

PSEUDO-ARISTOTELIAN *DE SPIRITU*:
A NEW CASE AGAINST AUTHENTICITY

The treatise *De spiritu*, transmitted with the Aristotelian corpus, has been considered spurious by a vast majority of scholars, from the fifteenth century to date.¹ In modern times, Werner Jaeger's classic 1913 study clinched the case against the treatise's authenticity. Jaeger has shown that the treatise, though firmly set in the Peripatetic tradition, diverges from Aristotle in central points of anatomy and physiology. In particular, the author distinguishes between two types of vessels, *artēriai* and *phlebes*, and advocates the view that only the former hold *pneuma*. This is the view propounded by Praxagoras of Cos (fl. ca. 300 B.C.E.) and adopted by the Alexandrian physician Erasistratus of Ceos (fl. ca. 260 B.C.E.). Jaeger establishes close affiliation of *De spiritu* with Erasistratus because there are passages that demonstrate familiarity with the attested doctrines of Erasistratus, most notably the doctrine of *triplokia*, according to which *artēriai*, *phlebes*, and *neura* are three components of other tissues and organs of the body.²

On the other hand, Jaeger argues, *De spiritu* shows no awareness of the distinction between motor and sensory nerves, which were discovered by Erasistratus and his contemporary Herophilus of Chalcedon, both active in Alexandria in the third century B.C.E. Nevertheless, the author of *De spiritu* is familiar, according to Jaeger, with the Alexandrian doctrine that *pneuma* percolates through *neura*, but tries to accommodate this doctrine to the traditional conception of *neura*, characteristic of the "Hippocratic" works and Aristotle, according to which *neura* are not sensory and motor conduits for *pneuma*, but hard and elastic structures connected to the bones, that is, structures that we would identify as ligaments and tendons. Convinced of its deep Erasistratean roots, Jaeger situated the treatise in the middle of the third century B.C.E. Although the author "ignores" some of Erasistratus' ideas, according to Jaeger, "Erasistratus' spirit hovers over the entire treatise."³ This dating is additionally supported by the mention of Aristogenes at 481a28, whose theory of respiration is criticized in chapter 2 of *De spiritu*. This is most probably Aristogenes of Cnidus, the pupil of Chrysippus of Cnidus and the personal physician of Antigonus Gonatas, the ruler of Macedonia from 276 to 240 B.C.E.⁴

However, two recent studies have tried to establish *De spiritu* as a genuine work of Aristotle. One is Patrick J. Macfarlane's unpublished doctoral dissertation from Duquesne University (2007), and the other is a translation and commentary of *De spiritu* by Abraham P. Bos and Rein Ferwerda (2008). Although these studies adduce many parallels between *De spiritu* and Aristotle's authentic works, thus confirming the view

1. An overview of the history of scholarship on the question of authenticity of *De spiritu* can be found in Roselli 1992, 13–18 and Bos and Ferwerda 2008, 4–9.

2. Jaeger 1913, 62–70; cf. Rose 1854, 167–71 for the general argument that this treatise postdates Erasistratus. For Erasistratus' theory, see Gal. *De usu part.* 7.8 (Helmreich 1.391 = K. 3.538 = frag. 88 Garofalo); *De fac. nat.* 2.6 (Helmreich 171, 176 = K. 2.96; 2.103 = frag. 89 Garofalo); *Anonymus Londiniensis* 21.23–28 (p. 46 Manetti = frag. 87 Garofalo). Galenic writings are cited by reference to the volume and page number in the Kühn edition (K.) and, when available, also to the page number in the more recent edition (listed in <http://cmg.bbaw.de/online-publications/hippokrates-und-galenbibliographie-fichtner/>).

3. Jaeger 1913, 69–70, 74.

4. Jaeger 1913, 73–74 and Roselli 1992, 76–78; cf. Bos and Ferwerda 2008, 9–11 for a different opinion. For Aristogenes, see Wellmann 1895a, col. 932–33.

of Jaeger and his predecessors that the author of the treatise relied heavily on Aristotle, these studies are less convincing in their attempts to align the substantive points of *De spiritu* with Aristotle's works. In addition, these recent studies tend to overlook or downplay the evidence that speaks against the treatise's authenticity.⁵

In this paper we would like to bring such evidence to the fore. The evidence is grouped under two headings. The first group includes terminological differences. There is a significant number of words on *De spiritu*'s five Bekker pages that do not occur elsewhere in Aristotle's works—either at all, in the works generally regarded as authentic, or in the sense in which they are used in Aristotle's authentic works.

The second group concerns doctrinal differences. Apart from the central idea of the distribution of *pneuma* through a network of *artēriai*, we draw attention to eight further points of divergence between Aristotle's attested views and those propounded by the author of *De spiritu*. Most of these points have received little or no attention in scholarly literature, including the two recent studies defending the authenticity of *De spiritu*.

1. TERMINOLOGICAL DIFFERENCES

There are seven words that are not found elsewhere in the Aristotelian corpus, two words that are found only in the works generally considered to be later additions to the Aristotelian corpus, and three words that are used in Aristotle's authentic writings, but in a different sense.

I. Words Not Found Elsewhere in the Aristotelian Corpus

ἀναζωπυρέω, 484a7: rekindling or additional kindling, of the hot by the hot.

ἀνεπίμικτος, 483b1: the characteristic of something incapable of being mixed with something; here of internal air or *pneuma* which is incapable of being mixed with external air.

ἄχονδρος, 484a29: having no cartilage, "like the spine."

διαμονή, 481a1, a27, 484a8: preservation or sustenance over time; here always of the connate *pneuma*.

ἐπίσπασις, 482a15: absorption; here ingestion of food.⁶

μαγειρικός, 485a35: related to the cook's craft, of fire as used by cooks.

χρυσοχοϊκός, 485a34: related to the goldsmith's craft, of fire as used by goldsmiths.

5. Bos and Ferwerda often use the tactic of attributing non-Aristotelian ideas in *De spiritu* not to the author himself, but to his "opponents"; e.g., on the use of the term *artēria* for structures other than the windpipe, they claim that "we will have to assume that the author is representing the view of opponents here" (2008, 67 n. ad 481a21–22; cf. *ibid.*, 93 n. ad 482a34). Macfarlane, on the other hand, tries to accommodate such theories within Aristotle's known doctrines (e.g., 2007, 101, 146–47).

6. Although the noun is a hapax in the corpus, and does not occur before Theophrastus, the cognate verb *ἐπισπᾶσθαι* and the adjective *ἐπίσπαστικός* occur with the same meaning in the Pseudo-Aristotelian *Col.* 6, 798a19 and *Pr.* 37.3, 966a4, respectively; cf. *Mund.* 6, 398b17 and *Pr.* 16.8, 915a15; 23.4, 931b22.

II. Words Found Only in the Works Generally Considered Spurious

ἐκπνευματώω, 482b31: pneumatization/vaporization of the moist, due to the trapping of the air, which causes pulsation. There are nine occurrences, all in *Problemata* (1.53, 866a3; 5.17, 882b14, b17, b20; 10.44, 895b21; 10.54, 897b1; 11.26, 902a2; 26.33, 944a14; 33.15, 963a18).

κοίλωμα, 483b23: the whole abdominal cavity, or the intestines. The only other occurrence is in *De mundo* 4, 395b34, where it refers to cavities in the earth.

III. Words Found in the Works Generally Considered Authentic, but in a Different Sense

ἀρτηρία, *passim*: the structure containing *pneuma* and forming a network in the body, a larger part of which pulsates. In Aristotle's genuine works this word often stands for the windpipe and the bronchi, but in some cases also for other vessels.⁷ Aristotle, however, does not think of such *artēriai* as part of a larger network of homogeneous structures, but rather as particular vessels in the network of *phlebes*; in one case his use of the term hints in fact at a technical use of *artēria* for the urethra.⁸ Moreover, in Aristotle only *phlebes* pulsate, not *artēria* or *artēriai*.

σωλήν, 483b28: pipe or duct that conducts material without leaking on the sides, delivering the content only through its opening or "mouth." In Aristotle's genuine works this word is used as a name for a pipe-like mollusk of the genus *Scaphopoda*.⁹

φλεβωδέστατος, 484a4:¹⁰ most characteristic of blood vessels; here of heat in *neuron* (i.e., heat in *neura* is most of all like heat in blood vessels). Aristotle uses the adjective φλεβώδης for persons or bodily parts with prominent blood vessels, or for structures that resemble blood vessels, never for qualities of blood vessels.¹¹ More to the point, he never uses this adjective in the comparative or superlative form.

In addition to these, we would like to note the following expressions:

βρογγιον, 483a22: The oldest and most authoritative manuscript for *De spiritu* (Z, Oxon. C.C.C. 108) reads βρογγίου at this place, referring to the windpipe or bronchial

7. For the windpipe: Arist. *De an.* 2.8, 420b29. For other vessels (following Balme's reading, attested in almost all mss., cf. Macfarlane 2007, 235–36): Arist. *Hist. an.* 3.1, 510a30–35, where ducts stretching from the *artēria* to the testicles are mentioned (cf. *De spiritu* 6, 484a14–15 and *Epid.* 2.4.1 [L. 5.124.4] and n. 8 below), and *Hist. an.* 1.17, 496b29–34, where the liver is said to have no connection with the *artēria*. Writings attributed to Hippocrates are cited by reference to the volume and page number in the Littré edition (L.) and, when available, also to the more recent edition (listed in <http://cmg.bbaw.de/online-publications/hippocrates-und-galenbibliographie-fichtner/>). These writings are cited only by the title of the work without an author name.

8. *Hist. an.* 3.1, 510a30–35; cf. *Epid.* 2.4.1 (L. 5.124.3–4) and see also Duminil 1983, 51.

9. For references, see Bonitz 1870, 741b55–742a3; cf. Lones 1912, 218–19 and Lennox 2001, 308 n. ad 683b17.

10. Roselli (1992, 107) accepts Furlanus' conjecture φλογωδέστατον, without any support in the manuscripts. The adjective φλογώδης occurs three times in Aristotle's spurious works: *Mir. ausc.* 37, 833a12; 38, 833a17; and *Mund.* 2, 392a35.

11. References in Bonitz 1870, 823b25–33.

tubes. This might be the singular of βρόγχια, which is attested in the “Hippocratic” *De diaeta in morbis acutis* 5 (Joly 43,12 = L. 2.262.7) and *De carnibus* 16 (Joly 198,8 = L. 8.604.8), but not in Aristotle, who uses the form βράγγιον, both in the singular and plural, for gills in fish.¹² Other manuscripts of *De spiritu* read βραγγίου at 483a22, which is accepted by few modern editors (Bekker).

κατὰ συνέχειαν, 482a35: this expression occurs only in the Pseudo-Aristotelian *Problemata*, 16.7, 914b3–4 and 17.1, 916a9. Here it is used to describe the continuity of the distribution of inhaled air to all parts of the body. Amneris Roselli observes that it is reminiscent of the Stoic vocabulary.¹³ The same can be said of the expression δι’ ὅλου at 481b19 and 482a33, where the author asserts that the connate *pneuma* pervades the whole body.¹⁴

τοπική <viz. κίνησις>, 484b13: This is a later term for what Aristotle calls κίνησις κατὰ τόπον.¹⁵

2. DOCTRINAL DIFFERENCES

I. The Taxonomy of Bodily Parts

At 484a33–34 flesh is said to be composed of *artēria* and *phleps*—of *phleps* because they bleed when pricked, and of *artēria* because air and moisture can exit (and possibly also enter) through them. Skin has one further component, and that is *neuron*, which renders it elastic (483b15–18). So, *artēria*, *phleps*, and *neuron* are treated as homoiomerous parts that constitute other structures, such as flesh and skin.

In Aristotle’s taxonomy, this would make flesh and skin anomoioomerous parts, whereas Aristotle in fact considers them to be homoiomerous parts (e.g., *Hist. an.* 1.1, 487a1–10). Furthermore, although *artēria*—which is Aristotle’s term for the windpipe—is neither explicitly called an anomoioomerous part nor listed among the examples of anomoioomerous parts; it is described in the section of *Historia animalium* that deals with internal instrumental—that is, anomoioomerous—parts. More precisely, *artēria* is described in *Historia animalium* 1.16, 495a23–b19, following the description of the brain and preceding that of the esophagus and the stomach.

II. How *Phlebes* Nourish the Flesh

At 483b26–28 the author claims that the nutriment (i.e., blood) is delivered to the flesh “not from the sides of blood vessels, but from their mouths, like pipes.”¹⁶ This

12. References in Bonitz 1870, 142a45–b25; cf. 143b36–37. The only exception to Aristotle’s use of βράγγιον for gills is *Hist. an.* 8.21, 603a32, where the word βράγγια seems to refer to the windpipe in pigs, possibly including also the bronchial tubes.

13. Roselli 1992, 88 n. ad loc.

14. See, e.g., *SVF* 2.443, 785, 797, 826, 885, 911; cf. *Mund.* 4, 394b9–12.

15. See, e.g., Sext. *Emp. Pyr.* 3.97 and *Math.* 10.42; Alexander of Aphrodisias *In Aristotelis topicorum libros octo commentaria* 96.20 and *Mantissa* 115.27–28; Plotinus *Enn.* 2.2.3.15, 6.3.21.44, etc. The term is preserved also in some mss. of Ps.-Arist. *De plantibus* (1, 815b24).

16. ἐκ δὲ τῶν φλεβῶν εἰς τὰς σάρκας διαδίδοσθαι τὴν τροφήν, οὐ κατὰ τὰ πλάγια ἀλλὰ κατὰ τὸ στόμα, καθάπερ σωλήνας. All translations are our own.

stands in opposition to Aristotle's claim in *De generatione animalium* 2.6, 743a8–10, that “as the nutriment oozes through the *phlebes*, that is, through the pores in each of them, just like water in unbaked ceramic vessels, it turns into flesh.”¹⁷ The comparison with water leaking from unbaked ceramic vessels implies that Aristotle is not thinking of the nutriment flowing out through the mouths of the vessels, but rather through the pores in their walls.

III. How *Neura* Move the Body

The author of *De spiritu* shares Aristotle's basic understanding of *neura*: they are elastic structures that connect the bones at the joints (ligaments), move the bones (tendons), get nourished by a mucous fluid, and are found in the heart. The author of *De spiritu*, however, goes beyond Aristotle in at least three points.

First, he recognizes, quite correctly, that there are *neura* that are connected to the bones at one end and that turn into flesh at the other end (484a18–20), referring to what we would identify as the tendons of skeletal muscles. There is no indication whatsoever that Aristotle considered the possibility that some *neura* are extensions of portions of flesh. He claims that *neura* are a hard, solid, and elastic homoiomerous part, whereas the flesh is a soft, supple, and vascularized homoiomerous part. Because they belong to two very different types of homoiomerous parts, Aristotle would be discouraged from regarding them as continuous.¹⁸

Second, the author of *De spiritu* takes the view that *neura* are very warm, warmer than *phlebes* and *artēriai* (484a3–5), which is absent from Aristotle. Perhaps this view has something to do with the fact that *neura* are said to be the structures “in which motor *pneuma* is primarily found” (ἐν ᾧ πρώτῳ τὸ πνεῦμα τὸ κινητικόν, 485a7–8). This claim marks the third and most striking departure from Aristotle. Aristotle thinks that *neura* move the bones and that this has something to do with *pneuma*, but not because there is *pneuma* in the *neura* themselves. Rather, Aristotle argues in *De motu animalium* 10 that as the *pneuma* in the heart expands and contracts in reaction to thermic alterations caused by perceptions and representations, it pushes and pulls on the *neura* in the heart, thus creating a mechanical impulse. This mechanical impulse is then transmitted to the periphery, getting diversified and augmented on its way, probably by exploiting the principle of the lever.¹⁹ In any case, the way *neura* move the bones is by being mechanically pulled and released, much like the ropes in automatic puppets (*De motu an.* 7, 701b1–10)—not because there is some special kind of *pneuma*, or a portion of *pneuma* with a special function, inside them. By contrast, the author of *De spiritu* neither says nor indicates how the motor *pneuma* operates in the *neura* so as to make them move the bones and thus bring about locomotion.

IV. The Role of the Spine

De spiritu 484b17–19 suggests that the spine is the origin of motion, on account of being fixed or unmoved: “The spine is the origin [. . .] there must be a thing of this kind,

17. διὰ μὲν οὖν τῶν φλεβῶν καὶ τῶν ἐν ἐκάστοις πόρων διαπιδύουσα ἡ τροφή, καθάπερ ἐν τοῖς ὁμοῖς κεραμίσις τὸ ὕδωρ, γίνονται σάρκες.

18. See Gregoric and Kuhar 2014, 96, 104–5.

19. This is elaborated further in Gregoric and Kuhar 2014.

for everything that moves is moved by something which is at rest.”²⁰ In Aristotle too the spine is an origin (ἀρχή), but it is the origin of other bones, whereas there is no indication that it might be an origin of motion.²¹ In fact, Aristotle is intent on showing in *De motu animalium* 9 that the origin of motion must be in the middle of the body, hinting at the heart or its analogue in bloodless animals. And in the next step of his argument he specifies that the ultimate origin of motion must be the soul, which is not itself a magnitude, but is “in” a magnitude, that is, in the heart or its analogue in bloodless animals.

V. The Source of the Connate *Pneuma*

De spiritu claims that the origin of connate *pneuma* is in the lungs, from which it pervades the whole body.²² There is no explicit statement in Aristotle about the origin of connate *pneuma* in the body, but the heart seems to be a much stronger candidate.²³

VI. The Concept of the Soul

The author shows awareness of Aristotle’s conception of the soul as a set of powers or *dunameis*. However, his commitment to that conception does not seem to be unwavering. For instance, at 482b22–25 he leaves it open whether the principle of respiration should be identified as the soul or as a *dunamis* of the soul. This is not the sort of dilemma one would expect Aristotle to pose; if anything, he would raise the question concerning the part of the soul that is the principle of respiration.²⁴ Moreover, at 483b11 the author entertains the idea that the soul is not something pure and unmixed, and he does so in connection with his finding that the primary receptacle of the soul (*pneuma*) is not a supremely fine and unmixed substance. This line of thought suggests a materialist conception of the soul that Aristotle rejects.²⁵

VII. Against Aristotle’s Criticism of Plato’s Division of the Soul?

At 483a27–29 the author appears to lean toward the Aristotelian view that the soul’s *dunameis* are prior to, or conditions of, the corresponding actions of *pneuma* in the body, in contrast with the more reductionist view that the soul’s *dunameis* are identical with the actions of *pneuma* in the body. Assuming that there is a *dunamis* of the soul in charge of the motion of *pneuma* that renders the body sensitive, the author seems to be reminded of objections raised against those who posit the calculative and spirited parts of the soul. The objections are found to be unfair, because these men also speak of the aforementioned parts as powers of the soul: “It is clear that the criticisms against those who [posit] the calculative and spirited [parts of the soul] are not correct, for they, too, speak of powers.”²⁶

20. ἀρχὴ δὲ καὶ μένον ἢ ῥάχιδις [. . .] ἀνάγκη γὰρ εἶναι τι τοιοῦτον· ἅπαν γὰρ τὸ κινουμένον ἐξ ἡρεμοῦντος.

21. Bonitz (1870, 665a9–10) is misleading in making references to ἀρχὴ καὶ μένον jointly to *Part. an.* 2.9, 654b12; *Hist. an.* 3.7, 516a10; and *De spiritu* 7, 484b17.

22. 482a33–34: τὸ δὲ σύμφυτον πνεῦμα δι’ ὅλου, καὶ ἀρχὴ ἀπὸ τοῦ πνευμένου.

23. See, e.g., *De motu an.* 10, 703a10–16 and *Resp.* 15, 478a22–25.

24. See *Resp.* 8, 474a25–b3, b10–12; cf. *Mem.* 1, 449b4–6; *De somno et vigilia* 1, 453b11–14; *De insomniis* 1, 458a33–b3.

25. See also 481a17, 483a26, a31–32. Aristotle is prepared to entertain Anaxagoras’ characterization of *nous* as pure and unmixed, which Aristotle unpacks in the sense that *nous* is a part of the soul without a bodily organ (see *De an.* 1.2, 405a13–17 and 3.4, 429a15–25, b22–25). This does not entail, however, that Aristotle would find purity and ability to be mixed as appropriate attributes of the soul properly conceived.

26. 483a28–30: διῆλον ὡς οὐκ ὀρθῶς ἐπιτιμήσεις τοῖς τὸ λογιστικὸν καὶ θυμικόν· καὶ γὰρ οὗτοι ὡς δυνάμεις λέγουσιν.

This is plausibly interpreted with reference to Aristotle's criticism of Plato's division of the soul into the calculating, spirited, and appetitive parts in *De anima* 3.9–10. If that is correct, the author of *De spiritu* seems to misunderstand the point of Aristotle's criticism. The point is not that the Platonic parts of the soul are not *dunameis*, but rather that they are the wrong *dunameis* into which the soul should be divided for the purpose of a systematic account (432a22–b7), resulting from an inadequate way of dividing the soul (433a31–b4).

VIII. The Pulse

The author of *De spiritu* considers the pulse (σφυγμός) a natural physiological motion in the body. This was also Aristotle's opinion, contrary to the "Hippocratic" sources (e.g., *Epidemics* and *Prognostics*), in which it is conceived as an unnatural motion caused by disease or extreme emotion.²⁷ In *De spiritu*, however, only the *artēria* and its branches are said to pulsate, not the blood vessels (*phlebes*). In Aristotle, by contrast, all and only the *phlebes* pulsate, due to their connection with the heart (*Resp.* 20, 480a10–13). Moreover, Aristotle has no doubt that the *phlebes* pulsate simultaneously with the heart (ἅμα ἀλλήλαις, *Resp.* 20, 480a13), whereas the author of *De spiritu* seems uncertain whether this is the case.²⁸ And while Aristotle thinks that pulsation is a mere side effect of the vaporization of blood in the heart, the author of *De spiritu* suggests that pulsation resembles an activity (*energeia*) or function of the heart (ἔοικεν ἐνεργεῖα τινί, 483a17).

Further differences are related to the pulse terminology. To begin with, the choice of the term σφυγμός in *De spiritu* for the natural motion of the heart and vessels was not an obvious one. Aristotle uses the terms σφυγμός and σφύξις interchangeably (*Resp.* 20, 479b27, 480a14; *Gen. an.* 5.2, 781a25). The early fourth-century B.C.E. physician Aegimus of Elis reserved the term *παλμός* for the natural motion of the heart, and Erasistratus restricted σφυγμός only to the pathological motion of the heart in fever.²⁹ Jaeger thus concludes that the author's choice of the term σφυγμός follows directly upon Aristotle and Praxagoras of Cos, rather than upon Erasistratus, whom Jaeger, as we have mentioned, considers the source for many of the views contained in *De spiritu*.³⁰ Despite the proximity to Aristotle, however, there are several points in the discussion of the pulse in *De spiritu* that dissociate it from Aristotle.

First, the author uses the term σφυγμός not only for the natural motion of the heart, but also for the unnatural motions that occur "in certain affections of the body and in distresses of the soul."³¹ Aristotle, by contrast, uses the term *πήδησις* for the heart's rapid motion in the emotional state of fear, explicitly distinguishing it from its natural

27. See Duminil 1983, 311–16; von Staden 1989, 268–69; Lewis 2014, 139–140; forthcoming.

28. 483a5–6: εἰ δὲ καὶ ἐν ταῖς ἀρτηριαῖς ὁ σφυγμός, καὶ ὁ αὐτὸς ὄν ἐν ῥυθμῷ καὶ ὁμαλῶς [ἦ], σκεπτέον ("We must examine whether the *artēriai* also pulsate and whether, having the same rhythm [as the pulse in the heart and *hē artēria*], [the pulse in the *artēriai*] is also even"). The evenness may, perhaps, refer to the question of whether the heart and the *artēriai* expand and contract simultaneously or alternately (ἐμπαλιν σφύζειν): while Erasistratus believed that the *artēriai* expand when the heart contracts (because it pushes the *pneuma* into the *artēriai* when it contracts), Herophilus and Galen claimed that the arteries expand together with the heart's expansion (Gal. *De diff. puls.* 4.2 [K. 8.703 = frag. 110 Garofalo]).

29. For Aegimus: Ps.-Rufus of Ephesus *Synopsis de pulsibus* (p. 219, 2–6 Daremberg/Ruelle); Gal. *De diff. puls.* 4.11 (K. 8.751). For Erasistratus: Gal. *De diff. puls.* 4.17 (K. 8.761 = frag. 208 Garofalo).

30. Jaeger 1913, 67 and see above, p. 159.

31. 483a3–4: ἐν τε σωματικοῖς τισι πάθεσι καὶ ἐν τοῖς τῆς ψυχῆς φόβοις.

and constant motion, σφυγμός.³² The author's use of one term for both types of the heart's motion is, therefore, clearly different from Aristotle's. Moreover, it points to an insight first attested in Praxagoras of Cos and further developed by Herophilus, the so-called Pneumatist physicians, and Galen, namely that the normal beating of the heart and vessels varies with the bodily and mental condition of the individual.³³

With the appearance of this conception of σφυγμός, the pulse became a central tool for diagnosing and prognosing patients, which created the need for technical terminology to mark different types of pulse and their relation to the patient's condition.³⁴ Here too the terminology of *De spiritu* is indicative: ἀνωμαλία, πυκνός, ὀμαλός, σφοδρός, ἀραιός,³⁵ and ῥυθμός (483a1–3, a6) were key terms in the ancient pulse lore.³⁶ True, the author describes respiration, rather than the pulse, as πυκνόν, ὀμαλόν, σφοδρόν, and ἀραιόν. Nevertheless, as Roselli points out, only the words πυκνός and ἀραιός are commonly used for describing respiration in the earlier sources, whereas σφοδρός is used only once (*Int.* 3, [L. 7.176.1]) and ὀμαλός never. The term ὀμαλός, however, is used with reference to the pulse once in *De spiritu*, at 483a6, and often in later sources, along with the word σφοδρός.³⁷

CONCLUSION

The aim of this paper has been to present new or underplayed evidence that lends support to the conclusion that *De spiritu* was not composed by Aristotle, despite its similarities with Aristotle's genuine works in points of terminology and doctrine. The doctrinal points raised above suggest implicit or explicit divergence from Aristotle's attested views, some of the divergences being related to substantive issues. The divergence in the meaning of certain terms discussed in section 1.III indicates further conceptual—rather than just terminological—differences. In light of these points, the fact that some terms used in *De spiritu* are not found in Aristotle's genuine works becomes more than mere evidence from silence.

None of the evidence we have adduced allows us to fix the date of the treatise with any certainty, but we are inclined to favor a slightly earlier dating than the one proposed by Jaeger. We see no compelling reason to think that this treatise was influenced by Erasistratus. The opposite direction of influence, if any, would explain why Erasistratus' doctrine of *triplokia* is found only in a rudimentary form in *De spiritu*, applied solely to skin and flesh, but it would also explain why *De spiritu* is silent on the discoveries of the Alexandrian physicians.

32. Arist. *Resp.* 20, 479b19–26 on the motion in fear; cf. 479b17–19, b27, 480a13–15, for the clear distinction between the two motions. Cf. Ps.-Arist. *Pr.* 27.3, 947b29, which also uses πήδησις, while σφυγμός never occurs in this work.

33. For Praxagoras, see Harris 1973, 182; Lewis 2014, 270–76, 285; forthcoming. For later authors, see in particular: Wellmann 1895b, 70–72, 169–201; Harris 1973, 244–51, 397–431; von Staden 1989, 262–88; Lewis forthcoming.

34. More on this in Lewis forthcoming.

35. Following Jaeger's and Roselli's reading.

36. Harris 1973, 244–71, 397–405; von Staden 1989, 273–88.

37. Roselli 1992, 95 n. ad 482b36. For the terminology in later authors, see references in n. 33 above.

In any case, releasing this treatise from Aristotle's shadow should contribute to our understanding of the history of anatomy and physiology between the late fourth and third centuries B.C.E., since *De spiritu* is the only integral treatise on these subjects that we have from that period.³⁸

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LITERATURE CITED

- Bonitz, Hermann. 1870. *Index Aristotelicus*. Berlin.
- Bos, Abraham P., and Rein Ferwerda. 2008. *Aristotle on the Life-Bearing Spirit ("De Spiritu")*: A Discussion with Plato and His Predecessors on Pneuma as the Instrumental Body of the Soul. Leiden.
- Duminil, Marie-Paule. 1983. *Le sang, les vaisseaux, le coeur dans la collection Hippocratique*. Paris.
- Garofalo, Ivan. 1988. *Erasistrati Fragmenta*. Pisa.
- Gregoric, Pavel, and Martin Kuhar. 2014. Aristotle's Physiology of Animal Motion: On *Neura* and Muscles. *Apeiron* 46: 94–115.
- Harris, C. R. S. 1973. *The Heart and the Vascular System in Ancient Greek Medicine: From Alcmaeon to Galen*. Oxford.
- Jaeger, Werner. 1913. Das *Pneuma* im Lykeion. *Hermes* 48: 29–74.
- Lennox, James G. 2001. *Aristotle: "On the Parts of Animals" I–IV*. Oxford.
- Lewis, Orly. 2014. *Praxagoras of Cos on Pulse, Pneuma and Arteries and His Role in the Development of Ancient Medicine*. Ph.D. diss., Humboldt-Universität zu Berlin.
- . Forthcoming. The Practical Application of Ancient Pulse-Lore and Its Influence on the Patient-Doctor Interaction. In *Approaches to the Patient in the Ancient World*, ed. Georgia Petridou and Chiara Thumiger. Leiden.
- Lones, Thomas E. 1912. *Aristotle's Researches in Natural Science*. London.
- Macfarlane, Patrick J. 2007. *A Philosophical Commentary on Aristotle's "De Spiritu"*. Ph.D. diss., Duquesne University. Pittsburgh.
- Rose, Valentin. 1854. *De Aristotelis Librorum: Ordine et Auctoritate*. Berlin.
- Roselli, Amneris. 1992. *[Aristotele]: "De spiritu"*. Pisa.
- von Staden, Heinrich. 1989. *Herophilus: The Art of Medicine in Early Alexandria*. Cambridge.
- Wellmann, Max. 1895a. Aristogenes. *RE* 2.1: 932–33.
- . 1895b. *Die pneumatische Schule bis auf Archigenes*. Berlin.