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Avicenna and Galen, Philosophy and Medicine: Contextualising Discussions of Medical Experience in Medieval Islamic Physicians and Philosophers

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Abstract

In this article I discuss Greek and Arabic philosophical and medical debates about experience (*tağriba*, *empeiria*). I consider the Greek and classical Arabic background for debates about experience among Arabic commentators on the Hippocratic *Aphorisms*. I argue that these authors are influenced by Galen's ideas about experience in his pharmacological and dietetic writings, and Aristotle's ideas about experience, expressed mainly in *Posterior Analytics*, Book Two. I argue, however, that the Aristotelian viewpoint of experience reaches the Arabic *Aphorisms* commentators through the intermediaries of Aristotle's Platonist commentators and Avicenna. I show that most of the Arabic *Aphorisms* commentators understand experience to have the various meanings Galen assigns it in his medical writings. Ibn al-Quff is the lone, but no less intriguing, exception. In his *Aphorisms* commentary, Ibn al-Quff uses Avicenna's definition of experience in the book *On Demonstration* (*Kitāb al-Burhān*) from Avicenna's summa *The Healing* (*Kitāb al-Šifā'*) to explain Hippocrates' words. Closely examining Avicenna's *On Demonstration*, Book One, Chapter 9, reveals that Avicenna continues late antique trends, which meld medical and philosophical debates. Avicenna uses Galen's idea of qualified experience to resolve interpretive challenges in Aristotle's *Prior Analytics*, Book Two, Chapter 23 and *Posterior Analytics* Book two, Chapter 19, where Aristotle speaks about experience's role in the inductive process of knowledge acquisition. I argue that the fluid way in which Ibn al-Quff deploys Avicenna's *On Demonstration* to explicate the Hippocratic *Aphorisms* marks a shift in which Avicenna's philosophical thought becomes increasingly influential in post-classical Islamic medical discourse.

Keywords: experience, Avicenna, Galen, Alfarabi, Simplicius, Philoponus, Aristotle, commentaries, Hippocratic *Aphorisms*

1. Introduction

In this article, I provide historical context for debates about medical experience (*tağriba*) in Arabic commentaries on the Hippocratic *Aphorisms*. I highlight two distinct accounts of experience that influenced classical authors such as Alfarabi (d. 950 or 951) and Avicenna

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(d. 1037) as well as the post-classical commentators on the Hippocratic *Aphorisms*.¹ The bases of these accounts can be traced to Aristotle's (d. 322 BC) *Prior Analytics*, Book Two, Chapter 23 (hereafter *APr.* 2.23), *Posterior Analytics* Book Two, Chapter 19 (hereafter *APo.* 2.19) and Galen's (d. ca. 216 AD) mainly pharmacological writings on "qualified experience (*dihōrismemē peira*)."² This article shows that classical and post-classical Arabic authors synthesised these two traditions and transformed the role experience plays in medicine and philosophy in ways that Aristotle and Galen never intended.

In Section 2, I outline what Galen meant by "qualified experience" in his pharmacological writings. I show, however, that Galen does not reserve this idea for pharmacology, since the intuitions behind qualified experience are also present in Galen's commentary on the first aphorism in the Hippocratic *Aphorisms*.

I argue in Section 3 that Alfarabi and Avicenna were keenly aware of Galen's doctrine of qualified experience. Both authors, however, express deep reservations about how effective qualified experience really is in pharmacology and anatomy. Of them, Alfarabi is by far the most critical of this aspect of Galen's medical methodology. As we shall see, Alfarabi attacks Galen's doctrines relating to medical experience by trying to show that the method is logically incoherent. We shall see that in his attack Alfarabi draws on logical concepts in Aristotle's *Categories* and on Platonist commentaries on the

1. 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; Jules Janssens, "Experience' (*tajriba*) in Classical Arabic Philosophy (al-Fārābī–Avicenna)," *Quaestio* 4 (2004): 45–62; Jon McGinnis, "Avicenna's Naturalized Epistemology and Scientific Methods," in *The Unity of Science in the Arabic Tradition: Science, Logic, Epistemology and Their Interactions*, eds. Shahid Rahman, Hassan Tahiri and Tony Street (Dordrecht: Kluwer Academic Publishers, 2008), 129–52; Miquel Forcada, "Ibn Bājja on Medicine and Medical Experience," *Arabic Sciences and Philosophy* 21 (2011): 111–48.

Categories.

In Section 4, I enumerate the different senses that Arabic commentators on the Hippocratic *Aphorisms* assigned to experience in their commentaries on the first aphorism. We shall see that most of the commentators assign to *tağriba* the same sense that Galen assigns to *peira* in his *Aphorisms* commentary and his pharmacology. One important exception to this rule is a commentary attributed to Ibn al-Nafīs (d. 1288) preserved in the unique manuscript Oxford, Bodleian, MS Pococke 294. In this commentary, Ibn al-Nafīs draws on Galen's commentary on the *Aphorisms*, but also supplements Galen's discussion with material inspired by the opening remarks of Avicenna's *Canon Book Two (On Simple Drugs)*.

I turn to the *Aphorisms* commentary by Ibn al-Quff (d. 1286) in Section 5. Like Ibn al-Nafīs, Ibn al-Quff also draws on Avicenna to explain the meaning of experience in the first aphorism. However, Ibn al-Quff paraphrases passages from Book One, Chapter Nine of Avicenna's *Book On Demonstration (K. al-Burhān)* in the logic of *The Healing* (Hereafter, *Dem.* 1.9). In it, Avicenna addresses a number of objections to Aristotle's account of the relationship between induction (Gr. *epagōgē*, Ar. *istiqrā'*) and experience in *APo.* 2.19 and the indemonstrable first principles of demonstrative science. In this chapter, Avicenna appropriates Galen's ideas about finding causes by using qualified experience in order to respond to objections that the first principles acquired by induction are not suitable for use in demonstrative science. In Section 6, I examine late antique precedents for using Galenic medical concepts and texts to solve interpretive challenges in Aristotelian philosophy. I conclude that part of Avicenna's medical legacy is that post-classical medical discourse comes to be infused with doctrines and debates from Avicenna's philosophical works.

2. Qualified Experience in Galen's *Aphorisms* Commentary

Philip van der Eijk has shown that Galen recognized that the conditions under which observations of phenomena are made impact the observations' evidentiary value with

regard to making a judgment about where responsibility for the observed phenomena lies.² Van der Eijk focuses mainly on Galen's pharmacological works, in which Galen is interested in assigning responsibility for certain pharmacological effects on the body to properties of drugs. According to van der Eijk, Galen shows a "keen awareness" that in "an empirical test of a substance's dietetic or pharmacological power" certain conditions must be fulfilled "in order to make the test have an evidential value and provide sufficiently specific information."³ Indeed, it seems that Galen developed the concept of qualified experience based on a clear recognition that the conditions under which observations are carried out must allow us to distinguish the drug's essential (*kath' hauto*) effects from its accidental (*kata sumbebēkos*) consequences.⁴

Yet, there is evidence from Galen's commentary on the Hippocratic *Aphorisms* that Galen recognized that manipulating the conditions under which observations are made to lend them greater evidentiary value is not a task whose importance is limited to pharmacology. In his commentary on the first aphorism, Galen makes the following comment on Hippocrates' cryptic statement that "the determination is difficult (*hē de krisis chalepē*):" Typically, Galen's comments serve as a thinly veiled dig at how his empiricist opponents understand reason's role in medicine. Nevertheless, Galen alludes to the fact that the problem of how to secure the evidentiary value of empirical observations

2. Philip van der Eijk, "Galen's Use of the Concept of 'Qualified Experience' in his Dietetic and Pharmacological Works," in *Medicine and Philosophy in Classical Antiquity: Doctors and Philosophers on Nature, Soul, Health and Disease*, ed. Philip van der Eijk (Cambridge: Cambridge University Press, 2005), 279–98, 289.

3. Ibid.

4. Ibid., 290.

confronts any empirically-minded physician, not just the empiricist.⁵

τοῖς δ' ἐμπειρικοῖς οὐχ ὁ λόγος εἰρήσθαι δοκεῖ κρίσις, ἀλλ' ἡ τῶν διὰ τῆς πείρας εὐρισκομένων βοηθημάτων ἐπίκρισις. ὄντως γὰρ καὶ τοῦτο χαλεπὸν καὶ δυσθῆρατον, ὅταν πολλῶν ἰαμάτων τῷ κάμνοντι γεγενημένων ἐν τι ἐξ αὐτῶν αἰτιᾶται τῆς ὠφελείας ἢ βλάβης. εἰ γὰρ οὕτως ἔτυχε κοιμηθέντος καλῶς αὐτοῦ καὶ καταιωνηθέντος ἐφεξῆς καὶ καταπλασθέντος ἐπὶ τούτῳ, κάπειτα κλυσθέντος ἢ αὐτομάτως τῆς γαστρὸς ἐνδούσης, εἶτα καὶ τραφέντος τοιάσδε τινὰς τροφὰς, κάπι τούτοις ἅπασιν ὠφεληθέντος ἢ βλαβέντος οὐ ῥάδιον εἰπεῖν διὰ τί τῶν γεγενημένων συνέβη τὸν ἄρρωστον ὠφελῆσθαι ἢ βλαβῆσθαι.

وأما أصحاب التجارب فيقولون إنه لم يرد بالقضاء القياس، وإنما أراد به الحكم على الأشياء التي توجد بالتجربة وما يعقب. وبالْحَقِيقَةُ فَإِنَّ هَذَا أَيْضاً عَسْرُ وَالْوَقُوفُ عَلَيْهِ صَعْبٌ، أَعْنِي أَنَّ يَكُونُ الْمَرِيضُ قَدْ عُولِجَ بِأَصْنَافٍ شَتَّى مِنَ الْعِلَاجِ فَتُظْهِرُ مَنَفَعَتَهُ أَوْ مُضَرَّتَهُ فَيَحْكُمُ أَنَّ تَكُونُ الْمَنَفَعَةُ أَوْ الْمَضَرَّةُ إِنَّمَا كَانَ سَبَبُهَا وَاحِدٌ مِنْ أَصْنَافِ ذَلِكَ الْعِلَاجِ. وَذَلِكَ أَنَّكَ إِنْ جَعَلْتَ فِي الْمَثَلِ أَنَّ مَرِيضاً نَامَ نَوْمًا صَالِحًا ثُمَّ انْتَبَهَ فَمَسَحَ بِيَدِهِ ثُمَّ ضَمَّدَ ثُمَّ حَقَنَ أَوْ انْطَلَقَ بَطْنَهُ مِنْ تَلْقَاءِ نَفْسِهِ ثُمَّ أَكَلَ طَعَامًا بِحَالٍ مَا ثُمَّ حَدَّثَتْ لَهُ هَذِهِ الْأَشْيَاءُ كُلُّهَا مَنَفَعَةٌ أَوْ مُضَرَّةٌ فَلَيْسَ يَسْهَلُ أَنْ يُقَالَ مِنْ قَبْلِ أَيِّ هَذِهِ الْأَشْيَاءِ كُلُّهَا الَّتِي كَانَتْ حَدَّثَتْ هَذِهِ الْمَنَفَعَةَ لِلْمَرِيضِ أَوْ الْمَضَرَّةَ.

[L1] The empiricists do not seem to mean by “reasoning” determining (*krisis*), but rather the verification of remedies discovered through experience. For, in reality, this too is difficult and elusive whenever one of the many remedies given to the patient is

5. Greek text: Galen, *Galenī opera omnia*, ed. Karl G. Kühn (Leipzig: Car. Cnoblochii, 1829), 17b:354, l.10–5, l.3. Arabic text: Galen, *Tafsīr Ġālīnūs li-fuṣūl Abūqrāt*, trans. Ḥunayn ibn Ishāq, ed. Taro Mimura (The University of Manchester, 2012–2017), doi: ab.1234/ref:cdef/5678. The English translation of L1 is based on the Greek. Unless otherwise advertised, this and all other translated texts in this paper are mine.

the cause of benefit or harm. For example, if, after the patient slept well, had a massage, was rubbed with oil, was purged or his stomach emptied on its own, and then he ate this or that food, and after all these things he received some benefit or was harmed, it is not easy to say which of these [therapies] is responsible for the benefit or harm to the patient.

In L1 Galen draws attention to the doctrines of the empiricist sect, whose notion of reasoning in medicine does not involve reasoning deductively from universal principles to particular instances. To the contrary, Galen represents the empiricists' notion of reasoning as a process of verifying by repeated applications that a certain correlation does in fact exist between drugs or foodstuffs and some therapeutic effect based purely on experience. According to Galen's representation of the empiricist view, medical reasoning is a strictly non-deductive process of inferring conclusions about how to treat particular illnesses based *not* on deductions from universal principles of pharmacology or humoral pathology but on a finite number of analogous cases histories.

Galen may dismiss the empiricist notion of reason, but in L1 he does concede—given the importance of qualified experience in his pharmacology he *must* concede—that establishing a causal connection between a drug and its therapeutic effect on the body is complicated by the myriad conditions under which the putative cause (e.g. scammony) and its therapeutic effect (purging yellow bile) is observed. Indeed, the purpose of qualified experience is to lend observations of the consequences of administering scammony to the patient evidentiary value by systematically eliminating those conditions that obscure the drug's essential effects on the body. In Galen's view, qualified experience is a *method* for distinguishing the essential effects of a drug from its accidental effects. In his pharmacological writings, Galen identifies a handful of conditions that must be controlled in order for these types of observation to have evidentiary value. Philip van der Eijk has identified several of them. These include ensuring that the body the drug is tested on is as balanced in temperament as possible, that the environment in which the drug is

tested is balanced, that the drug is simple and pure and not administered to the patient in combination with other types of therapy, that the drug is administered in the season that is most suitable, and that the drug is in line with the natural temperament and age of the patient to whom it is given.⁶

Galen's example in L1, however, describes a cocktail of different therapies, which are administered to the patient in such a way that ultimate responsibility for the benefit or harm to the patient is hopelessly obscured. Nor is this example uniquely pharmacological in scope. This observation underscores the fact that for Galen the problem of improving the evidentiary value of empirical observations by controlling the conditions under which the observations take place is not just a problem in pharmacology. This problem confronts anyone who is interested in providing empirically-based evidence for a claim such as "there is a causal connection between two phenomena *X* and *Y*," or "*X* causes *Y*," or "*X* is responsible for the existence of *Y*."

3. Logic of Experience in Alfarabi's *On Topical Analysis (Kitāb al-Taḥlīl)*

There is strong evidence that classical and post-classical Arabic physicians and philosophers thought deeply and critically about medical experience as a problem of scientific method. These authors recognized the fact that controlling the conditions under which observations are made forms a crucial methodological element in any argument in which the conclusion that *X* is *responsible for* or *causes Y* is based on a finite number of premises that are derived from empirical observations.

Evidence from the classical period comes from Alfarabi's criticism of Galen's *anatomical* method in *On Topical Analysis*, and from Book Two of Avicenna's *Canon of Medicine (al-Qānūn fī l-ṭibb, hereafter Canon 2)* on simple drugs (*adwiya mufrada*).⁷

6. van der Eijk, "Galen's Use of Qualified Experience," 287.

7. Peter E. Pormann, "Avicenna on Medical Practice, Epistemology, and the Physiology of the Inner Senses," in *Interpreting Avicenna: Critical Essays*, ed. Peter Adamson (Cambridge:

Avicenna does not employ an equivalent of Galen's term "qualified experience" to characterize the seven conditions that he says must be observed to ensure the value of observations of a drug's pharmacological action. These conditions and the fact that he uses them to distinguish between a drug's essential and accidental effects, however, show his debt to Galen's pharmacological thought. At the beginning of this chapter, Avicenna says that the powers in drugs can be discovered by experience (*ṭarīq al-tağriba*) or by a process of reasoning (*ṭarīq al-qiyās*).⁸ For experience to lead to reliable knowledge about a drug's power, Avicenna says that the physician must observe seven conditions (*šarā'it*).⁹ It is clear that Avicenna's thought in this section owes a great deal to Galen's notion of qualified experience in pharmacology. Nevertheless, according to Pormann, the conditions that Avicenna sets down "are much more detailed than those found in Galen's extant works."¹⁰ (1) The drug should be free from any "acquired quality (*kayfiya muktasaba*),"

Cambridge University Press, 2013), 91–108, 98–9.

8. Avicenna, *al-Qānūn fī al-ṭibb*, ed. Qāsim Muḥammad al-Rağab (Baghdad: Dār al-muthannā, 1971), 1:224. I recognise that in his philosophical works, Avicenna invariably uses *qiyās* to speak about the syllogism in its technical, Aristotelian sense. However, I do not assume that he uses it an identical way in his medical writings. This is why I have elected to use the more generic translation "process of reasoning." On the further complications associated with translating *qiyās* in classical and post-classical Arabic medical discourse, see Section 4.

9. See Pormann, "Avicenna on Medical Practice, Epistemology, and Physiology," 98.

10. Part of this passage is translated in Mona Nasser, Aida Tibi, and Emilie Savage-Smith, "Ibn Sina's *Canon of Medicine*: 11th Century Rules for Assessing the Effects of Drugs," *Journal of the Royal Society of Medicine* 102 (2009): 78–80. See the Appendix for a complete translation.

which works to obscure the drug's essential activity with its accidental effect; (2) the experience should be conducted on a "simple illness (*'illa mufrada*)"; (3) the drug's effects should be observed on a pair of illnesses whose humoral aetiologies are opposite to each other; (4) the power in the drug should correspond to the power in the illness; (5) the time in which the drug's effects appear should be observed closely; (6) the effect should be constant and occur in most cases; and (7) the human body rather than bodies of animals should be used for discovering the drug's effects.

In *On Topical Analysis*, Alfarabi takes up a polemic against Galen's polemic in the *Doctrines of Hippocrates and Plato* against Aristotle, Chrysippus and Praxagoras. These authors claimed that the heart rather than the brain is the origin of the nerves. Alfarabi's comments are intended to highlight Galen's incompetence as a logician rather than serve as a thorough refutation of Galen's doctrine that the brain is the origin of the nerves and of the governing part of the soul. Nevertheless, the fact that Alfarabi's comments are directed at Galen's anatomical method rather than Galen's pharmacology highlights the fact that Arabic physicians and philosophers believed that the *method of* qualified experience extends beyond Galen's pharmacology, ramifying into Galen's anatomy and therapeutic method. In addition, Alfarabi's comments occasion the conclusion that Arabic philosophers and physicians believed that in Galen's writings there is a generic inductive method for finding causes, which is on display equally in Galen's pharmacology, anatomy, and therapeutics.

In his discussion of Galen's arguments against Aristotle and Chrysippus in *Doctrines of Hippocrates and Plato*, Books One and Two, Alfarabi reduces the premises of Galen's argument to two "if, then" sentences:

(A) if the nerves are left intact, voice, sensation and voluntary motion remain.

(B) if the nerves are severed, voice, sensation and voluntary motion are impaired.

According to Alfarabi, Galen believes (A) and (B) alone are sufficient to prove that the

nerves originate in the brain and that the brain is where the ruling part of the soul resides. Alfarabi analyses (A)'s and (B)'s formal features in terms of existence (*wuǧūd*) and removal (*irtifāʿ*), where the existence of property *X* in *Y* means that *Y* possesses the attribute *X*; the removal of property *X* from *Y* means that attribute *X* is *absent* from *Y*.¹¹

Here, removal is not quite a kind of metathetic or privative negation.¹² It is not treated as an operation on terms that transforms the term's extension, as in the case of metathetic terms in Aristotle's *On Interpretation* 10.¹³ Rather, saying that *animal* is "removed from" *human* means that the reasoner hypothetically considers what items would fall under the extension of the term "human" if all the items falling under the term "animal" did not exist. In this case, since animal is part of the definition of human, nothing would fall under "human" if there were nothing falling under "animal."

In such a situation, Alfarabi and Aristotle's Platonist commentators say that "animal is removed when human is removed, but animal is not removed when human is removed." For example, in the *Categories*, Aristotle says that "prior (*proteron*)" has several senses. One of the senses Aristotle speaks (*Cat.* 14^a30–1) about is "what does not

11. Fritz W. Zimmermann uses the words "eliminate" and "cancel" to translate *rafaʿa* and *irtafaʿa*. For example, see Fritz Zimmermann, *Al-Farabi's Commentary and Short Treatise on Aristotle De Interpretatione* (Oxford: Oxford University Press, 1981), cxxx, n.2.

12. See John N. Martin, "Proclus and the Neoplatonic Syllogistic," *Journal of Philosophical Logic* 30 (2001): 187–240.

13. This is the topic of what Alfarabi calls the "Third Section" of Aristotle's *On Interpretation*, 19^b19–21^a33. For Alfarabi's "long commentary," see Zimmermann, *Al-Farabi's Commentary and Short Treatise on Aristotle De Interpretatione*, 100–57; for this topic in the "short commentary," see *ibid.*, 234–40. See also Paul Thom, "Al-Fārābī on Indefinite and Privative Names," *Arabic Sciences and Philosophy* 18 (2008): 193–209.

reciprocate in respect of what follows in existence (τὸ μὴ ἀντιστρέφον κατὰ τὴν τοῦ εἶναι ἀκολούθησιν=*mā lā yarǧī'u bi-t-takāfu'i fi luzūmi l-wuǧūdi*).¹⁴ In his commentary on this passage, Simplicius uses the later term “imply (*sunepipherein*)” to gloss Aristotle’s term “following (*akolouthēsis*).” It is not clear to me that Simplicius uses these terms with distinct senses. Simplicius explains the phrase as follows:

Δεύτερον δὲ τρόπον τοῦ προτέρου φησὶν τὸ μὴ ἀντιστρέφον κατὰ τὴν τοῦ εἶναι ἀκολούθησιν, ὅταν ἄλλω μὲν τεθέντι αὐτὸ ἔπεται, αὐτῷ δὲ τεθέντι τὸ ἄλλο μὴ ἔπεται, ὡς δυοεῖν¹⁵ μὲν ὄντων ἐν πάντως ἔστιν, ἐνὸς δὲ ὄντος οὐκ ἀνάγκη δύο εἶναι. ἀφ’ οὗ οὖν οὐχ ἔπεται ἢ ἀκολούθησις, πρότερον ἐκεῖνο, καὶ ᾧ τεθέντι ἔπεται τὸ ἕτερον, ὕστερον ἐκεῖνο. καλεῖν δὲ εἰώθασιν οἱ νεώτεροι τὸ τοιοῦτον πρότερον “συνεπιφερόμενον μὲν μὴ συνεπιφέρον δὲ

14. ‘Abd al-Raḥmān Badawī, *Mantiq Aristū* (Cairo: Maṭba‘at dār al-kutub al-miṣrīya, 1948), 1:70. For Aristotle’s use of *akolouthēin* to express various senses of *existing together*, see Jaakko Hintikka, *Time and Necessity: Studies in Aristotle’s Theory of Modality* (Oxford Clarendon Press, 1973), 41–61 [Chapter II], especially 43–5 and 51–4. Hintikka notes (*ibid.*, 42) that “usually translators and commentators [modern, ancient?] do not make any clear-cut distinctions between the different verbs Aristotle uses to express following, compatibility, logical equivalence, and logical entailment.” I am grateful to the peer-reviewer for directing me to this section of the book, and suggesting that I avoid translating *akolouthēin* as “entailment.” I have elected to use the generic notion of “following” because *following from* is not necessarily a symmetrical relationship in the way that *compatible with* is. It thus conveys the sense that Aristotle and Alfarabi are trying to impress on the reader about *priority* in existence. This translation also makes it clear why Simplicius would have felt comfortable glossing it with the Stoic term for *logical entailment* “*sunepipheirei*.”

15. Adopting “δυοεῖν” with other manuscripts against Kalbfleisch’s “δυεῖν.”

καὶ συναναιροῦν μὲν μὴ συναναιρούμενον δέ.”

[...]

οὕτως δὲ καὶ τὸ γένος πρότερον δείκνυται τῇ φύσει τοῦ εἴδους, ὡς συναναιροῦν μὲν μὴ συναναιρούμενον δὲ καὶ συνεπιφερόμενον μὲν μὴ συνεπιφέρον δέ· ζῶου μὲν γὰρ ἀναιρεθέντος συναναιρεῖται ἄνθρωπος, ἀνθρώπου δὲ ἀναιρεθέντος οὐ συναναιρεῖται ζῶον, καὶ κατὰ τὴν τοῦ εἶναι δὲ ἀκολουθίαν οὔτε συνυπάρχει οὔτε συνεπιφέρεται τῷ ζῷω ὁ ἄνθρωπος ὡσπερ τῷ ἀνθρώπῳ τὸ ζῶον.¹⁶

[L2] The second sense of being prior speaks about the what does not reciprocate with respect to following in being, when something follows [call it *Y*] from something else being posited [call it *X*], but positing *X* does not follow from *Y*. Thus, there being two, there is, in all events, one. There being one, however, it is not necessary that two is. Therefore, the prior is that from which the consequent does not follow [so, one is prior because two does not follow from it]; the posterior is that from the positing of which the other follows [so, two is posterior because one follows from positing that it exists]. The recent [philosophers¹⁷, *hoi neōteroi*] are tend to call what is prior in

16. Simplicius, *Simplicii in Aristotelis Categorias Commentarium* (CAG 8), ed. Karl Kalbfleisch (Berlin: Akademie der Wissenschaften, 1907) 419, l.20–20, l.5.

17. Gaskin says that οἱ νεώτεροι is “probably” referring to the Stoics. Simplicius, *On Aristotle’s “Categories, 9–15,”* trans. Richard Gaskin (Ithaca: Cornell University Press, 2000), 258. This is plausible. Michael Frede notes that ἐπιφορά “is the Stoic term, which corresponds to the Peripatetic συμπέρασμα.” Michael Frede, *Die Stoische Logik* (Göttingen: Vandenhoeck & Ruprecht, 1974), 118, n.2 (from original German). It may be that *sunepipheron* is a terminological innovation of Aristotle’s commentators when they began

this way “what is implied but does not imply, and removes but is not removed.”

...

In this way it is shown that genus is, by nature, prior to species because it [genus] is what removes [species] but is not removed [by species], and it is what is implied (*sunepipheromenon*) [by species] but does not imply (*sunepipheron*) [species]. For animal being removed removes human, but human being removed does not remove animal, and regarding following in existence, human does not coexist with or coimply animal, nor does animal coexist with or coimply human.

In Alfarabi’s discussion of Galen’s view, it seems that the Greek *sunanhaireitai* corresponds to Alfarabi’s *irtifā’* or “removal,” and the Greek *sunepipheretai* corresponds to Alfarabi’s *luzūm al-wuǧūd*. Alfarabi’s objection to Galen, then, is based on the logical concepts of

to adapt and mix Stoic and Peripatetic terminology. Nevertheless, the idea of implication and cancellation used in the sense they have in L2 recalls another passage in Aristotle’s *Categories*. The idea of cancellation as it is used here appears to derive from an earlier passage in Aristotle’s *Categories*, on “relatives (τὰ πρὸς τι).” At *Cat.* 7^b15–22, Aristotle observes that “it is clear that by nature relatives come to be together (Δοκεῖ δὲ τὰ πρὸς τι ἅμα τῇ φύσει εἶναι),” using the relation between master (δεσπότης) and slave (δοῦλος) to illustrate his point. Aristotle says: “there being the master, the slave is, and there being the slave, the master is. Other cases are like this. And this one cancels (συναναιρεῖ) the other, for there being no double, there is no half, and there being no half, there is no double.” Thus, what seems likely is that οἱ νεώτεροι refers to some of Aristotle’s Platonist commentators who synthesised these different parts of the *Categories* into an account of a type of following (ἀκολουθία) that exists between terms.

removal and following in existence. Though these terms appear in Aristotle's *Categories*, the somewhat formulaic manner in which we find them being used by Alfarabi and Simplicius in the form of conditional sentences likely represents a later stage of development, a result of a synthesis carried out by Aristotle's commentators and adopted by Alfarabi in his critique of Galen. For Alfarabi the logical form of Galen's premise (A) is therefore:

(I) if X, Y ;

and the logical form of (B) is:

(II) if $\neg X, \neg Y$.

According to Alfarabi, it was common to use the fact that (I) and (II) are true to conclude that X causes (*sabab li-*) Y . And Galen is one of the thinkers who uses this form of argument.¹⁸

على مثال ما يرى جالينوس الطبيب يستعمل ذلك كثيرا في ما يشاهده في أعضاء الإنسان بالتشريح فيجعله أسبابا لأشياء آخر لم يشاهدها بأن يستعمل هذا الموضوع مثل قوله إذا قطعنا العصب الفلاني، بطل الصوت أو الحركة أو الحس. فإذا وجد ذلك العصب هو سبب لوجود الصوت أو الحركة أو الحس.

[L3] For instance, Galen appears to have used [this kind of argument] frequently in what he observes about the human body when he is dissecting. He makes something a cause for other things he has not observed by employing this topos. For example, he says “when we sever a certain nerve, voice, motion and sensation are impaired. Therefore, the nerves are the cause of speech, motion and sensation.”

Later in the passage, Alfarabi explains why he believes that Galen's claim that (A) and (B)

18. Alfarabi, *al-Manṭiq ‘inda l-Fārābī*, ed. Rafīq al-‘Aḡam (Beirut: Dār al-mašriq, 1985), 1:103–4. Hereafter, citations from this work appear as follows: Alfarabi, *On Topical Analysis*.

together demonstrate that voice, sensation and voluntary motion originate in the brain is false.¹⁹

فنفول نحن الآن أمّا أنّ السبب الذي هو بالفعل ودائمًا سبب لشيء ما يلحقه ضرورة أن يكون إذا ارتفع، ارتفع الشيء وإذا وجد، وجد الشيء فذلك بيّن. وأمّا أن يكون كلّ ما إذا ارتفع، رفع الشيء وإذا وجد، وجد الشيء سببًا لذلك الشيء فليس يصحّ من قبل أنّه ليس يجب عن هذا شيء أكثر من أنّهما يتكافآن في لزوم الوجود. وذلك يتبيّن بمقابل ارتفاع الشيء وهو وجوده لزم من ذلك وجود الأمر. وقد كنّا وضعنا أنّ الأمر إذا وجد، وجد الشيء فيكون الأمر والشيء أي واحد منهما وجد وجد الآخر، فيكونان متكافئين في لزوم الوجود وليس يلزم ضرورة أن يكون أحدهما سببًا لوجود الآخر.

[L4] What we say now is that it is a necessary feature of the cause that it is actually and perpetually causing *E* [namely, its effect; literally, “the thing (*aš-šay*)”], and that when it is removed, *E* is removed, and if it exists, *E* exists. This is obvious. However, for every *X* such that when *X* is removed *Y* is removed and when *X* exists *Y* exists, it is *not* the case that *X* is the cause of *Y*. For the only fact that is necessary about them is that they follow each other in existence reciprocally (*yatakāfa’āni fī luzūmi l-wuġūdi*). This is made evident when the removal of *X* is in the antecedent and the removal of *Y* is in the consequent. If we assert the opposite of the removal of *Y*, this yields the opposite of the removal of *X*, which is that *X* exists, whereas we had already hypothesized that if *X* exists, *Y* exists. So whichever of *X* or *Y* exists, the other exists too. So they follow each other in existence reciprocally. But it is not necessarily the case that one is the cause of the other.

According to Alfarabi, Galen’s argument in *On the Doctrines of Hippocrates and Plato*, Books One and Two only allows us to identify phenomena that always coexist in time.

19. Alfarabi, *On Topical Analysis*, 106.

However, mere perpetual coexistence does not warrant the conclusion that one of the phenomena is *responsible for* or *causes* the other. Once again, Alfarabi is drawing in part on Aristotle's *Categories* and in part on some commentary source. In his discussion of the category "simultaneous (*hama*)," Aristotle identifies things that are "simultaneous in nature," which are "what reciprocate in relation to following in existence but never does one cause the other to exist (ὅσα ἀντιστρέφει μὲν κατὰ τὴν τοῦ εἶναι ἀκολούθησιν, μηδαμῶς δὲ αἴτιον θάτερον θατέρω τοῦ εἶναι ἐστίν)." Aristotle cites double and half as examples. The existence of each one entails the existence of the other, but neither causes the other. And Simplicius adds: "[For] the double and half always imply (*suneisagei*) and cancel (*sunhanairai*) one another, and neither is the cause of the other (γὰρ συνεισάγει καὶ συναναιρεῖ ἀεὶ ἄλληλα τὸ διπλάσιον καὶ τὸ ἥμισυ, καὶ οὐδέτερον θατέρω αἰτιόν ἐστι)." ²⁰

For Alfarabi, then, Galen's argument is not a demonstration because it is not impossible that (I) and (II) are true and the conclusion (C) "X causes Y" is false: it is possible that that Y causes X, or that neither X nor Y causes the other.

Thus, aside from his opinions about Galen's medical method, it is important to realise that Alfarabi believes that Galen has a generic method for inferring that X causes Y based on connections that are observed to *always exist* between X and Y, where X and Y may be anatomical parts or activities in the body, drugs and foodstuffs, or elements of medical treatment. Based on Aristotle and Platonist commentators, Alfarabi's objection is that the observations that Galen makes during a vivisection, for example, only yield knowledge about the concurrence of events. We might observe that phenomenon B always follows on phenomenon A, or that B is absent whenever A is. But when we are trying to come to a conclusion about whether A causes B, or B causes A, or neither, the value of this data about mere coincidence in existence is small.

The problem in Galen's anatomy, it seems, is the same as in the case of qualified

20. Simplicius, *On Aristotle's "Categories, 9–15,"* 424, ll.23–5 [p. 172]. Translation is Gaskin's.

experience in Galen's pharmacology. In relation to the question of whether X causes Y or Y causes X , the value of the observations of connections that perpetually and reliably exist between X and Y are lessened by the presence of *ambiguating conditions* in the observation. The *necessary* conditions for sensation (S) to exist in the body are a sound brain (B), nerves (N) connecting the brain to the rest of the body, and other factors f_1, \dots, f_n . All together N , B , and f_1, \dots, f_n constitute the *necessary* and *sufficient* conditions for S . This observation may be given the form of the conditional:

(III) if $N \& B \& f_1, \dots, f_n$ S .

(III) asserts that under all conditions if the nerves, brain and other background factors are present in the body, sensation will exist in the animal. In addition, since N , B and f_1, \dots, f_n are necessary conditions, the elimination of any one of them will eliminate S . For example, say that the nerves are damaged or severed. Sensation, then will be eliminated. This fact may also be expressed in a conditional:

(IV) if $(\neg N) \& B \& f_1, \dots, f_n (\neg S)$.

(IV) means that under all conditions if the nerves are severed or damaged but the brain and other factors are left intact, sensation will be eliminated. Alfarabi asks us to consider whether it is really safe to conclude from (III) and (IV) that B is *responsible* for the existence of S . In other words, does the fact that S and B coincide as two phenomena that follow each other in existence reciprocally authorize the assignment of responsibility to the brain, the nerves or to some other factors? What is more, Galen cites (IV) if $(\neg N) \& B \& f_1, \dots, f_n (\neg S)$ as proof that B is responsible for S , whereas it is obvious that N and f_1, \dots, f_n are equally responsible for S . In addition, it is only through the *combination* of N , B and f_1, \dots, f_n that the connection with S holds. So in Alfarabi's way of thinking (IV) does not establish that B is responsible for or the origin of S , but only that N , B and f_1, \dots, f_n together are responsible for S , without implying that B is any more responsible for S than N or f_1, \dots, f_n . Galen's argument according to Alfarabi only identifies certain conditions that always coexist. However, the observation that certain phenomena always coexist is not enough to

identify which of the phenomema is the origin of or bears ultimate responsibility for these activities in the body.

4. “Qualified Experience” in the Arabic Commentators on the Hippocratic *Aphorisms*

Alfarabi criticizes a method Galen employs in his anatomical works to discover where ultimate responsibility for activities in the body lies. Alfarabi says that Galen’s method does not yield conclusions that follow necessarily from the premises derived from experience, which in *On the Doctrines of Hippocrates and Plato*, Books *One* and *Two* is derived from dissection. The basis of Alfarabi’s criticism lies in the fact that certain ambiguating conditions in which the observations are made will inevitably undermine the evidentiary value of these observations in relation to the conclusion that is being sought. Despite the fact that Alfarabi directs his criticism at Galen’s anatomy, it is noteworthy that Alfarabi sees this criticism as valid in any situation in which we seek to identify that *X* causes *Y* based on repeated observations about predictable connections that exist (or do not exist) between *X* and *Y*.

Galen seems to have formulated the method of qualified experience in order to address this very problem. However, from his extant writings, it is not clear how Galen thought qualified experience should be used to ensure that the observations of particular instances do, in fact, prove the sought after conclusion about the power of a drug. Nor is it clear how Galen’s method of qualified experience might be taken outside pharmacology and introduced into other fields of medicine in which making statements about causes is based on empirical evidence. For hints about how to do both of these, we may turn to some of the Arabic commentators on the Hippocratic *Aphorisms*.

In their comments on the first aphorism, it is clear that post-classical Arabic commentators were aware of the different senses of “experience” that Galen used in his writings. In addition to qualified experience, Philip van der Eijk has also identified a

generic or unqualified type of experience, which in Galen is much more common.²¹ Unlike qualified experience, which seeks to increase the value of observations by modifying experimental conditions, this more common class of experience is used to test or determine (*dihorizein* or *dihorisasthai*, but also *dokimizein* = *imtaḥana*) the validity of a “statement, or claim, an issue, idea or notion.”²² For example, the statement that all olive oil irritates the eyes must be tested or validated *by means of experience*. In their comments on the statement that “determination is difficult and experience dangerous,” Arabic commentators on the *Aphorisms* invariably mention this type of experience, which they say is used as an instrument for testing universal statements. Thus, Ibn Abī Sādiq (d. after 1067), one of the earliest and most influential commentators on the Hippocratic *Aphorisms*, says:²³

وأما الخطر في التجربة، فإنَّ التجربة على وجهين. أحدهما اعتبار ما علم من القوانين الكلّية في المشاهدات الجزئية. وهذا يحتاج إليه كل واحد، وليس فيه خطر. والآخر امتحان الشيء من غير قياس يؤدّي إليه ولا صادر عن أصل وقانون. ومن البين أنّ هذا النوع من التجربة غير موثوق به، ولذلك هو خطر، كما يدلّ عليه الاستقراء. فإنّ من لا يعرف قوانين الكلام فهو إذا تعاطى علم التوحيد، فهو إلى أن يضلّ، فيضلّ أقرب منه إلى أن يصيب ويرشد. ومن جهل قوانين النحو واستعمل الإعراب في كلامه، كان الذي يخطئ فيه أكثر ممّا يصيب. ومن غني عن القوانين الطبيّة ثمّ شرع في تدبير المرضى، كان ما يفسده أكثر ممّا يصلحه. وهذا النوع هو الذي عناه لا غير.

[L5] In relation to the danger that is in experience, “experience” has two senses. The first is learning through experience what is known

21. van der Eijk, “Galen’s Use of Qualified Experience,” 282–3.

22. Ibid.

23. Ibn Abī Sādiq, *Šarḥ fuṣūl Abuqrāt*, ed. ARABCOMMAPH (The University of Manchester, 2012–2017), doi: ab.1234/ref:cdef/5678; Istanbul, Beyazid Devlet Kütüphanesi, ms. Veliyeddin Efendi 2508, fol. 2b, ll.2–11.

from universal principles in particular observations. Everyone needs this experience, and there is no danger in it. The other [sense of experience] is testing something [for example, a compound drug concoction] without a process of reasoning (*qiyās*) that leads to it, nor does it [the compound drug concoction] proceed from a foundation or rule. It is clear that this type of experience is unreliable, for which reason it is dangerous, as induction (*al-istiqrā'*) indicates. For whoever does not know the rules of Islamic scholastic theology (*qawānīna l-kalām*) yet busies himself with the science of oneness [namely, theology] is more likely to go astray than to hit the mark and be guided. Whoever is ignorant of the principles of grammar but uses case-endings in his speech is more likely to make errors than to speak correctly. Whoever dispenses with medical rules and then begins to treat patients does more harm than good. This is the kind [of experience] that [Hippocrates] is speaking about.

Ibn Abī Šādiq's comments are indebted to Galen. He affirms that the Galenic synthesis of experience (*al-tağriba*) and reason (*al-qiyās*) is reliable and safe for use on patients, and even that it is the kind of experience that Hippocrates himself would have favoured. Ibn Abī Šādiq also singles out how Galen's empiricist opponents used experience in a way that Hippocrates regards as a "danger (*ḥaṭar*)."¹ In the first kind of experience, there is knowledge about a universal statement, which is verified by experience derived from observation of particular instances. Thus, knowledge that the universal "all olive oil irritates the eyes" is verified by repeatedly observing that olive oil irritates people's eyes. The second type of experience discussed by Ibn Abī Šādiq is not connected with the task of verifying universal statements or principles. Experience in this sense is testing out a drug on a patient in order to bring about some effect. In this case, the (empiricist) physician acts on previous experience alone without recourse to the principles of medical theory. Since the empiricist physician does not make use of reason when he treats

patients, his knowledge of a limited number of cases does not adequately equip him to deal with cases the particulars of which he has never come across before. According to Ibn Abī Ṣādiq, ignorance of the principles of medicine is what makes the empiricist physician's treatment dangerous, since he tests a drug without knowing what the effects of it on the patient will be.

It is possible to read Ibn Abī Ṣādiq's and Galen's comments on the meaning of "experience" in their commentaries on the Hippocratic *Aphorisms* as being directed exclusively against empiricist physicians. On this interpretation, experience plays the *negative* role of falsifying hypotheses about the properties of drugs, foodstuffs, and therapies more generally. Galen's comments in L₁ about the difficulty of experience in relation to gaining knowledge about the causes and effects of drugs on the body, however, point to another sense of experience, one that is closely tied to Galen's idea of qualified experience. In this case, when experience is disconnected from the task of falsifying universal statements, it may play a *positive* or *productive* role in the inductive process of generating universal principles. Ibn Abī Ṣādiq appears not to assign experience this role. Yet, several important Arabic commentators do. For example, 'Abd al-Laṭīf al-Baġdādī (d. 1231), who was a prodigious writer in both medicine and philosophy and a strident critic of Avicenna,²⁴ says:²⁵

وقوله "والتجربة خطر،" أي غرر وإقدام بالفعل على غير بصيرة ولا ثقة. وإنما يستعمل هذه اللفظة، أعني الخطر، في شيء شريف خطير يقدم على مزاولته من غير ثقة بسلامته. وبدن الإنسان ممّا هو شريف. فالإقدام على معالجته بالتجربة من غير ثقة بسلامة العاقبة خطر. والطبيب يعالج المريض ليبرئ لا ليحرب. فإنّ التجربة تكرير الإحساس في شيء لتثق النفس أنّ فعله وانفعاله منسوب إليه لذاته، لا واقع على طريق الاتفاق. والمجرب متعلم، فإذا كنّا أبدأً مجربين، فيا ليت شعري، متى نكون مداوين.

24. Ullmann, *Medizin*, 171.

25. 'Abd al-Laṭīf al-Baġdādī, *Šarḥ al-fuṣūl*, ed. Sherif Masry (The University of Manchester, 2012–2017), doi: ab.1234/ref:cdef/5678.

[L6] “There is danger in experience,” that is to say, uncertainty (*ġarar*) and rushing into an action without discernment or confidence. He [Hippocrates] employs this word, that is “danger,” for something that is noble and important which one rushes to do without having any confidence that it will be safe. The human body is something noble. Therefore, rushing to treat it based [only] on experience without confidence that the outcome will be safe is dangerous. The physician treats the patient in order to cure him, not to experiment. Experience is making repeated observations of *X* [lit. “the thing (*aš-šay*)”] so that the soul is confident that the activity and passivity (*infī‘āl*) that is associated with *X* is essential to *X*, and is not associated with *X* by chance. The person who is trying [therapies] out is learning, so if we are always trying [therapies] out, then I would like to know when we shall use them.

Al-Baġdādī also associates experience with uncertainty and doubt about the effects of a particular therapy on the patient. Recalling Galen’s use of qualified experience in order to distinguish a drug’s essential from its accidental effects, al-Baġdādī says that experience is the act of making *repeated observations* of something (*tikrāru l-iḥsāsi fī šay’in*) so that the person acquires reliable knowledge that the characteristics or properties that we observe in the drug belong to the drug essentially (*li-dātihi*) rather than by chance (*lā ‘an ṭarīqi l-ittifāqi*).

The most explicit reference to the Galenic notion of experience as the conscious manipulation of the observational conditions under which a drug or foodstuff is administered to the patient appears in a commentary attributed to Ibn al-Nafīs (d. 1288).

والتجربة هي امتحان ما يؤثّر الشيء في البدن بإيراده عليه. وذلك على قسمين. أحدها امتحان ما اقتضاه القياس كما إذا دلّ القياس على برودة الكافور، فأردنا امتحان ذلك. وثانيهما امتحان الشيء من غير قياس. ولا شك أنّ الخطر في القسم الثاني أعظم.

وأما أن "القضاء عسر"، والقضاء هو الحكم، فقيل: "أراد الحكم على المريض بما يؤول إليه حاله من صحّة أو عطب." ولا شكّ في عسر ذلك. وقيل: "أراد الحكم بموجب التجربة." وذلك عسر أيضاً لأنّ التجربة إنّما يوثق بها إذا كانت على بدن إنسان وكان الوارد خالياً عن كلّ كَيْفِيَّةٍ غريبة، واستعمل في علل متضادّة وبسيطة بما قوّته مقارنة لقوّة العلة. وكان فعله أولاً ودائماً أو أكثرياً. ولا شكّ إنّما توقف على ذلك، فهو عسر، وخصوصاً إذا كنّا اتسعملنا صنوفاً من المعالجة كالقصد والاستفراغ وسقي أدوية، فحصل النفع فإنّنا لا ندري عن أيّها حصل.²⁶

[L7] Experience is testing what effect something has on the body by applying it to [the body]. This is of two types. One is [A] testing what syllogism entails, such as when syllogism indicates that camphor is cold, and we want to test that. The second is testing something without syllogism. Obviously, the danger is greater in the second type.

As for "the determination is difficult"—"determination" means making a judgment—some say that [Hippocrates] meant making a judgment about whether the patient's condition will end in health or destruction. The difficulty of this is obvious. Others say that he meant making a judgment [B] in accordance with what experience dictates. This is difficult, too, because experience is reliable when it is about the human body only, the drug (*al-wārid*) is free of any extrinsic quality, and when it [the drug] is used in simple diseases

26. Ibn al-Nafīs, *Šarḥ al-fuṣūl li-Abuqrāṭ*, ed. Sherif Masry (The University of Manchester, 2012–2017), doi: ab.1234/ref:cdef/5678; MS, Oxford, Bodleian Library, Pococke 294, fols. 4b, l.12–5a, l.10. For questions about authorship, see Emilie Savage-Smith, *A New Catalogue of Arabic Manuscripts in the Bodleian Library, University of Oxford Volume 1: Medicine* (Oxford: Oxford University Press, 2011), 18 [Entry No. 6].

that are opposite to it [the drug in quality] such that [the drug's] strength is close to the disease's strength, and when [the drug's] action is primary and persistent, or for the most part. Doubtless, anything that requires such conditions is difficult, especially when we use different kinds of therapy [at once], for example blood-letting, purging, and drugs. If, after applying [this combination of therapies] a benefit results, we do not know from which treatment the benefit was derived.

In this passage, Ibn al-Nafīs lists several different senses that “experience (*tağriba*)” has, the most relevant of which here are senses A and B. Sense A corresponds to the unqualified or simple experience that Galen prescribes for falsifying universal statements that have been inferred from first principles by a process of *sylogistic* logic. Sense B on the other hand appears in a passage that seems to expand on Galen's comments in L1. Similar to Galen, Ibn al-Nafīs points out that the difficulty in B-type experience involves the reliability (*tiqa*) of the experience. Like Galen too, he offers an example of compound therapies that makes it impossible to tell which therapy was principally responsible for the benefit to the patient. He lists several of what we can call “ambiguating” conditions the presence or absence of which affects the evidentiary value of the observations. He mentions four conditions, all of which focus on the drug's properties, and many of which are based on Avicenna's comments on observing the powers of drugs from *Canon 2* (see the Appendix). He says that in order for observations to give insight into the real pharmacological effects, the drug should be “free of any impure quality (*ḥāliyan ‘an kulli kayfiyatin ġaribatīn*).”²⁷ This suggests that the drug should be a simple drug and as pure as possible without compounding it with another drug or foodstuff. He recommends that the nature and strength of the drug accords with the nature and strength of the disease that it

27. See Condition 1 and 2 in the Appendix.

is being used to treat.²⁸ He also recommends that the pharmacological activity of the drug whose effects are being observed be associated with it in a primary way (*awwalan*). The idea here seems to be that observations of a drug's effects that are secondary or that cannot be directly attributed to the power of the drug are of little use in discovering the drug's essential therapeutic effects.²⁹ Lastly, he recommends making observations with drugs whose effects always come about (*dā'imān*), that is under all conditions, or at least

28. See Condition 4 in the Appendix.

29. See Condition 3 in the Appendix.

under most conditions (*aktarīyan*³⁰).³¹ Ibn al-Nafīs seems to have in mind that observations of a drug’s effects that rely on times of the year, or certain conditions in the body, or certain age-groups do not have evidentiary value if these conditions are not taken into account (for example, the true effects of a hot drug administered in cold weather or even in a cold climate will affect the effect of the drug on the patient, and thus the observations’ value to the physician).

The second important observation has to do with how in L7 I translate the term

30. This phrase is probably another importation of Aristotelian scientific jargon into medical discourse. It is used prominently in the *Metaphysics* and the *Posterior Analytics* to characterise what kind of object scientific knowledge is about. The Greek expression is ὡς ἐπὶ τὸ πολὺ, which is translated into Arabic variously as, for example, *fī aktari l-amri* or *‘alā l-amri l-aktari*. See, for example, Michael Winter, “Aristotle, hōs epi to polu Relations, and a Demonstrative Science of Ethics,” *Phronesis* 42 (1997): 163–89. Thus, *Posterior Analytics* 2.12 (96^a17–9): “There will be immediate first principles also in the case of what holds *for the most part* (*fa-takūnu idani l-mabādi’u ġayra dawāti awsāṭin li-l-ašyā’i llatī fī aktari l-amri*=ἔσσονται τοίνυν καὶ τῶν ὡς ἐπὶ τὸ πολὺ ἀρχαὶ ἄμεσοι, ὅσα ὡς ἐπὶ τὸ πολὺ οὕτως ἔστιν ἢ γίνεται).” Greek text: William D. Ross, *Aristotle’s Prior and Posterior Analytics* (Oxford: Clarendon Press, 1949); Arabic text: ‘Abd al-Raḥmān Badawī, *Manṭiq Aristū* (Cairo: Maṭba‘at Dār al-kutub al-miṣrīya, 1948), 2:461. Likewise, *Posterior Analytics* 1.30 (87^b19–22): “There is no knowledge (*epistēmē*, *ilm*) through demonstration of what holds by chance (*tuchēs*, *bi-l-ittifāq*). For what holds by chance is neither necessary nor does it hold *for the most part* (*fā-ammā š-šay’u lladī ‘ani l-ittifāqi fa-lā ‘ilma bihi bi-l-burhāni id kāna l-amru lladī bi-l-ittifāqi laysa huwa ḍarūrīyan wa-lā ‘alā aktari l-amri*=Τοῦ δ’ ἀπὸ τύχης οὐκ ἔστιν ἐπιστήμη δι’ ἀποδείξεως. οὕτε γὰρ ὡς ἀναγκαῖον οὐθ’ ὡς ἐπὶ τὸ πολὺ τὸ ἀπὸ τύχης ἔστιν).” Greek text: Ross, *Aristotle’s Analytics*; Arabic text: Badawī, *Manṭiq Aristū*, 2:417.

31. See Condition 6 in the Appendix.

“*qiyās*” with the technical, Aristotelian term “syllogism” rather than the more generic term “reason” or “reasoning process.” In the early Arabic medical tradition, *qiyās* was often used to render the Greek *logos* and its cognates.³² In the Arabic philosophical tradition, *qiyās* is used to render the Greek *sullogismos* and its cognates.³³ Early Arabic medical authors and philosophers were careful to distinguish between these distinct uses of *qiyās*,³⁴ one to pick out a generic mental activity of reasoning, the other the specific sense of *qiyās* as an Aristotelian syllogism. By the end of the thirteenth century at the latest, it appears that in *medical* discourse *qiyās* frequently came to refer to the *syllogism* rather than reasoning in an unqualified sense. The evidence for this is in L10 by Ibn al-Quff (d. 1286) below. In addition, in the same commentary on the *Aphorisms* preserved in Oxford, Bodleian, MS Pococke 294 from which L7 is taken, Ibn al-Nafīs (d. 1288) follows Galen-Ḥunayn in using *qiyās* as a gloss for *al-qaḍā’*. However, in the following passage, Ibn al-Nafīs speaks about *qiyās* in the context of the “science of logic (*ilm al-mantiq*)” as logic was famously referred to after Avicenna in the Arabic tradition:³⁵

وقيل: أراد بالقضاء القياس لأنَّ القياس يلزمه الحكم بموجبه فأطلق اسم اللازم على الملزوم. ولا خفاء بعسر معرفة صحيح القياس من فاسده. ولو سهل التمييز بينهما لما خالف العلماء ولا ناقض أحدهم نفسه. ونقول: العلم الذي يميز بين صحيح القياس وفاسده هو المنطق، فلا بد للطبيب القائن من معرفة المنطق.

32. See L1 above; Manfred Ullmann, *Wörterbuch zu den griechisch-arabischen Übersetzungen des 9. Jahrhunderts* [WGAÜ] (Wiesbaden: Harrassowitz Verlag, 2002), 397: for example, *ba‘ḍuhu mina t-taġāribi wa-ba‘ḍuhu mina l-qiyāsi=ta men ek tēs peiras, ta d’ ek tou logou*).

33. See Ullmann, WGAÜ, 650–1.

34. See Avicenna in Appendix; Ibn Abī Šādiq in L5 above.

35. Ibn al-Nafīs, *Šarḥ fuṣūl Abuqrāt*, ed. Sherif Masry (The University of Manchester, 2012–2017), doi: ab.1234/ref:cdef/5678; MS, Oxford, Bodleian Library, Pococke 294, fol. 6a, ll.10–13.

[L8] It has been said: “By “determination (*al-qaḍā'*)” he [Hippocrates] meant the syllogism (*al-qiyās*).” For the syllogism entails the judgment by necessitating it. Hence, the name of what is entailed (*al-lāzim*, the judgment that is inferred; the conclusion of the syllogism) is given to what entails (*al-malzūm*) it. There is nothing concealing the fact that knowing what syllogism is sound and unsound is difficult. For if distinguishing between them were easy, scholars would never disagree with each other, nor would one of them contradict himself. We [Ibn al-Nafis] say: “The science that distinguishes the sound syllogism from the unsound syllogism is logic. Thus, the physician who uses reason must know logic (*fa-lā budda li-ṭ-ṭabībi l-qā'isi min ma'rifati l-manṭiq*).”

Thus, where Ibn Abī Ṣādiq, Avicenna and other physicians before the 12th-century use *qiyās* to speak about a generic reasoning activity or process of inferring conclusions from principles, by the 13th-century *qiyās* is being regularly used in *medical* discourse with the meaning that it had in Arabic *philosophical* discourse since 9th-century.

We may conclude, then, that Ibn al-Nafis and 'Abd al-Laṭīf al-Baġdādī focus on experience as a *task* or *activity* undertaken by the observer in order to establish a causal and essential connection between a drug or type of therapy and its therapeutic effect. According to these thinkers, this task involves (1) repeated observations in which (2) the conditions under which the observations takes place are carefully adjusted to endow them with (3) evidentiary value; meaning that, taken together, the observations are a *demonstration* or *proof* that the drug's or therapy's effect is essential to it rather than accidental. As a matter of fact, the underlying logic of this procedure is nearly identical to the anatomical method Alfarabi attributes to Galen for finding the parts of the body that are responsible for activities in the body. For example, under conditions c_1, \dots, c_3 we are testing whether scammony (call it *S*) (the presence of scammony is also considered a condition) purges yellow bile (call this *P*). The initial observations may be put into the

form of a conditional proposition:

$$O^1: \text{if } S \text{ and } c_1 \text{ and } c_2 \text{ and } c_3, P.$$

O^1 means something like: when it is always the case that if scammony is given to a patient under these three conditions, yellow bile is purged. There is little evidentiary value in this first observation since it is not clear whether the therapeutic effect of purging is due to scammony alone, to one of the conditions, or to scammony in combination with one or more of the conditions. Thus, in the second observation O^2 we make sure to eliminate the ambiguating condition c_1 . If P still comes about we know that c_1 is irrelevant to generating P in the patient. The observation will thus have the form:

$$O^2: \text{if } S \ \& \ (\neg c_1) \ \& \ c_2 \ \& \ c_3, P.$$

O^2 means something like: when it is always the case that if scammony is given to a patient under possibly ambiguating conditions c_2 and c_3 , but condition c_1 is eliminated, purging in the patient results. The observations will be repeated two more times, where in each an ambiguating condition is eliminated. Observation O^4 looks like this:

$$O^4: \text{if } S \ \& \ (\neg c_1) \ \& \ (\neg c_2) \ \& \ (\neg c_3), P.$$

O^4 means something like: when it is always the case that if scammony is given to a patient and all ambiguating conditions c_1, \dots, c_3 have been eliminated, purging in the patient results. O^4 has strong evidentiary value. The final observation, O^5 , acts as a control for observations O^1, \dots, O^4 :

$$O^5: \text{if } (\neg S) \ \& \ (\neg c_1) \ \& \ (\neg c_2) \ \& \ (\neg c_3), (\neg P).$$

O^5 means something like: when it is always the case that if the patient is not administered any drug and all other conditions are in balance, the patient does not experience purging. For Galen as well as the Arabic commentators on the *Aphorisms* who speak about a generic empirical method for discovering causes, $O^1 \dots O^5$ count as a *demonstration* that responsibility for the purging effect experienced by the patient lies in the particular pharmacological properties of scammony *alone*, and is not a consequence of

environmental conditions, time of the year, the temperament of the patient, his age, the strength of the concoction, impurities in the scammony, or any other ambiguating factors. $O^1...O^5$ is a proof of the pharmacological principle: “Scammony causes purging of yellow bile.”

5. Senses of Experience in Later *Aphorisms* Commentators from Avicenna’s Philosophical Writings: Synthesising Galen and Aristotle

Alfarabi’s charge against Galen is that his anatomical method and his pharmacological method are not equipped to yield reliable knowledge about causes. He would argue, in effect, that $O^1...O^5$ do not yield necessary knowledge that scammony is the *reason for* purging, but only knowledge that purging always follows taking scammony and that, all other conditions being in balance, purging does not occur if the patient does not take scammony. According to this line of reasoning, these are simply temporal conjunctions that do not give insight into which of P or S is responsible for the other.

I believe that Galen’s response to Alfarabi’s criticism would have been: “So what?” In his critique, Alfarabi assumes that Galen’s method will only yield *reliable* or *necessary* knowledge about causal relations or relations of responsibility between X and Y if the conclusion that (C) “ X causes Y ” follows with *logical necessity* from the premises that (i) “if X , Y ” and (ii) “if $(\neg X)$, $(\neg Y)$.” I mean the following. He reduces the *form* of Galen’s argument in *On the Doctrines of Hippocrates and Plato*, Books One and Two into the argument that C follows necessarily from i and ii . Alfarabi assumes that Galen’s position can be refuted if it can be shown that the truth of C does not follow necessarily from the assumption that i and ii are true. He then produces a counter-example of Galen’s argument, in which the premises are true but the conclusion is false, for example, “it is day” could be substituted for X and “the sun is up” for Y so that that the premises of the argument are: (i') “if it is day, the sun is up,” and (ii') “if it is not day, the sun is not up.” i' and ii' are clearly true, but (C') “the fact that it is day is the cause of (or an explanation for) the fact that the sun is up” is clearly false. Alfarabi takes the fact that Galen’s argument is logically invalid (i.e. there are substitution-instances for X and Y such that the premises i and ii are true but C is false) as

a genuine critique of Galen's argument against Aristotle. According to Alfarabi, Galen's empirical method does not yield necessary knowledge about the cause because the statement "X causes Y" does not follow with logical necessity from the premises *i* and *ii*. Therefore, on this account, Galen's method should be dispensed with.

In the discussion of experience and reasoning as the two methods for discovering the pharmacological properties of simple drugs in *Canon 2*, Avicenna also seems sceptical about the value of experience (and reasoning) as a guide to gaining *necessary* and *certain* knowledge about the effects that drugs bring about in the body. His reasons, however, are not Alfarabi's. Avicenna does not fault experience for its failure to conform to the conditions of deductive logic. Instead, he appears to believe that there are ineliminable limitations on the ability of qualified experience to eliminate every ambiguating factor and bring to light a drug's essential pharmacological effects. We might recall that Avicenna says that in the process of determining a drug's pharmacological effects, the physician must take care to observe the time (*zamān*) in which the drug's effect appear to him (Condition 5 in Appendix).³⁶

والخامس أن يراعى الزمان الذي يظهر فيه أثره وفعله . فإن كان مع أول استعماله أقنع أنه يفعل ذلك بالذات . وإن كان أول ما يظهر منه فعل مضاد لما يظهر أخيرا أو يكون في أول الأمر لا يظهر منه فعل ثم في آخر الأمر يظهر منه فعل فهو موضع اشتباه وإشكال عسى أن يكون قد فعل بالعرض كأنه فعل أولا فعلا خفيا تبعه بالعرض هذا الفعل الأخير الظاهر . وهذا الإشكال والاشتباه في قوة الدواء والحسد أن فعله إنما كان بالعرض لقد يقوى إذا كان الفعل إنما ظهر منه بعد مفارقة العضو . فإنه لو كان يفعل بذاته فعل وهو ملاق للعضو ، ولاستحال أن يقصر وهو ملاق ويفعل وهو مفارق . وهذا هو حكم أكثرى مقنع . وربما اتفق أن يكون بعض الأجسام يفعل فعله الذي بالذات بعد فعله الذي بالعرض . وذلك إذا كان اكتسب قوة غريبة تغلب الطبيعية مثل الماء الحار ، فإنه في الحال يسخن وأما من اليوم الثاني أو الوقت الثاني الذي يزول فيه تأثيره العرضي فإنه يحدث في البدن بردا لا محالة لاستحالة الأجزاء المستعقبة منه إلى الحالة الطبيعية من البرد

36. Avicenna, *al-Qānūn*, 1:225, ll.17-27.

[L9] The fifth [condition, sc. *ṣart*] is that one observe the time in which the drug's effect and activity appear. If they appear directly after the drug is given, it is convincing that this [effect and activity] occurs essentially (*bi-d-dāt*). If what appears first is an activity that is opposite to what appears last, or no activity appears at first but then the activity appears last, this then will be a source of ambiguity and suspicion that it may be that the activity the drug has is accidental (*bi-l-ʿaraḍ*), as if the drug first had a subtle [essential] effect, which is then followed accidentally by this later, obvious effect. This suspicion and ambiguity about drug's power and the surmise (*al-ḥads*³⁷) that the drug's activity is accidental is strong when the [drug's] activity appears after departing from the body part (*al-ʿuḍw*). For if the drug were to act essentially, it would act whilst it was in contact the body part, and it would be impossible for it to remain ineffective whilst it was in contact with the body part but to act whilst it departs from the body part. This is a judgment that holds for the most part and is convincing.

37. Avicenna is using *ḥads* with its lexical meaning, not in the technical sense he assigns it in his psychology and epistemology, in which the philosopher's powerful intellect spontaneously *hits on* the middle term of demonstrative syllogism. See Dimitri Gutas, "The Empiricism of Avicenna," *Oriens* 40 (2012): 392–436, 400. Nevertheless, Gutas notes that the one of the types of proposition in Avicenna's logic is what Gutas calls "data provided by finding the middle term of a syllogism" which corresponds to Avicenna's term "*ḥadsyāt*." Gutas says that these are propositions that are "based on experience."

However, it sometimes happens that some bodies act essentially after they act accidentally. This happens when they acquire a power that is extrinsic to them that overwhelms the drug's natural power, as is the case of hot water. For in that state, [water] heats, but the next day or the next moment in which the accidental effect has dissipated, water ineluctably brings about a cold [quality] in the body owing to the fact that parts from which the water is constituted transform back to the cold that is in water in its natural state.

In this passage, Avicenna has two objectives. His chief purpose is to draw the physician's attention to the fact that the order in which the drug's various effects appear in the patient's body may be a reliable indicator of the drug's essential and accidental activity. To this end, Avicenna sets out the principle that the effect that first appears in the patient's body is associated with the drug essentially. In L9, however, Avicenna hastens to add that this "principle" is really no more than a rule of thumb. He points to situations in which different kinds of drug and foodstuff naturally behave in a way that obscures the drug's essential and accidental properties by violating this rule of thumb. For example, hot water, which has the direct effect of heating the patient's body, produces its heating effect *accidentally*. After several minutes, the heat dissipates and the cold that is in water *naturally* returns. Avicenna seems skeptical about this method's real utility, especially in the face of drugs that naturally produce their essential effect in a delayed fashion, even after the drug has left contact with the affected part of the body. In such cases, Avicenna does not believe that a series of observations of the drug's effect on the patient's body will allow the physician to distinguish the drug's essential and accidental effects, even if we carefully control the conditions underwhich the observations are made.

Avicenna believes that experience, even if carefully monitored in this way, still does not yield reliable, certain and necessary knowledge about causal relations between drugs and their effects. This belief appears, however, to be based on the practical conditions holding for *medical* treatment. Outside the idealised world of medical

textbooks, conditions are never ideal, and thus experience, even suitably qualified, will not necessarily yield reliable results about causal relations between drugs and their effects owing to the nature of particular drugs and foodstuffs.

Yet, as we shall see, Avicenna's *medical* views in *Canon 2* do not reflect the complexity of his *philosophical* doctrines regarding the role of experience in the process of knowledge acquisition. An important discussion by Abū l-Farağ Ibn al-Quff al-Karakī (d. 1286) draws our attention to the fact that by the end of the thirteenth century at the latest, Avicenna's *medical and philosophical* doctrines were treated as relevant to understanding Hippocratic and Galenic medical texts. It also highlights the manner in which Avicenna synthesised Galenic medical thought and Aristotelian philosophy.³⁸

In his commentary on the first aphorism, Ibn al-Quff takes the opportunity to speak about the role experience plays in acquiring first principles of medical science. Ibn al-Quff's discussion resembles a similar discussion by Aristotle at the end of *Posterior Analytics*, Book Two. In *APo.* 2.19 Aristotle discusses the role of experience in the process of

38. Gutas has written on this topic in Dimitri Gutas, "Medical Theory and Scientific Method in the Age of Avicenna," in *Before and After Avicenna*, ed. David C. Reisman (Leiden: Brill, 2003), 145–62. In this article, Gutas claimed that "medicine, given the status accorded to it in the classification of the sciences, never became part of the mainstream theoretical academic curriculum; it was only a practical craft, learned and transmitted mostly by way of apprenticeship in the hospitals (*ibid.*, 161)." Gerhard Endress' study on Faḥr al-Dīn al-Rāzī (d. 1210) and the influence of his commentary on Book One of Avicenna's *Canon of Medicine* shows that Gutas' claim is somewhat inaccurate. 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. E. Montgomery (Leuven: Peeters, 2006), 371–422.

acquiring first principles in demonstrative science. In his commentary, however, Ibn al-Quff is not referring to Aristotle, but is closely paraphrasing Avicenna's discussion of aporias involving experience, demonstration, and cause in *On Demonstration* 1.9 (hereafter *Dem.* 1.9).³⁹ In this passage from his *Aphorisms* commentary, Ibn al-Quff discusses what experience means. His choices are pragmatic, however. He copies the definition that Avicenna supplies for experience in *On Demonstration*, uses the same example to illustrate his point, and comes to the same conclusions about how experience has the capacity to yield reliable information about the natures and causes of observed phenomena. He omits, however, the more fundamental philosophical dilemma, which had originally inspired Aristotle and Avicenna, about the incongruity between the fact that experience yields first principles of demonstrations about causes, and the fact that these principles are not themselves demonstrated. In fact they are, like definitions, *indemonstrable*.⁴⁰

البحث الثاني عشر في معنى التجربة. التجربة هي القضية التي يصدق العقل بها بواسطة الحسّ وشركة من القياس. فإنّ الحسّ إذا تكرر عليه اقتران شيء بشيء مراراً غير محصورة، حصل في الذهن من هذا التكرار شيء، وهو أنّ هذا القدر ليس باتّفاقيّ. فإنّ الاتّفاقيّ ليس بدائم ولا أكثرّيّ، بل هو أمر طبيعيّ. مثاله السقمونيا، فإنّها تسهل الصفراء. وهذا القدر، لمّا رأيناها قد تكرر مع شرب السقمونيا، علمنا قطعاً أنّ التكرار

39. See Jon McGinnis, "Scientific Methodologies in Medieval Islam," *Journal of the History of Philosophy* 41 (2003): 307–327; Riccardo Strobino, "Avicenna on the Indemonstrability of Definition," *Documenti e Studi Sulla Tradizione Filosofica Medievale* 21 (2010): 113–63. Strobino notes (Strobino, "Avicenna on the Indemonstrability of Definition," 145) that *Dem.* 1.9 corresponds to *APo.* 2.19. This is true, but there is important material near the end of the chapter (Avicenna, *Burhān*, 97, ll. 1–15) that relates to the topic of accidental predication in *APo.* 1.5.

40. Abū al-Farağ Ibn al-Quff, *Kitāb Taysīr al-wuṣūl ilā tafsīr al-fuṣūl li-Abuqrāt*, ed. ARABCOMMAPH (The University of Manchester, 2012–2017), doi: ab.1234/ref:cdef/5678; MS, Gotha, Landesbibliothek, 1894, fols. 9a, l.10–10a, l.6.

هو الموجب لذلك الاعتقاد. إذ لا بدّ لكلّ حادث من سبب، وليس ذلك السبب أمر إراديّ من السقمونيا، فإنّ النبات عادم للإرادة. بل ذلك لأمر طبيعيّ في السقمونيا. وليس هو الجسميّة، وإلا تساوت الأجسام في ذلك. بل هو لقوّة حاصلّة فيه. فحينئذ يقضي العقل بأنّ السقمونيا التي في بلادنا تسهل الصفراء إذا كان المنفعل مستعداً للإسهال.

[L10] The twelfth investigation is about the meaning of “experience.” Experience is the proposition to which the intellect gives assent by means of the senses in cooperation with syllogism (*al-qiyās*). For if the senses repeatedly perceive the conjunction (*iqtirān*) of *X* [lit. “the thing (*aš-šay*)”] and *Y* [lit. “the thing (*aš-šay*)”] innumerable times, something is generated in the mind from this recurrent perception, namely that this power [in *X*, *qadr*] is not merely by chance (*bi-ttifāq*), since what is by chance does not happen perpetually or for the most part. Rather, [what occurs to the mind] is that this is something natural [to *X*].

Take scammony, for example, which purges yellow bile. When we see this power (*qadr*) [i.e to purge yellow bile] associated with drinking scammony, we know with certainty that the repetition is what necessitates this belief. Since every event must have a cause, in scammony this cause is not something volitional since plants do not have volition. Rather, the cause is something natural in scammony. Nor is it [the power, sc. *qadr*] on account of the fact that scammony is a body. If it were, all bodies would be alike [in their ability to purge yellow bile]. Rather, [the power] is owing to a capacity that resides in scammony. Then the intellect judges that the scammony in our lands (*fī bilādinā*) purges yellow bile on condition that the patient is fit for purging.

In L10, Ibn al-Quff takes “experience” to refer to a proposition (*qaḍīya*) that is a result of

the cognitive process of inducting (pharmacological or therapeutic) principles such as “scammony purges yellow bile” from the fact that we repeatedly perceive (*ḥiss*) the temporal conjunction (*iqtirān*) of a pair of phenomena. The first step in this process is that the reasoner repeatedly observes that two phenomena always occur together, for example the patient taking scammony and the purging of yellow bile that follows. The second step is that after a sufficient number of observations, a *sylogistic* process of reasoning (*al-qiyās*) allows the intellect to move from this collection of perceptions to form the universal judgment that all scammony causes purging of yellow bile. Ibn al-Quff says that we know that this experience gives reliable insight into the true nature of scammony because the perceptions are repeated. Our conviction (*i'tiqād*) that scammony causes purging is *not* necessitated because it has been deduced from first principles, but from repeatedly observing particular instances of scammony purging yellow bile. The repetition of perceptions necessitates *certainty* in the judgment that scammony causes purging, and that the purging effect is an *essential consequence* of scammony's nature, meaning that the purging is not a result of accidental conditions under which the observations were made, or secondary or non-essential pharmacological properties of scammony or extraneous conditions affecting the patient to whom the drug is given.

In fact, Ibn al-Quff is paraphrasing Avicenna's discussion of problems relating to induction's role in acquiring first principles in *Dem.*1.9. Yet there are important elements in this text that Ibn al-Quff omits. Though he mentions the syllogism at the beginning of L10, the importance of syllogism's role in generating universal propositions of the form “(all) scammony purges yellow bile” from experience is not emphasised in Ibn al-Quff's paraphrase. For his part, Avicenna synthesises Aristotle's somewhat incompatible accounts of induction (*epagōgē*) in the *Prior* and *Posterior Analytics*. In *Deliverance* (*Kitāb al-Nağāt*), Avicenna briefly summarises Aristotelian induction as it is presented in *APr.* 2.23. In this chapter, Aristotle holds that induction has an implicit syllogistic structure. Avicenna's summary account in the *Deliverance* rightly emphasises this fact as well.

الاستقراء هو حكم على كلي لوجود ذلك الحكم في جزئيات ذلك الكلي إما كلها وهو الاستقراء التام وإما

أكثرها وهو الاستقراء المشهور فكأنه يحكم بالأكبر على الواسطة لوجود الأكبر في الأصغر. ومثاله أن كل حيوان طويل العمر فهو قليل المرارة لأن كل حيوان طويل العمر فهو مثل إنسان أو فرس أو ثور والإنسان والفرس والثور قليل المرارة ومن عاداتهم أن لا يذكره على هذا النظم بل يقتصرون على ما هو كالصغرى أو ما هو كالكبرى.⁴¹

[L11] Induction is making a judgment (*ḥukm*) about a universal (*kullī*) owing to the fact that this judgment exists in the particulars in the extension of this universal. Either all of them [fall in the extension of the universal], in which case it is complete induction, or most of them [fall in the extension of the universal], in which case it is common induction (*al-istiqrāʾ al-mašhūr*). It is as if the major term is judged to belong to the middle term because the major term is in the minor term. An example of it is that [Conclusion] “every animal that is long-lived has a small amount of bile” because [major premise] “every animal that is long-lived is like humans, horses and bulls,” and [minor premise] “humans, horses and bulls have a small amount of bile.” Normally, however, they do no mention [the syllogism] in this order. They restrict themselves [to mentioning only] what is like the minor or what is like the major.

Similar to Aristotle in *APr.* 2.23,⁴² in L11 what Avicenna calls the “judgment (*ḥukm*)” is the major term “long-lived,” and what Avicenna calls the “universal (*kullī*)” is the minor term

41. Avicenna, *Kitāb al-Nağāt fī al-ḥikma al-mantiqīya wa-l-ṭabīʿīya wa-l-ilāhīya*, ed. Majid Fakhry (Beirut: Dār al-āfāq al-ḡadīda, 1982), 93. For other translations of this passage, see McGinnis, “Scientific Methodologies,” 309; and Asad Q. Ahmed, *Avicenna Deliverance: Logic* (Karachi: Oxford University Press, 2011), 83–4.

42. John P. McCaskey, “Freeing Aristotelian *Epagōgē* from *Prior Analytics* II 23,” *Apeiron* 40 (2007): 345–74, 358.

“having a small amount of bile.” The humans, horses and bulls are the particulars (*ḡuz’īyāt*) that, prior to the induction, are recognised to fall in the extension of the universal “having a small amount of bile.” Avicenna says that we inductively form the conclusion of the universal affirmative proposition “everything having a small amount of bile is long-lived” because we recognise that humans, horses, bulls and any other bileless animal have long lives. Given that Avicenna recognises the fact that Aristotle gives induction the propositional structure of a syllogism in *APr.* 2.23, it is no surprise that in *Dem.* 1.9 Avicenna speaks about experience as a *judgment*.

والتجربة مثل حكمنا أن السقمونيا مسهل للصفراء فإنه لما تكرر هذا مرارا كثيرة زال عن أن يكون مما يقع بالاتفاق فحكم الذهن أن من شأن السقمونيا إسهال الصفراء وأدعن له وإسهال الصفراء عرض لازم للسقمونيا.

ولسائل أن يسأل فيقول: ”هذا مما لم يعرف سببه. فكيف يقع اليقين الذي عندنا من أن السقمونيا لا يمكن أن يكون صحيح الطبع فلا لكون مسهل للصفراء؟“ أقول: إنه لما تحقق أن السقمونيا يعرض له إسهال الصفراء وتبين ذلك على سبيل التكرار الكثير، علم أن ليس ذلك اتفاقا. فإن الاتفاقي لا يكون دائما أو أكثريا. فعلم أن ذلك شيء يوجبه السقمونيا طبعاً إذ لا يصح أن يكون عنه اختياراً إذ علم أن الجسم بما هو جسم لا يوجب هذا المعنى. فيوجبه بقوة قريبة فيه أو خاصة له أو نسبة مقرونة به. فصح بهذا النوع من البيان أن في السقمونيا بالطبع أو معه علة مسهلة للصفراء. والقوة المسهلة للصفراء إذا كانت صحيحة وكان المنفعل مستعداً حصل الفعل والانفعال. فصح أن السقمونيا في بلادنا تسهل دائما الصفراء إذا كانت صحيحة. فإذا عرفنا الأعظم للأصغر بواسطة الأوسط الذي هو القوة المسهلة وهو السبب. وإذا حللت باقي القياس وجدت كل بيان إنما هو بيان بواسطة هو علة لوجود الأكبر في الأوسط، وإن لم يكن علة للعلم بالأكبر. فإذا بالسبب حصل لنا هذا النوع من اليقين أيضا.

[L12] Experience is like our judgment that scammony purges yellow bile, for when this repeats many times, it is no longer something that occurs by chance. So the mind judges that it is in the nature of scammony to purge yellow bile, conviction is placed in this [judgment], and purging yellow bile is a concomitant property

(*‘araḍ lāzim*) that scammony possesses.⁴³

Someone may ask, saying “This is the kind of judgment in which the cause is not known. So whence this certainty we have that it is not possible for scammony to have a sound nature and not purge yellow bile?”

I say: “When the fact that purging yellow bile follows scammony is realised (*taḥaqqāqa*), and it is made evident on numerous occasions, it is known that this [facility for purging yellow bile] is not by chance, for what is by chance is not always the case or for the most part. Thus, it is known that scammony is something that naturally purges yellow bile, for it is not fitting that it happen by way of volition, since it is known that body, insofar as it is body, does not entail this phenomenon (*al-ma‘nā*). Thus, it [purging] is entailed by a proximate capacity (*qūwa qarība*) in it, a property (*ḥāṣṣa*) that it possesses, or a relation that is connected to it.”

With this kind of account, therefore, it is true that scammony possesses a cause that purges yellow bile, either by its nature (*bi-ṭ-ṭab’*) or by virtue of some property that accompanies it. Furthermore, as long as the capacity for purging yellow bile is sound and the patient is fit for the drug, its [scammony’s] activity and passivity will come about. Therefore, it is true that the scammony in our lands (*fī bilādinā*) always purges yellow bile as long as it is sound. Thus, we

43. This portion of the text is translated in McGinnis, “Scientific Methodologies,” 317.

recognise that the major term belongs to the minor term by means of the middle term, which is “the purgative capacity (*al-qūwa al-mushila*),” which is the cause. Then, if you analyse the rest of the syllogism, you will find that every demonstration is by means of the thing that causes the major term to be in the minor term, even if it is not what causes knowledge of the major term.⁴⁴

As McGinnis notes, it is not Avicenna's view, as Avicenna says explicitly in another passage in *Dem.* 1.9, that experience alone, that is repeated observations of the temporal conjunction of phenomenon *X* and phenomenon *Y*, yields knowledge of the cause for the conjunction of the phenomena. Just as Ibn al-Quff alludes to in the beginning of *L10*, Avicenna stipulates that the certainty that the principle “*X* is *Y*” (“scammony purges yellow bile”) is true additionally requires a syllogism, in which the fact that *Y* (“purges yellow bile”) belongs to *X* (“scammony”) is the conclusion, *Y* (“purges yellow bile”) is the major term, *X* (“scammony”) is the minor term, and the cause (*sabab*) of the conjunction of phenomena is the middle term (“capacity to purge”).⁴⁵ Avicenna does not explicitly set out the syllogism he has in mind, but Gutas reconstructs it thus:⁴⁶

[Minor] Scammony has by nature the power to purge;
[Major] whatever has by nature the power to purge causes purging when ingested;
[Conclusion] therefore scammony by nature causes purging when ingested.

44. Avicenna, *al-Šifā al-manṭiq al-burhān*, ed. Abū al-‘Alā’ al-‘Afifī (Cairo: al-Maṭba‘a al-amīriya bi-l-Qāhira, 1956), 95.

45. McGinnis, “Scientific Methodologies,” 321 reconstructs the syllogism in a similar way.

46. Gutas, “Avicenna's Empiricism,” 400. I think Gutas is right to make much more of syllogism's role in Avicenna's theory of experience. It is certainly not a “throwaway line,” brief as it is (*ibid.*, 322).

Dimitri Gutas says that for Avicenna the part of experience that involves “repeated observation of the fact” is a process that is independent of the part of the *inductive* process that involves the syllogism. It is only in combination that knowledge of the cause is arrived at inductively by experience.

Together, LL11–12 represent Avicenna’s synthesis of Aristotle’s account of induction in *APr.* 2.23 and *APo.* 2.19. In this account, experience appears in the stage of induction (mentioned in both *APr.* 2.23 and *APo.* 2.19) in which data from particulars are required. According to Avicenna’s synopsis of *APr.* 2.23 in L11, experience supplies the premises for the induction, which involves particular observations of horses, humans and bulls. The premises based on these observations allow us to form a universal affirmative proposition as a conclusion through induction, in which the middle term is a list of particulars, not a universal term that acts as a cause for the fact that the predicate belongs to the subject. In other words, Avicenna recognised that the inductive process outlined by Aristotle in *APr.* 2.23 was the ideal form of reasoning for acquiring first principles for a demonstrative science based on perception and experience. Yet, in the final paragraph of L12 Avicenna alludes again to the syllogistic form of induction in which experience participates. In this text, however, the minor premise is a cause (*sabab*) rather than a set of particulars. Avicenna appears to believe that if the experience upon which the inducted first principles are based is carried out under the conditions prescribed by Galen in his medical works, the middle term for the inductive syllogism need not be merely a list of particulars but can be a cause. This is because qualified experience, unlike common, unqualified experience, allows the reasoner to see that the connection between the predicate “purges yellow bile” and the subject “scammony” is by nature rather than by coincidence.

LL11–12 are also where Avicenna addresses the question of the conviction (*i’tiqād*) or certainty (*yaqīn*) that we have in first principles that are acquired inductively. Like many commentators, Avicenna recognised that on this particular question Aristotle was silent. It is in order to address the question of how we can be *certain* that the universal judgments we make are true that Avicenna introduces Galen’s ideas about qualified experience. In his

reading of *APo.* 2.19, Avicenna takes “experience” to have, in effect, the characteristics of Galen’s qualified experience. Not just any sort of experience will yield certain and necessary first principles. Repeated experience of predictable connections between the predicate and subject whilst also remaining sensitive to the conditions in which the connections are observed yields knowledge that the connection between subject and predicate term arise not from mere chance, but from a natural connection or causal relation that exists between them. In short, Avicenna’s discussion in *Dem.* 1.9 is not a “critique” of Aristotle.⁴⁷ Rather, Avicenna enlists the aid of what was a well-known element in Galen’s medical thought to counter an obvious objection to Aristotle’s account of inductively acquiring first principles in the *Prior* and *Posterior Analytics*.

6. Attitudes about Philosophy in Medicine from Late-Antiquity to the Thirteenth Century

Unlike other Arabic physicians reviewed above, Ibn al-Quff uses Avicenna’s *Dem.* 1.9 to explain what experience means in the Hippocratic *Aphorisms*. Why? What historical-textual conditions between Hippocrates and Ibn al-Quff made it possible for the latter to use Avicenna’s *On Demonstration* to explain the lemma of the Hippocratic *Aphorisms*? Several explanations may be given.⁴⁸ Here is one that strikes me as plausible.

Aristotle’s Platonist commentators realised that several elements of Aristotle’s

47. “Ibn Sînâ’s attack on Aristotelian induction offers perhaps the most rigorous and technical critique of induction, as later ancient and medieval natural philosophers understood induction, until the modern period.” McGinnis, “Scientific Methodologies,” 308.

48. It is likely that Faḥr al-Dīn al-Rāzī (d. 1210) played an important role in the process of bringing Avicenna’s philosophical works to bear on his medicine by means of the lemmatic commentary in the twelfth and thirteenth centuries. For example, see Endress, “Reading Avicenna in the Madrasa,” 383–92.

account of the acquisition of first principles of demonstrative science required clarification if not modification, Aristotle's account of experience not the least. At *APr.* 2.23, Aristotle outlines the underlying syllogistic structure that contributes to how inductive reasoning (*epagōgē*) is able to yield conviction (Gr. *pistis*, Ar. *yaqīn*) about the universal affirmative judgment “A belongs to every B” from a limited number of observations of particulars in the extension of both A and B.⁴⁹ However, at *APr.* 2.23 Aristotle does not explicitly say that this is how the reasoner acquires *first principles*. At *APo.* 2.19 99^b20, Aristotle begins to describe a cognitive process by which the soul acquires first principles of a science from induction. First principles present something of challenge for Aristotle's axiomatic hierarchy of the sciences. Whilst knowledge of the theses of a science result from syllogistic demonstrations from first principles, the first principles themselves are “direct” or “immediate (*eirētai proteron*).”⁵⁰ The challenge for Aristotle in *APo.* 2.19 is two-fold. On the one hand, he wants to affirm that we have certain knowledge of first principles that is at least as secure as knowledge from demonstration. On the other hand, Aristotle needs to describe a non-demonstrative, non-syllogistic process by which we come to know first principles that is based on sense perception.⁵¹ The process detailed in *APo.* 2.19 100^a2-12 Aristotle calls “induction (*epagōgē=al-istiqrā'*),” an activity which he associates with an “innate faculty that discriminates (*dunamis sumphatos kritkē=qūwa*

49. This is the interpretation of this chapter offered by McCaskey. McCaskey, “Freeing Aristotelian *Epagōgē*.”

50. Ishāq b. Ḥunayn supplies the explicative translation “*gayr dawāt awsāt*,” lit. “they do not possess middle terms.” See Badawī, *Manṭiq Aristū*, 2:482, l.21.

51. For a clear statement of the many challenges posed by what Bayer calls this “tortuous last chapter” of Aristotle *Posterior Analytics*, see Greg Bayer, “Coming to Know Principles in *Posterior Analytics* II.19,” *Apeiron* 30 (1997): 109–42.

garīzīya muḥtabira)." This faculty Aristotle calls "perception (*aisthēsis*=*al-ḥiss*)," and says that it is shared by all animals, but only in animals such as humans do these perceptions persist to form a memory. Repeated memories constitute a single, unitary experience.⁵²

ἐν οἷς δ' ἔνεστιν αἰσθημένοις ἔχειν ἔτι ἐν τῇ ψυχῇ. πολλῶν δὲ τοιούτων γινομένων ἤδη διαφορά τις γίνεται, ὥστε τοῖς μὲν γίνεσθαι λόγον ἐκ τῆς τῶν τοιούτων μονῆς, τοῖς δὲ μή.

Ἐκ μὲν οὖν αἰσθήσεως γίνεται μνήμη, ὥσπερ λέγομεν, ἐκ δὲ μνήμης πολλάκις τοῦ αὐτοῦ γινομένης ἐμπειρία· αἱ γὰρ πολλαὶ μνήμαι τῷ ἀριθμῷ ἐμπειρία μία ἐστίν. ἐκ δ' ἐμπειρίας ἢ ἐκ παντὸς ἡρεμήσαντος τοῦ καθόλου ἐν τῇ ψυχῇ, τοῦ ἐνὸς παρὰ τὰ πολλὰ, ὃ ἂν ἐν ἅπασιν ἔν ἐνῇ ἐκείνοις τὸ αὐτό, τέχνης ἀρχὴ καὶ ἐπιστήμης.

وأما ما كان من الحيوان يثبت فيه [الحس] فقد يبقى عندما يحس شيء ما في أنفسها. وعندما يكون كثير من أمثال هذه فقد يحدث حينئذ تمييز ما وتفصيل، حتى أن لبعضها قد يكون من ثبات أمثال هذه قول، وبعضها لا. فمن الحس يكون حفظ كما قلنا. ومن تكرير الذكر مرات كثيرة تكون تجربة، وذلك أن الأحفاظ الكثيرة في العدد هي تجرة واحدة. ومن التجربة عندما يثبت ويستقر الكلبي في النفس الذي هو واحد في الكثير، ذلك الذي هو في جميعها واحد بعينه هو مبدأ الصناعة والعلم.

[L13] In those animals in which [the perception] persists, when they perceive, something remains in their souls. When there are many such things, a discrimination and distinction comes about (*diaphoratis=tamyīzun mā wa-tafṣīlun*) so that there is an account for those of them that persist, but for others not.

As we said, from perception comes memory, and from memory that

52. Greek text: Ross, *Aristotle's Analytics*, 99^b40–100^a8. Arabic text: Badawī, *Manṭiq Aristū*, 2:483–4. Translation is based on the Arabic.

is repeated many times comes experience. For memories that are many in number are a single experience. When the universal that is one in many, that which is identically one in every one of them [memories]—[when such a universal] persists and is fix in the soul, this is the principle of the art and science.

Aristotle describes a three step non-demonstrative, non-deductive process—this fact is made explicit in Ishāq’s interpretive translation of this phrase—in which the innate faculty of perception has many particular instances of perception, which together constitute a memory. Many memories all together constitute a single *experience*, the outcome of which is a universal first principle of the practical arts or the science. Aristotle later in the text calls this process “induction.” According to the scheme that Aristotle has set down, we will not *understand* the first principle “*X is Y*” in the sense that we will not derive them by means of a demonstrative syllogism in which the middle term is the *cause for* the fact that *Y* belongs to *X*. Nevertheless, there is a sense in which we *grasp* the first principles and it is our grasping these principles that serves as the basis for understanding. Yet, even if induction does not yield understanding (*epistimē*) of the first principles, as we have seen, according to *APr.* 2.23, induction yields (1) conviction (*pistis*) about universal statements (2) based on a finite number of observations of particulars. Moreover, the induction process does admit a (3) syllogistic structure, but one in which the middle term does not serve as a reason or the account for the fact that the predicate belongs to all (or none) of the subject.

First principles derived from experience that do not supply information about the cause for the connection between the subject and predicate are hardly suited to serving as the axioms of a demonstrative science, which Aristotle held to be a discourse yielding necessary knowledge derived from necessary premises linked by middle terms that serve as cause. Yet, in spite of this belief, in *APr.* 2.23 68^b30–32, Aristotle clearly holds that induction is the ideal means for acquiring first principles, since induction “is the sort of syllogism of a primary and unmiddled premise. For the middled syllogism is through the

middle term. But the syllogism that is not is by means of induction.”⁵³ Yet, how can the certainty and necessity Aristotle requires of demonstrative science be acquired by means of an inductive process based on perception?⁵⁴

Consistent with the importance of Aristotle’s and Plato’s philosophy and Galenic medicine in the Alexandrian curriculum, in order to overcome this difficulty it appears that some authors referred to the medical discourse on experience in Hippocratic and Galenic writings. In particular, it seems that medical debates relating to the problem of how to acquire reliable pharmacological data were recognised as being relevant to explaining Aristotle’s text. For example, in his commentary on *Posterior Analytics*, Book Tow, John Philoponus⁵⁵ (d. 570) says:

ἐκ δὲ μνήμης πολλάκις τοῦ αὐτοῦ γινομένης, ἤγουν πολλῶν δὲ μνημῶν
συναθροισθεισῶν, γίνεταί ἐμπειρία, ἤγουν γνώσις τις δυνάμεως πράγματός

53. Compare with Aristotle, *Prior Analytics*, trans. Robin Smith (Indianapolis: Hackett, 1989), 99–100.

54. Bayer states the difficulty as follows. “Aristotle the empiricist seems to be insisting on sense experience as the instrument for acquiring knowledge of the principles, while Aristotle the rationalist is positing a mental state even ‘truer’ and ‘more accurate’ than scientific understanding, let alone sense experience, for actually possessing them.” Bayer, “Coming to Know Principles,” 109.

55. Regarding the authorship of this text, Owen Goldin judges that it is “largely a paraphrastic condensation of either a lost commentary on *An. Post. 2* by Philoponus, or another commentary on this book that derives from the lectures of Ammonius.” Owen Goldin, *Philoponus(?): On Aristotle’s Posterior Analytics 2* (London: Duckworth, 2009), 4. Richard Sorabji argues that there is reason to believe that the text is by Philoponus; see Sorabji’s preface to Goldin, *Philoponus(?): On Aristotle’s Posterior Analytics 2*, vii–ix.

τινος. οἷον εἶδον μυριάκις τὸν ἐλλέβορον κενοῦντα χολήν, καὶ πολλὰ αἰσθήματα τοιαῦτα ἐν τῇ φαντασίᾳ μου ἐνετυπώθησαν, ἐξ ὧν ἐπισυνηθροίσθησαν μνήμαι πολλαί· ἐκ δὲ τῶν πολλῶν μνημῶν γέγονέ μοι ἐμπειρία καὶ γνῶσις, ὡς ὁ ἐλλέβορος δύναμιν ἔχει κενωτικὴν χολῆς. ἢ δὲ γνῶσις αὕτη ἡρεμήσασα καὶ ἐμπαγείσα καὶ ἐδραιωθείσα ἐν τῇ ψυχῇ μου, ὡς οὕτως ἔχει ὁ ἐλλέβορος καὶ οὐκ ἄλλως, τὸ καθόλου συνήξεν, ἤγουν τὸ “πᾶς ἐλλέβορος καθαίρει,” ὃ καθόλου ἐστὶν ἀρχὴ τῶν ἀποδείξεων.

[L14] From frequent memory of something coming about—that is, from many memories that have assembled together—experience (*empeiria*) comes about; that is to say, a certain recognition (*gnōsis tis*) of the capacity that something has. Such as when on numerous occasions I saw hellebore purge, many of these perceptions are imprinted in my imagination (*phantasia*), by which many memories are gathered together. And from the many memories comes my experience and recognition (*gnōsis*) that hellebore has the capacity to purge bile. Likewise, the recognition that hellebore has such [a capacity] and nothing else came to rest, became fixed and stable in my soul, that is to say the universal “all hellebore purges” was made to take shape [in the soul], the universal which is is the principle of demonstrations.⁵⁶

Of course, this text makes no pretense to supply a solution to the dilemmas in Aristotle’s text. However, it is at least clear that (1) Philoponus perceived that the challenges posed by experience derived from observing pharmacological phenomena were relevant to

56. Philoponus, *In Aristotelis Analytica Posteriora commentaria cum anonymo in librum II* (CAG 13.3), ed. Maximilian Wallies (Berlin: Akademie der Wissenschaften, 1882), 435, ll. 18–27.

interpreting Aristotle's text; and more importantly (2) Philoponus speaks about how numerous observations of hellebore purging yields recognition (*gnōsis* not *epistimē*) that there is a capacity (*dunamis*) in hellebore that causes purging. And though Philoponus does not speak about causes, middle terms or syllogisms, it is important to recognise the fact that Philoponus speaks about "capacity to purge," which is what Avicenna eventually identifies as the middle term in the syllogism that supplements raw experience, transforming it into knowledge of the cause.

We should see, then, Avicenna's discussion in *Dem.* 1.9 as a continuation of this trend in late antique commentaries on *APo.* 2.19, in which medical discourse on experience was brought to bear on this text. Indeed, when McGinnis observes that in *Dem.* 1.9 Avicenna urges the reader to "note the variables or various antecedent and background conditions surrounding the observations," we quickly realise that Avicenna has adapted Galen's medical theory of qualified experience into the philosophical discourse surrounding Aristotle's account of experience in *APo.* 2.19. For example, in *Dem.* 1.9, Avicenna uses the example of how using experience naively leads a person to the false conclusion "all people are dark-skinned" because he drew his experience exclusively from populations in countries where most or all people are dark-skinned.⁵⁷ With this example, Avicenna demonstrates that if proper attention is not given to the characteristic of the sample on which observations are made, "accidental or chance relations" between predicate and subject can be mistaken for universal and necessary relations.⁵⁸ In fact, by

57. Avicenna, *Burhān*, 95–6.

58. McGinnis, "Scientific Methodologies," 322–4. Based on James Lennox's work on the links between Aristotle's *Posterior Analytics* and Aristotle's biology, it is clear too that in *Dem.* 1.9, Avicenna sees qualified experience as relevant to Aristotle's discussion of essential and accidental predication in *APo.* 1.5; see in particular, Avicenna, *Burhān*, 97. The links between Avicenna's *Posterior Analytics* and the biology of the *Healing* and its relationship to Aristotle's philosophy of biology require a separate study; see James

enlisting the aid of Galenic qualified experience Avicenna is addressing precisely the problem with Aristotle's account of inductively acquiring first principles.

Thus, by the time that the debate about experience reached Ibn al-Quff at the end of the thirteenth century, the ancient debates about experience have been synthesised and given rigorous formulation not only in Avicenna's medical works such as the *Canon*, but in Avicenna's philosophical writings as well. Avicenna continues a trend that was apparently commonplace in late Alexandrian medicine and philosophy, in which Galen's medical thought was brought to bear on solving philosophical issues in Aristotle's philosophy. In the case before us, Galen's idea of unqualified experience is used to clarify Aristotle's discussion of how experience leads to acquiring first principles of demonstration. Thus, by the thirteenth century, it would have been natural for medical authors such as Ibn al-Quff to refer to Avicenna's philosophical works for insights into Hippocratic works. It appears that *aš-šayḥ ar-ra'īs* himself did the same.

7. Conclusion

In this article, I have tried to place the debates about medical experience in Arabic commentaries on the Hippocratic *Aphorisms* in their historical context. There were two influential accounts of experience that influenced these authors: Galen's qualified experience in his pharmacological works and Aristotle's discussion of experience in the final sections of the *Prior* and *Posterior Analytics*. I have shown how Aristotle's Greek commentators began to transform or even synthesise these senses of experience. However, it seems to me that Alfarabi and Avicenna took the synthesis of these philosophical and medical accounts of experience to new levels of rigour and complexity. Avicenna's contributions to the form taken by debates about experience among the Arabic *Aphorisms* commentators is especially noteworthy. Alfarabi's discussion of Galen's anatomical method shows that classical Arabic thinkers recognized that Galen had a generic method

Lennox, *Aristotle's Philosophy of Biology* (Cambridge: Cambridge University Press, 2000).

for discovering causal relations between phenomena that he used in pharmacology, anatomy and therapeutics. Alfarabi's criticism of Galen's method relies on the fact that ambiguating conditions reduce the evidential value of these observations for proving statements about causes. On the other hand, in the opening pages of *Canon 2* Avicenna distills Galen's scattered comments on qualified experience into a rule-based method for discovering pharmacological effects.

Yet, I have also tried to show how Avicenna's philosophical works come to influence post-classical medical authors such as Ibn al-Quff. Unique among the commentators on the first aphorism, Ibn al-Quff quotes from Avicenna's definition of experience in *On Demonstration*, which is his philosophical work based on Aristotle's *Posterior Analytics*. By drawing on Avicenna's philosophical works to explain Hippocrates' words, Ibn al-Quff is following Avicenna's example. For in *Dem. 1.9*, Avicenna uses Galen's notion of qualified experience to address problems he saw in Aristotle's account of what role experience plays in the acquisition of first principles of demonstration. Ibn al-Quff combines Avicenna's medical and philosophical thought to produce an entirely new understanding of the Hippocratic text that often has little to do with how Galen understood the same text.

Appendix: Translation of Avicenna on Medical Experience in the *Canon of Medicine*

This translation is based on a 1971 reprint of the 1877 Bulaq edition of the *Canon*: Avicenna, *al-Qānūn fī al-ṭibb*, ed. Qāsim Muḥammad al-Raġab (Baghdad: Dār al-Muṭannā, 1971), 1:224, l.30-6, l.4. Peter E. Pormann has translated the text of Condition 2 (225, ll.3–9) in Pormann, “Avicenna on Medical Practice, Epistemology, and the Physiology of the Inner Senses,” 99. A partial translation is in Nasser, Tibi and Savage-Smith, “Rules for Assessing the Effects of Drugs.” Finally, there is an adapted translation of *Canon 2* by Laleh Bakhtiar, *The Canon of Medicine (al-Qānūn fī l-ṭibb) (The Law of Natural Healing): Volume 2 Natural Pharmaceuticals* (Chicago: Kazi Publications, 2012).

The Second Discourse: *On Coming to Know the Powers of Drug Mixtures by Experience*

The powers of drugs come to be known in two ways. One of them is by a process of reasoning (*ṭarīq al-qiyās*). The other is by experience (*ṭarīq al-taḡriba*). Let us take up the discussion of experience first. We say that experience leads to reliable knowledge of the drug’s power when certain conditions are observed.

[Condition 1] The first is that the drug is free of any acquired quality (*kayfiya muktasaba*), whether it is heat that is accidental or cold that is accidental, or that it acquires a quality that comes from a transformation in its substance, or another [substance] combines with it. For even if water is cold by nature, when it is heated, it continues to heat for as long as it is hot. In spite of the fact that euphorbium (*al-furbiyūn*) is naturally hot, when it is made cold, it makes [other things] cold as long as it is cold. In spite of the fact that almonds (*al-lawz*) tend to be balanced and fine, when they spoil they heat strongly. And in spite of the fact that the flesh of fish is cold,

when it is salted it heats strongly.

[Condition 2] The second is that what experience of the drug is conducted on (*al-muğarrab ‘alayhi*) is a simple illness (*‘illa mufrada*). For if it is a compound illness (*‘illa murakkaba*) in which there are two elements that require therapies that are opposite to each other, and the experience of the drug is conducted on both of them, after which there is a benefit that comes about, the real reason for this [benefit] is not perceived. For example, if a patient has a phlegmatic fever, and we give him agaric to drink and the fever recedes, it is not necessary to judge that agaric is cold because it brings benefit in the case of a hot illness, which is the fever. On the contrary, it may happen that the agaric brought benefit because it dissolved the phlegmatic disease matter, or because it evacuated it from the body so that when the matter was eliminated, the fever receded. In reality, this is an essential benefit that is mixed accidentally. It is essential in relation to the disease matter, and it is accidental in relation to the fever.

[Condition 3] The third is that experience of the drug is conducted on a disease that is the opposite of the disease in question, so that if the drug brings benefit in the case of both diseases, the [drug's] temperament is not judged to be the opposite of the temperament of one of them. For it may be that the [the drug] benefits in one of the illnesses essentially but in the other accidentally. If experience of scammony is conducted on a cold illness, it is likely that it will bring benefit and heat. If it is conducted on a hot illness such as tertian fever, it is likely that it will bring benefit because it evacuates the

yellow bile. But if this is the case, the experience does not yield reliable [information] about whether scammony is hot or cold until it is known that the activity in the first case is essential and the activity in the other case is accidental.

[Condition 4] The fourth is that the power in the drug equals the power in the illness that [the drug] opposes. For the heat in some drugs falls short of the cold that is in the illness, so that [the drug] has no influence on the illness at all, but there might have been a heating action if the drug were used in the condition that the cold was less intense (*ahaff*). Thus, it is necessary that experience of the drug be conducted on the weakest form of the illness (*al-aḏʿaf*), and then [the strength of the disease that experience of the drug is conducted on] is gradually increased so that the strength of the drug is known and there is not any doubt about it.

[Condition 5] The fifth [condition, sc. *ṣart*] is that one observe the time in which the drug's effect and activity appear. If they appear directly after the drug is given, it is convincing that this [effect and activity] occurs essentially. If what appears first is an activity that is opposite to what appears last, or no activity appears at first but then the activity appears last, this then will be a source of ambiguity and suspicion that it may be that the activity the drug has is accidental, as if the drug first had a subtle [essential] effect, which is then followed accidentally by this later, obvious effect. This suspicion and ambiguity about the drug's power and the surmise that the drug's activity is accidental is strong when the [drug's] activity appears after departing from the body part. For if the drug were to act

essentially, it would act whilst it was in contact the body part, and it would be impossible for it to remain ineffective whilst it was in contact with the body part but to act whilst it departs from the body part. This is a judgment that holds for the most part and is convincing.

However, it sometimes happens that some bodies act essentially after they act accidentally. This happens when they acquire a power that is extrinsic to them that overwhelms the drug's natural power, as is the case of hot water. For in that state, [water] heats, but the next day or the next moment in which the accidental effect has dissipated, water ineluctably brings about a cold [quality] in the body owing to the fact that parts from which the water is constituted transform back to the cold that is in water in its natural state.

[Condition 6] The sixth is that one ensures that the drug's activity progresses continually or for the most part. For if it does not, its activity proceeds from it accidentally, since natural states of affairs proceed from their origins continually or for the most part.

[Condition 7] The seventh is that the experience is on the human body. For if it is conducted on other than the human body, it may be inadequate on two counts. The first is that it is possible that in relation to the human body the drug is hot, but cold in relation to a lion if [the drug] is hotter (*aḥarr*) in relation to the human but colder than the lion and the horse. It seems to me that rhubarb (*al-rāwānd*) is very cold for a horse but is hot for a human. The second is that it is possible that in relation to one of the bodies [the drug] has

a property (*ḥāṣṣīya*) that it does not possess in relation to the other body. For with respect to the human body monk's-hood (*al-biṣ*) [*Aconitum napellus*] has a poisonous property, but in relation to starlings (*al-zarāzīr*) it does not.

These, then, are the rules that must be observed when the powers of drugs are derived by way of experience. So understand that.

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