Anti-teleologism, Theory of Matter and Medical Corpuscularism in Galen’s Testimony on Atomism

Ambra Serangeli

A PhD thesis to be submitted to the University of Oslo

Department of Philosophy, Classics, History of Art and Ideas
UiO University of Oslo

February 2020
Acknowledgments

During my years of study as a Phd fellow I could profit from the support of many people that now I would like to thank. First, I wish to express my gratitude to my supervisors Eyjólfur Kjalar Emilsson and Lorenzo Perilli, who guided me through this long journey with great competence, encouragement and continuous support. Without their careful commenting, patience and invaluable advice, this research would have never been possible. I own them a large debt.

In Oslo, I had the opportunity to be part of the Society for Ancient Philosophy and benefited from stimulating discussions, workshops and conferences. I therefore would like to thank all the members of this group for their contribution to the development of my research. Among them, I especially thank Thomas Kjeller Johansen, Franco Trivigno, Øyvind Rabbås, Panos Dimas, Hilde Vinje, Panagiotis Pavlos and Pål Rykkaia Gilbert for having commented on both the first and the last chapters of my thesis. I also wish to thank Anastasia Maravela, who offered me the possibility to present my work at the Klassisk Seminar and read the very first draft of my dissertation.

I am also extremely grateful to the Philosophy Department of the University of Roma Tor Vergata and especially to the Research Centre “Forms of Knowledge in the Ancient World” for having given me the chance to collaborate with them and participate in conferences, workshops, reading groups and Phd seminars. They offered me their expertise in the study of ancient scientific thought and provided me inspirational advice. I learned a great deal from them. A big thank to Fabio Stok, Paolo Zellini, Virgilio Costa, Amneris Roselli, Philippe Mudry, Gianna Gigliotti, Riccardo Chiaramonina, Sabrina Grimaudo, Tommaso Raiola, Francesco Verde and to all the other scholars that I had the privilege of meeting during my stay in Rome. A special thank to Daniela Patrizia Taormina, who invited me to present my research at the international conference “Körperlichkeit in der Philosophie der Spätantike” and always offered me her support and advice.

I owe a particular debt of gratitude to Federico Aurora, for his great support, true friendship and expertise in Ancient Greek, and to Frøydis Gammelsæter, for her never-ending encouragement and for having shared with me the bads and the goods of this adventure.

Furthermore, I wish to thank Sebastian Watzl, Pia Søndergaard and all the participants at the Oslo Phd seminars for their helpful comments and critiques: Veli-Pekka Parkinen, Monica Roland, Hege Dyppedøkk Johansen, Jonas Jervell Indregard, Jola Feix, Eduardo Saldaña, Zacharias Andreadakis,
Feroz Mehmood Shah, Hedda Hassel Mørk, Jeroen Rijnders and Lars Christie. Thanks also to Linda Aas for English proofreading and to Giusi Lontano for having offered her linguistic expertise in the first stage of my Phd.

I am particularly grateful to my lifelong friends Chiara Manuguerra, Erica Astolfi, Marie-Hélène Criscione, Maria Mancini, Chiara Raponi, Federica De Angelis and especially Ilaria Campana for their spiritual support. Moreover, a very special thanks is due to my family and especially to my sister, Pamela Serangeli, and my parents, Alfredo Serangeli and Patrizia Morandi, for their affection, incredible support and, above all, for always believing in me more than I could possibly do.

Finally, I would like to thank my partner Leonardo. Without his patience, care, love, irony and endless support, this work would have never seen the light. I owe him everything, and it is to him that this dissertation is dedicated.
Contents

Introduction .................................................................................................................................................. 7

Chapter One: Galen’s Design Argument vs. Epicurean Evolution in De Usu Partium ...... 13
1.1 Genesis, Date and Aftermath of Galen’s De Usu Partium ..................................................... 14
1.2 Galen and anatomy as evidence for Nature-demiurge’s provident design ......................... 22
1.3 The Epicurean theory of adaptation and the case of hand tendons in Galen’s De Usu Partium 34
1.4 Two Notions of Suitability ....................................................................................................... 59
    1.4.1 Lucretius on spontaneous generations of suitable and monstrous bodies, and their adaptation by extinction .......................................................................................................................... 60

Chapter Two: Galen on Particles in De Elementis Secundum Hippocratem ...................... 81
2.1 De Elementis, date and contents ................................................................................................. 83
2.2 Indivisibility and Immutability of the Atoms in De Elementis .............................................. 85
    2.2.1 Galen’s Use of “ἕν” and his Description of the Democritean Atom as an Eleatic One 95
    2.2.2 The Properties of the Atoms and the Overlap between Ancient Atomism and Epicureanism in Galen’s De Elementis ................................................................................................. 100
2.3 The Reception of Atomism in the Late Authors. The Case of Galen’s De Elementis ........ 105
2.4 Galen against atomic impassibility. The “needle argument” and its background .............. 118
    2.4.1 Cicero’s Account .............................................................................................................. 119
    2.4.2 Pluratch’s Testimony in Adversus Colotem ........................................................................ 126

Chapter Three: Atoms or Molecules? The Nature of Asclepiades’ ὄγκοι and the Background of his Flux Theory .............................................................................................................................. 145
3.1 Nature and meaning of Asclepiades’ ὄγκοι .................................................................................. 147
3.2 The ancient testimonies on the nature of Asclepiades’ ὄγκοι ............................................... 148
3.2.1 Galen’s account ............................................................................................................. 148
3.2.2 Sextus’ account ......................................................................................................... 154
3.2.3 Caelius Aurelianus’ account ....................................................................................... 157
3.2.4 Calcidius’ account ..................................................................................................... 162
3.3 Asclepiade’s flux theory and the Epicurean doctrine of emanations ......................... 164

Bibliography .......................................................................................................................... 177
Introduction

Topic, Aim and Method

Galen is an invaluable source of information on earlier and contemporary doctrines of both doctors and philosophers. His extensive writings\(^1\) are still not fully explored. They continue to surprise scholars and to offer the possibility of new discoveries\(^2\). Galen is also notorious for his harsh criticism of his rivals and is considered as a problematic testimony whose reliability is often questionable. Indeed, Galen’s polemical accounts tend to serve his own philosophical and medical agenda, namely his self-representation as both a follower of the theories of Hippocrates, Plato and, to some extent, Aristotle\(^3\), and as a successful practitioner\(^4\) who does not adhere to any of the medical sects (the Dogmatic, the Empirical and the Methodical schools\(^5\)) that he considers responsible for an epistemological crisis of medicine in his age. In this sense, his account of atomism represents an

\(^1\) More than 20,000 pages (which are collected in Kühn’s edition) of his works, transmitted in different languages (Greek, Latin and Arabic), have survived and «constitute, by some distance, the largest surviving oeuvre of any ancient author». Cf. Hankinson’s preface in The Cambridge Companion to Galen, Cambridge 2008, p. XV.


\(^3\) On Galen’s ambivalent attitude toward Aristotle cf. section 1.2 of this work.

\(^4\) For Galen “the best doctor is also a philosopher”. Indeed, in order to ground medicine on a scientific method, the doctor has to master the three major parts of philosophy: logic, physics and ethics.

emblematic example. In Galen’s eyes atomism is, indeed, the most unacceptable philosophical theory and its followers are his main ideological rivals. Thus, he reserves his most vigorous attacks for them, offering interesting examples of well-informed reception of Epicureanism and historiographical strategies. Nevertheless, although Galen’s philosophical ideas and his role as a source of the previous philosophical traditions have progressively become a subject of numerous studies over the past few years, only a handful of contributions are specifically devoted to his refutation of atomism. Furthermore, in most cases this question has been investigated within works that primarily aim at reconstructing the lost theory of the physician Asclepiades of Bithynia, who conceives of the human body as composed of invisible corpuscles named ὄγκοι. Galen, who is our main source for Asclepiades, considers his corpuscular system as being derived from Epicureanism and having offered the basis for Methodism. Although both the theory of Asclepiades and its link with the Methodical school are crucial in Galen’s account of atomism, a broader investigation of the theories that he ascribes to the atomists and especially to Epicurus and his school seems to be advisable. Therefore, the main purpose of my study is to closely analyze both these aspects of Galen’s critique of atomism, attempting to assess its reliability by comparing its content with other testimonies and Epicurean texts. In the dissertation I will also focus on the presentation of Galen’s polemical arguments and the historiographical strategy that emerges from his recurrent assimilation of Asclepiades to Epicurus. At the end of each chapter I will demonstrate that, although Galen’s reading

---


8 In addition to his contributions on Asclepiades’ corpuscularism, David Leith has published a paper on “Galen’s Refutation of Atomism”, in which he focuses on Galen’s argument against atomism in the De Elementis Secundum Hippocratem. I will deal with the same topic and discuss Leith’s study in the second chapter of this work. Cf. D. Leith, “Galen’s Refutation of Atomism” in Philosophical Themes in Galen (above, n. 7), p. 213-34.

of atomism is not impartial and requires caution, his testimony offers a reliable account of Epicureanism, which, as for example in the case of the evolutionary theory in the *De Usu Partium*, might also reflect a version of the Epicurean doctrine that circulated within the Roman medical circles that were influenced by the philosophy of the Garden.

Galen has a good, presumably first-hand, knowledge of Epicureanism and, as I will try to show, his accounts often find support in Lucretius. Indeed, as the analysis of the terminology and the doctrines that he attributes to his rivals demonstrates, his description of atomism mainly corresponds to Epicureanism. Galen’s main reasons for rejecting this theory related to the questions of anti-teleologism and denial of continuity and qualitative change of matter, which he discusses in *De Usu Partium* and *De Elementis*.

In addition to the examination of his largest and most detailed reports on these topics, I will also focus on similar passages from other treatises, such as *De theriaca ad Pisonem*, *De Naturalibus Facultatibus*, *De Methodo Medendi*, *De Constitutione Artis Medicae* and make a comparison. My study will thus entail the use of the comparative method to multiple ends: 1) Analyzing the structure and the features of Galen’s polemical argument; 2) Assessing the correspondence between Galen’s reports on atomism and its extant remains; 3) Attempting a reconstruction of the philosophical background of Asclepiadean ὀγκοὶ and theory of flux with those given by other ancient sources, such as Sextus Empiricus, Caelius Aurelianus and Calcidius. As a doctor, Asclepiades is, indeed, the main target of Galen’s critique of atomism, which certainly aims at discrediting him and ensuring that his name would suffer from the same damnatio memoriae as that of the Epicureans. However, as I will argue in the dissertation, even if we cannot straightforwardly define Asclepiades as an Epicurean, I believe him to have derived many aspects of his physiological system from Epicureanism. Therefore, although Galen assimilates Asclepiades to Epicurus with the purpose of emphasizing their similarities and rejecting them as part of the same tradition, he is right about the Epicurean influence on the main principles of Asclepiades’ corpuscularism: the anti-teleologism, the qualitative status of ὀγκοὶ and the function of the pores.

---

10 Cf. Section 1.4.1 of this work.
Outline of the thesis

The structure of the thesis moves along the three aspects of atomism to which Galen mainly addresses his critique: anti-teleologism, the theory of matter and the way these ideas apply to the medical system of Asclepiades.

The denial of a final and an efficient cause in the generation of the species, the idea of invisible and discontinuous elements without qualities as the first components of the perceptible bodies, and the hypothesis of their motion through empty gaps within the structure of matter are, indeed, an anathema to Galen. Unlike his rivals, Galen is a convinced teleologist with a finalistic view of the human body and believes matter to be continuous and subject to qualitative change. In fact, his critique of atomism reflects the attempt to denounce the risks and the failures that a mechanistic view of the body entails: the incapability to explain in detail the complexity of anatomical structures and physiological processes, and the consequent development of a simplistic approach to pathology.

In Chapter 1 I introduce Galen’s fervent teleologism, and especially his notions of usefulness (χρεία) and activity (ἐνέργεια) of the bodily parts, by focusing on his monumental treatise De Usu Partium, in which he attributes to both Epicurus and Asclepiades the same evolutionary view of the human body. Unlike Galen, who insistingly describes the usefulness of the parts as the outcome of a provident design, Epicurus and Asclepiades deny final causality and give a mechanistic explanation that does not recognize any consequential link between the appropriateness of the bodily parts of living beings and the functions that they perform. In this regard, I especially examine the case of hand tendons, which is described by Galen as emblematic of Asclepiades and Epicurus’ anti-teleologism within biology. As a result of such analysis, I argue that in De Usu Galen attributes to his rivals two kinds of causal sequence, which correspond to the two stages of adaptation described by Lucretius in book five of De Rerum Natura. In conclusion, I also demonstrate that the comparison with Lucretius proves the Epicurean background of Asclepiades’ anti-teleologism and the reliability of Galen’s account.

In Chapter 2 I analyze Galen’s fullest account of the elementary theories posited by Democritus Epicurus and Asclepiades as preserved in De Elementis Secundum Hippocratem. In this treatise his main polemical interest is the qualitative status of their particles (atoms and ὀγκοί), namely the idea

---

11 Similarly to Galen, among others, Cicero also identifies anti-teleologism as a major reason for rejecting Epicureanism and in De Fin. I, VI, 19 defines it as: «the capital offence in a natural philosopher». Cf. Cic., De Finibus, ed. by P. Rackham, Cambridge-Harvard, 1951, p. 21.
of elements devoid of secondary qualities and incapable of undergoing changes as primary components of sentient and alterable bodies. Such an hypothesis is fiercely rejected by Galen, who underlines the impossibility for these principles to explain why human beings experience pain and disease. In addition, I give an overview of the reception of atomism in late sources, focusing on the overlap between ancient atomism and Epicureanism and I seek to identify the philosophical sources on which Galen relies for developing his account. As a result, I suggest its dependence on both Cicero and especially Plutarch’ *Adversus Colotem*.

In Chapter 3 I focus on the physiological system of Asclepiades, attempting to establish if, as Galen strongly argues, it relies on the Epicurean theory of matter. To this end, I first investigate Asclepiades’ notion of ὄγκος by giving a close reading of the surviving testimonies of Galen, Sextus Empiricus, Caelius Aurelianus and Calcidius and also discussing the conflicting modern debate on this controversial question. The main point of controversy is the nature of ὄγκοι, namely their qualitative status and their possible divisibility. As a conclusion of my analysis I argue that Asclepiades ὄγκοι are, as pointed out by Galen, primary elements without qualities that have the same ontological status of the atoms. However, unlike the Epicurean atoms, they are also divisible. Secondly, I also examine the flux theory developed by Asclepiades, highlighting relevant similarities with the Epicurean doctrine of eidola and especially with the role of emanations in Lucretius’ account of the plague.
Chapter One

Galen’s Design Argument vs. Epicurean Evolution in De Usu Partium

The controversy between teleologists and anti-teleologists about the generation of the species, namely between those philosophers who attribute the origin of animals and human beings to an intelligent cause and those who consider all creatures as the product of accident, is a long story of disagreement and harsh criticism that starts with the Presocratics and leads to Darwin and contemporary theories of evolution. The main representatives for these two opposite views in antiquity are Plato and Aristotle, on the teleologic side, and the atomists together with the medical systems influenced by their materialism, such as that of Asclepiades of Bithynia, on the other. Galen places himself within the “design argument tradition” of Hippocrates, Plato and Aristotle, and plays a significant role in contributing to the rebuttal of anti-teleologism within biology. He is a fervent and convinced teleologist, as clearly emerges from his De Usu Partium, in which he describes the human body as the outcome of divine planning, which is always provident and just. In other words, according to Galen, the anatomical structure of the human body reflects the best possible decision taken by the demiurge, which has molded it. Therefore, as will be shown later, in De Usu Partium all the organs of the human body are described as perfectly matched to their functions and every part of the body is conceived to be useful.

Given these premises, it should not come as a surprise that Galen dedicates a large number of pages of this treatise to the rebuttal of Epicurean zoogony and its idea of evolution applied to anatomy, namely the idea that particles and void are the only principles of the generation of the species, which obtain their anatomical structures only through adaptation to their environment. Such a view, described in particular by Lucretius, implies the rejection of the final cause and therefore the overturn of a teleological doctrine of causation similar to the one that later will be held by Galen. Indeed, in De Rerum Natura Lucretius conceives the process of the generation of the species as being subjected

---

to no plan or efficient cause, as is shown in book V by the idea of spontaneous generation of monstrous creatures (portenta) and the concept of adaptation by extinction.

In this chapter I will therefore focus on Galen’s teleological view of human anatomy and physiology in *De Usu Partium*, examining especially the case of the hands, which are presented as emblematic of the suitability of human bodily structure to human nature and also are at the core of his rejection of atomism. After introducing the genesis and contents of *De Usu* in section 1.1, I will begin my analysis by dealing with Galen’s notions of usefulness (χρεία) and activity (ἐνέργεια) of the bodily parts and discussing their definitions (section 1.2). Then I move to identifying the suitability of the anatomical structures to the functions that the parts have to perform as the primary meaning of χρεία.

In this chapter I will recognize the suitability as a key principle for both Galen’s teleology and the Epicurean theory of adaptation, and also as the main reason for their disagreement (1.3 and 1.4). Indeed, in section 1.3 I will examine their opposite views of the thickness of hand tendons in the light of their divergent understandings of the causal relationship between the suitability of the parts and their functions. While Galen conceives the structure of the hands as planned in accordance with their usefulness, in book four and five Lucretius gives priority to the generation of the part over its function and explains the suitability of the parts as something fortuitous. As a result of such analysis, I will argue that in *De Usu* Galen attributes actually two kinds of causal sequence to the atomists, that also correspond to the two stages of adaptation described by Lucretius. Finally, in section 1.4 I will focus on the role of suitability within the theory of spontaneous generation and adaptation by extinction, trying to demonstrate that the comparison with *De Rerum Natura* confirms the Epicurean background of Galen’s account and reveals his solid knowledge of the evolutionary view of his rivals.

1. 1 Genesis, Date and Aftermath of Galen’s *De Usu Partium*.

Galen’s *De Usu Partium* is a treatise of seventeen books, in which the author’s knowledge of anatomy and physiology is intertwined with theology in order to demonstrate that the generation of the human body is always due to a good and provident act of creation by Nature-demiurge\(^\text{13}\).

According to Galen, the study of the usefulness of the bodily parts leads to acknowledging the existence of a divine cause on which the world depends. The appropriateness of the anatomical structures to their functions reveal the power, the goodness and the providence of the superior intellect that has molded them. Indeed, in *De Elementis secundum Hippocratem* about the generation of the embryo, Galen claims that “Nature is a good demiurge”\(^\text{14}\). In his works he uses these two terms as synonyms, referring to both the wise creator figure and the immanent formative power which is intrinsic in the human body and is responsible for its growth and survival\(^\text{15}\).

As in Plato’s *Timaeus*, Galen’s demiurge acts as a craftsman who chooses and shapes the kind of matter necessary for realizing his own project\(^\text{16}\). As Galen points out in *De Usu*, XI, 14, 906, 15-907, 2 K. (II, 159, 10-4 H.) within the famous passage on the hair of the eyebrows and the eyelids, the matter is both a necessary precondition and a limitation for the demiurgical activity\(^\text{17}\):

\[
\text{ἀμφοτέρων οὖν τὸν θεὸν αἴτιον εἶναι φαμεν, τῆς τε τοῦ βελτίονος ἐν αὐτοῖς τοῖς δημιουργουμένοις αἱρέσεως καὶ τῆς περὶ τῆν ύλην ἐκλέξεως. ἐπεὶ γὰρ ἄμα μὲν ὀρθὰς ἀνεστηκέναι τὰς ἐπὶ τῶν βλεφάρων τρίχας ἐχρῆν, ἀμα δ’ ἴσας ἀεὶ φυλάττεσθαι μέγεθος τε καὶ ἀριθμόν, εἰς χονδρῶδες αὐτὰς κατέπηξε σῶμα.}
\]

We say, then, that god is the cause of two things, namely the choice of the better in what is being made and the selection of material. Since the hairs of the eyelids must stand erect and at the same time remain always of the same size and number, he implanted them firmly in a cartilaginous body (Transl. May, vol. II, p. 534).

Even though the Nature-demiurge is described by Galen as extremely powerful, provident and skillful, Galen also maintains that it cannot create things out of nothing. Therefore, unlike the Judeo-Christian god, Galen’s demiurge is not almighty and cannot set aside the constraints determined by


\(^{15}\) Id., *De Nat. Fac.*, I, II, 6-7; I, VI, 12-3 and especially II, III, 81-8; *De Temp.*, I, 635-7 K. (36, 23-4 H.). On Galen’s notion of Nature see Van der Eijk, 2014, p. 118-25.

\(^{16}\) Galen’s notion of the demiurge comes from a mixture of Plato’s cosmology and Stoic providence that he combines together with Aristotle’s principle “Nature does nothing in vain”.

\(^{17}\) For a wider discussion of this passage, see Hankinson, 1989, p. 218-9.
characteristics of the existing matter. The demiurge always acts for a reason and for the best, but it cannot produce things that are naturally impossible, such as making a human being out of a stone. Galen is very clear about the qualities of the demiurge, which we can infer from the observation of the bodily structures and of all the natural phenomena, but, at the same time, he is also agnostic about

18 As Galen explains in De Usu, XI, 15, 905, 6-906, 5 K. (II, 158, 7-159, 3 H.), the limitations of the demiurgical power concern both the generation out of the natural rules and the creatio ex nihilo. Unlike the god of Moses, Galen’s demiurge cannot shape the living beings according to his own will: ἢ Μωσῆς μὲν οὕτως ἐφυσιολόγει, καὶ βέλτιον οὕτως ἢ ὡς Ἐπίκουρος; ἄριστον μέντοι μηδετέρως, ἀλλὰ τὴν ἐκ τοῦ δημιουργοῦ φυλάττοντας ἀρχήν γενέσεως ἐν ἄπασι τοῖς γεννητοῖς ὁμοίως Μωσεῖ τὴν ἐκ τῆς ὕλης αὐτῆς προστιθέναι. διὰ τοῦτο μὲν γὰρ ἵστον αἰεὶ φυλάττειν αὐτὰς δεομένας τὸ μέγεθος ὁ δημιουργὸς ἤμων ἀπειράγαστο, διότι τούτο ἦν ἄριστον ἢ ὡς Ἐπίκουρος; ἄριστον μέντοι μηδετέρως, ταῖς δὲ σκληροῖς δέρμασι συμπαγεῖς τῷ χόνδρῳ διὰ τῶν ὀφρύων. οὐ γὰρ δὴ τὸ βουληθῆναι τοιαύτας γενέσθαι μόνον ἢν ἀυτάρκες· οὐδὲ γάρ, εἰ τὴν πέτραν ἐξαίφνης ἐθελήσει ἄνθρωπον ποιῆσαι, δυνατὸν αὐτῷ. καὶ τοῦτ' ἐστι, καθ' ὃ τῆς Μοσοῦ δόξης ἡ θ', ἡ δ' ἡ Πλάτωνος καὶ ἡ τῶν ἄλλων τῶν παρ' Ἐλλησιν ὀρθὸς μεταχειρισμένον τοὺς περὶ φύσεως λόγους διαφέρει. τὸ μὲν γὰρ ἀρκεῖ τὸ βουληθῆναι τὸν θεὸν κοσμῆσαι τὴν ὕλην, ἡ δ' εὔθυς κεκόσμησαν πάντα γὰρ εἶναι νομίζει τῷ θεῷ δυνατόν, κἂν εἰ τὴν τέφραν ἱππον ἄνθρωπον ἢ βοῦν ἔθελον ποιεῖν; Is this the way in which Moses reasons about Nature (and it is a better way than Epicurus)? Yet it is best for us to adopt neither, but, continuing to derive the principle of generation from the demiurge in all things generable, as Moses does, to add to this the material principle. For our demiurge has made these hairs feel the necessity of preserving always an even length for the reason that this was the better thing. And since he had decided that it was necessary to make them so, he spread beneath some of them [the eyelashes] a hard body like cartilage [the tarsus] and under the others [the eyebrows] a hard skin united to cartilage by means of the brows. Now it was not enough merely to will that they should be so; for even if he wished to make a rock into a man all of a sudden, it would be impossible. And this is the point at which my teaching and that of Plato and the other Greeks who have treated correctly of natural principles differs from that of Moses. For him it suffices for God to have willed material to be arranged and straightway it was arranged, because Moses believed everything to be possible to God, even if he should wish to make a horse or beef out of ashes (Trans. by May, II, p. 532-3). In this famous passage of De Usu, Galen compares Epicurus’ and Moses’ view, rejecting both of them. Even though, unlike Epicurus, Moses recognizes the existence of a order in nature and of a provident designer, Galen criticizes his doctrine for having set God’s will above the laws of nature and therefore for having diminished the role of the material principle. According to Walzer and Radice, Galen’s criticism of the Mosaic God refers especially to his creatio ex nihilo and relies on the doctrine of Philo of Alexandria, while Calabi has more recently denied both these hypotheses. She has suggested that in Galen’s text there is no reference to the creation out of nothing, but only to the absence of autonomy of the material principle from God’s almighty power. In addition to this aspect, she also interprets Galen’s testimony as based on various kinds of texts (the book of Genesis, Philo and some Christian authors) and therefore on a mixture of the Jewish and Christian doctrines. On these three interpretations, see R. Walzer, Galen on Jews and Christians, Oxford, 1949, p. 22-37; R. Radice, Platonismo e creazionismo in Filone di Alessandria, Milano, 1989, p. 366-9; F. Calabi, God’s Acting, Man’s Acting. Tradition and Philosophy in Philo of Alexandria, Leiden-Boston, 2006, p. 217-31.
the essence of the divine cause. Indeed, he considers the corporeity or incorporeity of the demiurge as beyond human knowledge and therefore impossible to establish. However, in De Usu Galen focuses primarily on the providence of the demiurge, which he praises and celebrates on almost every page of his text, especially in the “Hymn to Nature” that closes the treatise.

Galen developed De Usu in two different stages. He wrote the first book toward the end of his first stay in Rome, namely between 162 and 166 AD, as is indicated by its dedication to his friend and patron Flavius Boethus, who was about to leave for Syria where he was to become governor. Galen wrote the remaining books (II- XVII) of De Usu during his second stay in Rome, between 169 and 175 AD, while he was also working on his De Placitis Hippocratis et Platonis and on De Anatomicis Administrationibus, as the frequent cross-references show. In De Libris Propriis Galen himself informs us about the chronology of these treatises, stating in I, 16-18 B. that he gave the final version of the first book of De Usu and the first six books of De Placitis to Boethus before they both left Rome. Furthermore, after pointing out that he could finish writing both these two texts only after many years, in De Libr. Propri., III, 8-12 B. Galen describes the fortunate circumstances that enabled him to dedicate himself to his own research and to finish the De Usu during his second stay in Rome.

---

19 Gal. De Prop. Plac., II, 1; 56, 12-20 Nutton. Galen’s agnosticism about the substance of the demiurge depends on the fact that there is no experience that can lead the human being to know it.

20 I refer to book XVII of De Usu.

21 The De Usu is not the only treatise that Galen dedicated to Boethus, but in De Libris Propriis I, 6-8 Boudon he also lists some other titles of works he wrote during his second stay in Rome: De Causis Pulsuam, De Hippocratis Anatomia and De Erasistrati Anatomia.


24 In this treatise Galen lists all the titles and the contents of his books in order to offer their complete chronology and, above all, to avoid plagiarism and slander. Together with De Ordine Librorum Suorum and De Propriis Placitis, De Libris Propriis is a rare case in ancient literature, in which the autobiography is interwined with the author’s autobiography. On this topic see Galen, De Propriis Placitis, ed. by V. Nutton, CMG V 3,2, Berlin, 1999, p. 45-50; V. Nutton, Galen and Medical Autobiography, Proceedings of the Cambridge Philological Society 198, Cambridge 1972, p. 50-62; L. Perilli, “Note critico-testuali all’edizione del cosiddetto «testamento filosofico» di Galeno (De Propiis Placitis, CMG, V, 3,2)”, in Bollettino dei classici, 24, 2004, p. 69-86.

Called to Aquileia in 168 AD by Marcus Aurelius and his co-emperor Lucius Verus, when they were about to start the war against the German tribes, Galen again left his native country and reached northern Italy. On arriving there, he found that a terrible plague had spread and, after Lucius Verus’ death, the imperial court was forced to return to Rome. There Galen managed to avoid participation in Marcus Aurelius’ expedition against the German tribes (Marcomanni and Quadi) and obtained permission to remain in Rome, where he would have been responsible for the health of the young prince Commodus. During Marcus Aurelius’ long absence, Galen was able to spend his time working intensively and completed both *De Usu* and *De Placitis*. In *De Libr. Propr.*, III, 7 B. he describes this period between 169 and 176 AD as a very productive time for his activity as a writer, during which he could gather together all the material available about his masters’ doctrines and integrate it with his own latest research on both philosophical and medical issues:

---


27 The war against the Germans lasted from about the 168 until 176 AD.

28 In addition to *De Usu* and *De Placitis*, from 169 to 176 AD, Galen also wrote many other treatises as *De Elementis Secundum Hippocratem*, *De Naturalis Facultatibus*, the first part of *De Anatomicis Administrationibus*, the first part of *De Simplicium Medicamentorum Temperamentis ac Facultatibus*, various works on the pulse, the first part of *De Methodo Medendi*, the commentary on *Aphorismi*, on *In Hippocratis Epidemiarum I* and other commentaries on Hippocrates.

κατὰ τοῦτον οὖν τὸν χρόνον συνελεξάμην τε καὶ εἰς ἕξιν ἤγαγον μόνιμον ἃ τε παρὰ τῶν διδασκάλων ἐμεμαθήκειν ἃ τ’ αὐτὸς εὑρήκειν, ἔτι τε ζητῶν ἔνια περὶ τὴν εὐρέσιν αὐτῶν [ἐξον] ἔγραψα πολλά γυμνάζων ἐμαυτὸν ἐν πολλοῖς προβλήμασιν ἰατρικοῖς τε καὶ φιλοσόφοις.

The same kind of ἕξις μόνιμος\(^\text{30}\) mentioned in this passage was applied by Galen to the composition of De Usu, in which he also systematizes in a coherent scheme his predecessors’ knowledge; for example, Pelops’ theories about the movement of the lungs that he mentions in De Usu, De Libr. Prop. and in De Anatomicis Administrationibus\(^\text{31}\) together with what he presents as his own personal discoveries, like those concerning the muscles that move the fingers. But, in addition to the teaching of his masters and all the materials from his early career, the materials he worked on for writing the De Usu included also and above all: Aristotle’s De Partibus Animalium and De Generatione Animalium, Plato’s Timaeus, various Hippocratic treatises (especially De Alimento and De Officina Medici) and the tradition of Alexandrian anatomy\(^\text{32}\).

In De Libr. Propr., III, 9-12 B., Galen also adds some other relevant information about the genesis of De Anatomicis Administrationibus and the impact of De Usu, which immediately had wide circulation among his contemporaries. As already stated, these two treatises are closely related to each other\(^\text{33}\). Galen, indeed, wrote De Anat. Admin. in order to describe several recent discoveries he

\(^{30}\) The ἕξις μόνιμος that Galen mentions in this passage of De Libr. Prop. is the typical method of what Vegetti called his own “programma culturale di rifondazione della medicina”. See Vegetti, Nuovi scritti autobiografici, Roma, 2013 p. 145.

\(^{31}\) In De Libr. Prop., III, 5 Boudon, Galen refers to a lost treatise in three books entitled On the Movement of the Chest and Lung, one of his earlier works that, during his second stay in Rome, he discovered was in circulation under someone else’s name. Furthermore, he also points out that the first two books of that work were based on the doctrines of Pelops, who was his master in Smyrna. The work On the Movement of the Chest and Lung is mentioned again by Galen in De Usu, III, 6, 448 K. (I, 304 H.) within his long description of the anatomical structure of the lungs and also in De Anat. Adm. II, 217 K. (I, 1 Garofalo), where he gives an account of the genesis, the contents and circulation of this text very similar to that of De Libr. Propr. mentioned above. For further details on Pelops’ doctrines, see Boudon, Galien, 2012, p. 52-4.


\(^{33}\) In De Anat. Admin., 216 K. Galen states that he wrote two different versions of it, the first one during his first stay in Rome and the second during his second. Therefore Galen worked simultaneously on De Anat. Admin. and De Usu, both
made about anatomy during his public dissections that were not included in *De Usu*. In fact, *De Anat. Admin.* and *De Usu* share a similar structure. In both cases Galen begins to describe the anatomy of the human hand and then goes on to analyze all the other parts of the body in almost the same order\(^{34}\). However, even though these two texts show significant similarities in both structure and contents, they remain essentially different in their approaches to human anatomy. Indeed, in his *De Usu* Galen combines human anatomy and physiology stressing the teleological perspective in order to demonstrate that the human body is, in all its parts and as a whole, the outcome of a provident design. With this treatise Galen enters the controversy about the atomists and Asclepiades and his followers, who had an anti-teleological view of nature and to whom he dedicates many pages of the text, as will be shown later. But while the criticism against these materialists plays a central role in *De Usu*, it is totally absent from *De Anat. Admin.*, in which he never mentions the names of Epicurus or Asclepiades.

As Galen himself states in *De Libr. Propr.*, III, 9-12 B., the *De Usu* had a successful impact on both the philosophical and medical environments to the point that, in order to silence all the attacks of his detractors, he was forced to resume the practice of performing public dissections. In fact, according to Galen\(^{35}\), his slanderers spread rumors about him flaunting his superiority over his predecessors and not being able to prove that what he had argued in *De Usu* was based on anatomical observations. Because of that, *De Usu* aroused considerable interest and caused an immediate debate among Galen’s contemporaries, especially, he says in *De Libr. Prop.*, III, 12-13 B., among those philosophers who followed Aristotle and the doctors who adhered to the ancient medical tradition\(^{36}\).

---

\(^{34}\) In *De Anat. Adm.* the order of the anatomical parts described by Galen is: hands and arms, feet and legs, head, neck, trunk, digestive system, respiratory system, all the organs of the rib cage and brain (in the Greek version); and spinal cord, eyes, tongue, trachea, blood vessels, nerves and sexual organs (in the Arabic version). While in *De Usu* the digestive system comes after the feet and legs, the heart is described together with the respiratory organs, which are followed by head, neck, an overview of all the organs, veins, arteries and nerves. On the structures of both these texts see Garofalo-Vegetti, 1978, p. 139-40 and 296-7.

\(^{35}\) See *De Lib. Propr.*, III, 12-14 Boudon.

\(^{36}\) Ibid., III, 12, 26 Boudon, with the expression ὅσοι τὴν παλαιὰν ἰατρικὴν μετεχειρίζοντο Galen probably refers to the doctors who shared the principles of Hippocratic medicine.
Thus, for better or for worse, Galen’s *De Usu* had a certain clear impact[^37], which was probably due to two determining factors: the use of Aristotle’s zoological works[^38] and, in particular, *De Partibus Animalium*, and the emphasis given to the criticism of the so-called anti-teleologism.

By looking at the information about genesis, dating and circulation of *De Usu*, that Galen refers to in his autobiographical works, we have the possibility not only of placing its writing in a specific period of his life, but, above all, of reconstructing the cultural context in which *De Usu* matured. As mentioned above, according to Galen, *De Usu* provoked a certain turmoil in Rome among both philosophers and physicians, who studied, discussed and criticized its contents. This suggests that the *De Usu* did tackle matters which were anything but outdated for philosophers and doctors of that time, who were used to confronting one another in a climate of hostility and sectarian radicalism. At the same time, it is necessary to take into account the fact that Galen might have deliberately chosen to deal with issues that would have allowed him to provoke strong reactions and therefore to draw attention to his works. Indeed, it is not by chance that in *De Usu* Galen chooses to address Aristotle’s masterpiece in anatomy and Epicurus’ and Asclepiades’ idea of evolution. According to a work of Van der Eijk[^39], Galen’s selection and use of the former sources often depends on a strategy of self-presentation[^40].

On the one hand, Galen calls into question an authority such as Aristotle and on the other he extensively discusses and criticizes “the public enemies”. This means that he both calls into question those philosophers who, in his times, called themselves “Aristotelians” or “Peripatetics” and, as he was wont to do throughout his career, attacks the materialists of the methodical school. Combining

[^37]: Instead of the *De Anat. Admin.* which did not circulate very much after Galen’s death and was soon forgotten, the *De Usu* had good fortune. While Oribasius does not preserve any excerpts from *De Anat. Admin.*, he extracts extensive parts from *De Usu* in his medical compilations. On this topic see Galen, *On the Usefulness of the Parts of the Body*, trans. by M. T. May, vol. I, p. 3-8; and Garofalo-Vegetti, 1978, p. 137-45.


these two topics of certain interest for his audience with the description of his own achievements and
ewn discoveries within anatomy, Galen himself guarantees the wide circulation of De Usu described
in De Libr. Prop..

1.2 Galen and anatomy as evidence for Nature-demiurge’s provident design.
The De Usu is the summa of Galen’s teleology, in which he strongly argues that the best and the
highest art of Nature or Demiurge is mirrored in the suitability of human bodily structures to human
nature, namely to its rationality. Indeed, the primary aim of this treatise is to show that Nature
provides for each part of the body the anatomical structures which are appropriate to and functional
for human supremacy over all the other animals. This means that Nature assigns a specific usefulness
(χρεία) to every single part of the body, each of which is for the sake of something.
Following Aristotle, Galen conceives of the body as the instrument (δργανον) of the soul, as the tool
that realizes the organism’s nature\textsuperscript{41}, and in his De Usu he develops a functional explanation of the
human organism, which focuses on two fundamental notions: χρεία and ἐνέργεια, namely usefulness
and activity.
In book XVII, Galen points out that χρεία (“usefulness”) is the same as what people have called
ἐνέργησις “utility” (“serviceableness”), namely a kind of advantage to gain a certain end:

Galen, De Usu Partium, XVII, 346, 5-8 K. (II, 437, 6-8 H)
ἐνέργεια μὲν οὖν μορίου τῆς χρείας αὐτοῦ διαφέρει, καθότι καὶ πρόσθεν εἴρηται, τῷ τὴν μὲν
ἐνέργειαν κίνησιν εἶναι δραστικήν, τήν δὲ χρείαν ταύτον τῇ πρός τὸν πολλῶν εὐχρηστία
καλουμένη.

Now the action of a part differs from its usefulness, as I have said before, because action is
active motion and usefulness is the same as what is commonly called utility.
(Transl. May, vol. II, p. 724)

The brief passage quoted above is the only definition of χρεία that Galen gives in De Usu. But, since
the equivalence that he establishes between usefulness and utility lacks details and does not give a

\textsuperscript{41} According to Aristotle’s Nichomachean Ethics 1098 a 5-8, “the human function is activity of the soul in accord with
seems to conceive every living being as the outcome of its intrinsic and natural purpose.
proper and sufficient explanation of the notion of χρεία, this concept remains quite unclear and ambiguous for the reader. Hence, in order to identify what χρεία exactly is, the nature of this concept has to be understood on the basis of its use within the text. In De Usu the term χρεία occurs more than four hundred times and acquires various connotations, as “need”, “want”, “use”, “advantage”, “service” and “purpose”\(^\text{42}\). Indeed, it emerges as a broad notion, which has essentially two main meanings:

1) the suitability of the bodily structures to perform their functions.
2) the so-called “beneficial contributions” that the parts give to the organism’s good functioning\(^\text{43}\).

Thus, Galen’s idea of usefulness swings between these two aspects, which are essentially interconnected and work together as the necessary precondition for any activity performed by the parts. Both the lack of an exhaustive definition of the concept of usefulness in De Usu and the need to identify only one primary sense of χρεία has determined the debate between two opposite interpretations: the usefulness as essentially related to the suitability argued by May and as first associated to the contribution that every part gives to the good of the body as a whole, argued more recently by Schiefsky.

Starting from the assumption that these two aspects are inextricably linked and that in De Usu Galen conceives the notion of χρεία in both senses, I agree with May on giving priority to the suitability rather than to the beneficial contribution of the parts, since I understand the fitness of the parts as the precondition for their ability to serve the good of the living beings. Therefore, this means that I take the beneficial contribution given by the parts as a consequence of the appropriateness of their anatomical features. On the other hand, I also find it necessary to maintain that the suitability and the beneficial contribution are two sides of the same concept. For example, the usefulness of the hands is related to both their ability to grasp and manipulate objects of various shapes and sizes thanks to the unequal length and the mobility of the fingers, as well as to their making the human being able to defend itself from dangerous animals thanks to the construction of weapons.


\(^{43}\) This description of Galen’s idea of χρεία reproduces intentionally the one formulated by Schiefsky 2007 on page 14: «Chreia refers primarily to the beneficial contribution of the parts rather than to their “suitability” or “fitness” to make such contributions». 
In this section I will try to suggest that suitability should be considered the primary shade of meaning of the notion of usefulness. To this end, I will discuss especially the case of the hands, which is emblematic of the crucial role played by the concept of suitability within Galen’s teleological explanation in *De Usu*.

At the beginning of book one Galen gives the first description of the notion of χρεία, applying it precisely to the case of the hands. Referring to Aristotle’s *De Anima*\(^{44}\), he claims that, since the body serves as an instrument of the soul, even the usefulness of all the parts is always related to the soul\(^{45}\). Indeed, all the bodily differences between the creatures are conceived by Galen as adapted to their different kinds of soul: the lion, who is brave by nature, has strong and sharp teeth and claws, while the deer and the hare are both timid and thus have unarmed and defenseless bodies\(^{46}\).

Therefore, the human being, who is the most intelligent of all the creatures, is provided with hands, because these are the most suitable instruments for overcoming disadvantages and physical weaknesses to his own benefit. Like Aristotle in *De Partibus Animalium*\(^{47}\), Galen argues that it is

---

\(^{44}\) In *De Anima* 415 b 10 ff. Aristotle holds that the soul is the efficient, formal and final cause of the body, which serves the soul as instrument.

\(^{45}\) See Galen, *De Usu Partium*, I, 3, 6- 4,9 K (I, 2-6 H.)

\(^{46}\) Id., I, 2, 9- 3, 3 K. (I, 2-3 H.)

\(^{47}\) See Aristotle, *De Partibus Animalium*, 687a 7-18 and 20-1 (Anaxagoras A 102 DK). In this famous passage the Stagirite describes Nature as an intelligent human being who assigns organs to creatures according to a principle of suitability, namely the idea that each living being should own only the parts that it is capable of using. Thus, since the hand is the organ with the widest range of possible uses, Nature gives it to the human being, who is the most intelligent creature and can develop and take full advantage of that tool. Aristotle’s *De Partibus Animalium* was the cornerstone of ancient physiology and anatomy, from which Galen takes the general structure and the comparative method of which he makes ample use in *De Usu*, especially when he compares the ape to the human being. But Galen’s largest debt to Aristotle’s anatomy is the teleological view of nature that he applied to the study of the parts of the body. Although the *De Partibus Animalium* is one of the main sources of his treatise, Galen often makes implicit use of Aristotle’s theories and does not praise him as he does Plato and Hippocrates and also shows open criticism towards what he considers the failures and weaknesses of Aristotelian thought: inadequacy of dissection, cardiocentrism and a teleological view of nature which is not comprehensive enough. Indeed, Galen’s teleology is much stronger than Aristotle’s, since he conceives the bodily parts as equipped with the best possible and suitable structure for performing certain activities. Even in the *De Placit. Hipp. et Plat.*, a treatise that he wrote while he was working on *De Usu*, Galen shows a certain ambivalence towards Aristotle. He constantly tries to highlight the aspects that Plato and Hippocrates’ theories have in common and, at the same time, the mistakes made by Aristotle, when he shows disagreement with his predecessors. Galen’s attempt to present Plato as much closer to Hippocrates than Aristotle was considered by Hunain Ibn Ishāq, who translated PHP into Arabic, as the main purpose of the treatise. For this see Galen, *De Placit. Hipp. et Plat.*, CMG, V, 4,
because of its great intelligence that the human being has hands, not, as Anaxagoras claimed, because of its hands that the human being is the most intelligent:\footnote{For Galen on Anaxagoras’ view on human hands, see Flemming, 2009, p. 66; and M. L. Silvestre, \textit{Anassagora nella storiografia filosofica}, Roma, 1989, p. 164-7.}

\begin{quote}
Gal., \textit{De Usu}, I, 3, 5, 9-12 K. (I, 4, 2-5 H)

Οὕτω μὲν σοφώτατον τῶν ζῴων ἄνθρωπος, οὕτω δὲ καὶ χεῖρες ὄργανα πρέποντα ζῷῳ σοφῷ. οὐ γὰρ ὅτι χεῖρας ἔσχε, διὰ τοῦτο σοφώτατον, ὡς Αναξαγόρας ἔλεγεν, ἀλλ' ὅτι σοφώτατον ᾔν, διὰ τούτο χεῖρας ἔσχεν, ὡς Ἀριστοτέλης φησίν ὀρθότατα γιγνώσκων.  

For it is not because the human being has hands that it is the most intelligent, as Anaxagoras says, but because it is the most intelligent that it has hands, as Aristotle says, judging most correctly. (Trans. After May, vol. I, p. 69)
\end{quote}

Therefore, as May suggests in the introduction to her translation of \textit{De Usu}\footnote{After having pointed out that the term “usefulness” is the best translation for the Greek χρεία, she argued that: «χρεία means for him rather the suitability or fitness of a part for performing its action, the special characteristics of its structure that enable it to function as it does». See May, vol. I, 1968, p. 9.}, the term χρεία seems to be mainly related to the suitability of the structure of a part to perform a certain activity\footnote{On this interpretation see also Furley and Wilkie 1984, p. 59.}, namely to the anatomical adaptation of each part to the function that Nature-demiurge has assigned to it. This appropriateness determines what Schiefsky calls a “beneficial contribution” of the bodily parts to the organism’s life, namely to its primary and characteristic activities such as survival and reproduction. In book VI, within the description of the organs involved in the process of respiration (one of which

is the heart), Galen also describes χρεία as a criterion that permits establishing the degree of importance that the various bodily parts have in the living being’s life:

Galen, *De Usu*, VI, 7, 435, 11-436, 3 K. (I, 318, 5-15 H)

όπως δέ μοι τῷ λόγῳ μὴ μόνον νῦν, ἀλλὰ καὶ εἰςαὐθός ἐποιο παρακοῦον μηδέν, ἐθέλω σοι διηθέλειν, ἐξ ᾗν χρή διαγιγνώσκειν ἐν ζῷῳ σώματι μόριον ἄκυρόν τε καὶ κύριον. ἀπὸ μὲν δὴ τῆς χρείας ἄμφω κρίνειν. ἐπεὶ δ’ ἐστὶν αὕτη τριττή κατὰ γένος – ἦ γὰρ εἰς αὐτὸ τὸ ζῆν ἢ εἰς τὸ καλὸς ζῆν ἢ εἰς τὰς γένους φυλακὴν διαφέρει – τὰ μὲν εἰς τὸ ζῆν αὐτὸ χρηστὰ μόρια κύρια πάντως ἠγεῖσθαι, τῶν λοιπῶν δ’ ἐκατέρων γενῶν ἄκυρων ὑπαρχόντων, ὅσοις μὲν συμπάσχει ῥᾳδίως τὰ κύρια, ταῦτ’ ἦττον τῶν ἄλλων ἄκυρων νομίζειν, ὅσοις δ’ οὐ συμπάσχει, μᾶλλον.

In order that you may follow my discussion both now and later without misunderstanding, I wish to go over with you the criteria which must determine whether a part in the body of an animal is important or not. This can be decided in both cases by the usefulness. Now there are three kinds of usefulness; for a part is useful either for maintaining life itself, or for making better, or for preserving the species. Hence those that conduce to life itself should be regarded as absolutely essential, and of the two other less important kinds of parts, those readily affected along with the essential parts should be considered less trivial than those which are not. (Transl. After May, vol. I, p. 292).

Here Galen points out that, bearing in mind that there can be three kinds of χρεία of a bodily part, namely it can be useful for the living being’s self-maintenance εἰς αὐτὸ τὸ ζῆν (as it is in the case of the main organs such as the brain, the heart and the liver), for his better life εἰς τὸ καλὸς ζῆν (ensured by the organs of perception), or for guaranteeing the preservation of the species εἰς τὴν τοῦ γένους φυλακὴν (by the sexual organs), the physiologist is able to assess the work that each part does within the organism. Then he can establish a sort of hierarchy, at the top of which there are the parts that perform basic life functions of the organism as a whole, followed by the parts that the first and most

51 The hierarchy among the three different kinds of usefulness described by Galen in *De Usu*, III, 435, 11-436, 10 K. (I, 318 H) is the essential aspect on which Schiefsky’s argument is based. See Schiefsky, 2007, p. 14. On the same topic see P. Moraux, 1984, p. 325.
important ones can easily influence (as the use of the verb συμπάσχειν shows) and those that they do not affect at all.

In this passage Galen assigns more importance to the bodily parts that are closely related to those that are essential for the life of the organism itself, as for example the orifices of the right ventricle of the heart as compared to the mouths of the left one that he describes in VI, 7, 436,3-9 K. (I, 318, 16-21 H.). The heart is, indeed, crucial for the living being’s survival, since it serves as the source of innate heat that Galen famously defines as what governs the animal. But, although each part of the heart is essential to the performance of this function, some of them are even more important than others. The so-called “pneumatic ventricle” (the left ventricle)\(^{52}\), for example, is said to be more important than the “sanguineous ventricle” (the right ventricle).

Galen appeals to such a hierarchy in the usefulness of the parts of a single organ also in many other cases, including the hand as the part which is most representative of human nature. Indeed, as Furley and Wilkie pointed out\(^{53}\), together with the feet, the eyes and the ears, to Galen the hands are one of those parts that make the human being capable of surviving in a changing environment.

In the first book of *De Usu*, which is entirely dedicated to the description of the structure of the hand, Galen applies the same kind of hierarchical view of χρείαι to the case of the fingers. Among all the various parts of the hand, the key role is assigned to the thumb, which is defined ἀντίχειρ “hand-equivalent” according to both its position and its higher mobility compared with all the other fingers\(^{54}\). Indeed, Galen points out that the function of grasping assigned to the hand is equally affected by severing only the thumb or all the other four fingers. The thumb, already called “the great finger” by Hippocrates\(^{55}\), is therefore conceived as the most important part of the hand, since it performs a fundamental function for the purpose for which that organ is shaped.

As he points out in *De Usu* I, 2, 4, 12-5, 7 K (I, 3, 9-20 H), thanks to the hands a human being can shape everything needed in order to attack and to defend itself, as well as to develop the lifestyle that suits best its nature as a rational and political animal.

---

\(^{52}\) In this passage Galen states that the doctors usually call the left ventricle “the pneumatic ventricle”.

\(^{53}\) See Furley and Wilkie, 1984, p. 66.


\(^{55}\) Ibid., I, 22, 79,13 K (I, 58, 13 H.).
With these hands, the human being weaves itself a cloak and fashions hunting-nets, fish-nets and traps, and fine-meshed bird-nets, so that it is lord not only of animals upon the earth, but of those in the sea and the air also. Such is the hand of human being as an instrument of defense. But being also a peaceful and social animal, with its hands the human being writes laws for itself, raises altars and statues to the gods, builds ships, makes flutes, lyres, knives, fire-tongs, and all the other instruments of the arts, and in its writings leaves behind itself commentaries on the theories of them. Even now, thanks to writings set down by the hand, it is yet possible for you to hold converse with Plato, Aristotle, Hippocrates and the other Ancients. (Transl. After May, vol. I, p. 69)

Since only what by nature is apt to fulfill a given purpose can be defined as useful, then the anatomical suitability is an indispensable principle for Galen’s functional approach. Like Aristotle in his biological works, Galen explains the existence and the features of the parts in reference to the functioning of the organism as a whole, conceived as a system in which all the parts influence each other and cooperate for the wellness of the living being. Thus, unlike Schiefsky’s explanation in Galen’s Teleology and Functional Explanation56, the suitability of the structures should be seen as primary in the definition of χρεία rather than the contribution of the parts to the living being’s life.

To Galen the suitability of anatomical structures is, indeed, the fundamental precondition for performing actions which are necessary to the body and valuable for its maintenance, as for instance the different lengths and disposition of fingers are crucial for grasping various kinds of objects. This priority of the suitability of the structure clearly emerges in De Usu I, 9, 26,15-27,1 K. (I, 19, 9-14

where Galen claims that, in order to investigate the usefulness (χρεία) of any part, it is necessary to first examine what has determined its purpose, namely the characteristics of its substance. Therefore, according to Galen, the suitable features of the anatomical structure are the starting point for understanding what χρεία essentially is.

Referring constantly to the appropriateness of the anatomical structures to their end, in *De Usu* Galen establishes a strong connection between χρεία and “purpose”, as shown by the occurrences of the expression οὗ ἑνεκά “for the sake of which” with which he intends to recall Aristotle’s final cause. Thus, in Galen’s *De Usu* χρεία is first the adherence of a part to the aim for which it was molded and secondly it is the benefit that the body receives from the activity performed by a part. According to May, in fact, χρεία is the primary aim (πρῶτος σκοπός) of the generation of the parts, namely it is the main cause of both the features of the anatomical structures and of their activities (σκοπὸς τῆς ἐνεργείας). Hence, χρεία is the reason why the parts are constructed as they are. This also means that the usefulness of the parts takes priority over their activities.

---

57 *De Usu* I, 9, 26, 15-27, 1 K (I, 19, 9-14 H.): ὅταν οὖν τις ἀκριβῶς ἔθελῃ βασανίσαι τὴν χρείαν ἁπάντων τῶν ὑπαρχόντων τοῖς ὀργάνοις, πρῶτον μὲν ἔξετασάτω, καθ’ ὃ τὴν ἐνέργειαν ἐκτήσατο· τὰ πολλὰ μὲν γὰρ εὑρήσει κατὰ τὴν ἰδιὰν οὐσίαν, ἐστὶ δ’ ὅτε καὶ διὰ τί τῶν ἑπομένων, ὡς ἐν ὀφθαλμοῖς διὰ τὴν χρίαν; Accordingly, whenever one wishes to examine carefully the usefulness of everything appertaining to an instrument, let him first inquire to what its action is due, and he will find that in most cases the action is derived from the characteristic substance but sometimes from one of the secondary attributes, such as color in the case of eyes. (Trans. by May, I, p. 80).

58 See for example Galen, *De Usu*, I, 11, 29 K (I, 21 H); IV, 13, 129-30 K (II, 276 H). On this expression and its use in both Galen and Aristotle’s texts, see Furley and Wilkie, p. 60 and Schiefsky, p. 15-16.

59 May defines χρεία as «the reason why a part has a certain feature» on the basis of *De Usu* VI, 12, 464-5 K (I, 338-9 H), where Galen discusses Asclepiades’ theory of pulmonary arteries and veins referring to Aristotle’s four causes (see *Phys.*, II, 3, 194b 16-195a 3; *Metaph.*, A, 3, 983a 25 ff.) and arguing for the priority of the final cause: συγχωρήσαντες γένη τῶν αἰτιῶν ὑπάρχειν, πρῶτον μὲν καὶ μάλιστα, δὲ’ δ’ γίγνεται τι; I grant that there are several kinds of cause: first and most important, that for the sake of which a thing is formed (Trans. by May, vol. I, p. 308). On May’s definition quoted above see, vol. I, p. 9 and p. 308. Galen attributes to χρεία the connotation of cause also in *De Usu* XI, 12, 896, 17-897,7 K (II,152, 5-12 H) within the description of the structure of the ears: τὸ δ’ ἔξετασάν μὲν αὐτά κυρτά, καθά δ’ ἐνδοθέν ὑπάρχειν ἕνεκα τοῦ μητ’ ἐμπίπτειν τι τῷ πόρῳ μητ’ αὐτά πάσχειν ἐτοίμως ἐγένετο· πολλάκις γὰρ ἤδη λέλεκται πάντων δυσπαθέστατον εἶναι τὸ περιφερές. ἀλλὰ καὶ πολλάκις ἔκατερον ἑκάτερον αὐτόν ἐγένετο τῆς αὐτῆς χρείας ἕνεκα· μᾶλλον γὰρ οὗτος ἐπιτίθεσθαι δύναται καὶ διπλούσθαι καθ’ αὐτὸ ἢ εἰ ἀπλοῦν τε καὶ ὁμοιότατον ὑπῆρχεν· They are convex on the outside and concave on the inside in order that nothing may fall into the channels and that the ears themselves may not readily suffer harm. For I have already said many times that the rounded shape is the most resistant to injury. Moreover, they were both made much convoluted for the same reason, since they could thus be more folded over and doubled upon themselves than if they were simple and uniform (Trans. by May, vol. II, 529). For the causal
In addition to the definition of χρεία, at the beginning of book XVII Galen also distinguishes between that notion and ἐνέργεια, namely between the usefulness of a part’s activity and the part’s activity in itself. According to Galen, while χρεία refers to the beneficial contribution that, thanks to its anatomical suitability, each part gives to the organism’s system, ἐνέργεια is the specific activity that each part performs.

In De Usu, XVII, 1, 347, 1 K (II, 437, 8-9 H.) Galen also describes ἐνέργεια as an active motion ἐνέργειαν κίνησιν εἶναι δραστικήν\(^{60}\) that determines a change, such as for example when active muscles move limbs in different directions or food is transformed in the blood. Therefore, the term ἐνέργεια always refers to a process that guarantees the organism’s self-maintenance.

As shown by the case of the elephant’s trunk\(^{61}\) in De Usu, XVII, 1, 346-9 K (II, 437-40 H) the usefulness of the part remains unknown until the animal can actually be seen using it. Only then, observing the ἐνέργεια of that part, namely its activity of grasping things and breathing underwater, can it also be established what χρεία has been assigned to the trunk by Nature. Indeed, when Galen saw an elephant for the first time he thought that the trunk was superfluous, but, after having seen the

---

\(^{60}\) Galen defines the notion of ἐνέργεια as active motion by using the same terminology in both De Naturalibus Facultatibus, II, 7 K. (III, 105, 14 H.) and De Placitis Hippocratis et Platonis, VI, 1, 22 (V, 507 K.). This description of ἐνέργεια depends on the connection with the notion of δύναμις. Both of them are well-known technical terms in Aristotle, who, instead of Galen, does not use the word χρεία very often and he usually replaces it with the expression ἀναγκαία χρεία. Even if Galen takes this terminology from Aristotle, the meaning that he assigns to certain terms is quite different. Indeed, while Aristotle conceives δύναμις as potentiality, (namely as the capacity of a thing to develop or change into something else. See Methaph., V, 12), Galen takes this notion as the faculty of an organ to bring about its activity (ἐνέργεια), namely to ensure the actualization of its function. On Galen’s definition of δύναμις and ἐνέργεια, see also the interpretation provided by Brock in Galen, On the Natural Faculties, London-Cambridge, 1916, p. XXIX-XXX. On Aristotle’s use of δύναμις and ἐνέργεια, see G. E. R. Lloyd, Aristotle. The Growth and Structure of his Thought, Cambridge, 1968, p. 63-5. On the meaning of these notion in both Galen and Aristotle, see Furley and Wilkie, 1984, p. 60-1; I. Johnston, Galen. On Diseases and Symptoms, Cambridge, 2006, p. 28-31; R. J. Hankinson, Philosophy of Nature, in The Cambridge Companion to Galen, Cambridge, 2008, p. 225-9.

elephant using its proboscis and then having dissected it, he realized that the trunk functioned like the human hand and was also a tool of respiration:

Gal., *De Usu*, XVII, 1, 348,6-12 and 349,5-8 K. (II, 438, 12-18; 439,7-10 H).

In the place where other animals have a nose, the elephant has a narrow, free-swinging part, so long that it reaches the ground. When I first saw this, I thought it superfluous and useless, but when I saw the animal using it like a hand, it no longer seemed so, the usefulness of the part being bound up with that of the action; for the usefulness of a part is made manifest through its useful action... Later on, when I also saw that the part is pierced at the end and learned in addition that the animal breathes through these apertures as if through nostrils, I realized that clearly the part is useful for this purpose too. (Transl. May, vol. II, p. 725)

Therefore, in addition to the systematic distinction offered at the beginning of book XVII, Galen seems to conceive of the notions of χρεία and ἐνέργεια as interdependent. Since the usefulness of a part is necessarily connected to its activity and manifests itself through that activity, the ἐνέργεια (activity) of a part has to be understood as what reveals to the physician the function assigned to a certain anatomical structure and thereby also the reason why that part is necessary to the organism. The meaning of both these notions according to Galen may be summarized in the following table:
As the elephant’s trunk example clearly shows, this close connection between χρεία and ἐνέργεια has direct methodological implications. According to Galen, indeed, in order to understand why the organism posseses certain parts, the physician has to start his investigation from their activities and then proceed to both behavioural observations (namely how living beings normally use a certain part of their body) and dissections of the parts.

But, even though in the elephant’s case Galen seems to consider ἐνέργεια as the fundamental condition for knowing χρεία and bases his method of investigation on that priority, at the same time, as has been just mentioned above, he acknowledges their close mutual relationship. Indeed, as Galen argues in *De Usu* I, 8, 20, 2-4 K. (I, 14, 11-12 H.)\(^62\) «obviously, those who mistake the actions of the instruments also miss entirely the usefulness of the parts\(^63\)).

\(^{62}\) Gal., *De Usu*, I, 8, 20,3-4: ὡς, ὥσοι περὶ τὰς ἐνεργείας τῶν ὀργάνων ἐσφάλησαν, οὗτοι καὶ τῆς χρείας τῶν μορίων δήμαρτον.

The interdependence between χρεία and ἐνέργεια has great value in Galen’s view, since he conceives all bodily parts as essentially sympathetic. According to him, the mutual cooperation between the parts is made possible by the suitable structure that all of them have in view of the functions that they, or the organ of which they are parts, have to perform. This means that every single part of the body is able to work harmoniously together with the other parts, thereby ensuring the good functioning of the organism, just because its anatomical structure and its activity fit perfectly within the system. In the human body, like in the body of any animal, there are no failures or contradictions, everything is in a certain place, has a certain anatomical structure and has a certain function for a reason.

Everywhere in De Usu Galen stresses and repeats this concept as a refrain.

In Galen’s anatomy and physiology there is no room for chance. Similar to a jigsaw puzzle, in which every single piece has been specially cut and colored in order to fall into a specific place, in Galen’s anatomy every single part of the body has been molded by the demiurge for a purpose, namely for being useful to the organism as a whole. The anatomical configuration of every part, indeed, is always due to its function. According to Galen, it was precisely for this reason that the demiurge has provided all the parts (and therefore the body as a whole) with the best possible constitution. This means that, even if the anatomical structure of the parts is only minimally changed, the general harmony of the body would be compromised.

Gal., De Usu, I, 5, 9, 5-13 and 10, 3-8 K (I, 6, 15-7, 1 and I, 7, 10-15 H)

Φέρε ὦν τοῦτο πρῶτον αὐτοῦ βασανίσωμεν τὸ μόριον, οὐκ εἰ χρήσιμον ἀπλῶς οὐδ’ εἰ σοφῷ ζῷῳ πρέπον ἐπισκοποῦντες, ἀλλ’ εἰ παντοίως οὕτως ἔχει κατασκευὴς, ὡς οὐκ ἂν, εἴπερ ἐτέρως ἐγεγόνει, διέκειτ’ ἂν ἄμεινον. ἐν μὲν δὴ καὶ πρῶτον κεφάλαιον ἀρίστης κατασκευῆς ὄργανον ἀντιληπτικοῦ, εἰ πάντως μὲν σχημάτων, πάντων δὲ μεγεθῶν, ὡσα κινεῖν ἀνθρωπος πέφυκεν, ἐτούμως ἀντιλαμβάνοιτο. πότερον οὖν ἦν ἄμεινον αὐτῷ πρὸς ταῦτα σχισθῆναι πολυειδῶς ἢ παντάπασιν ἀσχίστῳ γενέσθαι; ... οὕτω μὲν δὴ πρὸς τῇ...
Come now, let us investigate this very important part of human body, examining it to determine not simply whether it is useful or whether it is suitable for an intelligent animal, but whether it is in every respect so constituted that it would not have been better had it been made differently. One and indeed the chief characteristic of a prehensile instrument constructed in the best manner is the ability to grasp readily anything of whatever size or shape that the human being would naturally want to move. For this purpose, then, which was better for the hand to be cleft into many divisions or to remain wholly undivided? ... Thus the end is the most excellently constituted for a firm grasp of things both larger and smaller than itself. Furthermore, if it was to be able to lay hold on objects of many different shapes, it was best for it to be divided into many differing members, as it now is, and for this purpose the hand is obviously adapted best of all prehensile instruments.

(Transl. after May, vol. I, p. 72)

Since the purpose of the demiurge was to give to the human being the most prehensile instrument possible, then it chose and shaped the hands with the most suitable structure, namely the one that could ensure the greatest mobility to the organ: the division into smaller components (the fingers). Therefore, the usefulness of the parts lies primarily in their fitness, which works as its first necessary precondition. The idea that living beings have the best possible constitution is totally absent in Aristotle’s biology and represents the peak of Galen’s teleologism, which pushes the design argument far beyond that of his predecessors.

1.3 The Epicurean theory of adaptation and the case of hand tendons in Galen’s *De Usu Partium*.

The investigation of the human hand that Galen places at the beginning of *De Usu* is emblematic of his functional approach, his fervent advocacy of teleologism and therefore of his anthropocentrism within biology.
As has already been stated, according to Galen, the anatomical structure of the hand is a paradigmatic example of Nature-demiurge’s providence in the generation of the human being. Indeed, since it is the only creature provided with a rational nature, the Nature-demiurge shaped it with hands, namely with the most versatile organ. Thus, in the anatomical structure of hands the central role that Nature has assigned to the human being within the cosmos is mirrored. Galen conceives the human being as by nature superior to all other creatures and looks at every part of its body, especially at the hands, as a clear demonstration of his view:

Gal., De Usu, I, 1, 3, 4-7 K (I, 2, 10-13 H)

ἀνθρώπῳ δὲ, σοφὸν γὰρ τοῦτο τὸ ζῷον καὶ μόνον τὸν ἐπὶ γῆς θείον, ἀντὶ πάντων ὀμοῦ τῶν ἁμυντηρίων ὄπλων χείρας ἐδωκεν, ὄργανον εἰς ἀπάσας μὲν τὰς τέχνας ἀναγκαῖον, εἰρηνικὸν δὲ οὐδὲν ἢπτον ἢ πολεμικὸν.

Now to human being - for it is an intelligent animal and, alone of all creatures on earth, godlike - in place of any and every defensive weapon, (the Nature) gave hands, instruments necessary for every art and useful in peace no less than in war.

(Transl. after M. T. May, vol. I, p. 68)

66 See Gal. De Usu, XVII, 353, 16-354, 5 K (II, 442, 20-443,5 H.): ἀνδρὶ μὲν οὖν ὡς ἀληθῶς ἐξετάζοντι τὰ τῆς φύσεως ἔργα καὶ χεῖρ ἀρκεῖ μόνη θεωρηθεῖσα πρὸ τῆς ἀνατομῆς. ὅστις δ', ὡς ἔφην, ἐχθρὸς τῇ φύσει, κἂν τὴν ἐνδον αὐτῆς θεάσηται τέχνην, ἢν ἐν τοῖς πρώτοις δύο γράμμασιν ἐξηγησάμην, ἀγρυπνεῖ ζητῶν, ὅπως ἐπηρεάσῃ τι τῶν ὀφθέντων; Hence for a man who is truly examining the works of Nature just the mere sight of the hand before dissection is sufficient, but, as I have said, if some enemy of Nature’s sees the skill exhibited in its inward parts too, as I explained it in the first two books, he will lie awake nights trying to find any one of the things he has seen which he can disparge (Trans. after May, vol II, p. 727).

67 In De Usu, XVII, 352, 14 K. (II, 442, 2-3 H.) Galen defines the hand as the most characteristic organ of the human body: ἡ χείρ ἢστιν, ὄργανον ἰδιώτατον ἀνθρώπου.

68 Following Aristotle’s De Part. Anim., IV, 687b and De Anima, 432a 1, 2 Galen describes the hand as “tool of tools”.

69 Thus, it is not a coincidence that Galen’s De Usu starts with a long description of the hands. His view is clearly mirrored in the structure of the treatise, as Vegetti also points out in the introduction to the translation of De Usu: «L’ordine nel quale Galeno presenta la sua descrizione del corpo umano obbedisce esso stesso ai principi fisiologici generali. Al primo posto compare l’organo umano per eccellenza, la mano, la cui minuziosa descrizione occupa il primo e il secondo libro, estendendosi a quella del braccio. Segue poi per ovvia affinità, la trattazione del piede e della gamba». See Vegetti-Garofalo, p. 296.
Here the human being is described as the most perfect creature on earth, since its rationality makes it the closest and the most similar to the demiurge 70.

Like Aristotle in his biological works, Galen also disputes the evolutionary theories that described the human being as originally devoid of defenses and of all the skills that normally distinguish it from the other species. After having discussed Anaxagoras’ view of the hand, in De Part. Anim., IV, 687a-688a Aristotle criticizes those who believed that “the structure of the human being is not good” and considered it worse than that of any other animal. Furthermore, according to the Stagirite, those philosophers use certain anatomical characteristics of the human being, for example the structure of the feet, as supportive evidence for their view and also describe humans as “barefoot, unclothed and void of any weapon of force” 71.

Even if Aristotle does not mention their names, as he does with Anaxagoras, he is presumably referring to the ancient atomists and to their intransigent anti-teleologism.

Following Aristotle’s argument, in De Usu I, 1, 4-5 K (I, 3-4 H) Galen stresses the necessary appropriate relationship between the nature and the parts as the fundamental principle followed by Nature in the generation of creatures. Therefore, since all living beings are shaped according to what is essential for a full actualization of their souls, then the hands have to be conceived as tools in the service of human rationality, namely as those instruments that enable human beings to develop τέχναι and improve their life conditions:

Gal., De Usu, I, 3, 5, 12-4 K (I, 4, 5-8 H)

οὐ γὰρ αἱ χεῖρες ἄνθρωπον ἐδίδαξαν τὰς τέχνας, ἀλλ' ὁ λόγος· αἱ χεῖρες δὲ ὀργανον, ὡς λόρα μουσικοῦ καὶ πυράγρα χαλκέως.

Indeed, not by its hands, but by its reason has human being been instructed in the arts. Hands are instruments, as the lyre is the instrument of the musician, and tongs of the smith.

(Transl. after May, vol. I, p. 69-70)

---

70 The idea of the human being as θεῖον, a term that occurs on the first line of the passage above, is probably taken from Aristotle’s De Part. Anim., IV, 687a 5 ff.. In that text the Stagirite says that all the parts of the human body are shaped by Nature in the most appropriate way to its being τὸ φρονιμώτατον among the creatures. Indeed, since Nature is said to always do the best (τὸ βέλτιστον), it gives hands only to the human being which is greater and superior (τὸ τιμιώτερον καὶ μεῖξον) to all other creatures.

Surely then, human being is not naked, easily wounded, defenseless, or unshod, but whenever it wishes, may have a corslet of iron (an instrument harder to damage than any kind of skin), and sandals, weapons, and vestments of all sorts are at its disposal. In fact, the corslet is not its only protection, since it also has houses, towers, and city walls. If we were born with a horn or some other defensive weapon of the kind growing upon its hands, it could not use them at all to build a house or tower, or to make a spear or corslet or other similar things. (Transl. after May, I, p. 68-9)

In both the passages quoted above Galen refers to the evolutionary theorists’ disregard for the crucial role of hands, that they placed within a broader picture of the human being as a defenseless creature that had evolved from a beastlike condition thanks to a combination of factors: adaptability, fortuitous discoveries and reasoning. Galen’s critique of the so-called evolutionary theories concerns especially the most well-known and influential version formulated by the atomists and, according to him, supported also by Asclepiades of Bithynia. Just as they conceive the feet to be easily exposed to danger, the atomists do not consider the hands to be an amazing outcome of Nature’s art. In fact, the atomistic theory does not recognize any natural link between the appropriateness of living beings’ bodily parts and their natures, or between their individual parts and the usefulness that those structures have. As Lucretius points out in his anti-teleological argument in De Rerum Natura IV, 823-57, there is no consequential relationship between the structure of the parts and the functions that they perform. According to him, as well as

his master Epicurus and other ancient atomists, all the creatures, like everything else, consist of fortuitous clusters of atoms generated at random, which means that the bodies of all the living beings are not designed to fully realize their own natures as Galen strongly believed. Rejecting the idea of a unique, static and perfect cosmos advanced by both Platonic and Aristotelian cosmologies, the Epicureans developed a notion of nature as essentially *atechnos*. To them nature is no longer the best possible scenario, that, if observed in all its smallest details, shows to have never acted in vain. On the contrary, nature becomes irrational and able to make many mistakes. The idea of nature as improvident is received and developed by Lucretius\(^7\), who forcefully denounces:

\[\textit{Nequaquam nobis divinitus esse creatam naturam mundi: tanta stat praedita culpa.}\]

That the nature of the universe has by no means been made for us through divine power: so great are the faults it stands endowed with.

(Transl. W. H. D. Rouse, p. 109)

The liberation from superstition and groundless fears\(^7\), which Epicureanism has as its main goal, is a bitter pill to swallow, since it leaves no room for any benevolent providence behind the generation of things. In fact, according to Epicureans, the cosmos has not been made as it is for the sake of human beings. In order to understand the atomistic view of the origin of the physical world and its distance from Galen’s on this issue, we should dwell on its main principles. As Epicurus claims in his *Epistula ad Herodotum*, [2], 39, 6, the only constituents of reality are “bodies and void” (τὸ πᾶν <σῶμα καὶ κενόν>\(^7\)), namely the atoms, their aggregates and the empty space through which the particles


\(^7\) It means liberation from the fear of both death and divine punishment. See for example Lucr., *De Rer. Nat.*, I, 104-9; IV, 6-7 and especially V, 1-54; V, 49-54.

\(^7\) See Epicurus, *Epistula ad Herodotum*, [2], 39, 8-9 Arrighetti. The interpretation of this lacuna in Epicurus’ text has been at the core of a long *querelle* among the scholars, namely among those who, like Gassendi (1649), suggested to fill it with <σῶμα καὶ κενόν> and those, like Usener, who argued for <σῶμα καὶ τόπος> ("bodies and space"). Gassendi based his interpretation on Plutarch’s *Adv. Col.*, 1114 a (74 Us.), Sextus Empiricus’ *Adv. Math.*, IX, 333 (75 Us.) and Lucretius’ *De Rer Nat.*, I, 420, while Usener relied only on Adv. Col., 1112 e (76 Us.). Unlike the latter hypothesis that has been accepted just by Bailey, Gassendi’s view has been accepted by most of the scholars (Arrighetti 1973, Isnardi Parente 1983, Adorno 1980, Long and Sedley 1987). For a broader reconstruction of this debate, see F. Verde, *Epicuro*. 

38
constantly move. Therefore Epicurus posits the existence of two levels of reality: the perceivable and changeable aggregates and the unperceivable and unchangeable atoms\textsuperscript{76}, which are intelligible only through reason\textsuperscript{77}. In addition to these primary entities, Epicurus indicates the void as belonging to the same dimension of what is intangible and can only be inferred from empirical observation and a subsequent generalization about what is τὸ ἄδηλον\textsuperscript{78}. Thus, unlike Democritus who, according to Plutarch’s account, conceived the void as a not-being that in some way must be\textsuperscript{79}, Epicurus attributes to atoms and void the same ontological status, which also implies assigning them similar characteristics, namely: being unlimited, eternal and uncaused\textsuperscript{80}. According to the Epicureans, as is well known, atoms and void are the only immutable and fundamental principles\textsuperscript{81} of reality from which everything comes into existence and then dissolves away\textsuperscript{82}. Although fragment 156 DK (78 L.) says that “μὴ μᾶλλον τὸ δέν ἢ τὸ μηδὲν εἶναι”, namely that “the thing is no more than no-thing (i.e., the thing exists not more than nothing)\textsuperscript{83}, Democritus does not fully equate bodies and void as

\textit{Epistola a Erodoto}, Roma, 2010, p. 89-90. As previously mentioned, Epicurus’ claim has been taken up by Lucretius in \textit{De Rer. Nat.}, I, 419-21, when he says: \textit{omnis, ut est igitur per se, natura duabus constitit in rebus; nam corpora sunt et inane, haec in quo sita sunt et qua diversa moventur}; The nature of the universe, therefore, as it is in itself, is made up of two things; for there are bodies, and there is void, in which these bodies are and through which they move this way and that. (Trans. Rouse, p. 35-7). Here Lucretius seems to translate literally from his master’s statement.

\textsuperscript{76} See Epicur., \textit{Hdt.}, [2], 40,10- 41 Arrighetti.

\textsuperscript{77} Ibid., 39, 9-10 Arrighetti.

\textsuperscript{78} Ibid., 39, 10 Arrighetti. According to Epicurus, void exists since the observable phenomena show that motion exists and since the presence of empty space is the fundamental condition of motion.

\textsuperscript{79} See Democritus fr. 68 B 156 DK (78 L.); Plut., \textit{Adv. Col.}, 1108 F.

\textsuperscript{80} See Epic., \textit{Hdt.}, [2] 41,6-42,5; 44,5-6 Arrighetti.

\textsuperscript{81} The description of the atoms as unchangeable begins with Arist., \textit{De Gen. et Corr.}, I 8, 326a 1; \textit{De Sens.}, 6, 445b 11-3 (fr. 429 L.). See also Simpl., \textit{In Aristot. Phys.}, 925, 10 (Democritus 67 A 13 DK; 113 L.).

\textsuperscript{82} On this topic see also Lucr., \textit{De Rer. Nat.}, V, 243 ff.

\textsuperscript{83} Presumably in reference to Eleatic ontology, ancient atomism conceives void as the empty space that exists as a “quasi-substance”. In other words the atomists maintained the distinction between the status of bodies and vacuum as beings and not being, but, at the same time, they assigned to the latter the characteristic of something that subsists as a (empty) “space occupier”. In fact, according to Sedley Democritus’ notion of void as “the negative substance that”, as well as the bodies, “occupies empty space” is based on the principle that existing always implies occupation of space. On this interpretation see D. Sedley, “Two Conceptions of Vacuum”, in \textit{Phronesis} vol. 27, n. 2, 1982, p. 182-3. For a broader discussion of Democritus fr. 156 DK (78 L.) and the differences between his and Epicurus’ notion of void, see chapter two of this work and especially section 2.2.1. On this topic see also L. Perilli, “Democr. fr. 156 DK (δέν vs ἓν)”, in \textit{Museum Criticum} XXXII, 2000, p. 95-102 and W. Burkert, “Logik und Sprachspiel bei Leukippos/Democritos: οὐ
Epicurus does later. Epicurus develops an idea of void that is ontologically stronger than that of Democritus since he defines both vacuum and atoms as φύσες, namely as primary and unalterable components of the sensible world. Therefore, with Epicurus the void is no longer a “negative substance” and becomes a fundamental existing being just like the particles. The ontological equalization of void and atoms and the consequent attribution of similar features to both of them, namely their being unlimited and eternal, is the precondition for Epicurus’ theory of the infinite number of worlds, which is emblematic of his rejection of any anthropocentrism and finalism within nature. There is much more to be said on this topic, but since a detailed discussion of the two atomistic notions of void is not the primary goal of this work, I give only a brief account here and reserve a broader analysis for another place.

Following his predecessors Leucippus and Democritus, in Hdt. [2], 45 Epicurus admits the existence of worlds that are infinite, generated and corruptible. Since the atoms are by nature infinite in number and eternally in motion through an unlimited empty space, it follows that their combinations cannot generate just one world and that it is necessary to postulate the constitution of infinite worlds. Although the general pattern of Epicurean cosmology relies on Democritus, there is also a significant difference between the two concerning the genesis of the worlds and the notion of the infinite. Unlike his predecessor, Epicurus conceives of the atoms as infinite in number but not in shapes. Indeed, as he points out in Hdt., [2], 42-3, the particles have by nature an inconceivably large but limited number of different shapes. Hence, this principle leads Epicurean cosmology to posit the generation of a limited number of possible kinds of worlds and species and, above all, to explain the

---

84 The term φύσες occurs in reference first to the atoms in Epicurus’ Hdt., [2], 41 and then to the void in [2], 44 Arrighetti.
85 Simpl., In de Cael., I, 5, 271b 1 (67 A 21 DK; 345 L.); Cic., Acad. Prior., II, 17, 55 (68 A 81 DK; 350 L.); Diog. Laert., De Vit. Phil., IX, 31 (67 A 1 DK; 355 L.); IX, 44 (68 A 1 DK; 356 L.).
86 On the same topic see also Epicur., Pyth., 89 Arrighetti; Lucr. De Rer. Nat., II, 1018-89.
88 Cic., De fin., I, 6, 21 (350 L.).
regularity within nature. Positing the existence of an infinite number of atoms with a limited variety of shapes in a context of infinite space and time means, first, allowing the generation of infinite worlds and, second, increasing the probabilities that there can be a certain number of worlds with similar characteristics. Therefore, if there are a limited number of types of atoms, the existence of \( n \) kinds of their possible combinations should also be assumed. Since Epicurus’ atomic aggregation works according to the idea that “like attracts like”, namely that each particle can combine only with those which are appropriately shaped and can fit with it, he conceives the limited number of shapes as that which makes a mechanism of repeatability within his cosmology possible. This natural tendency of atoms leads them to potentially reproduce the same kind of compounds an infinite number of times. So then, conceiving the primary entities as limited in their number of shapes and admitting that there is a limit on the possible types of atomic combinations, the Epicurean cosmology finds its regularity and can both argue for the spontaneous origin of life and avoid any hypothesis of intrinsic teleology.

Together with the principle that “like attracts like”, the boundless universe theorized by Epicurus includes another kind of “natural law”, the so-called isonomia, an ancient principle of Greek philosophy that goes back to the sixth century BC. Although Epicureanism does not admit any external and divine cause as responsible for the generation of the worlds and brings everything back to the material cause, both Lucretius and Cicero give notice of a distributive equality that governs the universe. According to this principle, indeed, everything has always its exact match and thus nature always tends to reach a certain equilibrium.

In II, 532-40 Lucretius speaks about the uniform distribution of species pointing out that: if in one region of the world there are few samples of elephants, then there are many more in other places like India. Instead in Cicero’s De Natura Deorum, I, 19, 50 the Epicurean Velleius defines isonomia as omnia omnibus paribus paria respondeant, namely as what makes everything always having its counterpart. In this text isonomia is also said to be a property of the infinite, literally a “vis

\[\text{vis infinitatis et magna ac diligentii contemplatione dignissima est, in qua intellegi necesse est eam esse naturam ut omnia omnibus paribus paria respondeant. Hanc ioovqiav appellat Epicurus, id est aequabilem tributionem. Ex hac igitur illud efficitur, si mortalium tanta multitudo sit, esse inmortalium non}\]

\[\text{See C. W. Müller, Gleiches zu Gleichem: Ein Prinzip frügriechischen Denkens, Wiesbaden, 1965.}\]

\[\text{This is how C. Bailey describes Epicurus’ universe in The Greek Atomists and Epicurus, New York, 1928, p. 462.}\]

\[\text{We don’t have notice of the use of this principle by Democritus.}\]

\[\text{Lucr., II, 532-40.}\]

\[\text{Cic., De Nat. Deor., I, 19, 50: Summa vero vis infinitatis et magna ac diligentii contemplatione dignissima est, in qua intellegi necesse est eam esse naturam ut omnia omnibus paribus paria respondeant. Hanc ioovqiav appellat Epicurus, id est aequabilem tributionem. Ex hac igitur illud efficitur, si mortalium tanta multitudo sit, esse inmortalium non}\]
infinitatis”, namely deduced by both the infinite number of atoms of each shape and the infinite empty space through which they move. Given these premises, it follows that each possible combination of shapes will occur an infinite number of times, which also means that in the universe there will be generated an equal number of any kind of aggregate. Thus, Epicurus gives an account of the origin of various types of things and holds that they all exist in the same quantity at any time. As Cicero points out in his testimony, this principle of equal distribution is also conceived of as something related to the motion of atoms. Referring to both the atomic movements that tend to aggregation and to dissolution of the compounds, Velleius claims si quae interimant innumerabilia sint, etiam ea quae conservent infinita esse debere and stresses that, since all the kinds of aggregates exist in the same quantity and are equally distributed, then also the natural forces involved

minorem, et si quae interimant innumerabilia sint, etiam ea quae conservent infinita esse debere; Moreover there is the supremely potent principle of infinity, which claims the closest and most careful study; we must understand that it has the following property, that in the sum of things everything has its exact match and counterpart. This property is termed by Epicurus isonomia, or the principle of uniform distribution. From this principle it follows that if the whole number of mortals be so many, there must exist no less a number of immortals, and if the causes of destruction are beyond count, the causes of conservation also are bound to be infinite (Trans. by H. Rackham, Cambridge-London, 1933, p. 51). In this passage the principle of isonomia is explicitly attributed to Epicurus, who is said to use it in order to demonstrate both the existence and the immortality of the gods. Indeed, since the gods live in the intermundia in a status of blissful isolation and do not concern themselves about human beings’ life, their existence has to be inferred from the necessity of a quantitative equilibrium between the number of mortal beings and immortal creatures. Thus, as has been pointed out by Bailey, the Epicurean principle of isonomia establishes that if there are a certain number of human beings on the infinite worlds, there must necessarily be the same number of gods between the worlds. As both Cicero and Lucretius’ testimonies show, this proportioned equilibrium concerns all the aspects of the Epicurean universe: the living creatures as well as the natural forces of conservation and destruction. In addition to gods’ existence, isonomia is what allows Epicurus to justify god’s immortality. Indeed, since he postulates that the gods are made up of atoms like human beings and hence that they also emanate effluvia, the principle of isonomia saves their divine nature from desegregation and guarantees their immortality. The amount of matter that gods lose within each effluvium is automatically refilled by a stream of atoms (On the nature of Epicurean gods, cf. Epic., Hdt., [2], 76-7; Id., Ep. ad Men., [4], 123-4 Arrighetti; Lucr., De Rer. Nat., VI, 86-79 and V, 1161-1225; Cic., De Nat. Deor., I, 43-9). On the Epicurean isonomia see Bailey, 1928, p. 461-3; Sedley, 2007, p. 155-7; M. Isnardi Parente, “La isonomia epicurea”, in Studi Classici e Orientali, vol. 26, 1977, pp. 287-98; Id., Epicuro. Opere, Torino, 1983, p. 32-5; K. Kleve, “The Epicurean Isonomia and its Sceptical Refutation”, in Symbolae Osloenses vol. 54, 1, 1979, pp. 27-35; J. Moreau, “Le mécanisme épiciurien et l’ordre de la nature”, in Les Études philosophiques, 4, 1975, pp. 467-86; M. Wifstrand Schiebe, “Sind die epikureischen Götter “thought-constructs”?” in Mnemosyne, 56, 2003 pp. 703-27; F. Verde, Epicuro, Roma, 2013, p. 130-1.

95 See the Latin text quoted in the preceding footnote.
in their generation and corruption have to act according to the same principle. Therefore, this *isonomia* seems to work as a natural counter balance mechanism that, together with the law of attraction, rules the Epicurean universe. Even though not admitting any provident design, in both these two principles the Epicureans find the natural law that saves their universe from chaos. Such a notion of nature, that recognizes matter and void as fundamental principles and then rejects the idea that something can come into being out of nothing and perish into nothing, cannot obviously admit the existence of a demiurge nor the idea of living beings created *ex nihilo*.

Given all these premises, it is therefore not surprising that the atomists stress all the mistakes that are easily observable within the cosmos, in order to free the concept of nature from any aura of perfection and divine benevolence. This view of nature as essentially dynamic and *atechnos* is particularly strong in Lucretius’ attack on the craft-nature analogy and his prehistory of civilization. In book V, 780-877 for example, the poet tells that, at the beginning of the world, the first living beings spontaneously arose from the earth, which produced both viable (*saecla*) and monstrous creatures (*portenta*), namely living beings with bodies that enable them to meet their needs and also with malformations. While the first had access to food, sexual reproduction and were able to survive, the latter died almost immediately. Therefore, as we will see later on in more detail, Lucretius argues that only those early creatures who came out by chance with certain appropriate characteristics could survive, since those suitable attributes make them able to adapt to their environment.

Indeed, as Lucretius’ argument in IV, 823-57 shows, the Epicurean biological explanation gives priority to the generation of the parts over their usefulness. It means that the usefulness of the parts is

---

96 The idea that nothing comes to existence from what is not is a cornerstone of Epicurean physics, which by definition implies as its corollary the fact that nothing can be generated only from the void and that it is necessary to admit the existence of certain eternal primary constituents of reality. On this aspect see Epicur., *Hdt.*., [2], 38-9 Arrighetti.

97 In *De Rerum Natura*, V, 805-6 Lucretius attributes the generation of the first mortal creatures from the earth to the abundance of heat and moisture: *multus enim calor atque umor superabat in arvis*. Lucretius indicates heat and moist as the two fundamental conditions for the origin of life from the earth also in V, 797-8, when he says that many animals are still generated in the same way. Thus, although the earth was much more fertile and fruitful in the good old days and now is *ut mulier spatio defessa vetusto* (*like a woman worn out by old age* see Lucretius, *On the Nature of Things*, V, 827, Trans. by W. H. D. Rouse (ed. by M. F. Smith), Cambridge-London, 1992 (first ed. 1975), p. 443), it is still the place from which a certain number of animals emerge.

98 Id., V, 845-59.

99 Since in *De Rerum Natura* Lucretius declares his loyalty to Epicurus (III, 9-13) and follows his doctrine closely, it seems reasonable to consider even his biological explanation as based on the Epicurean tradition. On this topic see at least
not planned in advance, as Galen and the other teleologists thought, but that all the bodily parts “discover their usefulness” only by their use. In order to discover the proper usefulness of their parts, all creatures need first to perform actions and to experience all the possible uses of their anatomical structures.

Therefore, according to the Epicureans there is no teleological relationship between the parts and their functions, as Lucretius clearly shows in IV, 836-42 when he argues against biological teleologism.

Lucr., De Rerum Natura, IV, 836-42.

Nec fuit ante videre oculorum lumina nata
nec dictis orare prius quam lingua creatast,
sed potius lange linguae praecessit origo
sermonem multoque creatae sunt prius aures
quam sonus est auditus, et omnia denique membra
ante fuere, ut opinor, eorum quam foret usus.
Haud igitur potuere utendi crescere causa.

There was no sight before the eyes with their light were born,
no speaking of words before the tongue was made;
but rather the origin of the tongue came along before speech,
and the ear was made long before sound was heard,
in a word all the members, as I think, existed before their use.
They could not then have grown up for the sake of use.
(Transl. W. H. D. Rouse, p. 343)

---

Not even the hand, so much celebrated and considered by Galen to be the strongest evidence for the validity of the design argument, is safe from Lucretius’ mechanistic view.

Indeed, the hands, presented by Galen as a paradigmatic example of human superiority, are described in Lucretius IV, 830-1 as *manusque datas utraque <ex> parte ministras, ut facere ad vitam possesmus quae foret usus*, namely as mere «ministering hands given on either side, only that we might be able to do what should be necessary for life»\textsuperscript{100}. Lucretius offers a variation on the Aristotelian topic of hand as “tool of tools”, taking away its role as the best evidence of Nature’s art. Indeed, even admitting their undoubted usefulness, Lucretius equates hands to the other organs\textsuperscript{101} just as he equates the generation of human beings to that of the other animals.

Hence, in Lucretius’ view the hands have a purely instrumental function and they are deprived of their anthropocentric value\textsuperscript{102}.

Lucretius argues that the hands, as well as all the other organs, determine their functions. Indeed, as we will see later on in further detail, he conceives the usefulness of the parts as the effect of both the

\textsuperscript{100} Trans. by Rouse, p. 343.

\textsuperscript{101} I do not believe that in *De Rer. Nat.*, IV, 825-31 the hands are listed last by chance. Lucretius’ choice to mention the hands after eyes, legs, feet, arms and shoulders is probably provocative, since, as I said above, they were the symbol of the teleology within biology: *lumina ne facias oculorum clara create, prospecere ut possimus, et ut proferre quaemus proceros passus, ideo fastigia posse surarum ac feminam pedibus fundata plicari, brachia tum porro validis ex apta lacertis esse manusque datas utraque <ex> parte ministras, ut facere ad vitam possems quae foret usus*; do not suppose that the clear light of the eyes was made in order that we might be able to see before us; or that the ends of the calves and thighs were jointed and placed upon the foundation of the feet, only to enable us to march forward with long forward strides; that the forearm again were fitted upon sturdy upper arms, and ministering hands given on either side, only that we might be able to do what should be necessary for life (Trans. Rouse, p. 341-3).

\textsuperscript{102} In *Cic.*, *De Nat. Deor.*, II, 150 the hands are enthusiastically described by Balbus, who claims: *quam vero aptas quamque multarum artium ministras manus natura homini dedit*; then what suitable servants for a great variety of arts are the hands which nature has bestowed on man! (Trans. After H. Rackham, p. 267). As in Lucretius’ text, here the hands are also said to be *ministras* (servants of the human body) but their instrumental role has a different meaning, since Balbus’ description of the hands is placed within his account of Stoic theology. Similarly to Galen’s account, Balbus clearly enhances the suitability of the hands to perform various arts and crafts, right after having referred to human rationality as a divine gift (See *De Nat. Deor.*, II, 147). Indeed, replying to the Epicurean Cotta, Balbus considers both human reason and organs as evidence for the care of the providence for human beings (See ibid., II, 147-9). Hence, like Galen in book I of *De Usu*, Cicero focuses Balbus’ description of the hands on the necessary relationship among the suitability, function and usefulness of this anatomical structure. Unlike Lucretius’ account, the hands are not mere “handmaids” of the body, but again symbol of an anthropocentric view of nature. For a broader analysis of the possible similarities between Cicero’s and Galen’s testimonies, see section 2.4.1 of this work.
existence of the organs and the needs related to the creatures’ survival. Therefore, in Lucretius’ eyes the design argument relies on an inconceivable reversal of the relationship cause-effect, putting the effect-usefulness in place of its cause, which is the generation of the bodily parts. In De Rer. Nat., IV, 833 he defines this twist as an omnia perversa praepostera sunt ratione, namely as a break and a change in the order of things.\(^{103}\)


*Cetera de genere hoc inter quaecumque pretantur
omnia perversa praepostera sunt ratione,
nil ideo quoniam natumst in corpore ut uti
possemus, sed quod natumst id procreat usum.*

Such explanations, and all other such that men give, put effect for cause and are based on perverted reasoning; since nothing is born in us simply in order that we may use it, but that which is born creates the use.

(Transl. W. H. D. Rouse, p. 343)

In response to the “perverted reasoning” of the teleologists, in IV, 843-57 Lucretius rejects any analogy between the organs and the artifacts. Unlike Galen in De Usu, I, 3, 5 K. (I, 4), Lucretius criticizes the comparison between the parts of the body and the objects that have been molded on the base of a design. The hands are not instruments like the lyre for the musician\(^{104}\), as Galen believed, since the functions are not preconceived and intrinsic in the anatomical structures.

---

\(^{103}\) This term occurs also in De Rer. Nat., III, 621 (praeposterus ordo) with the same meaning of “reversed order”. There, Lucretius explains that both the organs and the mind find their places in the body according to a natural law. Indeed, they have fixed places *ubi quicquid posset durare creatum*, namely “where they may endure when made” (Trans. by Rouse, p. 237).

\(^{104}\) As I said before, this example made by Galen in the De Usu occurs also in Cicero’s De Nat. Deor., II, 150. There, talking about the providence behind the distribution of the organs within the human body, Balbus claims that the Stoics usually compare the tongue to the quill of a lyre. Therefore, Lucretius’ anti-teleological critique of the analogy organs-artifacts probably has the Stoics as its main target.
Both the lack of a consequential link between the anatomical structure of the parts, their functions and their usefulness and the key role assigned by Lucretius to adaptation are at the core of Galen’s critique of Epicurus’ and Asclepiades’ view on the hand tendons in De Usu, I, 21, 74,6-75,8 K. (I, 54, 10-55, 3 H).

Galen, De Usu, I, 21, 74,6-75,8 K. (I, 54, 10-55, 3 H).

At this point it is proper for us not to pass over the statements of certain men who embrace the doctrines of Epicurus, the philosopher, and Asclepiades, the physician, and who disagree with me on these matters; we should rather examine their teachings carefully and show wherein they are mistaken. These men do not believe that it is because tendons are thick that their actions are powerful, or because they are slender that their actions are weak, but think that actions are what they are as the necessary result of their usefulness in life, and that the size of the tendons depends on how much they are moved; that is, tendons that are exercised in all likelihood thrive and grow thick, whereas those that lie idle get no nourishment and waste away. (Transl. May, I, p. 104-5)

According to this account, the materialists argue that some tendons are thicker than others, not because they are planned to work harder, but because they have worked harder. To them the thickness of hand tendons is therefore the product of the amount of use and not of a provident design. In this passage of De Usu Galen attributes to Epicurus, Asclepiades and their followers the same idea that

---

we find in Lucretius, namely, as he further explains in the following lines, that first come the anatomical structures and then their functions within the process of adaptation:

οὔκουν, ὅτι βέλτιον ἦν τῶν μὲν σφοδροτέρων ἐνεργειῶν ἰσχυροὺς καὶ παχεῖς εἶναι τοὺς τένοντας, τῶν δ' ἀσθενεστέρων ἰσχύοις καὶ ἀρρώστους, οὕτω διαπλασθῆναι φασίν ὑπὸ τῆς φύσεως αὐτῶν – οὐ γὰρ ἃν καὶ πιθήκοις γενέσθαι τοιούτους δακτύλους – ἄλλα, ὡς εἰρηται πρόσθεν, εξ ἀνάγκης ἀκολουθήσαι τοῖς μὲν γυμναζομένοις τὴν παχύτητα, διότι τρέφονται καλῶς, τοῖς δ' ἀργοῦσι τὴν ἰσχνότητα χεῖρον καὶ τούτοις τρεφομένοις.

Hence they say that Nature did not form the tendons as they are because it was better for the tendons of powerful actions to be strong and thick and those of more feeble actions to be thin and weak - for if so, would not have fingers like ours - but, as I have said before, they claim that parts which are exercised necessarily become thick because they are well nourished, and parts that lie idle are poorly nourished and become thin.

(Transl. May, I, p. 105)

Such a mechanistic explanation is also ascribed to certain unidentified followers of the doctrine of Epicurus and Asclepiades (τινὲς τῶν ἀσπαζομένων τοὺς Έπικούρου τε τοῦ φιλοσόφου καὶ Ἀσκληπιάδου τοῦ ἱατροῦ λόγους ἀμφισβητοῦντες ὑπὲρ τῶν τοιούτων λέγουσιν), presumably the Methodists that he considered the medical descendants of the atomists.106

106 Galen mentions again these unnamed followers of the materialists in De Usu, VI, 13, 473, 9-12 K. (I, 345,11-14 H.), within a harsh piece of criticism against Asclepiades’ explanation of the vessels of the lungs (VI, 12, 463-476 K.; I, 338-350 H.). After having defined Asclepiades’ view on the “inverted” structures of pulmonary veins and arteries as “depth idiocy” (VI, 13, 473, 9-12 K. (I, 345,11-14 H.)), Galen claims: νυνὶ δ᾽ ἐπειδὴ τινὲς τῶν μεταχειριζομένων τὰς τοιαύτας αἱρέσεις, ἐφ᾽ οἷς ἐχρῆν αὐτοὺς αἰδεῖσθαι, κομπάζουσιν, ἀναγκαῖον ἠγησάμην ἐξελέξασαι τὸν λόγον, ὅπως μὴ πλείους ἀπατήσειειν; now, however, since certain adherents of this schools of thought are bragging of what should rather shame them, I have thought it necessary to refute their reasoning in order to keep more people from being deceived (Trans. After May, I, p. 312). He refers presumably to those physiologists who were disciples or at least closely influenced by Asclepiades’ medical system. Reading the lines above as a further reference to the Methodists is the most likely interpretation. The Methodical school is certainly the main target of Galen’s criticism, but the usage of the plural “αἱρέσεις” leaves room for one alternative hypothesis. Indeed, the term could refer to both the Methodists and other physiologists that the ancient sources call “Democriteans”, referring to physicians who took inspiration from atomism and
As it often happens in his works, Galen does not seem interested in distinguishing between Epicurus’ and Asclepiades’ doctrines, since his main concern is to criticize the anti-teleological tradition as a

Asclepiades’ corpuscularism and who were not identified as part of the so-called Methodical school. In her book on the transmission of ancient atomism, Gemelli Marciano points out that between the first century BC and the first AD there was a revival of Democritus’ biology within medicine. Indeed, in Tusculanae I, 34, 82 (68 A 160 DK (586 L.): Num igitur aliquis dolor aut omnino post mortem sensus in corpore est? Nemo id quidem dicit, etsi Democritum insimulat Epicurus, Democritii negant) Cicero tells about the Democritii, a small group of physiologists influenced by ancient atomism who are said to have a controversy with the Epicureans on the interpretation of Democritus’ theory of the persistence of sensation and pain in dead bodies. Furthermore, Gemelli Marciano lists two other testimonies that mention these unknown “Democriteans”: Plutarch in Quaestiones Convivales, VIII, 733d 5 where they are named in relation to the explanation of hydrophobia and elephantiasis (these two disease were among the main interests of Themison, who was Asclepiades’ disciple and probably the founder of the so-called Methodical school), and Sextus Empiricus in Adv. Math., 7, 349 (68 A 197 DK; 456 L.), who wrote about their opinion on the location of the intellect within the body. The latter testimony differs from Tertullian account in De Anima 15, 5, in which he attributes the same idea to a physician called Moschion (who lived between 1 BC and 1 AD). The same name occurs also in Galen’s De Diff. Puls., 4, 15 (VIII, 758 K.), in De Comp. Med. Sec. Loc., 1, 2 (XII, 416 K.); 4, 8 (XII, 745 K.) and in De Comp. Med. per Gen., 2, 17 (XIII, 537 K.) where Moschion is described as the one who modified Aslepiades’ definition of σφυγμός (the pulse) and wrote pharmacological recipes. All these references lead Gemelli Marciano to argue that “the Democriteans” were a group of physicians who, even if they did not agree with all the aspects of Asclepiades’ medicine, shared the principles of his corpuscularism and were influenced by the atomistic tradition. Therefore, the expression “τινὲς τῶν μεταχειριζομένων τὰς τοιαύτας αἱρέσεις” in De Usu VI, 473 K. (I, 345 H.) could generally refer to the medical scenario that was closely related to the name of Asclepiades, namely to a context in which divergent interpretations of “medical atomism” were presented. Indeed, as also showed by Gemelli Marciano, in Adv. Math. 7, 349 (68 A 197 DK; 456 L.) Sextus calls the Democriteans as “τινὲς κατὰ Δημόκριτον” in order to mention a specific and well-known group of physicians with no need to name them one by one. Therefore, similarly to Sextus, in both De Usu I, 21, 74,5-7 K. (I, 54, 10-12 H.) and VI, 13, 473, 10 K. (I, 345, 11 H.), Galen probably used the words “τινὲς” and “αἱρέσεις” in reference to these two groups of physicians that developed theories closely related to those of Asclepiades and the atomists. The use and the application of the term “αἱρέσεις” have been reconstructed by J. Glucker, “Antiochus and the Late Academy”, in Hypomnemata 56, Göttingen, 1978 and H. Von Staden, “Hairesis and Heresy: the Case of the Haireseis Iatrikai”, in Jews and Christian Self-definition, vol. III Self-definition in Graeco-Roman World, ed. by B. F. Meyer and E. P. Sanders, London, 1982, p. 76-100. On the Democriteans see L. Gemelli Marciano, Democrito e l’Accademia. Studi sulla Trasmissione dell’Atomismo Antico da Aristotele a Simplicio, Berlin-New York, 2007, p. 6-8; V. Nutton, Ancient Medicine, London-New York, 2004, p. 147 and 196. For a deeper insight into the figure of Moschion see K. Deichgräber, Moschion, RE, Bd. XVI, Stuttgart, 1935, p. 349-50; Mansfeld, Doxography and Dialectic, in ANRW II, 36, 4, Berlin-New York, p. 3165; R. Polito, I Quattro Libri sull’Anima di Sorano e lo Scritto De Anima di Tertulliano, in Rivista di Storia della filosofia 49 (3), 1994, p. 423-68; J. Scarborough, “Moskhōn” in Encyclopedia of Ancient Natural Scientists, ed. by P. Keyser and G. Irby-Massie, London-New York, 2008, p. 563.
whole. Such an attitude does not necessarily mean that Galen ignores the contents and the possible related specificities of both their doctrines of hand tendons, but that which is more relevant to him is to highlight the elements of continuity between Epicurean atomism, which was considered as the anti-teleological theory par excellence, Asclepiadean corpuscularism and Methodical medicine.

Galen’s interest in making the anti-teleological tradition appears as more homogeneous and intransigent as possible\textsuperscript{107} could be read again in the light of a precise strategy of self-presentation. Indeed, as already stated in the section on the genesis and the aftermath of \textit{De Usu}, Galen’s first goal in this treatise is to place himself within the design argument tradition of Hippocrates, Plato and Aristotle and, at the same time, to distinguish and make his own view visible.

In \textit{De Usu}, I, 21 74.6-75.8 K. (I, 54, 10-55, 3 H) Galen’s criticism of Epicurus, Asclepiades and their unnamed followers relies especially on their concept of causation. As the statement ὅτι παχεῖς οἱ τένοντες ἐγένοντο, διὰ τοῦτο καὶ τὰς ἐνεργείας αὐτῶν εἶναι σφοδράς clearly shows, Galen assigns to the final cause the primary role in the generation of the parts. According to him, the arrangement of the parts is always a function of purpose, which means that the thickness of the hand tendons depend on the kind of activity they have to perform. Thus, within the critique of Asclepiades’ theory of the structure of pulmonary vessels, he points out that: πρώτη μὲν γὰρ αἰτία πᾶσι τοῖς γιγνομένοις, ὡς που καὶ Πλάτων ἐπεδείκνυεν, ὃ σκοπός τῆς ἐνεργείας ἐστί; «the first cause of everything that has been formed is the purpose of its action, as Plato has pointed out somewhere»\textsuperscript{108}. The reference is to \textit{Phaedo}, 97c-100a, where Plato admonishes Anaxagoras for not having conceived of the Nous as the ultimate cause of the order of things. According to Plato, only a rational cause can

\textsuperscript{107} This purpose emerges even more clearly in Galen \textit{De Elementis sec. Hipp.}, 60, 3-6 De Lacy (I, 417 K.), when, referring to both Democritus and Epicurus, he claims: οὐδὲ γὰρ ἔτι δεηθησόμεθα τῆς κατὰ μέρος ἐν αὐτοῖς διαφορᾶς, ἂν τὸ καθόλου τε καὶ κοινὸν ἀπασῶν τῶν αἱρέσεων ἀνέλομεν. ὑπόκειται γὰρ ἄπασι τούτοις ἁποιον εἶναι τὸ πρῶτον στοιχεῖον; we shall no longer need the particular differences among them, if we refute what is in general and common to all the schools. It is posited by all of them that the first element is without qualities (Trans. De Lacy, CMG, V, 1, 2, p. 61).

In addition to the atomists, in this passage Galen also lists the corpuscles of Asclepiades and the elements of Diodorus Cronus. Although, as correctly noted by Leith, this could be a sign of the use of doxographical material and therefore of a superficial account of those doctrines, it is also clear evidence of Galen’s interest in manipulating the sources in order to present the atomists and Asclepiades together as part of the same philosophical tradition. According to Leith, this attempt to build a rival tradition should also be understood in terms of Galen’s strategy of self-presentation. See D. Leith, “Galen’s Refutation of Atomism”, in \textit{Philosophical Themes in Galen} ed. by P. Adamson, R. Hansberger, J. Wilberding, London, 2014, p. 214.

explain why it is better that a certain thing would have certain characteristics rather than others. Indeed, the final cause is not just the purpose of the activity for which a part possesses a certain anatomical structure, but it is also the reason that directs its generation towards what is best. Therefore, regarding both the hand tendons and the pulmonary vessels, Galen stresses that there is a necessary and intrinsic connection between the purposive activity and the best possible outcome within the notion of final cause, constructing his own argument against Epicurus and Asclepiades’ anti-teleologism with expressions as (οὔκουν) ὃτι βέλτιον ἦν τῶν μὲν σφοδροτέρων ἐνεργειῶν ἰσχυρούς καὶ παχεῖς εἶναι τοὺς τένοντας, τῶν δ’ ἄσθενεστέρων ἰσχυνοὺς καὶ ἀρρώστους, οὔτω διαπλασθῆναι φασιν ὑπὸ τῆς φύσεως αὐτοῦς and πρώτην αἰτίαν, ὃτι βέλτιον ἦν ἐν τούτω μόνῳ τῷ σπλάγχνῳ στεγανὴν μὲν τὴν φλέβα, μανὴν δ’ εἶναι τῇ ἀρτηρίαν.

The occurrence of ὃτι βέλτιον is paradigmatic of Galen’s rejection of anti-teleologism in *De Usu*, in which he mainly blames the atomists and their followers for having substituted the final cause with the instrumental one, namely for having sacrificed the purposiveness of the anatomical structures to mere accidents. According to Galen, since the quantity of movement that the hand tendons and the pulmonary vessels perform is something contingent and not related to the purpose of their activities, it cannot be considered as the primary cause of their structures and above all it cannot give account for their appropriateness.

In *De Usu*, VI, 12, 465, 1-7 K. (I, 339, 9-13 H.) Galen lists the kinds of causes in a hierarchical scheme that adapts Aristotle’s four causes. Following the Stagirite, he includes final, material, efficient and formal causes and stresses the priority of the first one over the others. But to his

---

109 On Plato’s purposive explanation of the world see also *Timaeus*, 44d-47e.

110 *De Usu* I, 21, 74, 17-75, 2 K (I, 54, 21-24 H): Hence they say that Nature did not form the tendons as they are because it was better for the tendons of powerful actions to be strong and thick and those of more feeble actions to be thin and weak (Trans. May, I, p. 105).

111 Id. VI, 12, 465, 13-15 K. (I, 339, 18-20 H.): first cause, namely, that it was better in this viscous alone for the vein to be dense and the artery loose-textured (Trans. May, I, p. 308).


113 Galen lists five kinds of causes: the final cause ὃτι ἦν γίγνεσθαι τι, namely that for the sake of which a thing is formed; the efficient cause ὃ ἦν γίγνεσθαι, namely that by which something is formed; the material cause ὃς ἦν, namely that from which something is formed; the instrumental cause quoted above and the formal cause τὸ καθ’ ὃ, namely that in accordance with which something is formed. Unlike Aristotle, Galen has a quite ambivalent attitude towards the formal cause, which is mentioned only in this passage of *De Usu* as the last causal category in his list. His lack of interest in the formal cause seems to be confirmed also by the claim εἰ βούλει, that introduces this last cause and gives the impression
predecessor’s list of causes he adds the instrumental cause δι’ οὗ, namely that by means of which something is formed. Although the general pattern of Galen’s account of causation is clearly inspired by Aristotle, his notion of the instrumental cause follows the Middle Platonists and especially Philo of Alexandria, who gives to instruments the status of real and independent causal typology.

Gal., De Usu, VI, 12, 465, 1-7 K. (I, 339, 9-13 H.)

ημεῖς δ’, ὅπως μὴ δόξωμεν ὑπὲρ ὀνομάτων τερθρεύεσθαι, συγχωρήσαντες γένη πλείω τῶν αἰτιῶν ὑπάρχειν, πρῶτον μὲν καὶ μάλιστα, δι’ ὃ γίγνεται τι, δεύτερον δ’, ύφ’ οὗ γίγνεται, καὶ τρίτον, ἐξ οὗ, καὶ τέταρτον, δι’ οὗ, καὶ πέμπτον, εἰ βούλει, τὸ καθ’ ὅ, πρὸς ἕκαστον γένος ἀξιώσομεν αὐτοὺς ἀποκρίνασθαι περὶ πάντων τοῦ ξόου τῶν μορίων, εἴπερ ὄντως εἰσὶ φυσικοί. ημεῖς μὲν γὰρ ἐρωτηθέντες, διὰ τί τοῦ πνεύμονος ἐνήλλακται τῶν ἀγγείων ἡ φύσις, ἀρτηριώδους μὲν τῆς φλεβὸς ἀποτελεσθείσης, φλεβώδους δὲ τῆς ἀρτηρίας, ἀποκρινούμεθα τὴν ὄντως τε καὶ πρώτην αἰτίαν.

But in order to avoid seeming to quibble over names, I grant that there are several kinds of causes: first and most important, that for the sake of which a thing is formed; second, that by which; third, that from which; fourth, that by means of which; and fifth, if you wish, that in accordance with which. We shall expect those who are really natural philosophers to take each one of these causes into account when dealing with all the parts of the body. Now, as for me, when anyone asks me for what purpose the vessels of the lung have exchanged nature, that is to say, why the vein has been made arterial and the artery venous, I shall give the true, first cause (Transl. May, I, p. 308).


114 As Hankinson points out in his work on causation in ancient Greek thought, the addition of the instrumental cause often at the expense of the formal one is typical of so-called Syncretism and especially of Xenocrates (see Proclus, In Parm., 74), Antiochus of Ascalon (see Cicero, Topica, 68-9) and, as already stated above, Philo of Alexandria (see Cher., 125). On this topic see J. Dillon, The Middle Platonists, London-Itacha NY, 1977; Hankinson, 1998, p. 323-63; 379-80.
In *De Usu*, VI, 13, 466,4 K. ff. (I, 340,5 H. ff.) the accusation of having overturned the causal hierarchy in favor of the instrumental cause is directed to Asclepiades alone, who is mocked and said to have based his view on something that is not really a true cause that Galen compares to a “counterfeit drachma”.

However, Galen’s attitude towards the notion of instrumental cause may seem ambiguous, since he adds it to the list of the causal categories\(^{115}\), but at the same time he also downgrades its status and describes the instrumental cause as a kind of secondary cause.

Asclepiades passes by two causes, that derived from the providence of the demiurge, which I have called the first cause, and the second, called the material cause, so to speak, and arrives at a sort of cause which is the most insignificant of all and which I believe anybody versed in the philosophical method would call not a real cause, but one that is contingent or consequential, exactly like a counterfeit drachma. He thinks that he is persuasive and clever, being unmindful, I suppose, of the law of Adrastea, because no other reasoning refutes so well the absurd things he teaches as the very argument which he thinks he has cleverly discovered (Transl. after May, I, p. 309).

In addition to the definition of the instrumental cause as contingent or consequential (κατὰ συμβεβηκός ἢ εξ ἀκολουθίας αἰτίαν), in the sixth book of *De Usu* this causal category is also described as a necessary condition for the effective realization of an action, such as going to the

---

According to Galen, Asclepiades’ theory of causation leads him to argue that the primary cause of going to the market is not its purpose, namely meeting a friend or buying some fruit, but the fact that normally every human being owns two feet with certain anatomical characteristics that make it able to move. Thus, Galen accuses Asclepiades of having attributed to mere tools, that are just actual prerequisites of an action, the role of primary cause.

Unlike his rival, Galen conceives of the instrumental cause as just one of the causes that contribute together with others to achieving a certain result, but he also points out that its role can be interpreted in two different ways: as ἕν οὐκ ἄνευ, μᾶλλον οὐκ αἰτίαν, namely as «one without which [an action cannot be performed], or rather, one that is not [really] a cause»

This means that:

1) the instrumental cause can be understood as a necessary and actual precondition for the construction of an item, namely a tool such as an axe or any other instrument that, as Galen says in De Causis Procatarcticis, VII, 68-69, makes a carpenter able to produce a bed. Indeed, since a

---

116 Gal., De Usu, VI, 12, 464, 7-12 K. (I, 338, 22-339, 10 H.): τοιαυτοῦ οὐδ' ἐπερωτωμένῳ τινὶ τῆς εἰς τὴν ἀγορὰν ἀφίξεως τὴν αἰτίαν ἐπέρωσεν ἀποκρίνεσθαι κάλλιον ἐγχωρεῖ τάσυν παραλιπόντι γελοίος γὰρ ἂν εἴη, εἴ τις ἄντι τὸ φάναι τὸδε τῷ σκεδός ἢ ἀνάδρομον ἀνησυχίαν ἤθελεν ἢ φίλῳ τῷ τὸδε συντυχεῖν ἢ ἀποδόθαι τὸδε τοι, ταύτῃ μὲν παραλίποι, διότι δ' εἰ δοὺς τὸ δόομεν ὡς οἰκισθῇ τῷ ροδίως κατά τῆς γῆς ἀσφαλῶς στηρίζεσθαι, [τούτῳ ἑναλλάξει ἔκατέρω τῶν εἰρημένων ποδῶν] διὰ τοῦτο εἰς τὴν ἀγορὰν ἀφίξεσθαι λέγοι. εἴρηκε μὲν γάρ τινα καὶ οὗτος οὗς αἰτίαν, ἀλλ' οὗ τὴν ὄντως αἰτίαν οὐδετερήσῃ τὴν πρώτῃν, ἀλλ' ὁ ἄργον τοι τῇ ἀργοτέρᾳ μᾶλλον οὐκ αἰτίαν; If, then, anyone asks you why you have come to the market, it is hardly admissible to pass over the real reason and give another more elegant. For it would be ridiculous if a man instead of saying that he had come to buy some articles or a slave, or to meet a friend, or to sell something, should pass over all that and say that he had come to market because he had two feet capable of moving easily and supporting him in safety on the ground. He has, perhaps, given one cause, but not the real, first one; on the contrary, his is an instrumental cause, one without which [an action cannot be performed], or rather, one that is not [really] a cause (Trans. May, I, p. 307-8).

117 Ibid. VI, 12, 464, 14-17 K. (I, 339, 7-10 H.).

118 Galen, De Causis Procatarcticis, VII, 68-69: In humanis itaque artibus universis non convenientibus causis nunquam utique proveniret effectus. Nisi enim esset utilitas lecti, nunquam carpenterius lectum construeret, et si utilitas quidem esset, non autem adesset ei serra et dolabra et terebellum et regula et alia preparation carpentaricorum organorum, ac etiam neque si hoc habeat, lignis vero careat, poterit utique componere lectum, et si organa quidem assint et ligna et utilitas generationis eius proveniret, solus vero artifex absit, non poterit umquam fieri lectus. Ita autem est et in omnibus aliis artibus: gratia enim alicuius agunt omnes et materia etiam aliqua et organum indigent; In no human skillful activity, then, would any result ever come about without a combination of causes. The carpenter would never make a bed unless there were a need for one; and if one were needed, but he had not got a saw, an axe, a gimlet, a rule or the rest of the carpenter’s tool-kit (or if he had them, but no got any wood), he would not be able to construct a bed. Similarly, if
physical tool contributes with its own nature (which is the shape and all the other physical characteristics of its structure) to the construction of the bed, Galen conceives the instrumental cause as a genuine cause.

Therefore, the feet are necessary tools for someone that wants to go to the market, just as the thickness of the hand tendons and that of the pulmonary vein are indispensable structures for the fulfillment of their functions, which are vigorous movements. Unlike Epicurus and Asclepiades, Galen believes that the structures of these parts are the most suitable for hard working and therefore for contributing to the good functioning of the organ and of the body as a whole.

2) The instrumental cause can also have the role of “intermediary stage in a causal sequence”\textsuperscript{119}, namely of a secondary or cooperative cause that does not contribute with its own nature to the achievement of a purpose.

In the \textit{De Diff. Symp.}, VII, 47-8\textsuperscript{120} K., Galen classifies this kind of cause as \textit{συμβεβηκός}, incidental, which is the term that he also uses in \textit{De Usu}, VI, 13, 466, 4-10 K. (I, 340, 5-11 H.) when he gives a

\textsuperscript{119} Hankinson gives this very clear definition in his \textit{Cause and Explanation}, 1998, p. 381.

\textsuperscript{120} Gal., \textit{De Diff. Symp.}, VII, 47,16-8 K.: \textit{τὸ δ' ἐκ τῆς ἑαυτοῦ φύσεως εἰσφερόμενον τινα τῷ γινομένῳ μοῖραν τῆς γενέσεως αἴτιον αὐτὸν λέγεται. πλείω δ' ἐστὶ ταῦτα κατὰ γένος· ἢ τε γὰρ ὑλή καὶ ὁ σκοπὸς καὶ τὸ ὄργανον καὶ τὸ ὄργανον καὶ τὸ ὄργανον καὶ ὧν ἡ ἀρχὴ τῆς κινήσεως. ἐκατοστὸν γὰρ τούτων εἰσφέρεται τινα τῷ γινομένῳ συντέλειαν· τὰ δ' οὐδὲν μὲν εἰσφερόμενα, μὴ χορηζόμενα δὲ τῶν εἰσφερόμενων, τὸν ὧν ὑπὸ ὁνόματι λόγον ἐπέχει. τούτων οὖτως ἐχόντων, ἐνδέχεται τινα στίχον αἰτιῶν γενέσθαι πολλάκις ἀλλήλως διαδεχομένων, ὡς οἷς καὶ γεγονός ἡ ἐπικρίνει τὰ τῶν εἰσφερόμενων ἀλλήλως καὶ τὸ ὄργανον καὶ ὧν ἡ ἀρχὴ τῆς κινήσεως. οὕτως ἀκολούθησαν τοῖς πρώτοις, τὰ δὲ πρῶτα ἄποικα περιστασίας ἐχειν· εἰ μὴ τοῖς διορίζοντος τοῦ κατὰ συμβεβηκός ποιεῖν λεγομένου τὸ καθ' ἑαυτό, πάμπολλά τε καὶ ἀτοπώτα ταῦτα συμπεσεῖται τοῖς λόγοις ἁμαρτήματα. σημαίνει δὲ ταύτων τὸ μὲν καθ’ ἑαυτὸ τῷ πρώτῳ, κἂν εἰ τινὲς τῶν ἀντίκεισθιν φιλότοιον τοῦνομα, τὸ δὲ κατὰ συμβεβηκός τῷ δευτέρῳ· That which form its own nature contributes some part of the genesis of [something] by its occurrence is called its cause. There are a number [of causes] according to class: the material, the useful, the objective, the instrumental and that from which there is the origin of movement. Each of these contributes some joint action to what happens, whereas those which contribute nothing, yet are not separate from those that do, hold the relation of “those not without”. These things being so, it is often possible when causes succeed one another for a certain series to occur, as when many small stones are placed next to each other and someone moves the first one, this [moves] the second, and that the third, and so on in order, each [moving] the one adjacent to it. In all such things, unless one distinguishes that which is said to act \textit{per se} form that which acts \textit{per accidens}, many very absurd errors will occur in the arguments. Moreover, \textit{per se} signifies the same as “primary”, even if some Atticizers avoid the term, whereas
definition of Asclepiades’ instrumental cause. According to Galen, indeed, Epicurus’ and Asclepiades’ instrumental cause is more similar to a mere side effect, which is that of a line of billiard balls placed next to each other that move one another when the cue hits the first ball. The incidental cause is therefore that of the third ball that *per accidens* moves the fourth towards the fifth one. This means that, since the third billiard ball is not in direct contact with the primary cause and it is indirectly put in motion by that, it can in turn effect the fourth one only secondarily. Thus, in addition to the role of tools that contributes to fulfill their functions, the thinness and thickness of hand tendons and pulmonary vessels are also side effects of the amount of movement that they perform, namely secondary effects of their activities.\(^{121}\)

In *De Usu*, I, 21, 74,6-75,8 K. (I, 54, 10-55, 3 H), Epicurus and Asclepiades are said to argue that the size of hand tendons is directly proportional to how much they are exercised, which also means that the thick tendons are those that perform activities found by experience more useful to the body as a whole. Asclepiades applies the same principle to the case of the enigmatic structures of the pulmonary vessels. Indeed, the lungs are the only organ in which the artery and the vein have “exchanged structures”: the artery, that elsewhere is always thicker than the vein and carries *pneuma*, has a thin structure, while the vein has thicker one. Due to their unusual structures, the ancient physiologists called the first “the venous artery” and the latter “the arterial vein”.

In *De Usu*, VI, 466, 15-467, 11 K. (I, 340, 15-341, 3 H.), Galen gives an account of Asclepiades’ explanation of the pulmonary vessels pointing out that, according to his rival, both their structures are due to the lungs motion. Also in this case, the features of the anatomical structures are described by Asclepiades as secondary effects of the amount of movement:

\[
\text{διότι γάρ, φησίν, ἐν τῷ πνεύμονι μόνῳ τῶν ἀπάντων ὄργανων αἱ μὲν ἀρτηρίαι διπλῆν κινοῦνται κίνησιν, ἣν τ’ οἴκοθεν ἔχουσιν ἐκ τῆς σφετέρας αὐτῶν οὐσίας, σφύζουσα δηλονότι, καὶ ἣν ἐκ τοῦ τῆς ἀναπνοῆς ἔργου, σειομένου διὰ παντὸς τοῦ πνεύμονος, ἔπικτώνται, διὰ τοῦθ’ ύπερπονοῦσα καταλεπτύνονται, τῶν ἐν τοῖς ἄλλοις μορίοις ἀρτηριῶν}
\]

αὐτάρκως κινουμένων τὴν οἰκείαν κίνησιν οὖσαν μίαν καὶ διὰ τοῦτ’ εὔτραφῶν τε καὶ ἰσχυρῶν γιγνομένων. αἱ δὲ φλέβες, φησίν, αἱ μὲν καθ’ ὅλον τὸ ζώον ἀκίνητοι μένουσαι δίκην ἀνδραπόδου τινὸς ἀργοῦ καὶ ἀγυμνάστου, δικαίως ἀτροφοῦσι· αἱ δὲ κατὰ τὸν πνεύμονα τὴν τοῦ σπλάγχνου κίνησιν ἐπικτησάμεναι παχύνονται παραπλησίως τοῖς τὰ μέτρια γυμναζομένοις.

Now of all the instruments, he says, the lung is the only one in which the arteries have two motions, one of which is proper to them and derived from their own substance, that is, the pulse; the other they acquire from the act of respiration, since the lung is always in motion. For this reason the arteries of the lung labor excessively and grow very thin, whereas in the other parts of the body they move moderately with only their one proper motion and thus become well nourished and strong. The veins throughout the body, on the other hand, he continues, remain without motion and so logically waste away like a lazy slave that takes no exercise, but those in the lung acquire the motion of this viscus and so grow strong like persons who exercise moderately (Transl. May, I, p. 309).

Galen attributes to Asclepiades the idea that the venous artery is subjected to a quantity of motion which is twice that of all the other arteries in the body, while the arterial vein is the only vein that moves. Indeed, in addition to its own pulsation, the venous artery receives also movement from the lungs, while the arterial vein is exercised only by the respiratory activity. Thus, the excessive amount of movement would decrease the size of the artery, while the motion of respiration would make the vein thicker than usual.

Both in the case of the hand tendons and the pulmonary vessels Galen stresses the fact that the anti-teleologists base their theories on an inverted view of causation, namely, as already mentioned in this chapter, on the assumption that first came into being the parts and only later, by chance and experience, they found out their functions and usefulness. Epicurus and Asclepiades explain the features of the parts according to a causal sequence that lacks a final cause:

(A) (1) anatomical structures - (2) activity of the parts - (3) usefulness;

while Galen follows the teleological sequence:
(B) (1) usefulness (established by the rational design of the demiurge/Nature)-(2) anatomical structures - (3) activity of the part.

In addition to the reversed nature of causation outlined above, Galen’s testimony seems to attribute to the atomists a second kind of causal sequence when he discusses the mechanical effects that the amount of motion is able to produce on the structures of the parts. In fact, regarding both the hand tendons and the pulmonary vessels Galen seems to suggest a continuation of the causal sequence held by Epicurus and Asclepiades, as follows:
(C) (4) usefulness - (5) activity- (6) anatomical structures.

Taking the hand tendons as an example, the atomists argue that, once established that the flexibility of the fingers makes them useful for grasping objects of different shapes (A), the human being begins to perform that kind of activity much more often. Thus, the increased amount of movement exercises the tendons and causes changes in their structures (they become thicker) (C), which means that the bodily parts achieve their actual features only after having discovered their usefulness by experience. Therefore, in Galen’s account the evolutionary explanation held by Epicurus and Asclepiades relies on a “reversed”\textsuperscript{122} causal sequence, in which one may distinguish two stages of adaptation: the first one (A) that presumably happens early in human life and establishes that, similar to mere tools, the hands are adapted to perform certain activities which are very useful in terms of human survival\textsuperscript{123}; while the second stage (C) refers to the capacity of mechanical side effects to increase the suitability of the parts (“the size of the hand tendons depends on how much they are exercised”\textsuperscript{124}).

As I will try to show, this double level of adaptation shares significant similarities with the pattern of the origin of species held by Lucretius in the fourth and especially in the fifth book of \textit{De Rerum Natura}.

Lucretius conceives the generation and the development of the creatures in two rounds of adaptation by extinction in a context of struggle for life, which determines the survival of the fittest. This means that only animals and humans with suitable anatomical and behavioral features can survive, since

\textsuperscript{122} As said previously, in \textit{De Usu} Galen criticizes Epicurus and Asclepiades for having substituted the final cause with the instrumental one and therefore having placed the latter at the top of the hierarchy of the causal categories.

\textsuperscript{123} Gal., \textit{De Usu}, I, 21, 74, 12-3 K. (I, 54, 18-9 H.).

\textsuperscript{124} Ibid. 74, 13-17K. (I, 54, 19-29 H.) and 75, 4-6 K. (I, 55, 2-5 H.).
they are the creatures able to escape dangers and to satisfy their own necessities in a certain kind of environment.

Even if not explicitly, the Galenian testimony on Epicurus and Asclepiades’ theories of hand tendons and pulmonary vessels would therefore seem to refer to some fundamental aspects of the Epicurean zoogony and to give account of their application within medicine.

1.4 Two Notions of Suitability.

Like previous scholars, I use some terms typical of modern evolutionary biology as “adaptation by extinction”, “struggle for life” or “survival of the fittest” in order to clarify the nature of the Epicurean notion of suitability and the role that it plays within the mechanical process of adaptation of the bodies to their environment. But I never use terms such as these in a Darwinian sense and I do not intend to present Lucretius, Epicurus and Asclepiades as evolutionists ante litteram, since there are enormous differences between modern Evolutionism and the Epicurean evolutionary view of nature. Although Lucretius conceives the survival of the fittest creatures as the outcome of a process of adaptation by extinction, in the fifth book of De Rerum Natura he also places that idea within the context of a fixed view of the species, which means one species does not change into one another. This example shows that any comparison with Darwinian Evolutionism has to be made with certain clear limits and distinctions.

On the other hand, the careful employment of modern evolutionary language helps to elucidate the reason for Galen’s harsh criticism of the atomists, since his rejection mainly relies on their opposite understanding of the concept of suitability within biology. Suitability is the key-concept of both their patterns and, at the same time, the main cause of their controversy.

Galen conceives of the suitability of the parts to perform their activities as providential, whereas Lucretius’s sees it as something totally spontaneous. Indeed, in De Rer. Nat, V, 845-856 the generation of viable and monstrous creatures is described as purely accidental, since they both depend on a random aggregation of atoms. Even though Lucretius does not say it explicitly, it can be

easily inferred that, unlike the monsters, the viable creatures are those produced by compounds of suitable particles, namely of atoms that fit together.

1.4.1 Lucretius on spontaneous generations of suitable and monstrous bodies, and their adaptation by extinction

After having argued that even the heavenly bodies and their movements are not products of a divine cause, in *De Rer. Nat.*, V, 780-877 Lucretius deals with the origin of life. According to the poet, who preserves the fullest account of the Epicurean zoogony, the first living beings came out from the earth during her youth, when she was at the peak of her fecundity. The fertility of the earth was due

126 For the application of the Darwinian expression “adaptation by extinction” to Lucretius’ mechanistic account of the origin of the species, see Campbell, 2000 and 2003.

127 Lucr., *De Rer. Nat.*, V, 76-81: *Praeterea solis cursus lunaeque meatus expediam qua vi flectat natura gubernas; ne forte haec inter caelum terramque reamur libera sponte sua cursus lustrare perennis morigera ad fruges augendas atque animantis, neve aliqua divum volvi ratione putemus*; Besides, I will explain by what force pilot nature steers the courses of the sun and the goings of the moon; lest by any chance we think that these between heaven and earth traverse their yearly courses free, of their own will, and obliging for the increase of crops and of animals, or deem them to revolve by some plan of the gods (Tranls. Rouse, p. 385). According to Lucretius, the courses of the heavenly bodies are explained in terms of the same mechanistic process that has produced all the existing things. This means that the heavenly movements are due to the same atomistic principles that are at the base of the cosmos (as is clearly pointed out in verse V, 77 *qua vi flectat natura gubernas*). Like everything else indeed, the earth, the moon and all the other heavenly bodies do not have a divine nature and are destined to perish (on the mortality of the heavenly bodies see V, 107-9: *quod procul a nobis flectat fortuna gubernans, et ratio potius quam res persuadeat ipsa succidere horrisono posse omnia victa fragore*; but may pilot fortunate steer this far from us, and may pure reason rather than experience persuade that the whole world can collapse borne down with a frightful-sounding crash. And especially: V, 113-6 *multa tibi expediam doctis solacia dictis, religion refrenatus ne forte rearis terras et solem et caelum, mare sidera lunam, corpore divino debere aeterna manere*; I will expound to you many consolations in words of wisdom; lest by some chance bitted and bridled by superstition you think that earth and sun and sky, sea, stars, and moon are of divine body and must abide for ever Trans. Rouse, p. 387).

Therefore, since the cosmos is a compound of atoms exactly like every other body in the universe, it cannot be eternal, which means that it will exist only until the entanglement of particles from which it was generated will break.

On the same topic see also Epicurus’ *Hdt.*, [2], 76, 8-77, 11 Arrighetti, where he argues that the cosmos is not the outcome of a divine plan and therefore no heavenly phenomenon is ruled by a superior rational demiurge. Following Usener, Arrighetti reads this passage as a critique of the theology of the Academy and, similar to Bailey’s interpretation, especially of Plato’s *Timaeus*, 39-40, in which the demiurge is said to create the orderly movements of the heavenly bodies according to a heliocoidal orbit. On this interpretation see Epicuro, *Opere*, ed. by G. Arrighetti, Torino, 1973, p. 522; H. Usener, *Epicurea*, Lipsia, 1887, p. 380; C. Bailey, *Epicurus: The Extant Remains*, Oxford, 1926, p. 249-51.

128 On this topic see also Epicurus, fr. 333 Us.
to the presence of considerable amount of heat and moisture, which are identified by Lucretius as the two instrumental conditions for the origin of all kinds of creatures:


*Tum tibi terra dedit primum mortalia saecla.*

*Multus enim calor atque umor superabat in arvis.*

The earth, you see, first gave forth the generation of mortal creatures at that time, for there was great abundance of heat and moisture in the fields.

(Transl. by Rouse, p. 441)

The spontaneous generation of life from the earth was a very common belief among the ancient thinkers\(^{129}\), shared even by many teleologists. In *De Usu* Galen also describes the animals as emerged from the earth thanks to the heat and the moisture, but especially to the activity of an external and intelligent cause.

Gal., *De Usu*, XVII, 358, 13-359, 8 K. (II, 446, 8-23 H.)

\[\text{τίς δὲ οὐχ ἂν εὐθὺς ἐνθυμηθείη νοῦν τινα δύναμιν ἐχοντα θαυμαστὴν ἐπιβάντα τῆς γῆς ἐκτετάσθαι κατὰ πάντα τὰ μόρια; πανταχόθι γοῦν ὁρᾶται γιγνόμενα ζῷα θαυμαστὴν ἅπαντα κατασκευήν ἐχοντα. καὶ τοῖς ἄλλοις δὲ κανταῦθα φαίνεται νοῦς τις ἀπὸ τῶν ἄνω σωμάτων, ἔτει καὶ ἔθεσαμένοιν τινὰ παραχρῆμα θαυμάζειν ἐπέρχεται τὸ κάλλος τῆς οὐσίας, ὡς μὲν πρῶτα καὶ μάλιστα, μετὰ αὐτὸν δὲ σελήνης, εἶται τῶν ἀστέρων, ἐν οἷς εἰκός, ὡς εἰκός, ὡς ὁ ἄνθρωπος ἀναλάμαθε καὶ οὐκ ἂν οὐκ ἦν παρά νότια καὶ καθαρότερα, καὶ τῶν νοῦν ἐνοικεῖν πολὺ τοῦ κατὰ τὰ γήινα σώματα βελτίω τε καὶ ἀκριβέστερον. ὅσον γὰρ ἐν ἐλώι καὶ βορβόρῳ καὶ τέλματι καὶ φυτοῖς...}\]

\(^{129}\) The belief in the spontaneous generation of living beings from the earth was spread especially among the Presocratics, as showed by the fragments of Anaximander (12 A 30 DK), Anaxagoras (59 A 1), Empedocles (31 B 57, 59, 6, 71 DK) and Democritus (68 A 139 DK). See also Arist., *Metaph.*, 1032a 12-b 1; *Hist. Anim.*, 551a 1-552b 25 and 569a 11-570a 23; *De Gen. Anim.*, 762a 8-b 28. Therefore, Lucretius’s account of spontaneous generation relies on a long and well-established tradition. On the occurrence of this notion in the ancient sources, see Campbell, “Appendix A”, 2003, p. 331-3 and Schrijvers, 1999, p. 9 ff.
καὶ καρποῖς σηπομένοις ὅμως ἐγγίγνεται ζῷα θαυμαστὴν ἔχοντα τὴν ἔνδειξιν τοῦ κατασκευάσαντος αὐτὰ νοῦ, τί χρὴ νομίζειν ἐπὶ τῶν ἄνω σωμάτων;

Who would not straightway conclude that some intelligence possessed of marvelous power was walking the earth and penetrating its every part? For you see everywhere that the animals produced all have a marvelous structure. And yet, what part of the universe is more ignoble than the earth? Nevertheless, even here there appears to be some intelligence reaching us from the bodies above, and anyone seeing these is at once forced to admire the beauty of their substance, first and foremost that of the sun, after the sun that of the moon, and then of the stars. It is reasonable to suppose that the intelligence dwelling in them is as much better and more perfect than that in earthly bodies as their bodily substance is the purer. For when in mud and slime, in marshes, and in rotting plants and fruits animals are engendered which yet bear a marvelous indication of the intelligence constructing them, what must we think of the bodies above? (Transl. May, II, p. 729-30).

In this passage, the spontaneous generation\textsuperscript{130} is due to a pervasive divine power that, similarly to the pneum\textsuperscript{a} of the Stoics, penetrates and produces everything in the cosmos. This divine mixture of air and fire permeates all matter and gives account for all the bodies, from the animals that emerge from mere mud to the heavenly bodies that have purer substances and are at the top of Galen’s scal\textit{a} naturae.

Like the Stoic Balbus in the second book of Cicero’s \textit{De Nat. Deor.}\textsuperscript{131}, Galen also attributes to this all-pervasive principle a great intelligence, which is mirrored in the usefulness of all the parts of

\textsuperscript{130} In the \textit{De Usu} Galen describes spontaneous generation as a phenomenon that still arises in the areas where the earth is particularly moist. Galen mentions the notion of spontaneous generation also in \textit{De Caus. Procat.}, VII, 81-2.

\textsuperscript{131} As shown in the following quotations from Cicero’s \textit{De Nat. Deor.}, II, IX, there are some significant parallels between Balbus’ and Galen’s accounts. Referring first to Cleanthes, Chrysippus, Zeno and then to Posidonius, Balbus goes through all the main principles of Stoic theology. In his long speech, he uses some arguments that we also find in Galen, 17, 358-9 K. (II, 446-7 H.), even if summarized and mixed all together: 1) the pervasive and cohesive power that, thanks to its divine intelligence and its vital heat, produces and maintains the cosmos. \textit{De Nat. Deor.}, II, IX, 24-25: \textit{Omne igitur quod vivit, sive animal sive terra editum, id vivit propter inclusum in eo calorem. Ex quo intellegi debet eam caloris naturam vim habere in se vitalem per omnem mundum pertinentem. Atque id facilius cernemus toto genere hoc igneo quod tranat omnia subtilius explicato. Omnes igitur partes mundi (tangam autem maximas) calore fultae sustinuntur. Quod primum in terra natura perspici potest; Therefore every living thing, whether animal or vegetable, is alive on account of the heat.
creatures’ bodies and, even more so, into the ordered motion of the stars\textsuperscript{132}. Therefore, the scale of existence held by Galen reveals the highest grade of intelligence owned by the divine cause that has shaped and maintained the cosmos. According to Galen, the marvelous suitability of the bodily parts reveals the teleology of nature and then the providence of its designer. This also means that, as Galen himself points out in \textit{De Usu}, XII, 360, 13-14 K. (II, 447, 20-448 H.), the study of biology leads to theology\textsuperscript{133}.

enclosed with it. From this it must be understood that the element heat has within itself a vital power which pervades the whole world. We shall recognize this more readily from a more detailed account of this all-penetrating fieriness in its entirety. All parts of the world (I shall speak only of the greatest) are supported and maintained by heat. This can be seen first in the element earth. The same view is also offered in II, X, 28-29 and II, XXII, 57; 2) The nature and the ordered movement of the heavenly bodies as evidence for the existence of a rational design. \textit{De Nat. Deor.}, II, XVI, 43

\textit{Sensum autem astrorum atque intellegientiam maxume declarant ordo eorum atque costantia; nihil est enim quod ratione et numero moveri possit sine consilio, in quo nihil est temperarium nihil varium nihil fortuitum;} Again, the consciousness and intelligence of the stars is most clearly evinced by their order and regularity; for regular and rhythmical motion is impossible without design, which contains no trace of casual or accidental variation (Trans. Rackham, p. 161-2). On this view cf. also II, XV, 39. Furthermore, in the pages of book two on the description of the motion of heavenly bodies (\textit{De Nat. Deor.}, II, XIX-XXII), the sun, the moon and the stars are named in the same order that we find in Galen’s account.

\textsuperscript{132} On the interpretation of this passage of the \textit{De Usu} see Donini, 1980, p. 333-57 who, followed also by Frede, attributes to Galen’s demiurge a Middle Platonic background. This reading is not shared by Moraux, who criticizes Donini for having excessively schematized Galen’s theology and also for not having given enough importance to its agnosticism. See M. Frede, 2003, p.73-126; Moraux, 1984, p. 771-3. The relationship between Galen and Middle Platonism has also been recently discussed also by Chiaradonna in “Galen and Middle Platonism”, in \textit{Galen and the World of Knowledge} ed. by C. Gill, T. Whitmarsh and J. Wilkins, Cambridge, 2009, p. 243-60. Unlike Donini and Frede, Chiaradonna argues that, even though Galen was well acquainted with the Platonism of his time, he should not be considered as a Middle Platonist.

\textsuperscript{133} Galen, \textit{De Usu}, 17, 360,7-14 K. (II, 447, 14-448 H.): ὡς, δότης γε ἑλευθέρα τῇ γνώμῃ σκοπεῖται τὰ πράγματα, θεασάμενος ἐν τοσούτῳ βορβόρῳ σαρκῶν τε καὶ χυμῶν ὅμως ἐνοικοῦντα νοῦν, ἰδὼν δὲ καὶ ζῴου κατασκευὴν ὅτου δή – πάντα γὰρ ἐνδειξὶν ἔχει σοφοῦ δημιουργοῦ – , τὴν ύπεροχὴν ἐννοήσει τοῦ κατὰ τὸν οὐρανὸν νοῦ· καὶ τὸ δοκοῦν αὐτὸν σμικρὸν ἐννα πρότερον, ἢ περὶ χρείας μορίων πραγματεία, θεολογίας ἀκριβοῦς ἀληθὸς ἀρχὴ καταστήσεται, πολὺ μείζονός τε καὶ πολὺ τιμιωτέρου πράγματος ὅλης τῆς ἱστορίας; Thus, when anyone looking at the facts with an open mind sees that in such a slime of fleshes and juices there is yet an indwelling intelligence and sees too the structure of any animal whatsoever - for they all give evidence of a wise demiurge - he will understand the excellence of the intelligence in the heavens. Then a work on the usefulness of the parts, which at first seemed to him a thing of scant importance, will be reckoned truly to be the source of a perfect theology, which is a thing far greater and far nobler than all of medicine (Trans. After May, II, p. 731).
Unlike Galen, Lucretius describes the spontaneous generation of mortal creatures as a double-cycle process, in which the randomness of the atomic entanglements is the only reason for both the successes and failures of nature, namely for the genesis of both viable and monstrous bodies.

According to Lucretius, the beginning of the world was an era of abundance in which the fields were fertile (mollia terrae arva\textsuperscript{134}), nature was lush and the life of the living beings extremely easy. In this idyllic picture, the earth is described as so fecund as to be able to give birth to a large number of mortal creatures, grown in rooted wombs until they were well formed and ready to start their lives\textsuperscript{135}. The characteristics of this early golden era contrast with those of the earth’s later stage of decline.

Indeed, employing the traditional earth-mother analogy\textsuperscript{136}, Lucretius compares the softness and the fecundity of the young earth to that of a young woman’s body, while he likens the second stage of earth’s life to that of a mature woman. The mature earth was still capable of spontaneous generations of mortal beings, but she did it with less intensity and success. Indeed, in V, 837-50 the earth is said to generate at random both monstrous and healthy creatures, namely portenta\textsuperscript{137} with malformed limbs as well as humans and animals with

\textsuperscript{134} Lucr., De Rer. Nat., V, 780-2.

\textsuperscript{135} Id., V, 807-19: Hoc ubi quaeque loci region opportune dabantur, crescebant uteri terram radicibus apti; quos ubi tempore mature patetecerat aetas infantum fugiens umorem aurasse petessens, convertebat ibi natura foramina terrae et sucum venis cogebat fundere apertis consimilem lactis, sicut nunc femina quaeque cum peperit, dulci repletur lacte, quod omnis impetus in mammis convertitur ille alimenti. Terra cibum pueris, vestem vapor, herba cubile praebet multa et mollis lanugine abundans. At novitas mundi nec frigora dura ciebat nec nimio aestus nec magnis viribus auras;

\textsuperscript{136} Id., V, 795-6: ut merito maternum nomen adepta terra sit, e terra quoniam sunt cuncta creata; therefore, the earth deserves the name of mother which she possesses, since from the earth all things have been produced (Trans. by Rouse, p. 441). The reference to the earth-mother analogy occurs also in V, 780-2: nun redeo ad mundi novitatem et mollia terrae arva, novo fetu quid primum in luminis oras tollere et incertis creerint committere ventis; I now return to the world’s infancy and the soft fields of earth, to tell what first they thought fit to bring forth into the regions of light with new birth-throes and to commit to the wayward winds (Trans. Rouse, p. 439).

\textsuperscript{137} The spontaneous generation of portenta in the early prehistory is also mentioned by Lucretius in V, 69-70, where he summarizes all the topics that he deals with in the course of the book on the origin of species: tum quae tellure animantes extiterint, et quae nullo sint tempore natae; then what animals arose from the earth, and what have never been born at
viable bodies. Lucretius, following in Empedocles’s footsteps, tells about creatures that came into being without hands, or feet, or eyes, or mouth, or reproductive organs, or limbs not completely separated from the rest of the body. Those malformations do not permit the possibility of a long-term survival of *portenta* preventing them access to food and the possibility of performing all the fundamental activities necessary to ensuring their wellness. Unlike the healthy creatures, they cannot feed nor reproduce themselves and therefore not even generate new species.

Thus, in V, 845-50 Lucretius conceives the presence of certain anatomical structures as the first conditions for creatures’ survival, which also means that he recognizes the suitability of the parts as that which makes animals and humans able to overcome the mechanism of natural selection by extinction:


\[\text{Cetera de genere hoc monstra ac portenta creabat,}\]

\[\text{nequiquam, quoniam natura absterruit auctum}\]

nec potuere cupitum aetatis tangere florem
nec reperire cibum nec iungi per Veneris res.
Multa videmus enim rebus concurrere debere,
ut propaganda possint procudere saecla.

So with the rest of like monsters and portents that she made,
it was all in vain; since nature banned their growth,
and they could not attain the desired flower of age
nor find food nor join by the ways of Venus.
For we see that living need many things in conjunction,
so that they may be able by procreation to forget out the chain of the generations.
(Transl. by Rouse, p. 445)

Unlike Galen and others of the teleological tradition, in De Rerum Natura nature is explicitly and provocatively said to have acted in vain, namely, metaphors aside, to be the scenario of an uncontrolled mixture of random fruitful and unfruitful generations.
In Lucretius’ view the notions of nature and the role that suitability plays in it are completely overturned, and the golden commandment “nature does nothing in vain” held by Aristotle and Galen is clearly broken. The suitability of the parts is no longer the primary evidence of a teleological pattern within biology, but is conceived as the first condition for a randomly determined adaptation of creatures to their environment.
In addition to their physical characteristics, the survival of early viable creatures depends also on their behavioral features, namely on their innate capacity to act in ways that make them able to take advantage of other living beings. In V, 857-77 Lucretius lists strength, quickness, courage, cunning and usefulness for human beings as the main qualities that enable certain animals to escape dangers and to preserve their species. Therefore, even the creatures that are physically healthy can easily

---

138 Lucr., De Rer. Nat., V, 857-70: Nam quaecumque vides vesci vitalibus auris, aut dolus aut virtus aut denique mobilitas est ex ineunte aevo genus id tutata reservans. Multaque sunt, nobis ex utilitate sua quae commendata manent, tutelage tradita nostrae. Principio genus acre leonum saevaque saecla tutatast virtus, vulpis dolus et fuga cervos. At levisomna canum fido cum pectore corda et genus omne quod est veterino semine partum lanigeraeque simul pecudes et bucera saecla omnia sunt hominum tutelage, Memmi. Nam cupide fugere feras pacemque secuta sunt et larga suo sine pabula parta labore, quae damus utilitatis eorum praemia causa; For whatever you see feeding on the breath of life, either
perish if they lack suitable behaviors. Lucretius identifies the absence of behavioral features appropriate to the struggle for life in a competitive environment, together with unserviceable bodily parts, as that which prevents the survival of the creatures. Indeed, in the poem the physical malformations and the unadapted innate behavioral tendencies play the role of *fatalia vincla*:


*At quis nil horum tribuit natura, nec ipsa sponte sua possent ut vivere nec dare nobis utilitatem aliquam quare pateremur eaorum praesidio nostro pasci genus esseque tutum, scilicet haec alii praedae lucroque iacebant indupedita suis fatalibus omnia vinclis, donec ad interitum genus id natura redegit.*

But those to which nature gave no such qualities, so that they could neither live by themselves at their own will, nor give us some usefulness for which we might suffer them to feed under our protection and be safe, these certainly lay at the mercy of others for prey and profit, being all hampered by their own fateful chains, until nature brought that race to destruction. (Transl. by Rouse, p. 447)

It can be said, then, that the possibility of a creature’s survival relies on a mechanism of adaptation that, in turn, is determined by the combination of two main factors: the suitability of both the cunning or courage or at least quickness must have guarded and kept that kind form its earliest existence; many again still exist, entrusted to our protection, which remain, commended to us because of their usefulness. Firstly, the fierce brood of lions, that savage tribe, has been protected by courage, the fox by cunning, by swiftness the stag. But the intelligent dog, so light of sleep and so true of heart, and all the various kinds which are sprung from the seed of beasts of burden, woolly sheep also, and horned breeds of oxen, all these have been entrusted to men’s protection, Memmius. For these have eagerly fled from the wild beasts, they have sought peace and the generous provision gained by no labour of theirs, which we give them as the reward of their usefulness (Trans. Rouse, p. 445-7).
anatomical structures and the behavioral features, that animals and human beings possess by chance since birth.

Thus, in book V Lucretius seems to indicate two levels of adaptation by extinction:
1) The extinction of individuals born without suitable bodily parts to guarantee their feeding and reproduction.
Indeed, given both their malformed anatomical structures and especially their lack of some fundamental organs\textsuperscript{139}, the early \textit{portenta} die almost immediately and cannot found species.
2) The extinction of entire species which are physically viable, but that do not have any of the skills necessary for surviving in a context of struggle for life.

According to Lucretius, the species that overcome natural selection reach biological stability and become fixed. This means that, once the second round of adaptation by extinction of entire species is completed, there is no possibility for the generation of new kinds of creatures or for any change of existing species into another. The fixed species continue to reproduce themselves with the same characteristics\textsuperscript{140}, namely with those features that have been selected by the mechanism of adaptation in prehistory.

This means that, beyond the crucial role played by the process of adaptation by extinction and the consequent selection of the fittest, Lucretius’ evolutionary theory of nature is placed in the context of the fixity of the species.

As Campbell\textsuperscript{141} underlines, the first level of adaptation concerns only physical features, while the second relies especially on behavioral qualities. In the latter round of his evolutionary hypothesis, Lucretius introduces the relationship between the creatures and their environment as a fundamental aspect of their survival. The mechanism of adaptation by extinction selects the fittest, which means it


\textsuperscript{140} According to Epicurean embryology, the stability of the species is ensured by sexual reproduction. Both parents transmit their atomic combination (namely the one of their species) through the seed to their offspring. This mechanism ensures the fixity of the species, preventing modification of their fundamental atomic pattern. Therefore, despite the further physical modifications determined by the lifestyle and the cultural development, the species maintain their stability. On this topic see A. Schiesaro, \textit{Simulacrum et imago. Gli argomenti analogici del De rerum natura}, Pisa, 1990, p. 103; Schrijvers, 1999, p. 5; Campbell, 2003, p. 133.

\textsuperscript{141} Id., p. 119-38.
preserves only those species with useful characteristics in terms of the struggle for life. And, of course, even human beings are among those selected species.

In V, 925 ff. Lucretius shows that the generation of humans is not very different from any other species. As mentioned before, the first humans are described as beast-like creatures, physically strong and without any art that can make their lives easier, safer, more comfortable and different from those of the animals. Only later, when human beings started to cooperate with each other in order to gain mutual advantages and discovered by chance the use of fire, their life-style and their bodily constitution changed and became those we see today. This means that Lucretius conceives a cooperative life and the arts as the preconditions for a further step in the process of adaptation, which occur only within the human species and does not affect the fixity of his general pattern. Human beings modify their bodies and their behaviors in response to the acquisition of technologies and new habits, but this additional process of adaptation does not cause the generation of new species or the evolution into another species.


*At genus humanum multo fuit illud in arvis durius, ut decuit, tellus quod dura creasset, et maioribus et solidis magis ossibus intus fundatum, validis aptum per viscere nervis, nec facile ex aestu nec frigore quod caperetur nec novitate cibi nec labi corporis ulla.*

*Multaque per caelum solis volventia lustra vulgivago vitam tractabant more ferarum.*

And the human kind at that time was much hardier on the land,

142 See Lucre., De Rer. Nat., V, 953-7: *Necdum res igni scibant tractare neque uti pellibus et spoliis corpus vestire ferarum, sed nemora atque cavos montis silvasque colebant et frutices inter condebant squalida membra verbera ventorum vitare imbrisque coacti;* Not yet did they know how to work things with fire, nor to use skins and to clothe themselves in the strappings of wild beasts; but they dwelt in the woods and forests and mountain caves and hid their rough bodies in the underwoods when they had to escape the beating of wind and rain (Trans. Rouse, p. 453).

143 As I have previously mentioned, the stability of the species is the outcome of the second stage of adaptation by extinction. After the selection of the fittest there is no permeability between the species.
as was fitting inasmuch as the hard earth had made it,
it was built up within with bones larger and more solid,
fitted with strong sinews throughout the flesh,
not such as easily to be mastered by heat or cold
or strange food or any ailment of the body.
Through many lusters of the sun rolling through the sky
they passed their lives after the wide-wandering fashion of wild beasts.
(Transl. after Rouse, p. 451)

In these verses the first human beings are said to be vigorous and to live in a very harsh environment. As Lucretius also points out in V, 953-1006, human beings lived exposed to rain and cold as well as to the attacks of wild beasts, which easily killed them.

Lucretius’ description of human prehistory shows that the human body was as strong as the environmental conditions it had to face, which means that the body was suitable for living in such a tough context. Among the bodily parts that have changed their constitutions the most from primitive to modern humans, in V, 928 Lucretius names the tendons: validis aptum per viscera nervis. They are said to be validi, namely to be robust and to be responsible for connecting vigorous muscles and bones.

Lucretius puts the strength of the tendons in direct relationship to that of the bones (et maioribus et solidis magis ossibus, v. V, 927) and both, in turn, with the hardness of the earth from which the early humans emerged. As the double use of the adjective durus shows (at genus humanum multo fuit illud in arvis durius, ut decuit, tellus quod dura creasset, V, 925-6), Lucretius conceives the strong anatomical structures of the tendons as an effect of the environment: from the hard earth emerge tough creatures that have to deal with difficult life conditions, while from mollia terrae arva (v, 780) only soft creatures that, during the fertile youth of the mother-earth, have an easy life.

In addition to the idea that the environment influences the bodily constitution of the creatures\textsuperscript{145}, Lucretius also argues that later civilization determines changes in the human bodies, as the verses V, 1011-18 clearly show:

\begin{quote}
Inde casas postquam ac pellis ignemque pararunt,
et mulier coniuncta viro concessit in unum
cognita sunt, prolemque ex se videre creatam,
tum genus humanum primum mollescere coepit.
Ignis enim curavit ut alsia corpora frigus
non ita iam possent caeli sub tegmine ferre,
et Venus imminuit viris puerique parentum
blanditiis facile ingenium fregere superbum.
\end{quote}

Next, when they had got themselves huts and skins and fire,
and woman mated with man moved into one
[home, and the laws of wedlock] became known,
and they saw offspring born of them,
then first the human kind began to grow soft.
For the fire saw to it that their shivering bodies were less
able to endure cold under the canopy of heaven,
and Venus sapped their strength, and children easily broke
their parents’ proud spirit by coaxings.
(Transl. after Rouse, p. 457)

The discovery of fire, the development of the first societies and technologies led to a process of “softening” of the primitives into modern human beings with easier lives and weaker bodies. Therefore, Lucretius’ view of the acquisition of arts and cooperative lifestyle implies a kind of “further adjustment” of the anatomical structures.

\textsuperscript{145} This could be a reference to the Hippocratic tradition and especially to the treatise De aere, aquis et locis. On this interpretation see also Campbell, 2003, p. 186.
Even though there is no specific reference to the hand tendons in *De Rer. Nat.* V, 925-32, it should be noted that, similar to the explanation that Galen attributes to Epicurus and Asclepiades in the *De Usu*, I, 21 74,6-75,8 K. (I, 54, 10-55, 3 H), even Lucretius establishes a close relationship between the robust structure of the tendons and a hard lifestyle. It is for this reason that in V, 961 Lucretius refers to the tough constitution of primitive humans saying “valere et vivere doctus”, namely that they were taught to live and to be strong. This means that their suitable bodies became better adapted for surviving certain difficulties by experiencing the hard environment of prehistory.

Through a sequence of *fortuna et experientia*146, the beast-like life trained the human beings to be stronger and made their bodies more robust.

Therefore, similarly to Galen’s account, Lucretius seems to refer to the thickness of the tendons as due to the large amount of use that the tough life of early humans surely entailed. Thus, it may be reasonable to assume that in *De Rer. Nat.*, V, 925-32 Lucretius seems to confirm the Epicurean background of the theories that in the *De Usu* Galen ascribes to Epicurus and Asclepiades147.

As I said before, regarding both the hand tendons and the “exchanged” structures of the pulmonary vessels, the atomists are said to explain the peculiarities of these anatomical structures in terms of quantity and frequency of the activities that they perform. This aspect of their theories is especially stressed in the first book of *De Usu*, where Galen claims that, following their premises, we should admit the multiplication of limbs and organs in the case of those people who intensively use their bodies.

Gal., *De Usu*, I, 21, 75, 13-76, 6 K. (I, 55, 13-25 H)

---

146 Lucr., *De Rer. Nat.*, V, 960-1: *Quod cuique obtulerat predae fortuna, ferebat sponte sua sibi quisque valere et vivere doctus*; Whatever prize fortune gave to each, that he carried off, every human being taught to live and be strong for himself at his own will (Trans. After Rouse, p. 453). In addition to physical strength, *fortuna et experientia* are also what teach human beings the usefulness of the parts of their bodies, namely how the activities of these structures can beneficially contribute to their survival. The *utilitas* is part of the process of trials and errors that Lucretius and his master Epicurus consider as the main reason for gradual human civilization. In both *De Rer. Nat.* 1028-1090 and *Hdt.* 75-6, the two Epicureans indicate the natural origin of language as the emblematic example of this evolutionary mechanism, since it shows that even cultural aspects can be explained in terms of biology. Therefore, according to the Epicureans, progress is a process that is always determined by external causes. On this topic see also Lucr., *De Rer. Nat.*, V, 1252-68; 1382-7.

147 On this interpretation see also A. Serangeli, “The Anti-teleologism of Asclepiades and Epicurus in Galen’s *De Usu Partium*”, in Technai, 71, 2019, p. 89-115.
Now for one thing, you will find that the tendons controlling powerful actions are not only large, but double, and again, as regards the influence of age, we find that age makes no difference in the number of the tendons. On the contrary, alike in the infant and the adult and even in the child in the womb, although it performs as yet no action with its tendons, we find that the double tendons are still double and the large ones still large. But perhaps you think that in individuals who take excercise, parts somehow become double, and that in those who are lazy, parts are diminished by half. If this is so, then hard workers will doubtless have four feet and four hands, and those who take their ease will have only one leg and one hand! (Transl. May, I, p. 105-6).

Galen also uses the same tone and argument in *De Usu*, VI, 13, 468, 7-469, 7 K. (I, 341, 15-342, 8 H.), where, after having summarized Asclepiades’ view of the exchanged structures of pulmonary vessels, he rebuts his explanation saying:

ἀρ’ ἄγνοεις ὄντως οὐκ ἐχούσας τὸν ἔσωθεν χιτῶνα τὸν σκληρὸν τὰς φλέβας τοῦ πνεύμονος; ἢ τοῦτο μὲν γιγνόσκεις, οὔτε δ’, ὅταν ἰσχύων γίγνηται τι μόριον, οὐ τὸ πάχος αὐτοῦ τῶν χιτῶνων, ἀλλὰ τὸ πλῆθος διαφθείρεσθαι καὶ τῆς γαστρὸς ἄρα τοῖς μὲν ἐσχάτως ἰσχνοῖς εἷς ζῆται χιτῶν, τοῖς δ’ εὐέκταις τέτταρες. οὔτω δὲ καὶ τῶν ὀφθαλμῶν τρεῖς μέν, εἰ τύχοι, τοῖς ἀθληταῖς ἕπτα καὶ τούτων ἔτι πλείους τοῖς περὶ Μίλωνα καὶ Πολυδάμαντα. καλὸν δ’ ἦν, εἰ καὶ τοὺς τῶν χειρῶν δακτύλους ἐν μὲν ταῖς εὐεξίαις πλείους, ἐν δὲ ταῖς καχεξίαις ἐλάττους εἴχομεν. ἦν γὰρ ἂν οὕτως ἄξιον τῆς Ἀσκληπιάδου σοφίας τὸ θέαμα, τρεῖς μέν, εἰ τύχοι, δακτύλους ἔχον ὁ
Are you actually ignorant of the fact that the veins of the lung do not have the hard inner tunic? Or, knowing this, do you think that when a part becomes thin it is not the thickness of its tunics but the number of them that is diminished? If so, the stomach will have only one tunic in very thin people and four in persons that are in excellent condition! Similarly too, persons with phthisis will perchance have three tunics of the eye (for the eyes are greatly wasted in such cases); victims of other diseases will have four, we who are healthy will have five, those of us who are in excellent condition maybe six, athletes seven, and Milon, Polydamas, and their fellows even more! It would be a fine thing if we had more fingers on our hands in good health and fewer when we are ill! So too, it would be a sight worthy of the wisdom of Asclepiades to see Thersites with perhaps three fingers, Ajax with seven, Achilles with still more, and Orion and Talos with more fingers, I suppose, than an centipede has feet! (Transl. after May, I, p. 309-10).

At first glance it might seem that Galen’s testimony on atomistic biology does not completely fit with the theory of the origin of species held by Lucretius, since it lacks any reference to the prehistory and the fixity of species. Although Lucretius conceives the evolution of the early viable creatures into fully modern living beings as something that happens in a short period of time, Galen describes it as an ongoing process of adaptation of the parts. Hence, given these differences, one might think that Galen’s account is unreliable.

On the other hand, I believe that the absence of references to the mechanism of adaptation by extinction, which has ensured the survival of the fittest and established the fixed characteristics of the modern species in prehistory, could also be interpreted in two different ways:

1) The fact that Galen uses the examples of athletes and hard workers is emblematic of his intention to mock the atomists for having conceived the amount of use as something capable of


149 In De Usu, VI, 13, 469, 1 K. (I, 341, 4 H.) Galen names Milon of Croton and Polydamas of Skotussa, who were two famous athletes in the V century BC.

150 In I, 21, 76, 6 K. (I, 55, 23 H.) Galen uses the term οἱ διαπονοῦντες.
modifying, internally, the structures of the parts. Indeed, it is possible that Galen consciously exaggerated some aspects of their arguments, in order to discredit Epicurus, Asclepiades and their followers. Therefore, he might have especially emphasized the possible consequences of establishing a necessary relationship between the use and the features of the parts, since that was the main point of contention between the teleologists and the atomists.

According to Galen, Epicurus and Asclepiades’ theories inevitably lead to absurdity (namely to the idea that people who train their bodies hard can develop seven fingers per hand or four feet), since they are both based on ignorance about causation and dissection\textsuperscript{151}. In the two passages quoted above, Galen insists on their lack of empirical evidence, showing by contrast his extensive knowledge of human anatomy\textsuperscript{152}.

He replies to their evolutionary theories with detailed descriptions of the presence of double hand tendons and of tunics inside the vessels, which serve to demonstrate his hands-on experience in anatomical practice and therefore his reliability and superiority over his rivals. Galen sees direct observations and manipulation of the bodies as the only way to ground philosophical speculation and therefore to build a solid epistemology. Everywhere in \textit{De Usu} Galen accuses the atomists, and especially Asclepiades, of being sophists who base their biological explanation only on theoretical principles that cannot give reasons for the marvelous suitability of the parts to their functions. Concerning both the hand tendons and pulmonary vessels, he attacks the atomists precisely for their empiricism\textsuperscript{153}, trying to demonstrate with many examples their inability to provide objectivity in their accounts of biological phenomena.

Thus, the silence of Galen’s testimony on some crucial aspects of the atomistic theories of evolution and the lengthy discussion about some others, are not signs of poor knowledge of their contents. But it can be ascribed, as I said, to a deliberate choice, or to his interest in making Asclepiades’ doctrine seem as close as possible to that of the Epicureans. In this sense, the absence of reference to the spontaneous generation of monstrous creatures, held by Lucretius in the \textit{De Rerum Natura}, is an emblematic example. Even if Galen does not explicitly mention that, according to the Epicureans, in prehistory the earth generated both \textit{portenta} and viable living beings, he deals with their explanation of malformations in general:

\textsuperscript{151} Ibid. VI, 13, 475, 1-4 K. (I, 346, 14-6 H.).

\textsuperscript{152} However, Galen’s anatomy was essentially based on the observation and dissection of monkeys, that he considered the animals most similar to humans. This idea was also the main reason for the mistakes he made within anatomy.

\textsuperscript{153} See E. Casadei, 1997, p. 82-91.
διὰ τί γὰρ οὐδὲίς ἄνθρωπος οὐδέποτε τριπλασίους ἔσχε τὸ μέγεθος ἢ νῦν εἰς τοὺς δακτύλους; ἢ διὰ τί πάλιν οὐδ’ οὕτω σμικροὺς, ἡλίκη καθ’ ἐκαστὸν αὐτῶν ἐστιν ἢ πρώτῃ φάλαγξ; ἕγω μὲν γὰρ φημι, διότι τὴν χρείαν αὐτῶν διέφθειρε τὰ τηλικαῦτα μεγέθη. σὺ δ’, ὥς γενναϊότατε κατήγορε τῶν ἐργῶν τῆς φύσεως, οὐδὲν μὲν τούτων βλέπεις, ὅτι δ’ ἐν μυρίοις μυριάκαις ἄνθρωποις ἄπαξ ποῦ τιν’ ἐποίησεν ἐξ δακτύλους ἐχοντα, τοῦτο μόνον ὀρὲς. εἱ δὲ Πολύκλειτος ἐν τι σμικρὸν οὕτως ἰμαρτεν ἐν χιλίοις ἁνδριάσιν, οὔτ’ ἄν αὐτὸς ἐμέμψω καὶ τοὺς ἐγκαλοῦντας ἀγνώμονας ἐκάλεσε. ἀντίστρεψον οὖν αὐτὸ καὶ σκέψαι, τί ποτ’ ἂν εἴπης, εἰ κατὰ μὲν τοὺς χιλίους ἰμαρτεν ἢ χύσις, ἐν ἑνὶ δὲ μόνῳ κατώρθωσεν. ἃρ’ οὐκ ἐν τύχης ἔφερες, οὐ τέχνης ἔργον εἶναι τὸ κατορθοῦμεν; εἰ δ’ ἐν μυρίοις, ἐτι δὴ μᾶλλον; ἀλλὰ νῦν οὐκ ἐν χιλίοις ἢ μυρίοις ἄνθρωποις, ἐν μυριάκαις δὲ μυρίοις ὀρὼν ὤν τι δημαρτημένον εἰς τύχην ἀνα-φέρειν τολμᾶς τὰ κατορθοῦμενα θαυμαστῇ τινι δικαιοσύνη περὶ τὴν φύσιν χρώμενος.

Why, indeed, is there never anybody who has fingers three times the normal size? Or why, again, does no one ever have them as small as the first phalanx in each of them? Now I say that it is because such sizes would destroy their usefulness, but you, O most noble accuser of the works of Nature, have no regard for any of these things and see only that out of ten thousand times ten thousand men she has made a single one with six fingers. If Polyclitus made one such small error in a thousand statues, you yourself would not blame him and you would say that his accusers had no judgment. Well, then, look at this from another angle and see what you would say if Nature went wrong in a thousand cases and succeeded in only one. Would you not say that the one successful case was the result of chance, not of skill? And if she went wrong in ten thousand cases, would you not be still more justified? But as it is, when you see that Nature has failed with one single human being not out of just a thousand or ten thousand, but out of ten thousand times ten thousand, you dare refer to chance what she has done correctly, thus treating her with a most remarkable sort of justice!

(Transl. after May, II, p. 728).
The existence of humans with malformed bodies is a problematic issue for an enthusiastic teleologist like Galen\textsuperscript{154}. Of course, providing a reason for the unsuccessful products of nature’s art is a much more difficult task for a supporter of the design argument than for an atomist, who grounds his theory of the generation of species on random encounters of particles of different shapes and size. Unfortunately we do not have an exhaustive explanation of the atomic mechanism that, according to Lucretius, determines the genesis of *portenta* and therefore we have to infer it from what we know about the principles of atomistic physics\textsuperscript{155}. Since all the features of the things that we perceive depend on the coming together of suitable particles, the malformations should result from entanglements that are partially unfruitful.

\textsuperscript{154} For a discussion of Galen’s explanation of bodily imperfections in *De Usu*, see Hankinson, 1989, p. 225 and Van der Eijk, 2014, p. 100-1.

\textsuperscript{155} The spontaneous generation of monsters is not mentioned in any of the surviving works of Epicurus. Even if it is generally accepted that Lucretius closely follows Epicurus, it is impossible to establish whether the founder of the Garden shared the same idea as his disciple. Lucretius’ *portenta* are usually considered as an element that he took from Empedocles, who describes the generation of “man-faced ox-progeny” and other kinds of monstrous creatures in the early stages of his zoogony. According to Empedocles’ fragments B 57 and 61 DK, these monsters were the result of a random combination of separate limbs, which came together under the rule of Love. The idea of Lucretius’ debt to Empedocles is not shared by Bignone, who attributes to Epicurus the genesis of monsters on the base of Simplicius’ *In Phys.*, 371, 33-372, 11. However, as pointed out by both Ziegler and O’Brien, the use of Empedocles’ fantastic creatures in the *De Rerum Natura* could also have been on Lucretius’ own initiative. Although Sedley also thinks that Lucretius certainly appreciated Empedocles’ natural philosophy and knew his poem at first hand, he rejects the idea of *portenta* as based on the Empedoclean monsters. Relying on Plutarch’s account of the Epicurean mockery of Empedocles’ ox-creatures in *Adv. Col.*, 1123 B, Sedley claims: «There is nothing like this in the Epicurean theory, as we hear about it from Lucretius; and I can see no attempt in Lucretius book V to restore to Empedocles the credit which the Epicurean school traditionally denied him». Furthermore, in a footnote to this passage, Sedley points out that: «Where Empedocles describes isolated limbs, Lucretius describes whole organisms with congenital defects - and that represents a crucial difference between the two zoological theories». See Sedley, *Lucretius and the Transformation of Greek Wisdom*, 1998, p. 19-20. On this topic see also E. Bignone, *Empedocle*, Torino, 1916, p. 629-30; K. Ziegler, “Menschen- und Weltenwerden, ein Beitrag zur Geschichte der Mikrokosmosidee”, in *Neue Jahrbücher für das klassische Altertum*, 31, 1913, p. 537-8; D. O’Brien, *Empedocles’ Cosmic Circle*, Cambridge, 1969, p. 215-6; Furley, “Variations on Themes from Empedocles in Lucretius’ Proem”, in *Bulletin of the Institute of Classical Studies*, 17, 1970, p. 55-64; S. Blundell, 1986, p. 89-93; A. Martin, O. Primavesi, *L’Empédocle de Strasbourg (P. Strasb. Gr. Inv. 1665-1666). Introduction, edition et commentaire*, Strasbourg-Berlin, 1999, p. 54-7; 80-2; 95-7; Campbell, “Origins of Life and Origins of Species”, in *The Oxford Handbook of Animals in Classical Thought and Life* ed. by G. L. Campbell, Oxford, 2014, p. 241-2.
While Lucretius’ early monsters, that were born without essential organs and died almost immediately, result from unsuccessful combinations of atoms, the creatures that still come into being with minor malformations should therefore be the outcome of slightly better kinds of atomic compounds. Thus, the latter should presumably be determined by a cluster of particles in which most of them fit perfectly together, but with only a small percentage of atoms that cannot match very well. The fact that Galen tackles the issue of deformity from a statistical point of view, namely comparing malformed parts with rare mistakes that even a great sculptor like Polycletus can make, reflects his attempt to prevent his rival’s criticism. In order to protect Nature against the risk of atechnia, he describes malformations as a few errors compared to the large number of marvelous works that the Nature-demiurje normally makes. Therefore, a few failures cannot cast doubt on the providence of the demiurje, which, as Galen himself points out in XI, 14, 905, 6 K. ff. (II, 158, 3 H. ff.), is not all-powerful.\textsuperscript{156}

In this passage Galen does not admit the generation of monsters similar to Lucretius’ \textit{portenta} and replies to the atomists, setting the existence of malformations only within certain limits and also rejecting the idea that Nature could shape useless limbs. According to Galen, indeed, we cannot ever see fingers three times the normal size or as small as the first phalanx in each of them. Thus, the existence of these limits shows that, even in the case of maladapted creatures, Nature always acts in accordance to her intrinsic teleology.

Whether Galen knew about Lucretius’ \textit{portenta} or not is impossible to say, but his argument in \textit{De Usu}, XVII, 355, 5-356, 5 K. (II, 443, 21-444, 18 H.) certainly shows that he was aware of the fact that, at least in its Epicurean version, the anti-teleological argument admitted the occurrence of both large and frequent small mistakes within the generation of living beings. If this interpretation is correct, then the Epicurean theory of malformations might have triggered Galen’s reaction and attempt to assimilate Asclepiades to the Epicureans. He presumably seeks to highlight the similarities between the uselessness of certain parts\textsuperscript{157} of the human body argued by Asclepiades and the unserviceable bodies of the early monsters described by Lucretius. This means that even Galen’s lack of references to prehistory and his discussion only about malformations that are still produced by Nature should be understood in terms of the same historiographical strategy.

\textsuperscript{156} See Walzer, 1949 and Calabi, 2006.

\textsuperscript{157} In both \textit{De Usu} and \textit{De Nat. Fac.} Galen criticizes Asclepiades and his followers for having considered the kidneys and the ureters as useless organs.
2) There is also another possible explanation for the absence of certain fundamental aspects of Epicurean evolution in *De Usu.*

As I already said, Galen fails to place the atomistic theory of adaptation of the parts to their environment in a limited period of time and also to explain that this process continues beyond both prehistory and natural selection only in terms of small further “anatomical adjustments”, which are determined by the development of technologies and new habits. Therefore, unlike Lucretius in book V, Galen focuses only on the latter stage of adaptation, making it appear that “sub-level of adaptation” was the main reason for the structure of the parts. The fact that he insists especially on attributing to the atomists the idea that human anatomy is shaped *ex usu,* without even mentioning their idea of biological stability (reached by adapted species at the end of the second round of extinction), could also depend on the kind of interpretation of Epicurean zoogony that circulated in the Roman medical environment.

Galen’s critique might rely on a version of the atomistic theory of adaptation that was presumably mediated by Asclepiades and his circle, in which all the aspects that were not of direct medical interest had been removed in order to focus all the attention on the relation body-environment and especially on its effect on the structures of the organs.

However, beside the above interpretations, in *De Usu* Galen discusses aspects of atomistic evolutionary biology that actually occur in the fifth book of *De Rerum Natura.* As I tried to show, he is clearly aware of both the weaknesses and strengths of the anti-teleological argument and he bases his critique on them. Indeed, he finds it necessary both to give a solid explanation of the existence of malformed bodies and to stress Epicurus and Asclepiades’ inability to give reason for the usefulness of the parts, especially of the very small and marvelous anatomical structures.\(^{158}\)

We can therefore see his testimony in *De Usu* as a strong contribution to the teleologists’ long battle against the evolutionary theorists, namely to the harsh struggle between two opposite views of the

---

\(^{158}\) See *De Usu,* XVII, 361, 8-14 K. (II, 448, 9-14 H.) μὴ γὰρ δὴ κατ’ ἄνθρωπον ὑπολάβῃς μόνον εἶναι τοσαύτην τέχνην, ὅσην ὁ πρόσθεν ἔξηγήσατο λόγος, ἀλλ’ ὅτι ἄν ἀνατεμεῖν ἔθελεν ὁ ἄνθρωπος ἐν μικρότερον ἄλλῳ οὐσίᾳ τοιὸν δημιουργοῦ. Ἰσοπηγήσατο καὶ τοιῷ οὐσίᾳ τὸν δημιουργοῦ. Καθάπερ διὰ τὸ διαγλύφουσιν ἐν μικρὰῖς οὐσίαις οἱ δημιουργοῦ; In fact, you must not suppose that such skill as I have been explaining in this book is displayed in human being alone; on the contrary, any other animal you may care to dissect will show you as well both the wisdom and skill of the demiurge, and the smaller the animal the greater the wonder it will excite, just as when craftsman carve something on small objects (Trans. After May, II, p. 731).
causal structure of nature and especially of its most amazing outcome: the suitability of the anatomical parts.
Chapter Two

Galen on Particles in De Elementis Secundum Hippocratem.

Besides anti-teleologism, Galen’s testimony on atomism also focuses on the elementary theories posited by his rivals and especially on the nature of the particles, which the atomists maintain as the primary components of bodies. His fullest account of the atomists’ notion of corpuscles is preserved in De Elementis Secundum Hippocratem, a treatise in which Galen deals with the properties that Democritus and Epicurus assigned to the atoms and Asclepiades to his ὄγκοι. Once again Galen does not identify major differences between their theories and he pairs Asclepiades with the atomists, rejecting their views with the same argument.159 Together with the Hippocratic humoralism, in De Elementis the atomistic doctrine is his main interlocutor on the primary elements of reality, even though he gives opposite evaluations of them: he shows enthusiasm about the former theory and harsh criticism towards the latter, which is again accused of negligence and poor mastery of logic. As in the case of anti-teleologism in De Usu Partium, Galen distinguishes two main traditions within the debate about the elements:161

159 See De Elem., 19-22 De Lacy (I, 416 K.; fr. 221 L.), where Galen places Asclepiades among the “chorus” of Democritus’ and Epicurus’ followers. In his commentary to this treatise, De Lacy points out that, although Galen recognizes Asclepiades’ theory as different from those of Democritus and Epicurus, «he holds that they all can be refuted by a single argument». See De Lacy’s Commentary to his edition of De Elementis, p. 164. Galen shows a similar attitude towards the atomists’ and Asclepiades’ elementary theories also in De Constit. Artis Med., CMG V, 1, 3: 76, 3-9 Fortuna (I, 248, 9-11 K.).


161 Galen makes this distinction also in De Nat. Fac., I, 12, 27-30 (120, 7-122, 3 H.).
1) The tradition of Hippocrates, Plato, Aristotle, the Stoics and Galen himself, who conceived the nature of matter as being continuous;
2) The tradition of Democritus, Epicurus and Asclepiades, who described the matter as unchangeable, unalterable and divided in tiny particles.
Therefore, also in this treatise the main targets of Galen’s criticism are atomism and its followers. He focuses especially on the qualitative status of the particles and their consequent incapability to explain perception. Indeed, Galen rejects the theories of Democritus, Epicurus and Asclepiades for having based their ontology on an infinite multiplicity of qualityless, indivisible and immutable particles, which by nature cannot account for the variety of phenomena. According to him, the lack of secondary qualities makes these elements essentially impassible and therefore incapable of generating bodies that suffer from diseases and feel pain. Relying on the elements being immutable and identical in species, Galen accuses the atomists of having developed a pattern that is paradoxically a kind of monism. The first two sections of this chapter will thus be devoted to examining the contents of Galen’s rejection of atomism in the *De Elementis* (section 2.1), focusing on his comparison of the properties of the atoms with those of the Eleatic being and also discussing the modern debate regarding Galen’s use of ἐν in his version of Democritus’ famous fragment on the “conventionality” of secondary qualities (section 2.2).

The Galenian argument against the impassibility of Democritus’ and Epicurus’ atoms, which is presumably based on a tradition that goes back to the Stoics and that subsequently has been adopted by the Skeptics, is also taken on by both Cicero and Plutarch (section 2.3). In this regard, both *De Natura Deorum* and *Adversus Colotem* provide some evidence which it is worth dwelling on. For this reason, in chapter two I will also explore the significant parallelisms between these two accounts and that of *De Elementis*, showing how their similarities can help to trace the background of Galen’s argument against atomism (section 2.4).

---

162 Gemelli Marciano attributes the critique of atomic impassibility to the first phase of Stoicism and especially to Cleanthes, who wrote one treatise about Democritus and one about the particles (*Stoicorum Veterum Fragmenta*, I 481, 107,1 and I 493, 110,25-9 von Armin), and to Spherus, a disciple of Zeno who wrote against the atoms (*SVF* I 620, 139, 25). See Gemelli Marciano, Berlin 2007, p. 224-6.

2.1 De Elementis, date and contents.

In De Elementis secundum Hippocratem Galen addresses the question of the primary elements that are at the base of both the human being’s and the universe’s constitution, as well as of their mutual relationship. This issue is investigated by comparing the main doctrines of the elements with that of Hippocrates in De Natura Hominis, about whom Galen also wrote a commentary where De Elementis is mentioned. He also refers to this treatise in many other works, whereas in De Elementis he declares his intention to write De temperamentis, De medicamentis, De Methodo Medendi, De Facultatibus Naturalibus and a treatise against Asclepiades of Bithynia, which however has been lost. The numerous references and autobiographical remarks help us to date the treatise presumably around 169 AD. This means that Galen wrote De Elementis at the beginning of or in any case during his second stay in Rome, presumably while he was also working on the books II-XVII of De...
Usu Partium. Therefore, he ended this treatise only after having worked on *De Anatomicis Administrationibus* and before having finished both *De Placitis Hippocratis et Platonis* and his commentary on Hippocrates’ *De Natura Hominis*.

As mentioned above, *De Elementis* focuses on the primary elements and their mixture, namely on an issue that had been at the core of philosophical and medical debate for centuries. In the text Galen goes through the main theories about the fundamental components of reality, from the ἀρχή of the Ionian physiologists to the multiplicity of the pluralists up to materialism in the medical field, attacking and rejecting most of them\(^{170}\). Beside Hippocrates, the only thinkers he mentions with explicit appreciation are Plato and Aristotle\(^{171}\).

Galen deals with three main topics: the physical elements (στοιχεῖα), the qualities (ποιότητες) and the humours (χυμοί). The treatise begins with an attack on monism, namely on those theories that posited only one kind of substance, or multiple principles which are “one in form and power”\(^{172}\), and continues with an extensive analysis of the primary elements conceived as ἀπαθῆ καὶ ἀναίσθητα, namely as unaffected and insentient. Then Galen posits the correspondence of the primary elements (τὸ στοιχεῖον ἐλάχιστόν ἐστι μόριον οὗπερ ἂ ν ἄρχηται) with fire, air, water and earth\(^{174}\) and demonstrates that they undergo change.

In *De Elementis* the rejection of the qualityless particles held by the atomists (αἱ μὲν οὖν ἄτομοι σύμπασαι σώματ’ οὖσαι σμικρὰ χωρὶς ποιοτήτων εἰσί)\(^{175}\) leads to the critique of the impassible atoms as the primary components of the sensitive bodies. Indeed, in order to show the inadequacy of atomism, Galen underlines the contradiction between the characteristics of their particles and those of

\(^{170}\) In addition to the elements of the atomists and Asclepiades, Galen also rejects the theories of Anaxagoras and Empedocles. See *De Elem.*, 68, 8-11 De Lacy (II, 425 K.) and especially 130,4-10 De Lacy (II, 483-4 K.).

\(^{171}\) Galen considers Aristotle as a follower of Hippocratism, especially regarding his theory of the composition of things.


\(^{172}\) Cf. Gal. *De Elem.*, 58, 15-17 De Lacy (I, 416 K.)

\(^{173}\) Id. 56, 1 De Lacy (I, 413 K.).

\(^{174}\) According to Galen, it was Hippocrates who first introduced this type of procedure. Cfr. Gal., *De Elem.*, 58, 6-7 De Lacy (I, 415 K.).

\(^{175}\) Ibid. 60, 19-20 De Lacy (I, 418 K.).
the observable phenomena. He does it relying on empirical evidence, such as “the needle argument”\(^{176}\) or the example of the interlocked fingers\(^{177}\).

According to him, features, changes and affections of things can be explained only on the basis of elements that, in turn, thanks to their qualities, cause and undergo changes. Following Hippocrates, Galen explains the sentient bodies in terms of constituents that are not sentient themselves, but capable of alteration (ἄναισθήτων μὲν παραγόντων δὲ\(^{178}\)).

The treatise ends with a discussion on the role of the humours in reproduction and especially in the function of cathartic drugs, in which Galen criticizes Asclepiades for having denied the role of qualities in the bodily response to medicaments\(^{179}\). Indeed, the Bithynian is said to have rejected the idea that the drugs can draw what in our bodies is similar to them\(^{180}\). Similarly to the atomists, he assumes that corpuscles without secondary qualities generate all bodies by mechanical juxtaposition. In his hypothesis, there is no room for any mixture of the elements and therefore for any interactions of their qualities, such as has been argued by Hippocrates and Galen\(^{181}\).

Despite his critical stance, in *De Elementis* Galen recognizes atomism as a doctrine that, even if based on unacceptable principles, it is necessary to take into account in order to deal appropriately with the issue of the nature of the elements.

### 2.2 Indivisibility and Immutability of the Atoms in *De Elementis*.

The *De Elementis* preserves Galen’s fullest account\(^{182}\) on atomism, in which Leucippus\(^{183}\),

---

176 Ibid. 64, 4-10 De Lacy (I, 420-1 K.); on “the needle argument” cf. sections 2.4 and 2.4.2 of this work.
177 Ibid. 66, 11-3 De Lacy (I, 423 K.); on this example cf. section 2.4 of this work.
178 Ibid. 70, 8 De Lacy (I, 427 K.).
183 Galen mentions Leucippus only once along with the Megaric Diodorus Cronus and portrays him as the first who conceived the atom as indivisible because of its smallness: ἐνοι δὲ ὑπὸ σμικρότητος ἀδιαίρετα, καθάπερ οἱ περὶ <τὸν
Democritus and Epicurus are criticized for having hypothesized minima (ἐλάχιστα) without qualities and identical in species as the primary elements of the bodies. According to Galen, this hypothesis was correctly rejected by Hippocrates in De Natura Hominis with the argument that if the human being were composed of only one element, then it would not be able to feel pain and nothing would exist that could inflict pain on its body:

Gal., De Elem., 58, 14-15 De Lacy (I, 415 K.)

Ἐγὼ δέ φημι, εἰ ἐν ἢν ὁ ἀνθρώπος, οὐδέποτ’ ἂν ἦλγεεν· οὐδὲ γὰρ ἂν ἦν ψφ’ ὅτου ἦλγησειν ἐν ἔόν 184.

In De Elem., 58, 19-22 (I, 416 K.; 68 A 57 DK fr. 221 L.) Galen refers to the theories of matter held by Democritus, Epicurus and their followers, listing the terms with which they identify the main features of their elements:

ἰδέα δὲ καὶ δυνάμει δύναιτ’ ἂν τίς ἐν εἶναι λέγειν τὰ πάντα, καθάπερ οἱ περὶ τὸν Ἐπίκουρόν τε καὶ Δημόκριτον τὰς ἀτόμους. ἐκ ταῦτα δ’ εἰσίν αὐτοῖς χοροῦ καὶ οἱ τὰ ἐλάχιστα καὶ ἀναρμα καὶ ἀμερῆ τιθέμενοι στοιχεῖα.

But a person might say that all things are one in form and power, as Epicurus and Democritus and their followers say of the atoms. And of the same chorus with them are those who postulate elements that are least and unattached and without parts.

(Transl. De Lacy, p. 59)

Therefore, since according to Galen the primary components “cannot be one in form and power”, as the Atomists and their followers185 maintain (ἰδέα δὲ καὶ δυνάμει δύναιτ’ ἂν τίς ἐν εἶναι λέγειν τὰ Διόδωρον καὶ τὸν Δεύκιππον; some, like Diodorus and Leucippus, (postulate) that they are indivisible because of their small size (Trans. De Lacy, p. 63). See Gal., De Elem., 62,6-7 De Lacy (I, 418-19 K.). Gemelli Marciano points out that this kind of account, which distinguishes Leucippus’ view from that of Epicurus (who considered the indivisibility of the atoms as due to their hardness) is typical of late reports based on skeptical sources. See for instance Lact., Div. Inst., 3,17,21-27 (218, 235, 565 L.); De Ira Dei, 10,1ff. (218, 235, 272, 302, 591 L.). On this topic, see Gemelli Marciano, 2007, p. 234 ff.


185 Gal., De Elem., 58,19-22 De Lacy (I, 416 K.); fr. 68 A 57 DK (221 L.).
pάντα), he accuses them of monism. To Galen, conceiving of the primary elements as an infinite number of unchangeable substances (namely particles that are by nature always equal to themselves) means to reduce the multiplicity to unity and to fall victim to the same contradiction as Parmenides’ ontology\(^{186}\). Indeed, Galen sees the description of the elements as indivisible (ἀτομον)\(^{187}\), unattached (ἄναρμον), least (ἐλάχιστον) units without parts (ἀμέριστον), as the premise of a monistic argument.

---

\(^{186}\) The name of Parmenides is not explicitly mentioned in the text, but there is no doubt that Galen is referring to the Eleatics. Indeed, in De Elem., 58,22-26 (I, 416 K.) he says: πρὸς τοὺς τοιούτους οὖν ἃπαντας ὁ Ἰπποκράτης κοινὴν τὴν ἀντιλογίαν ποιούμενος ἀποδείκνυσιν οὖχ ἐν εἶναι τῇ ἑδαν τε καὶ τὴν δύναμιν τὸ στοιχεῖον οὐδὲ μημονεύσας ἐκεῖνων, οἶ καὶ τῷ ἁριθμῷ τὸ ὤν ἐν εἶναι φασίν, ὡς ἐμπληκτῶν τελέως; Hippocrates, then, making a common answer to all such a persons, proves that the element is not one in form and power; and he does not even mention those who say that what is is one in number, supposing them to be completely mad (Trans. De Lacy p. 59). As pointed out by De Lacy in his commentary (see p. 166), the Eleatics are considered as mad also by Aristotle, who in the De Gen. et Corr., I 8, 325 a 17-24 claims: Οἱ μὲν οὖν οὕτως καὶ διὰ ταύτας τὰς αἰτίας ἀπεφήναντο περὶ τῆς ἀληθείας· ἐπεὶ δὲ ἐπὶ μὲν τῶν λόγων δοκεῖ ταῦτα συμβαίνειν, ἐπὶ δὲ τῶν πραγμάτων μανίᾳ παραπλήσιον εἶναι τὸ δοξάζειν οὕτως· οὐδένα γὰρ τῶν μαινομένων ἐξεστάναι τοσοῦτον ὥστε τὸ πῦρ ἓν εἶναι δοκεῖν καὶ τὸν κρύσταλλον, ἀλλὰ μόνον τὰ καλά καὶ τὰ φαινόμενα διὰ συνήθειαν, ταῦτ' ἐν ψυχήν διὰ τὴν μανίαν οὐθὲν δοκεῖ διαφέρειν; Some philosophers, then, set forth their views about the truth in this manner and based them on these grounds. Furthermore, though these opinions seem to follow logically from the arguments, yet, in view of the facts, to hold them seems almost madness; for no madman is so out of his senses as to hold that fire and ice are “one”; it is only between things which are good and things which, through habit, seem to be good, that some people, in their madness, see no difference (Trans. E. S. Forster and D. J. Furley, Cambridge MA-London, 1955, p. 239). In both Aristotle’s and Galen’s texts, the allusion to the madness of the Eleatics is followed by the discussion of the main principles of atomism. See Galen, De Elem., 60, 1 ff. (I, 417 K.) and Arist., De Gen et Corr., I, 8, 325a 23 ff. In addition to this similarity with Aristotle’s text, De Lacy lists all the references to the treatises in which Galen uses the term “ἐμπληκτος” for charging Asclepiades and Julian of insanity: De Nat. Fac., II, 40, 13 K. (130, 8 H); De Meth. Med., I, 7 (X, 57 K.); Adv. Lycurm, 7, 11: CMG V 10, 3, p. 26, 21; Adv. Iul., 1,9; 2,3. 4; 6,3. 6; 8,5. 22: CMG V 10,3, pp. 35,8; 39,1. 4; 53,16; 54,24; 64,3; 70,9. Therefore, the accusation of madness seems to be a constant ingredient of Galen’s sarcasm about the poor logic of his rivals, namely of the atomists and the Methodists. On Galen’s attitude towards Julian and the figure of this Methodist physician, see Scarborough, “Iulianus”, in Encyclopedia of Ancient Natural Scientists, 2008, p. 448; M. Tecusan, The Fragments of the Methodists, Leiden- Boston, 2004, p. 18-9; (fr. 111) 290-331.

\(^{187}\) The indivisibility is the main feature of the atoms, since it is the first condition of their being immutable and eternal elements. Their indivisibility depends on the solidity and compactness of their matter, which is also mirrored in the etymology of the term ἀ-τομον. Indeed, the atom is somethig that cannot be cut (the verb τέμνειν means “cut, divide”) and that is often defined by Democritus as ναστόν, στερεόν, σκληρόν or πλῆρες. Therefore, as pointed out by Aristotle in De Gen. et Corr., I, 2, 316a 11-14 (68 A 48b DK; 105 L.) the solidity of the particles is a property that presumably derives from empirical observations and it is referred to a physical matter: Ἰδοὶ δ’ ἐν τις καὶ ἐκ τοῦτον ὅσον διαφέρουσιν οἱ
Although Galen seems to recognize different interpretations of the notion of particle within what he presents as the atomistic tradition, he does not dwell on their details. As already noted by De Lacy, he attributes to both Democritus and Epicurus the idea and the term ἄτομον without explaining the differences between their views. In fact, Galen does not make any reference to the well known changes introduced by Epicurus, such as the limited (but inconceivable) number of shapes and magnitudes of the particles, the swerve and the doctrine of minima. In addition to Democritus’ ἄτομα, Galen also lists ἄναρμα and ἐλάχιστα καὶ ἀμερῆ without naming explicitly the authors to whom he intends to refer, namely Asclepiades and presumably Diodorus Cronus.

Therefore, in this passage Galen omits adding explanations that could highlight the differences φυσικῶς καὶ λογικῶς σκοποῦντες· περί γὰρ τοῦ ἄτομα εἶναι μεγέθη οἱ μὲν φασιν ὅτι τὸ αὐτοτρίγωνον πολλὰ ἔσται. Δημόκριτος δ’ ἂν φανεῖ οἰκείοις καὶ φυσικῶς λόγος πεπείσθαι. Δῆλον δ’ ἔσται ὅ λέγομεν προιοῦσιν; One can see, too, from this the great difference which exists between those whose research es are based on the phenomenon of nature and those who inquire by a dialectical method. For on the subject of atomic magnitudes one school maintains their existence on the ground that otherwise the “ideal tringle” will be many, while Democritus would appear to have been convinced by arguments germane to the subject and founded on the study of nature (Trans. Furley, 1955, p. 177).


189 See Ep., Hdt. [2] 42,6-43,2 Arrighetti; Lucr., I, 1008-51; II, 512-14; Diogenes of Oin., fr. 67 Smith. According to F. Verde, Epicurus denied the infinite number of atomic shapes hypotesized by Democritus in response to methodological necessities. Indeed, since sensation, which is the first criterion of truth, shows that the aggregates have a limited number of shapes, then their components must also necessarily have the same property. F. Verde, Elachista. La dottrina dei minimi nell’epicureismo, Leuven, 2013, p. 19-32.

190 As we will see later on in this chapter (especially through the analysis of De Elem., 62, 4-13 De Lacy (I, 419 K.), the reference to Diodorus Cronus is disputed. While De Lacy considers the corpuscularism of Diodorus as part of the tradition criticized by Galen, Gemelli Marciano rejects this interpretation. See De Lacy’s commentary, 1996, p. 20-25; 166 and 169; Gemelli Marciano, 2007, p. 258.
between these theories and impede him from presenting them as a homogeneous group. His historiographical strategy is particularly evident in *De Elem.* 58, 23-4 De Lacy (II, 416 K.), where Galen claims that the structure of his argument is based on Hippocrates’ «making a common answer to all such persons»\(^{191}\), proves that the element is not one in form and power\(^{192}\), and especially in 60,3-6 De Lacy (II, 417 K.), where, after having listed the terminology for atoms and corpuscles mentioned above, he addresses the reader claiming that:

\[
\text{oùdè γὰρ ἐτι δεηθησόμεθα τῆς κατὰ μέρος ἐν αὐτοῖς διαφορᾶς, ἃν τὸ καθόλου τε καὶ κοινὸν ἀπασοῦν τῶν αἱρέσεων ἀνέλωμεν. ὑπόκειται γὰρ ἅπασι τούτοις ἄποιον εἶναι τὸ πρῶτον στοιχεῖον.}
\]

We shall no longer need the particular differences among them, if we refute what is general and common to all the schools. It is posited by all of them that the first element is without quality (Transl. De Lacy, p. 61).

Although Galen distinguishes between the atomists and refers their specific terminology, he also sees only marginal differences between their doctrines and considers them as sharing substantially the same concept of matter\(^{193}\).

Since the lack of secondary qualities\(^{194}\) is strictly related to Galen’s main concern in *De Elementis*, namely the impassibility of the atoms, he begins his refutation of atomism by quoting Democritus’ famous maxim about the mere conventionality of sensible qualities, such as sweetness and bitterness:

\[^{191}\text{As already said, in *De Nat. Hom.* Hippocrates argues against the first atomists and the Eleatics.}\]

\[^{192}\text{See Trans. De Lacy, p. 59.}\]

\[^{193}\text{According to him, they all base their views on the same principles: matter is divisible up to the limit of least particles, which are by nature indivisible, without qualities and consequently immutable.}\]

\[^{194}\text{As already said, these invisible substances do not have secondary qualities like those of the perceivable objects (color, taste...), but only several properties that make them able to generate the bodies by juxtaposition. According to the atomists, the particles have all the same kind of substances and they can be distinguished only in terms of different size, shapes (ῥυσμός), position (διάθητι) and ordering (τροπῆ) within the aggregates. See Epic., *Hdt.*, [2] 41; 48; 54-6 Arrighetti. In a well known passage of his *Metaphysica*, Aristotle replaces the names of these three terms with σχῆμα, τάξις and θέσις, underlying their geometrical meaning by a comparison with the letters of the alphabet. See Arist., *Metaph.*, I 4, 985b 5-23. The comparison between the letters of the alphabet and the elementary components is mirrored in Aristotle’s use of the term στοιχεῖα. For a similar use of the ambivalence of στοιχεῖα see also Pl., *Soph.*, 246a; *Theaet.,*}\]

89
According to Democritus, the secondary qualities are not properties of the elements, but only sensory appearances that belong to the sphere of *nomos*, namely to what is defined by human convention. While Democritus conceives the sensible qualities as the results of shapes, arrangements and


195 As pointed out by De Lacy, this version of the Democritean maxim does not occur in Aristotle, but is mentioned by Theophrastus in the *De Sensu*, where, however, he speaks of σχήμα instead of ἄτομα. See De Sens. 69 (68 A 135 DK; 3, 441 L.).
dispositions of atoms in the aggregates, he considers their specific descriptions such as “sweet” or “bitter” as ordinary characterizations formulated by human beings. Hence, the word *nomos* refers to the tendency of human beings to think and speak of sensible qualities such as sweet and bitter as if they were objective features of real things and perhaps also to their habit of making pseudo-ontological categories out of them. According to Furley, Democritus uses *nomos* in the same sense as Empedocles in B 9 DK, where he refers to the common usage of calling the combination of elements “generation” and their separation “destruction”.

Therefore, it is only by custom (*νόμος*) that the perceptible qualities categorized as sweet and bitter count as something real. This means that what we can perceive with our senses does not lead to objective knowledge, but only to an obscure understanding that needs to be clarified by the atomic theory. Indeed, the true knowledge of the nature of things (τὸ ἐτεόν) is only that of atoms and void.

Thus, Democritus seems to posits a contrast how the things appear to our senses with how they are in reality, suggesting the priority of the non-sensible properties of the atoms over the secondary and perceptible qualities.

Galen interprets the dichotomy between *νόμῳ* and ἐτεῇ held by Democritus in terms of a distinction between *νόμος* and φύσις, namely between what is established by custom and what is established by

---

196 For example, the sweet taste would be determined by the predominance of atoms that are round, smooth and the bitter by the predominance of those that are smooth, but also smaller and with curvatures on the surface. On this description see id., *De Sensu*, 66 (68 A 135 DK).
198 Plut., *Adv. Col.*, 1113 A-B.
199 See Democr., 68 B 11 DK (83 L.).
200 On this interpretation, see C. C. W. Taylor, *The Atomists: Leucippus and Democritus*, Toronto-Buffalo-London, 1999, p. 11; 216-8. Unlike Democritus’ caution, Epicurus recognizes perception as the solid and reliable base on which we can ground our knowledge of reality (see Plutarch, *Adv. Col.*, 8, 1110 E-1111). Indeed, as also underlined by Asmis: «On Epicurus’ view, sweet, bitter, and so on, exist by nature, not convention, as the effect of atoms that enter us from our environment. This environment is not a random fog, as it were, of atoms and void, but contains enduring objects that are joined to us by continuous streams of atoms and may be perceived just as they are». See Asmis, “Epicurean Empiricism”, in *The Cambridge Companion to Epicureanism*, ed. by J. Warren, Cambridge 2009, p. 103. On Democritus and Epicurus’ opposite evaluation of perceptible qualities, see also T. O’Keefe, “The Ontological Status of Sensible Qualities for Democritus and Epicurus”, in *Ancient Philosophy*, 17, 1997, p. 119-34; id., “Action and Responsibility”, in *The Cambridge Companion to Epicureanism*, ed. by J. Warren, 2009, p. 150-4.
nature\textsuperscript{201}. Furthermore, as shown by the occurrence of the term \textit{ἀλήθεια}\textsuperscript{202} in \textit{De Elem.}, 60,15 and 60,17-18 De Lacy (II, 418 K.), he also reads Democritus’ words as a devaluation of the role of the sense of perception. It almost seems that Galen understands the contrast between νόμῳ and ἐτεῇ in the light of the dichotomy between δόξα and ἀλήθεια\textsuperscript{203}, suggesting a relativistic interpretation of the Democritean argument.

As Morel\textsuperscript{204} points out, Galen translates ἐτεῇ with ἀληθῆς or κατὰ τὴν ἀλήθειαν as Sextus Empiricus also does in the \textit{Adversus Mathematicos}. Such a parallelism leads Morel to think that Galen’s account relied on a source close to the Skeptical Academy\textsuperscript{205}.


Δημόκριτος δὲ ὅτε μὲν ἀναιρεῖ τὰ φαινόμενα ταῖς αἰσθήσεσι καὶ τούτων λέγει μηδὲν φαίνεσθαι κατ’ ἀλήθειαν, ἄλλα μόνον κατὰ δόξαν, ἀληθὲς δὲ ἐν τοῖς οὖσιν ὑπάρχειν τὸ ἀτόμους εἶναι καὶ κενὸν: “νόμῳ” γὰρ φησὶ “γλυκὺ καὶ νόμῳ πικρόν, νόμῳ θερμόν, νόμῳ ψυχρόν, νόμῳ χριόν: ἐτεῇ δὲ ἀτόμα καὶ κενὸν.” (ὀπερ ἔστιν, νομίζεται μὲν εἶναι καὶ δοξάζεται τὰ αἰσθητά, οὐκ ἔστι δὲ κατ’ ἀλήθειαν ταῦτα, ἄλλα τὰ ἀτόμα μόνον καὶ τὸ κενὸν).

ἐν δὲ τοῖς Κρατυντηρίοις, καίπερ ὑπεσχημένος ταῖς αἰσθήσεσι τὸ κράτος τῆς πίστεως ἀναθεῖναι, οὐδὲν ἦτον εὑρίσκεται τούτων καταδικάζων. φησὶ γὰρ: “ήμεῖς δὲ τῷ μὲν ἐόντι οὐδὲν ἄτρεκὲς συνίεμεν, μεταπίπτον δὲ κατὰ τε σώματος διαθήκην καὶ τὸν ἐπεισιόντων καὶ τὸν ἀντιστηριζόντων.”

\textsuperscript{201} The constrast between νομός and φύσις was at the core of an intense philosophical debate in the fifth century B.C. in which the Sophists (especially Hippias, Antiphon and Critias), the Hippocratic physicians and also the atomists took part. See Taylor, “Nomos and Phusis in Democritus and Plato”, in Social Philosophy and Policy, 24 (2), 2007, p. 1-20; Gemelli Marciano, “Evidentemente il sapiente ha studiato medicina”. Per una revisione dei rapporti fra i cosiddetti presocratici e la medicina ippocratica. L’esempio di Democrito, in Medicina & Storia IX, 17-8, 2009, p. 129-56.

\textsuperscript{202} Gal, \textit{De Elem.}, 60,17-18 De Lacy (I,418 K.); fr. 68 A 49 DK (90 L.).

\textsuperscript{203} Unlike the \textit{De Elementis}, where Galen only implicitly interprets the Democritean contrast between νόμῳ and ἐτεῇ as a dichotomy between δόξα and ἀλήθεια, in his commentary to Hippocrates’ \textit{De Natura Hominis} he refers the polarity νομός-φύσις directly to that between opinion and truth. See Gal., \textit{In Hipp. de Nat. Hom.}, I 25, CMG, V, 9,1, p. 35,4-6.

\textsuperscript{204} See Morel, 1996, p. 375-391.

And Democritus in some places abolishes the things that appear to the senses and asserts that none of them appears in truth but only in opinion, the true fact in things existent being the existence of atoms and void; for “By convention,” he says, “is sweet, by convention bitter, by convention hot, by convention cold, by convention color; but by verity atoms and void”. (This means: sensible objects are conventionally assumed and opined to exist, but they do not truly exist, but only the atoms and the void). Moreover, although he had promised to ascribe the confirmatory evidence to the senses, in his Confirmations, he is nevertheless found condemning them. For he says: “But we in reality comprehend nothing invariable, but what shifts about according to the disposition of the body and the things which enter into it and the things which oppose it”. And again he says: “Now verily that we do not comprehend what the nature of each thing is or is not, has been oft-times maid plain” (Transl. After Bury, p. 75).

Galen’ and Sextus’ testimonies show significant similarities\textsuperscript{206} even in the use of νομός and νομίζεσθαι, both of which they place in the text in order to stress the relative value assigned by Democritus to the secondary qualities. Indeed, their use of νομός seems to suggest an interpretation of the secondary qualities as if they were empty affections or, as claimed by Sextus, mere names established by custom.

The similarity between these two accounts is accepted also by Gemelli Marciano, who focuses especially on the large number of quotations from otherwise unknown works of Democritus that occur in Sextus\textsuperscript{207}. However, although she agrees with Morel on the hypothesis of a skeptical source (or at least of a doxographical account based on material from the the Middle Academy) for Galen’s version of νόμῳ γλυκὺ κτλ., she does not seem to share his interpretation of this fragment. Indeed, in a footnote\textsuperscript{208} Gemelli Marciano lists the various versions in which the maxim νόμῳ γλυκὺ κτλ. has been transmitted, highlighting especially the one preserved by Sextus Empiricus. She underlines that,

\begin{footnotes}
\item[206] The necessity of analyzing Galen’s testimony on atomism bearing in mind that of Sextus is underlined by Morel, who supposes that they share the same philosophical approach to reading Democritus’ doctrine: «Enfin, les deux auteurs font état, en termes symétriques, d’une hesitation doctrinale, voire d’une crise interne à l’épistémologie de Démocrite» See Morel, 1996, p. 380.
\item[208] Ibid. p. 205.
\end{footnotes}
besides the sweet and the bitter, in Adv. Math., VII,135; 68 B 9 DK (55 L.) Sextus mentions also the hot and the cold\textsuperscript{209}, which are absent from Galen’s testimony\textsuperscript{210}.

Furthermore, the maxim transmitted by Sextus is described by Gemelli Marciano as based on a formulation that goes back to the Skeptical Academy, presumably to Arecesilaus, and is also transmitted by the Neo-Pyrrhonians\textsuperscript{211}, in which the sensible qualities are described as properties devoid of any true existential value. However, in Galen’s version of the maxim the sweet and the bitter have merely a relative value according to Gemelli Marciano. Thus, she translates the fragment preserved by Sextus as «per convenzione [è il] dolce...in realtà [ci sono solo] atomi e vuoto (by convention [is] sweet...in truth [there are only] atoms and void)», while the version transmitted by Galen as «per convenzione [qualcosa] è dolce...in realtà [è] atomi e vuoto (by convention [something] is sweet...in truth [is] atoms and void) »\textsuperscript{212}. Therefore, unlike Sextus who seems to deny both existence and epistemological value to the secondary qualities, Galen stresses just the subjective value of what human beings perceive through their senses. Such a reading is not accepted by Morel, who considers these two versions of νόμῳ γλυκὺ κτλ. as essentially convergent in their interpretations of Democritus’ gnoseology. Indeed, according to him, Galen would have shared with Sextus the same skeptical interpretation of the figure of Democritus. Therefore, Morel’s interpretation does not take into account the contradiction highlighted by Gemelli Marciano. Although she also recognizes Galen’s debt to the skeptical tradition, she identifies significant differences between these two accounts and finds irrelevant the fact that both authors attribute to νομός the meaning of custom without any objective value.

However, the difference between Sextus and Galen’s version of νόμῳ γλυκὺ κτλ. seems to me to be rather nuanced and free from any radical disagreement. As already said, Democritus conceives of the primary elements as qualityless and, in turn, the secondary qualities as features that cannot provide any objective knowledge to human beings. Unlike the atoms, that are by nature immutable and eternal principles, the sweet and the bitter result from ephemeral entanglements. In both Sextus and

\textsuperscript{209} See also Diog. Laert. 9,72 (68 B 117 DK; 51 L.).

\textsuperscript{210} See Gal., De Elem., 60,8-9 De Lacy (I, 2, 417 K.); 68 A 49 DK (90, 185, 197 L.) and also De Exp. med., 15,7, 114 Walzer; 68 B 125 DK (79-80 L.).

\textsuperscript{211} Cf. Gemelli Marciano, 2007, p. 20-1.

Galen’s accounts such a view assumes a relativistic connotation. Indeed, they present the sweet and
the bitter as so defined by pure convention which is based on the perceptual judgments of the
observers. This relativity of the secondary qualities is evident in both Galen’s and Sextus’ accounts.

2.2.1 Galen’s Use of “ἕν” and his Description of the Democritean Atom as an Eleatic One.

In the second part of the maxim νόμῳ γλυκὸ κτλ. transmitted by Galen, there is the most original and
interesting aspect of his testimony. Within the description of atoms and void as the elements of all
things, Galen uses the term “ἕν” instead of the typically Democritean “δέν” to assess the existence of
void as well as that of matter.

Gal., De Elem., 60, 17-18 De Lacy (A 49 DK; 185 L.)
κατὰ δὲ τὴν ἀλήθειαν ἓν καὶ μηδὲν ἐστι τὰ πάντα. καὶ γὰρ αὐτῷ καὶ τοῦτ' εἴρηκεν αὐτὸς ἓν μὲν
tὰς ἀτόμους ὀνομάζων, μηδὲν δὲ τὸ κενὸν. αἱ μὲν οὖν ἄτομοι σύμπασαι σώματ' οὖσαι
σμικρὰ χωρίς ποιοτήτων εἰσί, τὸ δὲ κενὸν χώρα τις.

But in truth the totality of things is one and nothing. For he himself said this too when he
called the atoms one and the void nothing. All the atoms, then, being small bodies, are
without qualities, and the void is a kind of place (Transl. by De Lacy, p. 61).

The term ἓν occurs only in the version of νόμῳ γλυκὸ κτλ. preserved in De Elementis, in which it is
used in reference to Democritus’ distinction between the nature of the atoms and the void, namely
between being and nothing. Unlike Galen, in all other testimonies that have transmitted the maxim213,
the distinction between matter and void is expressed by the terms δέν and μηδέν. Both Diels and
Mullach interpreted the use of ἓν as a mistake and changed it to δέν, without taking into consideration
that, as pointed out by De Lacy214, ἓν occurs in all the manuscripts of the De Elementis. If Galen had

68 B 156 DK (78; 7 L.); Philop. In Phys., 188a 19, 110,10 (188, 197, 328 L.).

214 See De Lacy’s commentary, 1996, p. 167 where he writes: «Diels-Kranz, following Mullach, change ἓν to δέν on the
basis of Plut., Adv. Col. 4: 1109 A = Democr., B 156: II, p. 174,17-175,1 D-K. Helmreich also accepts the change to δέν
in his “Kritische Bemerkungen”, p. 277. But the context clearly calls for ἓν, as Galen is still attacking monism. And
surely if Galen had written δέν he would have commented on this strange word». 
used δέν, he would have certainly commented on it, since it is usually considered as a rare Democritean term by the ancient sources.

The occurrence of ἐν in Galen’s account is a controversial issue that has always been at the core of a debate among those, such as De Lacy and Gemelli Marciano, who link the evidence found in the manuscripts to the context of Galen’s refutation of atomism as a kind of monism, and those, such as Diels, who follow Mullach’s correction. Therefore, in order to attempt to give account of Galen’s use of ἐν, it is necessary to go back to the passage where he argues for the monism of the atomists and to compare it with Plutarch’s testimony in Adv. Colot., 4, 1108 F:


Ἐγκαλεῖ δ’ αὐτῷ πρῶτον, ὅτι τῶν πραγμάτων ἐκαστὸν εἰπὼν οὐ μᾶλλον τὸιὸν ἢ τοῖον εἶναι συγκέχυκε τὸν βίον ἀλλὰ τοσοῦτον γε Δημόκριτος ἀποδεῖ τοῦ νομίζειν μὴ μᾶλλον εἶναι τοῖον ἢ τοῖον τῶν πραγμάτων ἐκαστὸν, ὡστε Πρωταγόρα τῷ σοφιστῇ τοῦτ’ εἰπόντι εἰμαχήθαι καὶ γεγραφέναι πολλὰ καὶ πιθανὰ πρὸς αὐτόν. οἷς οὐδὲν ἐντυχών ὁ Κωλώτης ἐσφάλη περὶ λέξιν τοῦ ἀνδρός, ἐν ᾗ διορίζεται μὴ μᾶλλον τὸ δὲν ἢ τὸ ‘μηδέν’ εἶναι, ‘δὲν’ μὲν ὄνομάζει πάντως ‘μηδέν’ δὲ τὸ κενὸν, ὡς καὶ τούτου φύσιν τινὰ καὶ ὑπόστασιν ἑδέν ἐχοντος.

[Colotes] first charges him [Democritus] with asserting that no object is any more of one description than of another, and thus throwing our life into confusion. But so far is Democritus from considering an object to be no more of one description than of another that he has attacked the sophist Protagoras for making this assertion and set down many telling arguments against him. Colotes who is innocent of the slightest acquaintance with them, mistook an expression in which Democritus lays it down that "aught" is not more real than "naught" of empty space, meaning that space like body has a real existence of its own (Transl. by B. Einarson and P. De Lacy, p. 199).

In this passage Plutarch reproaches the Epicurean Colotes for having misunderstood Democritus’ statements, to the point of attributing to him what the sophist Protagoras had argued. According to

---

Plutarch, Colotes misinterpreted the meaning of οὐδὲν μᾶλλον «this no more than that»\textsuperscript{216}, which is referred to the comparison between δέν and μηδέν (namely between being and nothing), since he did not have a first-hand knowledge of Democritus’ texts.

As suggested by Calogero\textsuperscript{217}, the term δέν has to be considered as the opposite of μηδέν, namely as a lexeme that has been deprived of its negative component “μη”. Therefore, if we want to reproduce the original etymology of these two terms, we should translate δέν as “thing” and μηδέν as “no-thing”. This means that we should read the Democritean maxim as «thing exists no more than no-thing».

There are various hypotheses on the origins of the lexeme δέν. Bailey\textsuperscript{218} attributes the genesis of δέν to Democritus himself, while Zeller and Luria\textsuperscript{219} see this word as an archaism, since it also occurs in the fragment 320 of Alcaeus: καὶ κ᾿ οὐδὲν ἐκ δένος γένοιτο. In this verse, indeed, the poet uses δέν in contrast with οὐδὲν, almost suggesting a development of the latter term from the former. According to the scholars, the use of this relationship οὐδέν-δέν can be interpreted in two different ways: literally as “nothing comes from anything” or, as suggested by Treu\textsuperscript{220}, as the first formulation of the notion of \textit{ex nihilo nihil}. Unlike Treu, Calogero denies any reference to this principle, since it emerged only later with Eleaticism\textsuperscript{221}. According to him, indeed, Alcaeus’ fragment seems to rely on the dichotomy between δέν and οὐδέν, namely between “something” and “nothing”. Given these premises, then Calogero suggests translating the contrast between δέν and οὐδέν in Democritus’ fr.

\textsuperscript{216} Cf. L. Castagnoli, “Democritus and Epicurus on Sensible Qualities in Plutarch’s Against Colotes 3-9” in \textit{Aitia}, 3, 2013, p. 2-35.


\textsuperscript{220} See Treu, \textit{Alkaios}, München, 1952, p.77.

\textsuperscript{221} Following Calogero, even Luria’s interpretation, which attributes the genesis of the term δέν to Thales, seems fairly weak.
156 DK as: «...qualcosa si sarebbe ridotto a nulla», namely «something would be reduced to nothing».

Beyond the different hermeneutic perspectives and the multiple hypotheses made by the scholars on the verse of Alcaeus and the genesis of δέν, the link between Democritus and the poet allows us to conclude that the Abderite used δέν in order to describe the atomistic doctrine by means of an unusual and sophisticated language. Like Parmenides and his famous antinomy ἔστιν ἥ ὦκ ἔστιν, Democritus presumably chose to use a rare term like δέν in order to charm his followers. In this respect, Calogero describes δέν as a sign of Democritus’ attempt to break with the archaic logical-verbal perspective, namely with Parmenides’ statement that “what is not” can never be linked to “what it is”.

Therefore, even the claim 'δέν' μὲν ὠνομάζων τὸ σῶμα 'μηδέν' δὲ τὸ κενόν, ὡς καὶ τοῦτον φύσιν τινὰ καὶ ὑπόστασιν ἴδιαν ἔχοντος preserved in Plutarch’s testimony, should be read in the light of Democritus’ polemic against the Eleatics. Referring to matter and void with the terms “δέν” and “μηδέν”, Democritus equates also the ontological status of filled and empty space. Plutarch, however, does not interpret the Democritean maxim in the context of the controversy against Eleaticism and sees a contradiction in the relationship δέν-μηδέν.

As also noted by De Lacy, the relationship between atomism and Eleaticism plays a crucial role even in the case of De Elementis and especially in the interpretation of Galen’s use of ἕν instead of δέν. Indeed, in his commentary he stresses the need to investigate this aspect in light of Galen’s argument against the qualitative monism of the atomists.

---

222 As pointed out by Gemelli Marciano, this hypothesis seems to be confirmed by Herodianus, Περὶ παρονύμων, 895,40 Lentz (68 A 32 DK; CXXV L.), where he attributes to the grammaticus Hegesianax a treatise entitled On the Style of Democritus. See Gemelli Marciano, 2007, p. 10.


225 On this aspect De Lacy takes a clear stand, claiming: «But the context clearly calls for ἕν, as Galen is still attacking monism. And surely if Galen had written δέν, he would have commented on this strange word». See De Lacy’s commentary on De Elementis, 1996, p. 167. Unlike De Lacy, Perilli argues for a different interpretation: «Sarebbe far
In *De Elementis* Galen refers to Leucippus, Democritus, Epicurus and their followers as those who posit only one kind of substance, namely an infinite number of identical particles, at the base of reality. According to his description, the atoms are an infinite multiplicity of tiny Parmenidean beings, which are by nature homogeneous (πᾶν ὁμοῖον\(^{226}\)) and indivisible\(^{227}\) because of their lack of internal space.

Given the large number of references to the features of the Eleatic being, we can assume that Galen wrote ἕν instead of δέν to ensure coherence with his account and especially with his argument against the atomistic monism. This hypothesis is also mirrored in De Lacy’s translation of *De Elem.*, 60, 17-20 (I, 418 K.; 68 A 49 DK, 185 L.), that, following closely the manuscripts, reads: «…but in truth the totality of things is *one* and nothing. For he himself said this too when he called the atoms *one* and the void nothing».

Therefore, Galen understands Democritus’ relationship between δέν and μηδέν in terms of his critique of Eleatism\(^{228}\), but, as Plutarch also did, he manipulates its content. Indeed, as I will attempt to show later on, Galen’s account shares significant similarities with Plutarch’s testimony, especially in terms of their discussion of the lack of qualitaties and the impassibility of the atoms.

---


\(^{227}\) Even Calogero argues for a similar interpretation: «Lo stesso avviene, del resto, a proposito della “pienezza”, che si identifica in fondo con la compattezza in quanto è proprio l’impossibilità di lacune che esclude il diradamento, la variazione di densità». See Calogero, 1967 p. 140.

\(^{228}\) This interpretation of ancient atomism is rejected by Gemelli Marciano, who claims: «Se essi hanno polemizzato anche contro gli Elea, lo hanno comunque fatto da posizioni dogmatiche già acquisite e non “riflettendo” sui problemi posti dalle aporie eleatiche, un atteggiamento, questo, tipico della scuola platonica». See Gemelli Marciano, 2007, pp. 163-64. On this topic Alfieri holds a totally a different opinion and writes: «il concetto di atomo sorge per approfondimento logico del concetto eleatico dell’essere, approfondimento che porta gli Abderiti all’ammissione della realtà obiettiva del non essere». See Alfieri, *Atomos idea. L’origine del concetto dell’atomo nel pensiero greco*, Firenze, 1953, p. 8.
2.2.2 The Properties of the Atoms and the Overlap between Ancient Atomism and Epicureanism in Galen’s *De Elementis*.

As already said, Democritus admits the existence of both atoms and void (κενόν) and considers them as the fundamental components of the bodies. According to his doctrine, the atoms are tiny and invisible particles that move through the void, which, in turn, is set as both the precondition for their multiplicity and their motion. Motion is one of the primary characteristics of the atomic pattern, since it has the function of determining the mechanism of combination and dissolution of the aggregates, namely of the generation and disaggregation of the bodies. The term κενόν is attested for both Democritus’ and Epicurus’ surviving texts and its occurrence in the *De Elementis* is clear evidence of Galen’s tendency to assimilate Democritean atomism to Epicureanism. Indeed, Galen describes the atomistic void as the empty space where the particles constantly move and collide by falling downward, and he also identifies this mechanism as what determines the generation of the sensitive bodies.


αἱ μὲν οὖν ἄτομοι σύμπασαι σώματ' οὖσαι σμικρὰ χωρὶς ποιοτήτων εἰσί, τὸ δὲ κενὸν χώρα τις, ἐν ἧς φερόμενα ταυτί τὰ σώματ' ἃνω τε καὶ τὰ σύμπασαι σώματα τὰ σύμπασαι ἡ ἐν τοῖς κατὰ τὰς τοιαύτας ὁμιλίας κἀκεῖνοι πάλιν εἰς μιᾶς ἑπεξεργάζεσθαι καὶ τὰ παθήματα τὰς ἀισθήσεις.

---

229 See Gal., *De Elem.*., 60, 8-18 De Lacy (I, 417-8) and Democritus 68 A 49 DK (90 L.).


231 See Gal., *De Elem.*., 60, 19-20 De Lacy (I, 418 K.); commentary p. 167.

232 The correction is due to De Lacy, who in a note explains: «The reference here is probably to the Epicureans, who held that the primary motion of the atoms is downward through the void. Upward motion is the result of collisions». See Gal., *De Elem.*, 60, 21 De Lacy (I 417 K.), 68 A 49 DK (298 L.); Comm. p. 167. The same aspect is also discussed by Perilli in “La fortuna di Galeno filosofo. Un nuovo testimone dei commentari neoplatonici (Scholia Yalensia) al *De elementis*”, in *La filosofia in età imperiale. Le scuole e le tradizioni* ed. A. Brancacci, Atti del colloquio Roma 17-19 Giugno 1999, p. 126-28.
All the atoms, then, being small bodies, are without qualities, and the void is a kind of place in which these bodies, being carried downward, all of them for all time, some how become entwined with each other or strike each other and rebound; and in such assemblages they cause separations and recombinations with each other; and from this (interaction) they produce, besides all other compounds, our bodies, their affections, and their sensations.\textsuperscript{233}

(Transl. by De Lacy, p. 62-3)

In describing the natural motion of the atoms as downward following right after having quoted Democritus’ νόμῳ γλυκύ κτλ., Galen ascribes to the Abderite a theory that is typically Epicurean. Indeed, as pointed out by Epicurus himself, Democritus did not attribute weight to the atoms, which is the precondition for their falling down, and considered their motions as an intrinsic property (which, in turn, is determined by the existence of void)\textsuperscript{234}.

However, Epicurus’ claim is only partly true, since, so far as we know, Democritus never did explicitly deny that the atoms have weight\textsuperscript{235} or even mention their falling downward. Unlike Epicurus, he conceives of their natural motion as a chaotic swarm, similar to motes of dust moving in a sunbeam\textsuperscript{236}. In this pattern the particles can easily collide, rebound and move again in any possible direction, until they become entangled with one another and form the bodies. Therefore, weight is

\textsuperscript{233} On the void as the precondition for multiplicity and movement, Alfieri claims: «L’infinita molteplicità degli atomi esigeva una somma di infiniti intervalli per spiegare le qualità, le trasformazioni e, come base di tutto, il movimento, che l’esperienza ci attesta reale e che anzi è la legge stessa della realtà». See Alfieri, 1953, p.77.

\textsuperscript{234} Epicurus relied on the Academic and Peripatetic notion of weight, which conceived it as the force that determines the fall downwards of one object. Therefore, all the late reports such as Aetius’, that attribute weight to Democritus’ atoms, are presumably based on Epicurean materials or at least on indirect testimonies that, in turn, gave account of the Epicurean theory of the atomic motion. From this point of view, the Galenic testimony is no exception. See Aet., I, 23,3 (68 A 47 DK). For a more detailed discussion on weight and movement of the atoms, see Alfieri, 1953, p. 77-95; D. O’Brien, Democritus weight and size, Paris, 1981; Furley, Two Studies in Greek Atomists, Princeton, 1967; id., “Weight and motion in Democritus’ theory”, in Oxford studies in ancient philosophy I, 1983, pp. 193-209; J. M. Rist, Epicurus: An Introduction, Cambridge, 1972, p. 46-52; L. Perilli, La teoria del vortice nel pensiero antico. Dalle origini a Lucrezio, Pisa, 1996, pp. 87-101, 123-157.

\textsuperscript{235} On this point, see Aristotle’s testimony in Gen. et Corr., I, 8, 326 a 9-10; 68 A 60 DK.

\textsuperscript{236} Arist., De An., A 2, 404a 1-21 (67 A 28 DK; 443a, 462 L.); Ep., Fr. 293 Us.; Lucr. 2,114; Gal., De Nat. Fac. 1,14 (II, 49 K.); Theodoret., 4,8-10 (Dox. 285; 113 L.). The example of the motes of dust moving in a sunbeam is also used by Anaxagoras in 59 A 74 DK (Plut., Quaest. conv., 722 A; Arist., Probl., 903a 7).
listed among the features of the atoms\textsuperscript{237} and plays a crucial role only in the Epicurean physics. This property is what provides a reason for the particles’ motion and makes Epicurus also able to introduce the principle of \textit{clinamen}, namely the swerve that justifies the encounters of the particles\textsuperscript{238}.

The question of weight involves also the atomistic theory of vortex (\textit{δίνη}). In fact, the heaviness of each atom plays a crucial role in the rotating movement that progressively determines aggregation of particles according to the law of \textit{simile cum simili}\textsuperscript{239}. In this whirling motion, the heaviest atoms tend to place in the centre of the vortex, while the lightest move to the outer part.

\textsuperscript{237} Epicurus considers the downward motion of the atoms as a necessary consequence of their weight, namely as something intrinsic to their nature, while he conceives the upward movement as determined by their collision. For the description of weight as one of the primary properties of the atoms, see Ep., \textit{Hdt.}, [2] 54- 54,3, while for the relationship between the downward motion of the atoms and their weight, see Epicurus’ theory of \textit{isotachia} in 61-61,10 Arrighetti. On the latter aspect see also Lucr., II, 230-42. As it is well known, even though there is no explicit reference to the \textit{clinamen} in Epicurus’ texts, the doctrine occurs in Lucretius, II, 216-93 (especially in II, 224); Cicero, \textit{De Fin.}, I, VI, 18, 19 ff.; id. \textit{De Fat.}, 22; Philodemus, \textit{De Sign.}, col. 36, 12-13; Diogenes of Oinoanda, fr. 54 Smith; Plutarch, \textit{De Soll. Anim. Procr.}, 964 C (281 Usner, 1887, p. 351) and \textit{De Anim. Procr.}, 1015 C (281 Us.). While Bignone saw a reference to the \textit{clinamen} in Epic., \textit{Hdt.}, 43, Verde has recently suggested that the absence of the swerve from the \textit{Epistula ad Herodotum} and its presence in other sources (especially Epicurean) might be due to the fact that Epicurus developed this theory only later in his life. See E. Bignone, \textit{Epicuro. Opere, frammenti, testimonianze sulla sua vita}, Roma, 1964, p. 78; Verde, \textit{Epistola ad Erodotum}, 2010, p. 180-1. On Lucretius’s testimony on the doctrine of swerve, see Long and Sedley, vol. I, 1987, p. 20-112; D. Fowler, \textit{Lucretius on Atomic Motion. A Commentary on De Rerum Natura, Book Two, Lines 1-332}, Oxford, 2002, p. 301-66; T. O’Keeffe, \textit{Epicurus on Freedom}, Cambridge, 2005, p. 112 ff.


In addition to the use of κενόν, the overlap between ancient atomism and Epicureanism in *De Elementis* emerges also with other terms, which do not occur in Leucippus and Democritus but are typically Epicureans. For example, within his description of the downward movement of the atoms, Galen uses the words φερόμενα…[ἄνω τε καὶ] κάτω and refers to the atomic motion with the expression διὰ παντὸς τοῦ αἰῶνος. Even the term αἰῶν occurs in Epicurus, but never in Democritus. The same can be also said for the term περιπλέκεται, which is used by Galen in reference to the entanglement of the atoms. This word is also attested in Galen’s commentary to the Hippocratic *De Natura Hominis* and Plutarch’s *Adversus Colotem* as περιπλοκή.

The presence of both Democritean and Epicurean terms in *De Elementis* might appear as a sign of Galen’s superficial knowledge of atomism, or, as I suggested at the beginning of this section, of his deliberate attempt to deal with this philosophical tradition generically. Indeed, his presentation of


\[242\] Given the multiplicity of acceptations that the ancient Greeks attributed to the term αἰῶν, it is hard to attribute just one meaning to this word. According to Homer, αἰῶν is the vital force that abandons the human being’s body at its death (see *Il.*, V, 685ss.), while in *Epid.* VII, 122 the Hippocratic author considers αἰῶν as the spinal marrow, that, when suffers from tabes, causes the death of the patient within the seventh day of his illness. In addition to the medical treatises that had technicalized this term, Euripides and Sophocles attributed to αἰῶν the meaning of “life”, in terms of both its lifespan and content (see Soph., *Trach.*, 2s.; Eur., *Alc.*, 336s.). In the fragments of Empedocles (fr. B 21.12; 23, 8 DK) and Heraclitus (fr. B 52; 79), as well as in Plato's dialogues, the term αἰῶν occurs in reference to the notions of cosmic time, infinite and indeterminate. On this topic, see E. Degani, “ΑΙΩΝ”, in *Eikasmos*, 5, 2001 and F. Solmsen, “Symphytos Aion (A., Ag. 106)”, in *The American Journal of Philology*, Vol. 100, n. 4, 1979, p. 477-9.

\[243\] Ep., *Hdt.*, [2], 43,6, Arrighetti.

\[244\] Gal., *De Elem.*, 60,21-62,1 De Lacy (I 418 K.), 68 A 49 DK (298 L.); *De Nat. Fac.*, II 49,13; 50,12 K. (137, 4; 137, 20-21 H); *De Usu*, XI, 7, 868, 5 K. (II, 131, 17 H.).

\[245\] As pointed out by De Lacy, the term περιπλοκή occurs in Epicurus, while in later accounts on atomism such as Galen’s and Plutarch’s we find the verb περιπλέκεσθαι. See Gal., *De Elem.*, 62,1 De Lacy (I 418K.), 68 A 49 DK (298 L.); Commentary, p. 168; Ep., *Hdt.*, [2] 43,8; 44,4; Plut., *Adv. Col.*, 10, 1112 B; Gal., *In Hipp. de nat. hom. comm.*, I 20: CMG V 9,1, p. 33,7. On the basis of these occurrences, it has been argued, for example by Perilli, 1996, p. 90, that the verb περιπλέκεσθαι should be considered as a technical term of atomism.

\[246\] On the overlap between the atomistic theories of Democritus and Epicurus in this passage see Perilli, 1999, p. 127: “Tuttavia, poiché la terminologia che immediatamente segue appare a tratti epicurea, non si può escludere che Galeno accomuni, come anche altrove gli accade di fare, entrambi, Epicuro e gli atomisti più antichi.”
Democritus and Epicurus as broadly sharing the same view in terms of “qualitative monism”\(^2\) seems to imply that their concordance of ideas matters more than any other possible difference. In *De Elem.*, 60,3-6 De Lacy (II, 417 K.) Galen himself explicitly suggests how we should design our arguments against atomism, namely focusing on “what is general and common to all the school” and leaving aside details about their disagreements on particular issues. Therefore, he does not deny that there are *diaphonias* in the atomistic tradition, but he presumably just intends to emphasize their similarities in order to make his critique more effective.

However, although this kind of statement tells a lot about Galen’s historiographical strategy, it does not dispel the doubts about his lack of firsthand knowledge of the Democritean texts. As pointed out by both Gemelli Marciano and Morel\(^3\), it seems unlikely that Galen could have had access to Democritus’ works, which were extremely rare in the imperial time. Even though this difficulty does not concern the Epicurean texts, we cannot ignore the fact that, similarly to other late authors, Galen often seems to rely on doxographical materials or at least on accounts that made Democritus’ and Epicurus’ theories appear as broadly convergent. Indeed, as we will see later on, the overlap between ancient atomism and Epicureanism is a typical element of late reports such as Galen’s, that suffered

\(^2\) See *De Elem.*, 60, 3-6 De Lacy (II, 417 K.).

\(^3\) After having argued the possibility of first-hand knowledge of Democritus work by the Empiricists, Gemelli Marciano concludes that: «È invece improbabile che Galeno, nonostante la sua erudizione, avesse letto le opera democritee…Per il resto i vari riferimenti agli atomisti antichi disseninati nella sua opera, compreso il lungo excursus del *De Elementis secundum Hippocratem*, sono basati sulla rielaborazione di resoconti di varia provenienza…Dopo Plutarco, le opera fisiche originali di Democrito sembrano sparate dall’orizzonte dei dotti» (Gemelli Marciano, 2007, p. 9). Indeed, she considers both the maxim νόμῳ γλυκὺ κτλ. (*De Elem.*, 60, 8-18 De Lacy (II, 417-8 K.; fr. 68 A 49 DK (90 L.)) and the fragments preserved in the *De Exper. Med.*, 9, 5, 99 Walzer (68 A 171 DK (558 L.)): «And in short, we find that of the bulk of mankind each individual by making use of his frequent observations gains knowledge not attained by another; for as Democritus says, experience and vicissitudes are taught men this, and it is from their wealth of experience that men have learned to perform the things they do»; 15, 7, 114 Walzer (68 B 125 DK (79-80 L.)) «But who does not know that the greatest confusion of any reasoning lies in its conflict with what is evident? For how could a reasoning, which does not even get off to a start without evidence, be trustworthy, if it rails against the evidence from which it took its starting points? This is what Democritus knew, too, when he maligned the phenomena. Having said “by convention there is colour, by convention there is sweetness, by convention there is bitterness, in truth there are just atoms and a void”, he lets the senses speak to the mind in this way “wretched mind, taking your evidence from us you overthrow us? Our overthrow is your downfall”» (Trans. from Arabic by Walzer and Frede, in Galen, *Three Treatises on the Nature of Science*, Indianapolis/Cambridge, 1985, p. 62 and 73-4), as a result of Galen’s indirect knowledge of the Democritean doctrine. On this interpretation see Gemelli Marciano, 2007, p. 9 and Morel, 1996, p. 375-91.
from the rearrangements to which that theory had been subjected for centuries, both within philosophical and doxographical contexts.

2.3 The Reception of Atomism in the Late Authors. The Case of Galen’s *De Elementis*.

Democritean physics was mainly transmitted within the philosophical schools by sources that had also mediated and often assimilated its content to the doctrine of Epicurus. This doxographical tendency, which was widespread in the imperial time, was the result of several conditions that had strongly influenced the late reception of atomism:

1) The scarcity of Democritus’ works. Although they became rare already in the first century BC, we know from Thrasyllus’ catalogue that they were still available one century later. Thus, their rareness is presumably the reason why Thrasyllus decided to write a list of Democritus’ texts.

2) Both the lack of a constant and wide interest in the first atomism among the ancients, and the overlap between his physics and that of Epicurus.

The great attention devoted to Epicurus by late testimonies such as Galen’s was mainly due to the intention of criticizing his doctrine, which was widespread and had a decisive influence on the reception of Democritean atomism in late antiquity. As shown by both textual and epigraphical evidence, the Epicurean tradition was lively and the object of general interest until the first half of the

---

249 This section on the transmission of atomism relies heavily on the valuable and detailed reconstruction provided by Gemelli Marciano in her book *Democrito e l’Accademia*, that I have already mentioned many times in this work.

250 Thrasyllus was an Egyptian astrologer and a Pythagorean philosopher, who wrote a catalogue of Democritus’ works in the first century AD. His bibliography, on which is also largely based the list of democritean texts transmitted by Diogenes Laertius (IX 45-49; A 33), shows the wide and encyclopaedic interests of the Abderite. For a detailed discussion of Trasyllus’ testimony on the works of Democritus, see H. Tarrant, *Thrasyllan Platonism*, Ithaca-London, 1993, p. 85-9; Mansfeld, *Prolegomena: Questions to be settled before the Study of an Author or a Text*, Leiden-New York-Köln, 1994, p. 97-104 and W. Leszl, “Democritus’ Works: from their titles to their contents, in Democritus: Science, the Arts, and the Care of the Soul”, *Proceedings of the International Colloquium on Democritus Paris 18-20 September 2003*, ed. by A. Brancacci and P. M. Morel, Leiden-Boston, 2007, p. 11-76.

251 According to Gemelli Marciano, after the first century AD the works of Democritus were almost impossible to find: “difficilmente si possono trovare indizi di una conoscenza diretta delle opera fisiche democritee. Gli autori da questo periodo in poi fanno ricorso, per lo meno per illustrare la doctrina fisica, a fonti indirette siano esse pure di pregevole fattura come quella di ascendenza teofrastea utilizzata da Diogene Laerzio per l’esposizione della cosmogonia leucippea”. See Gemelli Marciano, 2007, p. 22.

III century AD. Indeed, the *POxy. 5077*\(^{253}\) (early II sec. AD), the Oinoanda inscriptions\(^{254}\) (late II-early III century AD) and the testimony of Diogenes Laertius\(^{255}\) in *Vitae Philosophorum*, X, 28-154 (first half of the III century AD) demonstrate that, beside Athens, Rome and Alexandria, Epicureanism reached even the remote Lycia and that the Epicurean texts were still circulating in Galen’s time\(^{256}\).

Epicureanism absorbed Leucippus and Democritus’ theory revising many of its aspects and therefore making it difficult to distinguish the original atomistic pattern from the later adjustments made within the Garden. After Epicurus, the first atomism no longer had an autonomous existence and had always been transmitted and rejected together with Epicureanism. Such a historiographical tendency was also determined by Epicurus himself, who was critical towards Democritus and passed on his attitude to the disciples\(^{257}\). Although several Herculanenum papyri show evidence of the likely presence of Democritus’ works in the library of Epicurus\(^{258}\), the Garden did not help the diffusion of the first atomism. On the contrary, the Epicurean school contributed to its oblivion.

---


256 The conclusion that the Epicurean text were still circulating in the II century AD has been formulated by Ferguson and more recently confirmed and supplemented by Erler and Dorandi. See J. Ferguson and J. P. Hershbell, “Epicureanism under the Roman Empire”, in *ANRW*, II, vol. 36, 4, ed. by Berlin-New York, p. 2260-2327; M. Erler, “Epicureanism in the Roman Empire”, in *The Cambridge Companion to Epicureanism*, ed. by J. Warren, Cambridge, 2009, p. 46-64; Dorandi, 2016, p. 29-48.


258 As noted by Gemelli Marciano, in *Ad Contubernales*, fr. 111, 116 ff. Philodemus tells about Epicurus’ request for texts of Democritus to one of his disciples, while in the fr. 20 Olivieri (68 A 34 DK; 36a L.) of *De Libertate Dicendi* he refers to a treatise that he wrote on Democritus. Therefore, these testimonies suggest that Epicurus had direct access to the
In this respect, the case of Leucippus is emblematic. Aristotle tells that he was the master of Democritus and the author of the treatise Μέγας διάκοσμος, which is instead ascribed by Thrasyllus to Democritus.259 Unlike the Stagirite, Epicurus denied the existence of Leucippus, who almost disappears from the late accounts on atomism. Indeed, as pointed out by Gemelli Marciano,261 Leucippus’ name occurs only in the tradition that goes back to Theophrastus, namely in those accounts that put him in contrast to Epicurus. In these texts Leucippus is said to have considered atoms to be indivisible because of their smallness, while Epicurus believed the atoms to be indivisible because of their hardness. Leucippus, on the other hand, is totally absent from the testimonies that are based on the Stoic tradition and assimilate Democritus’ view to Epicurus’.

The topic of the diaphonia between Leucippus and Epicurus about the indivisibility of the atoms takes us back to De Elementis, where even Galen relies on the same dichotomy. In De Elem., 62, 4-13 De Lacy (II, 418-9 K.), he puts this contrast in direct relationship with the impassibility of the particles, which is described with the term ἀπαθῆ. As underlined by De Lacy,262 this word does not appear in the original fragments of Democritus, while it occurs in the accounts of atomism that summarize the main aspects of his doctrine together with that of Epicurus.263

---

259 Diog. Laer., IX, 42; 46 (68 A 33 DK; CXV L.).
260 Id., X, 13 (67 A 2 DK). The question of Leucippus’ existence has been at the core of an intense debate among the scholars, who came to four different conclusions: 1) Rohde, Tannery, Bokownew, Nestle, Howald question the reliability of Aristotle and Theophrastus testimonies and exlude that there was any philosopher named Leucippus; 2) The lack of evidence leads Brieger to an agnostic position on this issue; 3) Furley, Barnes, Kirk, Raven and Schofield, Salem and Taylor considers Leucippus as the founder of atomism, but they also see no way to distinguish his figure from that of Democritus; 4) Diels, Dyroff, Bailey, Guthrie, Alfieri and Graham argue for Leucippus’ very existence and the possibility to identify indications of his own view. For an overview on this debate, see D. Graham, “Leucippus’ Atomism”, in The Oxford Handbook of Presocratic Philosophy, ed. by P. Curd and D. Graham, Oxford, 2008, p. 333-52. On Epicurus’ attitude towards Leucippus, see also N. DeWitt, “Epicurus and Leucippus”, in Classical Weekly vol. 38, n. 20, (Apr. 9, 1945), p. 155-7.
261 See Gemelli Marciano, 2007, p. 4-5.
Moreover, it should also be taken into account the context in which the ancient sources refer to atomism, namely the fact that they often place the *doxai* of the atomists within texts that deal with particular topics, such as void or time. Indeed, the ancient witnesses used the views of their predecessors in order to discuss certain subjects, to support their arguments, or to criticize those of their rivals. Therefore, the representation of atomism transmitted by ancient historiography is filtered and its content is often the result of adjustments. Precisely for this reason, it is necessary to take the doxographical mechanism into account when we face a late testimony such as Galen’s. In this respect, his account on the indivisibility and impassibility of the atoms in *De Elementis*, 62,4-13 is an emblematic example.

Gal. *De Elem.* 62, 4-13 De Lacy (I, 419 K.).

ἀπαθῆ δὲ υποτίθενται τὰ σώματα εἶναι τὰ πρῶτα τινὲς μὲν αὐτῶν ὑπὸ σκληρότητος ἀθραυστά, καθάπερ οἱ περὶ τὸν Ἐπίκουρον, ἐννιοὶ δὲ ὑπὸ σμικρότητος ἀδιαίρετα, καθάπερ οἱ περὶ <τὸν Διόδωρον> καὶ τὸν Λεύκιππον, ἀλλ’ οὐδὲ ἀλλοιοῦσθαι κατά τι δυνάμενα ταῦτας δὴ τὰς ἀλλοίωσεις, ᾧ ἀπαντες ἀνθρωποι πεπιστεύκασιν εἶναι διδαχθέντες ὑπὸ τῶν αἰσθήσεων, οἷον οὐτε θερμαίνεσθαι τί φασιν ἐκείνων οὔτε ψύχεσθαι, κατὰ δὲ τὸν αὐτὸν τρόπον οὔτε ἔπαθεν οὔθ’ ὑγραίνεσθαι, πολὺ δὲ δὴ μᾶλλον ἐτί μήτε λευκαίνεσθαι μήτε μελαίνεσθαί μήτ’ ἄλλην τιν’ ὀλως ἑπιδέχεσθαι ποιότητα κατὰ μηδεμίαν μεταβολήν.

But (these philosophers) postulate that the first bodies are unaffected, some of them, like Epicurus, holding that they are unbreakable because of hardness, some, like Diodorus and Leucippus, that they are indivisible because of their small size; and (they hold that) these bodies cannot undergo any of those alterations in whose existence all men, taught by their senses, confidently believe; for example, they say that none of the first bodies grows warm or cold, and similarly none becomes dry or wet, and much less would they become black or white or admit of any change whatever in any quality (Transl. by De Lacy, p. 63).

---

According to Galen, all the atomists share the principle of the impassibility of the atoms, namely their capability of being free from every kind of change, but they also disagree about the reason for their indivisibility. Indeed, in this passage Epicurus is said to attribute the indivisibility of the particles to their hardness (ὑπὸ σκληρότητος ἄθραυστα), while Leucippus attributes it to their smallness (ὑπὸ σμικρότητος ἀδιαίρετα).

As Epicurus himself underlines in *Hdt.*, [2] 54, the solidity of the atoms is what precludes the infinite divisibility of the bodies and guarantees their function as the least elements of reality. This means that the solid nature of the atoms prevents the dissolution of the existing things into nothing. Therefore, Epicurus indicates the compactness of the particles, which is due to their lack of empty gaps, as the precondition for their indivisibility. Indeed, the compactness of the atoms implies their hardness and unbreakability.

Epicurus, *Hdt.*, [2], 54, 3-55 Arrighetti

For every quality changes, while the atoms do not change in any respect; for it is necessary that during the dissolution of compounds something should remain solid and undissolved, which will guarantee that the changes are not into what is not nor from what is not, but come about by rearrangements in many cases, and in some cases too by additions and subtractions [of atoms from the compound]. That is why it is necessary that the things which are rearranged should be indestructible and not have the nature of what changes, but rather their own masses and configurations. For it also necessary that these things should remain [unchanged] (Transl. B. Inwood and L. P. Gerson, p. 10-1).
Thus, although the hardness of particles is described by Galen with the term σκληρότης which is absent from Epicurus’ remaining texts and occurs only in Plutarch’s testimony, he certainly stresses a key-feature of the Epicurean atom. Moreover, the solidity of the atoms is described as the main reason for their indivisibility even by Lucretius, who defines the primary elements as solida corpora.

In addition to Leucippus, in De Elem. 62, 4-13 De Lacy attributes to Diodorus the idea of the indivisibility of particles because of their smallness. According to De Lacy, who accepts as genuine the Arabic version of the text translated by Hunayn ibn Ishāq, Galen refers to both the

---

265 In Adv. Col., 8, 1111 E Plutarch uses σκληρότης in reference to the hardness of the Epicurean atom. Therefore, although this term is present in the Epicurean tradition, it does not occur in Epicurus’ letters and fragments, in which the solidity of atoms is described by the adjective στερεὸν and its substantive στερεὸτης. See Ep., Hdt., [2] 54, 5; [29. 23] 3, 6; [2] 44, 3.

266 Lucr., De Rer. Nat., I, 485-8: Sed quae sunt rerum primordia, nulla potest vis stinguere; nam solido vincunt ea corpore demum. Etsi difficile esse videtur credere quicquam in rebus solido reperiri corpore posse; «But those which are the first-beginnings of things no power can quench: they conquer after all by their solid body. And yet it seems difficult to believe that anything with solid body can be found in creation»; I, 498-502: Sed quia vera tamen rationaturaque rerum cogit, ades paucis dum versibus expediamus esse ea quae solido atque aeterno corpore constant, semina quae rerum primordiaque esse docemus, unde omnis rerum nunc constet summa creat; «But because nevertheless true reason and the nature of things compels, be with me, until in a few verses I make it clear that there are such things as consist of body solid and everlasting, which we teach to be seeds of things and their first-beginnings, out of which now all the sum of things has been built up»; I, 518-9: Materies igitur, solida quae corpore constat, esse aeterna potest, cum cetera dissoluantur; «matter therefore, which consists of solid body, may be everlasting, though all else be dissolved»; I, 548-50: Sunt igitur solida primordia simplicitate, nec ratione queunt alia servata per aevom ex infinito iam tempore res reparare; «The first-beginnings are therefore of solid singleness, nor can they in any other way be preserved through the ages from infinite time past and make things anew» (Trans. Rouse, p. 41; 43; 46-7). Lucretius keeps describing the hard nature of the atoms with the same terms in I, 574 and 609.

267 Hunayn ibn Ishāq (808-873 AD) was a well-known Nestorian Christian physician, scholar and translator in Baghdad, who transmitted forty of Galen’s treatises into Arabic and about ninety into Syriac. His translations were always based on a preliminary large collection (and comparison) of Greek manuscripts and, in the interest of clarity, were not literal. He adapted Greek terms to Arabic and, when the translation would be hard to read, he paraphrased the text and sometimes added brief explanations (as he does in the passage about the appropriate drug for persons that suffer from “the dropsy known as the white phlegm” in De Elem., 144, 23-146, 1 De Lacy (II, 498 K.). According to De Lacy, the reference to Diodorus Cronus and Leucippus his an emblematic example of this method. Indeed, in the Arabic version of De Elem., 62, 6 De Lacy (I, 419 K.; 68 A 49 DK; 112 L.) he mentions “the adherents of Diodorus and Leucippus” (īl Diudūrus wa-Lūqibus), stressing their being both physiologists and theorists of a similar doctrine of the elements. Following Hunayn, De Lacy adds the name of Diodorus to his edition of De Elementis. On this aspect, see De Lacy’s introduction to his
founder of ancient atomism and the dialectician Diodorus Cronus\textsuperscript{268} (āl Diudūrus wa-Lūqibus). The ancient sources, especially Sextus Empiricus in \textit{Adv. Phys.}, II, 85-118, attribute to Diodorus four paradoxes of motion, which aimed to demonstrate the non-existence of actual movement of bodies. Diodorus bases his argument on the idea of matter and space (and maybe also time) as constituted of minimal, invisible partless and therefore indivisible entities\textsuperscript{269}: ἕλάχιστα καὶ ἀμερή. This hypothesis, which takes up the paradoxes of motion held by Zeno of Elea\textsuperscript{270} and the doctrine of indivisible lines developed by Xenocrates\textsuperscript{271}, presumably had a dialectical function and intended to criticize the physical doctrines that admitted actual motion. In fact, according to Diodorus the observable phenomenon of an object that changes its location does not prove that the things move, but only that

\begin{itemize}

\begin{flushright}
\begin{itemize}


\end{itemize}
\end{flushright}

111
they have moved. Sedley describes this view as «a staccato analysis of motion comparable to a series of film frames». However, even though most of the sources consider Diodorus’ partless entities as very similar to the atoms, they do not explicitly attribute a physical doctrine to him. Therefore, his ἀμερῆ are never portrayed as first constituents of the world. This lack of information about his possible elementary theory would support the interpretation of Diodorus’ minima as hypothetical principles of a dialectic argument.

Although the reference to Diodorus is absent from the Greek manuscript of this treatise, De Lacy considers very unlikely that Hunayn would have included Diodorus on his own initiative. This position is criticized by Gemelli Marciano, who calls into question the reliability of the Arabic translation underlying the absence of Diodorus’ name from any other text of Galen’s corpus. Even if Gemelli recognizes the pertinence of Diodorus’ ἐλάχιστα καὶ ἀμερῆ to the discussion on atomism, she also points out that the reference to his minima occurs just in late testimonies that distinguish the corpuscularists from the atomists. According to her, even the sentence ἐκ ταῦτα δ' εἰσίν αὐτοῖς χοροὶ καὶ οἱ τὰ ἐλάχιστα καὶ ἀναρμα καὶ ἀμερῆ τιθέμενοι στοιχεῖα in De Elem., 58, 21-2 De Lacy

---


274 Following Döring, Verde points out that the sources always put Diodorus’ ἀμερῆ in relationship with his paradoxes and never to a physical theory. Although Denyer recognizes the lack of textual evidence that can prove the existence of Diodorus’ physics, he does not totally exclude such a hypothesis. Unlike them, De Lacy accepts this idea and reads the occurrence of Diodorus’ name in the Arabic version of De Elementis (see De Elem. 62, 4-13 De Lacy (I, 419 K.)) as a proof of Diodorus’s interest for physiology: «I would regard as a genuine and as a proof that the Megarian dialectician Diodorus Cronus, who must be meant here, was also a natural philosopher in his own right». On this aspect, see Döring, Kommentierte Sammlung der Testimonien, 1972, p. 129; Denyer, “The Atomism of Diodorus Cronus”, in Prudentia, 13, 1981, p. 35; De Lacy, 1996, p. 22; Verde, 2013, p. 219.

275 Ibid., p. 219

276 On De Lacy’s position, see his edition of De Elementis, 1996, p. 20-5; 169.
(II, 416 K.) would be evidence for the absence of Diodorus from this treatise\textsuperscript{277}. Indeed, although Galen lists the minima without parts (ἐλάκιστα καὶ ἀμερὴ) among the primary elements posited by the followers of atomism\textsuperscript{278}, he does not mention Diodorus’ name. Therefore, as suggested by Gemelli, the diaphonia between Diodorus and Leucippus would just be a product of doxography. Like Galen, other late authors have put in mutual relation the invisibility and the solidity of the atoms. In her work on the transmission of the first atomism, Gemelli Marciano identifies three main traditions within the reception of atomism:

1) The Peripatetic-Epicurean tradition, which combines together Theophrastus’ interpretation of the Democritean atomism with Epicurean materials. The late accounts that follow this tradition\textsuperscript{279} focus on the physical aspects of the doctrine, which were at the core of Theophrastus’ testimony, and especially on the indivisibility and the hardness of the atoms. Indeed, this tradition relies on the Epicurean definition of the atom as indivisible because of its compactness, which is described with Epicurean terms such as στερεόν, σκληρόν and with their substantives στερεότης and σκληρότης\textsuperscript{280}. In addition to the physical properties, the Peripatetic tradition deals also with the mathematical interpretation of the atom as ἔλαχιστον\textsuperscript{281}. As Gemelli Marciano points out, in this kind of reports the theoretical indivisibility of the atoms is expressed by the terms ἀδιαίρετα and στοιχεῖα, which are both typical of the Academy\textsuperscript{282}. Thus, this


\textsuperscript{278} In De Elem., 58, 20-2 De Lacy (II, 416 K.) Gemelli sees a distinction between atomists and corpuscularists. On this aspect see also Verde, 2013, p. 27-8.

\textsuperscript{279} Among the late accounts that rely on the Peripatetic-Epicurean tradition, those of Alexander of Aphrodisias, Philoponus and Simplicius are the most typical examples. See Alex., In Metaph.,985a 21, 35, 26 ff. (214 L.); Simpl., In de Cael., 275b 29, 242, 18 (67 A 14 DK; 214 L.); Philop., In Phys., 184b 15, 25, 5 (200 L.); id., In de Gen. et Corr., 31b 32, 39, 4; In de An., 403b 31, 67, 21 (200 L.).

\textsuperscript{280} In his account Philoponus uses the Epicurean term σκληρότης within the description of Lucippus’, Democritus’ and Epicurus’ atoms as indivisible for their hardness. For a broader analysis of this testimony, see Mansfeld, “Out of touch. Philoponus as source for Democritus”, in Democritus: science, the arts, and the care of the soul, ed. A. Brancacci-P. M. Morel, 2007, p. 277-292.

\textsuperscript{281} See Ps.-Plut., I, 13 883b; Stob., I, 14, 1 (Dox., 312).

\textsuperscript{282} Gemelli Marciano argues that the testimonies that conceive the atoms as ἔλαχιστον, namely as “the last and indivisible unit of a finite division”, are influenced by Aristotle’s criticism of those theories that explain the generation of the bodies in terms of combination and disaggregation of elements in De Gen. Et Corr., A 10, 327b, 33 ff. and De Sens., 3, 440a 31-
historical tradition swings between the physical and the mathematical connotations of the notion of atom, showing how stratified the Peripatetic-Epicurean doxography is.

2) Similarly, even the tradition mediated by the Stoics and the Skeptics relies on Theophrastus’ account of the indivisibility of the atoms for their solidity, which assimilates Democritus’ doctrine to Epicurus’ and make them appear as broadly convergent. In addition, these kinds of reports are also focused on the impassibility of the particles, as emphasized by the frequent occurrence of the term ἀπαθῆ within the arguments on the qualityless nature (ἀποιος) of the particles. In these texts the atoms are described as unaffected and therefore incapable of generating the phenomena.

The absence of secondary qualities in the nature of particles is a typical topic of the Stoics, who conceived of matter as a passive principle (ὑλή ἀποιος) and as opposed to a divine active-ordering principle. As in the case of Galen’s De Elementis, the late accounts that rely on the Stoic transmission of atomism usually discuss the qualitative status of the atoms together with their being identical in species. Indeed, the atoms of both Democritus and Epicurus are described as ἀπαθῆ διὰ τὴν στερρότητα and ἀποια, namely as all impassible for their compactness. Therefore, as in Galen’s De Elementis, the Aristotelian-Theophrastean term ἀπαθῆ is usually combined with the Stoic

440b 4. According to this interpretation, Aristotles’ claims about the notion of ἔλαχιστον would be referred to the atomists and would also be part of his argument against the Academic theory of indivisibles held in Plato’s Timaeus. Indeed, unlike the atomists, this doctrine set geometrical-mathematical principles, namely theoretical minima, as the first components of the things. On this topic see Furley, 1967, p. 106; Gemelli Marciano, 2007, p. 188-204; Verde, 2013, p. 128 ff.


284 Arist., De Gen. et Corr., A 8, 326a 1ss.; De Sens., 6, 445b 11-13 (429 L.); Theophr., De Caus. Plant., 6, 7, 2 (68 A 132 DK; 499 L.); De Sens., 60 (68 A 135 DK; 71 L.); 69 (68 A 135 DK; 3, 441 L.).
As argued by Gemelli Marciano, the late accounts on atomism mediated by the Stoics were presumably designed with the purpose of rejecting Epicureanism, which, however, had, in turn, influenced their reading of Democritus’ doctrine. Such an interpretation of atomism emerged first in testimonies, such as Cicero’s De Natura Deorum, De Finibus Bonorum et Malorum, Academica and Plutarch’s Adversus Colotem, that go back to the Skeptical Academy. These texts show that the Skeptics focus especially on the indivisibility of the atoms and usually discuss this question within

The term is absent from both Aristoteles’ and Theophrastus’ accounts on atomism. In these texts the qualityless nature of the atoms and their consequent impassibility are described only with the term ἀπαθές. Furthermore, the adjective ἄποιος does not occur in Epicurus’ works and appears only in the doxographical accounts of Epicureanism.

On this interpretation see Gemelli Marciano, 2007, p. 18; 224-6.

In the De Natura Deorum, Cicero gives account of both Carneades’ argument against the indivisibility of the bodies and that of the Academic Cotta, who considers the Epicurean explanation of the universe as made up of indivisible units and void as untenable. Furthermore, in the Academica, Cicero makes Varro (who refers Antiochus’ ideas) say that in nature nothing is so small that it cannot be divided. Unlike Cicero, in the Adversus Colotem Plutarch focuses on the atomic impassibility, dealing also with the solidity and hence the indivisibility of the invisible particles set by the atomists.
polemical contexts, in which the figures of Democritus and Epicurus are the main target and tend to be assimilated at the expense of Leucippus. The criticism of atomism mediated by the Skeptics is the result of the use of materials of various origins, which were manipulated and adapted by the authors to their own purposes\textsuperscript{288}. Cicero’s testimony is an emblematic example of this mechanism. In addition to the use of various sources and the dialectic context typical of the Skeptical Academy, Cicero’s account shares significant similarities with Galen’s testimony in the \textit{De Elementis}.

3) The so-called “Diaphonic” tradition\textsuperscript{289} of late authors such as Lactantius and Pseudo-Plutarch is focused on the indivisibility of the atoms and especially on the opposite views held by Leucippus and Epicurus, or, in a few cases, by Democritus and Epicurus. Indeed, in these texts the interpretation of the atom as \(\text{ἐλάχιστον καὶ ἄμερός}\), namely as a partless minimum, occurs in reference to Leucippus and in contradiction to Epicurus’ notion of atom as indivisible for its hardness. In addition to the \textit{diaphonia} between Leucippus and Epicurus, which appears also in Galen’s \textit{De Elementis}\textsuperscript{290}, the late sources always tend to discuss the indivisibility of the particles on account of their smallness within dialectic contexts, as happens for example in Lactantius’ \textit{Divinae Istitutiones} and Pseudo-Plutarch’s \textit{Placita}. Like in the case of the Skeptics, these authors rely on various kinds of accounts in order to be able to criticize atomism from different points of view. The diaphonic tradition is therefore largely

---

\textsuperscript{288} These authors also had the tendency to extract maxims, like Democritus’ “νόμωι γλυκύ” and “ἐν βυθῶι”, from their contexts and interpret them according to their own purposes. On this aspect see Gemelli Marciano, 1998. Furthermore, it should also be taken into account that within the Skeptical Academy the doctrines were often transmitted orally and that, in many cases, these theories were the result of additions and changes made by the authors who dealt with atomism. The outcome of this practice is the presence of a significant variation within the representation of atomism provided by the accounts that rely on Skeptical sources. On the mechanism of transmission within the philosophical schools, see Mansfeld, “Sources”, in K. Algra, K. Barnes, J. Mansfeld, M. Schofield (ed.), \textit{The Cambridge history of hellenistic philosophy}, Cambridge, 1999, pp. 3-30.

\textsuperscript{289} I have borrowed this definition from Gemelli Marciano, 2007, p. 235 ff.

\textsuperscript{290} Gal. \textit{De Elem.}, 62,4-7 De Lacy (418-9 K.).
based on an indirect knowledge of the atomistic texts, namely on summarized versions transmitted within doxographical accounts.

The use of various sources is especially evident in Lactantius’ *De Opificio Dei*, in which, like Cicero\(^{291}\), Pseudo-Plutarch\(^{292}\), Plotinus\(^{293}\) and several Christian authors\(^{294}\) that deal with atomism, he refers only to Epicurus’ particles and to their indivisibility as due to their hard constitution. However, in the third book of the *Divine Institutiones*\(^{295}\) Lactantius describes the elements held by Leucippus, Democritus and Epicurus as all indivisible for their smallness, while he does not even mention their solidity\(^{296}\).

According to Gemelli, Lactantius’ arguments are presumably a reworked version of Cicero’s and Plutarch’s testimonies. He uses the same dialectic structures of their texts, in which the atomistic doctrine is discussed within the dialogues among several characters\(^{297}\), but, at the same time, he gives a different account of the indivisibility of the particles.

However, despite the use of Skeptical sources and especially of arguments that go back to Cicero and Plutarch, Lactantius does not focus his account of atomism on the critique of the impassibility of the particles, or of their qualitative monism which are at the core of both Galen’s and Plutarch’s testimonies.

Similar to Lactantius, even Pseudo-Plutarch tells about the *diaphonia* between Democritus and Epicurus on the indivisibility of the atoms\(^{298}\) and discusses their doctrines within a dialectic context. In his doxographical account, Pseudo-Plutarch focuses on the development of Epicureanism and its relationship with the first atomism\(^{299}\). He compares these two versions of atomism, underlying the corrections made by Epicurus to Democritus’ idea of atomic motion by introducing weight as the

\(^{291}\) Cic., *De Fin.*, 1, 6, 17 (68 A 56 DK; C, 15, 180, 361 L.); *De Nat. Deor.*, II, 37, 93.

\(^{292}\) Ps.-Plut., 2, 3 886 D.

\(^{293}\) Plot., 3, 1, 2; 3, 1, 3.

\(^{294}\) Cyrill., *Contra Jul.*, 2, 15; Didym. Caec., *Comm. in Eccles.*, 7-8,8; Ambros., *Hexaemer.*, 1, 2, 7.

\(^{295}\) Lact., *Div. Inst.*, 3, 17, 21-7 (218; 235; 565; 591 L.).

\(^{296}\) The description of the atoms as indivisible for their smallness occurs also in the *De Ira Dei*, 10, 1 (591 L.).

\(^{297}\) Ibid., 3, 17, 21-7 (591 L.).

\(^{298}\) Even though Lactantius and Pseudo-Plutarch’s accounts share strong similarities in both their structures and contents, the latter does not mention the name of Leucippus in reference to the indivisibility of the atoms.

\(^{299}\) See Ps.-Plut., 1, 3, 877 D. In addition to the comparison between Epicurus’ and Democritus’ doctrines, Pseudo-Plutarch also refers to the corpuscularism of Asclepiades of Bithynia.
reason of their movement downward. This aspect was discussed also by Cicero in the *De Fato*, 20, 46 (68 A 47 DK; 307; 365 L.), which could be considered as one of Pseudo-Plutarch’s source for his passage.

2.4 Galen against atomic impassibility. The “needle argument” and its background.

In *De Elementis* the charge of qualitative monism leads to Galen’s rejection of the atomistic account of sensation, namely to his “needle argument”. If, as Galen argues, positing infinite and undifferentiated particles without qualities is the same as holding just one element at the base of the phenomena, then the atomists must be considered as monists that have removed the necessary precondition for any kind of sensation: the multiplicity of elements which are susceptible to alteration. Indeed, Galen’s needle argument focuses especially on the impassibility of the atoms, namely on their unaffected nature and their consequent incapability to suffer from affections such as pain and diseases. In *De Elementis* he points out that if someone pricks the skin of a body made up of atoms with a needle, there can be no perception of pain in it. In fact, given the unalterability of its first components, the body has no reaction when the needle touches them. Therefore, this example shows that Galen builds his rejection of atomism on the direct and necessary relationship between the atoms’ lack of secondary qualities and their not being capable of alteration and sensation. According to him, in fact, there must be a correspondence between the nature of the elements and that of sensitive bodies. If the atoms are qualityless, unchangeable and unaffected, then their aggregates should be of the same kind.

The argument against the impassibility of the atoms is presumably of Stoic origin and, in addition to Galen’s *De Elementis* in which is preserved its fullest version, it also occurs in Cicero’s and Plutarch’s testimonies. Even if these two sources do not mention the needle argument, their critiques of atomism are built more or less around the same questions discussed by Galen. Both Cicero and especially Plutarch adopt arguments against the impassibility of the atoms that are similar to Galen’s and that, in addition to their relying on the same tradition, may also be themselves part of its background.

---

300 Ibid., 1, 3, 877 E (217; 234 L.).
301 Id., 1, 23, 884 C (68 A 47 DK; 307, 265 L.).
2.4.1 Cicero’s Account.

As already mentioned, Cicero devoted many pages of his works to the critique of atomism and especially of its Epicurean version, using polemical arguments similar to those of Galen in the *De Elementis*.

In the *De Natura Deorum* I, 10, 24, within a discussion on the notion of the divine nature in both Platonic and Stoic philosophy, the Epicurean Velleius puts the perception of pain in the human body in direct relationship to the intrinsic capability of its primary components to be affected and wonders why this pattern should not also be applied to the nature of the gods:

*Quodque in nostro corpore si minima ex parte significentur molestum sit, cur hoc idem non habeantur molestum in deo?*

Also, why should a condition that is painful in the human body, if even the smallest part of it is affected, be supposed to be painless in the deity? (Transl. H. Rackham, p. 27).

Even though in these lines there is no direct reference to the atomistic doctrine, their content shows Cicero’s interest in the question of the sensitive nature of the elements and that, similarly to Galen, he deals with it while making the example of physical pain. Indeed, in *De Elementis*, 62, 9-16 De Lacy (I, 419 K.) Galen criticizes the impassibility of the particles posited by the atomists and rejects their view claiming that:

*οἷον οὔτε θερμαίνεσθαι τί φασιν ἐκείνον οὔτε ψύχεσθαι, κατὰ δὲ τὸν αὐτὸν τρόπον οὔτε ξηραίνεσθαι οὔθ’ ψυχαίνεσθαι, πολὺ δὲ δὴ μᾶλλον ἐτι μήτε λευκαίνεσθαι μήτε μελαίνεσθαι μήτ’ ἄλλην τιν’ ὀλως ἐπιδέχεσθαι ποιότητα κατὰ μηδεμίαν μεταβολήν. εὐλόγως οὖν ὁ Ἰπποκράτης ἀντιλέγων αὐτοῖς ἐρεῖ μηδέποτε ἂν ἀλγέειν τὸν ἄνθρωπον, εἰ τοιαύτῃ τις ἢν ἦ* 

---


303 Nevertheless, this passage occurs in the first book of the *De Natura Deorum*, namely in the part of the text that Cicero devotes entirely to the description and the rebuttal of Epicureanism. The context in which this passage is placed allows us to attempt a comparison with Galen’s argument against the impassibility of the atoms in the *De Elementis*, in which he points out that any body that suffers from physical pain should be necessarily made up of elements that, in turn, have qualities and are capable of affection.
φύσις αὐτοῦ· τὸ γὰρ ἀλγῆσον χρὴ δὴ ποὺ δύο ταῦτ' ἔχειν ἐξ ἀνάγκης, ἀλλοιωτὸν τε καὶ αἰσθητικὸν ὑπάρχειν.

For example, they say that none of the first bodies grows warm or cold, and similarly none becomes dry or wet, and much less would they become black or white or admit of any other change whatever in any quality. With good reason, then, Hippocrates’ answer to them will be that man would never feel pain if his nature were such as this. Surely something that is to feel pain must necessarily meet these two requirements: it must be capable of change and capable of sensation (Transl. De Lacy p. 63).

The criticism Galen directs against atomism focuses especially on the inalterability of the atoms, that he describes as devoid of secondary qualities in virtue of their inability to undergo any kind of alteration and change (both of colour and temperature), namely to have their nature somehow modified. The impassibility (ἀπαθής) is what makes the atoms insensitive and unchangeable elements and, according to Galen’s critique, it is also what leads the atomistic doctrine to fall into the contradictions of qualitative monism. Therefore, having posited particles which are impassible and all of the same kind as primary components of the bodies, that, in turn, are sensitive and can become ill, is what makes the atomistic elementary theory exposed to Galen’s attack. Relying on Hippocrates’ rejection of monism in De Natura Hominis, Galen points out that, given both the impassible and the identical nature of the atoms, if the human body would be made up of only one kind of element, then it should not suffer from pain. Indeed, as Galen points out in De Elementis, 62, 15-6 De Lacy (I, 419 K.), the elementary theory held by the atomists fails to explain sensation because it does not meet two necessary requirements:

304 According to De Lacy, this is just one of the thirty times that Galen lists the four basic qualities of the elements (hot, cold, dry and wet) in the De Elementis. As in the passage above, he always tends to mentions them in opposite pairs, for instance: hot-cold and dry-wet. This sequence follows that of Hippocrates in the De Natura Hominis. On the lists of the four qualities in Galen’s De Elementis, see De Lacy, 1996, p. 49-52.

305 In the Liddell-Scott the term ἀπαθής is said to be reffered to the incapability of suffering affections (not suffering or having suffered, generally unaffected) and of feeling sensations (without passion or feeling, insensibile, free from emotion in Arist., Top., I, 25 b 23; Rh., 1378 a 5, 1383 a 28; Stoic., 3, 109). In addition to Aristotle and the Stoics, ἀπαθής occurs with the same meaning also in the medical field, where it usually describes the incapability of suffering from diseases and thus the healthy status (unaffected by disease, healty in Gal., De atra bile, 5, 122).

1) each element must be capable of change (ἀλλοιωτόν);
2) each element must be capable of sensation (αἰσθητικὸν).

As already mentioned in this chapter, Cicero’s argument against the impassibility of the atoms seems to be based on a Stoic critique. In De Natura Deorum the Academic Cotta rejects atomism for not having involved any incorporeal principle in its physics. The lack of an active ordering principle denounced by Cotta is both a clear reference to the Stoic natural philosophy and to a standard topic of anti-Epicurean polemics that criticize the impassibility of the atoms. Indeed, the Stoic doctrine of the two principles often has the function of addressing the critique of both the unaffected nature of the atoms and their consequent incapability of generating compounds with secondary qualities. In this regard, in De Nat. Deor., I, 39, 110 the Academic Cotta argues against the Epicurean Velleius pointing out that the collisions between qualityless particles cannot generate living beings, which are by nature sentient:

Omnis tamen ista rerum effigies ex individuis quo modo corporibus oritur? Quae etiamsi essent, quae nulla sunt, pellere se ipsae agitari inter se concursu fortasse possent, formare figurare colorare animare non possent.

But be that as it may, how do all your pictures of objects arise out of the atoms? Even if the atoms existed, which they do not, they might conceivably be capable of pushing and jostling one another about by their collisions, but they could not create form, shape, color, life. (Transl. Rackham, p. 107)

The incapability of atoms to produce sensible bodies is strictly related to the question of the difference between the nature of the particles and that of their aggregates, namely to the possibility that elements without qualities and incapable of changes and affections could generate bodies that are by nature so different from them. In fact, the atomists conceived the inalterability as an indirect

---

308 Cicero uses the same kind of argument in II, 37, 94: Ista autem quem ad modum adseverant ex corpusculis non calore non qualitate aliqua (quam ποιότητα Graeci vocant) non sensu praeditis sed concurrentibus temere atque casu mundum esse perfectum; «Yet according to the assertion of your friends, that out of particles of matter not endowed with heat, nor with any quality (the Greek term ποιότητα), nor with sense, but colliding together at haphazard and by chance, the world has emerged complete». On this aspect see also De finibus I, 6, 18 (68 A 56 DK; C, 15, 180, 361 L.).
demonstration for the indivisibility of the particles, whose solidity is, together with their impassibility, what ensures their eternity and therefore their role as primary elements of reality\textsuperscript{309}.

This argument also occurs in \textit{De Elementis}, where Galen compares a body made up of atoms with the constitution of one stone, which by nature cannot perceive the changes that its nature undergoes\textsuperscript{310}:

Gal., \textit{De Elem.}, 62, 16-22 De Lacy (I, 419-420 K.)
\begin{quote}
eἴτε γὰρ μηδέποτε μηδεμίαν ἀλλοίωσιν ἐπιδέχοιτο, φυλάξει διὰ παντὸς ἡν ἐξεν εξ ἀρχῆς κατάστασιν· οὗ φυλάττει δὲ γε τὸ ἀλγοῦν· εἴτε μεταβάλλοι, καθάπερ οἱ λίθοι τε καὶ τὰ ξύλα θερμαίνομενα τε καὶ ψυχόμενα καὶ διαιρούμενα, μὴ παρείη δὲ αὐτῷ τις αἴσθησις σύμφωνος, οὐκ αἰσθῆσαι τῆς ἁμφότερος γενομένης διαθέσεως, ὡσπερ οὖν οἱ λίθοι. καὶ μὴν ἁμφοῖν ἀπολείπεται τὰ τούτων στοιχεῖα μήτ' ἀλλοιούσθαι μήτ' αἰσθάνεσθαι πεφυκυίας ἀτόμου μηδεμίας.
\end{quote}

If it never undergoes any change, it will retain at all the times the state in which it was at the beginning; but what feels pain does not retain it; and if it changes its state, as stones and wood do when being heated and chilled and split, but no sensation is by nature present in it, it will not perceive the occurrence of the condition that is affecting it, just as stones do not. (Transl. De Lacy, 1996, p. 63, 19-21)

According to Galen, the changes that affect the bodies of all the living beings should necessarily imply the existence of a multiplicity of elements that, in turn, by nature undergo qualitative changes. In this sense, Galen’s view seems to presuppose both the Stoic\textsuperscript{311} and the Hippocratic notion of

\textsuperscript{309} According to Gemelli Marciano, the idea of the atomic impassibility could be considered as part of Democritus’ original doctrine and the term ἀπάτητον as his own \textit{hapax}. See fr. 68 B 131 DK; 828 L. and Gemelli Marciano, 2007, p. 208.

\textsuperscript{310} On this argument see Hipp., \textit{De Nat. Hom.}, 2, 13-5 and Gal., \textit{In Hipp. de Nat. Hom.}, I, 5, 35, 17ff. K.

\textsuperscript{311} The occurrence of the Stoic expression ἄποιος ὕλη in the \textit{De Elem.}, 114, 16-17 De Lacy (I, 469 K.) in reference to qualityless matter, seems to confirm this hypothesis, showing that Galen knew the Stoic doctrine of alteration and its terminology. However, it needs to be specified that in \textit{De Elementis} the expression ἄποιος ὕλη is referred to Athenaeus of Attaleia, the founder of the Pneumatist medical school that in the \textit{De Causis Contentivus}, 2, 1-3: CMG Suppl. Or. II, p. 55, 4-24 = p. 134,3-19 Galen himself defines as a pupil and a disciple of Posidonius and that in the \textit{De Elem.}, 102, 2 De Lacy (I, 457-8 K.) ff. he criticizes for having misunderstood Hippocrates’ elementary theory. On Galen’s testimony on
alteration, namely respectively the idea of qualitative change as the product of the action of an active body upon a passive one and as the outcome of a process of interaction between the properties of the primary elements (hot, cold, wet and dry). As in Galen’s De Elementis, even in Cicero’s account the Stoic notion of alteration is mixed with other doctrines of different origins. This suggests that both authors based their testimonies on materials that go back to the Skeptical Academy, or relied on a source that, in turn, used accounts that combined together doctrines from different philosophical traditions.

Although Cicero’s testimony is less detailed, he also shares some fundamental aspects of Galen’s argument. Indeed, in the Lucullus, in which Cicero defends Skepticism and criticizes the doctrine of

---

312 In the De Elem., 86, 110 ff. De Lacy (I, 442-4 K.); 88, 4 ff. (I, 444-5 K.) Galen lists the theories of the Presocratics, that he also considers as essentially monistic. Indeed, according to Galen, they set just one element (water, air, earth or fire) at the base of what exists and do not realize that everything is the product of a cyclical transformation of one constituent into another. Therefore, the Presocratics fail to understand that this mechanism does not involve just one element. Following the chronological order, Galen refers to: Thales, Anaximenes, Anaximander, Heraclitus and presumably to Xenophanes, who is not explicitly named. On Galen’s refutation of monism, see Moraux, 1984, p. 300-5.

313 On this view see the De Elementis, 130, 1-10 De Lacy (I, 483-4 K.), in which Galen refers explicitly to Hippocrates’ notion of alteration and claims: ἐφεξῆς ἤδη κέχρηται τῷ θερμῷ καὶ τῷ ψυχρῷ καὶ τῷ ξηρῷ καὶ τῷ ὑγρῷ πρὸς ἁπάσας τὰς ἄλλοιώσεις ἐκ μὲν τοῦ φαίνεσθαι λαβών, ὅτι τὰ πλησιάζοντα σώματα μεταβάλλειν εἰς ἄλληλα πέρυκε τῷ θερμαίνειν ἢ ψύχειν ἢ ξηραίνειν ἢ ὑγραίνειν, ἐκ δὲ τοῦ προδεδεχθαί τὸ τὴν οὕσιαν ἄλλοιοθθαί πᾶσαν εἴδος ἀντιπρόμενον, ὡς οὐκ ἐστι διάκρισις τε καὶ σύγκρισις ἢ φαινομένη τῶν σωμάτων ἄλλοιώσεως, ὡς οἱ περὶ τὸν Ἐπίκουρον τε καὶ Δημόκριτον ἔνομνον ἐτέρῳ τρόπῳ πάλιν Ἀναξαγόρας τε καὶ Ἐμπεδοκλῆς, ὁ μὲν τὰς ὁμοιομερείας εἰσάγων, ὁ δὲ ἀμετάβλητα νομίζων εἶναι τὰ τέταρτα στοιχεῖα: …immediately thereafter used hot, cold, dry and wet for all the alterations; he took from observation the fact that it is the nature of neighboring bodies to undergo mutual change by heating, cooling drying or wetting; and from his earlier proof that the whole substance is altered he knew that (that other view) is refuted, that the visible alteration of bodies is not by separation and combination, as Epicurus and Democritus believed, and as Anaxagoras and Empedocles also believed in a different way, the former bringing in the homoeomeries, the latter holding that the four elements are unchanging (Trans. De Lacy, p. 131). On the same topic see also 132, 14-18 De Lacy (I,485-6 K.): ὁ θερμὸς οὐκ ὁ Ἐπικοράτης οὐκ ἀνθρώπου μόνον, ἀλλὰ καὶ τῶν ἄλλων ἁπάντων τὴν φύσιν ἐκ θερμοῦ καὶ ψυχροῦ καὶ ξηροῦ καὶ υγροῦ συνίστασθαί φησι. καὶ γάρ δρά ταὐτύ εἰς ἄλληλα φαινομένος, ὡς ἄπαντες ὁμολογοῦσι, καὶ τὸ δράν ὁ λός ἐκ διακρίσεως ἔχει καὶ συγκρίσεως, ἀλλ’ ἐκ τοῦ πάσχει τε καὶ ἄλλοιοθθαί δι’ ὅλης τῆς οὕσιας αὐτῶν; Hippocrates then is correct when he says that the nature not of a man only but of all other things as well is formed from hot, cold, dry and wet. And it is evident that they interact, as all men agree; their ability to interact is not from their separating and combining but from their being affected and altered through their whole substance (Trans. De Lacy, p. 133).
Antiochus supported by Lucullus, he makes an explicit and polemical reference to Democritus and to
his doctrine of the difference between the properties of the atoms and those of their compounds:

Cic., Academica, II, 40, 125.

*Tune aut inane quicquam putes esse, cum cum ita completa et conferta sint omnia ut et quid
quid movebitur corporeum cedat et qua quidque cesserit aliud ilico subsequantur? Aut
atomos illas e quibus quidquid efficiatur illarum sit dissimillimum? Aut sine aliqua mente
rem ullam efficiat praetulam?*

Can you really suppose that any such thing as empty void exists, when the universe is so
completely filled and packed that whenever a bodily object is set in motion it gives place
and another object at once moves into the place that it has left? Or that any atoms exist out
of which are made things that are all entirely unlike them? Or that anything splendid can be

In addition to the inability of qualityless and unaffected atoms to generate sensitive bodies, both
Cicero’s and Galen’s accounts also deal with another fundamental property of these particles: their
indivisibility. Both in De Fin., I, 6, 18 and De Nat. Deor., I, 24, 67 Cicero rejects those
characteristics of the particles, that he calls both *individua corpora* and *individua corpuscula*,
together with their downward movement. Like the other sources that based their accounts on the
version of atomism transmitted by the Skeptics, his critique assimilates Democritus’ and Epicurus’
doctrines. Indeed, in De Finibus, I, 6, 17 he portrays Epicurus’ physics as a poor copy with small
adjustments to the theory of his predecessor 315:

“Principio”, inquam, “in physicis, quibus maxime gloriatur, primum totus est alienus.
Democritea dicit, perpauca mutans, se dita ut ea quae corrigere vult mihi quidem
depravare videatur”.

---

314 In this passage Cicero states objections to atomism relying once again on a Stoic argument. He also uses the same kind of argument in De Finibus I, 16, 17-8, in which he criticizes the absence of an efficient cause in the atomistic pattern together with the critique of the indivisibility of the atoms.

315 On this aspect, see also ibid. I, 6, 18-9. Cicero provides a similar argument also in De Nat. Deor., I, 24, 66.
“Let me begin”, I replied, “with the subject of natural philosophy, which is Epicurus’s particular boast. Here, in the first place, he is entirely second-hand. His doctrines are those of Democritus, with a very few modifications. And as for the latter, where he attempts to improve upon his original, in my opinion he only succeeds in making things worse” (Transl. Rackham, p. 19).

Although Cicero ascribes the foundation of atomism to Democritus, he focuses his account only on the theories of Epicurus and his followers. Such an attitude suggests once again that he probably used a set of polemical arguments that go back to the Skeptical Academy and that, in turn, might have been developed by Stoic sources.

The indivisibility and the motion of the particles are also similarly discussed in De Elementis, in which Galen mentions the atomic movement in reference to the diaphonia between Epicurus’ notion of atom as indivisible for its hardness and Leucippus’ and Diodorus Cronus’ view of the particles as indivisible for their smallness. However, whereas Cicero also mentions the Epicurean explanation of atoms’ indivisibility in De Finibus, he does not refer to the view attributed to Leucippus and Diodorus in any of his works.

Furthermore, similarly to Cicero’s account, in the De Elementis Galen deals with the question of the atomic movement from the point of view of Epicureanism. Indeed, although Epicurus is not explicitly named, Galen describes the motion of the particles using an Epicurean terminology.

Therefore, apart from the lack of explicit references to the doctrine of minima, Cicero’s account shows significant similarities with that of Galen, both in terms of topics and polemical attitude.

---

316 Leucippus is mentioned just once in the De Natura deorum and once in the Lucullus within an excursus on the Presocratics’ cosmogonies, in which Cicero attributes him the idea of solid elements that are placed in the void: Leucippus plenum et inane. See De Nat. Deor., I, 24, 66 and Ac., II, 37, 118. Unlike Leucippus, he never mentions the name of Diodorus in reference to atomism.

317 As underlined by De Lacy, the expression τῆς συνόδου τῶν ἀτόμων that Galen uses in De Elem., 60, 10 De Lacy (I, 417 K.) to describe the coming together of the atoms is of Epicurean origin. See Epic., Epist. Ad Pyth., 115 Arrighetti. The term σύνοδος also occurs in Plutarch’s argument against Epicureanism, while Cicero uses its Latin version concursu, which, in turn, appears even in Lucretius’s account of the generation of the world by chance combination of atoms and in three other cases. See Cic., De Nat. Deor., I, 34, 110; Lucr., De Rer. Nat., V, 426; I, 760; II, 549; 941. For the other Epicurean words used by Galen in reference to the movement of the atoms (De Elem., 60, 21; 62,1-2 De Lacy (I, 418 K.), see section 2.2.2 of this work.
towards the atomists. Indeed, even though I agree with Leith\textsuperscript{318} on considering Cicero’s testimony as not parallel to Galen’s, I also see as relevant the fact that both authors criticize the atomistic physics insisting especially on two aspects: the incapability of qualityless and unchangeable particles of generating the world and the difference between the nature of these elements and that of their compounds.

Certainly, the fact that Cicero’s rejection of atomism does not explicitly focus on its inability to explain sensation, as pointed out by Leith\textsuperscript{319}, represents a significant difference from Galen’s critique that I do not wish to ignore. However, it should also be noted that Cicero criticizes the impassibility of the atoms that, together with the lack of secondary qualities, is the first reason for their incapability to account for sensation. Therefore, Cicero discusses and shares the same premises that in \textit{De Elementis} are necessary for supporting the conclusions of Galen’s needle argument.

\subsection*{2.4.2 Pluratch’s Testimony in \textit{Adversus Colotem}.}

Like Cicero’s account, even Plutarch’s critique of the Epicurean Colotes\textsuperscript{320} shows significant similarities with the Galenian rejection of atomism in \textit{De Elementis}. Therefore, this means that, in turn, Plutarch’s testimony also shares some aspects with that of Cicero.

\textsuperscript{318} Although Leith recognizes some similarities in Cicero (he refers only to \textit{De Nat. Deor.}, II, 37, 94) and Galen’s arguments against atomism, he also claims that: «The criticism of atomism which Cicero makes here, however, is not its inability to account for sensation, and hence the passage does not offer a close parallel for Plutarch and Galen». See Leith’s footnote n. 41 from \textit{Galen’s Refutation of Atomism}, 2014, p. 222.

\textsuperscript{319} Ibid.

Indeed, the topic of Epicurus’ lack of originality and his dependence upon Democritus occurs in both Cicero\textsuperscript{321} and Plutarch\textsuperscript{322}. After having stressed Epicurus’ devotion to his predecessor, in \textit{Adv. Col.}, 1108 E-F, Plutarch refers to the debt that the founder of the Garden had to the first atomism:

καίτοι πολύν χρόνον αὐτὸς ἑαυτὸν ἀνηγόρευε Δημοκρίτειον ὁ Ἐπίκουρος, ώς ἄλλοι τε λέγουσι καὶ Λεοντεύς, εἰς τὸν ἐπ’ ἄκρον Ἐπικούρου μαθητῶν, πρὸς Λυκόφρονα γράφον τιμᾶσθαι τέ φησι τὸν Δημόκριτον ὡς Ἐπικούρου διὰ τὸ πρότερον ἁψασθαι τῆς ὀρθῆς γνώσεως, καὶ τὸ σύνολον τὴν περὶ φύσεως πραγματείαν Δημοκρίτειον προσαγορεύεσθαι διὰ τὸ περιπεσεῖν αὐτὸν πρότερον ταῖς ἄρχαις. ὥς δὲ Μητρόδωρος ἀντικρύς ἐν τῷ περὶ Φιλοσοφίας εἴρηκεν, ὥς, εἰ μὴ προκαθηγήσατο Δημόκριτος, οὐκ ἦν προῆλθεν Ἐπικούρος ἐπὶ τὴν σοφίαν.

And this although Epicurus long proclaimed himself a Democritean, as is attested among others by Leonteus, one of Epicurus’ most devoted pupils, who writes to Lycophron that Democritus was honoured by Epicurus for having reached the correct approach to knowledge before him, and that indeed his whole system was called Democritean because Democritus had first hit upon the first principles of natural philosophy. Metrodorus states outright in his work \textit{On Philosophy} that if Democritus had not shown the way Epicurus would not have attained to his wisdom (Transl. B. Einarson and P. De Lacy, p. 197-9).

Plutarch returns to this topic again in the \textit{Adv. Col.}, 1111 C-D, where he refers to the properties of the atoms held by Democritus and argues that Epicurus relied on this theory without being able to correct

\textsuperscript{321} Cic., \textit{De Fin.}, I, 6, 17 (68 A 56 DK; C, 15, 180, 361 L.); I, 6, 21 (182, 350, 470 L.); \textit{De Nat. Deor.}, I, 26, 73 (68 A 51 DK; XCIX L.); I, 33, 93 (CIV L.); I, 43, 120 (68 A 74 DK; 472a, 594 L.).

\textsuperscript{322} The presence of this topic in both Cicero’s and Plutarch’s testimonies is noted by Gemelli Marciano, who considers it as one of the most relevant parallelisms between these two texts and make them presumably based on Skeptical accounts. See Gemelli Marciano, 2007, p. 228-9. On the issue of the dependence of Epicurus upon Democritus in the \textit{Adversus Colotem}, see also Sedley, “Philosophical Allegiance in the Graeco-Roman World”, in \textit{Philosophia Togata: Essays on Philosophy and Roman Society}, ed. by M. Griffin and J. Barnes, Oxford, 1989, p. 118.
its contradictions, especially those which are related to the difference between the qualityless elements and the nature of their aggregates:

Plut., Adv. Col., 1111 C-D.

Οὐκ οὖν ἀναγκαῖον ὑποθέσθαι μᾶλλον δὲ ὑφελέσθαι Δημοκρίτου, ἀτόμους εἶναι τῶν ὅλων ἀρχῶν· θεμένῳ δὲ τὸ δόγμα καὶ καλλωπισμένῳ ταῖς πρώταις πιθανότησιν αὐτοῦ προσκυπτούν ἐστὶ τὸ δυσχερές, ἢ δεικτέον ὅπως ἁποια σώματα παντοδαπὰς ποιότητας αὐτῷ μόνῳ τῷ συνελθεῖν παρέσχεν.

There was no necessity to assume, or rather to filch from Democritus, the premise that the first elements of all things are atoms. But once you have laid down the doctrine and made a fine showing with its initial plausibilities, you must drain the disagreeable conclusions along with it, or else show how bodies without quality have given rise to qualities of every kind by the mere fact of coming together (Transl. Einarson and De Lacy, p. 213-5).

After having quoted the Democritean maxim νόμῳ γλυκὺ κτλ.323, Plutarch builds his argument on the critique of the characteristics of the primary elements posited by Democritus and Epicurus. Similarly to Cotta in Cicero’s De Natura Deorum and to Galen in De Elementis, he focuses his refutation of atomism on the impassible nature of the particles and their consequent incapability to generate sensitive bodies. Indeed, Plutarch’s critique relies on the same question that Galen attributes to Hippocrates’ De Natura Hominis: how can the human being, who is by nature composed of impassive and qualityless atoms, feel pain?324 In other terms, how do the atomists account for the observable alterations that all the living bodies are acted upon?

Plut., Adv. Col., 1113 E.

Καὶ πῶς ὁ πρὸ τοῦ βίου καὶ μετὰ τὸν βίον ἐκάστῳ λέγειν παρεῖναι δεινὰ καὶ ἔσθλὰ, περὶ τοὺς χοντας οὐκ ἀπολειπὴτε τὸ πάσχειν; τίσιν οὖν ἀληθῶς ἐπεται τὸ μή τραυματιζέσθαι μηδὲ νοσεῖν, ὦ Κωλῶτα; ὑμῖν τοῖς ἐξ ἀτόμου καὶ κενοῦ συμπεπηγόσιν, ὅν οὐδετέρῳ μέτεστιν.

---

323 Plut., Adv. Col., 1108 F-1109 A (68 B 156 DK; 78 L.); see also 1110 E-F (68 A 57 DK; 179 L.).
But how could one who says that before life and after life each person suffers “good and ill”, leave no suffering to the living? Who is it, Colotes, who really find themselves impervious to wounds and disease? You yourselves, compacted of atom and void, neither of which has any sensation. You may not object to this, but there is worse to come: there will be nothing to give you pleasure either, since your atom does not receive the causes of pleasure and your void does not respond to them (Transl. Einarson and De Lacy, p. 227-9).

The reference to the physical vulnerability of the human body, which Plutarch mentions in the passage above, plays a crucial role in Galen’s account. In fact, in De Elementis this topic functions as the main instrument for highlighting logical failures in the atomistic theory. In this regard, the most emblematic example is Galen’s needle argument, which grounds empirically his rejection of atomism as a kind of monism.

According to him, the hypothesis of qualityless and impassive components of the bodies leads to admitting that: if a needle pierces the skin, it will touch one or more atoms, but, in both cases, it will cause no reaction since the atoms are by nature impassible and therefore incapable of sensation. This means that the impassibility and the immutability of the particles determine the insensitivity of both the elements and their aggregate-body to the needle.

---

325 As Galen himself claims in the De Elem., 64, 27-66, 1 De Lacy (I, 422 K.) any scientific inquiry should always be conducted relying on both reason and experience: δυοῖν οὖν ὀργάνοιν εἰς τὰς τῶν τοιούτων ἀξιωμάτων εὑρέσεις, ἐμπειρίας καὶ λόγου, κατ’ οὐδέτερον αὐτῶν εὑρεθήσεται ποτέ τὸ σύνθετον εξ ἀναισθήτων καὶ ἀπαθῶν αἰσθητικῶν καὶ παθητικῶν; There are two instruments for the discovery of propositions such as this, experience and reason; with neither of them will it ever be found that what is put together from things that are insentient and impasive is sentient and capable of affection (Trans. De Lacy, p. 65 and 67).

According to Galen, reason and experience are the tools that together enable medicine to make significant discoveries about the nature of the things. On both the combined and separated use of reason and experience within medical inquiry, see also Galen, Meth. Med.,V, I, 10: CMG X 306,10 -13; 347, 1-3 K.; III, 1: X 159,14-15 K.; XIII, 6; XIV, 5: X 896,5-6; 962,5-9; De Plac. Hipp. et Plat., IX, 1,19-25: CMG V 4,1,2, p. 544,8-26.

326 The example of the needle in reference to the impassibility of the atoms occurs even in Philoponus’ In de Gen. et Corr., 164, 24-165, 4: τρίτον ὅτι ἀναιροῦσι τὴν συναίσθησιν καὶ τὰ πάθη, ὡς γὰρ ἐξηρτάτα πολλάκις, ὅταν κενισθῇ τὸ σῶμα βελόνῃ τις, ἀνάγκη πᾶσα ἢ ἐν τῷ κενῷ χωρῆσαι αὐτὴν ἢ τῆς ἀτόμου ὁψεται, διὰ τὸ ἀπαθῆ εἶναι πάλιν ὁὐκ
Thirdly, [the atomists] abolish self-awareness and the affections. For, as has been said many times, when a needle pierces the body, it must of necessity either move in the void or <touch> the atom. <If moves in the void, it will not be perceived; If, on the other hand,> it touches <the atom>, once again it will not be perceived on account of their being incapable of being affected. So perception is abolished and nothing is perceptible. For if perceiving means being affected in some ways by the perceptible objects, but there is no such thing as self-awareness or affection, then there could not be anything perceptible either, in the strict sense (trans. C. J. F. Williams, in Philoponus, On Aristotle’s On Coming to be and Perishing, 1, 6-2, 4, London, 1999). Similarly to Galen, Philoponus makes the example of the needle that pierces the skin in order to highlight the incapability of the atoms to be affected. But, even though he also uses the needle argument for rejecting atomism as an elementary theory, the description of the example is slightly different. Unlike Galen, he does not make the hypothesis of a needle that touches one or more atoms, but that pierces one atom and the void. Gemelli Marciano reads this contradiction between the two accounts as the proof that, despite the strong similarities, Galen is not the source of Philoponus’ account. For a broader explanation of this reading see Gemelli Marciano, p. 260. This view has been recently rejected by Leith, who argues that Philoponus was certainly aware of Galen’s report. According to him, Philoponus could have used Galen’s needle argument as he remembered that, without making the name of his source. Thus, as Leith points out in footnote 48, the discrepancy between their two versions of the same example should be attributed to a memory’s failure and to his use of Galen’s testimony. In addition to Philoponus’ familiarity with Galen’s account, Leith also maintains that his refutation of the atomistic explanation of perception is much closer to Galen’s than that of Plutarch, which has a different structure and misses to make the example of the needle. See Leith, 2014, p. 225.

327 Galen uses this term to describe the invulnerability of the atoms, which are said in this passage to be immune from wounds. The word ἀτρωτός occurs also in the Adv. Col., 1113 E when Plutarch claims that, if the human beings were made up of atoms and void, they would not suffer from wounds or other kinds of injuries. This suggests that ἀτρωτός was a term used in the accounts on atomism and especially in those that, as Galen and Plutarch’s, were focused on the difference between the impassibility of the atoms and the natural tendency of their aggregates to be affected. Furthermore, as pointed out by De Lacy, this term does not appear in the fragments of the first atomists and therefore it might be used only in reference to the Epicurean physics. Indeed, according to the Epicureans there are compounds with properties that are absent in their components. On this aspect see Lucr., De Rer. Nat., II, 865-85. See also De Lacy’s commentary to the De Elementis, p. 171.
I must try to clarify for them this general argument by means of some particular examples. If a person should prick the skin with the finest needle, the animal will of course feel pain, and the needle will be in contact with one or two or even more atoms. First suppose that it touches one atom. But each of the atoms was (said to be) unwoundable and without sensation. Then it will not be affected at all by the needle; nor, if it were affected, would it feel the affection (Transl. De Lacy, p. 65).

Therefore, as I already said, according to Galen the human being can feel the pain caused by the pierce of the needle, only if the primary components of its body are elements that, in turn, can be affected by qualitative change. The needle argument serves to prove that the atomistic theory fails to give account for perception, namely to explain that, even if only one small part of a body gets wounded, the whole body suffers from pain\textsuperscript{328}. According to Galen, the lack of the necessary relationship between the properties of the minimal parts and the secondary qualities of the whole aggregate is a logical mistake that, if it were accepted, would thwart consistency in both speculation and empirical inquiry on the physical world. Thus, since the particles do not meet the fundamental requirements for perception, namely alteration and sensation, the atomistic hypothesis has to be denied.

Given the alteration of the primary components as the necessary precondition for the occurrence of bodily sensation, Galen rejects even Anaxagoras’ homeomerias (ὁμοιομέρειαι)\textsuperscript{329}:

\begin{quote}

τὸ μὲν γὰρ ὀδυνᾶσθαι, καθότι καὶ πρόσθεν εἶρηται, δυοῖν τούτοιν ἐξ ἀνάγκης δεῖται συνιόντων ἀλλήλοις, ἀλλοϊόσεώς θ' ἀμα καὶ αἰσθήσεως ἔχουσι δ' οὐδέτερον αὐτῶν αἱ ἄτομα. δεόντως οὖν εἰ καὶ θάτερον αὐταῖς υπάρχειν υπόθοιο, μένουσιν ἔτ' ἀνώδυνοι. καὶ γάρ εἰ ἀπαθεῖς μὲν, αἰσθητικὰς δ' εἶναι συγχωρήσειας, οὐκ ἀλγήσουσιν, ὅτι μηδὲ πείσονται,
\end{quote}

\textsuperscript{328} In the \textit{De Elem.}, 64, 17-21 De Lacy (421-2 K.) and 66, 1-3 De Lacy (422 K.) Galen compares the impassible nature of the atoms to those of the hair, the pebbles and the diamonds.

καὶ εἰ πάσχειν μὲν, ἄλλ' ἀναισθήτους ὑπάρχειν, οὐκ ἀλγήσουσιν, ὅτι μηδ' αἰσθήσονται. χρὴ γὰρ, ός εἰρηται, καὶ πάσχειν καὶ τοῦ πάθους αἰσθάνεσθαι τὸ μέλλον ὀδυνήσεσθαι.

Feeling pain, as was also said earlier, necessarily has these two combined requirements, alteration and sensation; and the atoms have neither of them. Rightfully, then, even if you should suppose that one of the two requirements is satisfied, they will still remain without pain. If you grant that they are not subjected to affections but are sentient, they will not feel pain because they will be unaffected; and if you grant that they are subject to affections but are not sentient, they will not feel pain because they will have no feeling. For, as I said, a thing that is going to feel pain must be affected and must feel the affection.

(Transl. De Lacy, p. 67-68)

Galen attacks Anaxagoras by relying on the same critique that he formulated against the atomists. In fact, as Galen himself underlines, Anaxagoras’ homoemeries are sentient but also unaffected elements. This means that, similarly to Democritus’ and Epicurus’ atoms, Anaxagoras conceives the homoemeries as ἀπαθῆ. On the other hand, unlike the atoms, these “seeds” are infinitely divisible and do not function as minima330.

Therefore, since Anaxagoras’ theory shares with the atomists both the inalterability and the qualitative difference between the elements and the body as a whole, Galen accuses him of monism:

Gal., De Elem., 68, 3-11 (424-5 K.).

330 According to Anaxagoras, all the things are made up of a multiplicity of seeds and every kind of thing consists of all the seeds that, at the same time, are also the components of all the other aggregates. Therefore, as Anaxagoras himself claimed, there is “a portion of everything in everything” (Fr. 6, 11 Simpl., Phys., 164,26; 164,23). Indeed, according to his view every seed contains all the qualities of all the kinds of natural substances, which means that in each part of every existing thing there is the whole reality. Given this premise, it follows that the characteristics of phenomena are determined by the prevalence of a certain kind of element in the mixture of the seeds. For a broader discussion of Anaxagoras’ notion of homeomerias, Kirk, Raven, Schofield, 1983, p. 365 (fr. 481-2); C. Strang, “The Physical Theory of Anaxagoras”, in Studies in Presocratic Philosophy, II, ed. R. E. Allen and D. J. Furley, London, 1975, pp. 361-380; Barnes, The Presocratic Philosophers, London-New York, 1989, pp. 318-339; M. Schofield, An Essay on Anaxagoras, Cambridge, 1980; Sambursky, 1987; D. W. Graham, Explaining Cosmos. The Ionian Tradition of Scientific Philosophy, Princeton-Oxford, 2006, pp. 186-220; D. Sider, The Fragments of Anaxagoras. Introduction, Text and Commentary, Sankt Augustin, 2005.
It is therefore inadmissible that a sentient being be composed of elements that are unaffected and also insentient; it is inadmissible also that it be composed of elements that are unaffected and sentient; that (entity) too will never feel pain because it will not be affected. It will be potentially sentient but will never actually feel anything, just as our body, though obviously sentient, yet does not feel anything before it is affected by something. By this reasoning, then, the opinion of those who introduce homeomeries is also clearly refuted; for if some of their elements are sentient yet are wholly unaffected, how will the sentient (element) feel anything, since it stands forever clear of affection?

(Transl. De Lacy, p. 69, 44-6).

After having criticized the views of both the atomists and Anaxagoras, in De Elem., 70,1 ff. De Lacy (I, 427 K.) Galen goes on to distinguish four kinds of elementary theories on the base of their explanation of sensation. As recently argued by Leith331, he demonstrates the validity of his argument by listing all the possible options available. First, he deals with the two hypotheses that he explicitly rejects, namely:

1) the theory of the atomists: atoms are insensitive and impassible particles.
2) the theory of Anaxagoras: homoemeries are capable of sensation but incapable of being affected.

Then, Galen adds the explanation that would logically follow from the refutation of the two views named first and also his own hypothesis, which, of course, is the correct one:

3) the theory that posits elements, which are sensitive and capable of alteration (the philosophers who argued for this position are not identified).

4) Hippocrates and Galen’s theory: elements which are insensitive but capable of alteration.\textsuperscript{332}

In addition to the refutation of atomism, the diaeretic method applied by Galen also has the purpose of underlying the fact that perception occurs only at the level of compounds.

This means that, as both Hankinson\textsuperscript{333} and De Lacy\textsuperscript{334} also pointed out, the pain inflicted on the animal’s skin by the needle cannot be perceived by the first elements, even if they undergo changes.

At first sight this might appear to be in contradiction with the premises of Galen’s argument, namely, as already underlined, with the idea that the feeling of pain is due to two fundamental requirements: the capability of both sensation and alteration of the elements. However, in \textit{De Elem.}, 70,12-74,23 De Lacy (I, 427-32 K.) Galen explains that the sensitive nature of the body can be generated by both sensitive and insensitive elements, since what functions as the necessary precondition for feeling pain is the alterability of the first components. According to Galen, alteration is what explains the presence of qualities in the compounds that are slightly different from those of their elements. In this regard, he seems to identify three possible orders of qualitative change:

a) the alteration that produces properties corresponding to those of the elements.

In \textit{De Elem.}, 72,2-8 De Lacy (I,430 K.) Galen makes the example of a house that is made of bricks and underlines that their color, weight and hardness are present in the final product. Therefore, if the bricks are hard and red, the house cannot be soft and grey and has to be hard and red.

b) the alteration that determines the supervenience of qualities in the compounds to which the properties of their elements are similar but not identical.

In \textit{De Elem.}, 72,6 ff. Galen refers especially to the size and the shape of the bricks, pointing out that these qualities are not «precisely the same in the parts as in the whole.»\textsuperscript{335} Indeed, since «shapes produce shapes»\textsuperscript{336} like two half-circles form a whole circle\textsuperscript{337}, the house does not have the same

\textsuperscript{332} Leith sees in this schema the use of a diairetic method: «this inquiry remains intimately linked to the terms introduced by the refutation of atomism, and takes the form of a process of elimination within the framework of a \textit{diairesis}». Ibid. p. 220.


\textsuperscript{334} Leith, 2014, p. 220-1.

\textsuperscript{335} Trans. De Lacy, p. 73,7-8.

\textsuperscript{336} Ibid. 73,16.

\textsuperscript{337} See Gal., \textit{De Elem.}, 72,14-5 De Lacy (I, 430 K.).
shape of the bricks. Thus, as noted by Hankinson\textsuperscript{338}, Galen conceives this kind of properties of the compounds as something to which the elements were already qualitatively predisposed.

c) the alteration that produces the supervenience of properties that seem to not follow elements’ dispositions.

Galen applies this kind of qualitative change especially to the case of sensation, explaining the possibility of the generation of sensitive bodies from insensitive elements. Therefore, the alteration that occurs at the elementary level can also determine opposite properties in the compounds. According to Galen, after many changes, what was black can become white and what was insentient can become sentient\textsuperscript{339}. However, Hankinson maintains that such properties should not be considered as “generically different”, but, like the supervenient qualities described in b), as related to the kinds of properties to which the elements are disposed. Indeed, given his definition of sentience as a type of alteration, Hankinson describes the elements of sensitive bodies as necessarily capable of alteration, just as any object which has a shape must be composed of things that, in turn, have a shape\textsuperscript{340}. This means that the sentience is not a generically different property, but that it emerges in the compounds always in reference to the alterability of their elements.

Unlike Hankinson, Leith argues that Galen’s notion of alteration allows the Pergamene to admit the possibility of the supervenience of generically different properties and to conceive sentience as one of those\textsuperscript{341}. Indeed, as Galen himself points out in \textit{De Elem.}, 74,8-15 De Lacy (I, 431-2 K.)\textsuperscript{342}:

\begin{quote}
αἰσθησίς δὲ γε πάντη γένους ἐστὶν ἐτέρου σχήματός τε καὶ βάρους καὶ σκληρότητος, ἃ ταῖς ἄτομοις ὑπήρξεν, ὡσπερ αὖ καὶ τῶν ἄλλων, ἃ πυρὶ καὶ ἄερι καὶ γῆ καὶ ὕδατι. καὶ γὰρ παρὰ τὰ χρώματα καὶ τοὺς χυμοὺς καὶ τοὺς ἄτμοις καὶ πάνθ’ ἁπλῶς εἰπεῖν τᾶλλα τὰ τοῖς σώμασιν ὑπάρχοντα τὸ τῆς αἰσθήσεως ἐτερόν ἐστὶ γένος, ὡστε' οὐτ' ἐξ ἄτομων οὐτ' ἐκ πυρὸς καὶ
\end{quote}

\textsuperscript{338} On this interpretation, see Hankinson, 2008, p. 213.

\textsuperscript{339} Id., 72, 20-2 De Lacy (I, 430 K.) δόναται γὰρ ἐν πολλαῖς ταῖς μεταξύ μεταβολαῖς τὸ τέως μέλαν αὖθις γενέσθαι λευκὸν καὶ τὸ τέως λευκὸν αὖθις μέλαν καὶ τὸ νῦν ἀναίσθητον αὖθις αἰσθητικὸν; For it is possible that in the course of many intervening changes what was formerly black may in turn become white and what was formerly white may in turn become black and what is now insentient may in turn become sentient (Trans. De Lacy, p. 73,20-3).

\textsuperscript{340} Hankinson points out that of course the shape of the elements and that of the physical object do not have to be necessarily the same. On Hankinson’s position on the supervenience of qualities in the compounds that are different from those of the elements, see both Hankinson, 2008, p. 213 and 2009, p. 234-5; 237-8.

\textsuperscript{341} See Leith footnote 37, 2014, p. 221.

\textsuperscript{342} See also Gal., \textit{De Elem.}, 70, 20-3 De Lacy (I, 428 K.).
ἀέρος καὶ γῆς καὶ ὕδατος ἐγχωρεῖ γενέσθαι τὸ αἰσθητικὸν σῶμα μενόν τῶν ἀμεταβλήτων καὶ τοιούτων, οἷά πέρ ἐστι κατὰ τὴν ἑαυτῶν φύσιν.

But sentience is utterly different in kind from shape and weight and hardness, which were the properties of atoms, just as it is from the other properties that fire, earth, air and water have. When placed beside colors and flavors and odors and, in short, all the other things that bodies have, the property of sentience is a different kind of thing; it is therefore not admissible that the sentient body be generated either from atoms or from fire, earth, water and air, so long as they remain unchanged and such as they are in their own nature. (Transl. De Lacy, p. 75)

Therefore, in response to the atomists who posit elements by nature radically different from the sensitive bodies, Galen builds his argument around the direct and necessary relationship between the alterability of the elements and the capability of sensation of the compounds.

The notion of alteration used in Plutarch’s and especially in Galen’s argument about sensation are borrowed from Aristotle and especially from his critique of atomism in De Gen. et Corr., I, 8, 325b 35-326a 3 and I, 9, 327 a 14-6, in which he rejects the incapability of the atoms to be acted upon. However, since Aristotle’s critique of atomism does not focus on Leucippus and Democritus’ account of sensation as both Adversus Colotem and especially De Elementis do, Leith argues that their source could have been someone else among the members of the Lyceum, presumably Theophrastus.

Following De Lacy and especially Gemelli Marciano, Leith also compares Galen and Plutarch’s argument on sensation with Lucretius’ account in De Rer. Nat., II, 865-85 ff., taking these verses as a evidence in support of his hypothesis of a Peripatetic source that was probably almost contemporary of Epicurus. Indeed, as convincingly argued by Leith, in the second book Lucretius seems to reply to

343 Galen also uses the Aristotelian term ἀλλοίωσις for alteration, which occurs in De Elem., 62,16 and 22; 70,17; 130,2 and 132,6. Referring to Plato, Aristotle and Xenocrates’ doctrines of qualitative change, in Adv. Colot., 1111E Plutarch points out that, unlike the atoms, their elements can combine in a mixture «since they are bodies that interact on each other’s qualities and that change throughout» (Trans. De Lacy-Einarson, p. 215).


345 See De Lacy’s Commentary to De Elementis, p. 171.

an anti-Epicurean polemic that was probably spread in the Imperial time and that also seems to share relevant similarities with those formulated in *Adversus Colotem* and *De Elementis*. According to Leith’s interpretation, Lucretius’ account follows the same diairetical structure developed by Galen:

1) the poet begins his defence of the Epicurean explanation of sensation by maintaining in v. II, 865-7 that the first elements must be incapable of sensation\(^{347}\), which is exactly what Galen attributes to the atomists and lists as the first option of his division (atoms are insensitive and impassible elements). However, as pointed out by Leith\(^{348}\), Lucretius does not refer here to the impassibility of the atoms, which is discussed further in II, 935-6.

2) Referring presumably to Anaxagoras’ seeds, which is the second option of Galen’s diairesis, in II, 907-90, Lucretius attacks the elementary theory that conceives the first components as capable of sensation. Indeed, he points out that if the sentient bodies were be generated by sentient elements, then the latter could not be indivisible and eternal minima. Furthermore, if these elements were capable of the same sensations of their compounds, Lucretius concludes that they would even laugh, weep, speak and reason\(^{349}\) like human beings:

\[
\text{Lucr., De Rer. Nat., II, 914-6.} \\
\text{Linquitur ut totis animantibus adsimulentur.} \\
\text{Sic itidem quae sentimus sentire necescesset,} \\
\text{vitali ut possint consentire undique sensu;}
\]

It remains that they be like whole animals. 
So they must have sensation, 
in order that they may be able to feel with us the life-giving sensations everywhere. 
(Trans. Rouse, p. 167)

\(^{347}\) Lucr. *De Rer. Nat.*, 865-7: *Nunc ea quae sentire videmus cumque necessest ex insensilibus tamen omnia confiteare principis constare*; Now you must of necessity confess that all we perceive to have feeling consists nevertheless of first-beginnings that have no feelings (Trans. Rouse, p. 163). According to Lucretius, the fact that sentient bodies are generated by insentient principles is demonstrated by observable phenomena such as worms arising from mud. On this aspect see *De Rer. Nat.*, II, 870-82.

\(^{348}\) See Leith, 2014, p. 228.

\(^{349}\) For this ironic description of the atoms, see *De Rer. Nat.*, II, 973 ff..
3) In II, 931ff. Lucretius refutes the hypothesis of the theorists that sets elements’ capability of quantitative change as the necessary precondition for the occurrence of sensation in the bodies, which is basically the view of Galen:

Quod si forte aliquis dicet dumtaxat oriri
posse ex non sensu sensum mutabilitate,
aut aliquo tamquam partu quo proditur extra,
huic satis illud erit planum facere atque probare
non fieri partum nisi concilio ante coacto
nec quicquam commutari sinte conciliatu;

But if by any chance someone shall say that
sensation can at all events arise from not-sensation
by a process of change or by some process like a
birth by which it is brought forth, here is something
that will be enough to make clear to him and to
prove that birth does not take place unless there has been combination before,
and that nothing changes except by combination (Trans. Rouse, p. 169).

Unlike most of the scholars, Leith identifies the addressees of this critique with the Peripatetics instead of the Stoics. According to him, Lucretius’ description refers to a theory that posits insentient elements that undergo alteration. Thus, the term *mutabilitas* should be taken as a reference to the notion of alteration that Galen borrows from Aristotle and that occurs as the fourth option of his division. Indeed, Lucretius replies to this view pointing out that all the observable changes in the bodies are always due to the particles’ combination (*concilio*) and do not involve qualitative

---

350 The debate on the identity of Lucretius’ opponents in the verses above is well summarized by Leith, who, following Furley, underlines the absence of such a view from the Stoic remains and considers this controversy as based on a misinterpretation of Lucretius’ account: «Lucretius does not say, or imply, that according to this theory it is the elements themselves that change from being non-sentient to being sentient. Rather, the ability to sense is generated only at the level of compounds by a process of alteration (*mutabilitas*), while the elements from which the sentient bodies are composed may remain insentient». See Leith, 2014, p 227.
interaction. As he explains in II, 944-63, even phenomena such as sensation and birth imply arrangements of particles, while afflictions and death their separation. Therefore, except for the irrelevant absence of option 3), the comparison between Lucretius and Galen’s argument seems indeed to be reasonable. Even though I agree with Leith and consider his interpretation convincing, I also find that he misses to include a relevant detail, which could contribute to further strengthen his argument.

Only a few verses further on, Lucretius concludes his reply to the critics of Epicureanism referring precisely to the feeling of pain and explaining how this sensation can occur in a body made up of atoms:


Praeterea quoniam dolor est ubi materiai
corpora vi quadam per viscera viva per artus
sollicitata suis trepidant in sedibus intus,
inque locum quando remigrant, fit blanda voluptas,
scire licet nullo primordia posse dolore
temptari nullamque voluptatem capere ex se;
quandoquidem non sunt ex ullius principiorum
corporibus, quorum motus novitiae laborent
aut aliquem fructum capiant dulcedinis almae.
Haud igitur debent esse ullo praedita sensu.

Beside, since there is pain when the bodies of matter, attacked by some force through the living flesh and limbs, tremble in their secret habitats within, and when they move back to their place comes soothing delight, you may be sure that the first-beginnings cannot be assailed by any pain, and from themselves can take no delight, since they are not composed of any bodies of elements, so as to be troubled by any strangeness in their motions or to take any enjoyment of life-giving delight; therefore they are bound not to be endowed with any sensation (Trans. by Rouse, p. 171).
Now let me come back to our initial question. Although Plutarch shares with Galen both the definition of atomism as a kind of monism and its consequent inability to give account of sensation\textsuperscript{351}, he does not mention Anaxagoras’ homoemeries in relation to this issues and focuses only on the critique of atomism. Therefore, unlike Galen, Plutarch does not deal with the question of the discontinuous nature of the atoms either. Indeed, as underlined by Galen, since the atoms are by nature discrete and cannot produce a continuous body by aggregation, they also can hardly explain how the pain spread all over the body when only one single part of it gets injured. This argument is probably based on Aristotle’s critique of atomism that Simplicius has preserved in his commentary on the \textit{De Caelo} and that Philoponus has also used\textsuperscript{352}. There is an echo of this polemic in the argument of pain that Galen addresses against the atomists and especially in the example of the two twisted fingers in \textit{De Elem.}, 66, 11-16:

\[ \text{ὥσπερ γὰρ εἰ τοὺς δύο δακτύλους περιπλέξαις ἄλληλοις καίτοι γ’ αἰσθητικοὺς ὀντας, οὐδὲις ἐπεται πόνος ἐν τῷ πάλιν ἀφίστασθαι τε καὶ διαλύεσθαι, κατὰ τὸν αὐτὸν οἴμαι τρόπον οὐδ’ εἰ διστησί τε καὶ διαλλεῖ τὰς ἀτόμους ἀπ’ ἄλληλων ἤ βελόνη, τιτρώσκει δ’ οὐδεμίαν, οὐδαμῶς ἀλγήσει τὸ ζῷον. ἢ δειξάτωσαν ἐν τῷ περιπλέκεσθαι τε καὶ πάλιν ἀφίστασθαι τῶν αἰσθητικῶν ὁτιοῦν σωμάτων ὀδύνην. }\]

If you link two fingers together, then even though they are sentient no pain follows on their being unlinked and separated; in the same way, I think even if the needle dislodges the atoms and separates them from each other but wounds non of them, in no way will the animal feel pain. Or let them show that when any sentient bodies are linked together and then separated, pain follows. (Trans. De Lacy, p. 67, 38-40)

\textsuperscript{351} In addition to the \textit{Adversus Colotem} (see especially 1113 E), Plutarch deals with the insensitive nature of the atoms even in the \textit{De Prim. Frig.}, 948 A-C 8 (506 L.). According to Gemelli Marciano, in this passage Plutarch is defending Democritus’ and especially Plato’s unaffected elements from the critiques addressed by Aristotle and Theophrastus. Indeed, while Aristotle contrasted Plato’s principles with those set by Democritus, in the \textit{De Sensibus} his disciple attacks both philosophers for having explained the perceivable qualities in terms of fundamental geometrical figures (shape is one of the properties of the atoms). Therefore, Gemelli Marciano considers Plutarch’s text as especially influenced by Theophrastus. See Gemelli Marciano, 2007, 91-2.

\textsuperscript{352} See, Simpl., \textit{In De Cael.}, 612,15 and Philop., \textit{In De Gen. et Corr.}, 326a 14, 168, 4.
Even though they are both sentient, Galen compares two entangled fingers to the atoms. As with the impassible particles that can be separated from each other by a needle without affecting the body as a whole, they do not perceive any pain when they are divided.

In addition to impassibility of the atoms, as already said in this chapter, both Galen and Plutarch focus their accounts on the relationship between atomism and Eleatism, presenting them as essentially similar. In fact, in the *Adversus Colotem* even Plutarch describes the Epicurean idea of the universe as infinite, ungenerated, imperishable and immutable as corresponding to that held by Parmenides, which is, in turn, criticized by Colotes himself. According to Plutarch, Epicurus sees nature as a one within which there are matter and void.


καὶ γάρ Ἐπίκουρος, ὅταν λέγῃ τὸ πᾶν ἄπειρον εἶναι καὶ ἀγένητον καὶ ἀφθαρτον καὶ μήτ’ αὐξόμενον μήτε μειούμενον, ὥς περὶ ἕνος τινος διαλέγεται τοῦ παντός, ἐν ἀρχῇ δὲ τῆς πραγματείας ὑπειπών τὴν τὸν θανόν φύσιν σώματα εἶναι καὶ κενὸν 353 ὡς μιᾶς οὐσίας εἰς δύο πεποίηται τὴν διαίρεσιν, ὅν θάτερον ὄντως μὲν οὐθὲν ἔστιν, ὄνομαζεται δ’ ύψων ὡς ἀναφές καὶ κενὸν καὶ ἀσώματον· ἰσάτε καὶ ὕμιν ἐν τῷ πᾶν ἔστιν, εἰ μὴ βούλεσθε κεναῖς φωναῖς περὶ κενοῦ χρῆσθαι, σκιαμαχοῦντες πρὸς τοὺς ἀρχαίους.

So Epicurus too, when he says that the universe is infinite, ungenerated and imperishable, and subject neither to increase nor diminution, speaks of the universe as of some one thing. When he premises at the beginning of his treatise that "the nature of things is atoms and void", he treats that nature as one, dividing it into two parts, one of them actually nothing, but termed by you and your company as intangible, empty and bodyless. So that for you too the universe is one, unless you mean to use empty vocals about the empty void, shadow-boxing with the ancients (Trans. Einarson and De Lacy, p. 229-31).

Plutarch’s account also seems to share the same view of atomism that Galen offers in *De Elem.*, 60, 8-19 De Lacy (68 A 49 DK; 90 L.), where he quotes the Democritean maxime on the dichotomy

---

353 Plutarch quotes this sentence from Epicurus’ treatise *On Nature* (see fr. 74 Usener), showing to have a good knowledge of Epicureanism and to have probably read the works of its founder. On the relationship between Plutarch and Epicureanism, see J. P. Hershbell, 1992, p. 3353-83.
between the relative value of the sensible qualities and the objectivity of atoms (δέν) and void (μηδέν), replacing the term δέν with ἕν. With this word game, as previously explained, Galen stresses the monistic drift of atomism, which posits identical units as primary elements of the bodies. Although the use of ἕν instead of δέν is peculiar to Galen’s testimony and does not occur in the Adversus Colotem, Plutarch uses the word ἕν several times while he compares the atomistic physics with the doctrine of Parmenides. After having quoted Democritus’ fragment 156 DK (μὴ μᾶλλον τὸ δέν ἦ τὸ μηδέν εἶναι; «‘aught’ is no more real than ‘naught’»), Plutarch uses ἕν in order to emphasize how the atomistic ontology is essentially monistic. Moreover, similarly to Galen, he

354 Nevertheless, Parmenides never defined explicitly being as “one”, but he described it as something determined without deficiency, unchangeable and equal to itself on every side (see fr. 8, 42-9 DK), ungenerated and unperishing (see fr. 8,6-21 DK). Therefore, being’s image as one (ἔν) was only indirectly suggested by its own properties. With Melissus Parmenides’ view was radicalized and being defined as one (ἔν) and indeterminate (ἄπαρον). See Simpl. De Cael., 557, 16; Phys., 111, 18 (28 B 8, 4 DK). Even though Plutarch mentions only the name of Parmenides, he presumably uses “ἕν” in reference to the Elatics in general, as suggested by the context of the criticism of atomism as a monistic theory within which this term repeatedly occurs. On Parmenides’ fragments and their interpretation see at least Kirk, Raven and Schofield, 1983, p. 239-62 (especially p. 252-3); Guthrie, 1965, p. 26-49; O’Brien, Le poème de Parménide, Paris, 1987; Calogero, Studi sull’eleatismo, Roma, 1932; Barnes, “Parmenides and the Eleatic One”, in Archiv für Geschichte der Philosophie, 61 (1), 1979, p. 1-21. On Melissus’ notion of being see Kirk, Raven and Schofield, p. 395; Guthrie, vol. 2, p. 102-18; J. Palmer, “Melissus and Parmenides”, in Oxford Studies in Ancient Philosophy, 26, p. 20-54.

355 See Plutarch, Adv. Colot., 1108 F-1109 A (68 B 156 DK; 78 L.) Ἐγκαλεὶ δ’ αὐτῷ πρῶτον, ὅτι τῶν πραγμάτων ἕκαστον εἰπὼν οὐ μᾶλλον τοῦ ἢ τοίον εἶναι συγκέχυκε τὸν βίον. ἄλλα τοσούτον γε Δημόκριτοσ ἀποδεῖ τὸν νομίζειν μὴ μᾶλλον εἶναι τοῦ ἢ τοίον τῶν πραγμάτων ἑκαστόν, ὡστε Προταγόρα τῷ σωφρῆτε τοῦ τι εἰπόντι μεμαχῆσαι καὶ γεγαρανέα πολλά καὶ πιθανὰ πρὸς αὐτόν. οἶκ σοδ’ ὄναρ ἐντυχὼν ὁ Κωλώτης ἐσφάλη περὶ λέξιν τοῦ ἀνδρός, ἐν ἢ διορίζεται μὴ μᾶλλον τὸ ‘δέν’ ἢ τὸ ‘μηδέν’ εἶναι, ‘δέν’ μὲν οὖν ὁμομένων τὸ σώμα ‘μηδέν’ δὲ τὸ κενόν, ὡς καὶ τούτῳ φύσιν τίνα καὶ ὑπόστασιν ιδίαν ἔχοντος; “Colotes first charges him with asserting that no object is any more of one description than of another, and thus throwing our life into confusion. But so far is Democritus from considering an object to be no more of one description than of another that he has attacked the sophist Protagoras for making this assertion and set down many telling arguments against him. Colotes, who is innocent of the slightest acquaintance with them, mistook an expression in which Democritus lays it down that ‘aught’ is no more real than ‘naught’, using the term aught of body and naught of empty space, meaning that space like body has a real existence of its own” (Trans. Einarson and De Lacy, p. 199).

356 Ibid. 1113 F-1114: Ἐπεὶ δ’ ὁ μὲν Κωλώτης ᾧ ἐφεξῆς τῷ Δημόκριτῳ τὸν Παρμενίδην ἐβούλετο συγκατορύσσειν, ἐγὼ δ’ ὑπερβής τὰ ἐκεῖνα τῷ Εἵμπεδοκλέους προέλαβον διὰ τὸ μᾶλλον ἀκολουθέν τοῖς πρώτοις ἐγκλήμασιν αὐτοῦ, ἀναλάβομεν τὸν Παρμενίδην. ἂ μὲν οὖν αὐτὸν φησιν αἰσχρὰ σοφισμάτα λέγειν ὁ Κωλώτης, τούτοις ἐκείνος ὁ ἀνήρ οὐ φιλιάν ἐποίησεν ἀδοξοτέραν, οὐ φιλιάν ἔποιησεν θεραπεύτεραν, οὐ τοῦ καλοῦ τὸ ὄνομα ἐσφάλη καὶ δι’ ἐσφάλη τίμων ἀφελεῖν, οὐ τὰς περὶ θεῶν δόξας συνετάραξε: τὸ δὲ πάν ἔν εἰπόν οὐκ οὖν ὃς ζήν ἡμᾶς κεκόλυκε; Since Colotes did his best to demolish Parmenides next after Democritus, whereas I skipped that passage and dealt first with his treatment of
also develops his argument against the impassibility of the particles from the definition of atomism as a kind of monism. Since both authors consider atomism as a doctrine that emerged with the purpose of overcoming the eleatic impasse, they see the difference between the nature of the atoms and their sensitive aggregates as a big failure. According to both of them, indeed, Democritus and Epicurus ended up arguing for the same principles that they, in turn, denied and attributed to the Eleatics.

Therefore, Galen and Plutarch design their arguments on the basis of the same premises, namely the idea that the qualitative status of the particles is the main failure in the atomic pattern and also the

Empedocles because it has a better connexion for the first set of charges taken by themselves, let us return to Parmenides. As for the shameful sophistries that Colotes imputes to him, the great philosopher did not use them to lessen the high repute of friendship or to embolden the use for pleasure; he did not strip virtue of her native beauty or of being valued for her own sake; he did not play havoc with our beliefs about the gods. Yet by saying that ‘the universe is one’ he has somehow prevented us from living (Trans. Einarson and De Lacy p. 229). See also 1114 A: ὥστε καὶ ὑμῖν ἓν τὸ πᾶν ἔστιν, εἰ μὴ βούλεσθε κεναῖς φωναῖς περί κενοῦ χρῆσθαι, σκιαμαχοῦντες πρὸς τοὺς ἀρχαίους; so that for you too the universe is one, unless you mean to use empty vocables about the empty void, shadow-boxing with the ancients (Trans. by E. and D. L., p. 231).

357 In the Adversus Colotem Plutarch points out that, according to the properties ascribed to the atoms, they would not be able to produce aggregates. Indeed, the particles would collide, repel each other and then move away. Ibid. 1110 F (68 A 57 DK). Cicero also makes a similar statement in De Nat. Deor., I, 38, 110.

358 Plut., Adv. Colot., 1110 F-1111 A: πρὸς τοῦτον ἀντειπεῖν μὲν οὐδὲν ἔχω τὸν λόγον, εἰπεῖν δὲ, ὅτι ταῦτα τῶν Ἐπικούρου δογμάτων οὕτως ἀχώριστα ἔστιν, ὡς τὸ σχῆμα καὶ τὸ βάρος αὐτοὶ τῆς ἀτόμου λέγονται. τί γὰρ λέγει Δημοκρίτος; οὐσίας ἀπείρου τὸ πλῆθος ἀτόμως τε καὶ ἀδιαφθόρους, ἣτι δ’ ἀποίους καὶ ἀπαθεῖς ἐν τῷ κενῷ φέρεσθαι διεσπαρμένας; ὅταν δὲ πελάσωσιν ἄλληλαις ἢ συμπέσωσιν ἢ περιπλακώσι, φαίνεσθαι τῶν ἀθροιζομένων τὸ μὲν ὕδωρ τὸ δὲ πῦρ τὸ δὲ φυτὸν τὸ δὲ ἄνθρωπον, εἶναι δὲ πάντα τὰς ἀτόμους, ἰδέας υπ’ αὐτοῦ καλομένας, ἢτερον δὲ μηδένε· ἐκ μὲν γὰρ τοῦ μὴ ὄντος οὐκ ἔχει γένεσιν, ἐκ δὲ τῶν ὄντων μηδέν ἄν γενέσθαι τῷ μήτε πάσχειν μήτε μεταβάλλειν τὰς ἀτόμους ὅπως στερρότητος ὃθεν οὔτε χρώναν ἐξ ἀχρώστων οὔτε φόσιν ἢ ψυχὴν ἐξ ἀποίων καὶ ἄψυχον ὑπάρχειν; I cannot deny the truth of this, but I can affirm that this view is as inseparable from Epicurus’ as shape and weight are by their own assertion inseparable from the atom. For what does Democritus say? That entities infinite in number, indivisible and indestructible, destitute moreover of quality and incapable of modification, move scattered about in the void; that when they draw near one another collide or become entangled the resulting aggregate appears in the one case to be water, in others fire, a plant, or a man, but that everything really is the indivisible “forms”, as he calls them, and nothing else. For there is no generation from the non-existent, and again nothing can be generated from the existent, as the atoms are too solid to be affected and changed. From this it follows that there is no colour, since it would have to come from things colourless, and no natural entity or mind, since they would have to come from things without qualities or the capacity to be affected (Trans. Einarson and De Lacy p. 211).

359 Ibid. 1114 A; Gal., De Elem., 58, 19-22 and 68, 21-24 (I, 416 K.).
cause of its necessary rejection. Given all the parallelisms highlighted above, it seems reasonable to assume that, among other materials, Galen might have used Plutarch’s account to formulate his own testimony on atomism.
Chapter Three

Atoms or Molecules? The Nature of Asclepiades’ ὀγκοί and the Background of his Flux Theory.

Most of the time Galen’s rejection of the atomistic theory of elements also includes Asclepiades’ ὀγκοί, that he describes as qualityless and impassible particles just like Epicurean atoms. However, the ancient sources are not unanimous on the nature of ὀγκοί and give opposite accounts of their characteristics, also portraying them as both frangible and capable of alteration. The analysis of such contradictory testimonies and fragmentary materials raises the question: could the ὀγκοί really be assimilated to Epicurean atoms, or should they be considered as a different kind of substance? In other terms, should we believe Galen?

The present chapter focuses on the most controversial aspect of Asclepiades’ physiological theory, namely the ontological status of his imperceptible corpuscles called ἀνάρμοι ὀγκοί. Indeed, according to Asclepiades the human body (like all the other perceptible objects) is composed of minute particles. The free flow of corpuscles through the pores (πόροι) guarantees the state of health of the body, while the occurrence of blockages that impede, and in some cases stop, the movement of ὀγκοί cause diseases.

These invisible masses are at the core of a long-lasting controversy among the scholars who have attempted to reconstruct the contents and establish the philosophical background of Asclepiades’ lost theory. Most of the studies focus on two main questions: 1) the qualitative status of ὀγκοί, which are described by ancient sources, except for Sextus Empiricus, as particles without secondary qualities but only with fundamental properties such as size and shape that both Democritus and Epicurus had already assigned to their atoms; 2) the frangibility of the ὀγκοί, which is presumably expressed by the term ἀνάρμος and would indicate their physical divisibility. Thus, the nature of ἀνάρμοι ὀγκοί contradicts the first dogma of atomism, namely that of the indivisibility of the atoms.

The ancient account that, at least at first glance, differs most from the others and does not share the same tendency to assimilate Asclepiades’ corpuscularism to atomism, is that of Sextus Empiricus in Pyrrhoniae hypotyposes III 33. In this text he defines Asclepiadean ὀγκοί as στοιχεῖα θραυστὰ καὶ
ποιά, namely as elements that are divisible and possess qualities. The frail and qualityless nature of ὄγκοι is also confirmed by the late testimonies of Calcidius (IV century AD) and Caelius Aurelianus (V century AD), which, however, contain some textual difficulties that are still disputed. Given the heterogeneity of the surviving accounts, reconstructing the genesis and the contents of Asclepiades’ doctrine is anything but an easy task that mainly depends on the possibility of identifying the ontological status of ὄγκοι. Therefore, it is crucial to try to answer the question: was Asclepiades really an heir of atomism and, as pointed out by Galen, were his ὄγκοι atoms of which he has merely changed the name?

Modern accounts (such as those of Wellmann, Heidel and Vallance\(^\text{360}\)) that reject the hypothesis of an Epicurean influence on Asclepiades’ corpuscularism, consider the supposed divisibility of ὄγκοι as strong evidence for the absence of any debt to atomism\(^\text{361}\). Others (such as Pigeaud, Casadei, Leith and Verde\(^\text{362}\)) who accept the idea of a direct relationship with the theory of matter developed within the Garden, read in some cases (Pigeaud and Casadei) the fragility of ὄγκοι as a sign of their intermediate ontological status between atoms and perceptible aggregates and in some other cases (Leith and Verde), on the contrary, as an indication of a possible development of Asclepiades’ theory from atomism to an independent corpuscularism that admitted the infinite divisibility of elements and criticized the Epicurean doctrine of minima. According to such a view Asclepiades would have derived his theory of matter from Epicurus’, but he would also have modified some of its aspects and developed his own view on divisibility. Therefore, while the hypothesis of an intermediate ontological status leads to the conception of ὄγκοι as molecules, namely as invisible compounds of atoms, the latter identifies the ἄναρμοι ὄγκοι as the first principle of Asclepiades’ physiology.

In this chapter I will analyze the main surviving testimonies on Asclepiades’ physical system and discuss the various interpretations formulated by the scholars. I will seek to demonstrate that the


\(^{361}\) Among the researchers who do not attribute an Epicurean background to Asclepiades’ corpuscular system, there are also Lonie and Gottschalk, who wish to establish a direct relationship between his elements and the ἄναρμοι ὄγκοι of Heraclides of Pontus. See I. M. Lonie, “The "ANAPMOI ὍΓΚΟΙ of Heraclides of Pontus”, in \textit{Phronesis} 9, 1964, p. 156-64; H. B. Gottschalk, “Heraclides of Pontus”, 1980.

hypothesis of ὄγκοι as the most fundamental but divisible particles finds support in all ancient sources and does not imply the absence of an Epicurean influence. In addition, I will also attempt to show the presence of some relevant parallels between Epicurus’ doctrine of ἐἴδωλα and Asclepiades’ flux theory, suggesting the Epicurean background of the hypothesis of a stream of ὄγκοι and the reliability of Galen’s account.

3.1 Nature and meaning of Asclepiades’ ὄγκοι

Relying on the medical tradition that, from Hippocrates on, had described ὄγκος as a “mass” of solid matter or as “tumor”;363 relying also on Epicurus, who in his physics used the plural ὄγκοι in reference to the notion of invisible “masses”, and on Heraclides of Pontus, who first seems to have posited the existence of “corpuscles” called ἄναρμοι ὄγκοι, Asclepiades assigns to the ὄγκοι the role of fundamental physical principles of his elemental theory. Thus, after having been a common term that for a long time Greek authors used with multiple meanings,364 in order to express the concept of “mass”,365 ὄγκος becomes part of the terminology that

363 In his paper on the meaning of the term ὄγκος, Jouanna dwells upon the ambivalence of the meaning of ὄγκόω, stressing that the link between the swelling of the body and the protrusion of the ground in the case of a burial mound is also preserved by the Latin verb tumeo (“to be swollen” or “to be tumid”) and the substantive tumor. See Jouanna, “Le mot grec ὄγκος ou de l’utilité d’Hippocrate pour comprendre les textes poétiques”, in Comptes rendus des séances de l’Académie des Inscriptions et Belle-lettres 129.1, 1985, p. 31-62.

364 Most of the dictionaries (Chantraine, Frisk, LSJ and Montanari) list two different entries of ὄγκος respectively with the meaning of “curved object”, “barb” or “hook”, whose etymology has a correspondence in the Latin uncus, and of “mass” or “volume”, that swings between the metaphorical meaning of “weight” or “proud” and that more concrete of solid “body”, “heap/pile” or “weight/charge/load”. In line with the derivatives ὄγκωδης, namely “swelling” or “bulky”, but also “puffed up” or “pretentious”, ὄγκωμα (“swelling”), ὄγκωτός (“heaped up”) and the verb ὄγκον (“raise up”, “distend”, also “bury/entomb”), the substantive ὄγκος means “bulk” or “swelling”. Indeed, ὄγκος indicates both “the pride that swells the soul/spirit” and “the swelling of the body”, as well as the swelling of a specific part of the body. On the term ὄγκος as “bulk” or “swelling”, see Jouanna, 1985, p. 40-1.

365 Aristotle calls bodily masses ὄγκος, while Simplicius uses this term to refer to the atoms of Democritus. Instead, in Aetius’ Placita ὄγκος occurs in the account of Empedocles’ and Xenocrates’ first elements. The term ὄγκος also appears many times in Galen’s accounts, such as that of Erasistratus’ theory of respiration, in which ὄγκος refers to the volume-quantity of air that a human being can breathe. In another case, however, Galen uses ὄγκος to define the swelling that emerges when a tourniquet is placed around the arm. See Arist. Phys. Π 203b, 28-31; Simpl. De Cael. 294-5 (68 A 37 DK); Aet. Pl. 1, 17, 3 (31A 43 DK); Gal. De Usu Resp. 4, 473 K.; De Anat. Adm. 2, 387 K.
identifies medical corpuscularism and is regularly associated with the name of Asclepiades. Similarly to the usage attested in the treatises of both Hippocrates and Galen, in which the meaning of ὄγκος constantly swings between the notion of “swelling” and that of “volume” in the descriptions of the symptoms of diseases, Asclepiades also preserves the etiological view of ὄγκος as a solid mass that causes obstructions responsible for the development of pathologies. Thus, in his physical system the excessive buildup of ὄγκοι is identified as the main cause of diseases. According to Asclepiades both animal and human bodies are made up of ἀναρμότι ὄγκοι and πόροι, namely of minute, “unattached” and invisible particles, and empty interstices through which they move. When blockages due to the differences of size and shape between ὄγκοι and πόροι interrupt the flow of corpuscles, the doctor must provide treatments that aim to restore health by removing such obstructions. In this way, the system of a proper and balanced flow of ὄγκοι is re-established. Therefore, since the features and the motions of ὄγκοι are clearly the pivotal elements of both Asclepiades’ physiology and pathology, reconstructing their characteristics is an absolute priority for any study that intends to investigate his philosophical background and – Asclepiades’ works being lost – the role and reliability of the ancient testimonies, among them primarily Galen.

3.2 The ancient testimonies on the nature of Asclepiades’ ὄγκοι.

3.2.1 Galen’s account

In a section of his De Theriaca ad Pisonem, Galen assimilates Asclepiades’ doctrine of particles to that of Epicurus by equating ὄγκοι and atoms. As already underlined by Vallance, this is a key

367 As pointed out by Jouanna, the term ὄγκος and its derivatives appear in the treatises of the Corpus Hippocraticum more than any other text from V and IV century BC. See Jouanna, 1985, p. 37.
368 The term ὄγκος occurs in Galen’s texts hundreds of times, showing that in the II century AD the word was established as part of medical terminology.
369 The close connection between the meanings of “volume” and “swelling” (in CH suggests the physiognomy of a mass of solid matter similar to that of a “heap” or a “growth” protruding from a plane surface (see for example Hipp. Epid. I, 13, 10 (Littre II 704, 16 ff.) and II 2, 24). The term ὄγκος preserves the same meaning in Galen, who, for example, in De nat. fac. III 183,10-184,9 K. associates ὄγκος with a mass, establishing also a clear relationship with the notion of weight. Referring to the role of the eliminative faculty in miscarriage and childbirth, Galen indifies the mass of the embryo and its weight as what causes pain when they exceede the strength and the structural characteristics of the uterus.
passage for accounts (like that of Casadei) that support the idea of an Epicurean influence on Asclepiades’ corpuscularism, or, in some cases (like Piggeaud’s), even his being an actual member of the Garden:

Gal., De theriaca ad Pisonem, XI, 16-20 Leigh (XIV, 6-12 K.)
Ei μὲν γὰρ ἔξ ἀτόμου καὶ τοῦ κενοῦ κατὰ τὸν Ἐπικούρου τε καὶ Δημοκρίτου λόγον συνειστήκει τὰ πάντα, ἢ ἐκ τινῶν ὑγκῶν καὶ πόρων κατὰ τὸν ἰατρὸν Ἀσκληπιάδην· καὶ γὰρ οὕτος ἀλλάξας τὰ ὄνοματα πάντως καὶ ἀντὶ μὲν τῶν ἀτόμων τούς ὑγκοὺς, ἀντὶ δὲ τοῦ κενοῦ τοὺς πόρους λέγων τὴν αὐτὴν ἐκείνοις τῶν ὄντων οὐσίαν εἶναι βουλόμενος, εἰκότως ἂν ἔμενεν ἀναλλοίωτα τὰ φάρμακα.

For if everything were made up of atom and void as in the theories of Epicurus and Democritus or of masses and pores as the doctor Asclepiades contends (for he just changes the names and says ‘masses’ instead of ‘atoms’ and ‘pores’ instead of ‘voids’, and means the same as they do in describing the nature of reality), it would be reasonable to think that the drugs would remain unaltered (Trans. Leigh p. 119371).

Galen also associates Asclepiades with Epicurus in other texts, such as De Usu Partium in which he pairs ταῖς τ’ Ἐπικουρείοις ἀτόμοις καὶ τοῖς Ἀσκληπιαδείοις ὄγκοις (UP XI: III 873, 17–18 K.), De Nat. Fac. I 45, 4-6 K. (Ἐπικουρος μὲν οὖν καὶ παραπλησίους Ἀσκληπιαδή στοιχείους πρὸς τὴν φυσιολογίαν χρώμενος ὄμως ὑμολογεῖ) and Morb. Diff. VI 840, 1–5 K. (εἰ μὲν ἐξ ἀτόμων, ἢ ἀνάρμων, ἢ ὀλὼς ἔξ ἀπαθῶν τινῶν σύγκειται, sc. τὸ τῶν ζώων σῶμα). Likewise, in De Meth. Med., IV, 267,19–268,7 K. Galen equates again ὑγκοὺ and atoms, extending such a correspondence also to Asclepiades’ pores and the atomistic void. In addition, Galen attributes the same characteristics of impassibility and immutability to both kinds of elements, which are therefore described, as already shown in the second chapter of this work, as qualityless substances:

ὑποθεμένοις, ἢ ἄτομα καὶ κενὸν, ἢ ὅλως ἀπαθῆ καὶ ἀναλλοίωτα τὰ πρῶτα στοιχεῖα, μόνοις ἐγχωρεῖ λέγειν, ὥσπερ οὖν καὶ λέγουσι καὶ συνεχῶς αὐτοῖς χρῶνται τοῖς ὀνόμασι.

Now however, since it is a characteristic of their stupidity arising from the hypothesis of Asclepiades, as do the rest of their theories also, they are right, I suppose, to interpret their peculiar dreams, with their postulations of bodies coming together and separating, and of corpuscles and pores, or atoms and void, and it is possible for them alone to speak of altogether impassible and immutable first elements, as they do when they speak of and continually use these terms (Trans. I. Johnston and G. H. R. Horsley, p. 407).

Although Galen clearly considers their elemental theories as essentially analogous and places the names of Asclepiades and Epicurus in «the same chorous» of those who believe in infinite particles\(^372\), in most of these passages he also distinguishes the specific terminology and features attributed to their particles. Indeed, the parallel ἄτομος-ἀνάρμος seems to suggest a difference instead of a complete identity.

As noted by Leigh\(^373\), although pairing ὄγκοι and atoms is part of a recurring pattern in Galen’s testimony, the statement preserved in De theriaca ad Pisonem is by far the most radical one. Nowhere else Galen does push their assimilation to the level of such an absolute uniformity. As stressed by Leigh, this raises a question about the reliability of this account, especially if compared with those passages in which Galen indentifies several differences between the two systems. For example in De Nat. Fac. I, 44, 20-54 K. (133, 11 H.) Galen distinguishes Epicurus’ from Asclepiades’ theory of magnetism and in De Const. Art. Med. 76, 19-20 Fortuna (I, 249, 11-15 K.) he describes ὄγκοι as frangible elements. Thus, although the assimilation of ὄγκοι and atoms is a typical element of Galen’s account, his testimony is also based on a full, even if intentionally reduced and also often hidden, awareness of the existing differences between the two kinds of elements. Indeed, such a tendency to assimilate ἀνάρμοι ὄγκοι to atoms never includes a detailed account of Asclepiades’ theory of matter, which remains obscure. The Epicurean stigma is certainly a clear purpose of Galen’s testimony on Asclepiades’ corpuscularism and can be a possible explanation for the deliberate manipulation of its contents.

\(^372\) See Gal. De Elem., 58, 21-22 De Lacy (I 416, 6-14 K.); De San. Tu., I, VI, 15,8-13 K.).

\(^373\) Ibid. p. 40-1.
Most of the time Galen’s main interest is the question of pain and, as we have already seen in the previous chapter, his accounts of Epicurus’ and Asclepiades’ theories are often focused on the lack of secondary qualities shared by both ὄγκοι and atoms. His priority is to deny the impassibility of the elements in order to support their alterability. In De Const. Art. Med. 76, 3-11 Fortuna (248,9-249,4 K.) the rejection of the impassible nature of ὄγκοι, atoms and minima as incapable of explaining the perception of pain in the body represents a safe method for disarming the rethorical weapons that the Epicureans usually use:

Thus, the first argument refutes the hypotheses of atoms, unattached corpuscles and least bodies, whereas, according to the second argument, the theory of homoeomeries and that of Empedocles are refuted, for Empedocles wishes bodies to be composed of four elements which do not change into one another. Now direct your attention to the argument as it reveals quicker than expected the most important part of the things you were seeking, for it demonstrates that the elements of flesh need to be passible. The followers of Epicurus will therefore no longer constrain you by the argument about the combination of the impassible bodies which they postulate are elements of the nature of all existing things, saying they are what generate pain (Trans. after Johnston, p. 51374).

The sequence of specific terms and the structure of the argument of this passage are quite similar to those Galen uses in De Elementis 58, 20-2 (416 K.), 60, 1-6 (417 K.) and 62, 4 ff. De Lacy (418-9

---

K.) 375. In both these treatises he insists first on the idea that the body cannot be constituted of a multitude of identical elements and then on the necessity of understanding pain as a phenomenon that depends on affection and, in turn, implies complete alteration and continuity of the elements. Indeed, similarly to *De Elem.* 66, 11-3 De Lacy (423 K.) he also makes the example of two fingers that are first interwined to each other and then separated in order to demonstrate that neither contact between elements nor their separation can cause pain in the body. It does not matter if the elements come together or separate, or even if they are divisible, they have to be passible. Hence, in *De Const. Art. Med.* 76, 17-21 Fortuna (249,9-13 K.) Galen rejects the hypothesis of ἄναρμοι ὄγκοι formulated by Asclepiades claiming that:

ὅποτ’ οὖν οὐδ’ ἐν τοῖς παθητικοῖς ἐναργῶς σώμασιν οὐθ’ ἢ σύνοδος, οὐθ’ ἢ ἄφοδος ὀδύνην ἐργάζεται, σχολῇ γε ἂν ἐν τοῖς ἀπαθέσιν ἐργάσαιτο. οὐ μήν οὐδέ τὸ ἄναρμον τὸ Ἀσκληπιάδου θραυστὸν ὃν ὀδυνήσεται θραυόμενον, ἀναίσθητον γάρ ἐστιν.

Therefore, when neither coming together nor separate produce pain in bodies that are clearly possible, it will hardly do so in those that are impassible. Nor will the frangible unattached corpuscles of Asclepiades feel pain when broken for they are without sensation.

(Trans. After Johnston, p. 53)

In this passage Galen surprisingly describes Asclepiades’ ἄναρμοι ὄγκοι as frangible and therefore as divisible elements. If compared to to the radical account preserved in *De Ther. ad Pis.*, XI, 16-20 Leigh (XIV, 6-12 K.), such a statement mirrors a radically divergent interpretation and can be read as an admission of the existence of a significant difference between the nature of ὄγκοι and the Epicurean atoms, which are by definition indivisible. However, such a difference does not stop Galen from considering Asclepiades and Epicurus as part of the same tradition. Indeed, his main interest is again rejecting atoms and ὄγκοι on the basis of their impassibility.

The divisibility of ὄγκοι seems to be confirmed also by *De Met. Med.* X, 852-3 K., where Galen discusses the genesis of pain. Starting from the assumption that the perception of pain depends on «a dissolution of continuity or some (qualitative) change» (X, 852, 9-10 K.: συνεχείας λύσιν ἢ

375 The theories of Anaxagoras and Empedocles are also explicitly rejected right after that of Epicurus in *De Elem.* 130, 4-10 De Lacy (483-4 K.).
For this reason, it was said correctly by those who would put together the body from atoms, or impassible and unattached elements, that it is quite impossible to find a condition from which pain arises. For it is obvious that nothing that simply touches is painful, yet such bodies simply touch each other. Even if they do not only touch but also break each other in the collision, there is nothing more for the creation of pain if the things broken exist without sensation, unless we shall say that stones too feel pain when they are divided. But I gave consideration to these matters at greater length in certain other [works] and in the fifth book of *On the opinions of Asclepiades* (Trans. after Johnston and G. H. R Horsley, p. 287).

Similarly to *De Const. Art. Med.* 76, 17-21 Fortuna (249, 9-13 K.), Galen claims that neither the contact between two elements nor their division after collision can justify the phenomenon of pain. Indeed, in this passage he seems to list two different possible situations, which immediately follow the above list of specific terms ἀτόμων ἢ ἀναισθήτων ἢ ἀνάρμων στοιχείων and would correspond to the two different hypotheses formulated by Epicurus and Asclepiades:

1) while κἂν εἰ μὴ ψαύοι δὲ μόνον would refer to the contact between Epicurean atoms due to their collision;

2) ἀλλὰ καὶ θραύοι κατὰ τὴν πρόπτωσιν ἀλλήλα would allude to the case in which Asclepiades’ ὄγκοι can break and be physically divided after a collision.

If such an interpretation is correct, this account would represent a clear proof of Galen’s awareness of a difference between Asclepiades’ and Epicurus’ theory of matter. However, in his eyes the potential
divisibility of ὄγκοι had to be a marginal problem and certainly not a threat to the consistency of his doxographical strategy. Indeed, since the nature of ὄγκοι remains unaltered even after any division that might occur, admitting their frangibility does not change their qualitative status and does not save them from rejection. Furthermore, the explicit reference to the fifth book of the treatise *On the Opinions of Asclepiades*, in which these aspects are said to have been widely discussed, is a further confirmation that the question of pain was of particular concern to Galen and that he considered it as one of the strongest reasons for rejecting Asclepiades’ corpuscularism as a kind of atomism.

### 3.2.2 Sextus’ account

The qualitative status and the divisibility of Asclepiades’ corpuscles are also discussed by Sextus Empiricus, who, however, does not show a specific interest in the question of pain and, at first glance, seems to contradict central aspects of Galen’s account.

In fact, in *Pyrr. Hyp.* III 33-34,1 Sextus describes Asclepiades’ ὄγκοι as alterable corpuscles which are both θραυστά, divisible, and ποιά, provided with secondary qualities, implying their capability to undergo qualitative changes.

Sext. Emp., *Pyrr. Hyp.* III 33,1-34,1

υτόεις τοίνυν καὶ έτι πλείονος διαφωνίας γεγενημένης περὶ τῶν ὑλικῶν ἄρχον παρ' αὐτοῖς, ήτοι πάσαις συγκαταθησόμεθα ταῖς κειμέναις στάσεσι καὶ ταῖς ἄλλαις ἡ τισίν. άλλα πάσαις μέν οὐ δυνατόν ὁ γάρ δήπου δυνησόμεθα καὶ τοῖς περὶ Ἀσκληπιάδην συγκατατίθεσθαι, θραυστά εἶναι τὰ στοιχεῖα λέγουσι καὶ ποιά, καὶ τοῖς περὶ Δημόκριτον, ἄτομα ταῦτα εἶναι φάσκουσι καὶ ἄποια, καὶ τοῖς περὶ Ἀναξαγόραν, πᾶσαν αἰσθητὴν ποιότητα περὶ ταῖς ὁμοιομερείαις ἀπολείπουσιν.

Since, then, there exists amongst them as much divergence as this, and even more, regarding the material principles, we shall give assent either to all the positions stated, and all others as well, or to some of them. But to assent to all is not possible; for we certainly shall not be able to assent both to Asclepiades, who says that the elements can be broken up and possess qualities, and to Democritus, who asserts that they are indivisible and void of quality, and to Anaxagoras, who leaves every sensible quality attached to the homoeomerides.

(Trans. Bury p. 347)
However, according to Leith, the contradicting presence of the term ποιά could depend on a wrong textual correction and should be read as ἄποια. Indeed, the word ποιά does not occur in the manuscript tradition, which, instead, preserves τοῖα and talia in the Latin translation of Paris. lat. 14700. Instead, the word ποιά appears for the first time only in the printed edition of 1621. Although the term τοῖα does not make very much sense in the text, as Leith himself indeed admits, its occurrence in the manuscripts demonstrates that the discordance between Democritus and Asclepiades in Pyrr. Hyp. III 33-34,1 could depend on an emendation to ποιά and not originally be part of Sextus’ account. In fact, unlike Heidel and Gottschalk, Leith convincingly argues that the word ἄποια would make better sense with the diaphonic structure of the argument, since it would emphasize the disagreement between Asclepiades’ and Anaxagoras’ elements. A similar account also occurs in Adv. Math., X 318,1-9, where Sextus presents again Asclepiades’ ὄγκοι as elements that can undergo changes:

έξ ἀπείρων δ’ ἐδόξασαν τὴν τῶν πραγμάτων γένεσιν οἱ περὶ Ἀναξαγόραν τὸν Κλαζομένιον καὶ Δημόκριτον καὶ Ἐπίκουρον καὶ ἄλλοι παμπληθεῖς, ἀλλ’ ο μὲν Ἀναξαγόρας ἐξ ὀμοίων τοῖς γεννωμένοις, οἱ δὲ περὶ τὸν Δημόκριτον καὶ Ἐπίκουρον ἐξ ἁνομοίων τε καὶ ἀπαθῶν, τουτέστι τῶν ἀτόμων, οἱ δὲ περὶ τὸν Ποντικὸν Ἡρακλείδην καὶ Ἀσκληπιάδην ἐξ ἁνομοίων μὲν, παθητῶν δὲ, καθάπερ τῶν ἀνάρμων ὄγκων.

But Anaxagoras of Clazomenae and Democritus and Epicurus and a host of others held that the generation of things is from innumerables; yet whereas Anaxagoras said that these are like to the things generated, Democritus and Epicurus said that they are unlike and impassive (namely, the atoms), while Heracleides of Pontus and Asclepiades said that they are unlike but passive (namely, the unattached corpuscles) (Trans. after Bury p. 367).

After having summarized Empedocles’ four-element theory, Sextus deals with those philosophers who explain the generation of the physical world on the basis of an indeterminate multitude of ultimate elements and distinguishes their theories in two main categories: 1) that of elements, such as

---

Anaxagoras’ homoemeries, which are like (ὁμοίων) the whole they constitute; 2) that of elements, such as the atomists’ Asclepiades’ and Heraclides Ponticus’ particles, which are by nature different from the perceivable bodies they generate (ἀνομοίων). Nevertheless, according to Sextus, atoms and ὄγκοι do not have exactly the same features and a further distinction is required. While Democritus’ and Epicurus’ atoms are impassible, Asclepiades’ ὄγκοι are said to be capable of being altered (παθητῶν) like the ἀναρμοὶ ὄγκοι attributed to Heraclides Ponticus. Such a statement contradicts the key point of Galen’s account: on the question of pain Epicurus and Asclepiades have identical positions, since they both conceived the ultimate elements as qualityless and impassible. Galen’s insistence on this aspect suggests that the question of pain was probably a well-known vulnerable point of both Epicurus’ and Asclepiades’ systems and also a point of convergence of their theories. Thus, apart from its clear relevance to medicine, the topic of pain offered to Galen the possibility of easily coalescing the characteristics of atoms and ὄγκοι and rejecting their hypothesis as essentially identical. I therefore find it difficult to believe that Galen may have misinterpreted the similarities between the features of these particles, especially since they were the most crucial evidence in support of his argument. Furthermore, as we will see later on, Galen’s testimony on the qualitative status of ὄγκοι is also confirmed by Caelius Aurelianus, who only attributes to them primary qualities similar to those of the atoms.

Given all these premises, the contradictions in Sextus’ account appear suspect and, as argued by Leith, can only be justified if we accept the emendation to ποία in Pyrr. Hyp. III 33 and the hypothesis that in Adv. Phys., II 10 the word παθητῶν does not refer to the capability of ὄγκοι to suffer qualitative changes but to their divisibility. According to Leith the similar structure of these two passages might, in fact, suggest that «Sextus was in fact saying the same thing in both»3, namely that Asclepiades’ ὄγκοι are qualityless and frangible corpuscles. The only difference between the two accounts would be in the terminology. In both passages Sextus compares homoemeries, atoms and ὄγκοι, indentifying two levels of dissimilarity:

1) A wider dissimilarity between Anaxagoras’ homoemeries, on the one side, and Democritus’, Epicurus’ and Asclepiades’ particles on the other. This first level of dissimilarity depends on the uniformity (homoemeries) or the diversity (atoms and ὄγκοι) of the elements in comparison with the


bodies they generate, namely on the elements having or not having the same qualities of their compounds.

2) A second level and more specific dissimilarity lies within the group of ἀνομοίων elements. Indeed, although atoms and ὀγκοί share the same qualitative status (lack of secondary qualities), they are dissimilar in terms of divisibility. While atoms are by definition indivisible, ὀγκοί are frangible and in this sense capable of undergoing changes. Thus, Leith’s interpretation re-establishes coherence in Sextus’ account and convincingly demonstrates that its content does not contradict Galen.

3.2.3 Caelius Aurelianus’ account

Galen’s description of ὀγκοί as qualityless and divisible elements is also confirmed by the Roman doctor Caelius Aurelianus in Celeres passiones I 14, 105-15 Bendz (p. 80-6), a late text (V century AD) in Latin which relies on the Methodist Soranus of Ephesus and preserves one of the fullest account of Asclepiades’ corpuscular system. Indeed, this testimony gives an overview, however brief and polemical, of the principles of the doctrine:

Cael. Aur., Cel. pass., I XIV, 105-6 Bendz (P. 80-2)

Asclepiadi responsuri eius primum dogma proponamus, qua voluti apprehensionis falsitate peccatis etiam involvuntur curationum. primordia namque corporis prima constituerat atomos, secunda corpuscula intellectu sensa sine ulla qualitate solita atque ex initio concitata <et> aeternum moventia, quae suo incursu offensa mutuis ictibus in infinita partium fragmenta solvantur, magnitudine atque schemate differentia. quae rursum eundo sibi adiecta vel coniuncta omnia faciant sensibilia, vim in semet mutationis habentia aut per magnitudinem sui aut per multitudinem aut per schema aut per ordinem. nec, inquit, ratione carere videatur, quod nullius faciant qualitatis corpora. aliud enim partes, aliud universitatem sequetur: argentum denique album est, sed eius affricatio nigra, caprinum cornu nigrum, sed eius alba serrago.

381 Leith argues that «while being indivisible is clearly not coextensive with being impassive, indivisibility is certainly one of the characteristics which might qualify a subject as being so; likewise being frangible and being capable of being acted upon».


383 On Caelius’ debt to Soranus, see Van der Eijk, 2009, p. 289.
Before answering Asclepiades, let us first set forth his basic doctrine, for this doctrine involves him and his followers in misconceptions which lead to mistakes in treating diseases. For he had posited atoms as the first principles of the body, second corpuscles apprehended only by the intellect, endowed with none of the customary qualities of things, having been in motion from the beginning and eternally moving. These [corpuscles], when they suffer collision by their mutual impact, are resolved into infinite fragments of parts, and differ in size and shape. On the other hand, when in their course they are attached or joined to each other, they create all sensible things, and have within themselves the capacity for change by reason of their size, number, shape, and arrangement. And it would not be illogical, says Asclepiades, to hold that bodies which possess no quality could do this, for the properties of a whole are different from those of its parts. For the properties of a whole are necessarily different from those of its parts. For example, silver is white, but particles rubbed off are black; a goat’s horn is black, but particles chipped from it are white.

(Trans. Leith after Drabkin (p. 67\textsuperscript{384}) p. 287-8\textsuperscript{385})

Through the years this corrupt passage has been subject to different interpretations, which mainly focus on the relationship between the *atomos*, the *corpuscula* and the *fragmenta* named by Caelius and disagree on their ontological status. As convincingly argued by Leith, in this account Asclepiades is said to have posited, at first, atoms as primary components of the sensible bodies and, secondly, non-perceivable qualityless corpuscles (*corpuscula intellectu sensa sine ulla qualitate solita*) that are constantly in motion. Their movement can lead them to collide with one another and break into infinite fragments (*in infinita partium fragmenta solvantur*), or to intertwine and generate bodies with secondary qualities thanks to their variety of size, number, shape and arrangement.

Unlike Bendz’s edition, which has *prima* and *secunda*, Leith suggests reading *primo*, which occured in the earliest printed editions of the text, and *secundo*, which Drabkin\textsuperscript{386} already indicated as a plausible, however problematic, emendation. Such an interpretation identifies a specific internal order in Asclepiades’ theory and implies the distinction between *atomos* and *corpuscula*, identifying the


\textsuperscript{385} See Leith 2009, p. 287-8.

\textsuperscript{386} See Drabkin, 1950 p. 67. Drabkin’s emendation is not accepted by Vallance, who does not see a syntactic connection with *primo*. On this point see Vallance, 1990, p. 19.
latter with the ὀγκοὶ and the fragmenta as a consequence of their possible division. Indeed, by referring to both the relative clauses introduced by quae to the corpuscula, Leith also succeeds in making sense of the most problematic and confusing aspect of Caelius’ testimony, the ontological status of fragmenta. Taking both quae as introducing subordinate clauses that describe the possible outcomes of the motion of corpuscula, Leith rejects the hypothesis that indicates the fragmenta as the particles responsible for the generation of the sensible bodies and assigns this primary role to the corpuscula. Therefore, unlike the so-called “two-level theory” developed by Gottschalk and substantially shared by Lonie, Pigeaud and Casadei, which conceives of corpuscula/ὀγκοὶ as «a second order of particles», namely as compounds that can split into fragmenta with the same function and features of Epicurean atoms, Leith does not ascribe any active role for the fragmenta.

According to Leith, indeed, Caelius describes Asclepiades’ ὀγκοὶ as frangible primary elements and indicates two alternative scenarios that can result from their motion: 1) collision and consequent divisibility in “infinite fragments of parts” (in infinita partium fragmenta solvantur); 2) aggregation into sensible compounds (coniuncta omnia faciant sensibilia).

The corpuscula, described as intellectu sensa sine ulla qualitate solita, are therefore said to be devoid of the secondary qualities of the perceptible objects, but capable of generating them thanks to their different sizes, shapes and arrangements (per magnitudinem sui aut per multitudinem aut per schema aut per ordinem). This means that Asclepiades’ ὀγκοὶ are characterized by the same primary qualities that Caelius also attributes to the fragmenta, which differ in size and shape (magnitudine atque schemate differentia). Both particles have the same qualitative status, which, except for the absence of a reference to the property of weight, also corresponds to that of the Epicurean atoms. However, as pointed out by Leith who rejects Casadei’s hypothesis of a Democritean background to

---

390 Casadei, 1997, p. 93
392 Pigeaud takes the term comitata as a possible latin translation of the greek σύγχρησις. See Pigeaud, 1980 p. 197.
393 See Leith 2009, p. 290, where he also points out that «the fragmenta are nowhere else mentioned by Caelius and no other source for Asclepiades’ doctrine recognizes any kind of active role for fragments of ὀγκοὶ».
Asclepiades’ theory\textsuperscript{395}, in \textit{Hdt.} [2] 54-54,3 Epicurus establishes a direct and intrinsic connection between shape and weight. Thus, since an Epicurean influence on the qualitative status of ὀγκοί seems much more probable than a Democritean one, we cannot exclude that Asclepiades also listed weight among the primary qualities of his particles and that Caelius failed to add this detail to his account.

If Leith’s hypothesis is correct, then the term \textit{fragmenta} would not refer to a different and more fundamental order of particles, but only to the case in which the occurrence of a collision causes the division of ὀγκοί, which are by nature frangible, into smaller parts. However frangible, the \textit{fragmenta} do not have secondary qualities and therefore would maintain the same primary qualities, differing in shape and size among themselves and from those of the corpuscles they separated from. According to Caelius, indeed, the \textit{corpuscula}/ὀγκοί, and not their fragments, are the ultimate elements of Asclepiades’ physical theory and they differ from the \textit{atomos} mentioned at the beginning of the passage basically only in virtue of their divisibility. This aspect has been widely discussed by Vallance, who reads \textit{in infinita partium fragmenta solvantur} as a reference to the infinite divisibility of corpuscles and as proof of a clear incompatibility between Epicureanism and Asclepiades’s system\textsuperscript{396}: admitting the possibility of an infinite division of matter would necessarily imply the absence of particles like \textit{atomos}\textsuperscript{397}. Although Leith agrees with Vallance on this conclusion, he also finds odd the idea of an ὀγκος that split into an infinite number of fragments and suggests reading \textit{in infinita<rum> partium fragmenta}, as “into fragments of infinite parts”\textsuperscript{398}. This emendation, which has also been recently accepted also by Verde\textsuperscript{399}, would therefore entail that the fragments of \textit{corpuscula} have an infinite number of parts and are infinitely divisibile.

According to Leith, Asclepiades developed this view in open contrast to the Epicurean doctrine of \textit{minima}\textsuperscript{400}, rejecting the notion of ἔλαχιστα, namely the idea of physical limits in the constitution of...


\textsuperscript{396} On this aspect see Vallance, 1990, p. 42-3.

\textsuperscript{397} Unlike Casadei, Vallance judges unreliable the description of Asclepiades’ ὀγκοί as indivisible atoms preserved by Galen’s \textit{De Experientia Medica}, 24, 6 Walzer and attributes the occurrence of the term atoms to a gloss of the Arabic translator Hunain Ibn Ishāq. On the different interpretation of this testimony, see Vallance, 1990, p. 25; Casadei, 1997, p. 94; Leith, 2009, p. 310-2.

\textsuperscript{398} Leith, 2009, p. 312-3.

\textsuperscript{399} See Verde 2019, p. 36-40.

the atoms that can guarantee their indivisibility, in order to legitimate his theory. Similarly to the position criticized by Lucretius in *De Rer. Nat.*, I, 615-8 Asclepiades, indeed, would posit ὄγκοι without πέρατα but with infinite parts.

Such an interpretation seems to confirm Vallance’s hypothesis and exclude any possibility of analyzing Asclepiades’ corpuscularism in the light of Epicureanism. However, as Leith argues in the conclusions of his paper, Caelius’ mention of both atomos and corpuscula and his clear distinction between them suggest a reference to two different stages in Asclepiades’ thought. After having been a follower of Epicureanism in his early career, Asclepiades would have developed his own independent physical theory, challenging the Epicurean golden rule of atomic indivisibility and positing frangible ὄγκοι as first elements of the bodies. Except for this major difference, Caelius’ account, which is likely based on his or more plausibly on Soranus’ first-hand knowledge of Asclepiades’ works, also shows strong similarities between ὄγκοι and Epicurean atoms, confirming that both kinds of particles are the most fundamental elements of matter and possess only primary qualities which are responsible for the features of the phenomena. Therefore, the Epicurean influence on Asclepiades’ physical system seems beyond questioning.

Although Leith’s hypothesis of “two separate stages in Asclepiades’ thought” seems plausible and well supported by textual evidence, one may be surprised at the silence of Galen about such a relevant aspect. Even if always hostile, the Pergamene is indeed a well informed source, which has a first-hand knowledge of and a true obsession with Asclepiades’ theory. However, it should also be

---

401 For a broader discussion of this comparison, see Leith’s brilliant argument on p. 313 ff.
402 Ibid. p. 316.
403 Following Polito’s argument on Asclepiades’ probable trip to Alexandria at the end of the 3rd century BC, Verde points out that, given the documented success that Epicureanism had there at that time, he likely had direct access to Epicurean texts and learned the principle of atomism during his stay. See Polito, “On the life of Asclepiades of Bithynia”, in *Journal of Hellenistic Studies* 119, 1999, p. 48-66; Verde, 2019, p. 38. On Asclepiades’ chronology see now also F. Stok, “Quando Asclepiade arrivò a Roma?”, *Technai* 10, 2019, p. 11-20.
noted that in his accounts of the nature of ὄγκοι Galen does not omit their divisibility, but he just fails to place this question in a biographical perspective. If the idea of a development in Asclepiades’ system is to be accepted, Galen’s attitude might be interpreted as due to his already mentioned historiographical strategy, which aims at highlighting the similarities and mitigating the differences between Asclepiades and Epicurus.

### 3.2.4 Calcidius’ account

A description of the primary qualities of ὄγκοι is also preserved in Calcidius’ commentary on the *Timaeus*. Unlike the other testimonies, however, this account does not refer to Asclepiades’ ὄγκοι in general, but focuses on the specific kind of corpuscles that constitute the soul. According to Asclepiades the soul is, indeed, material just like everything else and consists of the ordinary air that the living being inhales from outside through the mechanism of respiration:

Calc. *In Tim.* 215 Waszink

_Aut enim moles quaedam sunt leves et globosae eademque admodum delicatae, ex quibus anima subsistit, quod totum spiritus est, ut Asclepiades putat, aut ignitae atomi iuxta Democritum, ... vel id ipsum atomi casu quodam et sine ratione concurrentes in unum et animam creantes, ut Epicuro placet ..._

For either there are certain *onkoi* out of which the soul is composed (which is _pneuma_ in its entirety) that are smooth, round, and at the same time very fine, as Asclepiades thinks, or atoms of fire according to Democritus, ... or, what is the same, there are atoms which run together by chance and for no reason to create the soul, which is Epicurus’ opinion...

(Trans. Waszink p. 229,18-230,2405)

The soul is therefore a sort of _pneuma_, a vital breath made up of smooth (_leves_), round (_globosae_) and very fine (_delicatae_) corpuscles. The translation of these adjectives has been extensively discussed by scholars, who disagree especially on the meaning of _delicatae_. Whereas Vallance reads _delicatae_ as equivalent to the Greek ἄναρμος, which he also considers as a synonym for θραυστός and interprets

as “weak” or “loosely held together”, namely as a reference to the frangibility of ὄγκοι, Polito focuses on the occurrence of delicatae in one of the manuscripts, which he defines as a lectio difficilior and translates as “tied together”.

More recently both these opposite interpretations have been disputed by Leith, who, even if he accepts the reading delicatae supported by Vallance, refuses the link with ἄναρμος, which typically identifies Asclepiades’ corpuscles, since it would not apply to the ὄγκοι of the soul in particular but to all the ὄγκοι in general. Therefore, using the word delicatae in reference to the divisibility of Asclepiades’ corpuscles would be unnecessary in this passage of Calcidius’ account. Instead, Leith suggests linking delicatae with the notion of fineness, λεπτομέρεια, which would recall the tenuissima corpuscula. Caelius in Tard. Pass., III, IV, 65 attributes tenuissima corpuscula to Asclepiades and indicates that they are the components of what he calls spiritus, which in Cel. Pass. I, XIV, 113 he also explicitly describes as leptomeres.

In his account Calcidius also describes the ὄγκοι of the soul as levis, which has been translated as both “light” and “smooth”. Unlike Vallance who sees in this term a direct relationship with the primary quality of weight, Leith reads lēvis (instead of lĕvis) and attributes to this kind of ὄγκοi the same property of smoothness that Democritus and Epicurus also assign to the atoms of the soul. Indeed, as attested by textual evidence, corpuscles and atoms of the soul are both smooth, round (a characteristic that Calcidius describes with the word globosae) and very fine. According to Calcidius, the parallel between Asclepiades and the atomists also relates to the constitution of the soul, which they all consider as air that enters the body through respiration. However, as correctly noted by

---

406 Relying on Heidel and Gottschalk’s analysis of the term, Vallance also compares ἄναρμος to the Latin solutus, suggesting a direct relationship with the fragmentation described by Caelius with the verb solvo. On this interpretation, see Vallance, 1990, p. 21 and also Heidel, 1909, p. 19-20; Gottschalk, 1980, p. 38 ff.

407 This translation follows Gottschalk’s understanding of ἄναρμοι ὄγκοι as “monolithic” corpuscles. See Polito, 2007, p. 315.


Polito and Leith, these similarities do not imply the assimilation of Asclepiades’ doctrine of the soul to the atomistic ones, but rather the opposite. Indeed, in In Tim. 214 (p. 251) Waszink Calcidius attributes Asclepiades’ idea that the soul is widespread and not localized in a specific part of the body to both Democritus and Epicurus, who, on the contrary, placed the ruling part of the soul in the brain and in the chest. Similarly, even when Calcidius describes the atomistic theory that explains the nature and the presence of the soul in the body through the mechanism of respiration, stressing the primary role of the organs involved in this process, he is again reporting Asclepiades’ account. Thus, as convincingly argued by Polito and Leith, Calcidius’ account presumably preserved the original doctrine of the soul developed by Asclepiades. Given these premises, we can conclude that, similarly to the other sources analyzed in this section, Calcidius’ testimony also corroborates the description of ὄγκοι as the most fundamental components of the bodies, namely as corpuscles that share the same qualitative status of the atoms.

3.3 Asclepiades’ flux theory and the Epicurean doctrine of emanations.

The description of the soul as a vital breath that enters the body through respiration involves a constant motion of ὄγκοι and portrays Asclepiades’ physical system as essentially dynamic. Indeed, as Calcidius claims in In Tim. 217, p. 253-4 Waszink, according to Asclepiades both the soul and the body are «always in flux and subject to changes». Such a view of vital and psychic activities is also reported by Galen in De Util. Resp. 4, 484 K. (p. 96, 9-98, 13 Furley and Wilkie) where he attacks Asclepiades for having conceived of the soul as a non-persistent substance, but as a result of an ongoing breath of outer air:

κατά δὲ τὸν Ἀσκληπιάδην οὐδὲ ἁριθμῆσαι δυνατὸν δοσας ἔχει· ἢ μὲν γὰρ ὀλίγον πρόσθεν οὕσα νῦν οὐ ὀξεῖται τελέως, ἄλλῃ δὲ ἐστιν ἡ νῦν οὕσα, μικρὸν δ’ ὑστερον οἰχήσεται μὲν αὐτῇ, γενήσεται δ’ έτέρα. <ὁπερ> ὡς ἔστιν αὐτὸν καὶ ἄτοπον, δι’ ἐκείνων ἀποδέδεικται.

413 See Polito, 2007, p. 299.
414 Ibid. p. 292
415 As noted by both Polito and Leith, the idea that the soul is a material substance constituted of the air that we breathe goes back to Democritus. However, the anatomical perspective of Calcidius’ account is presumably a later development elaborated by Asclepiades. On this interpretation, see Polito, 2006, p. 298 and Leith, 2009, p. 300.
But according to Asclepiades there is no counting how many souls one has: for even the one existing a moment ago is now totally gone, and that which exists now is another, and a moment later that will go too and another will come into being. That this is impossible and ridiculous has been proved in that place\(^{417}\) (Trans. Furley and Wilkie, p. 97-9).

A similar account occurs also in *Adv. Math.* VIII, 7-8, where Sextus attributes to Asclepiades the idea that sensible things are in flux and constantly changing, linking his theory to Plato’s analogy of the river\(^{418}\) and putting him in clear contrast with Epicurus’ empiricism:

\[\text{oī dè perì τὸν Πλάτωνα καὶ Δημόκριτον μόνα τὰ νοητὰ υπενόησαν ἕλθη ἔτι, ἀλλ’ ὁ μὲν Δημόκριτος διὰ τὸ μηδὲν ὑποκεῖσθαι φύσι αἰσθητόν, τῶν τὰ πάντα συγκρινούσων ἀτόμων πάσης αἰσθητῆς ποιότητος ἐρημοῦ ἐχουσῶν φύσιν, ὁ δὲ Πλάτων διὰ τὸ γίγνεσθαι μὲν ἂει τὰ αἰσθητά, μηδέποτε δὲ εἶναι, ποταμοῦ δίκην ῥεούσης τῆς οὐσίας, ὡστε ταύτῳ μὴ δύο τοὺς ἐλαχίστους χρόνους ὑπομένειν, μηδὲ ἐπιδέχεσθαι, καθάπερ ἔλεγε καὶ ὁ Ἀσκληπιάδης, δύο δείξεις διὰ τὴν ὀξύτητα τῆς ροής.\]

Plato and Democritus supposed that only intelligibles are true; but whereas Democritus did so because nothing sensible exists by nature, - since the atoms which compose all things possess a nature which is void of every sensible quality, - Plato did so because sensibles are always becoming and never being, as their substance keeps flowing like a river, so that it does not remain the same for two moments together, and, as Asclepiades said, does not admit of being pointed out twice owing to the speed with which it flows.

(Trans. Bury, p. 243)

All these accounts\(^{419}\) present Asclepiades’ theory of the flux as rather radical, especially in epistemological terms, suggesting that he considered what appears to the senses as an unreliable

---

\(^{417}\) Galen refers here to his treatise on Asclepiades theory of the soul, which he also mentions in *De Libr. Propr.*, 19, 38 K.

\(^{418}\) Cf. Plat., *Tim.*, 43b-c; 77c; 79a; 80d.

\(^{419}\) The comparison between Galen’s and Sextus’s accounts was first suggested by Wellmann and later accepted and discussed by Decleva Caizzi and more recently by Polito. See Wellmann, 1908 p. 699; F. Decleva Caizzi, “La “materia
source of knowledge. Such a version of Asclepiades’ epistemology is however contradicted by Sextus himself in *Adv. Math.*, 7, 201-2, where Asclepiades is paired again with Epicurus and portrayed by Antiochus as a keen advocate of sensation\(^{420}\) who «believed that sensations are really and truly acts of knowledge, and that we apprehend nothing at all with the aid of a reason\(^{421}\)». Such a statement also conflicts with the definitions of όγκοι and πόροι as λόγῳ θεωρητά\(^{422}\) and *corpuscula intellectu sensa*\(^{423}\), as well as with his reputation as a dogmatist who, as Galen repeatedly stresses in the *De Usu*, bases his biological explanations only on the postulation of theoretical and non-evident principles\(^{424}\). In this regard, in *De Nat. Fac.*, I, 31,18-32,2 K. (123, 20-23 H.) Galen criticizes Asclepiades’s theory of the bladder claiming that: ἀξίον ἀκοῦσαι καὶ θαυμάσαι τἀνδρὸς τὴν σοφίαν, ὃς καταλιπὼν οὕτως εὐρείας ὁ δοὺς ἐναργῶς φαινομένας ἀφανεῖς καὶ παντάπασιν ἀναισθήτους ύπέθετο; «one is forced to marvel at the ingenuity of a man who puts aside these broad, clearly visible routes (the ureters), and postulates others which are narrow, invisible indeed, entirely imperceptible»\(^{425}\).

Thus, I agree with Polito’s hypothesis\(^{426}\) that Antiochus’ controversial reference to Asclepiades might have been part of a deliberate doxographical strategy, which aimed to discredit Epicurus and portrayed him as philosophically inferior even to a doctor. Such an interpretation also leads Polito to scorrevole"; sulle traccie di un dibattito perduto", in *Matter and Metaphysics: Fourth Symposium Hellenisticum* ed. by J. Barnes and M. Mignucci, Napoli 1988, p. 464; Polito, 2006, p. 326.

\(^{420}\) In the quotation from the second book of Antiochus’ *Kanonika* Asclepiades’ name is not explicitly mentioned and is added by Sextus, who interprets the description of «a certain other man, second to none in the art of medicine..» as an allusion to the famous doctor. Given Sextus’ great interest in medicine and extensive knowledge of Asclepiades’ doctrine, the possibility of a reference to the Bhytinian seems probable. Cf, trans. Bury, p. 109.

\(^{421}\) Cf. trans. by Bury, p. 109.


\(^{423}\) Cael. Aur. *Cel. pass.*, I XIV, 105-6 Bendz (P. 80-2).

\(^{424}\) As already showed in this work (cf. chapter two and section 3.2.1 of the present chapter), Galen’s main interest is the question of qualitative change and he repeatedly attacks Asclepiades on the inability of his corpuscularism of giving reason for the phenomena. According to Galen (cf. chapter one on *De Usu Partium*), indeed, Asclepiades ignores anatomy and his arguments are inconsistent. On this reading of Galen’s account, see Vegetti, “Historiographical Strategies in Galen’s Physiology”, in *Ancient Histories of Medicine. Essays in Medical Doxography and Historiography in Classical Antiquity*, ed. by Van der Eijk, Leiden, 1999, p. 385; Leith, “Pores and Void in Asclepiades’ Physical Theory”, in Phronesis 57, 2012, p. 168.

\(^{425}\) Trans. by Brock, p. 51.

\(^{426}\) See Polito, 2006, p. 324.
convincingly conclude that, since Asclepiades considers reasoning and perceiving as both products of the bodily processes involved in the mechanism of respiration, he does not reject the role of reason, but he just «abolishes it as a separate faculty»\textsuperscript{427} and conceives of reasoning as an activity of the senses.

Even if a full discussion of Asclepiades’ epistemology is beyond the scope of this chapter, a preliminary analysis already reveals the centrality of the flux theory in his corpuscular system. Asclepiades’ ὄγκοι are indeed ὕλη ῥευστή\textsuperscript{428}, a stream of invisible restless matter that constantly enters, moves through and also leaves the body thanks to the latter’s porosity. In addition to vital and psychic activities, such a mechanistic view also applies to etiology. As reported by Galen in \textit{De Placitis Hippocratis et Platonis}, 308, 27-30 De Lacy (V, 449-50 K.) and \textit{De Meth. Med.} X, 268, 10-13 K., Asclepiades maintains that health is determined by συμμετρία τῶν ὄγκων καὶ πόρων, while the onset of disease depends on the interruption of such a correspondence\textsuperscript{429}.

Galen’s account is confirmed by Caelius, who in \textit{Cel. Pass.}, I XIV, 106 Bendz (P. 82) specifies that, like the ὄγκοι, the πόροι (viae) also differ in shape and size:

\begin{quote}
fieri etiam vias ex complexione corpusculorum intellectu sensas, magnitudine atque schemate differentes, per quas sucorum ductus solito meatu percurrens si nullo fuerit impedimento retentus, sanitas maneat, impeditus vero statione corpusculorum marbos efficiat.
\end{quote}

Now out of the union of corpuscles passages varying in size and shape are formed, which may be apprehended only by reason. Through these passages the body’s fluids are conducted with a regular motion. So long as it process is not checked by any impediment, the state of health continues; but if the flow is impeded by a blocking of the corpuscles, a state of disease results (Trans. by Drabkin p. 67).

\textsuperscript{427} Ibid. p. 329.

\textsuperscript{428} Therefore, the image of the flux, which for a long time ancient philosophers (the most emblematic example is certainly Heraclitus) used to describe the continuous change of the sensible world, finds concrete application within medicine and is often rendered by terms such as ῥεῖν and ῥεῦμα. On the medical use of the image of the flux and for the expression ὕλη ῥευστή applied to Asclepiades’ theory, see Decleva Caizzi 1988, p. 432 and 463 ff..

\textsuperscript{429} See also Ps.-Gal., \textit{Introductio sive Medicus}, XIV, 728-9 K. and Celsus, \textit{De Medicina}, I 15-6.
Therefore, in Asclepiades’ physiology the interaction between ὄγκοι and πόροι functions as the main regulator of the corpuscular flow, namely as that which controls the mechanism responsible for the health of the human body. Then, it is no coincidence that Asclepiades identifies the obstructions of πόροι, due to the piling up of corpuscles with unappropriate shapes and sizes, as the main cause of disease. For example, according to his etiology, phrenitis is an acute mental disease caused by a blockage of the pores that cover the membranes of the brain. A similar account also occurs in Sextus:


οὕτω γοῦν τρισὶν ὑποθέσεσι κεχρῆσθαί φαμεν τὸν Ἀσκληπιάδην εἰς κατασκευὴν τῆς τὸν πυρετὸν ἐμποιούσης ἐνστάσεως, μιᾷ μὲν ὅτι νοητοί τινές εἰσιν ἐν ἡμῖν πόροι, μεγέθει διαφέροντες ἄλληλοιον, δευτέρᾳ δὲ ὅτι πάντοθεν ὑγροῦ μέρη καὶ πνεύματος ἐκ λόγῳ θεωρητῶν ὄγκων συνηράνισται δι' αιώνας ἀνηρεμήτων, τρίτῃ δὲ ὅτι ἀδιάλειπτοι τινες εἰς τὸ ἐκτὸς ἔξ ἡμῶν ἀποφοραὶ γίνονται, ποτὲ μὲν πλείους ποτὲ δὲ ἐλάττους πρὸς τὴν ἐνεστηκυῖαιν περίστασιν.

Thus we say that Asclepiades made use of three “hypotheses” to demonstrate the initial condition which produces fever, - the first, that there exist in us certain intelligible (or “non perceptible”) passages, differing from one another in size; the second, that particles of moisture and air are collected from all sides out of corpuscles perceived by reason and eternally in motion; the third, that certain unceasing effluvia are emitted from within us to the outside air, these being now more, now less, in number according to the condition prevailing at the moment (Transl. Bury, p. 247).

In this passage Sextus provides an overview of Asclepiades’ physiological system by listing three fundamental bodily conditions for the occurrence of fever, which also is one of the symptoms that typically characterized the onset of phrenitis:430:

1) The presence of imperceptible πόροι of different shapes and sizes;

2) That of ὄγκοι of moisture and air\textsuperscript{431} that move from different directions and gather together producing a blockage;

3) The emanations of corpuscles (ἀποφοραί) that constantly flow from the human body towards the outside air. The quantity of these effluvia is said to increase or decrease according to variations in body condition.

Therefore, Galen’s, Caelius’ and Sextus’ testimonies are unanimous in describing the flux of matter through the body as dependent on the presence of empty passages, namely on the existence of void that can enable the motion of ὄγκοι. As convincingly argued by Leith\textsuperscript{432}, the features and the function of Asclepiades’ πόροι recall those attributed by Epicurus to the free gaps, also named πόροι, between atoms entangled in compounds through which other particles can pass. In fact, Epicurean pores also vary in shape and size, and are commensurate with the atoms that move through them\textsuperscript{433}. Such a correspondence, described in Hdt. [2] 47,10 and 61,5 with the expression πάντα πόρον σύμμετρον\textsuperscript{434}, reduces the risk of collisions and enables the rapid flow of particles and eidola\textsuperscript{435}. Given these premises, I believe with Leith that Asclepiades’ doctrine of the pores qualifies him as a “void theorist” and reveals its Epicurean background. In fact, the idea of void spaces within the matter that constitutes the body developed by Epicurus fitted Asclepiades’ need to explain the movement of matter, such as fluids and gases, within the body and therefore to give reason for both physiology and pathology\textsuperscript{436}. As in the case of the features of ὄγκοι, Asclepiades relied on Epicureanism, but he also adapted the theory to his medical system. Thus, despite the exaggerations connected to his polemical agenda, Galen’s assimilation of Asclepiadean πόροι to Epicurean void appears to be well-founded\textsuperscript{437}.

\begin{itemize}
\item \textsuperscript{431} According to Vallance, Sextus refers to Asclepiades’ idea of «bodily fluids and pneuma are made from corpuscles». See Vallance, 1990, p. 27.
\item \textsuperscript{432} Cf. Leith, 2012, p. 182-3.
\item \textsuperscript{433} The theory of pores has a very long tradition that goes back to Empedocles, to whom is also attributed a theory of effluences. See 31A 92 DK (Plat. Men. 76c); 31A 86 e 89 DK (Theophrast. De sensu lff.; Alex. Aphr. Quaest. II 23). On Empedocles’ effluences-pores see O’Brien, 1970; L. Gemelli Marciano, 1991, p. 8 ff.; K. Ierodiakonou, 2005, p. 1-34.
\item \textsuperscript{434} On the interpretation of this expression in Epicurus, see Verde, 2010, p. 122-5.
\item \textsuperscript{435} On this aspect see also Lucr., De Rer. Nat., II, 230-42 and IV, 649-57.
\item \textsuperscript{436} Leith points out that «while Asclepiades’ theory entailed that there were certain void spaces within any solid structure, and so a fortiori within the human body, his interest lay in their potential to explain a range of physiological processes, in particular to explain the movement of matter within the body». Cf. Leith, 2012, p. 187.
\item \textsuperscript{437} Ibid. p. 189. I therefore share Leith’s rejection of the hypothesis of an Erasistratean background of Asclepiades’ theory formulated by Vallance, who denies the influence of Epicureanism and argues that the motion of ὄγκοι through the body
\end{itemize}
The hypothesis of an Epicurean influence on Asclepiades’ flux theory is also corroborated by Sextus’ reference to the emanations, as one of the three conditions for the occurrence of a blockage. The idea of a continuous flux of invisible effluvia also has a crucial role in the Epicurean doctrine of εἴδωλα, namely the theory of “images” through which Epicurus explains perception and Lucretius also propagation of magnetism and disease. As explained by Epicurus in the case of vision, perception is determined by the actual contact of solid matter with the eye: fine εἴδωλα emitted by an external object move with great speed through the air towards the sensory organ and penetrate its porous surface, causing the occurrence of perceptual experience.

In Hdt., [2] 52, 6-10 and 53,1-13 Epicurus describes this flow of matter that moves towards the ear as a ῥεῦμα of ὀγκοί. Indeed, in [2] 52, 6 he claims that the stream of εἴδωλα is organized in “masses of similar parts” (τὸ δὲ ῥεῦμα τούτο εἰς ὀμοιομερὲς ὀγκοὺς διασπείρεται), namely in invisible atomic compounds whose composition is similar to that of the originating source. Such a description of ὀγκοί makes it difficult to believe that Epicurus could have used the term ὀγκος as a synonym of would be based on the principle of πρὸς τὸ κενούμενον ἀκολουθία (PTKA), which, in turn, would derive from Strato. According to this hypothesis, as also previously argued by Lonie, Asclepiades would be influenced by Strato’s microvoids, namely invisible and discontinuous interstices in the matter. However, as convincingly pointed out by Leith: «while Erasistratus shows knowledge of what appears to be the Stratonic distinction between large-scale void and disseminate void, it seems clear that he thought of the principle of PTKA to be connected only with the impossibility of the existence of large scale-void, and that he did not therefore feel the need to pronounce definitely on the existence or non-existence of the disseminate kind». In addition, Leith also underlines that this hypothesis of a link between Erasistratus and Asclepiades does not find sufficient support in ancient sources. Likewise as Furley and Leith noted and Verde also admitted, there is no textual evidence that can prove that Asclepiades’ idea of imperceptible void interstices was also inspired by Strato’s microvoids. For a broader discussion of this debate, see Lonie 1965 p. 128-9; Furley 1989, p. 157; Vallance 1990, p. 63-89; Leith 2012, p. 188-9; Verde 2019, p. 40-8.

The crucial role of emanations in Asclepiades’ etiology is also described by Cassius the Iatrosophist in Problemata 40. On this account see Vallance, 1990 p. 86-8.


The ὀμοιομερὲς ὀγκοὺς mentioned in paragraph 52 seem to confirm what Epicurus himself argued in Hdt. [2] 46, 1-2 Arrighetti, when he defined εἴδωλα as «images which have the same shape (ὁμοιοσχήμονες) of the observed objects», namely as compounds in which atoms preserve the same positions that they had in the solid object from which they originate.
ἄτομος, especially since this would have implied a clear violation of the doctrine of atomic indivisibility. Rather, Epicurus seems to suggest the existence of atomic compounds similar to molecules that, as a whole, constitute a ῥεῦμα and that, as single aggregates, have parts which correspond to the atoms. Furthermore, the expression ὁμοιομερεῖς ὄγκους seems also to indicate the internal mutual similarity between the arrangements of the masses (ὄγκοι) which constitute a ῥεῦμα of εἴδωλα. According to Epicurus, this homogeneity is what guarantees the unity and the compactness of the stream of εἴδωλα and therefore what, for example, allows emanations to spread the sound that we perceive as continuous. In Hdt. [2] 53,6 and 10 the term ὄγκος occurs again in reference to compact “masses” composed of atoms:

For without some harmonious set coming from there, this sort of perceptual experience could not occur. So one must not think that the air itself is shaped by emitted voice or even

443 Verde points out that: «È probabile che Epicuro usi in maniera del tutto deliberata questo termine, proprio al fine di richiamarne l’assoluta materialità. L’accostamento tra le partes minmae e gli ὄγκοι, eccetto un caso alquanto controverso, non sembra riscontrabile nei testi, né in Epicuro né in Lucrezio». See Verde, 2013, p. 100-1. On Epicurus’ use of the term ὄγκος, cf. also Serangeli 2017, p. 36-43.

444 In this passage there is no reference to the doctrine of minima, which is discussed by Epicurus in Hdt., [2] 55-9 Arrighetti.


446 On this interpretation, see Verde, 2010, p. 141.
by things of like character - for it is far from being the case that it [i.e., air] is affected in this way by that [i.e., voice] - but rather when we emit voice the blow which occurs inside us precipitates the expulsion of certain masses which produce a flow similar to breath, and which causes in us the auditory experience. Further, one must also believe that the [sense of] smell, like hearing too, would never have produced any experience if there were not certain masses moving from the object and being commensurate for the stimulation of this sense organ, some of them of one sort, i.e., disturbing and uncongenial, and some of another, i.e. non-disturbing and congenial [to the organ of smell].

(Transl. B. Inwood and L. P. Gerson, p. 10)

Once again Epicurus puts the term ὄγκοι in direct relationship with εἴδωλα, describing them explicitly as ὄγκων τινῶν ῥεύματος, namely as a stream of molecules. These ὄγκοι τινές reproduce the features of an external object and flow towards the sense organ in a pattern that Epicurus defines as “appropriate” to penetrate through the commensurate pores (πόροι σύμμετροι)447 which, as he explains in Hdt., [2] 47, 7-10, cover its surface. The suitability shape and size of ὄγκοι to those of πόροι is therefore identified by Epicurus as the necessary precondition for the free motion of εἴδωλα and the occurrence of perception448.

Even if ὄγκος is not a technical term in Epicurus and its use in the Epistula ad Herodotum has the rather generic meaning of “compact masses”449, it should also be noted that, as in the accounts of Asclepiades’ physiological system, it repeatedly occurs in reference to emanations, namely to a flux of matter. However, a direct relationship between Asclepiadean ὄγκοι and Epicurean ὄγκων τινῶν ῥέωμα must be excluded. Indeed, as I have attempted to demonstrate in this chapter, Asclepiades’ ὄγκοι have the same ontological status of Epicurean atoms and therefore they cannot be intended as atomic compounds, or compared to molecules450.

Nevertheless, given the influence of Epicureanism on both Asclepiades’ theory of matter and void, I also believe that the hypothesis of a link between their views of the stream of invisible matter should

447 This expression also occurs in Plutarch’s testimony on the Epicurean theory of perception in Adv. Col. 1109c.
448 Epicurus refers to this principle also in the Pyth. [3] 107, 6 Arrighetti. On this aspect, see also Lucr. De Rer. Nat., IV 187 and VI, 332.
449 In Hdt. 54, indeed, the term ὄγκος does not indicate a cluster of atoms, but refers to the solidity of the atom. On this interpretation, see Isnardi Parente 1983, p. 165 and Verde, 2010, p. 147-8.
be considered as a possibility. Indeed, in both Epicurus’ and Asclepiades’ views the occurrence of a flux of matter implies:

1) an imperceptible flow of solid and compact masses;
2) a mechanism of interaction between masses and pores (συμμετρία τῶν ὀγκῶν καὶ πόρον), which is grounded on the primary and necessary condition of their mutual suitability of shape and size.

A further confirmation to this hypothesis comes from Lucretius’ account of the Athenian plague in *De Rer. Nat.* VI, 1090-96, where he ascribes the cause of diseases to an invisible flow of *semina*:

\[
\text{Nunc ratio quae sit morbis aut unde repente}
\]
\[
\text{mortiferam possit cladem conflare coorta}
\]
\[
\text{morbida vis hominum generi pecudumque catervis,}
\]
\[
\text{expediam. Primum multarum semina rerum}
\]
\[
\text{esse supra docui quae sint vitalia nobis,}
\]
\[
\text{et contra quae sint morbo mortique necessest}
\]
\[
\text{multa volare.}
\]

Now I will explain the reason for diseases, and from what place the force of disease can suddenly gather together, and blow together a storm of deadly destruction for mankind and for flocks and herds. Firstly I have shown above that there are many seeds of things which support our life, and on the other hand there must be many flying about which make for disease and death (Trans. by Rouse p. 575).

Similarly to Asclepiades, Lucretius applies the idea of an invisible flux of particles to pathology, explaining epidemic contagion in terms of the motion of noxious particles that spread infections between humans and animals by penetrating into their bodies. Lucretius, indeed, defines the plague as a *mortifer aestus*\(^\text{451}\), namely as a mortal emanation, that permeates the water, the food and also directly the human body through respiration:

\(^{451}\) Lucr., *De Rer. Nat.*, VI, 1138.
Lucr., De Rer. Nat., VI 1125-30:

Haec igitur subito clades nova pestilitasque
aut in aquas cadit aut fruges persidit in ipsas
aut alios hominum pastus pecudumque cibatus,
aut etiam suspensa manet vis aere in ipso
et, cum spirantes mixtas hinc ducimus auras,
illa quoque in corpus pariter sorbere necesst.

Accordingly this new plague or pestilence suddenly
either falls on the waters, or settles on the corn itself
or other sustenance of mankind or food of beasts,
or even remains as a force suspended in the air itself,
and when breathing we inhale the air mixed with it,
this also we must likewise absorb into our body.
(Trans. by Rouse p. 577-9)

Even if Lucretius does not explicitly mention here the pores, their function is certainly implied by the
use of the verbs persidere, which refers to the particles penetrating and poisoning the food and the
water, and sorbere, which suggests that, once inhalated, the infected air flows through the body and is
absorbed by all the parts. In both his accounts of perception and magnetism, in fact, Lucretius
posited the permeability of the bodies on the basis of a συμμετρία τῶν ὀγκῶν καὶ πόρων and therefore
maintained that, in order to enter the bodies, any kind of emanation has to fit their pores (foramina).
His description of the plague is vivid and explains how this extremely violent disease attacks every
organ, causing unbearable suffering and death. The contagion is rapid and affects both humans and
animals. In VI, 1218 birds and beasts who eat unburied corpses are said to be immediately infected
and die very quickly. This means that, according to Lucretius, an epidemic can spread both by
inhalation of a mortal breath and by direct contact with a contaminated body.

---

452 Cf. also the use of the verb confluere on the verse 1152.
453 Ibid. IV, 645-50 and VI, 981-3.
454 Ibid. VI, 1151-3.
Lucretius is also very specific about the symptoms of this disease, providing us with a very detailed description of its development and showing what Nutton has defined «a sophisticated use of medical examples»⁴⁵⁵. Indeed, his account of the plague shows that the Epicurean theory of emanations found application in medical questions and was especially used to explain the causes of diseases. Despite the divisibility of ὄγκοι, Asclepiades’ physiological system appears to have employed all the fundamental principles of the Epicurean physics: the anti-teleologism, the void, the invisible particles without secondary qualities and their imperceptible flow through commensurate pores. Given these similarities, I find the Epicurean influence on Asclepiades’ system undeniable and would suggest that the latter might have conceived of his idea of a continuous flow of invisible ὄγκοι on the base of Epicurus’ ῥεῦμα of ἐἴδωλα. Therefore, such conclusions also represent a further confirmation of the reliability of Galen, who, besides his historiographical strategy, provides a well-founded testimony on atomism.

Bibliography

Editions and translations of ancient text

Alcaeus:
Treu M. 1952, Alkaios, München.

Anaxagoras:

Aristotle:


Caelius Aurelianus:


Calcidius:

Carneiscus:
Diogenes Laertius:


Cicero:

Empedocles:

Epicurus:


Galenus:


Hellenistic philosophers:

Hermodorus:

Hippocrates:

Lucretius:

Megarians:

Methodists:
Philoponus:

Plutarchus:

Presocratics:

Senocrates:

Sextus Empiricus:

Socrates and Socratics:

Stoics:

Other texts:


Angeli A. Lettere di Epicuro dall’Egitto (POxy. 5077), in *Studi di Egittologia e Papirologia*, 10, 2013, p. 9-31


---- 2003, Lucretius on Creation and Evolution, Oxford.


Casadei E. 1997, La dottrina corpuscolare di Asclepiade e i suoi rapporti con la tradizione atomista, in Elenchos, 18: 77-106.

Castagnoli L. 2013, Democritus and Epicurus on Sensible Qualities in Plutarch’s Against Colotes 3-9, in Aitia, 3, p. 2-35.


Cole T. 1990, Democritus and the Sources of Greek Anthropology, Atlanta.


Ferguson J. and J. P. Hershbell 1990, Epicureanism under the Roman Empire, in ANRW, II, 36, 4: 2260-2327.


Frede M. 1987, Essays in Ancient Philosophy, Minneapolis.


---- 1967, Two Studies in Greek Atomists, Princeton.


Isnardi Parente M. 1977, La isonomia epicurea, in Studi Classici e Orientali, 26: 287-98.


Lagerkrantz O. 1911, *Elementum*, Uppsala.


---- 2007 *Creationism*, London.


---- 2003, *Supplement to Diogenes of Oinoanda, the Epicurean Inscription*, Napoli.


---- 1993, La scuola medica Empirica a Roma. Problemi storici e prospettive di ricerca, in ANRW II 37,1, p. 600-645.


--- 2009, Aristotle! What a thing for you to say!, in J. Wilkins, T. Whitmarsh and Ch. Gill (eds.), 

*Philosophical Themes in Galen*, p. 89-134, London.


---- 2013, Elachista. La dottrina dei minimi nell’epicureismo, Leuven.


