Knowledge and Perceptions between Alcmaeon and Parmenides

E-ISSN 2531-7288
ISSN 0394/9001

Francesca Gambetti
Sapienza University of Rome, Italy

MEDICINA NEI SECOLI
Journal of History of Medicine and Medical Humanities
37/3 (2025) 31-50

Received: 29.07.2025
Accepted: 04.09.2025
DOI: 10.13133/2531-7288/3181

Corresponding Author:
francesca.gambetti@uniroma1.it

ABSTRACT

The aim of this paper is to examine Alcmaeon and Parmenides' doctrines of knowledge, trying to highlight parallels and differences, eventual influences of the physician from Croton upon the *physiologos* from Elea. I will try to argue that Parmenides – in deconstructing ancient cosmogonies and in his quest for an explanation of all that exists – may have used Alcmaeon's new findings on perceptions, which provided him with a strong epistemological set of tools and with a theory of knowledge, capable of validating his work. Both represent an important turning point in the criticism of mythical thinking and the development of a rational investigation of the human body and nature. Some scholars have tried to downplay his role, but the attention that ancient doxography paid to Alcmaeon is a sign of how innovative his research was considered to be, and how we too should take it into account, not only with respect to medicine but also to philosophy.

Keywords: Alcmaeon of Croton - Knowledge - Medicine - Parmenides

1. Introduction

It is remarkable that in the space of about thirty years, between the end of the 6th and the beginning of the 5th century B.C., in the same corner of the Western Mediterranean sea, just a few dozen kilometers apart, two outstanding personalities - Alcmaeon and Parmenides - scholars of human physiology and of nature, represented a fundamental turning point in the development of medicine and philosophy[1].

Although the most recent studies have largely highlighted the apparent distinction between medicine and early Greek philosophy, and the overlapping of the study of the nature of things with the study of the nature of the body, it is nevertheless possible to attribute to the former a major interest in medical matters, and to the latter a stronger involvement in research into nature[2].

According to Philip van der Eijk, Alcmaeon put his "investigations of the human body in a physicist and cosmological framework"[3], while according Magali Année he was "un veritable poète-médicin pour qui le rythme du discours importait autant que son contenu pour la simple raison qu'il devait représenter, à ses yeux, l'une des 'puissances constituantes' - l'une des δυνάμεις […] de son savoir médical"[4].

Beyond labels, Alcmaeon, thanks to the input of the rationalizing-mathematising insights of Pythagoreanism, gave scientific shape to the long series of experiences in the field of knowledge of the human body matured within the school of athletics in Croton, which had produced a group of athletes winners of the major sports games of the time[5]; athletes so successful that the saying Κροτωνιατῶν ὃ ἔσχατος πρῶτος ἦν τῶν ἄλλων Ἑλλήνων (the last of the Crotonians is the first of the Greeks) had become popular[6].

He was the author of the first definition of health as the dynamic equilibrium of bodily elements[7], he gave the first explanation of the functioning of the sense organs contained in the head and developed a brain-centered epistemology, which clearly distinguished the faculty of perceiving from thinking[8].

Parmenides, a complex and multifaceted figure, was an all-round sage: a legislator, the founder of a medical congregation dedicated to Apollo the Healer, and the author of a didactic poem that would give impetus to all western ontology. In the field of naturalistic research and cosmogonic speculation, he set out to explain "what it is", identifying the *logos* as the criterion and instrument of this quest[9].

Both of them – contiguous with Pythagoreanism, but not Pythagoreans in the strict sense[10] – are two scholars whose undefined outlines make it possible to identify certain points of contact and overlap with their main fields of research.

In fact, although starting from different point of view (medical the former, naturalistic the latter), and from different needs (explaining perceiving mechanisms the former, justifying the origin of reality the latter), both affirm the importance of establishing an epistemic model and of having a valid theory of knowledge to ground their research.

Whereas Alcmaeon maintains the distinction between understanding and perceiving, and limits the possibility of knowledge to what men have tangible evidence of

(*tekmairesthai*)[11], Parmenides, on the contrary, does not distinguish between thinking and perceiving, and establishes an analogy between the quality of knowledge and thought and the condition of balance and health of the elements of the body allowing the right reasoning[12].

The aim of this paper is to examine their doctrines of knowledge, trying to highlight parallels and differences, eventual influences of the physician from Croton upon the *physiologos* from Elea. I will try to argue that Parmenides – in deconstructing classical cosmogony and in his quest for an explanation of all that exists – may have used Alcmaeon's new findings, which provided him with a strong epistemological set of tools and with a theory of knowledge, capable of validating his work.

2. Alcmaeon's theory of knowledge between perceiving and understanding

Many scholars have stressed the importance of Alcmaeon for the development of medicine, considering him the father of 'experimental medicine', the founder of Western biology, and the first neuroscientist[13].

Also, Hippocratic medicine would have derived from Alcmaeon important methodological insights such as the importance of observation and empirical research, the model of the central nervous system and the centrality of the brain, the concept of health as a balance (*isonomia*) of the qualities (*dynameis*) that make up human body[14].

So far, no one has highlighted the importance of Alcmaeon's research for the development of philosophy to such an extent, even though his achievements have great relevance in terms of a theory of knowledge. Accordingly, I would like to shift the focus from medicine to philosophy, in order to see whether Alcmaeon's insights may have had a relevance in the development of philosophy as well.

Leading scholars such as Lloyd and Mansfeld[15] have strongly limited Alcmaeon's experimental research, and have doubted the report by Chalcidius that he carried out anatomical dissection of the eye[16].

Moreover, Laks and Most have restricted the possibility of reconstructing Alcmaeon's thought since in their *Early Greek Philosophy* edition have not included the passage from Plato's *Phaedo* (96b) in which many scholars have seen a meaningful reference to Alcmaeon's epistemology[17].

This general downgrading of Alcmaeon's research does not seem to me to be justified, and on the contrary, I think it is philosophically very relevant, even if it was not produced by systematic anatomical dissections (but maybe by repeated occasional observations of fractures, wounds, or incisions on cadavers).

He developed a structured theory of knowledge, distinguishing perception from comprehension (and humans from other animals), thanks to his anatomical and physiological observations of the sense organs in the head.

Our main and reliable source is Theophrastus[18]. He is very explicit in reporting Alcmaeon's theory that knowledge is produced by the dissimilar, but above all he

points out that Alcmaeon "first argued the difference between animals" (πρῶτον ἀφορίζει τὴν πρὸς τὰ ζῶια διαφοράν), saying that "man is different from the others for only he conceives, the others perceive, but do not conceive" (ἄνθρωπον γάρ φησι τῶν ἄλλων διαφέρειν ὅτι μόνον ξυνίησι, τὰ δ' ἄλλα αἰσθάνεται μέν, οὐ ξυνίησι δέ), since thinking and perceiving are different (ἕτερον ὂν τὸ φρονεῖν καὶ αἰσθάνεσθαι)[19]. Theophrastus is very detailed in reporting Alcmaeon's physiological descriptions on:

a) earing, that "occurs by the ears, since there is void in them" (ἀκούειν μὲν οὖν φησι τοῖς ὠσίν, διότι κενὸν ἐν αὐτοῖς ἐνυπάρχει); this resounds and a sound is produced by what is hollow, and the air makes an echo in response" (τοῦτο γὰρ ἠχεῖν. φθέγγεσθαι δὲ τῶι κοίλωι, τὸν ἀέρα δ' ἀντηχεῖν)[20];
b) smelling, that "occurs by the nostrils, at the same time as breathing occurs, by making the breath rise up to the brain" (ὀσφραίνεσθαι δὲ ῥισὶν ἅμα τῶι ἀναπνεῖν ἀνάγοντα τὸ πνεῦμα πρὸς τὸν ἐγκέφαλον)[21];
c) taste: flavors are distinguished by the tongue, that being tepid and soft, melts and transmits them (γλώττηι δὲ τοὺς χυμοὺς κρίνειν˙ χλιαρὰν γὰρ οὖσαν καὶ μαλακὴν τήκειν τῆι θερμότητι˙ δέχεσθαι δὲ καὶ διαδιδόναι διὰ τὴν μανότητα καὶ ἀπαλότητα)[22];
d) and seeing, that occurs in the eye "thanks to the peripheral water. But it is clear that it contains fire, for when it is struck it flashes. But it sees by means of what is brilliant and is transparent when it reflects, and does so all the more the purer it is (ὀφθαλμοὺς δὲ ὁρᾶν διὰ τοῦ πέριξ ὕδατος. ὅτι δ' ἔχει πῦρ, δῆλον εἶναι˙ πληγέντος γὰρ ἐκλάμπειν. ὁρᾶν δὲ τῶι στίλβοντι καὶ τῶι διαφανεῖ, ὅταν ἀντιφαίνηι, καὶ ὅσον ἂν καθαρώτερον ἦι, μᾶλλον)[23].

In this reporting Theophrastus is really concerned to mention that:

1. all senses are somehow led back to the brain through channels, *poroi*, which convey perceptions from sensory organs to the brain, which thus becomes the fundamental center of all human cognitive activity (ἁπάσας δὲ τὰς αἰσθήσεις συνηρτῆσθαί πως πρὸς τὸν ἐγκέφαλον)[24];
2. the stability and immobility of the brain is fundamental to understanding, because its displacement or alteration creates obstruction of the *poroi*, thus stopping the passage of perceptions (διὸ καὶ πηροῦσθαι κινουμένου καὶ μεταλλάττοντος τὴν χώραν. ἐπιλαμβάνειν γὰρ τοὺς πόρους, δι' ὧν αἱ αἰσθήσεις)[25].

The theory of *poroi* connecting the sense organs with the brain reported by Theophrastus is consistent with the contested testimony of Chalcidius[26], who attributes to Alcmaeon, together with Callisthenes, a pupil of Aristotle, and Erophilus (the Ellenistic anatomist founder of the medical school of Alexandria), the invention of the optic chiasma, i.e.

the narrow conduit that starts in the brain, then bifurcates and ends in the orbits, where it curves into eyeballs. Actually, the observation of the optic chiasm was possible even without deliberate anatomical dissection, but it was sufficient to be able to observe occasional skull fractures or war wounds, and from this to infer, by analogy, similar structures for the other sense organs in the head (and for this reason Alcmaeon would say nothing about touch).

From these early anatomical observations Alcmaeon drew an initial theory of knowledge. It is not very clear what he actually meant by the verb *xyniesi*, nor how the movement of the brain caused the obstruction of the *poroi*, but from these few references it can be assumed that he had developed an early materialistic theory of knowledge. Since perception and understanding are two distinct phenomena, knowledge seems to be a further step, subsequent to perceptual activity, in which sensory data are stabilized and reworked by the brain.

This very theory is reported by Plato in *Phaedo* 96b in Socrates' famous autobiographical excursus: when he was young, he was overcome with an extraordinary passion for investigating nature, for questions such as whether it is blood what we think with (Empedocles), or is it air (Anaximenes), or fire (Heraclitus), or none of these, or

> *it is the brain that gives us the sense of hearing, sight and smell. From these come memory and opinion, and from memory and opinion, once they have become firm, comes knowledge.*
>
> *ὁ δ' ἐγκέφαλός ἐστιν ὁ τὰς αἰσθήσεις παρέχων τοῦ ἀκούειν καὶ ὁρᾶν καὶ ὀσφραίνεσθαι. ἐκ τούτων δὲ γίγνοιτο μνήμη καὶ δόξα, ἐκ δὲ μνήμης καὶ δόξης λαβούσης τὸ ἠρεμεῖν, κατὰ ταῦτα γίγνεσθαι ἐπιστήμην*[27].

Even if Mansfeld and Sassi[28] are not sure whether to attribute the all reference to Alcmaeon, the doctrine given in the first part (the brain gives us the sense of hearing, sight and smell) is undoubtedly to be ascribed to him; the second part, which is a corollary of the first, in my opinion must be attributed to him as well, although one cannot fail to notice a discrete influence of the Platonic perspective, related to the use of the terms *mneme*, *doxa*, and *episteme*, which probably did not fully belong to Alcmaeon[29].

Although Alcmaeon distinguished between perceiving and understanding, this should not lead one to attribute a mind-body dualism to him, because both are equally produced by bodily elements.

The main philosophical consequence of the theory of the stability of the brain as the fundamental condition of the cognitive process, and of knowledge as further activity of comprehension based on perceptions, is that perceptions are the perimeter, the boundaries within which man's epistemic possibility is constrained. For "only the gods have clear knowledge of both unseen and human things, men can only proceed on the basis of evidences" (περὶ τῶν ἀφανέων, περὶ τῶν θνητῶν σαφήνειαν μὲν θεοὶ ἔχοντι, ὡς δὲ ἀνθρώποις τεκμαίρεσθαι καὶ τὰ ἐξῆς)[30].

The uncertainty of human knowledge was a widespread *topos* of the archaic mentality, which occurs frequently in both epic and lyric poetry. But here the limitation imposed by Alcmaeon instead of reaffirming the instability and fallibility of such a knowledge seems on the contrary to give it a solid basis, embedding it in the materiality of reality and the body[31].

Within this theoretical framework, the concept of health stated by Alcmaeon did not apply to the medical sphere only, it also had great value for any materialistic epistemology, since the quality of health of the body necessarily produces also the quality of knowledge.

Aëtius is the source who transmits to us Alcmaeon's definition of health, the oldest we have, that used a refined political metaphor, where *isonomia* and *monarchia* translate respectively "health" and "desease". A definition of health as the "overall balance of the forces that make up the body", that would be also central to the later Hippocratic-Galenic medicine, and in some ways still valid today. Let me report the textual reference:

> *What maintains health is the equality of the powers, of the moist and dry, cold and hot, bitter and sweet, and the other ones, while the monarchy of only one among them causes sickness, for the monarchy of one of the two. […] health is the proportionate mixture of the qualities.*
>
> *τῆς μὲν ὑγιείας εἶναι συνεκτικὴν τὴν* ***ἰσονομίαν*** *τῶν δυνάμεων, ὑγροῦ, ξηροῦ, ψυχροῦ, θερμοῦ, πικροῦ, γλυκέος καὶ τῶν λοιπῶν, τὴν δ' ἐν αὐτοῖς* ***μοναρχίαν*** *νόσου ποιητικήν· φθοροποιὸν γὰρ ἑκατέρου μοναρχίαν. […] τὴν δὲ ὑγείαν* ***τὴν σύμμετρον τῶν ποιῶν κρᾶσιν***[32].

Scholars generally believe that, although the passage presents a lexicon influenced by later traditions, the underlying concepts are authentically due to Alcmaeon[33]. About the analysis of the concept of isonomy Vlastos, Cambiano, and Kouloumentas have written leading contributions[34]. What is important for our purposes is not the degree of development of the political model that the concept of isonomy implied, but the type of balance. Vlastos believes that Alcmaeon advocated a type of 1/1 ratio, on the arithmetic model developed by the Ionian culture, quite different from the Pythagorean harmony based on asymmetrical ratios (2/1, 3/2, 4/3)[35].

This very difference, together with the opposites listed by Alcmaeon not coinciding with those of the Pythagorean school (having omitted three important pairs, i.e. limit-limit, odd-even, good-evil), would be the proof that he did not fully belong to the Pythagorean movement (as also referred by Aristotle in *Metaphysics*)[36].

Alcmaeon's isonomy, on the contrary, is closer to Pythagorean harmony as much as it is not based on quantitative equality but on an equality of functions. Cambiano emphasizes precisely that the overall balance (*synektiken ten isonomian*) derives from the *krasis* of the forces, from the "conflict between antagonistic powers" and not from the lack of conflict; in the *krasis* of the powers there is a kind of "solidarity", of integration and not a simple addition or juxtaposition of the *dynameis*[37].

Even Kouloumentas, although acknowledging some influence of the doxographer who transmitted the information[38], considers that the balance concerns each of the couples within and between them, since "each pair of opposites has some strength, quantity and degree of concentration that can affect the others".
The account of Theophrastus seems to confirm this interpretation, since in the case of sight, the balance resulting from the prevalence of water and fire allows for a brighter, more transparent, and therefore better, sharper sight[39].
As a consequence disease is produced not by conflict, but by victory, by the total prevalence (monarchia) of one element over the other, or of one pair over the others; this can have internal causes, as heat or cold, excess or lack of food, or external causes such as water, blows or drought that can affect blood, or marrow, or brain[40].
Alcmaeon, therefore, produced a much more structured model than the one he probably took from Ionian speculation, and most likely he had been able to do it thanks to the input from the Pythagoreanism.
Unfortunately, ancient sources do not transmit much more about Alcmaeon writings, and we do not know whether he provided explanations on the process of understanding as precise as those on perceptions, whether this was related to the balance of bodily powers as well.
Although at this historical period it is not fair to clearly separate medical from philosophical-naturalistic research, it cannot be denied that in Alcmaeon the interest in medicine, in questions concerning the functioning of the body, the explanation of its conditions of health and illness, was preponderant over other topics that concerned the investigation of nature in general.
He lived in a context in which medicine, the development of cures, not only on a dietary basis, had reached advanced levels, known far beyond the borders of Magna Graecia, so much so that the Crotonian physician Democedes was called to the court of King Darius to treat both the consequences of his fall from a horse and his wife Atossa's severe mastitis.
Croton's relationship with health was proverbial: the saying ὑγιέστερον Κρότωνος "healthier than Croton!" concerned the healthiness of the territory, the extraordinary quality of its inhabitants, and was something deeper, going all the way back to the city's founding myth, when Miskellus, forced by the oracle to choose between wealth and health, chose the latter[41].
Within this framework, it seems to me that Alcmaeon represents a turning point not only in the theoretical development of medicine but also of philosophy: at that time human knowledge was emancipating itself from theology and discovering itself to be historical and progressive (as attested by Xenophanes[42] and by the *Proem* of Parmenides' poem), studying the physiology of perceptions led to inescapable epistemological implications that, although not developed by Alcmaeon himself, would not be long in coming.

3. Parmenides between medicine and epistemology

Parmenides is one of the most stimulating and divisive figures of antiquity. As is well known, Plato in the *Theaetetus* (183e) describes him as "venerable and awesome", and immediately afterwards adds that his thought is so deep that he fears not to understand what he has said, and that it is much more what is out of reach for him than what he can understand.

The interpretation of his didactic poem is still in some ways an enigma today, delivering us three different Parmenides: the philosopher of absolute being, the scientist and the mystical healer and legislator.

A famous and successful historiographical *topos* constructed by Hegel[43] wants him to be the philosopher who expressed the simple thought of absolute being as the absolute and as the only truth, compared with Heraclitus, the philosopher of becoming; this *topos*, taken up by Zeller[44], would have directed not only Diels' interpretation of his poem[45], but also much part of the idealistic historiography of the first half of the 20th century.

Popper, on the other hand, considered him a scientist: issues and modes of argumentation that paved the way for what would become the philosophical enquiry a few decades later would begin with the naturalistic, truly scientific Parmenides' reflection[46].

Finally, there is a third Parmenides, which in recent years has been advocated by Burkert's school among others, and namely by Gemelli Marciano, who proposes to set him in the "cultural, social and religious context" of his time, referring to him as a particular sapiential figure who moves between "Pythagoreanism and Apollonian healing cults", between "hiatromantic, legislative and philosophical activity"[47].

Parmenides is famously credited with specific interests related to medicine, particularly embryology, having advocated the doctrine of the double seed and having addressed not only the question of the birth of the first men, but also that of subsequent generations, explaining healthy and sick procreations[48].

An inscription dating back to the 1st century AD[49] says he was "son of Pyres, of the family of the Ouliads", according to Laks-Most translation, but I prefer to translate it "a healer scholar of nature**"**, a *physiologos* devoted to Apollo the healer, according to a successful translation by Italian philosopher Guido Calogero[50].

These elements are enough, according to Sassi, to attribute to Parmenides a complex investigation into perceptual mechanisms, which is scarcely documented in ancient sources, with the exception of the Platonic passage in the *Phaedo* concerning Socrates' autobiographical excursus, which should be referred to him.

As argued above, I believe the Platonic excerpt, on the contrary, must be referred to Alcmaeon, but I agree with Sassi that Parmenides was the first to apply the concept of balancing physical elements within an epistemological context[51].

In fact, I do not believe that Parmenides developed this concept by pursuing his own medical interests, but it is more plausible he took it from who had conducted specific and in-depth medical researches, and adapted it to his own philosophical aims, namely

to differentiate his explanation of reality from that of the other poet-sages. This medical researcher could have been Alcmaeon.

The relationship of Alcmaeon and Parmenides with medicine is very different. Alcmaeon was truly an experimental researcher who based his research on empirical observation. Parmenides, on the other hand, was the type of healers attacked by *Ancient medicine*[52], who try to explain diseases by resorting to only two principles, who seek healing through divine action and the interpretation of dreams. The discovery of a series of statues with the inscription PHOLARCHOS, referring to the cave where animals retire to lethargy, seems to suggest precisely this interpretation[53].

Ancient sources compare Parmenides and Alcmaeon on two occasions only, one provided by Galen, who says they were both authors of a work entitled *On Nature*, together with Melissus, Empedocles, Gorgias and Prodicus[54]; the other provided by Censorinus, who attributes the doctrine of the double seed to both of them[55].

These are weak elements not able to prove a strong relationship between the two, but chronological reasons and geographical proximity suggest that Parmenides could hardly have been unaware of Alcmaeon's discoveries, and some textual elements seem suggesting this hypothesis.

The three issues of Alcmaeon's inquiry that Parmenides seems to take up are:

1. the stability and immobility as criteria for the validity of perceptions[56], and moreover as the criterion of all cognitive experiences, since Parmenides did not distinguish thought from sensation[57],
2. the physiology of perceptions[58], and
3. the theory of health as balance and *krasis* (blending) of elements[59], which in Parmenides' materialistic epistemology becomes the criterion for distinguishing the healthy-true from unhealthy-false thinking.

The criterion of immobility is introduced since the beginning, in the *Proem*, when the Goddess, programmatically presenting the content of her teachings (and of the poem in general), informs the young adept that he will learn everything (χρεὼ δέ σε πάντα πυθέσθαι), starting with "the unshakeable heart of the well-convincing truth" (Ἀληθείης εὐκυκλέος ἀτρεμὲς ἦτορ) and then the not really reliable opinions of men (βροτῶν δόξας, ταῖς οὐκ ἔνι πίστις ἀληθής)[60].

It is rather strange and paradoxical that the Goddess defines the heart as unmoved (the only human muscle that must always be in motion and beating in order to keep the body alive), but here both the metaphor and the analogy are evident, since according to the archaic mentality, the *noos* has its seat in the heart, and the very stability of thought seems to be a reworking of Alcmaeon's theory of the stability of the brain.

As Alcmaeon believed that the brain must remain still (without obstructing the pores) in order to perceive, so Parmenides seems believing that the heart must remain still in order to think well.

Later, when the Goddess wants to steer her young pupil away from the wrong path of research (σ' ἀφ' ὁδοῦ ταύτης διζήσιος ⟨εἴργω⟩), on which men who know nothing proceed in a contradictory manner (βροτοὶ εἰδότες οὐδὲν πλάττονται δίκρανοι), she criticizes them for letting their thought go astray due to the instability in their hearts (ἀμηχανίη ἐν αὐτῶν στήθεσιν ἰθύνει πλαγκτὸν νόον)[61].

Therefore, as Parmenides considers thought and sensation to be the same thing (τὸ γὰρ αἰσθάνεσθαι καὶ τὸ φρονεῖν ὡς ταὐτὸ λέγει)[62], he can apply to thought the same 'stability criterion' that Alcmaeon applied to perceptions, can use the *noos* to know how things are in their entirety (ὡς τὰ δοκοῦντα χρῆν δοκίμως εἶναι διὰ παντὸς πάντα περῶντα)[63], can investigate 'what it is' globally, examining realities that are remote (*apeonta*) – in time or space – as if they were firmly present in thought (νόωι παρεόντα βεβαίως)[64].

Usually these verses are interpreted as an invitation to give up the deceptive senses in favor of thought. But in Parmenides there can be no such condemnation of the senses and no separation of perception from thought. The difference between the two kinds of knowledge lies in the different, particular or general, perspectives[65].

At this point, it is worth pointing out once again the striking difference between Alcmaeon and Parmenides: while the former is an experimental scientist, who based his research on observation and proceeded inductively on empirical evidences, the latter was a *physiologos*, a scholar of nature who used general patterns, hypotheses, inferences and *reductio ad absurdum* reasoning.

Thus, while Alcmaeon, as a true physician, stopped at studying what his perceptual organs provided him with, Parmenides wanted to go beyond perceptual experience, to access thought and reasoning, thus opening the way to further philosophical inquiry.

Therefore, if we assume that Parmenides was familiar with Alcmaeon's research, the Goddess's invitation to leave the path of habit (ἔθος πολύπειρον ὁδὸν), the unseeing eye and the echoing ear (ἄσκοπον ὄμμα καὶ ἠχήεσσαν ἀκουήν)[66], would take on a different meaning than the standard interpretation: it would not be a matter of leaving the senses because they are deceptive, but of leaving them because the investigation being carried out does not require the senses but the reasoning (κρῖναι δὲ λόγωι).

Parmenides could know that men do not see with the eyes or hear with the ears, that they perceive with their brains (as Alcmaeon affirmed), but for joining the Goddess's investigation, he must go beyond perceptions, must use the *noos*. Therefore according to Parmenides, knowing the truth means thinking with a firm heart and recognizing the unbalanced blending of the elements of the body that produce wrong perceptions and thoughts.

Within a materialistic epistemology, therefore, a theory of health has both medical and also epistemological value, and Parmenides seems to be aware of this.

Our source in this regard is Aristotle[67], who quotes *verbatim* the verses of Parmenides' poem stating that for all men thought is produced by nature in the same way (τὸ

γὰρ αὐτό ἔστιν ὅπερ φρονέει μελέων φύσις ἀνθρώποισιν καὶ πᾶσιν καὶ παντί), that it is produced by the blending of very changeable parts (ὡς γὰρ ἕκαστος ἔχει κρᾶσιν μελέων πολυπλάγκτων), that the quality of the blending determines the quality of thought (τὼς νόος ἀνθρώποισι παρίσταται)[68].

Aristotle quotes Parmenides' verses in order to criticize all thinkers (as Democritus and Empedocles as well) who believed that thought was a kind of *aisthesis*, because they are forced to admit either that all thoughts as well as all impressions received through sensation are true, or, since the physical state changes, they are forced to admit that thoughts are also changeable, and therefore unstable and unreliable. However it seems he did not properly grasp the specificity of Parmenides' perspective, and in this case his objections miss the point, because Parmenides also had a polemic objective and wanted to distinguish between right and wrong thoughts, and between right and wrong reasoning.

Theophrastus unlike Aristotle, seems to recognize the specificity of Parmenides' theory, and summarize it in details[69]: he held that sensation occurs through the like (as Empedocles and Plato thought), and that since two elements are involved, heat and cold, the quality of knowledge [both perceiving and thinking] depends on which one prevails (δυοῖν ὄντοιν στοιχείοιν κατὰ τὸ ὑπερβάλλον ἐστὶν ἡ γνῶσις); if heat prevails, the thought is purer and better (ἐὰν γὰρ ὑπεραίρηι τὸ θερμὸν ἢ τὸ ψυχρόν, ἄλλην γίνεσθαι τὴν διάνοιαν, βελτίω δὲ καὶ καθαρωτέραν τὴν διὰ τὸ θερμόν), even if between the two elements, however, there must always be a certain balance, proportion (ταύτην δεῖσθαί τινος συμμετρίας); also memory and forgetting are produced by the blending (*krasis*) of heat and cold (καὶ τὴν μνήμην καὶ τὴν λήθην ἀπὸ τούτων γίνεσθαι διὰ τῆς κράσεως)[70].

Theophrastus also quotes the same verses from Parmenides, but above all points out that for him, perceiving and thinking are the same thing (τὸ γὰρ αἰσθάνεσθαι καὶ τὸ φρονεῖν ὡς ταὐτὸ λέγει), and that shows us why having a theory of health was important to him: precisely since in everyone the nature of the parts, of the organs, is the same, thinking and being are the same thing (τὸ γὰρ αὐτὸ νοεῖν ἐστίν τε καὶ εἶναι)[71], and between thinking and what is thought of there is an absolute contiguity (ταὐτὸν δ' ἐστὶ νοεῖν τε καὶ οὕνεκεν ἔστι νόημα)[72], a theory of physical illness was absolutely necessary in order to recognize wrong knowledge, which is one of the educational purposes of the goddess (βροτῶν δόξας, ταῖς οὐκ ἔνι πίστις ἀληθής)[73].

Many verses of Parmenides' poem describe the symptomatology of physical and epistemic disease that affects ordinary people: disarticulation of the limbs (μελέα πολυπλάγκτα), instability of thought (πλαγκτὸν νόον), bewilderment (τεθηπότες), blindness and deafness (κωφοὶ ὁμῶς τυφλοί).

It is the health that – due to the complete contiguity between thinking, thought and reality – forces to judge thought with the *logos*, and to deduce all the signs according to which truly thinking reality: ingenerated and incorruptible, immutable, immobile and complete (ἀγένητον, ἀνώλεθρόν, οὐλομελές, ἀτρεμὲς ἠδ' ἀτέλεστον)[74].

Conclusion

Between the end of the 6th and the beginning of the 5th century, a rationalizing process took place in Magna Graecia regarding medical and nature investigation. Alcmaeon and Parmenides are the main actors in this cultural revolution triggered by Pythagoreanism.

In the emancipatory movement away from the divine causality of diseases and natural phenomena, Alcmaeon paves the way for scientific medicine, for experimental research, based on the observation of concrete signs, while Parmenides introduces the use of deductive reasoning in the investigation of nature, with a precise epistemic materialism as a premise.

Both of them felt the need to have a strong theory of knowledge to support their research, but they are very different.

Alcmaeon, maybe also as a result of the advanced knowledge of the body developed by the school of athletics at Croton[75], studied the sense organs contained in the head to explain perceptual processes, to which, however, he did not reduce understanding, and consequently knowledge. As a result, forced to follow the evidence, he did not arrive at formulating a proper theory of the mind.

Parmenides, on the other hand, moved in the context of cosmogonic poetry, probably also of Orphic inspiration, whose contradictory myths he criticized, in the same spirit of deconstruction of traditional theology that his mentor Xenophanes had brought to Elea from Colophon[76].

It is true that for this period it is not possible to make a clear distinction between medical and naturalistic investigations, that there was a great overlap between the two domains[77], and that Alcmaeon and Parmenides were both physicians and *physiologoi*, but their way of being physicians was very different. The discovery at Elea of several inscriptions attesting to the existence of a school of medicine, of which Parmenides is said to have been the founder, linked to the cult of Apollo Oulios and the practice of *incubatio*, suggests that he followed traditional pre-Hippocratic treatments rather than anatomical research[78].

Alcmaeon, on the other hand, does not seem to have been interested in the practice of treating diseases (like the famous Crotonian physician Democedes), but was more interested in the principles of medicine and anatomical research. This difference in perspective, and Alcmaeon's small anteriority, allows to plausibly speculate that Parmenides might have been familiar with his new findings and that – in deconstructing the classical cosmogony and seeking an explanation of all that exists – he might have used them as a strong epistemological set of tools, capable of validating his work.

Even if one assumes that there were some "retroactive projections" in the doxography of Aëtius, the idea of the quality of knowledge being dependent on the symmetry of heat and cold referred by Theophrastus seems authentic and can only refer back to the concept of health as a proportionate blending of qualities formulated by Alcmaeon.

In fact, within a materialistic epistemology, true knowledge necessarily corresponded to the healthy balance of bodily parts and elements.
Certainly, it must not have been easy for Parmenides' audience to give up the traditional view of weakness human knowledge and ignorance, and to embrace the idea that there is a way able to lead man to true knowledge.
Alcmaeon still appears to be very much affected by the traditional mentality, but nonetheless he tried to break the epistemic opacity in which man seems condemned, and as a true empirical doctor, he opened the field of knowledge to what man can have concrete evidence of.
Parmenides, on the other hand, as a true founder of philosophy, did not set these limits, and expanded the field of knowledge to hypothetical-deductive enquiry.
The downplaying of Alcmaeon's experimental research should not lead us to underestimate the philosophical significance of his research, which on the contrary made a significant contribution to the Magna Graecia cultural milieu of the period, to the point of stimulating Parmenides himself, showing how much medicine, from its very beginnings, offered to philosophy research topics on human nature, life, death, etc.
Werner Jaeger, better than other scholars, summarized the close relationship that existed between medicine and philosophy. He thought that the rise of medicine had its roots in the fruitful conflict with philosophy, and that medicine was a powerful cultural force, a constituent part of the general culture and intellectual guide of the whole Greek people[79].
Thanks to Alcmaeon and Parmenides, then, we can better understand these words.

Bibliography, notes and references

Année M, Alcméon de Crotone. Fragments, traité scientifique en prose ou poème médical? Paris: Vrin; 2019.
Calogero G, Filosofia e medicina in Parmenide. In: Filosofia e Scienze in Magna Grecia. Atti del V Convegno di studi sulla Magna Grecia, Taranto, 10-14 ottobre 1965. Napoli: Arte tipografica; 1966. pp. 69-71.
Cambiano G, Patologia e metafora politica. Alcmeone, Platone, Corpus Hippocraticum. Elenchos 1982;3(2):219-236.
Cerri G, Parmenide di Elea Poema sulla Natura. Milano: Rizzoli; 1999.
Cordero NL et al., Eleatica 2006: Parmenide scienziato? Sankt Augustin: Academia Verlag; 2008.
Coxon AH, The Fragments of Parmenides: A critical text with introduction, translation, the ancient testimonia and a commentary, revised and expanded edition with new translations by Richard McKirahan. Las Vegas-Zurich-Athens: Parmenides Publishing; 2009.
Diels H, Parmenides Lehrgedicht. Berlin: Reimer; 1897.
Diels H, Kranz W, Die Fragmente der Vorsokratiker. Berlin:Weidman; 1951-1952[6].
Doty RW, Alkmaion's discovery that brain creates mind: a revolution in human knowledge comparable to that of Copernicus and of Darwin. Neuroscience 2007;147(3):561-568.
Ebner P, A Velia una scuola di medicina? Rassegna Storica Salernitana 1961;22:196-198.

Erhard H, Alkmaion, der erste Experimentlbiologe. In: Sudhoffs Archiv für die Geschichte der Medizin und der Naturwissenschaften 1941;34:77-89.
Foca A, The origin of experimental medicine in the school of Alcmaeon from Kroton and the diffusion of his philosophy within the Mediterranean area. In: Σκέψις: Περιοδικὴ Ἔκδοση Φιλοσοφίας καὶ Διεπιστημονικῆς Ἔρευνας = A Journal for Philosophy and Inter-Disciplinary Research 2002-2003;13-14:242-253.
Gambetti F, Beyond disciplinary Boundaries. Alcmaeon of Croton between Physics, Medicine and Philosophy. b@belonline 2023;10:95-104.
Gazzaniga V, La medicina antica. Roma: Carocci; 2014.
Gemelli-Marciano ML (ed.), Die Vorsokratiker. Griechisch-Deutsch. Berlin-Boston: De Gruyter; 2011.
Hegel GWF, Die Wissenschaft der Logik. Hamburg: Felix Meiner Verlag; 1832.
Hippocrates, On Ancient Medicine. Translated with Introduction and Commentary by MJ Schiefsky. Leiden-Boston: Brill; 2005.
Hirzel R, Zur Philosophie des Alkmäion. Hermes; 1876;11:240-246.
Huffman C, Alcmaeon. The Stanford Encyclopedia of Philosophy (Fall 2025 Edition); Zalta EN, Nodelman U (eds), https://plato.stanford.edu/archives/fall2025/entries/alcmaeon/ (accessed on 25.7.2025).
Jaeger W, Paideia. Die Formung des griechischen Menschen. Berlin-Lepzig: de Gruyter; 1947.
Jouanna J, Politique et médecine. La problématique du changement dans le Régime des maladies aiguës et chez Thucydide (livre VI). In: Gremek M, Robert F (eds), Hippocratica - Actes du Colloque hippocratique de Paris, 4-9 septembre 1978. Paris: Edition du CNRS; 1980.
Jouanna J, Hippocrates. Paris: Fayard; 1992.
Kouloumentas S, Aristotle on Alcmaeon in relation to Pythagoras: an addendum in Metaphysics Alpha? In: Golitsis P, Ierodiakonou K (eds), Aristotle and his Commentators. Berlin-Boston: De Gruyter; 2019.
Kouloumentas S, The Body and the Polis: Alcmaeon on Health and Disease. British Journal for the History of Philosophy 2014;22(5):867-887.
Lafrance Y, Le suject du Poème de Parménide: l'être ou l'univers? Elenchos 1999;20:265-308.
Laks A, Most GW, Early Greek Philosophy: Western Greek Thinkers. Vol. 5; part 2. Cambridge (MA)-London: Harvard University Press; 2016.
Lane Fox R, The Invention of Medicine from Homer to Hippocrates. London/Dublin: Penguin; 2020.
Lebedev AV, Alcmaeon of Croton on Human Knowledge, the Seasons of Life, and Isonomia: a New Reading of B1 DK and Two Additional Fragments from Turba Philosophorum and Aritotle. In: Vassallo C (ed.), Topics in Presocratic Philosophy and its Reception in Antiquity. Trier: Wissenschaftlicher Verlag; 2017. pp. 227-258.
Leikola A, Alcmaeon of Croton as the founder of western biology. Opuscula Instituti Romani Finlandiae 1989;4:43-52.
Lesher JH, Early interest in knowledge. In: Long AA, The Cambridge Companion to Early Greek Philosophy. Cambridge: Cambridge University Press; 1999. pp. 225-249.
Lloyd GER, Alcmaeon and the early history of dissection. Sudhoffs Archiv für die Geschichte der Medizin und der Naturwissenschaften 1975;59:113-47.
Mansfeld J, Alcmaeon: 'Physikos' or Physician? With some remarks on Calcidius' "On Vision" compared to Galen, Plac. Hipp. Plat. VII. In: Mansfeld J, de Rijk LM (eds), Kephalaion: Studies in Greek Philosophy and its continuation offered to Professor C.J. de Vogel. Assen: Van Gorcum; 1975. pp. 26-38.

Mansfeld J, Physical doxai in the Phaedo. In: Kardaun M, Spruyt J (eds), The Winged Chariot. Collected Essays on Plato and Platonism in Honour of L.M. de Rijkk. Leiden-Boston- Köln: Van Gorcum; 2000. pp. 1-17.
Mansfeld J, Aristotle et la structure du de Sensibus de Théophraste. In: Mansfeld J, Runia DT, Aëtiana. The method and Intellectual context of a Doxographer. Vol. 3. Leiden-Boston: Brill; 2010. pp. 203-235.
Mansfeld J, The body politic: Aëtius on Alcmaeon on isonomia and monarchia. In: Harte V, Lane M (eds), Politeia in Greek and Roman Philosophy. Cambridge: Cambridge University Press; 2014. pp. 78-95.
Mele A, Crotone e la sua storia. In: Atti del XXIII Convegno di Studi sulla Magna Grecia, Taranto 7-10 ottobre 1983. Taranto: ISAMG; 1984. pp. 9-87.
Nutton V, The medical school of Velia. La Parola del Passato 1970;25:211-25.
Palmer J, Parmenides. The Stanford Encyclopedia of Philosophy (Spring 2025 Edition). Zalta EN, Nodelman U (eds), https://plato.stanford.edu/archives/spr2025/entries/parmenides/ (accessed on 25.7.2025).
Panegyres KP, Panegyres PK, The Ancient Greek discovery of the nervous system: Alcmaeon, Praxagoras and Herophilus. Journal of Clinical Neuroscience 2016;29:21-24.
Perilli L, Alcmeone di Crotone tra filosofia e scienza. Per una nuova edizione delle fonti. Quaderni Urbinati di Cultura Classica 2001; 69.
Popper KR, The World of Parmenides. Essays on the Presocratic Enlightment. Londra: Routledge; 1998.
Pugliese Carratelli G, ΠΑΡΜΕΝΕΙΔΕΣ ΦΥΣΙΚΟΣ. La Parola del Passato 1965;20:306.
Pugliese Carratelli G, φώλαρχος. La Parola del Passato 1963;18:385-386.
Pugliese Carratelli G, Sulla scuola medica di Velia. In: Filosofia e Scienze in Magna Grecia. Atti del V Convegno di studi sulla Magna Grecia, Taranto, 10-14 ottobre 1965. Napoli: Arte tipografica; 1966. pp. 119-122.
Rossetti L, Ripensare i Presocratici: da Talete (anzi no da Omero) a Zenone. Milano: Mimesis; 2023.
Sassi MM, Parmenides and Empedocles on 'Krasis' and Knowledge. Apeiron 2016;49(4): 451-469.
Sassi MM, Ordre cosmique et " isonomia ": en repensant "Les origines de la pensée grecque" de Jean-Pierre Vernant. Philosophie Antique: Problèmes, Renaissances, Usages 2007;7:189-218.
van der Eijk Ph, The Role of Medicine in the Formation of Early Greek Thought. In: Curd P, Graham DW (eds), The Oxford Handbook of Presocratic Philosophy. Oxford: Oxford University Press; 2008.
Vegetti M, Ippocrate, Opere. Torino: UTET; 1965.
Vlastos G, Isonomia. American Journal of Philology 1953;74:337-366.
Wöhrle G (ed.), Alkmaion von Kroton, Hippon von Metapont und Menestor von Sybaris. Berlin-Boston: De Gruyter; 2022.
Zeller E, Die Philosophie der Grieschen in ihrer geschichtlichen Entwicklung. Leipzig: Reisland; 1892.
Zemelka AM, Alcmaeon of Croton - Father of Neuroscience? Brain, Mind and Senses in the Alcmaeon's Study. Journal of Neurology and Neuroscience 2017;8(3):190-194.
Zhmud L, Ancient Greek Historiography of Science. In: Taub L (ed.), The Cambridge companion to ancient Greek and Roma Science. Cambridge: Cambridge University Press; 2020. pp. 265-287.

1. About Alcmaeon and Parmenides' dating, must be taken into account the arrival of Pythagoras in Croton, around 530 BC (as a young Alcmaeon attended an old Pythagoras), and the foundation of Elea following the battle of Alalia, around 540 B.C. (*terminus post quem* for Parmenides' birth); so it can be assumed that Alcmaeon is older than Parmenides by around 20-30 years. Alcmaeon's research should be placed in the 20 years Pythagoras remained in Croton, until his escape to Metapontum in 510. The dedication of the poem to the three Pythagoreans of Metapontum is also an indication for the dating of Alcmaeon's writing. See Lane Fox R, The Invention of Medicine from Homer to Hippocrates. London/Dublin: Penguin; 2020. p. 57. Kouloumentas S, Aristotle on Alcmaeon in relation to Pythagoras: an addendum in Metaphysics Alpha? In: Golitsis P, Ierodiakonou K (eds), Aristotle and his Commentators. Berlin-Boston: De Gruyter; 2019. pp. 49-67. There is no conclusive reason to move its dating between 500 and 450 BC as Huffman does. Huffman C, Alcmaeon. The Stanford Encyclopedia of Philosophy (Fall 2025 Edition), Zalta EN, Nodelman U (eds), https://plato.stanford.edu/archives/fall2025/entries/alcmaeon/ (accessed on 25.7.2025).
2. See van der Eijk Ph, The Role of Medicine in the Formation of Early Greek Thought. In: Curd P, Graham DW (eds), The Oxford Handbook of Presocratic Philosophy. Oxford: Oxford University Press; 2008. pp. 385-389.
3. Ivi, p. 388. Jouanna J, Hippocrates. Paris: Fayard; 1992. Tr. Eng. Baltimore-London: Johns Hopkins University Press; 1999. p. 262.
4. Année M, Alcméon de Crotone. Fragments, traité scientifique en prose ou poème médical? Paris: Vrin; 2019. p. 16.
5. See Lane Fox R, Ref. 1. p. 57.
6. Milo was only the most famous of a group of athletes, wrestlers and runners, who had excelled in the Olympics, in the Pythian and Nemean games; Strabo, 6, 262 ff. mentions the names of many winners and recalls the proverb.
7. 24B4DK / 24D30 LM /Alk28 W.
8. See 24A5 DK / 24D11-19b LM /Alk11 W. See also Perilli L, Alcmeone di Crotone tra filosofia e scienza. Per una nuova edizione delle fonti. Quaderni Urbinati di Cultura Classica 2001;69:55-79.
9. For a general overview of the many issues concerning the interpretation of Parmenides' thought see Palmer J, Parmenides. The Stanford Encyclopedia of Philosophy *(*Spring 2025 Edition). Zalta EN, Nodelman U (eds), https://plato.stanford.edu/archives/spr2025/entries/parmenides/ (accessed on 25.7.2025). For an interpretation of Alcmaeon as a philosopher see Rossetti L, Ripensare i Presocratici: da Talete (anzi no da Omero) a Zenone. Milano: Mimesis; 2023.
10. Diogenes Laërtius (24A1 DK / 24P3 LM /Alk 42W) states that Alcmaeon was a disciple of Pythagoras, and Iamblichus lists him among the Pythagoreans from Croton. Aristotle, on the other hand, emphasizes the difference between Pythagorean dualism and that of Alcmaeon, suggesting that he did not belong completely to the school. Parmenides is also included by Iamblichus in the catalogue of the Pythagoreans from Elea and Diogenes states that he was initiated to the "quiet life" by the Pythagorean Ameinias. The membership of both of them in the Pythagorean school is therefore to be highly attenuated and interpreted as their living in a cultural and research milieu deeply inspired by the Pythagorean rational-mathematical paradigm.
11. 24B1 DK / 24D4 LM /Alk42 W.
12. 28A46 DK / 19D52 LM; 28B16 DK / 19D51 LM.

13. The entry Alcmaeon in the PubMed database (https://pubmed.ncbi.nlm.nih.gov/?term=Alcmaeon) has 31 results mainly related to the fields of neurology, neurosurgery, history of neurology and medicine, cardiology. The most prominent are: Erhard H, Alkmaion, der erste Experimentlbiologe. Sudhoffs Archiv für die Geschichte der Medizin und der Naturwissenschaften 1941;34:77-89. Leikola A, Alcmaeon of Croton as the founder of western biology. Opuscula Instituti Romani Finlandiae 1989;4:43-52. Foca A, The origin of experimental medicine in the school of Alcmaeon from Kroton and the diffusion of his philosophy within the Mediterranean area. In: Σκέψις: Περιοδικὴ Ἔκδοση Φιλοσοφίας καὶ Διεπιστημονικῆς Ἔρευνας = A Journal for Philosophy and Inter-Disciplinary Research 2002-2003; 13-14; 242-253. Doty RW, Alkmaion's discovery that brain creates mind: a revolution in human knowledge comparable to that of Copernicus and of Darwin. Neuroscience 2007;147(3):561-568. https://doi.org/10.1016/j.neuroscience.2007.02.046 Panegyres KP, Panegyres PK, The Ancient Greek discovery of the nervous system: Alcmaeon, Praxagoras and Herophilus. Journal of Clinical Neuroscience 2016;29:21-24. Zemelka AM, Alcmaeon of Croton - Father of Neuroscience? Brain, Mind and Senses in the Alcmaeon's Study. Journal of Neurology and Neuroscience 2017;8(3):190-194.
14. See Vegetti M, Ippocrate, Opere. Torino: UTET; 1965. Jouanna J, Politique et médecine. La problématique du changement dans le Régime des maladies aiguës et chez Thucydide (livre VI). In: Gremek M, Robert F (eds), Hippocratica - Actes du Colloque hippocratique de Paris, 4-9 septembre 1978. Paris: Edition du CNRS 1980. According to both Alcmaeon's embryology also formed the basis of the Hippocratic one and – with encephalocentrism – provided the explanation for the origin of diseases such as *morbum sacrum*.
15. Lloyd GER, Alcmaeon and the early history of dissection. Sudhoffs Archiv für die Geschichte der Medizin und der Naturwissenschaften 1975;59:113-47. Mansfeld J, Alcmaeon: 'Physikos' or Physician? With some remarks on Calcidius' "On Vision" compared to Galen, Plac. Hipp. Plat. VII. In: Mansfeld J, de Rijk LM (eds), Kephalaion: Studies in Greek Philosophy and its continuation offered to Professor C.J. de Vogel. Assen: Van Gorcum; 1975. pp. 26-38.
16. 24A10 DK / 24 R6 LM /Alk48 W.
17. 24A11 DK / Alk2 W reports Plato, Phaedo 96b; LM put it under MEDICAL 29 T23. Wöhrle put it as Alk 2. The first scholar who recognized Alcmaeon in Socrates' autobiographical excursus was: Hirzel R, Zur Philosophie des Alkmäion. Hermes 1876;11:240-246.
18. Theophr. *De sens*ibus 25.
19. 24A5 DK / 24 D11 LM / Alk11 W.
20. 24A5 DK / 24 D12a LM / Alk11 W
21. 24A5 DK / 24 D13 LM / Alk11 W.
22. 24A5 DK / 24 D15 LM / Alk11 W.
23. 24A5 DK / 24 D16 LM / Alk11 W.
24. 24A5 DK / 24 D19a LM / Alk11 W.
25. Ibidem.
26. 24A10 DK / 24R6 LM / Alk48 W.
27. Plat. *Phaedo* 96 b (24A11DK / Alk2 W).
28. See Mansfeld J, Physical doxai in the Phaedo. In: Kardaun M, Spruyt J (eds), The Winged Chariot. Collected Essays on Plato and Platonism in Honour of L.M. de Rijkk. Leiden-Boston- Köln: Van Gorcum; 2000. pp. 1-17. Sassi MM, Parmenides and Empedocles on 'Krasis' and Knowledge. Apeiron 2016;49(4)451-469.

29. I do not believe that these lines generically demonstrate that "Plato introduces a set of views on how *phronein* is produced according to various anonymous representatives of the *peri physeos historia*" and that he was "fully aware of the fact that making cognitive activities to depend on corporeal substances and processes was distinctive of the approach of the *peri physeos* tradition" (Sassi MM, Ref. 28. pp. 452-453). Although the materialistic knowledge was a widely accepted theory, the detail of the explanation given and the link with encephalocentrism makes one argue for an attribution to Alcmaeon. See also Perilli L, Alcmeone di Crotone tra filosofia e scienza. Per una nuova edizione delle fonti. Quaderni Urbinati di Cultura Classica 2001;69:55-79,69.
30. Diog. Laert. 8. 83 (24B1 DK / 24D4 LM / Alk42 W).
31. See Lebedev AV, Alcmaeon of Croton on Human Knowledge, the Seasons of Life, and Isonomia: a New Reading of B1 DK and Two Additional Fragments from Turba Philosophorum and Aritotle. In: Vassallo C (ed.), Topics in Presocratic Philosophy and its Reception in Antiquity. Trier: Wissenschaftlicher Verlag; 2017. pp. 227-258.
32. 24B4 DK / 24D30 LM / Alk28 W.
33. Kouloumentas S, The Body and the Polis: Alcmaeon on Health and Disease. British Journal for the History of Philosophy 2014;22(5):867-887.
34. Cambiano G, Patologia e metafora politica. Alcmeone, Platone, Corpus Hippocraticum. Elenchos 1982;3(2):219-236. Vlastos G, Isonomia. American Journal of Philology 1953;74:337-366. See also Sassi MM, Ordre cosmique et "isonomia": en repensant "Les origines de la pensée grecque" de Jean-Pierre Vernant. Philosophie Antique: Problèmes, Renaissances, Usages 2007;7:189-218.
35. Vlastos G, Ref. 34. pp. 345-346.
36. Aristot. Metaph. 1, (24A3 DK / 24D5 LM / Alk9 W). See Kouloumentas S, Aristotle on Alcmaeon in relation to Pythagoras: an addendum in Metaphysics Alpha? In: Golitsis P, Ierodiakonou K (eds), Aristotle and His Commentators. Studies in Memory of Paraskevi Kotzia. Berlin-Boston; De Gruyter; 2019. pp. 49-67.
37. Cambiano G, Ref. 34. p. 223.
38. Kouloumentas S, Ref. 33. p. 877. Mansfeld J, The body politic: Aëtius on Alcmaeon on isonomia and monarchia. In: Harte V, Lane M (eds), Politeia in Greek and Roman Philosophy. Cambridge: Cambridge University Press; 2014; pp. 78-95. He disputed that the origin of the two terms dated back to A and argued that they were included in the lemma Alcmaeon by a doxographer influenced by the debate on the best constitution in Herodotus' Histories.
39. 24A5 DK / 24D16 LM / Alk11 W.
40. 24B4 DK / 24D30 LM / Alk28 W.
41. Strabo VI, 262. See Mele A, Crotone e la sua storia. In: Atti del XXIII Convegno di Studi sulla Magna Grecia, Taranto 7-10 ottobre 1983. Taranto: ISAMG; 1984. pp. 9-87.
42. 21B18 DK / 8D53 LM.
43. Hegel GWF, Die Wissenschaft der Logik. Hamburg: Felix Meiner Verlag; 1832; part 1; §§ 85-86.
44. Zeller E, Die Philosophie der Grieschen in ihrer geschichtlichen Entwicklung. Leipzig: Reisland; 1892. Tr. It. Mondolfo R, La filosofia dei Greci nel suo sviluppo storico. Part 1; vol. 3; Reale G (ed.), Gli Eleati. Firenze: La Nuova Italia; 1967.
45. Diels H, Parmenides Lehrgedicht. Berlin: Reimer; 1897, reprinted by Sankt Augustin: Academia Verlag; 2003.

46. Popper KR, The World of Parmenides. Essays on the Presocratic Enlightment. Londra: Routledge; 1998. (Tr. It. Minazzi F,) Casale Monferrato: Piemme; 1998. See also Enriques F, La relatività del movimento nell'antica Grecia. Periodico di matematiche 1921;4(1):77-94. Cordero NL et al., Eleatica 2006: Parmenide scienziato? Sankt Augustin: Academia Verlag; 2008. Tradition ascribes to Parmenides five discoveries: the moon is spherical; it does not shine with its own light but reflects the light of the sun; its rise and fall is actually just a play of shadows; the earth is spherical, and the morning and evening star (the planet Venus) are one and the same. About the sphericity of the earth, there is actually no consensus in tradition, since according to Diogenes Laertius some attribute the discovery to Pythagoras, while Theophrastus attributes it to Parmenides (28A40a 42, 44 DK / 19D22, 23, 29, 30, 33b).
47. Gemelli-Marciano ML (ed.), Die Vorsokratiker. Griechisch-Deutsch. Berlin-Boston: De Gruyter; 2011. (Tr. It. Fondazione Lorenzo Valla) Milano: Mondadori; 2024. pp. XI and 7. According to Gemelli-Marciano Parmenides was a *iatromantis* who heals through incubation, and the founder of a group of healer-soothsayers who were followers of Apollo.
48. 28A54 DK / 19D48, 50 LM.
49. 19P23 LM and not in DK.
50. Calogero G, Filosofia e medicina in Parmenide. In: Filosofia e Scienze in Magna Grecia. Atti del V Convegno di studi sulla Magna Grecia, Taranto, 10-14 ottobre 1965. Napoli: Arte tipografica; 1966. pp. 69-71. See also: Pugliese Carratelli G, ΠΑΡΜΕΝΕΙΔΕΣ ΦΥΣΙΚΟΣ. La Parola del Passato 1965;20:306.
51. Sassi MM, Ref. 28.
52. Hippocrates, On Ancient Medicine. Translated with Introduction and Commentary by MJ Schiefsky. Leiden-Boston: Brill; 2005. See chapter 14.
53. Ebner P, A Velia una scuola di medicina? Rassegna Storica Salernitana 1961;22:196-198. Pugliese Carratelli G, φώλαρχος. La Parola del Passato 1963;18:385-386. Pugliese Carratelli G, Sulla scuola medica di Velia. In: Filosofia e Scienze in Magna Grecia. Atti del V Convegno di studi sulla Magna Grecia, Taranto, 10-14 ottobre 1965. Napoli: Arte tipografica; 1966. pp. 119-122. Nutton V, The medical school of Velia. La Parola del Passato 1970;25:211-25.
54. 24A2 DK / 24D2 LM / Alk29 W.
55. 24 A13 / 24D23 LM / Alk37 W; 28A53 DK / 24D44 LM.
56. 28B1, 28-30 / 19D4 LM; 28B6 DK /19D7 LM.
57. 28A46 DK / 19D52 LM.
58. 28B7 DK / 19D8 LM.
59. 28B16 DK/ 19D51 LM.
60. 28B1, 28-30 DK / 19D4 LM.
61. 28B6, 3-5 DK / 19D7 LM.
62. 28A46 DK / 19D52 LM.
63. 28B1, 31-32 DK / 19D LM.
64. 28B4 DK / 19D10 LM. The underlying issue here is what is the main topic of the poem and how to understand *to eon*. See Lafrance Y, Le suject du Poème de Parménide: l'être ou l'univers? Elenchos 1999;20:265-308.
65. See commentary to fragment 4 DK in: Coxon AH, The Fragments of Parmenides: A critical text with introduction, translation, the ancient testimonia and a commentary. (Revised and expanded edition with new translations by Richard McKirahan) Las Vegas/Zurich/

Athens: Parmenides Publishing; 2019. Cerri G, Parmenide di Elea Poema sulla Natura. Milano: Rizzoli; 1999. pp. 196-197.

66. 28B7 DK / 19D8 LM. These verses are usually interpreted as well as an invitation to give up perceptions as they are deceptive.
67. Aristotle, Metaphisics, IV, 5, 1009 b 21 (28B16 DK / 19 D 51 LM).
68. Ibidem.
69. 28 A46 DK / 19D52 LM. About doxography in Aristotle and Theophrastus see Mansfeld J, Aristotle et la structure du de Sensibus de Théophraste. In: Mansfeld J, Runia DT, Aëtiana. The method and Intellectual context of a Doxographer. Vol. 3. Leiden-Boston: Brill; 2010. pp. 203-235. Zhmud L, Ancient Greek Historiography of Science. In: Taub L (ed.), The Cambridge companion to ancient Greek and Roma Science. Cambridge: Cambridge University Press; 2020. pp. 265-287.
70. Reducing causes to a few principles is something that the author of *Ancient Medicine* (chapter 14) considers to be a serious error.
71. 28B3 DK / 19D6 LM.
72. 28B8, 34 /19D8, 39 LM.
73. 28B1, 30 /19D4, 30 LM.
74. 28B 8, 9-10 DK / 19D8, 8-9 LM.
75. In Aristotle, *Nic*. *Eth.* II, 6, 1106 a 29-1106 b 7 there is an interesting reference to the famous Crotonian athlete Milo and to some dietary instructions that were probably formulated by the city's athùletics school.
76. See Lesher JH, Early interest in knowledge. In: Long AA, The Cambridge Companion to Early Greek Philosophy. Cambridge: Cambridge University Press; 1999. pp. 225-249.
77. Gambetti F, Beyond disciplinary Boundaries. Alcmaeon of Croton between Physics, Medicine and Philosophy. In: b@belonline 2023;10:95-104.
78. Gazzaniga V, La medicina antica. Roma: Carocci; 2014.
79. Jaeger W, Paideia. Die Formung des griechischen Menschen. Berlin-Lepzig: de Gruyter; 1947. See vol. 3, chapter1.

Francesca Gambetti Orcid Id: https://orcid.org/0009-0005-9026-5727