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Praxagoras of Cos on Arteries, Pulse and Pneuma. Review

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Orly Lewis. *Praxagoras of Cos on Arteries, Pulse and Pneuma.* Fragments and Interpretation. Studies on Ancient Medicine 48. Leiden: Brill, 2017. 391 p.

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The theories of Praxagoras of Cos (ca. 300 BCE) and his followers constitute an important landmark in the history of ancient medical knowledge. The principal ancient evidences about Praxagoras and his school are preserved in Galen, Caelius Aurelianus, the so-called *Anonymous of Paris* and other later writers. We know that Praxagoras distinguished himself in all major branches of the *tekhne*, related to the Hippocratic tradition in medicine, such as anatomy, physiology, sphygmology, dietetics, therapeutic methods and so on. Besides, he is also noted for the theoretical speculations associated with these practical aspects, which places him in the context of ancient philosophy of nature, mostly this of the Peripatetic school. Such peculiarities of Praxagoras' teaching as his idea that arteries beat by themselves and are filled with pneuma, that the soul is seated in the heart, etc. as well as his daring methods of therapy which allowed Caelius Aurelianus, in many years, to call him a reckless (*protervus*) surgeon, are especially intriguing and call for explanation and contextualization.

Although Praxagoras' teaching is inevitably a part of any history of ancient medicine,[2] separate studies, dedicated to the Coan physician, are surprisingly rare. A collection of the fragments of Praxagoras' teaching, which also includes sections, dedicated to his immediate followers Phylotimus, Plistonicus and Xenophon, was published by Fritz Steckerl in 1958.[3] Numerous evidences about the doctrine of his most renovated student Herophilus have recently been collected by H. von Staden (1989).[4] The Hippocratic sources of Praxagoras' theories are studied by D. Nickel in a 2005 article.[5] One may

[1] Supported by the program of improvement of the competitiveness of Tomsk State University.

[2] See e.g. Bardong K. (1954) Praxagoras 1. RE 22.2, P. 1735–1743; Harris C.R.S. The heart and the vascular system in ancient Greek medicine: From Alcmaeon to Galen. Oxford, 1973 (passim); Nutton V. Ancient medicine. London, 2004. P. 126–127.

[3] Steckerl F. (ed). The fragments of Praxagoras of Cos and his school. Leiden: Brill, 1958.

[4] Staden H. von. Herophilus: the art of medicine in early Alexandria. Cambridge, 1989.

[5] Nickel D. Hippokratisches bei Praxagoras von Kos? Hippocrates in context. P.J. van der Eijk, ed. Leiden, 2005. P. 315–323.

also note Italian[6] and Russian[7] translations of the fragments. This makes apparent that a new book dedicated to Praxagoras' anatomy and physiology definitely constitutes a long-needed addition to contemporary scholarship and, in this capacity, deserves special attention.

The book consists of two parts. The first part is essentially a collection of ancient evidences, thirty-three in total. Here Orly Lewis translates and analyzes the evidences (conventionally called the fragments) which allow reconstructing Praxagoras' teaching about arteries, pulse and pneuma. All other ancient texts, testifying about Praxagoras dietetics, pathology, diagnosis, prognosis, and therapy, are left for future studies. The second part of the book is a detailed study of Praxagoras' doctrines on arteries and pulse (Chapter 1) and pneuma (Chapter 2).

Lewis offers a new reading of the fragments based on the editions superior to those available half a century ago, and also identifies a new evidence on Praxagoras pulse theory, transmitted by Marcellinus (*On pulse* 14.463–464 = fr. 15) and absent in Steckerl's collection. The context of the evidences, supplied in all cases, helps the reader to evaluate the reliability of the fragments. Her comments to the fragments are particularly comprehensive.

Praxagoras is reported to distinguish between the vessels stemming from the aorta (arteries), on the one hand, and the vessels stemming from the vena cava (veins), on the other, and to separate these types of vessels as if they form two distinct systems. For Praxagoras arteries are distinguished by their appearance (they look like '*neura*', a cord), function (they are naturally pulsating by themselves) and, finally, their content (they are filled with the *pneuma*). The body of the arteries "is *neura*-like, but hollow, and in the course of their branching further and further in the animal their hollows become so small that their walls collapse on one another; and as soon as this happens, the vessel already looks like a *neuron*" (Galen, *PHP* 1.6.18 = fr. 3). Arteries pulsate naturally, due to certain innate ability (power) similar to this of the heart (Galen, *De diff. puls*. 4.2 = fr. 9). The purpose of this pulsation is distribution of the pneuma throughout the body. This idea is truly remarkable. On the one hand, it is plainly mistaken, but on the other, it definitely indicates that Praxagoras correctly recognizes the natural character of the pulse, unlike the majority of ancient writers, Aristotle included, who thought that pulsation is a sign of pathological conditions or emotional movements, rather than a special type of bodily movement. This means that the pulse is distinguished from other arterial motions, such as spasm, tremor or palpitation. Praxagoras therefore went a step further in comparison with the earlier writers and explained the pulse 'not only in terms of material and efficient causes... but also in terms of its final cause' (p. 222 f.). On the basis of new evidence from Marcellinus (fr. 15) Lewis notes however that this does not presuppose that Praxagoras had never used the term *sphygmos* to identify any excessive or unnatural movements occurring, for instance, in the case of fever. This may be due to a general terminological variety in Praxagoras' time as well as to his attempt to determine with better exactness when a normal pulse turns in a pathological spasm and, then, tremor and palpitation (p. 225).

Arteries contain no humour, just pneuma. This idea was strange even in Praxagoras time, since everyone believed that pneuma flowed through all vessels, mixed with the blood. Unfortunately, our sources contain no definite information about Praxagoras' anatomy, so it is impossible to say whether he thought that the left part of the heart to which aorta is attached is also bloodless and whether it is connected through lungs to the external supply of air (p. 231).

Exploring the origins of Praxagoras' conception of arteries (p. 232 f.), Lewis emphasizes the role empirical observations of the properties of the vessels played in ancient medicine. Apparently, the Coan physician took a lot from the Hippocratic treaties and Aristotle, but still his conclusions (even the mistaken ones) are seem to be firmly based on his anatomical observations. There is no denial though that some theoretical speculations, including the Aristotelian notion of the causes, played no minor role in his doctrine. Although Lewis' attempt to prove that Praxagoras' claims that arteries pulsate and contain only pneuma are based on

[6] Capriglione J.C. Prassagora di Cos. Naples, 1983.

[7] Afonasin E.V., Afonasina A.S. Praksagor i ego shkola [Praxagoras and his theories]. Ocherki istorii antichnoy meditsiny [Essays on history of ancient medicine]. Saint-Petersburg, 2017. P. 87–107.

anatomical observation rather than pathological theories (see her discussion of Galen, *PHP* 6.7.3–6 = fr. 10) are hardly conclusive, her suggestion that Praxagoras had an Aristotelian frame of mind, with its emphasis on teleology, looks more promising (p. 251).

For Praxagoras, pneuma is an airy substance, somewhat denser than the inhaled air. It flows through arteries thanks to their natural expanding and contracting independent from the heart, which is, however, the major source of pneuma in the organism. If the pneuma cannot freely flow from the heart through the aorta, severe diseases such as epilepsy and apoplexy occur (*Anonymous of Paris* 3, p. 18.11–14 = fr. 25). Lewis rightly notes that the statement by Galen that Praxagoras (as well as Herophilus, Diocles, Hippocrates, etc.) "thought that pneuma is drawn ... not only from the heart alone, but from everywhere" (Galen, *An in art*. 8.1–2 = fr. 11) should not be taken literally as an indication of his believe that the pneuma is also supplied by the process of transpiration through the skin or some sort of air, generated internally. Our evidences are highly inconclusive at this point. The outside air, inhaled through the windpipe, flows, via the lungs and pulmonary vessels, in the heart due to expansion and contraction of this organ and then is distributed via arteries, which also expand and contract, to all bodily parts. Technically speaking pneuma for Praxagoras is not simply air. It undergoes some qualitative transformation in the organism and becomes a special sort of vital substance, not unlike the Aristotelian innate pneuma (or vital heat). Unfortunately, our sources are notoriously uncertain in this point. In her analysis of Praxagoras' doctrine of pneuma (p. 252 f.)[8] as well as a short prehistory of the concept in ancient philosophy of nature (on which also see her earlier study Lewis, Gregoric 2015), Orly Lewis is highly critical of the previous scholars, most notably F. Steckerl and especially his suggestion that the pneuma in the arteries is a mixture of the hot vapour rising from the blood and the cold air entering from the outside as well as his speculative hypothesis that the pneuma for Praxagoras is the soul, which would connect him with the Stoics (p. 264 f.). She concludes (p. 275) that our sources seem to allow us to believe that the sole source for the pneuma according to Praxagoras is the external air and that it is prepared in the organism in the manner of food concoction (*pepsis*). Besides, although there is no clear indications to this point, Praxagoras is likely to accept the influential Aristotelian concept of innate or inborn pneuma, found already in the embryo (cf. Aristotle, *Generation of animals* 736b30 ff.).

Overall, although a bit repetitive, the book, in general, is a pleasure to read. It is well written and perfectly structured. The conclusions drawn are always emphasized. Various indices help to work with the evidence edited, translated and discussed. The book is well produced, and will, no doubt, be useful to all scholars, interested in the history of ancient medicine.

[8] Lewis O., Gregoric P. The context of De spiritu. Early Science and Medicine. 2015: 20; P. 125–149.

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