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Pseudo-Aristotle Problem 7.8: Text, Syntax, and Two Theories of Contagion

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Abstract

The earliest Greek text to explain how disease contagion was understood to work is the pseudo-Aristotelian *Problemata*. In fact, the fullest causal discussion of contagion in all of Greco-Roman literature is found in Problem 7.8. This Problem has long been a source of consternation, due to its difficult syntax combined with obscurities in its theories of contagion. Through a close reading within its philosophical context and the full history of its interpretation, this paper offers a philosophical and grammatical explication of the Problem, and explores its two theories of contagion. One would prove highly influential; the other would subsequently disappear.

Keywords

contagion – Aristotle – *Problemata* – textual history – Greek language and linguistics

1 Introduction

Several of the pseudo-Aristotelian *Problemata* ask questions about the possibility of, and the mechanisms for, disease contagion.¹ The *Problems* are an important source for ideas about contagion in antiquity, in no small part because they seem to be the earliest Greek texts to discuss prospective mechanisms by which contagion might work.² Moreover, although there is recognition (or fear) of disease contagion apparent in a few other ancient non-medical sources like Thucydides, there is—notoriously—almost no mention of contagion in Greek and Latin medical texts proper.³ Admittedly, we do not know much (if anything) about the possible relationships or interdisciplinary identities that may have existed between the author(s) of the pseudo-Aristotelian medical *Problems* and the practising medical professionals of their day.⁴ Nevertheless, the long sections on medicine and the clear philosophical focus and expertise of the *Problems* as a whole bring it perhaps closer to the medical tradition than many of our other, more popular, sources for ideas about contagion. The theories of contagion that the *Problems* contain therefore repay careful study.

One theoretically rich discussion of contagion (the longest and most detailed of those in the *Problemata*, and indeed in all of ancient literature),⁵ Problem 7.8, has repeatedly puzzled modern readers, and editors and translators have raised important interpretive questions for the text and its theories of disease and the body. This puzzlement has generated suspicions of more than minimal textual corruption in the manuscripts, and at key points in the aetiological narrative. In this paper, we argue that although the text is difficult, it is not significantly corrupt. Through close examination of the two importantly distinct theories of contagion that Problem 7.8 provides, we offer a new grammatical, semantic, and medico-philosophical interpretation that leaves

1 These are *Problems* [*Prob.*] 1.7, 7.4, and 7.8. On the medical content of the *Problems*, see Oikonomopoulou 2014; Thomas 2014; Bertier 1989; Marengi 1966.

2 On the authorship and textual history of the *Problems* see Mayhew 2014; Centrone 2011. In the Budé edition, 119–22, Louis argues that Book 7 of the *Problems* is closer to ideas found in the known works of Aristotle than are the other books of the collection. Louis never quite says that he thinks Aristotle himself was the author of this section, but he certainly hints at the possibility (we thank an anonymous referee for this point).

3 See Lehoux, forthcoming; Harris 2021; Hankinson 2018, 1995; Fausti 2003; Nutton 2000, 1983; K. Smith 2013; Gourevitch 1995; Leven 1993; Sudhoff 1915.

4 Philosophers and physicians in antiquity often saw significant overlap between the two disciplines. The literature on this is vast, but see for example Lloyd 2014, 2009, 1987, 1979; Singer 2014; Berryman 2011; Hankinson 1998.

5 The latter claim is made by Harris 2021, 20. We believe that he is correct in this assessment.

the readings of the remarkably consistent manuscripts largely intact while providing insight into the philosophical and medical issues with which the author was concerned.

2 Text and Translation

The problems in Book 7 are loosely clustered around very broad ideas of contagion, or (even more generally) certain kinds of action-at-an-apparent-distance: the contagion of yawning, the need to urinate when near fire or running water, disease contagion, and wincing at certain sounds and sights. The title that appears in the manuscripts at the head of Book 7 says that these questions are discussions of *sympathy*, ὅσα ἐκ συμπαθείας. For our part in this analysis, however, we have refrained from saying explicitly that these are examples of ‘sympathetic contagion’ because we cannot be certain that the author of any of these problems would have meant by *sympathy* what a later Hellenistic philosopher or physiologist meant by it. It is certainly possible, but this instance would be an early such use, and we choose to err on the side of caution.⁶ Furthermore, the question of whether the title is original to the collection or appended at a later date is not knowable.⁷

The text of Problem 7.8 (Bekker pages 887a22–a39) has been professionally edited most recently by Louis in the Budé, Marengi in a collection of medical excerpts from the *Problems*, and by Ruelle, Knoellinger, and Klek in the Teubner.⁸ It has been translated into English, French, German, and Italian by Mayhew, Louis, Marengi, Ferrini, Flashar, Hett, and Forster.⁹ Our own analysis will build on these editions and translations, as well as late antique, medieval and early modern Latin and Arabic translations and commentaries by pseudo-Alexander (third c. CE or later), Hunayn ibn Ishaq (ninth c.), Bartholomew of Messina (mid-thirteenth c.), Pietro d’Abano (early fourteenth c.), Georgius Trapezuntius, Theodorus of Gaza (both fifteenth c.), Giulio Guastavini, Ludovico Settala (both early seventeenth c.), and U.C. Bussemaker (1857).¹⁰

6 See the essays collected in Schliesser 2015.

7 For his part, Louis 1991, 122, attributes the title to a late-twelfth-century compiler.

8 Louis 1991; Marengi 1966; Rouelle, Knoellinger, and Klek 1922.

9 Mayhew 2011; Louis 1991; Marengi 1966; Ferrini 2002; Flashar 1962; Hett 1936; Forster 1927.

10 For the textual and exegetical history of the *Problems* in the Middle Ages, see the collection of essays in De Leemans and Goyens 2006, and the extensive bibliography on 295–317.

Of the modern editions of the Greek original, Marengi's is the best for our purposes, and it is the most complete in its notation of variants found in the MSS; both the Budé and Teubner often omit variant readings, unfortunately, even from MSS which they seem to have consulted. We follow Marengi's edition with a few minor emendations as noted here or in the commentary below. Where possible we have consulted digital copies of the MSS in question to verify readings.

διὰ τί ἀπὸ φθίσεως καὶ ὀφθαλμίας καὶ ψώρας οἱ πλησιάζοντες ἀλίσκονται, ἀπὸ δὲ ὕδρωπος καὶ πυρετῶν καὶ ἀποπληξίας οὐχ ἀλίσκονται, οὐδὲ τῶν ἄλλων;

ἢ ἡ μὲν ὀφθαλμία, ὅτι εὐκίνητότατον ὁ ὀφθαλμὸς, καὶ μάλιστα ὁμοιοῦται τῷ ὀρωμένῳ τῶν ἄλλων, οἷον κινεῖται ἀπὸ κινουμένου, ὥστε καὶ ἀντιβλέπων τεταραγμένῳ, ταράττεται μάλιστα;

ἢ δὲ φθίσις, ὅτι τὸ πνεῦμα φαῦλον ποιεῖ καὶ βαρῦ, τάχιστα δὲ τὰ νοσήματα ταῦτα ἄπτεται πάντων, ὅσα τούτου φθειρομένου γίνεται, οἷον τὰ λοιμώδη. ὁ δὲ πλησιάζων τοιοῦτον ἀναπνεῖ.¹¹ νοσεῖ μὲν οὖν, ὅτι νοσῶδες· ἀπὸ μόνου δέ, ὅτι ἐμπνεῖ,¹² νοσεῖ, οἱ δὲ ἄλλοι ἐτέρως· τὴν αὐτὴν δὲ νόσον,¹³ ὅτι ᾧ ἂν ἀσθενήσῃ, τούτῳ ἀναπνεῖ τοιοῦτον, οἷον εἰ πεπονθῶς ἦν.

ἢ δὲ ψώρα μόνον¹⁴ τῶν ἄλλων, οἷον λέπρας καὶ τῶν τοιούτων, ὅτι ἐπιπολῆς τε καὶ γλίσχρον τὸ ἀπορρέον· τὰ γὰρ κνησμώδη τοιαῦτα. διὸ αὐτὰ τῷ ἐπιπολῆς γίνεσθαι καὶ γλίσχρον εἶναι ἄπτεται. τῶν δ' ἄλλων τὰ μὲν οὐχ ἄπτεται διὰ τὸ μὴ ἐπιπολῆς γίνεσθαι, τὰ δὲ ὄντα ἐπιπολῆς, ὅτι οὐ προσμένει διὰ ξηρότητα.

11 Some MSS have ἀνάπτει here, 'the person nearby touches [= is infected by?] such a breath.'

12 ἐμπνεῖ following the β recension in the MSS. The modern editions tend to follow the α/γ/δ recensions which have ἐκπνεῖ. See our commentary below.

13 Punctuation following modern edd. except Marengi, who puts οἱ δὲ ἄλλοι ἐτέρως in parentheses (for stylistic clarity, we assume, since it is grammatically neutral). One MS, Urb. gr. 50, construes τὴν αὐτὴν δὲ νόσον with the preceding clause rather than the following one (e.g., punctuating it as: ἀπὸ μόνου δέ, ὅτι ἐμπνεῖ, νοσεῖ· οἱ δὲ ἄλλοι ἐτέρως τὴν αὐτὴν δὲ νόσον· ὅτι ..., 'he becomes sick from the breath alone (others come down with the same disease differently), because ...'). So too d'Abano and his copy of Bartholomew. This reading is certainly possible. See our commentary below for fuller remarks.

14 Modern edd. all read μάλλον for μόνον, against the majority of MSS. Only three manuscripts have μάλλον, all from the one family and even then it is a minority reading within that family. We also note that the oldest translation, that of Bartholomew, has *solum* not *magis*. Forster and Flashar likewise translate alone/*allein*. The difference is medically significant, insofar as μάλλον would imply that other diseases like leprosy are also, at least to some extent, contagious, which is not the majority medical opinion in antiquity, although it was certainly thought to be so in some nonmedical accounts (see Lehoux, forthcoming).

Why are people nearby seized by consumption, ophthalmias, and *scabies*,¹⁵ but are not seized by dropsy, fevers, seizures, and other diseases?

In ophthalmia, is it because the eye is easily affected, and more than the other organs becomes similar to the object that is seen; for example, it is itself affected by something that is affected, and looking at something disturbed becomes readily disturbed itself?

In consumption, is it because it makes the breath poor and laboured, and those diseases infect¹⁶ people fastest of all which come about with the breath corrupted, like plagues? The person nearby breathes such a breath. He becomes sick because it is diseased. And because he inhales it, he gets sick from the breath alone (others [get the disease]¹⁷ differently); and [he gets] the same disease because he breathes, with that part in which he is susceptible, such a breath as he would if he had already come down with it.¹⁸

But *scabies* alone, among other diseases such as leprosy and the like, is [of this sort] because its discharge is on the surface and sticky.¹⁹ Itchy rashes are of this sort. Thus they cause infection by occurring on the surface and being sticky. With the other diseases, some don't infect because they do not occur on the surface, others, although they are on the surface, don't cling due to their dryness.

15 The use of italics is explained at the start of section 3.3 below.

16 The Greek word for *touch* here seems to mean 'infect' or 'bring about contagion.' This appears to be its earliest use in this extended medical sense. For this and other Greek terminology around contagion, see Nutton 2000.

17 We read the ἄλλοι as the subject of an elliptical νοσοῦσιν (from the earlier νοσεῖ), on which see our commentary below. Our change of translation for the elided verb from 'gets sick' to 'gets the disease' is motivated by our concern that the phrase 'others get sick differently' may sound like the text is speaking about other people coming down with some different, unspecified, diseases, which makes little sense in the context. The same disease is clearly implied.

18 Alternatively, following d'Abano's reading as outlined above, this last sentence would be translated as: 'And because he inhales it, he becomes sick from the breath alone (others come down with the same disease differently), because he breathes, with that part in which he is susceptible, such a breath as he would if had already come down with it.'

19 Oribasius, *Synopsis ad Eustathium filium* 7.48.1 (fourth c. CE) distinguishes *lepras* from *scabies*, *leukē* and *alphos* on the grounds that the latter three diseases are superficial, as *lepras* is here, but τὴν λέπραν δ' ὁ γεννῶν χυμὸς ἄχρι βᾶθους διήκει, τῆς ψώρας ἐπιπολαιότερας οὔσης, 'the humour that causes *lepras* extends especially deep, whereas *scabies* is more superficial.'

3 Commentary

3.1 Case 1: *Ophthalmia*

The text here is fairly straightforward. The mechanism offered for the contagion of ophthalmia(s) is one of what we will call *similation*,²⁰ where the eye simply *becomes similar* to what it sees. If we think about the ready transmissibility of something like pinkeye, for example, the vividness and appeal of this explanatory mechanism becomes apparent. Seeing an already diseased eye, our eye simulates to it, ὁμοιοῦται. It becomes just like the diseased eye that it sees. It is important to note that there is no insinuation here that some disease-agent moves from the ailing person to their companion.²¹ Everything happens simply through sight. This mechanism has much more in common with the contagion of yawning than it does with germs.²²

We read κινεῖται ἀπὸ κινουμένου as a true passive construction: ‘it is itself affected by something that is affected’ (literally *moved by something that is moved*). By contrast, Flashar, as well as Marengi and Louis following him, read the verbs as anticausatives (where the external source of motion is suppressed) or autocausatives (where the cause of motion is internal) rather than as true passives (where the cause of motion is an external agent, explicit or implied):

Flashar: *es sich z. B. bewegt, wenn sich ein Gegenstand bewegt*, ‘it moves, for example, when an object moves’.

Marengi: *segue ad es. nel movimento un oggetto che si sposta*, ‘for example, it follows in its movement an object that moves’.

Louis: *il se trouve entraîné par la vue d'un objet en mouvement*, ‘it finds itself pulled along by the sight of an object in motion.’²³

20 We say *simulate* here rather than *assimilate* because the latter has the (etymologically secondary) meaning of ‘to absorb into’ which may in fact be its most common meaning these days (think of the Borg in *Star Trek*). The worry is that a modern reader will be led astray by that meaning, especially given modern germ theory where we ‘assimilate’ germs into our bodies all the time. In the ophthalmia case we have a completely different disease theory and we wish to maintain its conceptual distinction.

21 Having said that, the later tradition would superimpose emanations onto this example. See the discussion in section 4, below.

22 Indeed, the contagion of yawning is discussed explicitly in several of the problems in Book 7.

23 This may look like a true passive, but we find a subtle but important distinction between the eye being moved by an external object of its sight (the *thing that it sees* moves the eye) and the eye being moved by or in the process of the act of its own seeing (properly an internal cause). This is to say that Louis’ wording has *the sight* of the moving object as the (auto)causal agent, not *the external object itself* as in a true passive construction.

We feel that these readings make less sense than the simpler passive reading. Where we take ἀπό as causative (the eye is moved *by means of* something that is itself moved), Flashar, Marengi, and Louis must be reading it as either positional or else as only metaphorically causal. If the positional reading were correct, the eye would seem to have to move *away from* the moving object (the normal positional meaning of ἀπό), not to follow it. This seems unlikely. If ἀπό is causal,²⁴ we have a moved thing causing the eye to move. Reading the verbs as passive, then, the text would simply be saying that the eye is *changed* by something it sees (where ‘change’ is a common Aristotelian usage of the verb *to move*). This seems the cleaner reading. For his part, Mayhew appears to agree with us, although it is just possible that he is splitting the difference.

Mayhew: ‘it is moved by [seeing something] *being moved*’ (emphasis ours).

The appeals to similation and to movement of the sense-organ both have good Aristotelian pedigree. The former is a specific application of the general principle of perception in Aristotle’s *De Anima* 418a5–6: the perceptual faculty, ‘having been affected, is similated and takes on the same quality as the sense-object’, πεπονηθὸς δ’ [τὸ αἰσθητικὸν] ὁμοίωται καὶ ἔστιν οἷον ἐκεῖνο [τὸ αἰσθητὸν].²⁵ The movement of the sense-organ too, especially when interpreted passively with causal ἀπό, is consistent with what we know of Aristotle’s theory of vision, and with ancient theories of vision more generally.²⁶ In addition to entities such as αἱ ἀπὸ τῶν αἰσθητῶν κινήσεις, ‘movements from the sense-objects’ (*De sensu et sensibilibus* 446a22, which are held in some accounts to arrive at the sense-organ), in the *De anima* (419a13–15) it is said that colour ‘moves’ a translucent medium such as air, and that the sense organ is then ‘moved’ in turn by this moved, continuous body of air (τὸ μὲν χρῶμα κινεῖ τὸ διαφανές, οἷον

24 As it admittedly is in the ἀπὸ μόνου of the discussion of consumption, below.

25 Whether Aristotle would have countenanced the extension of simulatory qualitative change in the visual faculty to diseased states is debatable, since it is uncertain whether he thinks the qualitative changes involved in perception are ‘physical’ in the ordinary sense and so could plausibly include disease. See Lorenz 2007 for the controversy of how to understand the qualitative change in the perceiver’s sense-organ brought about by the sense-object.

26 For a good introduction to theories of vision, see A.M. Smith 1999. On Aristotle’s theory of vision, see Costello 2021; Kalderon 2015; Sorabji 2004; Burnyeat 1995. There is a passage in *Meteorology* 373a35–b13 where Aristotle, contrary to his theory elsewhere, seems to use something like an extramission theory of vision to explain rainbows. On the tension between that theory and the *De anima* account, see Lindberg, 1976 217 n. 39; Lehoux 2012 114–15.

τὸν ἀέρα, ὑπὸ τούτου δὲ συνεχοῦς ὄντος κινεῖται τὸ αἰσθητήριον). Here κινεῖ is used generically in the sense of ‘cause a change in’ and doesn’t describe locomotion of the kind involved in atomistic theories where particles from objects of sense-perception pass from perceived to perceiver. Quite how this change was brought about was a mystery that generated considerable puzzlement. Unlike the cases of smell and hearing, with sight the effect of sense objects upon the visual faculty seems immediate even though the intervening medium may be vast.²⁷ Empedocles and the atomists, who were committed to a locomotive theory of vision, maintained that there must in fact be some delay in the transmission, however slight.²⁸ In *De sensu et sensibilibus* (446a22–447a12), Aristotle objects that any movement is really qualitative change (ἀλλοίωσις), which can be instantaneous, as observed for example in the freezing of water. But he worries that large masses do in fact require time for such changes to permeate the entire body, as for instance in the heating of a large body of water, where one part heats the part next to it and so on, and the intervening mass of air that must be ‘moved’ for vision to happen can indeed be very large. This difficulty is never resolved, and Aristotle even toys with rejecting the view that vision involves movement in any sense at all so as to avoid it, but he ultimately never fully escapes the popular conception of vision as the κίνησις of the sense organ brought about by some external cause.²⁹

Underlying this section of Problem 7.8, then, is an assumption of some kind of ‘sympathetic’³⁰ relation between objects of sight and the eye itself by which a change in the former activates in some way a change in the latter.³¹ Thus to call the eye εὐκίνητότατον is to say that this relation is especially sensitive in the case of sight, and that there the κίνησις occurs very quickly and easily between

27 See for example Galen, *De placitis Hippocratis et Platonis* 7.5.7.

28 On the Epicurean theory of vision, see Smith 1999, and Masi and Maso 2014. On Empedocles, see Kalderon 2015; Sedley 1992.

29 For the complexities, see Ross, 1906, 212–16.

30 *Sympathy* as an active force in nature would become a common explanatory mechanism in Hellenistic physics, particularly but not only Stoicism. How early the concept was so used is a bit of an open question (hence our ‘scare quotes’, to be cautious). See our fuller comments in section 4, below.

31 The activation would ordinarily require an intervening medium in order to avoid atomistic effluences on the one hand as well as magical action at a distance (via nothing) on the other (cf. Aristotle *De anima* 419a15–21), but there is no evidence of this in the text beyond the invocation of κίνησις. Whether this is because the text believes that similitude is unmediated (in the face of criticism of non-spatial, purely relational explanations of vision at *De sensu* 446b10–12), or because brevity simply assumes some form of mediation as background knowledge, is hard to say.

the sense object and the sense organ.³² Nonetheless, just why a πάθος such as ophthalmia can be propagated by similation but other properties like heat cannot (the eye does not get hot when looking at a hot thing) is not accounted for even if it was commonly believed that various other wondrous effects could in fact be transmitted through sight. For example, drawing on an extramission theory of vision in which the πολυκίνητος ὀφθαλμός emits ἀύγη or other effluences, one of the dinner party guests in Plutarch's *Quaestiones conviviales* even claims that jaundice can be cured by looking at a χαραδριός, where the diseased effluences drain from the eyes into the unfortunate bird. He then claims that this action is why ophthalmia is especially catching, as it has 'a swift ability' to impart to another the beginning of pathology.³³ In a similar vein, Pietro d'Abano in his influential late medieval commentary on Problem 7.8 adduces the supposed case of menstruating women staining mirrors with their looks (cf. Aristotle *De insomniis* 2 459b27–460a23) as an example of the mechanism involved. Aristotle is clear there that the reason for the stained mirrors is that 'vision, as well as being affected by the air, can also affect it and move it', αἴτιον δέ, ὡσπερ εἴπομεν, ὅτι οὐ μόνον πάσχει ἢ ὄψις ὑπὸ τοῦ ἀέρος, ἀλλὰ καὶ ποιεῖ τι καὶ κινεῖ, in this instance by disturbances in the blood around the eyes that are propagated into the continuum of air and transmitted to the mirror. In summary, the eye's apparent dynamism—its unparalleled ability both to act and be acted upon at a distance—may go some way to explaining why two eyes looking at each other are thought to provide such a potent link for the transmission of disease.³⁴

3.2 Case 2: Consumption

This section of the text has caused the most consternation for modern editors and translators, and it is here that we find the heaviest editorial hands at work when concrete solutions have been proposed above and beyond the more common airing of suspicions.

32 Cf. Guastavini 281: *oculus ... pars est omnium nostri corporis maxime mobilis similitudinesque omnes, et omnes impressiones prompte recipit, cum facile a re quae movet, moveatur*, 'the eye ... is the most movable part of all in our body and readily receives every image and every impression since it is easily moved by a thing which causes movement.'

33 Note that the text of this section of the *Problems* does not talk about effluences. Effluences are a Plutarchian or pre-Plutarchian innovation with respect to ophthalmia (see section 4, below).

34 Cf. Plutarch *Quaestiones conviviales* (*Quaest. conv.*) 681a8–9, where the fiery δύναμις that spreads from eye becomes the means 'by which humans both produce and experience many effects', ὥστε πολλὰ καὶ πάσχειν καὶ ποιεῖν δι' αὐτῆς τὸν ἄνθρωπον.

The wording in this section is difficult, to be sure. The basic outline of the mechanism for contagion has been clear to most commentators, even while specifics have been contested. As opposed to the simulation proposed for ophthalmia, above, we here find the breath of the consumptive becoming ‘corrupted’, φθειρόμενον, and this corrupted breath is then inhaled (importantly, we argue, into the lungs) by a companion or housemate who becomes ill in turn. The disease is said to *touch*, ἅπτεται, those around the sick person, thus making them ill.

This much is clear, but there are several passages where the details become tricky to disentangle, not least because of the difficult syntax coupled with and compounded by minor (but sometimes semantically significant) variations in the manuscripts.

Perhaps the three most persistent difficulties are how to understand the phrases (1) ἀπὸ μόνου in ἀπὸ μόνου δέ, ὅτι ἐμπνεῖ, νοσεῖ (whether μόνου is referring to a person or to a breath); (2) οἱ δὲ ἄλλοι ἐτέρως in connection with its two preceding verbs (breathing, getting sick), and (3) the datives ᾧ ... τούτῳ in the final clauses of the section.

Let us start with the first, ἀπὸ μόνου δέ, ὅτι ἐμπνεῖ, νοσεῖ. All translations in the last hundred years or so have taken μόνου to refer to a person, as for example Mayhew, whose translation ‘and he gets it from only one person’ is typical. The Latin versions of Bartholomew and Georgius, which both have *a solo*, and Bussemaker’s *ab unico*, are ambiguous between a person or a thing, while Theodorus makes clear through the addition of *unus* in the next clause that he means a person. However, d’Abano’s commentary suggests he took it to refer to the noxious breath rather than to a person (*quoniam aegrotat solum a vapore putrido quem expirat infirmus*, ‘because he gets sick only from a putrid breath that the sick person exhales’). Moreover, an *alia manus* in a manuscript of Georgius’ translation tells us in a marginal note to supply *aere aegrotativo*, ‘a sickly breath’, to complete Georgius’ unspecified *solo*, ‘only’, in the phrase *a solo autem quia inspirat aegrotat*, ‘he becomes sick from *only* [a breath? a person?] because he inhales’.³⁵ We agree with this reading and would add that diseased breath is the most salient candidate for μόνου since it is the subject of the preceding clause.

35 The manuscript is Urb. lat. 1322, 35v., whose relevant section has been edited by Marengi 1966, 298–9. The full note reads *Supple: aere aegrotativo aegrotat homo, quia inspirat et attrahit ipsum ut aegrotativum et aptum inficere partes spiritales hominis*, ‘read as: *from a sickly breath* the person becomes ill, because he inhales it and draws it in as disease-causing and suited to infecting a person’s respiratory organs.’

According to Marengi, Georgius was working from an ‘excellent codex’ belonging to the β family of manuscripts,³⁶ which reads ἐμπνεῖ after ἀπὸ μόνου instead of the majority ἐκπνεῖ ($\alpha/\gamma/\delta$ recensions), and which Georgius translates with *inspirat*, ‘he inhales’, rather than the $\alpha/\gamma/\delta$ reading of ‘he exhales’. On this interpretation, which we follow, the text would mean that the inhalation of the corrupted breath alone is sufficient to cause infection. Reading ἐμπνεῖ avoids the difficulty of an unmarked change of subject in the back-to-back sequence of ἐκπνεῖ, νοσεῖ, since ἐκπνεῖ would have to take the infector and νοσεῖ the infected as subjects, whereas the infected would be the subject of both ἐμπνεῖ and νοσεῖ, which is syntactically more natural. This is admittedly not a conclusive argument, since the compressed syntax of texts in an Aristotelian style are often *laissez-faire* about changes of reference. We also note that medically there is not much to choose between ἐκπνεῖ and ἐμπνεῖ. Either the sick person exhales and the healthy gets sick [by inhaling], or the healthy person inhales [what the sick exhales] and gets sick. Our preference for the latter is not a make-or-break interpretive point, but on balance seems grammatically smoother. That being said, we think that one final clue points slightly toward ἐμπνεῖ as well. The adverb ἐτέρως in the following parenthetical remark (whose interpretation we further clarify below, and which is meant contrastively), seems to suggest that there are different ways to contract the same disease (e.g. through an imbalance or through poor regimen), again emphasising the *contracting* of the disease by the new patient rather than the *spreading* of it by ‘patient zero’. Finally, we readily admit that the switch in vocabulary for this sentence, where the ἀναπνεῖ above and below it becomes ἐμπνεῖ here, is notable. If the β reading is correct, the change of vocabulary may be motivated by a subtle emphasis on the danger of inhaling in particular, versus the earlier and later references to a simpler and more general ‘respiring’, ἀναπνεῖ. It may also be meant to foreshadow the emphasis on the role of the susceptible organ, the lungs of the infected person, that we find in the ϕ ... τοῦτω at the end of the passage (on which see below).

Let us now move to problem (2) of the text, οἱ δὲ ἄλλοι ἐτέρως in connection with its two preceding verbs, in the sequence ὅτι ἐμπνεῖ [or ἐκπνεῖ], νοσεῖ, οἱ δὲ ἄλλοι ἐτέρως. Although their exact renderings differ, English translators have been unanimous in reading οἱ δὲ ἄλλοι ἐτέρως with an elliptical ἐκπνεῖ and understanding it as a reference to the different, presumably healthy respiration of others who are not sick, which healthy breath is contrasted with the corrupt breath of the infected individual:

³⁶ Marengi 1966, 268.

Forster: ‘... because that person inhales this particular breath, *which is different from that which others exhale*’ (reprinted without change in Barnes; italics ours).

Hett: ‘... the others exhale differently’ (Loeb edition of 1936; Mayhew adds ‘while’ at the start of the clause).

Flashar and Marengi also take it this way, again supplying the elided verb explicitly:

Flashar: *während die anderen auf andere Weise (ausatmen)*, ‘while others exhale differently’.

Marengi: *mentre gli altri espirano diversamente*, ‘while others exhale differently’.

Louis in the Budé supplies a generic *sont: alors que les autres sont autrement*, ‘even though others are otherwise’, and thus appears also to take the phrase as somehow referring to healthy other people (without singling out their breathing in so many words).

This interpretation faces both linguistic and contextual problems. Linguistically, it requires the phrase οἱ δὲ ἄλλοι ἑτέρως to be construed not with the most recent verb, νοσεῖ, but instead to leapfrog over this and take the prior verb ἐκπνεῖ as its predicate, as follows: V₁, V₂, οἱ δὲ ἄλλοι ἑτέρως (V₁), where V stands for a verb and parentheses for an ellipsis. This problem was recognised by Pietro d’Abano, whose commentary on the *Problemata* became a key text in its reception and transmission in the Renaissance.³⁷ D’Abano took οἱ δὲ ἄλλοι ἑτέρως to be governed by the closer of the two verbs as would be most natural. On his reading, other people *get sick* (V₂: νοσεῖ) differently. We believe that d’Abano’s interpretation is the most natural given both the word order of the sentence and the context of the argument as a whole. Why, after all, would the author of this Problem feel the need to point out that healthy people breathe differently? Throughout the text, the author is consistent in taking considerable pains to single out the breath *of the sick person*, not the healthy person, as what is anomalous, calling it φαῦλον, βαρὺ, φθειρόμενον, and νοσῶδες, ‘poor’, ‘laboured’, ‘corrupted’ and ‘diseased’, as well as twice emphasising its abnormality with qualitative demonstratives (τοιούτων). It is clearly the breath of the consumptive, not of healthy people, that is at issue throughout. The reader does not need reminding that everybody else still breathes normally. Moreover,

37 The work was completed in 1310 and its *editio princeps* is the incunabulum *Expositio problematum Aristotelis cum textu* (Mantua, 1475).

the Problem is arguing for what it surely knows is a novel interpretation of disease causation (if the answer was just standard, then why the question in the first place?). In a medical context where the vast majority of diseases are due to breakdowns of one sort or another in the functioning of the individual body itself, it is the unusual case of disease contagion, as here, that requires explaining. The text never says that contagion is the *only* way that people come down with consumption, after all. Indeed, the section ends with the author alluding to other, unstated, mechanisms of transmission (τούτω ἀναπνεί τοιοῦτον, οἷον εἰ πεπονθῶς ἦν, 'he breathes such a breath as he would if he had already come down with the disease').

The meaning of ἐτέρως is thus that others get sick with this disease differently, that is via different infected intermediaries or a different mechanism, presumably through 'normal' disease processes such as exposure to inclement atmospheric conditions or an imbalance in the body.³⁸ The text then underscores the fact that they get sick with the same illness, τὴν αὐτὴν δὲ νόσον. Whether to read τὴν αὐτὴν δὲ νόσον with the preceding or following clause is another problem, however. On the majority reading, which we follow above, the δέ in τὴν αὐτὴν δὲ νόσον is taken to be the third contrastive in a μὲν ... δέ ... δέ sequence and begins a new clause: νοσεῖ μὲν οὖν, ὅτι ... ἀπὸ μόνου δέ, ὅτι ... τὴν αὐτὴν δέ, ὅτι ... 'he gets sick because ... and it's from the breath alone because ... and [he gets] the same disease because ...' However, as noted above (n. 13), d'Abano reads it with the preceding clause and understands 'others come down with the same disease differently.'³⁹

Whichever is correct, something very like τὴν αὐτὴν νόσον seems implied across the whole sequence: either it explicitly applies to the phrase after it and is implicitly applied to the phrase before it (as in our reading), or it explicitly

38 As described, for example, in the Hippocratic *Airs, Waters, Places (Aer.)*. See e.g. *Aer.* 4 [= Heiberg 59.2], *Aer.* 10 [= Heiberg 66.19].

39 Bartholomew's translation dates to around 1260. See the 'Introduction', xiv, in De Leemans and Hoenen 2016. The translation in d'Abano's commentary had mistakenly been credited to d'Abano himself, a view corrected by Marengi, 268. Other versions of Bartholomew's Latin text (e.g. Vat. lat.2993 f. 169v) generally have *secundum* instead of *vel* in the sequence *a solo autem quia expirat, aegrotat alii autem aliter vel eundem morbum*, 'from the breath alone, because [the one] exhales it, [the other] gets sick, and others differently but with the same disease', as did the version consulted by Guastavini, for he notes (281–2) that the *antiqua translatio* adds *secundum*, without any corresponding word in the Greek, before *eundem morbum*. The absence of punctuation before *vel eundem morbum* in d'Abano (f. 96r) suggests reading it together with *aliter*, although Vat. lat.2993 and other manuscripts of Bartholomew have a punctuation mark before *secundum*. It may well be that *secundum* was added just because an internal accusative is not as natural with *aegrotat* in Latin as it is with the Greek νοσεῖ.

applies to the phrase before it (as in d'Abano) and implicitly to the phrase after it. This is to say that we take the text throughout as articulating a theory about how people catch consumption in particular, not about how people simply get sick (or breathe) generically.

The majority modern reading of ἐτέρως as referring to breath appears to go back to Theodorus of Gaza, whose interpretation was picked up by Giulio Guastavini, writing in the early seventeenth century.⁴⁰ Guastavini was the first to discuss problems in the text's interpretation. He compares Bartholomew's translation, which he calls the *antiqua translatio*, with Theodorus', which he includes in his edition alongside the original Greek. Although Guastavini follows Theodorus in his reading of ἐτέρως, he acknowledges that Theodorus had added some things which are not in the Greek and 'which can significantly change the meaning, [such as the phrases] *that one person and in this way, quae multum sententiam immutare possunt, unus ille, & sic*. Theodorus obviously adds *sic*, qualifying the respiration of a person who is ill with consumption, so as to give an explicit contrast with *secus*, qualifying the respiration of healthy others. Thus Guastavini reads him as saying that 'Aristotle' is explaining why a person gets sick only from the sick person he is in close contact with and not from others: *atque videtur ita interpretari verba, tamquam Aristoteles declaret, quare a solo eo morbosus cui appropinquat, aegrotet, non autem ab aliis*, 'and he seems to interpret the words as Aristotle explaining why someone gets sick only from the ill person he is near, but not from others'. Guastavini also takes issue with d'Abano's account of a sequence of contagion (*ordinem contagionis*, on which, see below), noting that he 'cannot see how the text's words can be made to fit this sense' (*sed verba quomodo huic sensui adaptentur, ego videre non possum*), and explaining d'Abano's 'misinterpretation' as a product of his ignorance of Greek and his reliance on Bartholomew's literal translation. Guastavini conjectures that d'Abano must have thought that *taliter* should be read instead of Bartholomew's *aliter*, meaning that these others get sick 'in such a way (as the first person who catches it)'. However, what Guastavini himself was missing, we believe, is that ἐτέρως here is functionally equivalent to a Greek construction such as οἱ δὲ ἄλλοι ἀπ' ἄλλων or ἀφ' ἐτέρων, or else ἀφ' ἐτέρων [ἀιτιῶν]. Either others come down with the disease but through a different cause, or the corrupt breath is of the same kind but the persons one catches it from are different.

40 Guastavini 1608, 280–3.

The latter reading has precedent in d'Abano's commentary. D'Abano expounds on the chain of transmission in his exegesis:

Et quod ita sit patet, quoniam aegrotat solum a vapore putrido quem expirat infirmus in alium dispositum, quem postea alius inspirans aegrotat, et ulterius isti alii sic infecti a priori aegrotante. Inest quod alter tertium disponat ab eo quod erat prius, scilicet inficiendo ipsum eodem morbo quo infectus fuit a primo, quoniam secundus respirat tale etiam et fumum putridum fetentemque tertius inspirans postea aegrotabit et sic deinceps.⁴¹

It's clear that it's this way because he gets sick just from the diseased exhalation which the unwell man breathes out onto another disposed person, which another afterwards breathes in and so gets sick, and further on those others infected in such a manner by a prior sick person. There is something in it that causes the second person to put the third person in such a state by that process which occurred earlier, namely by infecting that very person with the same illness with which he was infected by the first person, since the second person's breathing has a similar quality, and the third person, breathing in the diseased and foul vapour, will afterwards get sick, and so on and so forth.

We see here d'Abano unpacking Bartholomew's *alii autem aliter vel eundem morbum* into a detailed description of person-to-person contagion in a continuous process that repeats the first event of transmission from patient zero. This is surely correct, as we have argued. Nevertheless, Bartholomew's translation was later superseded by Theodorus of Gaza's new translation into Latin in the fifteenth century, which takes the text in a different direction by construing οἱ δὲ ἄλλοι ἑτέρως with ἐκπνεῖ instead: *ab uno autem morbum excipit, quoniam unus ille sic spirat, ceteri secus*, 'however he receives the disease from one person, because that one person breathes in this way [but] others differently'.⁴² Theodorus' Latin then becomes the basis for all subsequent interpretations of the text. We should add here that Theodorus' translations were attacked by his

⁴¹ D'Abano f. 96r.

⁴² Theodorus' translation first appeared in 1454 but was revised in 1474 in light of criticism from Georgius. It is published alongside the Greek in Erasmus' edition, as well as in various subsequent editions.

rival Georgius Trapezuntius,⁴³ and that Georgius himself (against Theodorus but with Bartholomew and d'Abano) seems to have read οἱ δὲ ἄλλοι ἑτέρως with νοσεῖ, since, like Theodorus, he places the verb of getting sick (in his case *aegrotat*) immediately before *alii vero aliter*.⁴⁴

Let us now treat the last remaining difficulty in this section, namely (3) the function of the phrase ϕ ... τούτῳ near the end of the passage. All modern translations want to take it as referring to the breath, so that ϕ is a dative of means specifying that it is *by* the corrupt breath that one gets sick. But in that case the second dative, τούτῳ, should be accusative because ἀναπνεῖ is transitive, as shown by the construction τοιοῦτον ἀναπνεῖ that occurs earlier and then is repeated in this same sentence. This fact troubled Forster enough that he proposed emendation to τοῦτο, which was also approved by Flashar. Yet Forster was still unhappy with the text. He further ventured the bold emendation τὴν δὲ αὐτὴν τούτῳ ὃς ἂν ἀσθενήσῃ, ὅτι ἀναπνεῖ ..., '(he contracts) the same disease as whoever is sick, since he breathes ...', an intervention Marengi is duly wary of.⁴⁵ Nevertheless, Forster's unease about the emended τοῦτο is warranted. An accusative demonstrative τοῦτο when we already have an accusative demonstrative τοιοῦτον, both apparently referring to the same breath, is certainly awkward.

On the other hand, there is nothing wrong with the text as we have it if we understand this dative construction as an instance of Aristotelian jargon, specifying the organ with which one carries out an activity. Such a construction is common enough in Aristotle, for example in Aristotelian psychological texts addressing the part with which one performs some cognitive function, e.g. *De memoria* 449b30. Indeed Bussemaker, in a third and final Latin translation of the text, renders it exactly this way: *quia qua parte ille aegrotarit, eadem hic tale spirat*, 'because this person breathes such a breath with the same part with

43 E.g. in his *Protectio Aristotelis Problematum*, edited by Monfasani 2021. See also Marengi 1966, 268.

44 The interpretation of the marginal commentator on Georgius' translation in Urb. lat. 1322 is worth noting here: *Alii qui sc. eundem aerem inspirant; aliter i.e. non aegrotant, quapropter eundem aerem non aegrotativum sibi attrahunt; infectus enim aer non est aequaliter omnibus aegrotativus, sed aliis magis, aliis minus, aliis minime*, 'others clearly means those who breathe in the same air; differently, that they don't get sick, because they take in air that isn't sickness-inducing to them. For infected air isn't equally sickness-inducing to everyone, but more so to some, less to others, and not at all to others.' We do not think this interpretation is correct, since if we are to understand *aegrotant*, getting sick differently cannot be forced to mean not getting sick at all.

45 *Locum ita dubitanter rest. Forst.*, 94 ad loc.

which that person has become sick'.⁴⁶ Bussemaker is surely right here. This reading provides a neat solution to the problem without meddling with the text, and while maintaining good Aristotelian sense. After all, there is an extra entity involved in contagion besides just the corrupt breath: the susceptible organ with which one breathes, and in which one gets sick.⁴⁷

Read this way, the text's view of contagion is more complex and richer than has generally been understood. It suggests an open-ended sequence of transmission from one person to another as well as a means by which the corrupt breath takes root in the body and causes pathology. Regarding the latter, there is some suggestive evidence that d'Abano also understands a *quo ... hoc* as referring to an organ. In characterising the corrupt breath emanating from infection with *phthisis*, he calls it *anhelitus pravus et corruptus plenus humoribus putridis fetentibus procedentibus ab ulcere pulmonis*, 'a horrid and corrupt breath, full of stinking, putrid humours coming from an ulcer of the lung'. It is thus a sore in the lungs which ultimately gives off the putrid humours that are transmitted via respiration to another body. In this account, the lungs would be both the organ in which the infection takes hold, and also the source of further corrupt breath that may infect others. This is a theoretical improvement over a picture in which there is no role for a diseased organ, for one is left wondering how future streams of corrupt breath will be produced and sustained if the contagion is to spread, unless one absurdly proposes that it is one and the same instance of infected breath that jumps from person to person.

3.3 Case 3: Scabies

We italicise *scabies* here to flag that we are not committed to associating the Greek disease classification with the modern parasitic disease called 'scabies', which is the name of a specific skin inflammation caused by certain mites of the species *Sarcoptes scabiei* (varieties of which are also a primary cause of mange in other animals).⁴⁸ Nevertheless, the Greek ψώρα was regularly trans-

46 Bussemaker 1857, 154. Bartholomew and Theodorus both have *hoc*, which is ambiguous between accusative and ablative, though the latter's *hoc non aliter spirat quam*, in which τοιοῦτον οἶον is understood adverbially, would suggest it is meant accusatively.

47 Note that there is a role for the lungs too as the target of disease in the collection of problems attributed to the Aristotelian commentator Alexander of Aphrodisias (Problem 2.42, Ideler 1841, 64): '*phthisis* transmits in turn via the respiration of the healthy person the pathology and decay to the lung', ἡ δὲ φθίσις ... διαδίδωσι πάλιν διὰ τῆς ἀναπνοῆς τοῦ ὑγιαίνοντος τὸ πάθος καὶ τὴν σῆψιν τῷ πνεύμονι.

48 We are less concerned with rendering φθίσις as 'consumption' simply because consumption is an outdated disease name, even if there may be general agreement that what used to be called consumption is the same disease as we now call 'tuberculosis'. As with *scabies*,

lated into Latin as *scabies*, from which the modern condition gets its name.⁴⁹ As with many disease names, their diagnoses and aetiologies can change considerably over time. We accordingly read ψώρα/*scabies* simply as some kind of itchy, probably purulent skin disease.

In this section, as in the previous, we have translated ἄπτεται as ‘infect,’ implying ‘infect through contagion.’

The mechanism for contagion in this instance is perhaps slightly less explicit in its articulation than the previous two cases, although it appears to be the same mechanism as that in the case of consumption. For *scabies*, the text seems to be saying that because the disease happens superficially and on the surface of the skin, and because its discharge is sticky, that stickiness can infect people, presumably by simply getting onto their skin through touch.

This seems to be the implication of the final sentence, τῶν δ' ἄλλων τὰ μὲν οὐχ ἄπτεται διὰ τὸ μὴ ἐπιπολῆς γίνεσθαι, τὰ δὲ ὄντα ἐπιπολῆς, ὅτι οὐ προσμένει διὰ ξηρότητα, ‘with the other diseases, some don’t infect because they do not occur on the surface, others, although they are on the surface, don’t cling due to their dryness.’ We are here translating προσμένει as ‘cling’ to preserve a nuance that is picked out by the use of the προσ- in προσμένει rather than the more common μένει, ‘remain.’ Most translators have treated προσμένει as equivalent to a simple μένει in this passage:

Flashar: *Die anderen genannten Krankheiten sind nicht ansteckend, teils, weil sie nicht an der Oberfläche auftreten, teils, weil sie zwar an der Oberfläche auftreten, aber dort nicht lange bleiben, da sie trocken sind,* ‘the other diseases mentioned are not contagious, either because they do not appear on the surface or because, although they do appear on the surface, they don’t remain there for long because they are dry’.

Marengi: *Delle altre, alcune non sono infettive, perché non affiorano in superficie, altre perché, pur manifestandosi sull'epidermide, non si attaccano in quanto non danno essudati,* ‘concerning the others, some are not contagious because they do not appear on the surface, others because, although they do show up on the skin, they don’t stick there because they do not produce exudates’.

the main point is that we do not wish to imply that ancient φθίσις is the same disease as modern tuberculosis. ‘Ophthalmia’ is a sufficiently general modern term that we see no risk of retrospective specification.

49 LSJ offers ‘itch, mange, scurvy,’ and ‘scab’ (a disease of trees).

Louis: *Les autres ne sont pas contagieuses, soit parce qu'elles ne naissent pas à la surface de la peau, soit parce que, si elles le font, elles n'y restent pas en raison de la sécheresse*, 'the others are not contagious, either because they are not generated on the surface of the skin, or if they are, because they don't remain there on account of their dryness'.

Mayhew: 'But of the others, some are not contracted, because they do not appear on the surface, while others [are not contracted], though they are on the surface, because owing to their dryness they do not remain on the surface.'

There is, furthermore, some ambiguity about whether the implied dative complement of οὐ προσμένει is the skin of the infector or the skin of the person to be infected, or perhaps both. Bartholomew's *non permanent* and Theodorus' *persistere non possunt* seem to promote the first option and Bussemaker's *non adhaerent* the second. D'Abano follows the first option in his exegesis and takes the text as saying that two properties are required for contagion through contact: the disease must have a sticky texture, *and* it must remain on the surface. Some conditions that manifest on the surface do not remain (*non permanent*) because they have a dry discharge that easily evaporates (*de facili evaporabile*). However, the diaeretic structure of the Greek text probably favours the second option. After specifying the two requisites as 'occurring on the surface' (τῷ ἐπιπολῆς γίνεσθαι) and 'being sticky' (γλίσχρον εἶναι), the text introduces a μὲν ... δὲ contrast that considers those non-contagious diseases that satisfy the second condition but fail the first, and another set that satisfy the first but fail the second. This means that οὐ προσμένει, which describes the second set, must be read as a consequence of not being sticky. Be that as it may, since the ability to stick to the surface of another implies the ability to stick to the surface of oneself, and vice versa, the difference is moot. We feel that 'cling' preserves that ambiguity better than 'remain' does.⁵⁰

50 Some versions of the Greek text lack the negative particle οὐ, as did the version which Guastavini was working from in his commentary, who interprets the resulting text as follows (282): 'dry diseases remain and stay put and aren't able to stick [sc. to another] since they lack viscosity or stickiness', *sicci permanent, et consistunt, nec possunt adhaerere, cum lentore, seu glutine careant*. The role of stickiness is more complicated in ps.-Alexander's version of the problem (Problem 2.42, Ideler 1841, 64), where *scabies* is similarly said to be contagious due to its occurrence on the surface and its 'having a sticky discharge', γλίσχρον ἔχουσα τὸ ἀπορρέον, but some surface conditions are not contagious because they 'don't produce a discharge due to stickiness and thickness and dryness' (διὰ δὲ γλίσχρότητα καὶ παχύτητα καὶ ξηρότητα μηδὲν ἀπορρέοντα). Apparently, what is meant is that if a disease is *too* sticky, matter cannot detach to infect another.

4 Two Mechanisms of Contagion

Modern theories of disease contagion generally point to the transmission of some disease agent, usually a biological agent like a virus or bacterium, from one individual to another.⁵¹ This disease agent is produced in or by the sick animal or sick person's body (a virus that someone catches when another coughs is not precisely the same particle that was inhaled by the initial patient). The agent then brings about sickness, and generally the same sickness, in another individual. Importantly, not everyone who comes in contact with the sick person will come down with the ailment, for one reason or another.

There may be exceptions to many or all of these criteria (contagion is notoriously hard to define precisely), but this marks at least a broad outline of what we mean, today, when we say that a disease is contagious. Obviously quite a number of these criteria will not be applicable to an ancient theory, but articulating them will at least give us a framework for talking about what the ancient theories are and what they are not.

We have shown that there are two distinct theories of disease contagion outlined in Problem 7.8. In the case of ophthalmia, the mechanism of contagion is what we have called *similation*, the becoming-like of a previously healthy person's organ by causal interaction with a sick person's organ. The eye of the beholder sees the ophthalmic eye and because the eye is easily moved or changed, it changes to become like that which it beholds.

The mechanism proposed for the second pair of diseases (consumption and *scabies*) is, we believe, the same in both cases, and notably different from that for ophthalmia. In both consumption and *scabies* we see the following: (1) the mechanism is specifically described with the verb *to touch*, ἄπτεται, (2) something produced by the sick person's body is said to come into contact with the second person's body,⁵² and to come into contact (3) exactly in or on that organ that is prone to the particular disease. In the case of *scabies*, it is the sticky eruption produced on the skin of the initial sick person that then gets on (and presumably sticks to) the skin of the second person, causing the disease then to manifest in them. In the case of consumption, the breath of the sick person is said to be corrupted, and that corrupted breath is then inhaled 'with that [very] part' in which the second person is susceptible, the lungs. We thus have a sick organ in one person producing a corrupted or sick-making

51 Although there are certainly extended uses of *contagion* in common and scholarly parlance, such as the contagion of yawning, emotional contagion, moral contagion, political, religious, and many more. See for example Gallup 2021; Herrado and Constantinides 2021; Seth and Panda 2018; Roitto 2016; Cheng *et al.* 2014.

52 Compare this to the mechanism for contagion of plague at Problem 1.7.

emanation that then comes into contact with a healthy but susceptible person's healthy organ, according to the following causal schema:

corrupted organ^A → corrupt emanation → healthy organ^B → corrupted organ^B

Essential to this picture is the idea of an emanation originating in the sick person that then physically touches the healthy to make them sick.

We note that this mechanism of contagion appears consistent with that given for plague (λοιμός) in Problem 1.7. There, persons already in a weak condition are said to be quickly caught by it due to the 'fuel' (ὕπεκκαυμα) of the sickness arising from those receiving treatment (καὶ γὰρ διὰ τὸ ὑπέκκαυμα τῆς νόσου τῆς παρὰ τῶν θεραπευομένων γινομένης ταχέως ὑπὸ τοῦ πράγματος ἀλίσκονται).⁵³

Interestingly, at some point after the composition of Problem 7.8, this contact model came to displace the model of similation for ophthalmia as well. Sometime in the succeeding few centuries, people would come to read the ophthalmia case in this text as though it simply were just another example of this second type of contagion, contagion by touch. For example, Alexander's version of this problem explicitly adds a moving disease-agent: 'diseased rays exiting with the [visual] *pneuma* transmit a share of the pathology to the easily affected eye', ἀκτίνες δὲ μετὰ πνεύματος ἐξιούσαι νοσώδεις τῷ εὐπαθεῖ ὀφθαλμῷ μεταδιδόασιν τοῦ πάθους. Similarly, both d'Abano and Ludovico Settala propose that the moved thing by which the eye is moved is some corrupt effluence passing from the infector into the eye of the infected (d'Abano: *vapore interiori et spiritu corrupto*, 'an internal vapour and a corrupted breath'; Settala: *exhalationes subtilissimas*, 'very thin exhalations'). In Settala's interpretation, the eye transmits these exhalations together with light (*simul cum lumine transmittit*), which reach the other person almost instantaneously. D'Abano also gives another option, in which the moved mover is the eyelid, which on opening makes the eye ready to receive the *fumi putridi*, 'putrid fumes' coming from the infector.

The same development is observed in the Arabic revision of the problems, whose equivalent of 7.8 explains all contagious diseases by vapours (*buḥārāt*).⁵⁴ These vapours issue from the diseased organs (*'aḍā'*) of the sick and penetrate the corresponding organs in others, especially those organs that are susceptible to receiving such flows (*wa-lā siyyamā 'l-'aḍā'u 'llatī hiya sahlatu*

53 We leave to a future paper a fuller discussion of this text and its relation to 7.8 in the context of the Peripatos.

54 The text is edited by Filius 1999. Its version of Problem 7.8 given as Problem 8.7 (368). Filius favours Hunain ibn Ishaq as its translator.

ʿl-qubūli li-mā yansabbu ʿilay-hā), organs such as eyes and lungs because they are porous (*mutaḥalḥil*). In his edition, Filius proposes that the Arabic version was dependent on an intermediate Greek revision that in a number of places updated the original collection of problems in line with prevailing Galenic theory and ps.-Alexander.⁵⁵ We can add that Problem 7.8 in particular has been significantly reworked in this version so as to emphasise transmitted vapours as a single unitary mechanism of contagion.

These readings follow a general shift to an extramission theory of vision in which the visual organ emits *pneuma*. Such accounts of ophthalmia may have a shared origin in (or at any rate a shared motivation with) the somewhat jumbled reworking of this problem that we find in Plutarch's *Quaestiones convivales*, in a discussion of how the evil eye might work.⁵⁶ As a comparator to the possible causal mechanisms of the evil eye, Plutarch has his characters theorise the contagion of ophthalmia. The account given is clearly indebted to two different pseudo-Aristotelian *Problems*, 7.7 and 7.8, which is to say, to our Problem here as well as the one just preceding it. Where 7.8 is concerned with the three diseases we have been discussing, 7.7 asks a very different question about why people wince when they see someone else being tortured or injured. Interestingly, such wincing is treated as a kind of contagion. Plutarch offers a version of ophthalmia that, like 7.7's account of wincing, compares the mechanism of contagion to (a) smell and hearing, and (b) pleasures and pains, which is to say that it works via emanations. Building on this material from 7.7, details from the account of ophthalmia in 7.8 then carry over. The eye is said to be very easily moved (*πολυκίνητος* in Plutarch, *εὐκίνητος* in 7.8), but in the end Plutarch borrows the mechanism for wincing from 7.7 ('emanations', *ἀπόρροιαί* in both 7.7 and Plutarch) to override the explanation of ophthalmia in 7.8 (simulation), without noting—or perhaps even noticing—that he is doing so.⁵⁷ Our conjecture is that Plutarch clearly remembers many details

55 Filius 1999, XXIV. Filius dates the work to the ninth century, where the intermediate Greek revision would have been considerably earlier, although later than Galen.

56 Plutarch, *Quaest. conv.* 680b–683b. On Plutarch's jumbling of the two accounts, see Lehoux forthcoming. The pneumatic theory is also adopted by Galen, *De plac. Hipp. et Plat.* 7.5.5–7 and influenced by the Stoic treatment of sight as a kind of touching via *pneuma*. See Ierodiakonou, 2014.

57 There appears to be a shadow of Plutarch's language, via ps.-Alexander, in Settala's account, as all three have light and some kind of *pneuma* or other exhalation being transmitted together. Note however that in ps.-Alexander it appears that the light itself is diseased, whereas in Settala it is the exhalation.

from this pair of problems but then conflates their different explanations into a single cause, emanations. This may have been because, as with ps.-Alexander and subsequent philosophers, Plutarch and his audience simply found the contagion-by-contact model more persuasive. In any case simulation seems to have disappeared from the philosophical and medical explanatory chain for disease.

While we concede that it is at least conceivable that something like this emanation mechanism was in the back of the original pseudo-Aristotelian author's mind when he was explaining ophthalmia in Problem 7.8, it is notable that he does not say so explicitly even though he clearly had the vocabulary to do so. Unlike the cases of consumption and *scabies* that follow this one, he does not here say that anything 'touches' anything else in the contagion of ophthalmia, nor that any diseased emanation is produced by the sick organ, both of which are central and explicitly described in the other two accounts. If we look back at the explanation for ophthalmia as worded, the eye is simply said to 'become similar to what it sees.' Simulation appears to be all of the explanation that the author feels he needs to offer, and we take it at face value, even if that original account was doomed to slip away and quietly elide into an emanation theory in later retellings.

5 Conclusion

Although it has frequently puzzled modern commentators, the Greek text of Problem 7.8 as transmitted in the primary manuscripts has not suffered from appreciable corruption even if its syntax is occasionally cramped and terse. Through careful attention to the philosophical, physiological, and aetiological contexts, and in dialogue with later commentators, translators, and editors, we have shown that the pseudo-Aristotelian author offers a coherent account of two distinct mechanisms for disease contagion. In the cases of *scabies* and consumption, the mechanism involves the diseased organ producing a corrupted exhalation or exudate that then touches the relevant organ of a healthy person to make them similarly sick. In the case of ophthalmia, the mere act of looking at a diseased eye is enough to move the eye of a healthy person to become similarly sick. These mechanisms are interesting in themselves, but they are also of significant philosophical and historical interest for being among the earliest attested descriptions in Greek of how contagion was thought to work (including the earliest use of 'touch' as a metaphor or technical term for contagion), and of how diseased bodies could act as causal agents on healthy bodies.

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