it is warmer, and that is obvious.”⁶⁰ And since the right ovary is already warmer than the left by virtue of being inside the body and closer to the liver, there are two safeguards to ensure that the semen produced by the right ovary is not entirely different in temperament from the left. The first safeguard, as mentioned above, is that the left ovary is associated more with the heart so as to ensure that it is heated up more than the right ovary is. This is accomplished by first warming up the left kidney using an additional artery, and then by the left ovary receiving an arterial branch from the left renal artery in addition to the branch it receives from the descending aorta. The second safeguard is that the ovaries derive the material which they use to generate semen from the opposite kidney, as Ibn al-Nafīs states, “The matter that each ovary (*kull bayḍa*) receives (from which it generates semen), it receives from the kidney in the

⁶⁰ Ibn al-Nafīs, *Sharḥ al-Qānūn*, fol. 458b14.

opposite direction (*min al-kulya al-mukhālaḥa fī al-jihha*).”⁶¹ Here too, Ibn al-Nafīs flips the traditional Galenic position in that the right kidney does not send materials to the right, but rather to the left ovary, and vice-versa. This suggests that Ibn al-Nafīs believed that the left gonadal vein does not originate in the left renal vein but rather in the vena cava itself, at least in women. Nonetheless, this difference in the heat of the female semen derived from the right and left ovaries is still miniscule and thus plays a minor role in determining the sex of the fetus. The major onus for sex differentiation falls upon the heat of womb, as the Hippocratic aphorism in its most literal sense asserts:

(Ibn Sīnā’s) saying: “Similarly, when the semen is placed in the right womb” it tends primarily to being male even if the semen is extracted from the left ovary (*bayḍa*) since the right side of the womb is warmer based on what we mentioned earlier that members on this side are warmer. Since this is the case, it must increase the heat of the semen necessarily.⁶²

Hippocratic Authority and Empirical Verification in Ibn al-Nafīs’s Works

Although in the examples discussed above Ibn al-Nafīs defends the literal meaning of the Hippocratic text, there are also instances in the *Commentary on the Canon* where he does not do so. For example, Hippocrates had claimed that the brain is the

⁶¹ Ibid, fol. 458b16–17.

⁶² Ibid, fol. 458b22ff.

first part generated in the fetus during generation. According to Ibn al-Nafis's new understanding of fetal generation though, the left ventricle of the heart is generated first to house the spirit after which the umbilical chord is generated. The brain completes its generation before the heart as a whole, but only because it is more moist and not due to an actual need for the brain's functions, or even due to its attachment to the soul. The liver too is not generated till later since, according to Ibn al-Nafis, it is not the source of the natural faculties.⁶³ There is therefore no pressing need to generate it since the fetus initially does not need to cleanse the blood or generate the humors, which it receives from the mother through the umbilical chord. So Ibn al-Nafis defends the Hippocratic claim that "the first member that is generated is the brain" by stating that what Hippocrates really meant was that "the brain is the first chief organ to complete its generation (*hādha al-kalām inna ṣahh 'an abuqrāt fa-l-murād bihi anna al-dimāgh awwal 'uḍw min al-a'dā' al-ra'īsa yatimm takawwunhu*)."⁶⁴

The focus in the preceding discussion on the aphorisms' conformity with medical theories may also give the incorrect impression that Ibn al-Nafis (and other commentators) were content with *philosophical* rather than *empirical* verification (*taḥqīq*). Yet, "doctrinal amplification ... by means of 'empirical' evidence" was "a crucial

⁶³ Fancy, *Science and Religion*, 91.

⁶⁴ Ibn al-Nafis, *Sharḥ tashrīḥ*, 446.

stratagem in the commentator's legitimation of his own scientific authority" ever since antiquity, and one that Galen used often.⁶⁵ After all, it is the real anatomical difference between the origins of the left gonadal vein and the right gonadal vein that supports Galen's claim that the left generative organ produces cooler, watery and more female-inclined semen, thus validating his interpretation of *Aphorism V.48*. Ibn al-Nafis's rejection of this anatomical claim thus seems counter-productive from an empirical, scientific standpoint. However, even though Ibn al-Nafis (incorrectly) rejects the anatomical difference between the left and right gonadal veins in women, he (incorrectly) accepts this difference for the left and right gonadal arteries in women. He thus (correctly) recognizes that the arteries and veins do not accompany one another in this specific case, something that both Galen and Ibn Sīnā had assumed, and only Vesalius later showed to be not the case. We do not know definitively whether or not Ibn al-Nafis dissected animals, so it is premature at the moment to say much more on this issue.⁶⁶

⁶⁵ von Staden, "Woman Does Not," 114, my emphasis.

⁶⁶ For opposing views on whether Ibn al-Nafis practiced anatomical dissection, see Max Meyerhof, "Ibn an-Nafis (XIIIth Cent.) and His Theory of the Lesser Circulation," *Isis* 23 (1935): 100–120, 118; and A. K. Chéhadé, *Ibn al-Nafis et la découverte de la circulation pulmonaire* (Damascus: Institut Français de Damas, 1955). There was no *per se* taboo against dissection, particularly animal dissection, in the Islamic world; see Emilie Savage-Smith, "Attitudes Toward Dissection in Medieval Islam," *Journal of the History of*

Nevertheless, empirical evidence plays an important role in Ibn al-Nafis's medical commentaries. His reliance on the Hippocratic two-seed theory, and the semen's potencies being drawn from all parts of the body, are based on the evidence that children inherit different bodily traits from their parents. He would also maintain, along with Galen, that his understanding of the greater heat of men is empirically based. But perhaps the most striking example of his use of empirical evidence on gynecological matters is in the section on miscarriage/abortion (*isqāt*).

In the *Canon*, Ibn Sīnā goes over the various physical and emotional causes of miscarriage, some of which are natural and some of which are accidental. Amongst the latter, Ibn Sīnā includes the evacuations of humors, especially excessive blood, particularly if this takes place after the seventh month.⁶⁷ At this point in the commentary, Ibn al-Nafis interjects the Hippocratic aphorism (V. 31), "When the

Medicine and Allied Sciences 50 (1995): 67–110. There is one unambiguous passage where Ibn al-Nafis reveals that he had examined dead bodies. This is in the section on the anatomy of the gall bladder where he denies that the bile duct from the gall bladder penetrates into the stomach and the intestines by claiming "we have seen it many times (*shāhadnāhu mirāran*)"; Ibn al-Nafis, *Sharḥ tashrīḥ*, 415. This statement is part of his reworking of the anatomy of the digestive organs, which I hope to address in a subsequent publication.

⁶⁷ Ibn Sīnā, *al-Qānūn*, III.21, 773.

pregnant woman is bled she miscarries, especially when the child is big,”⁶⁸ in order to undercut Ibn Sīnā’s authority by showing that his entire discussion can be subsumed under the brief Hippocratic saying. However, he then continues to the next passage where Ibn Sīnā suggests that miscarriages may also occur due to the death of a fetus. Ibn Sīnā mentions that when “pus flows from (the fetus) and burns the womb and harms it (*wa-khuṣūṣan idhā jarā minhu ṣadīd wa-ladha‘a al-raḥim fa-ādhāhā*),”⁶⁹ a miscarriage may result. In his comments, Ibn al-Nafīs relates a story of a pregnant woman that had suffered from precisely this condition while he was in Damascus. He states that her fetus had died while inside her, and “eighteen days had passed since the death (of the fetus).” He then describes in detail the visible symptoms that repulsed the physicians who were attending to her in the famous Nūrī hospital (*wa-hiya bi-l-bīmāristān al-[n]ūrī al-[ma]‘mūr bi-dimashq ḥarasahā allāhu ta‘ālā*). These physicians mentioned her case to Ibn al-Nafīs (*qad akhbarūnā bi-amrihā*), who informed them that once the fetus leaves her body she will be recover and live (*tabra’ wa-ta‘īsh*). He then subsequently visited her and ten days after he first saw her she was cured (*thumma*

⁶⁸ Ibn al-Nafīs, *Sharḥ al-Qānūn*, fol. 460b35–36. Also compare with the following manuscript, MS Şehid ‘Alī Pāşa 2051, Süleymaniye Library, Istanbul, fol. 510a.

⁶⁹ Ibn Sīnā, *al-Qānūn*, III.21, 773.

bara'at ba'd 'ashara ayyām min ḥīn shāhadtuhā).⁷⁰ His own personal experience thus confirmed the validity of Ibn Sīnā's (seemingly) theoretical discussion in the *Canon*.

Conclusion

The aforementioned examples from Ibn al-Nafīs's commentary on book five of the *Aphorisms* support much of what Abou Aly had found in her analysis of book one of that commentary, particularly that Ibn al-Nafīs's commentary shows remarkable independence from that of Galen. As we have seen, Ibn al-Nafīs intentionally differentiates the views of Galen from those of Hippocrates, and this differentiation is most visible in places where he disagrees with the medical theory that underlies Galen's interpretations of Hippocrates. Ibn al-Nafīs exploits this difference most effectively in his *Commentary on the Canon*, where he separates the Hippocratic saying from Galen's larger medical system in order to reject aspects of the latter. In doing so, he also marshals the authority of Hippocrates in order to defend his own medical

⁷⁰ Ibn al-Nafīs, *Sharḥ al-Qānūn*, fol. 460b36–461a5. This passage is clearer in the manuscript, MS Şehid 'Alī Pāşa 2051, fol. 510a17ff. I would like to thank Ahmed Ragab for suggesting the emendations to the text. The passage reveals that Ibn al-Nafīs wrote at least this part of his *Commentary on the Canon* after he had left Damascus, suggesting that he may have departed the city as early as 1242 CE; see Fancy, *Science and Religion*, 13–14. Moreover, the tenor of the passage suggests that neither was Ibn al-Nafīs employed at the Nūrī hospital, nor did he ever study there, as Iskandar claims; Gillespie, *Dictionary of Scientific Biography*, s.v. "Ibn al-Nafīs."

system over and against those of Galen, Ibn Sīnā and others. Moreover, he also strategically deploys certain Hippocratic sayings within his *Commentary on the Canon* to undermine the authority of Ibn Sīnā by suggesting that what may seem novel and true in the *Canon* is already present in a succinct Hippocratic aphorism. This explains why he inserts Hippocratic aphorisms in his *Commentary on the Canon* but never cites Ibn Sīnā's *Canon* in his *Commentary on the Aphorism*, even when directly quoting from the former. Nevertheless, Ibn al-Nafis's defense of a Hippocratic saying is not always straightforward, suggesting that, like Galen, he only accepts the validity of the saying in light of his own, *verified* medical system.*

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