

Theory and Terminology of Mixture in Galen.
The concepts of *krasis* and *mixis* in Galen's thought

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νομίζεται δὲ ὑπὸ τῶν ἀνθρώπων τὸ μὲν ἐξ Ἄιδου ἐς φάος αὐξηθὲν γενέσθαι, τὸ δὲ ἐκ τοῦ φάος ἐς Ἄιδην μειωθὲν ἀπολέσθαι· ὀφθαλμοῖσι γὰρ πιστεύουσι μᾶλλον ἢ γνώμη, οὐχ ἱκανοῖς εἶναι οὐδὲ περὶ τῶν ὄρεομένων κρῖναι· ἐγὼ δὲ τάδε γνώμη ἐξηγέομαι. ζῶα γὰρ κάκεῖνα καὶ τάδε· καὶ οὔτε, εἰ ζῶον, ἀποθανεῖν οἶόν τε, εἰ μὴ μετὰ πάντων· ποῖ γὰρ ἀποθανεῖται; οὔτε τὸ μὴ εὐόν γενέσθαι, πόθεν γὰρ ἔσται; ἀλλ' αὐξεται πάντα καὶ μειοῦται ἐς τὸ μήκιστον καὶ ἐς τὸ ἐλάχιστον, τῶν γε δυνατῶν. Ὅ τι δ' ἂν διαλέγωμαι γενέσθαι ἢ ἀπολέσθαι, τῶν πολλῶν εἴνεκεν ἐρμηγέω· ταῦτα δὲ συμμίγεσθαι καὶ διακρίνεσθαι δηλῶ· ἔχει δὲ καὶ ὅδε· γενέσθαι καὶ ἀπολέσθαι τωὐτό, συμμιγῆναι καὶ διακριθῆναι τωὐτό, αὐξηθῆναι καὶ μειωθῆναι τωὐτό, γενέσθαι, συμμιγῆναι τωὐτό, ἀπολέσθαι, [μειωθῆναι,] διακριθῆναι τωὐτό, ἕκαστον πρὸς πάντα καὶ πάντα πρὸς ἕκαστον τωὐτό, καὶ οὐδὲν πάντων τωὐτό· ὁ νόμος γὰρ τῇ φύσει περὶ τούτων ἐναντίος.

De victu CMG I 2.4 pp. 126.29-128,11 Joly

But the current belief is that one thing increases and comes to light from Hades, while another thing diminishes and perishes from the light into Hades. For they trust eyes rather than mind, though these are not competent to judge even things that are seen. But I use mind to expound thus. For there is life in the things of the other world, as well as in those of this. If there be life, there cannot be death, unless all the things die with it. For whither will death take place? Nor can what is not come into being. For whence will it come? But all things increase and diminish to the greatest possible maximum or the least possible minimum. Whenever I speak of “becoming” or “perishing” I am merely using popular expressions; what I really mean is “mingling” and “separating”. The facts are these. “Becoming” and “perishing” are the same thing; “mixture” and “separation” are the same thing; “increase” and “diminution” are the same thing; “becoming”, “mixture” are the same thing; “perishing”, “separation” are the same thing, and so is the relation of the individual to all things, and that of all things to the individual. Yet nothing of all things is the same. For in regard to these things custom is opposed to nature. (Trans. Jones, slightly modified)

A Vincenza.

A Matteo.

INTRODUCTION – PART I

GALEN'S THEORY OF MIXTURE

1.1 Galen's adoption of the model of a mixture of primary elements as the theoretical basis for medical investigation: An "archaic" or a modern and up-to-date choice? Introductory overview and general setting of the thesis objective.

As Mario Vegetti has argued, in the time of Galen of Pergamum, the physician-cum-philosopher of the Roman Empire, the medical *technē* and society seem at least in Galen's eyes to undergo a moral and epistemological crisis. On the one hand, Galen portrays doctors of his age as only inspired by hunger for money and power and as slavishly and supinely subjected to their well-off clients' desires: while leading themselves astray, they tend to neglect the study of Hippocratic medicine and abstain from pursuing any training in logic or indeed any philosophical search for truth and, as a consequence, sink into the most profound ignorance. On the other hand, this crisis is also exacerbated by the fact that over time the medical *technē* had split into several rival sects or *haireseis*:¹ on the one hand, the Empiricists who constitute, as well as the Methodists later on, a relatively small group endowed with a compact and

¹ As Von Staden notes, classical meanings of the term *hairesis*—"taking", "choice", "course of action", "election", "decision"—all continued to survive throughout the various stages of the Greek culture. But *hairesis* also served to designate "any group of people perceived to have a clear doctrinal identity"; cf. Von Staden 1982 p. 76.

coherent doctrinal apparatus, and on the other hand, the Rationalists or Dogmatists who, on the contrary, encompass very diverse theoretical positions ranging from the original Herophilean school to the more recent medical doctrines of Asclepiades of Bithynia and the Pneumatists.²

Each of these medical sects is provided with a different and peculiar set of reference models and therapeutic methodologies through which to interpret both the hygienic and pathological dynamics of the living organism and to elaborate efficient healing strategies. If we want to capture the intellectual atmosphere prevailing in the medical schools of Galen's age, more precisely, Galen's own position in this context, we will have to briefly focus our attention on these schools and their conceptual underpinnings.

The Empirical school of medicine originally derives from a schism in the Alexandrian medical group founded by Herophilus of Chalcedon, a schism initiated by the physician Philinus of Cos (in the middle of the 3rd century BCE). In their support for medical tendencies going right back to the Hippocratic treatise "On Ancient Medicine", these physicians rose up against the principles of Rationalist medicine (to which Herophilus' school belonged), according to which medical science had to be grounded on strong explanatory theoretical models aimed at unfolding the "hidden causes" determining the physiological functioning as well as the healthy and pathological conditions of human nature. The Empiricist sect survived a long time, being also very active at the time of Galen, who analysed their medical system in three of his most relevant works belonging to the genre of *hairesis*-literature:³ *De sectis*, *De experientia medica*, and the *Subfiguratio empirica*⁴. What lies at the core of the Empiricist medical system is the rejection of any training in logical disciplines as well as the disparagement of any theoretical assumptions concerning the subject matter of medicine, on the basis of the fact that theory, in its very nature, is based on non-

² Vegetti 1995 pp. 67–73 with references. The first part of this introductory overview, containing a reconstruction of medical scenarios of Galen's time and Galen's criticisms of the medical *haireseis*, fundamentally follows the vivid historical sketch provided by Vegetti 1995. In the second part of the overview, however, I focus on my main objective and set up some criticisms of Vegetti's views.

³ On the origins of the *hairesis*-literature, cf. von Staden 1982, esp. pp. 77–81.

⁴ *De sectis ad eos, qui introducuntur* ed. G. Helmreich, *Scripta minora*, 111, Leipzig 1893 *De experientia medica* ed R. Walzer, Oxford 1944 (an edition with English translation of the Arabic translation of this work), *Subfiguratio empirica* ed. K. Deichgraber, *Die griechische Empirikerschule*, Berlin 1965.

observable facts and entities of which we cannot have any knowledge.⁵ On the contrary, instead they settle their medical methodology on sheer empirical observation (*peîra*) of external phenomena and, more precisely, on two important principles: i) *autopsía*, i.e. repeated autoptical observations both of a patient's particular pathological picture and of the results achieved by applying a particular healing technique; and ii) *historía*, i.e. the written records of other doctors' (among whom were also the Hippocratic authors) repeated autoptical observations,⁶ which permit them to formulate so-called *theorems*.⁷ By building on repeated observations accumulated over a sufficiently long timespan, these *theorems* could furnish adequate indications concerning clinico-pathological data and diagnostic and therapeutic policies.⁸

⁵ As Frede notes, it is understandable that in repudiating any kind of assumption of nonobservable facts, Empiricists relied on a form of scepticism; and, in fact, Empiricist scepticism has traditionally been associated with Pyrrhonian scepticism, as indeed later Empiricists quite explicitly drew on Pyrrhonism. However, Frede tends to identify a difference between early Empiricists' extreme scepticism and Pyrrhonism (if by Pyrrhonism we mean the systematization of Pyrrho's theories as operated by Aenesidemus in the 1st century BCE). The main gist of Frede's observations is that, if the Pyrrhonists left open the question of whether nonobservable facts could be known by reason, the early Empiricists completely denied the ability of reason to understand the hidden causes of phenomena and even the external phenomena themselves (differently from later Empiricists, who indeed began to attribute some importance to the use of reason in the acquisition of medical knowledge which, as a consequence, allowed them to formulate, if not proper theoretical aetiological models built on invisible inner causes, then at least reasonable conjectures on phenomena), cf. Frede 1987b pp. 248–249 and pp. 256 ff. It also has to be noted that their disavowal of invisible causes of phenomena turns out to have repercussions on the entire medical system. In fact, Empiricists do not regard either the study of physiology or anatomical investigations to be truly reliable for the understanding of a certain pathological and clinical picture and for the establishment of therapeutic treatments (*De sectis* p. 10 Helmreich; henceforth H.). For although it may be useful in order to discern the right position of our organs throughout our body, in their opinion the study of human anatomy cannot reach a primary causative level (*De exp. med.* XXVI p. 141 Walzer) as there is no inferential link between the anatomical-physiological level (which, in anatomy of Alexandrian origin, relies in turn on alleged invisible structures) and disease and its treatment (*De sectis* p. 10 H.). Therefore, according to the Empirical school, neither anatomy nor physiology could be seen as a deciding factor in relation to issues of pathological aetiology; on this cf. Vegetti 1995 p. 73.

⁶ *De emp. subfig.* III p. 49 Deichgräber

⁷ *De sectis* pp. 3–4 H.

⁸ One objection that Empiricists found themselves having to deal with is how they could face an as-yet-unexperienced pathological case. In such a circumstance, they advocate the so-called “transition from the similar to the similar” (which was a later theoretical addition and was formulated in the form of the *epilogismós* by Menodotus in the 2nd century CE, cf. *De emp. subfig.* XII p. 88 Deichgräber), that is, either the application of the same remedy to another as-yet-unidentified but similar pathology, or of a remedy habitually applied to a particular bodily part to another similar part, or also the transition from a particular healing technique to another similar technique in treating the same disease (cf. *De sectis* 3–4 H., *De emp. subfig.* III p. 49 Deichgräber), cf. Frede 1987b p. 251 and Vegetti 1995 p. 75. On the Empiricist method cf. Deichgräber 1930 pp. 291–305; von Staden 1982 p. 82; Frede 1987b pp. 243–260; Vegetti 1995 pp. 73–76.

As for the Methodists,⁹ this medical school arose as a reaction against both Empiricists and Rationalists, and Galen himself informs us that the theoretical foundations of the Methodical sect stemmed from the dogmatic teachings of Asclepiades of Bithynia (1st century BCE) who, as is well-known, conceived of the matter as constituted by invisible *onkoi*¹⁰ – where the same conviction was also shared by his followers, such as Themison of Laodicea (1st century BCE) and then the imperial physician Thessalus (1st century CE)¹¹. The Methodists have in common with Rationalists the notion of “indication” (*endeixis*), but in contrast to Rationalists (and also to Empiricists), the Methodists left open the question of the correspondence between pathological facts and underlying unobservable causes; therefore, in their view *endeixis* has to be interpreted as an obvious and self-evident connection between a certain disease and its medical treatment.¹² For the same reason, like the Empiricists, they disdain the study of anatomical evidence and physiology¹³ and instead base their medical system on a far more simplistic reduction of all pathological states to three manifest

⁹ For an account of the Methodical school of medicine, cf. Frede 1987c pp. 261–278; Vegetti 1995 pp. 81–82; cf. also Tecusan 2004.

¹⁰ *De nat. fac.* p. 133.11 ff. H., *De const. art. med.* CMG V 1.3 p. 72.16 ff. Fortuna.

¹¹ *De simpl. med. (temp. ac) fac.* K. IX 783.

¹² Cf. *De sectis* p. 12.14ff.; 13.13; 17.5ff. H.; *De meth. med.* K. X 351.7; *Med.* K. XIV 677.12; Ps.-Galen, *De opt. secta* K. I 125.2ff.; 164.1 ff. As Frede points out, the notion of indication is not of Methodist origin but stems from Hellenistic epistemology; it was initially used to distinguish between different kinds of suggestive signs. For example, something A is a *suggestive sign* of B if we know by experience that B is the case if A is the case. Therefore, for example, the presence of smoke is a suggestive sign of the presence of fire. In the case of a proper indication, instead, A is an *indicative sign* of B, if we know, not by experience, but by reason that B is the case if A is the case. For example, as Frede reports, an Atomist should consider motion an indicative sign of the presence of void. But no one of these examples of indication could match what Methodists really meant by *endeixis*. For they, as well as Empiricists, deny any connection between a manifest pathological state and unobservable and hidden causes (thus, the second type of *endeixis*) but, in contrast to the Empiricists, they claim that the right treatment for certain pathologies has to be found not on the basis of the past experience (that is, the first kind of *endeixis*) but on the basis of an immediate and obvious connection between a certain disease and its treatment that does not entail any chain of reasoning; cf. Frede 1987c pp. 263–265. To show this, Frede also gives a clarifying example from Sextus Empiricus, who in his work *PH I* 238 says: “As [...] the sceptic is guided by thirst towards drink, by hunger towards food, and thus with the rest, in a similar fashion the methodical doctor is guided by the affections towards what is fitting for them, by constriction to dilation, just as somebody tries to escape from condensation due to intensified cold by getting to a warm spot”. On Sextus’ association between Methodists and Sceptics cf. Frede’s analysis in Frede 1987c pp. 276–278. As Frede points out by appealing to a position originally held by Edelstein, Methodists actually allowed for the possibility of theoretical belief and, for this reason, their position can be assimilated with a brand of late Academic Scepticism more than Pyrrhonian Scepticism. On the concept of *endeixis* in Galen’s medicine, cf. Van der Eijk 2008 pp. 292–295.

¹³ *De meth. med.* K. X 9.10; 107.11 ff.; 319.17; 349.16A; 928.5ff.; Frede 1987c p. 270 and Vegetti 1995 p. 82.

“generalities”:¹⁴ *sténosis* (costiveness), *rhúsis* (relaxation), and a mixed pathological state resulting from both. Therefore, if a pathology arises due to an excessive costiveness, the remedy will be the contrary process, i.e. relaxation, and if it is due to an excessive relaxation, the remedy will be the contrary action, i.e. costiveness, and if the pathology is mixed, the physician will use both healing strategies.¹⁵

The vivid diversity of the medical scene by Galen’s time was enriched by the presence of the “*haireisis*” of the so-called Rationalists or Dogmatists.¹⁶ In the late 3rd century BCE, Philinus was succeeded as leader of the Empiricist school by Serapion of Alexandria, who wrote a treatise in two books, the *Ad sectas* (or *Against the Haireseis*), the title referring to a number of rival medical schools, such as the Praxagoreans, Herophileans, Erasistrateans, etc., all of which were defined by later Empiricists as “Rationalists” or “Dogmatists,” and which afterwards also included Asclepiades of Bithynia, the Pneumatic school, etc.¹⁷ The rise of diverse medical orientations that led to the establishment of different medical *haireseis* took place in a particular historical moment that

¹⁴ For the concept of “generality”, i.e. *commune* or *koinotēs* cf. Frede 1987c pp. 266–270.

¹⁵ *De sectis* p. 12 H., cf. Vegetti 1995 p. 81 and cf. also Von Staden 1982 pp. 83–85. As Frede remarks, these were also the assumptions on which Asclepiades’ physiology was based (he in fact seems to have explained many illnesses as being due to the contraction and relaxation of invisible pores), but the difference to the Methodists lies in the fact that the Methodists consider it an open question whether the manifest states of contractions and relaxations present a correspondence with the states of the invisible structures underlying the phenomena; cf. Frede 1987c p. 272.

¹⁶ Who are respectively designated as *logikoi* because of their constant appeal to *logos* as opposed to *peíra* and *dogmatikoi*, because they trust in the reliability of theories, i.e. *dogmata*; cf. Vegetti 1995 p. 76. As Von Staden quite aptly points out, in the case of the so-called Rationalists the terms “*haireisis*” or “*secta*” can be very deceptive. In fact, in Galen’s *De sectis* he singles out three major *haireseis* (or *sectae*): Empiricists, Methodists, and Rationalists/Dogmatists. Now, although this threefold division has become canonical over time and has influenced medical historiography up to our own age, it can be misleading because, while Empiricists and Methodists were two compact medical groups, under the label “Rationalists”, by contrast, one finds very different and independent medical *haireseis*; cf. Von Staden 1982 p. 77 and pp. 81–82.

¹⁷ Von Staden 1982 p. 78. In the proem of his *De medicina*, another work belonging to the *haireisis*-literature (Von Staden 1982 p. 80), Celsus (1st century BCE–1st century CE) uses the Latin term *rationalis* (his translation of the Greek *logistikós*) to designate the Rationalists or Dogmatists who, in contrast to the Empiricists, were convinced of the fact that medical *technē* required a knowledge of ‘hidden causes’ relating to the physiological functioning of the human body and its pathological states, and that such knowledge could only be achieved through a process of reasoning. Cf. Celsus *De med. proem.* 13. As Longrigg perceptively notes, Celsus uses the term “*rationalis*” *stricto sensu*, whereas the correspondent English term “rational” may also be applied *lato sensu* “to embrace more widely those general attempts, ultimately derived from philosophy, to account for phenomena in terms of purely natural causes without recourse to any supernatural agency”; cf. Longrigg 1993 p. 4.

determined a profound breakthrough in the history of medicine. For in the first half of the 3rd century BCE, Greek rational medicine was transplanted into Egypt and into Ptolemaic Alexandria, where two distinguished Greek physicians practiced and taught medicine, namely Herophilus of Chalcedon and the slightly younger Erasistratus of Ceos, who performed dissections on human corpses and, in all probability, even vivisections of condemned criminals, and who also made extraordinary physiological and anatomical discoveries¹⁸ that were progressively systematized by a strong theoretical apparatus.

In fact, the Alexandrian anatomists, but also the later Rationalist schools, have in common a commitment to various forms of theoretical medicine and, more precisely, a search, beyond the realm of the sheer observability, for invisible causative principles to which to attribute all external phenomena.¹⁹ According to them, reason can in fact proceed from the visible (and therefore from the anatomical external evidence) to the invisible (i.e. to the non-observable causative structures) and back again from the invisible to the visible, in order to attain, on the one hand, a view of the innermost level of pathophysiological causes and, on the other, to infer from them general theories relating to the therapeutic treatment of a disease.²⁰ The logical tool that is at the basis of the rationalist method is the so-called *analogismós*, which, as opposed to the empirical *epilogismós*, consists in making inferences from the visible to the invisible and *vice versa*.²¹

¹⁸ Von Staden 1992 pp. 223–241 and cf. also Longrigg 1993 p. 177 ff. Brunschwig and Lloyd 2000 pp. 415–418.

¹⁹ *De emp. subfig.* VII p. 63 Deichgräber.

²⁰ *De sectis* p. 4ff. H.; *De exp. med.* XXIV pp. 132–133.

²¹ *De exp. med.* XXIII pp. 131–132 Walzer and cf. Vegetti 1995 p. 76–77. As Vegetti reports, two Galenic examples could clarify what exactly the *analogismós* is. When it comes to explaining what insomnia is, Rationalists or Dogmatists will not adduce as causes observable elements, such as fatigue or daily regimen, but will bring the *explanandum* back to a nonobservable *explanans*: that is, for example, the *dynamis* of an unobservable element, such as *pneuma* (*De exp. med.* XXV pp. 138–139; XXVII p. 145 Walzer). Or else, they will explain the pathology by recourse, as in Erasistratus' case, to the anatomical evidence of veins, nerves, and arteries and, beyond the visible structures, to the invisible *triplokía* (triplet of nerve, vein, and artery), a structure that is visible only by the *logos*; or, in the case of Asclepiades of Bithynia's theories, the cause of disease will be attributed to the interweaving of *onkoi* and *poroi* (cf. *De exp. med.* XXVII p. 145 Walzer), cf. Vegetti 1995 p. 77.

Galen engages in a series of critiques against all of these medical sects (Empiricists,²² Methodists,²³ and Rationalists/Dogmatists), carving out *per differentiam* a peculiar personal position within this variegated medical framework. It is against Rationalist medicine and its hidden pathophysiological causes in particular that he makes his more cogent and insistent criticism, and we will look more closely at this as we go along, as Galen himself follows in the footsteps of the ancient Greek rational and Rationalist medical tradition that he, however, harmoniously fuses with a more empirical approach.²⁴

²² In the first place, he criticizes the Empiricists for two main substantive reasons. For on the one hand, Galen points out that experience without theoretical schemes becomes completely uncontrollable (*De exp. med.* III pp. 88–89; VII p. 94; VI pp. 92–93 Walzer and cf. Vegetti 1995 pp. 75–77.). On the other hand, Galen realizes that, since the Empiricists disavow the importance of a general theoretical structure grounded on dogmatic and nonobservable entities, they fail to recognize the real and inner causes of the various pathologies afflicting the human body. Hence, for fear of failure in medical treatment, they always resort exclusively to the written records of all the doctor’s past experiences, which, however, only incidentally and by way of chance proved to be successful: thus they end up going back over the same healing strategies and, in so doing, commit to fallacy of therapeutic ultra-conservatism, instead of theoretically interpreting and deciphering all the external pathological data that have to be only confirmed by the *peîra* (*De plac. Hipp. et Plat.* CMG V 4.1.2 p. 578 De Lacy); cf. Vegetti 1995 p. 77.

²³ In the second place, Galen attacks the entire Methodical medical system by besieging it from all sides (ethical, social, and doctrinal). First of all, he views the imperial physician Thessalus (who re-founded Methodical medicine in Rome at the time of the emperor Nero) as the personification of all the vice and wickedness upsetting contemporary society as well as the medical *technē*. For Galen depicts him as the anti-physician *par excellence*: by continuously practising the art of flattering his rich Roman clients and making his way as a shameless social climber, he corrupts the professional and ethical status of the physician. Moreover, Galen’s critical remarks also concern more specifically doctrinal aspects of Methodical medicine. First of all, Galen reprimands the Methodists for the absence of a finalistic and providential design of nature, an aspect they inherit from the materialism of Asclepiades. Second, Galen points out how the Methodical sect can be regarded as inferior to both Dogmatists and Empiricists, as the Methodists disown both the combination of *logos* and *peîra*; cf. *De meth. med.* K. X p. 29. More particularly, Galen lambasts the Methodists above all for finding the rationalist recourse to nonobservable principles useless. From this derives their marked refusal to inquire into the concealed causes of the disease starting from an analysis of the outer evidence and an investigation of the specific nature of the patient which, however, also takes into account the external conditions (climate and seasons or the nature of places)—in other words all the factors that distinguished ancient Greek rational medicine from its very beginnings. On the contrary, they hinge their medical art, as we have seen, upon such a reductive pathological aetiology and therapeutic method that they boasted that the art of medicine could be taught in only six months, and sarcastically claimed that, contrarily to what “Hippocrates” said, “life is long, and art is short” (*De sectis* p. 15.6; 24.22 H.; *De meth. med.* K. X 5.2; *De praecogn.* CMG V 8.1 p. 68 Nutton). In fact, as Galen reports, Thessalus provocatively but wittingly broke with both the Hippocratic traditional doctrines and the teachings of established medical authorities. Thessalus declared that he had overcome them all *en bloc*; but according to Galen, “he had better compete with workers of his own kind: cooks, dyers, woolmen, shoemakers and tailors” (Thessalus himself was in fact the son of a wool weaver)—cf. *De meth. med.* K. X 19; on Galen’s criticism of the Methodical sect cf. Vegetti 1995 pp. 69–70.

²⁴ For *peîra* and *logos*, in this hierarchical order, constitute the essential outline of Galen’s medical system insofar as in his view the art of medicine has been discovered and developed thanks to *logos* in union with experience (*De exp. med.* I p. 85 Walzer). For, to begin with, without the further validation given by sense-perception and experience, one may be compelled

For, while he is highly indebted to Alexandrian medicine's breakthrough achievements in the fields of anatomy and physiology, Galen chastises these Rationalist physicians essentially because of the fact that in their attempt to grasp the invisible structures regulating the entire functioning of human nature, they halt prematurely without reaching the very first causative level, i.e. the primary elements or *stoicheía*, that is, hot/cold and dry/wet, which, in Galen's view, "Hippocrates" himself identified as the first basic constituents of both human nature and the entire cosmos. That is, the Rationalist physicians deal with the medical *technē* "regardless of the knowledge of the *stoicheía* of the homoeomerous parts,"²⁵ and, as a consequence, prove to be only half-rationalists, paradoxically ending up approximating the Empiricist method. For neither Herophilus and Erasistratus relied on the primary elements as explanatory causes of physiopathology: while Erasistratus theorized the *triplokia*, the triple web of nerve, artery, and vein, as the last invisible structure graspable only by *logos*, Herophilus, according to Galen, kept himself within the bounds of anatomical evidence.²⁶

In contrast to the abovementioned Dogmatists (but also to Empiricists and Methodists, of course), what instead lies at the heart of Galen's physiopathology, together with *pneuma*²⁷ and innate heat,²⁸ is the model of mixture or κρᾶσις of

either to sceptically suspend one's own judgement or to aprioristically choose one of the possible theses, which, considered individually and without a further verification by direct observation, may give the impression of being sound (*De exp. med.* XXIV p. 135 Walzer). Moreover, in the Empirical medical method, insofar as it is grounded on cumulative *autópsia* and its written record, *historía* (which would find its original repertoire in the Hippocratic *Epidemics*) vouches for the diachronic, progressive, and gradual advancement of medical *technē*, whereas the truth provided by *logos* is all-encompassing, instantaneous, and beyond time (*De exp. med.* X p. 101 Walzer). However, although Galen is profoundly convinced of the fact that *peíra* and *logos* will always prove to be incomplete without each other and only by working together will achieve best results in medicine, his preference goes undoubtedly to the logical therapeutic method which, contrary to the empirical approach, allows for an aetiological understanding of rare, unknown, and as-yet-unexperienced pathologies (*De loc. aff.* K. VIII 142). On the relation between theory and experience in Galen's medicine, cf. Vegetti 1995 pp. 82–84.

²⁵ *De meth. med.* K. X 421.

²⁶ Vegetti 1994 pp. 1702–1704; Vegetti 1995 pp. 79–80. Cf. also more recently Leith 2015a (on the rejection by Herophilus and Erasistratus of the elementary level of the *stoicheía*) and Leith 2015b (on Erasistratus' *triplokia*).

²⁷ Galen's *pneuma* is a vaporous substance formed in part by the vaporization of the arterial blood and in part by the inspired air (cf. *De resp. usu* pp. 120–2 Furley-Wilkie) and is conceived of as the principal instrument of animals' sense-perception and voluntary motion as well as the primary instrument of the soul (cf. *De plac. Hipp. et Plat.* CMG V 4.1.2 p. 446.11–14 De Lacy); cf. Debru 2008 pp. 271–272.

²⁸ Running counter to Erasistratus and other physicians, such as Praxagoras and Asclepiades (who believed in the acquired form of heat), Galen posited the existence of innate heat and, as a

the primary *stoicheia*, that is, hot/cold and dry/wet, seen as the building blocks of the nature of the human body and of the cosmos at large, and as the hidden first causes of physio-pathological facts.

On the one hand, in fact, the constitution of the human body and of its parts, its physical features and its so-called “natural” faculties or *dynameis* (as opposed to the “psychic” faculties, which take care of the area of sense-perception and voluntary motion), which are responsible for generation, growth, and nutrition in living things, depend on the basic composition of tissues, ultimately deriving in turn from the primary elements and their mixtures.²⁹ On the other hand, one of the types of disease that Galen theorizes is thought to be attributable to a bad mixture or *dyskrasia* of the uniform parts of the body; Galen in fact distinguishes eight different types of *dyskrasiai*, on the basis of which physician should elaborate a particular healing strategy,³⁰ and he also classifies mixture (together with formation or *diaplasia*, position or *thesis*, power or *dynamis*) among the criteria for obtaining indications for a particular disease and its treatment.³¹ Moreover, Galen’s pharmacology also depends on the notion of a mixture of primary qualities, insofar as each physical object, and therefore also food and drugs, are possessed of a certain mixture in potentiality (a definition of Aristotelian origin), which releases its own powers or *dynameis* (which in turn depend on the elementary qualities, e.g. hot/cold and dry/wet) when it comes in contact with the mixture of the patient.³²

follower of the theories of Hippocrates and Aristotle, assigned to it, concurrently with the mixture of primary elements, a pivotal role in physiology: in fact, it has a prominent role in digestion, in the distribution of food to the various parts of the body, and in the generation of humours and growth. For children grow because of it and while the infant has most innate heat, in the elderly innate heat withers away, and when it is finally extinguished, death takes place; cf. Durling 1988 p. 210 (who in his paper reconstructed the possible content of a lost treatise by Galen on innate heat) with references. Innate heat is defined by Galen as well-mixed “in both substance, as it exists primarily in blood and pneuma, and in quality, as it is a well-mixed mixture of heat and cold” (cf. *De plac. Hipp. et Plat.* V 4.1.2 p. 524, 19–22 de Lacy); cf. Durling 1988 p. 210; cf. also Debru 2008 p. 273.

²⁹ Debru 2008 pp. 266–267.

³⁰ *De meth. med.* K. X 121–122.

³¹ Van der Eijk 2008 pp. 295–296. As Van der Eijk points out, Galen identifies three different types of diseases: “diseased consisting in physiological ‘imbalances’ (*dyskrasiai*) affecting the homoeomerous parts of the body, diseases afflicting the organic parts and disease that consist in a breakdown of the body’s overall coherence”; cf. Van der Eijk 2008 p. 295. On Galen’s fundamental therapeutic principles, cf. Van der Eijk 2008 pp. 288–297.

³² *De temp.* pp. 98.23–99.13 H. For the basic principles of Galen’s pharmacology cf. Vogt 2008 pp. 304–310, esp. 307–309.

But what are the sources, historical and conceptual, of such a vital theory which, as I have just hinted, turns out to be fundamental for Galen's entire medical system and which makes the core of Galen's medical system so dissonant in comparison with all the other possible alternatives at his disposal, including those we have just sketched? To put it simply: why κρᾶσις?

As Vegetti observes, in contrast to the aforementioned medical alternative systems (Empiricists, Methodists, Rationalists/Dogmatists), Galen certainly lays out the foundation of a dogmatic medical doctrine, but in contrast to the other Dogmatists, he falls back on an "archaic" explanatory model of both physiology and pathological aetiology of the human body, on he bases his theory of the eight morbid *diatheseis*: the Hippocratic (and, as Vegetti purports, "pre-Aristotelian") model of the mixture of hot/cold and dry/wet. According to Vegetti, this "archaic" recovery of the Hippocratic theory of mixture would allow Galen, on the one hand, to pursue one of the main objectives of his medical system, that is, the re-foundation of a degraded and impoverished medicine, such as that of the Methodists, on the basis of the old and illustrious Hippocratic tradition and, on the other hand, to get further and go beyond the causative level reached by the contemporary Rationalists, in order to gain a much deeper insight into human nature and its biological and pathophysiological workings.³³

Now, it seems to me that Vegetti's claim concerning Galen's archaism is correct (excluding the definition of Galen's mixture as "pre-Aristotelian", as I will explain later on), but it is not the end of the story. To begin with, it is certainly an indisputable fact that in the formulation of his theory of the mixture of hot, cold, dry, and wet as constitutive factors of the nature of the human body (and of the entire physical world at large), and as opposites upon whose symmetry (in the sense of equilibrium or due proportion)—that is, *eukrasia* (i.e. good mixture as opposed to eight *dyskrasiai* or bad-mixtures)—the health and well-being of the human organism depend, Galen draws on a very old and longstanding medical and philosophical tradition, as we will see in detail later.³⁴ As is well-known, this tradition goes back to the speculations of Alcmaeon of Croton and the early pluralists, among whom Empedocles is at the forefront, as

³³ Vegetti 1995 p. 80.

³⁴ On this cf. *infra* p. 137 ff.

well as to the repercussions of these medical and philosophical tendencies in the early medical writings of the Hippocratic Collection.³⁵ For by marvellously combining influxes coming from pre-Socratic *Elementen-und-Mischungslehre* with the awareness of the presence of humoral bodily fluids of the *Volksmedizin*,³⁶ it is precisely the early Hippocratic medical writings that gave life to a synchronically multiform and versatile model of κρᾶσις (or more precisely, κρῆσις, in Ionic dialect), a term which explicitly means “balanced mixture,” principally intended both as i) a *procedure* through which to mix different ingredients endowed with strong *dynamies*, with the aim of obtaining a uniform and mild compound and ii) a *state* resulting from the mixture of basic bodily constituents of various kinds (humours, *dynamies*, qualities), which mix and in their mixing reach a balanced state. Thus, the Hippocratic concept works as explanatory model of both the nature of the human body (and its relation to the external physical environment or macrocosm) and its healthy and pathological states.³⁷

On the other hand, however, in his definition of Galen’s mixture as solely an “archaic” (even “pre-Aristotelian”) explanatory model, Vegetti overlooks two all-important aspects which instead would allow us to see Galen’s choice, on the contrary, as extremely up-to-date and perfectly in line with the thought of his time: a modern and up-to-date choice.

In the first place, one must not forget that before Galen’s time the Dogmatic tradition of Pneumatic medicine had already adopted a model of mixture as theoretical basis for physiopathology. The Pneumatic school arose at the time of the emperor Claudius (1st century BCE–1st century CE), was founded by the physician Athenaeus of Attalia and was still active in Galen’s time. Its main distinguishing feature was its peculiar fusion of doctrines coming from Stoic natural philosophy and medical principles issuing from Dogmatic/Rationalist medicine.³⁸ The Pneumatists developed a complex medical system organized by Athenaeus in five different areas: physiology,

³⁵ Cf. Harig 1974 pp. 38–41; Longrigg 1993 pp. 52–53 and pp. 89–91; Jouanna 2002 pp. 38–43.

³⁶ Cf. esp. Harig 1974 p. 41.

³⁷ Festugière 1948 pp. 37–38; Jouanna 1996 pp. 294–295 and *infra* pp. 254 ff.

³⁸ Wellmann 1895 p. 7.

dietetics, the so-called *materia medica* (pharmacology), pathology, and therapy.³⁹ More precisely, as we will see, Athenaeus himself and his followers, based their medicine, and especially their physio-pathological doctrines on causes, such as *pneuma*, and hot/cold, dry/wet and their mixture, developed a system of nine mixtures (one *eukrasia* and eight *dyskrasiai*) on which, at least according to the philologist Max Wellmann, Galen's theory of mixture seems to entirely rely.⁴⁰ We will scale down the weight of Wellmann's statement by bringing to light analogies and disanalogies between the Pneumatic formulation and Galen's own,⁴¹ but for now we can certainly infer that, although it was not adopted by the other abovementioned medical schools, the model of the mixture of hot/cold and dry/wet and the scheme of mixtures resulting from different elementary combinations do not have to be exclusively viewed as "archaic". For although originally developed by the early medical tradition, the model of κρᾶσις, seen as the theoretical basis of an understanding of the nature of the human body, underwent a momentous revival in Galen's time in both the field of medicine, thanks to the Pneumatists, and in the field of the philosophy of nature, thanks to the Stoic/Peripatetic controversy—which at that time animated a vivid debate concerning modality and the inner justification of the theory of mixture within the respective philosophical systems.

This in fact is the second reason why we can say that at Galen's time the topic of mixture underwent a substantial renaissance, which is witnessed by a contemporary philosophical text, the *De mixtione* by the Peripatetic Alexander of Aphrodisias (2nd–3rd century CE).⁴² On the one hand, the Stoic school, from the time of its founder, Zeno, worked out a model of mixture, the so-called total mixture (ὅλων δι' ὅλων κρᾶσις), involving the four corporeal primary elements (fire, air, water, and earth) completely coextensive with one another (the so-called process of ἀντιπαρέκτασις). This theory was afterwards adopted by the third leader of the school, Chrysippus, to explain the motion of the *pneuma* (thought of as a mixture of fire and air and essentially conceived both as the physical principle responsible for the psychic functions of the soul and as the

³⁹ Wellmann 1895 p. 131.

⁴⁰ Wellmann 1895 p. 144–146 esp. n. 5, p. 145.

⁴¹ Cf. *infra* pp. 210 ff.

⁴² See *infra* pp. 63 ff.

corporeal divine principle permeating matter) through passive matter.⁴³ Against this theory, which, as we will see, was the fulcrum of the entire Stoic philosophical system, in Galen's time, the Peripatetic school, which propounded a very different model of mixture, reacted very strongly⁴⁴. In fact, over time the Peripatetic philosophers had been working on and re-working the Aristotelian model of the mixture of primary elements (fire, air, water, and earth)⁴⁵, an explanatory model which in turn benefitted from all previous speculations on this issue, Pre-Socratic and early medical alike; the results of this continuous operation of exegesis on Aristotle's account are distinctly visible in the philosophical outputs of Alexander of Aphrodisias, where not only has the process of mixture been interpreted somehow differently from the original Aristotelian account⁴⁶, but the inner justification of the theory too seems to undergo a remarkable rethinking. If on the one hand the mixture of primary elements still explains, as Aristotle's model does, the generation of the so-called "homoeomerous" bodies (inorganic and organic materials, such as nerves, sinews, flesh, cartilage, bones, and so on), on the other hand, the soul itself is seen by Alexander as the *eidos* which follows upon (*epigignómenon*) the mixture according to a certain proportion of the elementary bodies (cf. *De anima* 25.2).⁴⁷

From this brief overview of Galen's contemporary medical and the philosophical fields of enquiry, we can certainly see that dealing with mixtures in the 2nd century CE was not at all out-of-date, as one could infer from Vegetti's words, but on the contrary was perfectly in keeping with the times—there is even evidence of a thriving literature on the topic, within both the philosophical and the medical fields, which is testified, on the one hand, by Alexander of Aphrodisias' treatise *Perì kraseōs kai auxēseōs* and, on the other hand, by Galen himself, who wrote a medical treatise *Perì kraseōn* or *De temperamentis* in which he makes reference to "those who have left writings (*hupomnēmata*) about mixtures" which we can infer is a reference to medical writings on mixtures.⁴⁸

⁴³ For an account of the Stoic theory of total mixture from Zeno to Chrysippus, see *infra* pp. 49 ff.

⁴⁴ On the main lines of criticism against the Stoic theory of total mixture, cf. pp. 63 ff.

⁴⁵ For the main sources of Aristotelian account cf. pp. 63 ff.

⁴⁶ On the peripatetic interpretation of Aristotle's theory of mixture cf. pp. 63 ff.

⁴⁷ See *infra* pp. 75 ff.

⁴⁸ *De temp.* p. 82.11–12 H. Cf. Van der Eijk 2015a pp. 677–678.

In the present work, we will try to identify the historical and theoretical sources on which Galen relies in developing his model of the mixture of the primary elements. More specifically, we will aim at bringing to light how Galen's model of mixture bears, in Galen's own peculiar Dogmatic-but-undogmatic way, striking resemblances to the Peripatetic model of mixture, both in the description of the concrete process of mixture and in the inner justifications that the theory proves to have within the entirety of Galen's medical and philosophical system. We will also examine to what extent, by contrast, it distances itself from the defining traits of the Stoic total mixture. What will emerge from this picture will be a philosophically sound model of mixture which shows a clear internal logic and comes under the sway of the Peripatetic natural philosophy of the 2nd century CE, while in no way renouncing the "archaic" Hippocratic background that had already conceived mixture as theoretical basis both for understanding the human body's physio-pathology and for the theory of health and disease. In so doing, we will also assess the contribution of Pneumatic medicine, which, although it has a substantially different starting point to Galen's medical and philosophical system (such as, for instance, the theory of the primary elements), will also play a role in the definition of Galen's scheme of mixtures.

All these aspects, both those that are "archaic" and those that are more recent and up-to-date, which also constitute the historical and theoretical sources of Galen's model of mixture, will be highlighted in the present work: this systematic investigation of Galen's sources for his theory of mixture will provide students of Galen's medicine and philosophy with a much deeper insight into the issue and also represents the major novelty of this research, as the scholarship of the past expressed very conflicting views on this very point—as we will see in our *Forschungsstand*.

1.2 Primary sources

As is well-known, in Galen's *corpus* the concept of mixture is a multifaceted yet central notion, linked to all the focal points of Galen's medical and philosophical research: his theory of the primary στοιχεῖα and the generation of homoeomerous bodies, the problem of elemental constitution of a living body and the harmony of the elements, the body–soul relation, his considerations on pharmacology and therapeutics. In the present study I focus on the physical aspects of the issue of the mixture of the primary elements, and this defines the main primary sources of my study. Galen expounds his theory of primary elements and their mixture from an ancient physical perspective in three fundamental works: i) *On elements according to Hippocrates* (*De elementis ex Hippocratis sententia*. CMG V 1.2 De Lacy) ii) the *Commentary on Hippocrates' Nature of Man* (*In Hipp. Nat. Hom. comment.* III CMG V 9.1 Mewaldt), especially in his book I iii) the three books of *On mixtures* (*De temperamentis* III Helmreich), especially in his book I.

These three texts are closely related both chronologically and in terms of content. *On elements* and *On mixtures* are thought by Ilberg to have been composed early on during his second sojourn in Rome.⁴⁹ According to De Lacy, Galen composed *On the elements* long before he wrote his *Commentary on Hippocrates' Nature of Man*,⁵⁰ although the latter also belongs to Galen's second stay in Rome⁵¹

Both *De elementis* and the *Commentary on Hippocrates' Nature of Man* (book I) are fundamentally based on an exegesis of the first of the three sections

⁴⁹ Cf. Ilberg 1892 p. 513. Cf. De Lacy 1996 p. 42 for the passages where Galen indicates that *De temperamentis* closely followed *De elementis*; cf. also Tassinari pp. 7–9. As De Lacy remarks in *De ord. libror. suor.* pp. 85.22–26 Müller, Galen mentions the sequence *De elementis*, *De temperamentis*, *De simplicium medicamentorum (temperamentis et) facultatibus* and *De compositione medicamentorum*; cf. De Lacy 1996 p. 42.

⁵⁰ Cf. De Lacy 1996 pp. 42–43 (cf. *In Hipp. Nat. Hom. comment.* CMG V 9.1 3.4–19 Mewaldt).

⁵¹ Cf. *De libr. propr.* pp. 113.13–18 Müller; cf. Jouanna 2012a pp. 317–18.

of the Hippocratic treatise *De natura hominis* (Ch. 1–8),⁵² although they approach the issue in two rather different ways. The first is principally conceived for a well-trained reader and presupposes a good knowledge of the Hippocratic text, whereas the second is instead a line-by-line commentary on the Hippocratic treatise with lemmata and textual discussions, and is intended for a wider audience.⁵³ The Hippocratic treatise *De natura hominis* (end of the 5th century BCE) was held in the highest esteem by Galen and although today the treatise is attributed to Polybus, Hippocrates' student,⁵⁴ Galen considered the first eight chapters to be authentically Hippocratic, where according to him the great physician set out his theory of primary elements⁵⁵. These two closely intertwined works are fundamental to the understanding of Galen's theory of the mixture of the primary elements, because by elucidating his system of primary elements, in some passages – which we will quote throughout the dissertation – Galen also describes how the elements combine and mix. The third work used as primary source here is *On mixtures* where Galen treats the process of mixture of the primary elements as a *datum* on which to build further developments, both on an epistemological level (insofar as he would consider the process of mixture as a given on which to build other parts of his theory) and on an ontological level (since the merely physical process of mixture is the basis for understanding other processes). In this work, he passes on to describe, within a historical framework, his system of nine mixtures – eight bad mixtures and one good mixture (Book I), its application to physiology (Book II), and to pharmacology (Book III). Like the aforementioned works, *On mixtures* is also fundamental for our purposes, especially Book I. In this book, Galen on the one hand deals with physical aspects and offers us a glimpse into his theory of mixture; while on the other hand he passes on to describe his system of nine mixtures in the form of a polemic with his old and more recent predecessors. Throughout the present work, I will also make use of textual *loci* taken from the whole Galenic corpus in order to underpin my arguments.

⁵² Cf. Jouanna 2002 pp. 19–37 and also Jouanna 2012a pp. 314–315.

⁵³ Jouanna 2012a and cf. *In Hipp. Nat. Hom. comment.* CMG V 9.1 p. 3.4–19 Mewaldt. Cf. also Manetti and Roselli 1994 pp. 1554–1557.

⁵⁴ Cf. Jouanna 2002 pp. 55–61.

⁵⁵ Cf. Jouanna 2012a.

1.3 *Forschungsstand* concerning Galen's theory of mixture of the primary elements.

In 1974 Georg Harig published the book *Bestimmung der Intensität im medizinischen System Galens. Ein Beitrag zur theoretischen Pharmakologie, Nosologie und Therapie in der Galenischen Medizin*. Although dedicated to pharmacology, physio-pathology, and the therapeutic aspects of Galen's medicine, Harig presents a chapter, entitled "Die philosophisch-medizinischen Voraussetzungen für die Intensitätsbestimmung in der Galenischen Medizin", where he deals with the philosophical and medical origins of Galen's doctrine of elements, humours, and mixture. Harig reconstructs the roots of both the four-element theory (from Empedocles to Aristotle's formulation in *De generatione et corruptione*) and the four-humour theory of the Hippocratic *De natura hominis* (which combine some features of the Empedoclean quadripartite *Elementenlehre*, with the awareness of the presence of the many different bodily humours of the *Volksmedizin*).⁵⁶ On the one hand, in his *De elementis* and *Commentary on De natura hominis* Galen refers to Hippocrates (i.e. the Hippocratic author of *De natura hominis*) as the first to consider the hot, the cold, the dry, and the wet as the initial building blocks of the entire cosmos.⁵⁷ On the other hand, as Harig rightly remarks, Galen connects this Hippocratic statement to Aristotle's elemental system of *De generatione et corruptione* insofar as he associates primary elements with primary qualities: the element is the body where the quality is present to the extreme degree (although, in contrast to later scholarship, Harig does not enquire into the differing ontological status of primary elements and primary qualities, treating them as entirely "gleichbedeutend" or equivalent).⁵⁸ Harig does not dwell on the precise relation between elements, qualities, and humours,⁵⁹ but goes on to state that the body is conceived by Galen as made up of a mixture of four *Primärqualitäten bzw. Elemente* (which for him are equivalent); this mixture can be simple (hot, cold,

⁵⁶ Harig 1974 pp. 38–44.

⁵⁷ Harig 1974 pp. 45–46 with references.

⁵⁸ Harig 1974 pp. 46–47 with references.

⁵⁹ Harig 1974 pp. 48 with references.

dry, and wet mixtures) composite (hot and dry, hot and wet, cold and dry, cold and wet) or well-mixed (the good mixture, in which none of the qualities prevails).⁶⁰ This mixture, as the Hippocratic physicians had pointed out, can be influenced by external and internal factors such as gender, age, location and climate, and customs: when the mixture is in equilibrium the individual is healthy, whereas when this internal balance is disrupted the body suffers and diseases and pains arise within it.⁶¹

In contrast to Harig, whose account of Galen's elemental mixture was instrumental for treating the medical aspects connected to his theory of mixture, Paul Moraux devoted his work on Galen to philosophical topics and hence also to Galen's elementary physics. In 1984 the second volume of his magisterial work, entitled *Der Aristotelismus bei den Griechen von Andronikos bis Alexander von Aphrodisias* was published, dedicated to the Aristotelianism in the 1st and 2nd centuries CE. The fifth part of the second book of this volume deals, among others, with Galen's theories of the primary elements and mixture: two specific brief sections represent the starting point of our research.

First of all, Moraux underlines that Galen's *Elementenlehre* displays syncretistic tendencies, as he equally attributes it to Hippocrates, Plato, Aristotle, the Stoics.⁶² Thus, in Moraux's view, Galen himself does not regard his theory of elements as exclusively derived from Aristotle but as an achievement generally reached over time by natural philosophy.⁶³ As Moraux notes, according to Galen the element is "the smallest part of that of which it is an element" (cf. *De elem. sec. Hipp.* p. 56.3 De Lacy), as "they are parts which are primary and simplest by nature and which are no longer capable of being resolved into other parts" (*De elem. sec. Hipp.* p. 58.2–3 De Lacy and cf. *De plac. Hipp. et Plat.* p. 490.12–13 De Lacy).⁶⁴ Moreover, Galen distinguishes between the primary elements and the principles (*archai*). According to him, in fact, the primary elements (fire, air, water, and earth) are generated by the

⁶⁰ Harig 1974 pp. 49–50 with references.

⁶¹ Harig 1974 pp. 50–51 with references.

⁶² Moraux 1984 pp. 299f.; cf. also p. 300 n. 195 for the references.

⁶³ Moraux 1984 p. 300.

⁶⁴ According to Moraux, this definition shows links with Nemesius of Emesa's definition of element: "Τὸ στοιχεῖον τὸ κοσμικὸν ἔστιν μέρος ἐλάχιστον τοῦ συγκρίματος τῶν σωμάτων" (*De nat. hom.* p. 150 Morani); cf. Moraux 1984 p. 301 n. 205.

predominance of the corresponding pairs of four primary qualities (hot/cold and dry/wet) in an underlying substratum, with matter and qualities as the two *archai* constituting the primary elements.⁶⁵ These primary elements, that is, fire, air, water, and earth, can also be designated using the names of the four qualities, that is the hot, the cold, the dry, and the wet. For, as Galen claims, hot, cold, dry, and wet can be said *trichōs*, i.e. in three ways: a) as a quality; b) as an unmixed body, i.e. the pure element which can be known by abstraction, that is fire, air, water, and earth, where the primary qualities (hot, cold, dry, and wet) are present to the extreme degree; and c) as a mixed body (i.e. a body where the quality is prevalent)⁶⁶. Moraux provides us with a very general summary of Galen's views and does not analyse or compare them with contemporary parallels such as the Stoic and the Peripatetic accounts.

The same is true of Moraux's account of Galen's theory of mixture. On the whole, Moraux offers some relevant points for consideration. In the first place, he points out that Galen's theory of mixture draws on the Aristotelian theory but is also affected by Stoic theories of mixture although he does not explain what exactly Galen has in common with the Stoic and the Peripatetic accounts.⁶⁷ Secondly, he also notes that Galen recognizes a difference between Aristotelians and Stoics à propos the theory of mixture: according to the Aristotelians, the qualities are involved in the process of mixture, whereas according to the Stoics the bodies mix, while the qualities are present in a mixture intact. However, Moraux only sketches this distinction and does not delve deeper into Galen's own peculiar position within what we will see is a great Stoic/Peripatetic controversy⁶⁸. For, according to Moraux, it is essential to underline that in Galen's view there is a difference between real mixture and a mere juxtaposition of constituents. In the second case, the ingredients retain their original composition unchanged. Thus, stones, bricks, or planks remain perfectly intact as they were before the construction of the house. By contrast, in the real

⁶⁵ *De elem. sec. Hipp.* CMG V 1.2 p. 114.16–25; p. 126.1–11 De Lacy; cf. also *in Hipp. Nat. Hom. comment.* CMG V 9.1 pp. 17.28–18.15 Mewaldt; cf. Moraux 1984 p. 302 with n. 207. Moraux observes that this distinction is surely pregalenic and that Alexander and Eudemus had already dealt with this topic; cf. *Simpl. in Phys.* 10.8–24.

⁶⁶ *De elem. sec. Hipp.* CMG V 1.2 pp. 114.24–116.5 De Lacy.

⁶⁷ Moraux 1981a pp. 89–91.

⁶⁸ Moraux 1984 pp. 303–304 cf. *infra* pp. 86 ff.

mixture, exemplified by Galen through the image of the *tetrapharmakon* the final product acquires new qualitative determinations in comparison to the original ingredients of the mixture.⁶⁹ For this reason, for example, during the many intervening qualitative changes the passage from the non-perceptive to the perceptive can take place (δύναται γὰρ ἐν πολλαῖς ταῖς μεταξὺ μεταβολαῖς τὸ τέως μέλαν αὔθις γενέσθαι λευκὸν καὶ τὸ τέως λευκὸν αὔθις μέλαν καὶ τὸ νῦν ἀναίσθητον αὔθις αἰσθητικόν):⁷⁰ a new form has arisen from the many changes that have occurred. As Moraux observes, it is with this in mind that later in his *Quod animi mores* Galen reinterprets Aristotle's definition of soul as the form of the body and holds that the capacities of the soul follow the bodily mixtures of the four primary elements.⁷¹ As Moraux stresses, Galen's view of the soul seems to rely on contemporary Peripatetic ideas and, more precisely, shows close similarities with his younger contemporary Alexander of Aphrodisias' doctrines on the soul.⁷² Galen's theory of the soul and its relationship with the Peripatetic thought of his age have been discussed by previous scholarship⁷³, whereas what is still lacking is a more detailed study concerning Galen's elementary physics of the mechanism of mixture. In this regard, although Moraux's account seems to be on the right track on several points, it proves to be insufficient as a rather superficial picture emerges insofar as Galen's model of mixture takes the shape of an indistinguishable *pastiche* of syncretistically Stoic–Peripatetic origins without even mentioning or acknowledging his medical, or more precisely, Hippocratic background.

We should go beyond Moraux's account and highlight therefore those studies that have over time made important contributions to our knowledge of Galen's theory of mixture and its relation with earlier and more recent reference models taken from natural philosophy and medicine.

⁶⁹ *De elem. sec. Hipp.* CMG V 1.2 p. 70.18 De Lacy. Cf. Moraux 1981a p. 91 and Moraux 1984 p. 304-305. On the example of the tetrapharmakon cf. more infra pp. 100 ff.

⁷⁰ *De elem. sec. Hipp.* CMG V 1.2 p. 72.20–22 De Lacy ; cf. Moraux 1984 p. 304.

⁷¹ Moraux 1984 pp. 304-305 cf. *Quod an. mor.* K. IV 774.7-15.

⁷² Cf. Moraux 1981a pp. 91–92 and Moraux 1984 pp. 304-305.

⁷³ On the correspondences between Galen's and Alexander's theories on the soul in antiquity cf. Michael Ephesius *In Parv. Nat.* 134.24–30 Wendland; and in modern scientific literature cf. Donini 1974, Todd 1977, Moraux 1981a and 1984 pp. 304-305, and, more recently, Tieleman 1996b, Cordonier 2007, Caston 1997 pp. 347-354 and 2012 pp. 9-12.

Important points regarding Galen's account of mixture were raised in a 1991 article by Rosa María Moreno Rodríguez, which has two scholarly merits. The first is that it draws a distinction between the Hippocratic and the Galenic accounts of mixture. Moreno Rodríguez shows that in contrast to the Hippocratic treatise *De natura hominis*, Galen did not define the *krasis* as the mixture of the four humours but as the mixture of the four primary elemental qualities.⁷⁴ While Galen does make use of the four humours of the Hippocratic *De natura hominis* in his physio-pathological theories, Moreno Rodríguez stresses that the Hippocratic four-humour doctrine is just one of the factors playing a role in Galen's physio-pathology together with *pneuma*, *innate heat*, and the *krasis* of the four primary qualities.⁷⁵ Moreno Rodríguez explains the relation between humours and elemental qualities in the course of formation and maintenance of the homoeomerous parts. Whereas on the one hand the four humours present in the menstrual blood are responsible for the formation of the simple parts of the embryo during the phase of embryogenesis, on the other hand the primary qualities enter the body and nourish the homoeomerous parts through the process of digestion of food and drink, which gives rise to the four humours in the body.⁷⁶ According to Moreno Rodríguez, the homoeomerous part assumes a privileged position insofar as it is to be considered the elemental unity (*unidad estequiológica*) of an organic body. For the mixture of primary qualities determines the proper function (*ergon*) and properties (hardness, smell, taste and colour) of the homoeomerous parts and constitutes the substance of the anhomoeomerous parts (whose accidental properties are position, greatness, structure, and shape) that in turn constitute the bases of the structure of the whole organism.⁷⁷ Moreno Rodríguez's contribution is extremely important insofar as it sheds light on the articulation elements–humours–homoeomerous parts. Yet its major shortcomings lie, on the one hand, in the fact that it does not take into consideration Galen's complex contemporary philosophical background (in brief: which primary elements constitute the basis of the elemental unity, the Stoic or the Peripatetic?) and, on the other, in the fact that it does not take account

⁷⁴ Moreno Rodríguez 1991 pp. 92–93.

⁷⁵ Moreno Rodríguez 1991 p. 93.

⁷⁶ Moreno Rodríguez 1991 pp. 96–100.

⁷⁷ Moreno Rodríguez 1991 pp. 100–102.

of the intimate philosophical significance of this straightforward physical/physiological articulation elements–humours–homoeomerous parts.⁷⁸

In *Der Begriff der Physis bei Galen vor dem Hintergrund seiner Vorgänger* of 2001, Franjo Kovačić deals with important philosophical aspects of Galen’s conception of nature (in connection with his embryology, physiology, soul doctrines, and teleology). Kovačić also outlines the basics of Galen physics and, after an overview of the Platonic, Aristotelian, and Stoic conceptions of “nature”,⁷⁹ points out that according to Galen nature is primarily defined as “the whole substance and the mixture out of the primary elements, hot, cold, dry and wet” (*De temp.* p. 104.1–3 H.: “φύσιν δ’ ὅταν εἶπω, τὴν ὅλην οὐσίαν τε καὶ κρᾶσιν λέγω τὴν ἐκ τῶν πρώτων στοιχείων, θερμοῦ καὶ ψυχροῦ καὶ ξηροῦ καὶ ὑγροῦ”). To make this concept clearer, he enquires into Galen’s elementary physics and observes that it is modelled on Aristotle’s since, as in *De generatione et corruptione*, the elemental change is due to an exchange of the qualities within the underlying substratum.⁸⁰ Out of the elemental mixture the homoeomerous parts arise, the perceptible elements or αἰσθητὰ στοιχεῖα. They are formed by the proximate (*syneché*) elements, the four humours of the Hippocratic tradition, which are placed in a so-called Zwischenstufe between primary elements and homoeomerous parts (although Kovačić does not develop, as Moreno Rodríguez does, the abovementioned physical-physiological articulation and, more importantly, does not clarify the reason why the homoeomerous parts would maintain a qualitative composition).⁸¹ More importantly, he points out that, analogously to Aristotle, Galen conceives of a physical body as a hylomorphic compound of matter and form but, in contrast to Aristotle, in Galen’s view the form or internal structure of the composite coincides with the mixture, i.e. the particular *ratio*, between the primary elements.⁸²

⁷⁸ Vegetti 1994 bridges this gap and underscores that it is adopted because Galen wants to develop a non-reductionist solidist view of the body which, in contrast to the Alexandrian anatomists, relies on the simplest and ultimate *stoicheia*, cf. more *infra* pp. 127 ff.

⁷⁹ Kovačić 2001 pp. 92–95 with references.

⁸⁰ Kovačić 2001 p. 97 with references.

⁸¹ Kovačić 2001 pp. 98–99 with references.

⁸² Kovačić 2001 p. 104 and cf. *Quod animi mor.* IV K. p. 773. Although Kovačić does not stress this, we should point out that the mixture is form and essence (that is, **substance** in the primary

Along the same lines, in an essay published in 2008 R. J. Hankinson tackles the topic of Galen's primary elements and their mixture. Like Moraux, Hankinson raises some important points: the definition of primary element, the difference between principles and *archai* (for which Hankinson refers to Aristotle, cf. *De gen. et corr.* 329a27–33), and Galen's awareness of the difference between the Aristotelians and the Stoics as regards the efficient cause of the mechanism of mixture and his preference for the former position (cf. *De elem. sec. Hipp.* pp. 136.23–138.14 De Lacy and *De propr. plac.* p. 116.5–19 Nutton; cf. *De nat. fac.* p. 104.2–20 H.). To these points, Hankinson adds some further observations regarding the relation between primary qualities, primary elements and humours. First of all, he points out that, like Aristotle (cf. *De gen. et corr.* 330a30–331a6), Galen sets each primary element in correspondence with a couple of primary qualities (water is cold and moist, air moist and hot, fire hot and dry, earth dry and cold; cf. *De elem. sec. Hipp.* p. 112.24–116.5 De Lacy; cf. *in Hipp. Nat. Hom. comment.* p. 49.26–29 Mewaldt; cf. *De plac. Hipp. et Plat.* p. 502.23–5 De Lacy).⁸³ Second, every humour is associated with a couple of primary qualities, as in Hippocrates *De natura hominis*: yellow bile is hot and dry, black bile dry and cold, blood moist and hot, phlegm moist and cold (*Caus. Morb.* VII 21–2).⁸⁴ Third, although the humours are coupled with two primary qualities each and are assimilated to the primary elements (cf. *De plac. Hipp. et Plat.* p. 502.22ff. De Lacy), humours and primary elements are different, since in contrast with the primary elements the humours do not contain the primary qualities to the extreme degree (cf. *De temp.* 1.16–17 H.).⁸⁵ Moreover, like Moreno Rodríguez, Hankinson argues that according to Galen the humours play a pivotal role in the formation and nourishment of the homoeomerous parts, as the maternal menstrual blood (which also contains an admixture of the two biles and phlegm) generates the homoeomerous parts; and in Hankinson's view in this Galen follows Aristotle (*De gen. an.* 737b8–739b33).⁸⁶ According to

sense, in the sense of *Metaph.* VII 11) and, therefore, **nature** *qua* essence (in the sense of *Metaph.* V 4 1015a).

⁸³ Hankinson 2008a pp. 210–217.

⁸⁴ This account is different from other passages where Galen associates each humour with a couple of primary qualities except the blood, which, as he declares in this passage, originated in a balanced mixture of the primary elements (and corresponding qualities), cf. *infra* p. 111 n. 271

⁸⁵ Hankinson 2008a p. 219.

⁸⁶ Hankinson 2008a p. 218.

Hankinson, this menstrual blood (which, in Galen's opinion, is a mixture of blood, phlegm, and the two biles, each of which is associated with a couple of primary qualities) is responsible for "the ability to be the matter for structures quite different in qualitative type", that is, the homoeomerous parts, which are defined as hot, cold, dry, and wet.

In parallel with the studies of Kovačić and Hankinson, Philip Van der Eijk has examined the physiological side of the question and has provided us with an investigation that links physics and physiology. Here we will mention two contributions by Van der Eijk: a) a 2010 essay entitled "Von der Natur des Menschen. Menschenbild und Naturwissenschaft im antiken und frühchristlichen Denken" and b) an article of 2014 entitled "Galen on the nature of human beings". Focussing on the passages mainly taken from *De temperamentis* and *De foetuum formatione*, these two contributions show that in Galen's account of human nature there is a marked tendency to recourse to two antithetic explanatory strategies, one top-down and the other bottom-up. On the one hand, as Van der Eijk underlines, Galen identifies a unifying formative principle—a shaping capacity residing in the embryo—which shapes the parts of the animal in accordance with the soul traits and which is thought of as of a higher and even divine origin (cf. *De temp.* pp. 35.17–37.1, 79.6–80.24 Helmreich; *De foet. Form.* 6). On the other hand, Van der Eijk notices that Galen displays also a more materialistic tendency and explains physical structures and physio-pathological processes at work within the human beings in terms of primary qualities, with their mixtures defined as "states of the body and parts of the body, constituted by the proportion between the four elementary qualities hot, cold, dry and wet". In this Galen would follow Aristotle insofar as he speaks of a mixture of hot, cold, dry and wet and not of humours.

As we have seen, these contributions recently given by Kovačić, Hankinson, and Van der Eijk throw light on the Aristotelian background of Galen's physics. More recent studies have changed the perspective a little as they look into the relations between Galen and his contemporary Stoic and Peripatetic elementary physics.

In the first case, two scholars, Christopher Gill and Véronique Boudon-Millot, have reconsidered the Stoic background of Galen's theory of mixture. In

his most recent study, “Naturalistic Psychology in Galen and Stoicism” (2010), Gill in fact underlines that Galen shared a so called “high-naturalistic” approach to reality with the Stoics, conceived as an animated material continuum teleologically oriented. According to Gill, in this high-naturalistic framework the Stoic idea of total mixture or $\delta\iota' \ \acute{\omicron}\lambda\omega\upsilon\upsilon\ \kappa\rho\tilde{\alpha}\sigma\iota\varsigma$ fits into Galen’s schema very well. Like the Stoics, Galen was a continuist and held a theory of primary elements capable of mutual intertransmutation, which would have been better embodied by the Stoic notion of total mixture or interpenetration than the Aristotelian equivalent, Gill claims, insofar as the Stoic and the Galenic accounts created a link between the total interpenetration and the idea that living things have inherent vitality and the capacity for more complex functions.⁸⁷ In her essay “La notion de mélange dans le pensée médicale de Galien: mixis ou crasis?” (2011), Boudon-Millot discusses philological and philosophical issues concerning the theory and terminology of mixture. In this section, we will focus on Boudon-Millot’s remarks on philosophical themes related to Galen’s theory of mixture, leaving terminological observations for the next section. First of all, analogously to Moreno Rodríguez, Boudon-Millot affirms that Galenic medicine is not based on humoralism and that Galen’s $\kappa\rho\tilde{\alpha}\sigma\iota\varsigma$ is not, or is very rarely, a mixture of humours. Instead it is a mixture of primary qualities⁸⁸ that is performed by God or Nature.⁸⁹ in Galen, $\kappa\rho\tilde{\alpha}\sigma\iota\varsigma$ is a special term that indicates the proportion between opposite forces (hot/cold, dry/wet) in living bodies,⁹⁰ where the primary qualities are not confused with one another but are conserved.⁹¹ Furthermore, Boudon-Millot analyses a passage from Alexander of Aphrodisias’ *De mixtione* (*De mixt.* 216, 14 Bruns = SVF II 473), where Alexander describes the Chrysippean classification of mixtures. Boudon-Millot draws a comparison between Galen’s conception of $\kappa\rho\tilde{\alpha}\sigma\iota\varsigma$ and Chrysippus’ total mixture arguing that Galen’s account of $\kappa\rho\tilde{\alpha}\sigma\iota\varsigma$ may have been influenced by the Stoic theory of mixture. Boudon-Millot claims that the Galenic and the Stoic $\kappa\rho\tilde{\alpha}\sigma\iota\varsigma$ correspond to a certain mixture where the ingredients (bodies with corporeal qualities in the

⁸⁷ Gill 2010, pp. 64–77, esp. 76–77. The idea is also present in vestigial form in Gill 2007, p. 93 and 99–100.

⁸⁸ Boudon-Millot 2011 p. 262.

⁸⁹ Boudon-Millot 2011 p. 268.

⁹⁰ Boudon-Millot 2011 p. 265 cf. *De temp.* p. 1 H.

⁹¹ Boudon-Millot 2011 p. 274

case of the Stoics and qualities alone, according to Galen) fuse together without qualitative mingling insofar as they are preserved intact in the mixture.⁹²

Other recent contributions have stressed a close relation between Galen and Peripatetic elementary physics. Three contributions in particular are of interest: a) Valérie Cordonier, “Matière, qualités, mélange. La physique élémentaire d’Aristote chez Galien et Alexander d’Aphrodise”; b) Inna Kupreeva, “Galen’s Theory of Elements”; c) Jocelyn Groisard, “Galien et l’alternative médicale”, a chapter of the book *Mixis*, devoted to the problem of mixture from Aristotle to Simplicius.

In her 2007 article, Cordonier analyses the evolution of Aristotle’s doctrine of mixture in Galen and Alexander of Aphrodisias. She first remarks that Galen relies on the Aristotelian elementary physics of *De generatione et corruptione* and thought of hot, cold, dry, and wet as primary qualities undergoing a so-called alteration or *alloyôsis* according to the whole substance, allowing for both mixture and substantial generation.⁹³ Now, according to Cordonier, this conflation can be explained by assuming, not an oversimplification of the Aristotelian qualitativist physics of *De gen. et corr.*, but the influence of Stoic corporeal physics on Galen. For the founder of the school, Zeno, describes the elemental change or *tropê* as a mixture that takes place through a change (*metabolê*) of the elements into one another happening when a body completely interpenetrates another (cf. SVF I 102). Although Cordonier does not consider Alexander’s criticism of Stoic corporeal physics in his *De mixtione* in detail, she postulates the same Stoic influence in Alexander’s commentary on Aristotle’s *De sensu* Ch. 3 (cf. *In De sens.* 63.20–65.3), where Alexander distinguishes between a juxtaposition of the constituents (*parathesis*) and *mixis*, which gives rise to the intermediate colours and which is described as a total ($\delta\iota'$ ὄλων) mixture where the constituents “are changed through and through” (ὄλων $\delta\iota'$ ὄλων τροπομένων). As Cordonier remarks (although she does not take into account the crucial difference between the two physical systems): “Cette influence cryptée du Portique serait anodine si elle se limitait à une nouveauté

⁹² Boudon-Millot 2012 pp. 276–277.

⁹³ Cordonier 2007 pp. 90–93 with references.

terminologique, mais son impact s'exerce aussi sur la présentation qu'Alexandre fait du mélange aristotélicien, en affirmant en toutes lettres que l'interaction des qualités réciproquement actives et passives y permet que soit 'générée une nouvelle forme, unique, issue des deux ingrédients' (*In De sens.* 64.17–25). Il est des glissements lexicaux dont l'incidence sur l'évolution des idées est décisive: la façon dont Alexandre traduit ici la transformation qualitative des éléments en termes de génération d'une forme prise en son sens substantiel marque bien l'aboutissement et le dépassement des réflexions galénique et stoïcienne qui, comme je l'ai montré, valorisent à l'extrême la fonction 'généralive' du mélange et de l'altération opérée par lui".⁹⁴

In her 2014 article Inna Kupreeva brings out Galen's profound polemics against the Atomists/Corpuscularists and the Pneumatists, and argues that Galen's derivation of the primary elements differs considerably from Aristotle's in *De generatione et corruptione* II 1–4 and *De Caelo* III–IV (which are based on physical and cosmological arguments concerning the qualitative composition of the simple bodies or their natural motions). According to Kupreeva, in his new derivation of the primary elements (which, as we will see, does not exclude the Aristotelian background of *De gen. et corr.*), Galen displays an innovative technique taken from Aristotelian logic. By making recourse to the distinction, drawn by Aristotle in his *Categories*, between "being said of a subject" (synonymous predication) and "being said in a subject" (inherence), Galen distinguishes between the hot, the cold, the dry, and the wet *qua* qualities from the hot, the cold, the dry, and the wet, which by way of inherence can refer to bodies that have these qualities within them either to the extreme degree (i.e. the primary element) or "by prevalence" (the homoeomerous bodies). This new derivation leads to Kupreeva's second point, which more clearly reveals the close connection between Galen's elementary physics and Alexander's. For differently from Aristotle, who spoke of elemental qualities as *stoicheia*, Galen adopts a hylomorphic analysis of the primary elements that approaches Alexander's position insofar as he draws a clear difference between element and

⁹⁴ Cordonier 2007 pp. 96–98.

quality and defines the *stoicheia* as qualified bodies in which the primary qualities are present to the extreme degree.⁹⁵

While Kupreeva unfolds the later Peripatetic background of Galen's theory of elements, Groisard tackles Galen's theory of mixture of the primary elements. His recent research sets the stage for novel (although still partial) achievements in Galen's elementary physics and theory of mixture. In the first place, Groisard recognizes the syncretistic formulation of Galen's theory of mixture: Galen attributes a Peripatetic theory to Hippocrates by using the Stoic terminology of the total mixture.⁹⁶ For he adopts the common part from the Stoic and the Peripatetic *Mischungslehren* (attributing it to his predecessor Hippocrates), thus giving rise to a diachronic philosophical *consensus* and avoiding taking a position in their dispute on: i.e. whether it is the qualities or the bodies that activate the process of mixture (we will see, at any rate, that Galen does not remain neutral towards this Stoic/Peripatetic debate and instead, in his own characteristic way, takes an active position that is perfectly in line with his own epistemological convictions).⁹⁷

In fact, as Groisard maintains, the Aristotelian position (the qualitativist option) is chosen solely because it is more certain than the Stoic one (although Groisard does not take into account that, throughout his work, Galen refuses and even ridicules the fulcrum and inner justification of the Stoic theory, i.e. the bodily interpenetration, as we will see) and it is for this reason that Galen exhibits a model of mixture which presents strict resemblances with the Peripatetic model exemplified by Alexander's *De mixtione*: both texts in fact describe the mixture as a progressive division of particles ending in a final unification.⁹⁸

Finally, Groisard makes some observations concerning the reversibility of the ingredients that have been mixed. Now, since Galen adopts the image of the *tetrapharmakon*, (which, as will become clear, in some Stoic sources is used to

⁹⁵ Kupreeva 2014 pp. 153–196.

⁹⁶ Groisard 2016 pp. 176–178 comments on *De nat. fac.* K. II 5.4–17 (= *De nat. fac.* p. 104.2–15 H.)

⁹⁷ Groisard 2016 pp. 181–182 comments on *De meth. med.* K. X 16,12–17,2 = SVF II 411.

⁹⁸ Groisard 2016 pp. 182–183 comments on *De elem. sec. Hipp.* CMG V 1.2 pp. 136.22–138.14 De Lacy and *De mixt.* 231.12 ff. Bruns.

exemplify a fusion where the constituents are all dissolved without being mixed through and through, as in the total mixture) from this Groisard infers that when it comes to the topic of the reversibility of the elemental constituents, Galen, as it were, suddenly switches from the Aristotelian to the Stoic *Mischungslehre* (and therefore, incoherently, from a qualitativist to a corporealist physics) and no longer distinguishes between mixture and fusion, because he thinks that the ingredients are simply destroyed within the mixture, while they give rise to something else, a new property out of themselves.⁹⁹

These were the last relevant contributions that come out of Galen's elementary physics and, therefore, the starting points of our research, which closely follows Groisard's approach, although it expands the research field and develops a peculiar position that distances the present work from Groisard's. For although, as we will see further below, we acknowledge Groisard's identification of the similarities between Galen's and Alexander's models of mixture as a progressive division of corpuscles due to a qualitative interaction, therefore pursuing an innovative and perfectly up-to-date trend, we cannot do this without stressing some all-important critical points. First of all, Groisard does not consider the question of Galen's Hippocratic heritage, i.e. i) how the four-humour Hippocratic theory dovetails with the Galenic model of mixture; and ii) what impact the mainly Hippocratic idea of a symmetry of bodily constituents has on the Galenic account of mixture. Second, Groisard seems to interpret the Galenic sources so as to reconstruct a somewhat incoherent binary model of mixture, where the first phase (the progressive division) is in accord with Peripatetic physics, while the second phase (the reversibility, or better, the lack of reversibility) is in line with Stoic fusion. By contrast, we will show that by taking our primary sources into consideration along with a larger sample of evidence from the Galenic writings, every aspect of Galen's theory of mixture (constituents, progressive division, qualitative change, ontological status of the constituents in the mixture, generation of a *tertium quid*, and reversibility of the constituents) can be more coherently embedded into a revisited and rethought Aristotelian physics. Finally, Groisard does not place Galen's theory of mixture

⁹⁹ Groisard 2016 pp. 191–192 comments on *De caus. cont.* CMG Suppl. Or. II p. 56.14–19 Lyons. Cf. also Groisard 2016 pp. 194–195.

into a wider medical and philosophical framework. If on the one hand he neglects the nexuses (and the debate that has arisen) between Galen and contemporary Pneumatic medicine (which had already developed an idea of good mixture or *eukrasia* and a complex system of mixtures), on the other hand he does not relate, as we will, Galen's theory of mixture with his own profoundly teleological world-view regarding both the single individual and the entire cosmos.

INTRODUCTION – PART II

GALEN’S TERMINOLOGY OF MIXTURE

2.1 *Status quaestionis*

As we have seen, this thesis is composed of two parts: the first enquires into Galen’s theory of mixture, while the second focuses on Galen’s terminology of mixtures. The only specific study on Galen’s terminology of mixtures so far is the 2011 article, by Véronique Boudon-Millot, ‘La notion de mélange dans la pensée médicale de Galien: Mixis ou Crasis?’. As Boudon-Millot remarks, throughout his corpus, Galen makes use of two nouns to render the idea of mixture, κρᾶσις and μίξις, but because of the particularly high number of occurrences of the terms within Galen’s work (1519 for κρᾶσις and 345 for μίξις), she restricts her own study to some meaningful examples of the use of each term.¹⁰⁰

As Boudon-Millot observes, from *De temperamentis* I 1 (where Galen deals with the linguistic usage of the term) we can infer that he defines κρᾶσις as a “rapport de force entre les quatre qualités où l’une d’elles (ou bien deux d’entre elles dans les tempéraments dits composés) est appelée à dominer les autres”.¹⁰¹ As a matter of fact, Boudon-Millot declares, κρᾶσις is constantly utilized to indicate the mixture of *qualities* (hot, cold, dry, and wet) brought about by God or nature in living bodies; and it preserves the meaning, already attested in Homeric Greek, of “mélanger pour tempérer”.¹⁰² Moreover, Boudon-Millot is convinced that the Stoic terminology and notion of total mixture (δὲ

¹⁰⁰ Boudon-Millot 2011 p. 262 and p. 266

¹⁰¹ Boudon-Millot 2011 p. 265, comments on *De temp.* I 1 (= p. 1.1 H.)

¹⁰² Boudon-Millot 2011 pp. 266–267.

ὄλων κρᾶσις) deeply influenced Galen's usage of the term and notion of κρᾶσις.¹⁰³

With regard to the term μίξις, in commenting on some examples of Galen's usage, Boudon-Millot affirms that his notion of μίξις does not refer to the mixture in living beings but has the more narrow designation of a mixture of *inanimate substances* (fire, air, water, and earth).¹⁰⁴ This type of mixture is the only kind that can be brought about by human beings and coincides with a juxtaposition of constituents or παράθεσις.¹⁰⁵ However, this type of mixture does not remain a pure juxtaposition: the substances end up fusing together (here Boudon-Millot points to a correspondence between the Galenic usage of μίξις and the Stoic σύγχυσις¹⁰⁶), and for this reason Galen privileges the term μίξις in pharmacological applications: by means of the μίξις of various ingredients, it is possible to produce a new substance, a medicament.¹⁰⁷ Moreover, Galen's use of the term μίξις remains connected with the meanings of μείγνυμι conveying the image of the sexual union,¹⁰⁸ but indicates in a more technical manner the mixture of two substance (the male and female seeds), bringing about the generation of a new being.¹⁰⁹

2.2 Methodology

Boudon-Millot's study, although it stands alone, has evident limitations. First of all, she does not accurately examine Galen's terminology in relation to the original meaning, reconstructed through an etymological investigation, of κρᾶσις and μίξις. Second, she establishes a terminological and conceptual correspondence between Galen's use of κρᾶσις and μίξις and the Stoic, specifically Chrysippean, classification of mixtures without taking the

¹⁰³ Boudon-Millot 2012 pp. 276–277.

¹⁰⁴ Boudon-Millot 2011 p. 268.

¹⁰⁵ Boudon-Millot 2011 pp. 268–269, comments on *De temp.* I 9 (= p. 32.5ff. H.)

¹⁰⁶ Boudon-Millot 2011 p. 276–277.

¹⁰⁷ Boudon-Millot 2011 pp. 270–272.

¹⁰⁸ Boudon-Millot 2011 pp. 272–273, comments on *in Hipp. Nat. Hom. comment.* CMG V 9.1 p. 170.8ff. Mewaldt.

¹⁰⁹ Boudon-Millot 2011 pp. 273–273, comments on *De sem.* CMG V 3.1 p. 90.21 ff. De Lacy.

fundamentals of Galen's (Peripatetic) elementary physics or his Hippocratic background into account. Finally, she does not identify the multiplicity of meanings that, as we will see later on, κρᾶσις acquires in different contexts.

In this thesis, I will proceed in the following way. First of all, I will give an overview of the meanings that the etymological and Ancient Greek lexicons attribute to κρᾶσις and μίξις in order to understand the situation from a lexicographic standpoint. Second, since – as we will see later on – Ancient (etymological and not) lexicons do not arrive at a univocal solution, I will examine the original meaning of the roots of κρᾶσις and μίξις by summarizing the research of Elio Montanari, who addresses the issue in a 1979 monograph, *Κρᾶσις e μίξις: un itinerario semantico e filosofico*. Third, I will connect these original meanings both with the terminologies of the theoretical models Galen seems to reference (the Hippocratic, the Aristotelian and Peripatetic, and the Stoic, regarding the ways in which their terminologies have already been investigated by the secondary literature) and with Galen's own usage of κρᾶσις and μίξις. Since it is not possible for a doctoral thesis to deal with all the occurrences of κρᾶσις and μίξις in Galen's corpus, I limit myself to analysing only the occurrences that occur in our primary sources (see above).

2.3 Research objectives

I will pursue four research objectives in this thesis:

- a) The first is to bring to light Galen's usage of the terms κρᾶσις and μίξις, words which (as we will see in the third chapter) can indicate either a process of mixture or a state resulting from the process; by working on the basis of the occurrences I found in my primary sources and by supporting my claims through examples extracted from the entire Galenic corpus, I will investigate which meanings each term acquires in Galen's work relating to the mixture of primary elements.
- b) The second research goal is to understand if and in what way Galen uses the terms κρᾶσις and μίξις differently, and in what sense the difference between κρᾶσις and μίξις would dovetail with Galen's theoretical model of the

mixture of primary elements, which, as I will demonstrate, strictly depends on the contemporary Peripatetic model.

- c) Moreover, in my terminological study of Galen's notions of κρᾶσις and μίξις, I would like to understand the relation between Galen's usage of the term and the original meanings of these word-families (i.e. the basic set of meanings of these two word-families, κεράννυμι and μείγνυμι) in the form that they have been investigated in the secondary literature, especially by Montanari.
- d) Finally, I will also try to explain the relation between Galen's own terminology and those of other major theoretical models in which he was interested (the Hippocratic, the Aristotelian/Peripatetic, the Stoic) in order to understand how each influenced Galen and contributed to shaping his scientific lexicon of mixture.

PART ONE

Chapter I

Between Stoicism and the Peripatetic tradition. Galen's theory of the mixture of primary elements.

1 Galen's theory of the mixture of primary elements against the background of the Stoic/Peripatetic controversy.

A very useful text for starting an enquiry on Galen's account of the mixture of primary elements is the treatise *De mixtione* by the Peripatetic Alexander of Aphrodisias, Galen's (slightly younger) contemporary,¹¹⁰ insofar as this writing

¹¹⁰According to the traditional dates, Galen was born in 129 and died circa 199 (source: Suda); cf. Fazzo 2002 n. 1. However, according to Nutton it would be possible to postpone his death to the beginning of the 3rd century, on the basis of three main arguments: a) a passage preserved by an Arabic mediaeval author, as-Sijistani, reporting Alexander's critiques of Galen's agnosticism; b) the chronology of Galen's later writings that have to be placed in the Severan period—Nutton argues that the impressive amount of tracts from this phase could not have been completed by the traditional date of death; c) the authenticity of the work *De theriaca ad Pisonem*, which recounts an accident that befell the son of Piso during a performance of the *Lusus Troiae* dated to 204 CE; cf. Nutton 1995 pp. 30 ff.. Cf. also, more recently, Fazzo who reports that some medieval Arabic sources state that Galen and Alexander met in Rome; Fazzo 2002 p. 111 n. 2. As for Alexander, we know that Alexander's *De fato* is dedicated to the emperors Septimius Severus and Caracalla (who reigned jointly between 197 and 211). However, as Todd argues, since Geta was created Augustus in 209 but not mentioned by Alexander in *De fato*, it seems feasible that Alexander was appointed as holder of the chair in Peripatetic philosophy between 198 and 209 (although it is not known whether Alexander taught in Athens or not; cf. Sharples 1987 p. 1177 and n. 3; on this cf. also Todd, who is instead inclined to think that Alexander taught in Athens—1976 p. 1 n. 1); on this cf. Todd 1976 p. 1 n. 2. Therefore, chronologically, such an encounter might have indeed happened (even before 198), although there are two objective elements that might jeopardize such a claim. On the one hand Galen never explicitly refers to Alexander of Aphrodisias, although he does mention an Alexander of Damascus (*On prognosis* K. XIV 627.3–628.4) who is said to be holder of the Peripatetic chair in Athens (*Inquiries into Anatomy* K. II 218), cf. Todd 1976 p. 6 n. 29, and whom an Arabic author, al Mubaššir, mistakes for Alexander of Aphrodisias and calls

gives us an interesting view of the contemporary debate concerning theories of matter in Antiquity and provides us with a clear and historically framed picture of models of mixture and related issues in Galen's time. For this reason, it can work as a valuable reference point from which to compare Galen's own account to others of his time, and to understand and elucidate this comparison as clearly as possible.

In the opening chapter of his *De mixtione*, Alexander declares that theories of mixture depend on theories of matter, and the latter can be subdivided into atomistic and continuum theories.¹¹¹ In the case of atomistic theories, Alexander attributes an account of mixture to Democritus and to some extent to Epicurus, whose theories he briefly brings into focus¹¹² and then explicitly criticizes.¹¹³ Alexander claims that this mixture is a mere appearance and sensory illusion; he describes it as a mere juxtaposition of atoms placed next to one another (and in fact in the case of Democritus, Alexander calls it κρᾶσις κατὰ παράθεσιν).¹¹⁴

“Alexander of Aphrodisias of Damascus”; cf. Fazzo 2002 p. 116 n. 20. Cf. Todd 1976 pp. 4–11 and n. 29 for an account of Alexander of Damascus, with references. On the other hand, it is incontrovertible that Alexander of Aphrodisias knew of Galen, but he quotes him among other philosophers (such as Plato and Aristotle), and hence already as an *auctoritas* to which to appeal; this suggests distance—also temporally; cf. Alex. *In Top.* 549.24 Wallies. What seems ultimately more plausible in this regard is that as Galen and Alexander lived in the same period, and shared and displayed the same Peripatetic tendencies in their writings, although Galen eclectically combines the study of Peripatetic philosophy with many other philosophical inputs, as we will shortly see. Moreover, in this regard it has to be noted that, as far as we can gather from Greek and Arabic sources, they knew the same Peripatetic teachers, such as Aspasius (under one of whose students, probably Eudemus of Pergamum, Galen studied; cf. Moraux 1984 p. 687 n. 1), Herminus (*contra* Fazzo 2002 pp. 116–117), and Aristotle of Mytilen (cf. Todd 1976 p. 3 and pp. 11–12, with references, cf. also Rescher and Marmura 1965 p. 1 and p. 12 n. 5, cf. Sharples 1987 pp. 1177–8 and n. 8 and 9 with references). For an updated and well-documented overview of the extant Greek and the Arabic sources at our disposal, cf. Fazzo 2002. On the basis of her reading of these sources Fazzo sceptically questions the orientation recently adopted by some scholars to interpret the Greek sources through the polemic, in Fazzo's view more legendary than real, between Alexander of Aphrodisias and Galen, reported by some surviving mediaeval Arabic sources; cf. Fazzo 2002 p. 111ff.

¹¹¹ *De mixt.* 213.13 ff. Bruns. More precisely, Alexander distinguishes between those who say that matter is unified (corresponding to the Stoic and the Peripatetic schools) and those who say that it is divided and discrete (οὐ γὰρ μόνον διηρέθησαν πρὸς ἀλλήλους περὶ τοῦδε τοῦ δόγματος οἱ μίαν ὕλην ὑποκεῖσθαι πᾶσι τοῖς ἐν γενέσει σώμασιν λέγοντες πρὸς τοὺς ἐκ διωρισμένων τε καὶ κεχωρισμένων σωμάτων ποιούντας αὐτήν).

¹¹² *De mixt.* 214.16–215.8 Bruns.

¹¹³ *De mixt.* 215.8–216.1 Bruns.

¹¹⁴ As Todd 1976 p. 184 and Groisard 2013 p. 56 aptly observe, this “Democritean theory” (*De mixt.* 214,18-28 Bruns = D.-K. 68A 64) reconstructed by Alexander seems to be a reference to the first model of mixture, with its juxtaposition of constituents escaping the sense-perception, rejected by Aristotle in *De gen. et corr.* I 10 328a8–16. However, as Todd notes *ad loc.*, there is no good evidence for attributing the theory of a κρᾶσις κατὰ παράθεσιν to Democritus. As regards Epicurus, Alexander claims that the difference seems to be that according to Epicurus the mixture does not occur through a simple juxtaposition of corpuscles but after a reduction of

However, while in this writing Alexander quotes and overtly attacks both Democritean and Epicurean atomism, he actually dedicates much more attention to two rival schools, the Stoics and his own Peripatetic school.¹¹⁵

On the one hand, as leading proponents of a continuum theory of matter, the two schools are united in their rejection of any form of atomism and the conviction that matter is entirely unified, continuously sub-divisible, and underlying everything that comes to be. Furthermore, both their elemental systems—albeit formulated differently—descend from and consist of the four intertransmutable Aristotelian “elements” (fire, air, water, and earth, although in the Aristotelian thinking they are more correctly labelled as “simple bodies”),¹¹⁶ undergoing processes of mixture.

the latter to the elements producing them (*De mixt.* 214.28–215.8 Bruns = U290). This process of reduction of the constituents to the elements is called by Alexander ἀναστοιχείωσις (*De mixt.* 215.20 Bruns).

¹¹⁵ Alexander’s *De mixtione* is characterized, like his other monographs, by a tripartite structure: enunciation of the topic, a *pars destruens* that is a polemic section of criticism of other heterodox philosophical accounts relating to a given issue, and finally a *pars construens* coinciding with the exposition of Aristotle’s doctrine on a particular subject matter. Alexander’s *De mixtione* fully respects this schema. For Alexander dedicates Chapters one and two to the exposition of the topic of mixture and the debate concerning theories of matter in Antiquity, the Chapters three to twelve to description and refutation of the Stoic account, and Chapters thirteen to fifteen to the exegesis of Aristotle’s model. In addition, it presents a sort of polemic appendix against the Stoic account of growth (Ch. 16). On the structure of *De mixtione* cf. Groisard 2013 pp. 17–20.

¹¹⁶ The origins of both the elemental systems, their association with the primary qualities, and reciprocal relations are difficult to track down. In the fifth century, Empedocles, together with the other Early Pluralists (Anaxagoras and the Atomists), exemplifies the growing conviction that a single underlying substance, such as were water, air, fire, or some “indefinite” principle, would not have been sufficient to explain the way in which natural objects and living beings can come to be out of the combination of the elemental substances. In contrast to his contemporaries (who proposed, respectively, the Everything-in-Everything theory and the atomistic solution), Empedocles was convinced that everything is composed out of four material elements moved by two opposing forces, Love and Strife, i.e. aggregation and separation (cf. D.-K. B 17, B 71 and *alibi*). These elements, which Empedocles calls more precisely “roots” (*rizomata*), are identified with fire, air, earth, and water. As regards the four primary qualities, as Lloyd points out (cf. Lloyd 1964 p. 100), the first extant physical theory where hot, cold, dry, and wet are regarded as the ultimate cosmic constituents is the Hippocratic *De natura hominis*. As Rashed underscores, this Hippocratic treatise and *De victu* (where fire and water are associated with the four qualities) are at the root of Aristotle’s qualitativism of *De generatione et corruptione*. For in this Aristotelian treatise each primary element, coming from the quadripartite Empedoclean system, is associated with two primary qualities (*De gen. et corr.* 330b3–5: fire is hot and cold, air is moist and hot, water is cold and moist, earth is dry and cold); cf. Rashed 2005 pp. 24–26; cf. also Vizgin 1980, Althoff 1992 p. 12–13 n. 8 and 9, cf. Longrigg 1993 pp. 220–226. Moreover, as Rashed argues, on close inspection of the text of *De gen. et corr.*, Aristotle seems to reveal that he is also well acquainted with the theories of Philistion of Locris, the first to draw a connection between the four Empedoclean primary elements and the four *dynameis* (cf. fr. 4 Wellmann); cf. Rashed 2005 pp. 35–48, whose activity seems to be posterior to the composition of *De natura hominis* (420–400 BCE). For Philistion was active at the court of Dionysius II the Younger in Syracuse (cf. Ps.-Plato’s Letters II 314d = fr. 2 Wellmann); cf. Jouanna 2002 pp. 51 n. 4. In Philistion’s system fire is hot, air *cold*, water *moist*, and earth *dry*; cf. fr. 4 Wellmann. Philistion’s

However, as clearly emerges from the treatise, the Stoic and the Peripatetic schools expressed conflicting views regarding both how these primary elements mix with one another and which place this theory occupies within their philosophical systems. In this respect, Alexander's *De mixtione* and his ferocious attack on the Stoic theory of total mixture are fundamental for reconstructing both theories in the way in which they presented themselves to Galen's eyes. But it is also fundamental for clearly laying out the related debate which, though germinated centuries before, flourished to the fullest in Galen's and Alexander's time.

For our purposes, I shall briefly summarize, on the one hand, the Stoic, and especially the Chrysippean, theory of total mixture together with the critiques offered by its opponents—principally Alexander—and, on the other hand, the Peripatetic account issuing from Aristotle. I will integrate pieces of evidence that we can gather from Alexander's *De mixtione* with other extant sources in order to outline both the Stoic and the Peripatetic theories and place them within their respective philosophical systems. Afterwards I will deal with Galen's theory of the mixture of primary elements more specifically, with a threefold aim.

In the first place, I will illustrate the peculiar constitutive features of Galen's theory of the mixture of primary elements, which, although it is formulated in very syncretistic terms and has to be understood within its manifold medico-philosophical *milieu*, reveals a proper internal coherence. Therefore, from this perspective my goal will be to unfold the main key issues relating to the physical process of Galen's mixture and in this sense I will try to make clear: i) what is the exact mechanism of mixture ii) which ontological status pertains to the constituents in the mixture and iii) in which relation they

Ur-qualitativism seems to have been a deciding factor also in the development of the Stoic coupling between primary elements and primary qualities; and it was possibly through the mediation of Diocles of Carystus (a physician very close to the Peripatetic school), that it was adopted by the founder of the Stoic school; cf. Longrigg 1975 pp. 227–228. As well as Aristotle's primary elements, the Stoic ones are capable of mutual transformation, but between the two systems there is a fundamental difference. While Aristotle's primary elements turn into one another because of an exchange of two of the qualities within the underlying substratum, the Stoic elements transform into one another through a change in density and volume cf. Hahn 1985 pp. 42–43. This difference is very clearly spelled out by Galen in *De nat. fac.* pp. 106.4–107.7 H. (= SVF II 406); cf. Hahn 1985 p. 48 with n. 34.

stand to each other while mixed, iv) what the final outcome of the mixture is, and v) to what extent in Galen's account the process of mixture is reversible.

In the second place, while dealing with Galen's account I will *pari passu* relate it to the above mentioned contemporary Stoic/Peripatetic controversy in order to show in which terms and to what extent Galen, as well as his predecessors and contemporaries, took an active part in this debate, preserving his own ideals of anti-dogmatism and faithfully sticking to his own criteria of truth and to his epistemological outlook.

Finally, my aim will be to bring to light some clues that can lead us to establish a linkage between Galen and the contemporary Peripatetic account of mixture as opposed to the Stoic model of mixture, although, as we have seen, most recently it has been argued that there might be analogies between the Galenic and the Stoic theory of total mixture¹¹⁷. As we will shortly see, these analogies seem to me to hold only up to a point, whereas, as it will be shown, there are much more cogent reasons to think that the Peripatetic account together with some due integrations from Galen's Hippocratic background would better fit into Galen's own medical and philosophical system.

1.1 The Stoic theory of δι' ὅλων κρᾶσις (total mixture) from Zeno to Chrysippus. Textual evidence, aim and justification of the theory.

The Stoic idea of total mixture (ὅλων δι' ὅλων κρᾶσις), whose roots can be traced back to the founder of the school, Zeno,¹¹⁸ became over time one of the linchpins of Stoic physics and metaphysics, especially with the third head of the Stoic school, Chrysippus.

Here I will give an overview of the textual evidence that we have for Zeno and Cleanthes, and then I will discuss the Chrysippean formulation in more detail. In analysing the sources, my focus will be to explain i) the modality of

¹¹⁷ Cf. Intr. I pp. 29ff.

¹¹⁸ Regarding Zeno's account of mixture, cf. Mansfeld 1982 and 1983. See SVF I 102 and I 92. Mansfeld explicitly rejects Todd's view that Zeno did not formulate a theory of total mixture; see Mansfeld 1983, p. 306 n. 1. Cf. Todd 1976 p. 30 n. 44. More recently, Collette-Dučić and Delcomminette have reaffirmed the Zenonian origins of the Stoic theory (Collette-Dučić and Delcomminette 2006 pp. 5–6 with nn. 1, 2, and 3).

the mixture, ii) the elements of both continuity and innovation of the Chrysippean model in relation to the previous Stoic accounts, iii) the aim and justification of the theory, and iv) critiques made against it in Antiquity, from the earliest criticism offered by the Academic Arcesilaus to Alexander of Aphrodisias (which also entails a comparison with the Peripatetic model of mixture).

The textual evidence at our disposal for Zeno's and Cleanthes' accounts is scant. As we can gather from the extant sources, Zeno's notion of mixture appears to be linked to the generation of the cosmos, that is, the generation of the primary elements and living beings within it (SVF I 102).

In the first section of SVF I 102, which is part of Arius Didymus fr. 38 and reported in Stobaeus I.17, a chapter entitled “On mixture and blending” (Περὶ μίξεως καὶ κράσεως), we have—integrated into a doxographical report—a *verbatim* (διαρρήδην) report of Zeno's account of cosmogony. Zeno describes the cosmogony at the beginning of a new cosmic cycle when the elements change (the term used is τροπή) into one another: from fire comes to be water through air, then a portion of this water turns into earth by condensation and another portion into air through vaporization, and then a part of this latter changes into fire again through a process of rarefaction. Afterwards he adds: “τὴν δὲ μίξιν [μ. secl. von Arnim; μ. <καὶ> Diels] κράσιν γίνεσθαι τῆ εἰς ἄλληλα τῶν στοιχείων μεταβολῆ σώματος ὅλου δι' ὅλου τινὸς ἑτέρου διερχομένου”¹¹⁹. In this section of the fragment two elements are worth stressing. The first is a rather problematic connection between mixture and transformation of the elements into one another; the second is the corporealistic view, which will also be maintained afterwards as the main characteristic of this theory. For the bodies are said to go through one another as wholes (σώματος ὅλου δι' ὅλου τινὸς ἑτέρου διερχομένου).

¹¹⁹ SVF I 102 (= Stob. *Ecl.* I 17.3 152.19 Wachsmuth = Ar. Did. fr. 38) Ζήνωνα δὲ οὕτως ἀποφαίνεσθαι διαρρήδην· τοιαύτην δὲ δεήσει εἶναι ἐν περιόδῳ τὴν τοῦ ὅλου διακόσμησιν ἐκ τῆς οὐσίας, ὅταν ἐκ πυρὸς τροπὴ εἰς ὕδωρ δι' ἀέρος γένηται, τὸ μὲν τι ὑφίστασθαι καὶ γῆν συνίστασθαι, ἐκ τοῦ λοιποῦ δὲ τὸ μὲν διαμένειν ὕδωρ, ἐκ δὲ τοῦ ἀτμιζομένου ἀέρα γίνεσθαι, λεπτυνομένου δὲ τοῦ ἀέρος πῦρ ἐξάπτεσθαι, τὴν δὲ μίξιν [μ. secl. von Arnim; μ. <καὶ> Diels] κράσιν γίνεσθαι τῆ εἰς ἄλληλα τῶν στοιχείων μεταβολῆ σώματος ὅλου δι' ὅλου τινὸς ἑτέρου διερχομένου.

The second piece of evidence at our disposal is the second part of SVF I 102, a cosmological report by Diogenes Laertius (VII 135–136 = SVF I 102 p. 28.22–29 and VII 142 = SVF I 102 p. 28.29–29, 2 = SVF II 581 p. 180.17–23). In the first part of Diogenes’ account (VII 135–136) we find a description of the cosmogony before the creation of the primary elements: at the beginning God (or intellect, fate, or Zeus) was in himself (καθ’ αὐτόν) and changed the entire substance into water through air. As the seed is embraced in the seminal fluid, this too (the god), *qua spermatikos logos*, is left behind as such in the wet, making the matter adapt to the generation of the things to come next; and so he gives rise to the four elements first of all, namely fire, water, air, and earth. Further in the text (VII 142), after describing the action of God on the qualityless substance or prime matter, leading to the generation of the cosmos, Diogenes Laertius outlines the Stoic elemental cycle, which seems to correspond closely to Zeno’s quotation as we find it in Stobaeus, as the fire changes into ὑγρότης (whereas in Stobaeus and in Diogenes’ previous passage—VII 135–136—we have “water” ὕδωρ) through air, then a thicker part of this water becomes earth and another part becomes first air and then fire again, through a process of rarefaction. Afterwards Diogenes adds that out of the mixture of these elements¹²⁰ come to be plants, animals, and the other γένη (εἶτα κατὰ μῆξιν ἐκ τούτων φυτὰ τε καὶ ζῷα καὶ τὰ ἄλλα γένη).

¹²⁰ One of the most puzzling difficulties of Stoic physics is the coincidence between the different phases of the cosmogony and the elemental change. For elemental change is also used (together with the biological image of reproduction and birth and the body–soul relation, cf. Hahm 1977, pp. 57 ff.) to explain the origin of the cosmos (for Zeno’s, Cleanthes’, and Chrysippus’ cosmogonies, cf. the basic study by Hahm 1977 esp. pp. 57–82; for Stoic elemental change cf. Hahm 1985; furthermore, some cosmogonical aspects and the divergences between Cleanthes and Chrysippus are discussed by Salles 2009a, pp. 118–134, which is however mainly devoted to the topic of the conflagration or the ending phase of the world-order). In Zeno’s cosmology, there is a difference between the elemental change leading to the constitution of the world-order and the real primary elements and it is important to stress this distinction in order to precisely determine the constituents of Zeno’s mixture. Hahm has pointed out that the real elements come to be from a pre-elemental stage of pure water, cf. Hahm 1977 p. 57, and indeed in Diogenes Laertius’ cosmological report (VII 135–136) it is said; “In the beginning he (*sc.* God) was by himself; he transformed the whole of substance through air into water, and just as in animal generation the seed has a moist vehicle, so in cosmic moisture God, who is the seminal reason of the universe, remains behind in the moisture as such an agent, adapting matter to himself with a view to the next stage of creation. Thereupon he created first of all the four elements, fire, water, air, earth (εἶτα ἀπογεννᾶν πρῶτον τὰ τέσσαρα στοιχεῖα πῦρ, ὕδωρ, ἀέρα, γῆν)” (trans. Hicks). More recently, Cooper has followed this suggestion and distinguished proto-elements of the cosmogony from the real primary elements originating from the watery stage; cf. Cooper 2009 pp. 105–107. As Salles also notes, this watery stage is fundamental for Zeno’s theory of elements; cf. Salles 2013 p. 11 (“Cause et Matière dans la cosmologie Stoïcienne”, paper

Therefore, we see that the mixture of the four mutually transformable (corporeal) elements going through one another as wholes is used to account for the generation of compounded bodies. As Diogenes says afterwards in the same report, Zeno would have described topics concerning the generation and corruption of the cosmos (and presumably of the compounded bodies within it) in his work *On the whole* or *περὶ τοῦ ὅλου*. It therefore seems reasonable to think that Zeno expounded his theory of mixture in this work.

De facto, what we can glean from the texts at our disposal is very little. We can safely say that Zeno formulated a theory of mixture and that the constituents of the mixture are the four mutually transformable corporeal elements, which go through one another in the process. These are two essential features of the theory that will also be maintained afterwards: the corporealistic perspective and the connection of mixture with the element theory.¹²¹ Moreover, it seems reasonable to think that the theory of mixture was treated in a specific work, *On the whole*, concerning topics in generation and corruption of the cosmos, and would have accounted for the generation of every animate and inanimate being (εἶτα κατὰ μίξιν ἐκ τούτων φυτά τε καὶ ζῶα καὶ τὰ ἄλλα γένη = SVF I 102 = Diog. Laert. VII 142).¹²²

delivered at the seminar “Causes et Principes de l’Antiquité au Moyen Age” at the Centre Leon Robin, Paris, 16th May). In the two accounts (Stobaeus and the second section of Diogenes’ report) describing Zeno’s theory of mixture, however, this distinction between proto-elements and real elements is not so straightforward, but if Cooper is right in distinguishing two sets of turning in the Zeno-Chrysippean cosmogony—(i) first set of turning: proto-fire-air-water and (ii) second set of turning: from the proto-watery stage actual earth is produced, from the same water the element water is produced, and through rarefaction actual air and fire are produced; cf. Cooper 2009 pp. 106–107—and since the mixture in both reports is said to be taking place after the proto-water stage, we can therefore say that in Zeno’s account the primary elements are at work.

¹²¹ Collette-Dučić and Delcomminette 2006, p. 6.

¹²² The gap in the evidence has been bridged by Jaap Mansfeld, who tries to clarify some obscurities and in the meantime give an overall interpretation of Zeno’s account of mixture. In the first place, Mansfeld explains the connection between the mixture and mutual transformation of the elements by postulating the influence of Aristotle’s theory of mixture on Zeno’s. Indeed the questionable link between mixture and mutual transformation of the primary elements had already been noted by von Arnim, who in his critical apparatus annotates *γίγνεσθαι-μεταβολῆν vix sana; nam κρᾶσις non potest fieri τῆ εἰς ἄλληλα μεταβολῆν*. Contrary to von Arnim, Mansfeld says that this textual problem can be solved on the assumption that here Zeno is influenced by Aristotle. As Mansfeld aptly observes by making reference to *De gen. et corr.* II 7–8, Aristotle’s homoeomerous parts come to be from a mixture in which the primary elements have changed into one another. As Mansfeld rightly points out, the coming to be of mixed compounds is a “special case” of the reciprocal transformation of the elements, when the contraries meet one another *half-way*; and in his view this would be the point of contact with Zeno’s account, where the mixture is linked to reciprocal elemental transformation, with the only—albeit considerable—difference being the corporealistic perspective; cf. Mansfeld 1983 pp. 307–308.

Cleanthes' account of mixture can be gathered from a rather obscure report by Stobaeus *Ecl.* I 17.3 p. 153.7 Wachsmuth (= SVF I 497 = Ar. Did. fr. 38) which is part of his chapter *On blending and mixture*. In his meticulous analysis of this passage, Hahm divides Stobaeus' paraphrase into two sections. The first section describes a pre-cosmic stage where a first mass of fire undergoes variations leading to the constitution of the world-order (διακοσμεῖν).¹²³ The second section seems to preserve vague traces of Cleanthes' doctrine of mixture and perhaps on the account of this it was added to Stobaeus' chapter *On blending and mixture*. Literally, Stobaeus reports the following statement: “for as all the parts of a thing grow from the seeds at appointed times, so also the parts of the whole, among which there are for example animals and plants, grow at the appointed times; and as certain *logoi* of the parts, coming together into a seed, are mixed and separate out again when the parts come to be, so all things come from one and one is combined from all (καὶ ὡςπερ τινὲς λόγοι τῶν μερῶν εἰς σπέρμα συνιόντες μίγνυνται καὶ αὖθις διακρίνονται γινομένων τῶν μερῶν, οὕτως ἐξ ἑνός τε πάντα γίνεσθαι καὶ ἐκ πάντων ἓν συγκρίνεσθαι,) the cycle proceeding harmoniously on its course”. As Hahm points out, this section describes an alternation between the one and the many: during the process of

A further confirmation that Zeno was influenced by Aristotle, in Mansfeld's view, is the connection between mixture and zoogony (cf. the abovementioned passage from Diog. Laert. VII 142 = SVF I 102 where the mixture serves as explanatory basis of the generation of animals, plants, and other genera: κατὰ μίξιν ἐκ τούτων φυτὰ τε καὶ ζῷα καὶ τὰ ἄλλα γένη); cf. Mansfeld 1983 p. 310. However, although Mansfeld's interpretation of Zeno's account may be one position to take into account, it seems to be lacking more stable support of textual evidence; and in any case, if really worked for Zeno, it seemingly did not prove to be appealing for the Stoics yet to come, such as Chrysippus—as we will shortly see.

¹²³ The first change begins in the middle with a process of sinking (συνίζειν), which as Hahm points out, is often associated in Stoic texts with the formation of earth (SVF I 104; II 569). The second change seems to correspond to a process of quenching of adjacent parts (εἶτα τὰ ἐχόμενα ἀποσβέννυσθαι δι' ὅλου). Then, as the testimonium reports, all has become wet (Τοῦ δὲ παντός ἐξυγρυνθέντος) and this image seems to refer to the second change, from earth to water. Afterwards the extreme part of fire (which according to Hahm coincides with the part of fire remaining after earth and water have been formed in the middle region) moves upwards and starts structuring the cosmos (ἄρχεσθαι διακοσμεῖν τὸ ὅλον). In fact, Hahm confutes this sequence (fire/earth/water/fire) and argues that it may be due to Stobaeus' misunderstanding or to the inaccuracy of his source. According to Hahm's reconstruction, this sequence in fact conflicts with the Stoic orthodox account according to which fire turns first into water through air. This misunderstanding might be due to the fact that Cleanthes heavily reworked Zeno's account provided in *On the whole*, which takes up a single volume, in his *On the natural science of Zeno*, given in in two books (SVF I 481), and in the doxographic abridgement there might have arisen confusions; cf. Hahm 1977 pp. 240–248. Recently Salles has questioned Hahm's reconstruction (Salles 2013 pp. 12–14) and is inclined to restore the sequence fire/earth/water/fire as originally Cleanthean and set in opposition to Zeno's.

generation of the world-order the cosmos in fact consists of the four elements, giving rise to the parts of the whole, whereas in conflagration it consists of only one element, which absorbs within itself the whole substance (fire, cf. SVF I 98; II 596; II 618; II 626).¹²⁴ In this section it seems that it is the *spermatikoi logoi* that are mixed and separated out when the parts (of the cosmos, including animals and plants) come to be. By comparing this account with Zeno's, we note that two accounts of mixture are both related to the generation of the cosmos, including animals and plants. However, whereas in Zeno the mixture is connected with the elemental transformation and it seems to be a mixture of the primary elements, in Cleanthes it is the *spermatikoi logoi* that come together and mix, and once set apart give rise to the parts of the cosmos. This difference, however, seems to be only a matter of technical detail, as it is god (who at the conflagration stage is pure fire, encompassing within it the *spermatikoi logoi*) who gives rise to the other elements and then to the multiplicity of the world by acting on the substance or prime matter (Cf. SVF I 102 = II 580).¹²⁵ In Cleanthes' case too, therefore, the mixture is connected to the constitution of the world-order and the generation of every existing thing in the cosmos.

In the case of Chrysippus we definitely have more evidence from which to reconstruct his theory of total mixture¹²⁶. We know from two sources that

¹²⁴ Hahm 1977 pp. 241–242.

¹²⁵ Further, as Mansfeld notes, in Zeno's there might also be a connection between mixture and *spermatikoi logoi*. In Zeno's theory of reproduction, in fact (SVF I 128), the male seed is defined as pneuma in liquid form πνεῦμα μεθ' ὕγρου and as a fragment (ἀπόσπασμα) of the soul and is said to be mixed with the parts of the soul according to the mixture of the *logos* of the forefathers (ἀνθρώπου δὲ σπέρμα, ὃ μεθήσιν ὁ ἄνθρωπος μεθ' ὕγρου, συγκίρνασθαι (λέγουσιν) τοῖς τῆς ψυχῆς μέρεσι κατὰ μιγμὸν τοῦ τῶν προγόνων λόγου). In order to explain Zeno's description, Mansfeld links this account of the male seed containing the seminal reason of the forefathers with the theory of the *spermatikoi logoi*, that is, divine enmattered seeds that grow progressively together with the cosmos providing it with their rational structures; cf. SVF I 102 and SVF II 1027. For the relation between the Stoic *spermatikoi logoi* and theory of reproduction in its manifold context (with references to the Presocratics, Hippocratic medicine, Plato, and Aristotle), cf. the accurate study by Hahm 1977, esp. pp. 60–75.

¹²⁶ As we have no original extant Chrysippean treatise dealing with the subject, our sources fall into two main types. The first group includes: doxographical reports (Stobaeus *Eclogae* I.17.4 153.24 Wachsmuth = Ar. Did. Fr. 28 = SVF II 471) and testimonies from biographical tradition (Diogenes Laertius VII 151 = SVF II 479) or summaries of Greek philosophy in religious writings (Hippolytus *Philos.* 21 571.23 DDG = SVF II 469; Philo *de conf. ling.* 264.23 Wendland = SVF II 472). The second group includes philosophical sources which contain the reception and criticism of the Stoic theory (Galen *in Hipp. Nat. Hom. comment.* CMG V 9.1 p. 19.4 Mewaldt = SVF II 463; Galen *De elem. sec. Hipp.* CMG V 1.2 p. 136.15 De Lacy = SVF 465; Plutarchus *De comm. not.* 1077e, 1078b = SVF II 465 and 1078e = SVF II 480; Alexander of Aphrodisias *De mixtione* 219.16 Bruns = SVF II 466; *De mixtione* 216.1 Bruns = SVF II 470; *De mixtione* 216.14 Bruns; *De mixtione* 221.16 Bruns = SVF II 474; 226.34 Bruns = SVF II 475; *De mixtione*

Chrysippus dealt with the topic of total mixture in the third book of his *Physics* (SVF II 479) and in the first book of the *Physical Enquiries* (SVF II 480). The theory of total mixture seems to have been formulated before Chrysippus, as it was criticized by the Academic sceptic Arcesilaus.¹²⁷ Alexander, however, attributes this theory directly to Chrysippus and for our purposes it is of relevance to note that still in the 2nd century CE, that is by Galen's time, this was still the mainstream theory (SVF II 473)¹²⁸.

First of all, differently from his predecessors Zeno and Cleanthes, Chrysippus seems to have systematized the theory of mixture, as his theory has been handed down to us embedded in a tripartite classification of mixtures. In fact, in his *De mixtione*, Alexander attributes to Chrysippus the classification of mixture, which apart from the total mixture includes παράθεσις or juxtaposition by contact of the constituents, such as a heap of grains, and σύγχυσις or fusion, which occurs through a joint destruction or σύμφθορσις of the constituents and brings about a new superior quality, such as in the case of the production of medicaments.¹²⁹ This is the first element of innovation: the systematization of the typology of mixtures, since in Zeno and in Cleanthes we do not find any evidence of such a classification.

As for the total mixture (δι' ὅλων κρᾶσις), according to the evidence at our disposal, differently from juxtaposition and fusion, a mutual coextension (called ἀντιπαρέκτασις or described by the correspondent verb ἀντιπαρεκτείνω, cf. SVF II 471, II 472, II 473 II 479)¹³⁰ of the ingredients takes place so that they are

213.2 Bruns = SVF II 481; Alexander of Aphrodisias *Quaest.* II 12 57.9 Bruns = SVF II 476; Alexander of Aphrodisias *Mant.* 139.30 Bruns = SVF II 477; Simplicius *In Aristot. Phys.* 530.9 Diels = SVF II 467; Themistius *Paraphr. In Aristot. Phys.* IV 1 p. 256 Spengel = SVF II 468; Plotinus *Ennead.* II.7.1 p. 127 Müller = SVF II 478).

¹²⁷ *De comm. not.* 1078b–c.

¹²⁸ It has to be noted that Alexander refers to a diversity of opinions within the Stoic school as regards the theory of total mixture. Although Chrysippus' theory would have had the best reputation, according to Alexander, other later Stoics were influenced by Aristotle's views on the theory of mixture; Alexander explicitly makes mention of Sosigenes, a student of Antipater (cf. *De mixt.* 216.4–13 Bruns); cf. Groisard 2013 pp. 58–60

¹²⁹ Apart from SVF II 473 (= *De mixt.* 216.14 ff. Bruns) also Arius Didymus (SVF II 471 = Ar. Did. Fr. 28) attributes this classification to Chrysippus; cf. also the unattributed classifications present in SVF II 472 (Philo *De conf. ling.* 264.23 ff. Wendland) and An. Lond. XIV 16–23 Manetti. On Chrysippus' terminology cf. ch. III pp. 213 ff.

¹³⁰ As Todd explains, the verb ἀντιπαρεκτείνω is used in ancient Greek texts to describe a process of coextension and it is applied to the movement of the cavalry extending in line with a wall; or more conceptually, it is said of a point extending and becoming equal to a line. The concept is also applied in theological contexts, for example Greg. Naz. *Or.* 43 p. 852e, which refers to a human ἀντιπαρέκτασις towards God; cf. Todd p. 32 n. 53 for further references. Todd's point is

preserved in their own substance and qualities¹³¹ and at the same time their volumes completely and mutually coextend with one another: practically speaking, the final result is that the two bodies will coexist in the same place¹³².

The peculiarity of this mechanism of mutual coextension of the ingredient volumes is that it could also account for mixtures between bodies unequal in bulk. For according to the Stoics, this process would allow a body small in bulk to mix with another far greater. No matter how small a body is, through this process its volume will come to be coextensive with the other and every part of it will be present in the blend without increasing the overall volume.¹³³ This borderline case is well described by the paradox of the drop of wine mixing with the entire sea. For if it is possible, as Chrysippus says, that “there is nothing to prevent a single drop of wine blending with the sea”, then “in the blending the drop will extend through the whole universe.”¹³⁴ This Chrysippean paradox explicitly breaches one of Aristotle’s requisites of mixture, i.e. equilibrium

to stress the coextension of a small entity with a greater one. However, although this is a distinctive feature of the coextension, Long and Sedley point out that that is just one possibility and that the mechanism could account also for the mixture of bodies relatively equal in bulk; cf. Long and Sedley 1987 p. 293. Many sources in fact express this phenomenon by recourse to the expression “body going through the body” (σῶμα χωρεῖν διὰ σώματος) (SVF II 469, II 468, II 465), which points to the reciprocity of the process. However, Todd rejects this expression as un-Stoic insofar as it is absent in the primary sources (what he refers to as primary sources, i.e. fragments with *verbatim* quotations); cf. Todd 1976 p. 74. Most recently, as well as Long and Sedley, Collette-Dučić and Delcomminette have reaffirmed the reciprocity of the process of coextension on the basis of their reading of the texts, cf. Collette-Dučić and Delcomminette 2006 pp. 32–33. As Todd notes, in one case the process of coextension is associated with fusion (SVF II 472), but it seems to be a misunderstanding of the theory: Todd 1976 p. 51 n. 128 and pp. 56–57 and n. 143.

¹³¹ Cf. *De mixt.* 216.26–28 Bruns; Todd 1976, p. 33. Moreover, in Stob. *Ecl.* I.17.4 155.3 Wachsmuth (SVF II 471 part), the qualities of each of the constituents of total mixture are said to συνεκφαίνεσθαι, “to show forth together”. Cf. also Philo *De conf. ling.* 264.23 Wendland (= SVF II 472). The example given by both is that of a sponge soaked in olive oil, by means of which the original water and wine can be recovered from the mixture.

¹³² SVF II 465, II 466, II 468, II 475, II 476, II 477, II 481.

¹³³ As we can infer from Alexander’s criticism in *De mixt.* 219.9–14 Bruns, “if they deny that bodies receive one another in this way, but say that insofar as they are full they go through one another, one might first inquire why any given body does not contribute to an increase in the size of a similar body in all dimensions; for by such a mutual composition *quanta* make their compound greater than each of the components” (trans. Todd). However, as Collette-Dučić and Delcomminette perceptively note, sometimes the mixture does produce an increase in the volume, cf. the example of incense and of fire (*De mixt.* 220.16–18 Bruns). Cf. also Plotinus’ report according to which the Stoics uphold that in the majority of cases there is no increase in volume (and therefore not in all cases), cf. SVF II 478 and cf. Collette-Dučić and Delcomminette 2006 p. 52. This point is also made by Nolan 2006 pp. 169–170.

¹³⁴ Two fragments explicitly attribute this paradox to Chrysippus: Plutarch *de comm. not.* 1078e (= SVF II 480) and Diogenes Laertius VII 151 (= SVF II 479); cf. also Alexander’s *De mixt.* 217.31–32 Bruns.

between the constituents. In his *De generatione et corruptione* (I 10 328 a 23–31), Aristotle gives the very same example as we find in Chrysippus, namely the mixture of wine and water, but he clearly spells out that the mixture of a drop of wine with a large amount of water is not a proper mixture, but only an increase of the dominant body, because the drop of wine loses its εἶδος and turns into the whole water (οὐ ποιεῖ μίξιν, ἀλλ' αὐξήσιν τοῦ κρατοῦντος· μεταβάλλει γὰρ θάτερον εἰς τὸ κρατοῦν, οἶον σταλαγμὸς οἴνου μυρίοις χοεῦσιν ὕδατος οὐ μίγνυται· λύεται γὰρ τὸ εἶδος καὶ μεταβάλλει εἰς τὸ πᾶν ὕδωρ).

Be it a polemic answer to Aristotle or not, as it has been argued,¹³⁵ this Stoic paradox expresses in a nutshell the Chrysippean adjustment of the theory of total mixture to the idea of interpenetration between pneuma and matter. For by accounting for a mixture between bodies unequal in bulk, it would clearly have been very suitable to explain how the rare, light, and tenuous pneuma can totally pervade far greater portions of water and earth.¹³⁶ For according to Todd, it is highly likely that Chrysippus first adopted the theory of total mixture in order to illustrate the relation between pneuma and passive matter and more precisely pneuma's motion through matter.¹³⁷

In Todd's view, this theory is only an analogical and fictive example used by Chrysippus in order to illustrate the relation between pneuma, which in turn is a mixture of the active elements, fire and air, and passive matter, constituted by the passive elements (water and earth cf. SVF II 418). For differently from

¹³⁵ According to Pohlenz (1947 II vol. p. 42), in this Chrysippean claim there is proof that the Stoa knew Aristotle's school-works. Replying to Pohlenz, Sandbach affirms that there is no room for thinking that Chrysippus would have explicitly referred to Aristotle's account of mixture in *De gen. et corr.*, as there is no evidence that the early Stoics were familiar with Aristotle's writings. As Sandbach says, the mixture of wine and water may have been just a common example, as it was an "everyday event in Greece", cf. Sandbach 1985 pp. 33–34. Cf. Sorabji 1988a pp. 80–81.

¹³⁶ Cf. Sambursky 1959 p. 15; Long and Sedley 1987 p. 293.

¹³⁷ Todd 1976 pp. 29–73. The connection between the theory of total mixture and the interpenetration of pneuma and matter clearly appears in the following passage from *De mixtione*, which also makes clear that the theory of total mixture is at the very core of the entire Chrysippean philosophical system (*De mixt.* 224.32–225.9 Bruns): "Entering the argument at this point one might reasonably challenge them with also claiming the existence of two universal principles, matter and God, of which the latter is active, the former passive; and with saying that God is mixed with matter and pervades the whole of it, in this way shaping and forming it and creating the universe. For if God is on their view body—an intelligent and eternal pneuma—and matter is body first there will again be body going through the body; then this pneuma will certainly be either one of the four uncompounded bodies which they say are also elements, or a compound of them (as of course they themselves say; for they certainly suppose that pneuma has the substance of air and fire)" (transl. Todd).

the physical systems of Zeno and Cleanthes, which were based on a designing fire releasing the vital power of heat,¹³⁸ and probably following new medical tendencies (such as those represented by the physician Praxagoras of Cos),¹³⁹ Chrysippus put much more emphasis on the concept of pneuma, which he conceived as a mixture of fire and air (SVF II 841, 310, 442, 786 and cf. Galen *Quod animi mor.* IV K. 784.7–12) and both as physical principle (insofar as it was the main vehicle of the psychic functions and the sustaining cause of the cosmos) and as metaphysical entity (since it coincides with the corporeal divine principle permeating matter cf. SVF II 1033, 1035, 1037, 1047).

But how can the pneuma mix with the matter so as to completely pervade it? That is to say, how does this process of coextension or ἀντιπαρέκτασις work? And if according to the Stoics two or more bodies coextend with each other so as to interpenetrate, would that also mean that these bodies coexist in the same place? And if so, how may this concretely occur?

Many scholars have endeavored to explain the coexistence of two bodies in the same place through *antiparektasis*, proposing different solutions,¹⁴⁰ but I

¹³⁸ It must be underlined that Chrysippus was not the first Stoic to use the notion of pneuma. For Zeno had already defined the soul as πνεῦμα ἐνθερμον (cf. SVF I 135 = Diog. Laert. VII 135). In defining the soul as pneuma, Cleanthes followed Zeno (cf. SVF I 521 and 525), but he seems to have stressed the role of heat in the psychic functions of the soul; moreover, he is the first to make use of the term πνεῦμα in order to define the world-soul (cf. SVF I 533; Verbeke 1987 p. 55); but in his cosmology it is also heat that is the cause of all the functions of the world-soul and its sustaining cause; cf. LS 47 C (= Cic. *De nat. deor.* II 23.5–28.30), the connection between soul, heat, and the sustaining principle of the world is evident from this section: “therefore, every living being, whether animal or vegetable, is alive on the account of the heat enclosed within 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 [...] therefore the world must be god, and all the power of the world must be sustained by a divine element (*deum esse mundum omnemque vim mundi natura divina contineri*)”; cf. also SVF I 534. In assigning heat this primary role both in the psychic and cosmic domain, Cleanthes might have followed Zeno (Cf. SVF I 120); however he introduced the concept of *tonos* for the first time, which is assigned to fire, as it is defined as a blow of fire (πληγὴ πυρὸς ὁ τόνος ἐστὶ; cf. SVF I 563. Cleanthes’ idea of *tonos* seems to be more closely related to the image of plucking the chords of a musical instrument in order to produce harmony; SVF I 502 cf. 503 cf. Hahn 1977 esp. pp. 153–155).

¹³⁹ Cf. Hahn for an account of the influence on Chrysippus of contemporary medical ideas relating to pneuma as the main agent of psychic activities (with reference to Praxagoras, but also to the Alexandrian medicine of Herophilus of Chalcedon and Erasistratus of Ceos), Hahn 1977 pp. 160 ff.

¹⁴⁰ Sorabji (1988b pp. 50–51) suggests that the paradox of two bodies existing in the same place can be explained by recourse to Stoic reductionism. According to the Stoic theory of the four categories, it is possible to distinguish a) matter, b) qualified matter, c) disposed qualified matter, and d) relatively disposed matter. On this cf. Menn 1999 (for an account of the gradual development of the Stoic theory of the categories from Zeno through Chrysippus, see esp. pp.

think the notion of total interpenetration between pneuma and passive matter can be more easily envisioned if we describe the way in which pneuma moves through matter. For although, as we have seen, Todd's interpretation establishes a firmer link between the process of ἀντιπαρέκτασις and Chrysippus' notion of pneuma, it does not make clear *how* the pneuma moves through matter and what consequences pneuma's motion through the matter has. Fortunately, further studies have attempted to close this interpretative gap from two different perspectives, which I will try to unify here, as they appear to be complementary.

The pneuma has *tonos* and moves through a tensile motion (τονική κίνησις) conceived as a force able to go through matter¹⁴¹ and endowed with the capacity of changing the density of matter.¹⁴² Pneuma can in fact be regarded as a factor responsible for the phenomena of contraction and expansion of matter where it is the degree of density and the volume of a body that modifies.¹⁴³ But

227 ff.). The four categories then, although they take different predicates, are not distinct, as they are reduced to the very same body to which they belong. Now, according to the Stoics the qualities are bodies, but on the basis of Stoic reductionism this it is equal to saying that the qualities are a human body, variously disposed (p. 50). The same argument is offered in Sorabji (1988a pp. 89–91). Menn replies to Sorabji that this interpretation is impossible for two reasons: a) qualities are *pneumata* (SVF II 389, II 449); all qualities are causes and all causes are *pneumata* (SVF II 340). But bodies are not only pneuma, they also contain passive matter, therefore they cannot coincide with the entire body of an individual, for example. b) Consequently, as Menn notes, quality is a part of the qualified body: the qualities are of course qualified bodies but *qua* part of a whole, the body of an individual, for example, which also comprehends passive matter; f. Sextus Empiricus *Adv. Math.* XI 24 (virtue is part of the sage, as a hand is = quality is a just a part of the qualified body), cf. Menn 1999 p. 222 n. 10. However, although qualities are indeed a part of a qualified body, they are not additionally present in the body, as if the individually qualified body were just the result that we obtain by adding the two parts. In fact—at least from Chrysippus on—the pneuma, which gives matter its essential qualitative determinations and the other properties, also provides—*qua* sustaining cause and in its different degrees of *hexis*, *physis*, and *psyche*—*tonos* and unity through its tensile movement inwards and outwards: it is the unifying principle of matter, the glue which holds together and makes coherent a whole, which cannot be merely made up of parts, cf. SVF II 439, II 441, II 442, II 444, II 449, II 716, II 802 (where Philo gives the example of glue), Nem. *De nat. hom.* 70.6–71.4 Morani (“the tensile movement [...] moves inwards and outwards, the outwards movement produces quantities and qualities, and the inward one unity and substance”). As regards another possible solution of the paradox of two bodies, cf. the illuminating contribution by White (1986), who proposes to distinguish a mass sense of quantity from a volume sense of quantity. In the Stoic total mixture, as White argues, the mass would not be subject to variation, but rather its volume (in my view to be read together with the account provided by Collette-Dučić and Delcomminette, cf. below pp. 51–52). See also Lewis, who questionably stresses the relation between ἀντιπαρέκτασις and joint-destruction of the constituents by preserving the reading of the manuscripts in Diog. Laërt. VII 151 (= SVF 479): Lewis 1988 pp. 90–91; cf. also Cooper 2009, p. 11.

¹⁴¹ Sambursky 1959, pp. 29–33.

¹⁴² As is clear from this passage from Ps.-Censorinus 76.1–5 Jahn (absent from von Arnim's collection): “*Ea (sc. principia) Stoici credunt tenorem atque materiam; tenorem, qui rarescente materia a medio tendat ad summum, eadem concretescente rursus a summo referatur ad medium*”.

¹⁴³ Hahm 1985 pp. 42 ff.

the *tonos* of the pneuma does not change only the density of matter: it also works as its sustaining cause as it holds matter together and provides it with unity and qualitative determinations¹⁴⁴. In this way, pneuma gives matter tension and structure (in the different degrees of *hexis*, *physis*, and *psyche*, SVF II 716, II 634 and more clearly in II 458) and continuity therefore creates a sympathy between the parts of the cosmos.

Therefore, this motion of pneuma through matter—which would lie at the core of the process of total coextension or ἀντιπαρέκτασις of pneuma with passive matter—brings about a double effect.

On the one hand, the motion of pneuma through matter causes, as we have seen, a change of density in matter. Accordingly, White proposes to distinguish a “mass” sense of “quantity” from a “volume” sense of “quantity”. In the Stoic total mixture, as White argues, the mass would not be subject to variations, but rather its volume. Consequently, a body, while small in bulk, can have a different degree of density and on the account of this its volume can undergo variations and expand, so that it becomes equal to the volume of the other body with which it mixes.¹⁴⁵

On the other hand, pneuma’s motion through matter has a second important consequence: as we have seen, it gives tension to matter and works from within as its inner organizing and structuring principle. But how could we imagine this transmission of tension? By making use of a Stoic example (SVF II 425), Collette-Dučić and Delcomminette have compared this transmission of tension that the *antiparektasis* produces to the circular undulations that can be

¹⁴⁴ cf. Nemesius *De nat. hom.* 70.6–7.4 Morani = LS 47J, SVF II 451; cf. also SVF II 452, II 441, II 449. This double power of the tensile motion of pneuma is also very well explained in SVF II 452, where it is said that the inwards motion is the cause of rarefaction and at the same time of being, whereas the outwards motion is cause of solidification and at the same time of qualitative determinations.

¹⁴⁵ White 1986 p. 386. Moreover, as Sorabji observes, when two ingredients mix, their volumes are not just added, as in the objection that Plutarchus and others raise (Plutarchus *De comm. not.* 1078a–b = SVF II 465, Sextus *Pyrrh. Hyp.* III 60, III 96, Alex. *Mant.* 141.9–16, Philop. *In Phys.* 213b5–14), according to which if two ingredients mix and through the mutual coextension their volumes become equal, but the process would bring about a doubling of volumes. The two volumes are not added to each other because they are not separate from each other: they form a whole. As Sorabji explains, “[i]f the Stoics say that the wine is spread through three litres and the water is also spread through three litres, why does not that make a total of six litres? The answer is that the wine is able to expand to three litres only because it is not separate from the water. In order to obtain six litres, we should need the wine and water to be separate from each other after their expansion, contrary to the whole idea of interpenetration”; cf. Sorabji 1988a p. 102.

provoked by a stone that has been cast into a pool and which propagate on the water's surface. The wave extends itself through the total water surface and propagates until it reaches uniformity in each of its points.¹⁴⁶

That is the second great innovation of Chrysippus' theory of total mixture (at least according to the evidence at our disposal): what we do not encounter either in Zeno or in Cleanthes is the connection between the theory of total mixture and pneuma as all-pervasive and animated principle penetrating and giving cohesion to matter through a tensile movement. If Cleanthes introduced the concept of *tonos* for the first time, relating it to the image of the fiery sun's rays plucking and harmonizing the cosmos,¹⁴⁷ it was Chrysippus who strengthened the link between pneuma *qua* mixture of fire and air and *tonos*, through which the interpenetration of pneuma and matter is possible.

Recently Collette-Dučić and Delcomminette have tried to challenge Todd's interpretation given in his classical study on the theory of total mixture (as we have already pointed out, in Todd's view, the theory of total mixture proved to be only a fictive example used by Chrysippus in order to clarify the relation between pneuma and passive matter) and which in any case had not encountered widespread approval.¹⁴⁸ Even though it remains the main justification of the theory of total mixture, these scholars have drawn attention to the fact that this theory was not merely a "purely mental conception"¹⁴⁹ that after Chrysippus would have been integrated in a later classification of mixtures, but would really have worked on different levels of application.¹⁵⁰

¹⁴⁶ Cf. also Todd and Collette-Dučić and Delcomminette's remarks, which also point to the connection of the process of *antiparektasis* to the tensile movement of the pneuma; Todd 1976 pp. 36–38; Collette-Dučić and Delcomminette 2006 pp. 32–33.

¹⁴⁷ Cf. the splendid image in SVF I 502: "ἀντικρυς πλήκτρον τὸν ἥλιον καλεῖ· ἐν γὰρ ταῖς ἀνατολαῖς, ἐρείδων τὰς ἀγῆας, οἷον πλήσσω τὸν κόσμον εἰς τὴν ἐναρμόνιον πορείαν ἄγει". As we see, Cleanthes defines the sun as *πλήκτρον*, and as we have previously seen (cf. previous footnote n. 133), *tonos* is defined as a blow (*plēgē*—by using the same root of *πλήκτρον*) of fire.

¹⁴⁸ Cf. Sharples 1977 pp. 86–90; Sandbach 1978, pp. 362–263; Moraux 1981a pp. 641–646; Mansfeld 1982 pp. 389–391; White 1986 p. 384–385; Long and Sedley 1987 p. 287 n. 1 and p. 293; Sorabji 1988a p. 84.

¹⁴⁹ Todd 1976, pp. 71–73.

¹⁵⁰ It seems relevant to underline that Todd's interpretation of the theory of total mixture as a simple analogical example tries to escape a great difficulty of this theory: the fact that according to one of the two main Stoic definitions of the body, analogously to Aristotle (*Phys.* 204b20), body is defined—by Apollodorus—as "three-fold extension together with resistance" (cf. SVF III 6 = 45 E LS with SVF II 381 = 45 F LS, cf. Long and Sedley's comments *ad. loc.*). Hence the difficulty: how is it possible for two bodies, understood as three-dimensional entities, to mix without an increase in overall volume? In order to give coherence to his reasoning, Todd

In the first place, the total mixture would explain not only the relation between pneuma (constituted by the active elements fire and air) and passive matter but also the relation between the purely active principle, God or reason, and the purely passive principle or prime matter¹⁵¹ whose primary effect is the production of the primary elements and therefore of pneuma, which pervades the qualified matter.¹⁵² Second, the scholars point to different usages of the theory of total mixture in physics and physiology. On the one hand, the theory really accounts for everyday mixtures, where already qualified bodies are involved, such as mixtures of liquids (a mixture of wine and water or of honey and vinegar)¹⁵³ or of solids (such as the total interpenetration of iron and fire).¹⁵⁴ On

elaborates two different and somewhat contradictory solutions. On the one hand, he denies that the total mixture implies a theory of body, as it is a fictional example (Todd 1976 p. 83); on the other hand, he says that for the everyday mixtures the standard definition of body as a three-dimensional solid can be valid, whereas to explain pneuma's motion through matter a more general Stoic definition of body than that which is capable of acting or being acted upon is required (cf. SVF I 90 = 45A LS and SVF I 85 = Diog. Laert. VII 134 with reference to the bodily active and passive principles), as if it were a "*corpsenergie*", which does not necessarily entail bodily three-dimensionality (cf. *id.* p. 47 n. 113).

¹⁵¹ For the difference between prime matter and (already qualified) passive matter, cf. Gourinat 2009 p. 48 ff.; and the testimony by Diog. Laert. VII 150 (= SVF I 87 part): "The primary matter they make the substratum of all things: So Chrysippus in the first book of his *Physics*, and Zeno. By matter is meant that out of which anything whatsoever is produced. Both substance and matter are terms used in a twofold sense according as they signify (1) universal or (2) particular substance or matter. The former neither increases nor diminishes, while the matter of particular things both increases and diminishes" (trans. Hicks).

¹⁵² That the two *archai* also interpenetrate each other can be inferred straightforwardly from this passage in *De mixtione* 227.5–10 Bruns: "for their theory of blending does not rely on something else, but their views on the soul depend on it, and their notorious Fate and their universal Providence gain conviction in this way if indeed their theory of principles and God, as well as the unification and sympathy of everything depend on it; for the God that pervades matter is all of these things for them" (= SVF II 475). However, it must be noted that the very elegant solution proposed by Collette-Dučić and Delcomminette does not perfectly match the evidence, because although they tend to separate god (a pure actively corporeal principle) from pneuma (an active but already qualified body which is in turn generated by the interpenetration of god and prime matter)—and conversely a purely passive principle, i.e. qualityless matter, from a relatively passive principle, i.e. passive matter—, the first distinction is much more nuanced in our texts. For example, in the abovementioned text we see a perfect equivalence between god (the first principle) and pneuma: *De mixt.* 224.32–225.9: "Entering the argument at this point one might reasonably challenge them with also claiming the existence of two universal principles, matter and God, of which the latter is active, the former passive; and with saying that God is mixed with matter and pervades the whole of it, in this way shaping and forming it and creating the universe. For if God is on their view body—an intelligent and eternal pneuma—and matter is body first there will again be body going through the body; then this pneuma will certainly be either one of the four uncompounded bodies which they say are also elements, or a compound of them (as of course they themselves say; for they certainly suppose that pneuma has the substance of air and fire)" (trans. Todd).

¹⁵³ Cf. Stobaeus I 17.4 155.4–5 Wachsmuth (= Ar. Did. fr. 28 = SVF II 471).

¹⁵⁴ Stobaeus I 17.4 154.16–17 Wachsmuth (= Ar. Did. fr. 28 = SVF II 471); *De mixt.* 218.1–2 Bruns (=SVF II 471); on this example and Alexander's criticism, cf. Kupreeva 2004a pp. 305–8.

the other hand, it seems that the Stoics used the process of coextension for physiological purposes too, and more precisely it would have answered for living beings' growth and nutrition.¹⁵⁵

1.2 Alexander's criticism of the Stoic theory of total mixture. Alexander's account of mixture in his *De mixtione*, aim and justification of the theory.

The earliest criticism of the notion of total mixture can be traced back to an attack made on the Stoic theory by Arcesilaus the head of the new Academy.¹⁵⁶ He claimed that if a small body could coextend with a much greater one, then a leg could also be chopped off, thrown into the sea, and extend to the extent that even Xerxes and the Greeks could fight a sea battle in it. Moreover, not only was the Stoic theory attacked by an exponent of the Platonic school, but, Galen reports, the corpuscularist physician Asclepiades of Bithynia also challenged the Stoic theory of total mixture in his work *On elements*, although Galen does not dwell on the arguments that Asclepiades used against them.¹⁵⁷ However, according to the evidence that we have at our disposal, the Peripatetic Alexander was the first to elaborate a much more serious critique of the Stoic total mixture. In *De mixtione*, Alexander of Aphrodisias' criticism against the

¹⁵⁵ Cf. *De mixt.* 233.14–24 and 234.23–32 Bruns (= SVF II 735) cf. Collette-Dučić and Delcomminette 2006 pp. 58–59. Cf. Mansfeld 1982 p. 392. As Alexander claims, the Stoics would have found support for their view on total mixture by invoking the process of growth of animals through nourishment, which according to them would have worked analogously. For according to them, if nutriment pervades the whole body as a body, then it necessarily follows that body goes through body; cf. *De mixt.* 233.14–233, 24 Bruns. As Collette-Dučić and Delcomminette note, the Stoics make mixture and growth equivalent to each other and therefore they would not have respected Aristotle's distinction (*De gen. et corr.* I 10 327b13–14) according to which if two bodies are unequal in bulk there cannot be mixture but only an increase of the dominant ingredient, as the smaller would be dissolved completely into the greater. In the last chapter of *De mixtione*, Alexander also attacks this application of interpenetration to growth, for Alexander's account of growth (as implying the persistence of form and, somehow, also of matter), cf. Kupreeva 2004a pp. 314–329. An alternative is Todd's position, who does not consider this theory Stoic because of the fact that Alexander's Chapter 16 is directed more generally against those who "explain growth by bodily interpenetration" (although the whole treatise *De mixtione* refers to bodily interpenetration, *σῶμα διὰ σώματος χωρεῖν*, as a Stoic theory); cf. Todd 1976, pp. 8–84.

¹⁵⁶ Plutarch. *De comm. not.* 1078c–d. Cf. also Todd 1976 pp. 73–75.

¹⁵⁷ *De elem. sec. Hipp.* CMG V 1.2 p. 136.23–26 De Lacy. Asclepiades' activity in Rome dates back to the age of Cicero and Crassus, cf. Nutton 2006a.

Stoic total mixture concentrates upon two key features of the Stoic theory: the preservation of the ingredients in the blend and their complete coextension.

First of all, as a good Aristotelian, Alexander cannot accept that the constituents are preserved intact in the mixture: according to him the constituents are preserved only in potentiality, while as long as they are mixed they give rise in actuality to a *tertium quid*.¹⁵⁸ Second, Alexander seeks to undermine the physical process of mutual coextension or *antiparektasis* of bodies by bringing to light its difficulties and interpretative issues. More precisely, in his *De mixtione* Alexander attempts to rule it out by claiming that it is utterly absurd to say that a full body can contain within it another full body without an increase in the overall volume, as in this case the two bodies would coexist in the same place.¹⁵⁹ As Collette-Dučić and Delcomminette show, in Alexander's criticism a reduction of body to place seems to have occurred. For in Alexander's view, the total mixture requires that a body receives within it another body, meaning that this body is something that is capable of receiving something else: therefore, it is a *place*. As the scholars note, this reduction of body to place would completely distort the Stoic conception of place. In fact, for the Stoics place does

¹⁵⁸ This aspect is well illustrated by Kupreeva 2004a pp. 305–8. More precisely, Alexander questions the Stoic standard example of the “heated iron” (cf. Stob. *Ecl.* I 17.4 153.24 Wachsmuth = SVF II 471, Alexander's *De mixt.* 471 222.35–223.5 and 227.17–228.4 Bruns, Hierocles *Elem. Eth.* IV 3–10 Bastianini-Long, where the author reports the example to explain how the soul pervades the body), which is used to make clear the presence “in actuality” of two different bodies that interpenetrate one another. According to Kupreeva, Alexander makes two main points to reject this Stoic example. The first draws attention to the fact that when the fire totally pervades the iron, the permanence and coexistence of fire and iron is only a matter of time; as the process of burning goes on, some of the heated iron does get destroyed and the fire will lose its proper form; cf. *De mixt.* 222.35–223.6 Bruns. The next is that Alexander does not conceive of the heat of fire as a corporeal entity which interpenetrates another corporeal entity; rather, according to him the heat can be regarded as a quality which always needs a matter in which to subsist; cf. 227.26–228.6. It is exactly this feature of the Stoic total mixture that strongly clashes with the Peripatetic account; cf. Kupreeva 2004a p. 304 “The point of Alexander's theory of mutual replacement is to rule out the idea that propagation of physical qualities involves corporeal agents other than the sensible substances in which these qualities reside. According to Alexander, qualities and states have no separate existence outside the material individuals in which they inhere. Therefore, a composite quality arising in a mixture as a result of the coming together of several qualified individuals cannot be regarded as an immediate product of ingredient qualities, as the Stoic picture suggests, so that both the old ingredient qualities and the new resultant quality would now be present in a mixture. Rather, when a new (composite) quality comes to be, the old qualities must in some sense cease to exist”.

¹⁵⁹ Cf. *De mixt.* 218.17–218.24 Bruns “It is, indeed, a natural notion that what is full can no longer receive anything is itself; for it is obvious that that which has space in it capable of receiving another body cannot be full, and on account of this natural and common preconception some think it reasonable that there be something receptive of bodies which we call place. For how could someone who did not wish to talk nonsense think that anybody, full of itself and with no empty interval in it, received in itself another similarly full body?”

not really *exist* but, although is probably three-dimensional (SVF II 502), it actually only *subsists* (SVF II 331 = LS 27D) since it can be defined as the *incorporeal* extension that an existent body can and does occupy (cf. SVF II 503, II 505).¹⁶⁰ But where, then, does Alexander's interpretation issue from? Todd plausibly explains Alexander's argument as principally stemming from exegetical activity on Aristotle's *Physics* and more precisely on the textual *locus* in *Physics* IV 1 (*Phys.* 209a4–7), where Aristotle dismisses the view that place is a body by saying that if so, two bodies would paradoxically coexist in the same place. This Alexandrian argument will then be reused by many other later commentators on Aristotle's *Physics*, such as Themistius, Simplicius, and Philoponus.¹⁶¹ However, the argument does not seem to have been originally elaborated by Alexander, as we also find it in Plutarch's *De communibus notitiis adversus Stoicos* (1077e), but according to Todd he may have also drawn on a Peripatetic source.¹⁶²

In his *De mixtione*, Alexander sets his own account of mixture against the Stoic model, and dedicates the final chapters of the work (XIII–XV) to the explanation of Aristotle's account of mixture, which—as Alexander himself declares—due to the Philosopher's *syntomia* or concision was not so well known among philosophers at the time.¹⁶³ His exegetical activity mainly focusses on the Chapter I 10 of Aristotle's *De generatione et corruptione*. Alexander's exegesis expands all the key points of Aristotle's account of mixture (constituents, potentiality–actuality continuum, difference between mixture and

¹⁶⁰ Collette-Dučić and Delcomminette 2006 pp. 52–53.

¹⁶¹ Todd 1976, pp. 75–81, esp. pp. 76–77.

¹⁶² Although his claim seems to be quite reasonable, as the paradox of the two bodies in the same place was widely used by Aristotle and not only with reference to his theory of place (cf. *Phys.* 214b6, *De gen. et corr.* 321a5–6 criticism of the theory that growth occurs by body, *De an.* 418b13–18 dismissal of the view that light is a body, *De caelo* 305a19–20 rejection of the theory that elements are generated by body), unfortunately Todd does not put forward a great deal of argument in support of his statement. On the other hand, Pohlenz maintains that this passage has to be considered Plutarch's direct criticism (cf. Pohlenz 1939, pp. 29–30), whereas according to Mansfeld it is more likely to attribute the argument to a Skeptic Academic source; cf. Mansfeld 1982 p. 391.

¹⁶³ The sources at our disposal for reconstructing Alexander's theory of mixture are a) *De mixtione* Chapters 13–15; and b) Philoponus' commentary on Aristotle's *De generatione et corruptione* (the only commentary in Greek extant on this Aristotelian treatise), as he amply draws on a lost commentary on *Generation and Corruption* by Alexander—Philoponus cites it explicitly 35 times; cf. Todd 1976, p. 251.

generation and corruption),¹⁶⁴ but what seems to be much more detailed and original compared to Aristotle's account in *De generatione et corruptione* I 10

¹⁶⁴ In the first place, Alexander discusses i) the constituents of mixture: already in Aristotle the constituents involved in the process of mixture are said to be substances *qua* composite of form and matter (*De mixt.* 228, 16–17 Bruns, Alexander makes explicit what Aristotle did not specify, since he claims that only χωριστά can be mixed—*De gen. et corr.* I 10 327b27–29). It has to be underlined that among the constituents of a mixture the liquids are the most mixable, insofar as they are the most easily divisible (τὰ εὐόριστα, cf. *De gen. et corr.* 328b3–4); the presence of moisture in the ingredients is, in fact, a *conditio sine qua non* of the mixture; cf. Joachim 1922 p. 186 (comm. on *De gen. et corr.* 328a24). The same point is made by Alexander at *De mixt.* 230.34–231.1 Bruns. ii) He then deals with the preliminary requisite of mixture: interaction (the other being contact), i.e. *poiein and paskhein*. As Alexander says, interaction “occurs among bodies with the same underlying matter and a mutual contrariety” (*De mixt.* 229, 17–19 Bruns), and he adds that “certainly the four bodies known as elements (*stoicheia*) are of this sort: Earth and Water, Air and Fire” (*De mixt.* 229.30–31 Bruns). As has been recently pointed out by the scholarship (Todd 1976 pp. 232–233; Kupreeva 2003, pp. 307 ff.), it is possible to recognize two tendencies in the Aristotelian tradition of the 2nd century CE. On a merely qualitative Aristotelian account of the *stoicheia*, a hylomorphic theory has progressively gained ground. For whereas according to Aristotle the term *stoicheia* was used to refer to the primary qualities (cf. *De gen. et corr.* 330a30), as we see here in Alexander the term instead indicates what Aristotle calls more appropriately “simple bodies”. On the other hand, in contrast to Aristotle (cf. *De gen. et corr.* 323b29–324a3), “since only those things which either involve a ‘contrariety’ or are ‘contraries’—and not any things selected at random—are such as to suffer action and to act, agent and patient must be ‘like’ (i.e. identical) in kind and yet ‘unlike’ (i.e. contrary) in species. (For it is a law of nature that body is affected by body, flavour by flavour, colour by colour, and so in general what belongs to any kind by a member of the same kind—the reason being that ‘contraries’ are in every case within a single identical kind, and it is ‘contraries’ which reciprocally act and suffer action) and in order to avoid Stoic inferences about the causal efficacy of bodies Alexander relegates the causal agency to the incorporeal qualitative contrarieties present in the underlying matter. Alexander’s new hylomorphic formula is made explicit in *De anima* (7. 9–14 Bruns) “bodies act and are acted upon in accordance with incorporeals”; cf. Kupreeva 2003 pp. 307–310. In the *De mixtione* it is specified by Alexander that constituents act and are acted upon by the means of the contrary qualities “whenever the bodies that are unified are of the kind that have qualities by which constituents can reciprocally interact [...] blending also occurs” (ὡς ἔχειν ποιότητος, καθ’ ἃς τὰ μιγνύμενα ποιεῖν τε καὶ πάσχειν ὑπ’ ἀλλήλων ἐστὶν οἷά τε [...], τότε καὶ τούτων κρῆσις γίνεται, *De mixt.* 229.3–6 Bruns, cf. *De gen. et corr.* 334b8–15). Like Aristotle, Alexander claims that reciprocal interaction occurs among opposites and also their intermediaries. Not only is hot changed and acted on by cold (or vice versa), “but also the points between each of the extremes” (τὰ μεταξὺ ἐκατέρου τῶν ἄκρων, *De mixt.* 229.22–24 Bruns, οὐ γὰρ μόνον τὸ θερμὸν ὑπὸ τοῦ ψυχροῦ καὶ τὸ ψυχρὸν ὑπὸ τοῦ θερμοῦ μεταβάλλεται τε καὶ πάσχει, οὐδὲ τὸ ὑγρὸν ὑπὸ τοῦ ξηροῦ καὶ τὸ ξηρὸν ὑπὸ τοῦ ὑγροῦ, ἀλλὰ καὶ τὰ μεταξὺ ἐκατέρου τῶν ἄκρων, ὅτι κατὰ μίξιν ἐστὶ τῷ πρὸς ἐκάτερον τῶν ἐναντίων τὸ μεταξὺ τὸν θατέρου τῶν ἐναντίων σώζειν λόγον), as happens in mixture. The mixture in fact implies a process of reciprocal qualitative assimilation, a *two-way* qualitative change, as it is defined by Frede, where the opposites find a common midpoint or *μεταξὺ*; cf. Frede 2004 p. 301. Cf. Cooper 2004 p. 321 ff. De Haas 1999 p. 29. iii) This entails a distinction, which Alexander clarifies, between mixture and coming-to-be and passing-away. For in the mixture none of the bodies exceeds another by its contrariety so as to destroy it. If this were so, there would be corruption and at the same time the generation of something else. In the mixture in fact there must be an equality of powers of the constituents, *isotēs tōn dynamēōn* (*De mixt.* 230.14–34 Bruns). As Todd remarks, the difference between mixture and generation and corruption drawn by Alexander is an expansion of Aristotle’s remarks at *De gen. et corr.* 328a23–31 (cf. also the corresponding aporia in the trilemma at the beginning of the Chapter I 10 327a35–327b6, and later also *De gen. et corr.* 327b28–31). iv) Finally, Alexander describes the process of mixture by recourse to the Aristotelian distinction between potentiality and actuality. As in Aristotle, the constituents are said to be preserved in potentiality, while a new quality has arisen out of their mixture (*De mixt.*

is the description of the mechanism of mixture. Alexander represents such a process of mixing as a progressive division (or *diairesis*) of the constituents into small parts, which during the division are juxtaposed as corpuscles and become progressively smaller and smaller (*De mixt.* 231.12–231.21).¹⁶⁵ As in Aristotle,

232.20–31 Bruns ; cf. *De gen. et corr.* 327b22–31). But which kind of potentiality are Aristotle and Alexander referring to? This aspect was not analysed in depth by Aristotle, but was examined by the commentators. As De Haas notes, it cannot be the first potentiality because the recovery of the constituents does not coincide with a full generation. Nor can it be second potentiality (namely first actuality), because the ingredients are not yet actualized. Recently De Haas has suggested that it can be an in-between potentiality, a third kind of potentiality, a tempered first actuality. Cf. De Haas 1999 p. 32. De Haas applies this notion of a third kind of potentiality to Philoponus' interpretation of Aristotle's account of mixture, which seems to have been influenced by Alexander's commentary on *De gen. et corr.* In his commentary on *De gen. et corr.*, Philoponus (188.17–25) draws a comparison to the state of the ingredients in a mixture and the state of a drunken geometer. The geometer is awake and she already knows geometry (potentiality 2), but she is not able to completely actualize this knowledge (actuality 2) because of her state of drunkenness (tempered actuality 2). In their reply to De Haas, Wood and Weisberg point out that De Haas' tempered second potentiality (of the state of the ingredients in the mixture as distinct from the tempered second actuality of the drunken geometer) does not seem to match Philoponus' intentions. For according to Wood and Weisberg, Philoponus' text is somewhat cryptic and aims more at stressing the state of "abatement" of the potentiality rather than pinpointing the exact position of this third potentiality in the potentiality–actuality continuum; cf. Wood and Weisberg 2004, pp. 688–689.

¹⁶⁵ The point of departure of Alexander's interpretation is *De gen. et corr.* 328a31–35, where Aristotle declares that the constituents of a mixture act and are acted upon one another reciprocally and "they combine more freely if small pieces of each of them are juxtaposed (*παρὰτιθέμενα*). For in that condition they change one another more easily and more quickly; whereas this effect takes a long time when agent and patient are present in bulk". In this regard, Cooper rightly points out that the mixture is made possible through a juxtaposition of small bits acting and being acted upon one another and therefore shifting, "so that they lose those qualities which mark them off from one another and each gets in replacement a *common* new set of qualities that constitute the nature of the new substance itself"; Cooper 2004 p. 322 (original emphasis). In his *De mixtione*, Alexander returns afterwards to the dynamic of the process and analyses it in greater detail: cf. *De mixt.* 233.2–14 Bruns: "Also it is known by perception that the constituents first divide one another, and by their juxtaposition as corpuscles become malleable and are unified and assimilated in form and likeness. For as long as each constituent still remains with its own substance, their subsequent dissociation can also be recognized by their difference in colour, for as moist, easily-divided, and dissimilar bodies their division of one another starts from the pressure caused by the one overflowing on the other, and if they should also happen to be unequally balanced the heavier moves downward in dividing, while the parts of the lighter body yield to the heavier one and readily cover their surface. The change in qualities which unifies them in total similarity stops at the preceding change of place—a fact also known by sight" (trans. Todd). Cf. also Philoponus *In gen. et corr.* 199, 10 ff. Vitelli: "Δείξας ὅτι οὔτε κατὰ παράθεσιν ἢ μίξις οὔτε τῆ εἰς μικρὰ διαίρεσει, νῦν φησιν ὅτι εἰ καὶ μὴ ἔστιν ἢ παράθεσις μίξις, συντελεῖ μέντοι εἰς τὴν μίξιν ἢ εἰς μικρὰ διαίρεσις καὶ παράθεσις. (*progressive division*) ῥῶον γάρ, φησί, τὸ μικρὸν ὑπὸ τοῦ μικροῦ πείσεται μᾶλλον ἢ τὸ μέγα ὑπὸ τοῦ μεγάλου, τὸ δὲ πολὺ, φησὶν, ὑπὸ τοῦ πολλοῦ χρονιώτερον πάσχει (*speed of interaction*)". As Kupreeva observes, this kinetic mechanism of liquids might be compared to the original Platonic concept of "ἀντιπερίστασις", or mutual replacement, used by Aristotle to indicate the meteorological process whereby cold and hot air separate by a mutual replacement and form homogeneous masses. See Kupreeva 2004a pp. 302–303. According to Groisard, the key to understanding the dynamics of mixture is to see a two-phase process where a progressive division of the ingredients into smaller particles culminates in a final unification of the substratum. See Groisard 2013, cf. comments *ad loc.* p. 106 n. 469. One of the points at issue is to what extent Alexander's account of mixture as a progressive division of bodies is innovative. As far as we know from Galen,

the smallness of the particles is directly proportional to the ease of the qualitative interaction: the smaller the particles, the more easily they interact with one another. The process culminates in a final unification of the constituents, giving rise to one body both in substrate and quality, a new unified body,¹⁶⁶ which is defined, as in Aristotle, as homeomerous.¹⁶⁷

As in Aristotle, the process of mixture is reversible, as it is possible to recover the constituents—although Aristotle does not explain how and Alexander has to fill the gap in order also to more distinctly mark the difference to the Stoic account. However, contrary to the Stoics, who according to Alexander purport to really recover the original constituents of the blend, Alexander claims that it is impossible to recover both identical and numerically identical ingredients. The constituents can be recovered only in their own form, and thus they will be only specifically, but not numerically identical.¹⁶⁸ For if they were preserved intact numerically, as in the Stoic mixture, we would have seen only a juxtaposition, and not a blending.¹⁶⁹ On the contrary, in order to be recovered they need to pass from a state of potentiality to actuality, and through this process of actualization they are somehow “created” (*De mixt.* 231, 32:

Theophrastus would have dealt with the topic of mixture, although Galen’s report is so concise that it is not possible to extrapolate a clear picture of Theophrastus’ account—with reference to Theophrastus Galen distinguishes a mixture leading to a uniform compound from a mere juxtaposition of constituents (*De simp. med. (temp. ac.) fac.* K. XI 593.11–594.3). We can gather some more evidence from a brief account by the Stoic Arius Didymus (1st BCE–1st CE), who preserves a small fragment of a Peripatetic account of mixture: fr. 4 “Ἀριστοτέλους καὶ τῶν ἀπ’ αὐτοῦ. Τὰ μὲν σώματα φασὶ θρυπτόμενα κατὰ μικρὰ μόρια παρατίθεσθαι ἀλλήλοις, τοὺς δ’ ἀσωμάτους λόγους, εἴ τινές εἰσι λόγοι, συγκρίνασθαι”. As we see, the bodies are said to be broken into small pieces and juxtaposed to one another and it is also said that incorporeal *logoi* mix together (συγκρίνασθαι). Moraux upholds that this fragment by Arius describes a theory composed of two different phases, juxtaposition and final mixture (cf. the opposition μὲν/δὲ). As he aptly remarks, Arius’ reference to *logoi* (which Moraux translates as *Formen* or *Eigenschaften*) seems to be ascribable to a Stoic influence (cf. Cleanthes’ mixing *logoi*), but according to him this terminology would correspond to the rather Aristotelian term *poiote̓s*, which can be found in other sources of the Peripatetic account (such as Galen, as we will see). However, Moraux ascribes this theory, which noticeably differs from Aristotle’s genuine account of *De gen. et corr.* I 10, not to an emergent Peripatetic doctrine (a solution to be considered, given the resemblances with Alexander) but to a doxographical simplification and distortion of Aristotle’s theory; cf. Moraux 1973 pp. 280–283.

¹⁶⁶ *De mixt.* 231.12–16 Bruns. Cf. also *De gen. et corr.* 328b22.

¹⁶⁷ *De gen. et corr.* 328a.10–13; *De mixt.* 231.30 with reference to milk.

¹⁶⁸ Cf. Philop. *In gen. et corr.* 191.27–28 Vitelli “διὰ τινῶν διακριτικῶν τε καὶ ἀλλοιωτικῶν ὀργάνων ὀλόκληρον πάλιν τὸ οἰκεῖον εἶδος ἀπολαβεῖν”.

¹⁶⁹ *De mixt.* 231.25–27 Bruns.

γεννήσας τρόπον τινά) from every part of the blend where they were present only in potentiality.¹⁷⁰

After having made Alexander's account of the process of mixture and its reversibility clear, which in turn stems from the interpretation of Aristotle's account, I will try to place this theory within the Aristotelian physical system in order to understand its aim and justification and to throw into sharp relief the difference between the Peripatetic and the Stoic systems.

As we have seen, in *De mixtione* as well as in *De generatione et corruptione* I 10, the product of mixture is defined as homoeomerous. However, Alexander does not explicitly explain the connection between the notion of mixture and Aristotle's physical system, as his main goal seems to be that of setting up a criticism of the Stoic account.¹⁷¹ But what exactly is a homoeomerous part, for Aristotle? In *De generatione et corruptione* I 10, Aristotle describes the result of the mixture as follows: “the result of the mixture

¹⁷⁰ *De mixt.* 232.26–31 Bruns “with the bodies that have been blended the difference is that each of the things in potentiality in the body produced from the blend is separated out, changing into the actuality of which it was deprived because of the fact that they are reciprocally acted upon to an equal extent” (trans. Todd; translation modified). For Alexander's notion of potentiality cf. *supra* n. 159. One of the three examples that Alexander gives in order to illustrate the separation of constituents is that of a heated stone cast into milk, which is “a homoeomerous body containing in potentiality both moist and solid” that “separates each of them from it, and in some way creates them, making the one into cheese, the other into whey, not through separating a part actually inherent in the milk but by creating each of them from every part” (*De mixt.* 231.30–232.1 Bruns trans. Todd; slightly modified). Apart from the example i) (that of a heated stone cast into milk, which re-creates the solid (cheese) and the liquid parts (whey) contained in the milk), Alexander gives two additional examples of separation of constituents: ii) that of fermentation in must, separating from the whole both air and wine; and iii) the Stoic example of the sponge dipped into olive oil, which attracts wine from a mixture of wine and water. As Kupreeva underscores, i) and ii) are not properly examples of reversibility but the causal mechanism is the same as that in which he describes the reversibility of water and wine from the mixture, cf. Kupreeva 2004a, p. 308 ff., who gives a clear description of the examples that Alexander puts forward and brings out the inner the anti-Stoic polemic that underlies his account of the recovery of the ingredients as only specifically identical.

¹⁷¹ For the refutation occupies the central and most extensive part of *De mixtione* and the anti-Stoic polemic permeates the whole treatise, including the last chapter on growth. Groisard's explanation appears less convincing, according to which Alexander does not develop the connection between homoeomerous parts and mixture in depth, instead opting for a much stricter description of the theory as concretely applied only to the liquid mixable bodies, because of a reaction against the broad range of applications that the Stoic account of total mixture had within Stoic philosophy; cf. Groisard 2013 p. LVI. On the other hand, the lack of a biological *Hintergrund* underpinning Alexander's *De mixtione* can be explained as a distinctive feature of Alexander's overall philosophical project, where physics is subordinated to metaphysics and Aristotle's interest in empirical observation is played off in favour of his overriding concern with an investigation of forms; Groisard 2013 pp. 42–66.

(τὸ μιχθὲν) must be uniform in texture throughout—any part of such a compound being the same as the whole, just as any part of water is water” (τὸ μιχθὲν ὁμοιομερὲς εἶναι, καὶ ὥσπερ τοῦ ὕδατος τὸ μέρος ὕδωρ, οὕτω καὶ τοῦ κραθέντος).¹⁷² In this passage the adjective ὁμοιομερής is used to indicate every result of a mixture, whether inorganic or organic.¹⁷³ Although the terminology is not always straightforwardly applied by the philosopher, it seems that, when the adjective is used as noun, it indicates all the homogeneous bodies, both inanimate and animate, but with a particular emphasis on biological—animal and vegetal—tissues.¹⁷⁴

Since the notion of a homoeomerous part embraces both the inanimate and animate realms, we can see how Aristotle’s account of mixture can be applied to

¹⁷² *De gen. et corr.* 328a10–13 trans. Joachim.

¹⁷³ Kullmann 1982 p. 215, and analogously Joachim 1922 p. 192.

¹⁷⁴ Kullmann strictly distinguishes between a more general and a technical usage of the term ὁμοιομερής. As an adjective, according to Kullmann, it is used in a more general sense with reference to the equal repartition between sea and earth (cf. *Top.* 135a20ff.), or with reference to a continuous body understood from a physical perspective (cf. *Phys.* 212b5); whereas as a substantive, it would more technically indicate the homogeneous parts of living beings; cf. Kullmann 1982 p. 209. However, as Kullmann also admits, Aristotle does not always use the substantive with reference to a living beings’ tissues, as in *Meteor.* IV 388a13ff.; among homoeomerous stuffs he also includes “metals”, such as bronze, gold, silver, tin, iron, stone (as we will see, this usage will be followed by Galen), as does Joachim (1922 p. 188), who distinguishes between animate (animal and vegetal) and inanimate (stones and metals) homoeomerous parts. In the biological writings the term ὁμοιομερής is defined in opposition with the anhomoeomerous parts (ἀνομοιομερής), indicating the organic unities of living beings, which are distinguished by a proper inner function; cf. Kullmann 1982 pp. 209–210. On the other hand, it is true that whereas Aristotle sometimes includes metals among the homoeomerous parts, on other occasions he clearly draws a distinction between μεταλλεύόμενα and homoeomerous parts understood as biological tissues (cf. *Meteor.* IV 384b30ff. “ἐκ μὲν οὖν ὕδατος καὶ γῆς τὰ ὁμοιομερῆ σώματα συνίσταται, καὶ ἐν φυτοῖς καὶ ἐν ζῴοις, καὶ τὰ μεταλλεύόμενα, οἷον χρυσὸς καὶ ἄργυρος καὶ ὅσα ἄλλα τοιαῦτα”). For an historical overview of the development of the concept of homoeomerous parts from Aristotle to Bichat’s tissues, cf. Forrester 1994. Cf. also Chalmers 2009, who also draws attention to a possible alternative account of the homoeomerous parts in *Meteorologica* IV and *De generatione et corruptione*. For Chalmers argues that, differently from *De generatione et corruptione*, in *Meteorologica* IV some homoeomerous parts, such as metals and rocks, are discontinuous and have pores in their composition, the reason for this being a less strict application of the definition, which entails the homogeneity of the compound; cf. p. 21. Moreover, we have to note that in his account of mixture, Aristotle does not draw a distinction between two types of homoeomerous stuff (we can call them “basic”, i.e. that generated by a mixture of the four simple bodies, and “complex”, i.e. that generated by a mixture of mixtures), as Fine remarks (cf. Fine 1995 pp. 301–302). If, in fact, we inspect his account of mixture in *De gen. et corr.* (I 10, II 7–8), Aristotle puts both kinds on equal footing: bones, flesh (*De gen. et corr.* 334b30), a mixture of wine and water (*De gen. et corr.* I 10 328a27), and an alloy of tin and copper (*De gen. et corr.* 328b8). Fine argues that in Aristotle’s account of mixture the hylomorphic structure of the primary elements has to be put on the same level as the hylomorphic structure of the mixture (the levelling version, which he opposes to the ascent version, the view that the hylomorphic complexity of the mixture is higher than its constituents). On Aristotle’s definition of ὁμοιομερής cf. also Höffe 2005 s.v.

two different scientific domains, that is, to both the study of the formation of compounds out of a mixture of primary elements (which would correspond to our inorganic chemistry) and biological sciences.

On the one hand, Aristotle's theory of mixture, as it is formulated in *De generatione et corruptione*, together with the other Aristotelian "chemical treatise" *Meteorologica* IV,¹⁷⁵ blazed new trails for the study of the process of mixture of inanimate compounds, and in this sense is regarded by scholars as the point of departure of both the ancient speculations on metals and their reception by ancient Greek alchemists,¹⁷⁶ and also the constitution in modern times of what we nowadays call "chemistry."¹⁷⁷ However, it seems that Aristotle himself did not develop this scientific field very widely, although it is true that he was able to precisely grasp the main principle of chemistry (the transformation of the substances into one another and the formation of compounds out of a process of mixture) without making reference to modern measurement techniques.¹⁷⁸

Second, and more importantly, the concept of the homoeomerous part was broadly applied by Aristotle to his biological theories, insofar as the term designates organic tissues understood as one of the levels of structure in a living organism.¹⁷⁹ In fact, although the main concern of *De generatione et corruptione*

¹⁷⁵ Both treatises are linked in terms of content. In the first place in both the primary elements are thought of as composed of two of the four contrary powers, hot/cold and dry/wet, with two active (hot/cold) and two passive (dry/wet); cf. *Meteor.* IV 1 378b10–26; *De gen. et corr.* II 3 330b3–5; and *ibid.* II 2 329b24–26. Second, in both the treatises, all the natural composite bodies are made of passive and active qualities, although in *Meteorologica* IV it is clarified that the passive qualities (dry/wet) work as material cause and the active qualities (hot/cold) work as efficient cause; cf. *Meteor.* 378b10–26; also 384b24–385a11. Differently from *De gen. et corr.*, however, *Meteorologica* IV closely investigates the qualitative composition and "chemical" behaviour of the homoeomerous parts, as compounds of either earth or water or of both. However, although in *De gen. et corr.* Aristotle's speculation on the homoeomerous parts does not pervade the whole treatise, there we find a much sharper account of the connection between Aristotle's theory of mixture and the generation of the homoeomerous parts. On the link between *De generatione et corruptione* and *Meteorologica* IV, cf. Frede 2004 p. 309 ff.

¹⁷⁶ On this cf. Viano 1996, who investigates the influence of Aristotle's account of mixture in *De gen. et corr.* I 10 on the ideas of ancient Greek alchemists, such as Zosimus, Stephanus, and Olympiodorus (in whose writings Aristotle's conceptions related to mixture can be found, such as the difference between potentiality and actuality in the mixture or the active role of the qualities in the process of mixture as efficient cause); cf. Viano 1996 pp. 189–213.

¹⁷⁷ Bogaard 2012, Needham 2012.

¹⁷⁸ Kullmann 1982 pp. 214–215.

¹⁷⁹ In *De part. an.* II 1 646a12–24, Aristotle's describes the three *syntheses* of living beings' organisms: the first from elemental powers to simple compounds, the second from simple compounds to homoeomerous parts (that is, organic tissues like flesh, bone, etc.), and the third from homoeomerous to anhomoeomerous or organic parts (face, hand, etc.), cf. Lennox 2001 comments *ad* 646a12–24 pp. 180–181. In his *De mixtione*, Alexander follows Aristotle's

is that of giving a thorough account of the μεταβολαί of the substance (substantial generation, alteration, growth, and diminution) and to provide a clear description of the system of primary elements and their reciprocal qualitative transformation, it can be also partly seen as a prolegomenon to Aristotle's biology.¹⁸⁰ For in Chapters II 7 and II 8 of *De generatione et corruptione* the process of mixture, which was described in more general terms in I 10, is concretely applied to the generation of the homoeomerous parts out of a mixture of the primary *stoicheia*. In these chapters, Aristotle's biological perspective comes out clearly, as the homoeomerous parts he speaks of are clearly animal tissues, such as flesh, marrow, and bones,¹⁸¹ where all of the simple bodies, namely fire, air, water, and earth, are equally present (in different proportions).¹⁸² A homoeomerous compound in fact comes to be when the primary elements merge together and give rise to an intermediate product, as hot and cold reach a common midpoint (*metaxu*) by acting and being acted upon by one another and, at the same time, dry and wet also reach a common midpoint by acting and being acted upon by one another through the action of the "immanent" tempered-hot, which, *qua* active quality, acts on them.¹⁸³

Two all-important and interrelated aspects concerning the nature of this intermediate product, the homoeomerous part, remain to be clarified: the ontological status of the homoeomerous part and its hylomorphic analysis. According to Aristotle (although the principle undergoes modification in the tradition and in particular in Alexander), the parts of animals are not full-fledged substances insofar as they are not i) separate and ii) do not form a unity.¹⁸⁴

terminology: in the section dedicated to growth he differentiates between homoeomerous and anhomoeomerous parts of the living beings' structure; *De mixt.* 234.32ff. Bruns.

¹⁸⁰ On the link between *De gen. et corr.* and Aristotle's biological works, cf. Rashed 2005 intr. pp. 140–186

¹⁸¹ *De gen. et corr.* 334b24ff. "out of the elements there come-to-be *flesh and bones and the like*, the hot becoming cold and the cold becoming hot when they have been brought to the 'mean'. For at the mean is neither hot nor cold".

¹⁸² *De gen. et corr.* 334b30ff.

¹⁸³ *De gen. et corr.* 334b8–16 and Joachim's comments *ad loc.* in Joachim 1922 pp. 241–242. Cf. also Joachim 1904 pp. 81–86. Cf. also Joachim 1922 comm. ad *De gen. et corr.* 329b24–26 in Joachim 1922 pp. 204–207.

¹⁸⁴ *Metaph.* 1040b5ff. "Φανερόν δὲ ὅτι καὶ τῶν δοκουσῶν εἶναι οὐσιῶν αἱ πλεῖσται δυνάμεις εἰσὶ, τὰ τε μόρια τῶν ζώων (οὐθὲν γὰρ κεχωρισμένον αὐτῶν ἐστίν· ὅταν δὲ χωρισθῆ, καὶ τότε ὄντα ὡς ὕλη πάντα) καὶ γῆ καὶ πῦρ καὶ ἀήρ· οὐδὲν γὰρ αὐτῶν ἐν ἐστίν, ἀλλ' οἷον σωρός, πρὶν ἢ πεφθῆ καὶ γένηται τι ἐξ αὐτῶν ἐν". Cf. Rashed 2005 126–127. In contrast to Aristotle, however, Alexander of Aphrodisias declares that parts of substances are themselves substances; cf. *De an.* 6.3–4 Bruns; cf. Caston 2012 comm. *ad De an.* 6.3–4 Bruns p. 82.

However, although they cannot be substances in the fullest sense of the word, the homoeomerous parts are possessed of a coarse and incipient matter–form distinction. They are materially constituted by the primary *stoicheia*¹⁸⁵ (fire, air, water, and earth are in fact simple bodies, whose matter in turn cannot be separable but is always bound up with a contrariety¹⁸⁶), whereas their form (in the sense of internal structure and as opposed to matter), though rudimental and primitive,¹⁸⁷ is the *ratio* or *proportion* (*logos*) of the primary elements within the mixture¹⁸⁸—even though it must be underlined, in the key textual *loci* dealing with mixture (*De gen. et corr.* I 10 and II 7–8), only at one point does Aristotle clearly speak of *logos* as referring to the proportion of the elements in the mixture: he is far more concerned with singling out a broader central region (or *meson*) out of which come the homoeomerous parts.¹⁸⁹ Moreover, as Joachim remarks: “the ‘formula expressing the essential nature’ of a ὁμοιομερές (like bone) is the λόγος τῆς μίξεως of its constituents, i.e. the scheme of proportions constituting the plan of the combination. This ‘combining formula’ (a) adequately expresses the ‘form’ (and is therefore the scientific definition) of the ὁμοιομερές; and (b) states the normal or perfect development of the ὁμοιομερές,

¹⁸⁵ In *De gen. et corr.*, the primary *stoicheia* are understood qualitatively (cf. *De gen. et corr.* II 3 330a30ff.) “Ἐπεὶ δὲ τέτταρα τὰ στοιχεῖα, τῶν δὲ τεττάρων ἕξ αἱ συζεύξεις, τὰ δ' ἐναντία οὐ πέφυκε συνδυάζεσθαι (θερμὸν γὰρ καὶ ψυχρὸν εἶναι τὸ αὐτὸ καὶ πάλιν ξηρὸν καὶ ὑγρὸν ἀδύνατον), φανερὸν ὅτι τέτταρες ἔσονται αἱ τῶν στοιχείων συζεύξεις, θερμοῦ καὶ ξηροῦ, καὶ θερμοῦ καὶ ὑγροῦ, καὶ πάλιν ψυχροῦ καὶ ὑγροῦ, καὶ ψυχροῦ καὶ ξηροῦ”. Cf. also Frede 2004 p. 303. However, in *De gen. et corr.* II 8 334b31–335a9 esp. 334b31–32, it is said that all the intermediate bodies are made up of simple bodies, in patent contrast with *De part. an.* II 1. Rashed perceptively seeks to harmonize this account in *De gen. et corr.* II 8 with the previously quoted text from *De part. an.* II 1 646a12–24 (where—as we have seen—the homoeomerous parts are seen to be constituted by primary qualitative *dynameis*) although the question remains controversial since *De gen. et corr.* II 8 does not go much deeper into the question. As Rashed remarks, Aristotle’s account might appear to disagree with *De part. an.* II 1, but this disagreement seems to him to be only apparent. For, as Rashed maintains, by means of nutrition (the nutritional chain, from the omnivorous animal to the simple bodies, is described at *De gen. et corr.* II 8 335a9 ff.), the primary qualities together with the simple bodies are supposed to enter the living body, to be assimilated and thus found at the first level of composition of blooded animals, i.e. the homoeomerous parts; cf. Rashed 2005 pp. 128–129.

¹⁸⁶ Cf. *De gen. et corr.* 329a24–35; this matter, seen as the ultimate material substratum, has been traditionally identified with so-called prime matter. The question of whether in Aristotle such a concept exists is still hotly debated in the scholarship; for a good summary of the noteworthy Aristotelian passages and the main positions taken by scholars, cf. Caston 2012 pp. 76–78.

¹⁸⁷ Furth 1987 p. 43 n. 46.

¹⁸⁸ Rashed 2005 p. 127.

¹⁸⁹ *De gen. et corr.* 334b10–28. Solmsen attributes the reason for such a reluctance to Aristotle’s polemic against Empedocles cf. Solmsen 1960 pp. 375–377 ; cf. *amplius infra*.

its φύσις in the sense of τὸ τέλος τῆς γενέσεως (cf. e.g. *Met.* 1015a10–11), i.e. its good.”¹⁹⁰

However, Aristotle’s λόγος τῆς μίξεως does not have the same importance as the form of the entire living being. As Furth remarks, in Aristotle’s view a living being’s form considered *as a whole* cannot be reduced to the mere mixture of its basic constituents: there is a considerable difference between *mixture* and form as internal (biological) *structure* marking off *a distinct type* of living being and its distinctive activities (and if one fails to appreciate this, one falls into the Empedoclean trap). For it is this inner principle of organization of living being that, by being chronologically and logically prior and by being transmitted through the process of reproduction, determines the precise and eternal replication of the proportions of elements in the formation of the individual parts of a new living being belonging to a certain species: this is the reason why a human being begets a human being.¹⁹¹

Finally, there is a last point to be dealt with in our account of the Aristotelian and Peripatetic models of mixture and this explicitly relates to the evolution of Aristotle’s philosophical system brought about by the Peripatetic tradition, especially by Alexander of Aphrodisias. This point concerns the account of the soul and the “ensouling” of a body, and its connection to the theory of the elemental mixture.

In *De anima*, the soul or *psyché* of all living beings is regarded as a form insofar as it is the unifying organising principle (of we spoke earlier) which is the source of the inner structure and the distinguishing activities that demarcate different types of living beings, plants and animals¹⁹² (it is defined as ἀρχὴ τῶν ζώων *De an.* 412a7–8). However, as Moraux notes, although the form is

¹⁹⁰ Joachim 1922 p. 235 comm. *ad De gen. et corr.* 333b16–20.

¹⁹¹ Furth 1987 and esp. pp. 42–46 for Aristotle’s criticism of the Empedoclean theory of mixture. Cf. *De part. an.* 640a10–b4. Cf. also Tracy 1969 p. 169–170 with n. 26. In natural processes, in fact, formal, efficient and final causes often coincide: *Phys.* 198a24ff: “ἔρχεται δὲ τὰ τρία εἰς ἓν πολλάκις: i) (formal) τὸ μὲν γὰρ τί ἐστὶ καὶ ii) (final) τὸ οὗ ἕνεκα ἔν ἐστι, iii) (efficient) τὸ δ’ ὄθεν ἢ κίνησις πρῶτον τῷ εἶδει (species) ταῦτὸ τούτοις: ἄνθρωπος γὰρ ἄνθρωπον γεννᾷ”.

¹⁹² As is well known, Aristotle defines the soul as “the form of a natural body which potentially has life” (*De an.* II 1 412a21), each type of body having a distinct form of its own (*De an.* I 3 407b23–24), and, by zeroing in on the soul’s causal powers corresponding to the distinctive *energiai* of living beings, also as “the first actuality (*entelecheia*) of a natural body possessed of organs” (*De an.* II 1 412b5–6). On Aristotle’s definition(s) of soul within the context of *De anima*, cf. Menn 2002.

transmissible from the living being (which already possesses it in act) to a new living being, in order to guarantee the eternity of the species, the soul, insofar as it is form, cannot be generated from an elemental mixture and cannot even be said to be “generable” as the *synolon* is.¹⁹³

Differently from Aristotle and by probably drawing on and responding to the views of his predecessors, not in *De mixtione* but instead in *De anima*, Alexander of Aphrodisias establishes a clear link between mixture and the arising of soul in living things and defines the soul “as the power or the form that supervenes (or follows) on the blend of bodies in a particular proportion” (ἡ γὰρ δύναμις καὶ τὸ εἶδος τὸ ἐπιγινόμενον τῆ κατὰ τὸν τοιόνδε λόγον κράσει τῶν σωμάτων ψυχὴ cf. *De an.* 25.2–5 Bruns),¹⁹⁴ comparing it to a healing power which emerges from a blend of drugs (cf. *De an.* 24.23–25.2 Bruns).¹⁹⁵ Alexander arrives at this definition after having considered the nature of all the natural bodies within the physical realm and their relation to one another. For he declares that, when the simple bodies (fire, air, water, and earth, which are made up of (prime) matter and form) mix with one another, out of this mixture arise compounded bodies with simple bodies as their matter and their own distinctive form (which although emerges from the underlying constituents no longer coincide with them but is over and above them). When these latter compound bodies in turn mix with one another and, therefore, serve as underlying matter, more and more complex compound bodies are generated with a higher-order distinctive form (NB: the compounded bodies to which Alexander refers are all the other natural bodies in the *scala naturae*, ranging from inanimate compounded bodies to living beings, such as plants and animals):¹⁹⁶ each level

¹⁹³ Cf. *Metaph.* 1033b5–9, b16–18, esp. 1039b20–27, cf. also 1043b16–18, 1069b35–36; cf. Moraux 1942 pp. 37–38.

¹⁹⁴ Galen reports that the Aristotelian Andronicus of Rhodes (1st century BCE) affirmed that the soul is “either a mixture or a *dynamis* that follows on the mixture” (*Quod animi mor.* K. IV p. 782). According to Caston (2012 p. 114), in his *De Anima* Alexander would have wanted to defend the second alternative proposed by Andronicus while instead rejecting the simple *harmonia*-theory of the soul that stringently identified the soul with the mixture and that, centuries ago, had started gaining ground even among some members of Aristotle’s Lyceum. In general, on pre-Alexandrian Aristotelian psychology, cf. Moraux 1942 pp. 1 ff. and Caston 1997 pp. 339–346.

¹⁹⁵ A blend of drugs which Caston identifies with the *tetrapharmakos*. Cf. Caston 2012 p. 114 comm. *ad De an.* 24.23–25.2 Bruns, cf. *amplius* infra pp. 100 ff.

¹⁹⁶ *De an.* 1.1–11.1 Bruns. On Alexander’s concept of prime matter and his hylomorphic analysis of simple and compounded bodies, cf. Caston 2012 pp. 5–6. Cf. also Moraux 1942 p. 30 ff. and Accattino 1995 pp. 184–197.

of complexity of the underlying bodies corresponds to an advancement and a progressive enrichment of the complexity of the formal differences which, at each level, from plants to human beings, are responsible for the behaviours and activities that distinguish each type of living being (esp. *De an.* 9.1–11.1 Bruns).

To quote Alexander:

If there is to be a compound natural body, over and above the simple bodies (παρὰ τὰ ἀπλᾶ σώματα), then it must have several simples bodies as its underlying subjects [...] The [body] then which has many differing forms conjoined with matter as its underlying subject, has a nature and form that is of necessity more complex and more advanced, since each nature in the bodies underlying it makes a contribution to the form that stands over them all and is common to them [ἐκάστης φύσεως τῶν ἐν τοῖς ὑποκειμένοις αὐτῇ σώμασιν συντελοῦσης τι πρὸς τὸ ἐπὶ πᾶσιν κοινὸν εἶδος αὐτοῖς] For this sort of form is in a way a form of forms and a kind of culmination of culminations (εἶδος γὰρ πως εἰδῶν γίνεται τὸ τοιοῦτον εἶδος καὶ τελειότης τις τελειοτήτων]. (*De an.* 8.5–13 Bruns, trans. Caston; additions in Caston's original)

As Caston clearly explains:

Each new level of complexity therefore involves formal differences that cannot be identified with or reduced to the levels underlying it as matter. The primary causal explanation of behaviour distinctive of a certain level will thus always be 'from the top' in terms of the higher-level form that emerges, even if the lower underlying levels determine which form emerges. And even there the role of form is still paramount. Higher-level forms emerge only in compound bodies, where the constituent materials are themselves bodies and so have form and matter of his own; and it is these lower-level *forms* which contribute to something (*suntelousês ti*) to the higher-level form that stands in common over them (*to epi pasin koinon eidos*). It is for this reason that Alexander describes the higher-level form as 'in a sense a form of forms and a culmination of culmination'.¹⁹⁷

¹⁹⁷ Caston 2012 pp. 11–12; emphasis added.

Hence, it is understandable now why the soul is defined by Alexander as “as the power or the form that supervenes on the blend of bodies in a particular proportion,” because, at each level of organization of the living being, the form emerges from (*epigignesthai*) the mixture of all the underlying natural bodies (ultimately deriving in turn from the mixture of the four simple bodies, ἡ γὰρ γένεσις αὐτῆς (*sc.* of the soul) ἐκ τῆς ποιᾶς μίξεώς τε καὶ κράσεως τῶν πρώτων σωμάτων at *De an.* 24.3–4 Bruns): in this progressive hierarchy of forms the distinctive lower-level forms of the material constituents are responsible for the higher-level distinctive forms.¹⁹⁸

As we see from this overview of the Stoic and Peripatetic accounts of mixture, therefore, the two accounts of mixture differ notably with regard to their

¹⁹⁸ *De an.* 10.17–19 Bruns and cf. the very clear example of fire at 5.4–6 Bruns. For useful comments, supported by references to Alexandrian texts, relating to the key role played by lower-level forms in determining higher-level forms, cf. Caston 2012 pp. 86–87 *comm. ad* 10.17–19 Bruns. As Caston argues, Alexander’s non-reductive naturalism can be labelled *emergentism* (in a very similar way to that which in modern philosophy of mind is called emergentism as opposed to epiphenomenalism: both admit the supervenience of mental facts from physical facts but only the first allows for the downward causation of mental on physical; cf. Caston 1997 pp. 309–319 and pp. 353–354. The case of Alexander of Aphrodisias is analysed at pp. 347 ff. As Accattino (although he is not inclined to speak of non-reductive naturalism; cf. Accattino 1995 pp. 199–200) and more recently Caston have observed, the notion of the “supervenience” of form on matter (which in Alexander’s quoted text is expressed by recourse to the Greek verb *epigignesthai*) reaches back to Aristotle himself, who makes use of verbs such as *gignesthai* *epi/epigignestai* to express the case in which the form supervenes on or is engendered in the arrangement of matter, as long as the *synolon* of which it is form exists: in this case, therefore, the form “appears” in the *synolon* (Accattino uses the Italian “*presentarsi*”, which translates into German as “*aufreten*”, adopted by Frede and Patzig to express the supervenience of form on matter; cf. Accattino 1995 p. 198) without being subjected to generation/corruption; cf. *Metaph.* 1035a5 and 12, 1036a31–2 and 1036b6. However, it must be admitted that although the notion of the supervenience of form on matter can be found scattered throughout Aristotle’s work, it seems indeed that Alexander goes a big step further than Aristotle when he says that ἡ γὰρ γένεσις αὐτῆς (*sc.* of the soul) ἐκ τῆς ποιᾶς μίξεώς τε καὶ κράσεως τῶν πρώτων σωμάτων at *De an.* 24.3–4, cf. also 26.22 (Accattino tries to brand it as an *isolated statement*, while it is instead, as we have seen, the very core and the heart of Alexander’s argument; cf. Accattino 1995 p. 200). Another interrelated issue concerns the priority and primacy of form over matter. Moraux observes that the mixture of the constitutive elements is not only the *conditio sine qua non* of the generation of the soul but also its innermost cause: therefore, rather than being a prior principle of internal organization/structure of a living being, the soul *qua* form is not only posterior to the mixture but is also its final “result”; Moraux 1942 p. 33. Sharples perceptively raises an objection to Moraux’s view by pointing out i) that in Alexander’s *De anima* it is clearly stated that it is the form of each thing which *a priori* determines its nature (*De an.* 7.4–8), and by reporting ii) a passage taken from a report by Simplicius (*In Phys.* 310.25–311.19) of Alexander’s account of the generation of living beings where, as in Aristotle, the form plays the overriding role of formal/efficient cause thought of as prior to and setting in motion the process leading to the formation of a new living creature; cf. Sharples 1994 pp. 163–168. It seems to be reasonable, as Sharples aptly underscores, to say that Alexander emphasizes just one aspect of Aristotle’s theory; cf. Sharples 1994 pp. 163–164.

theoretical frameworks and physical and metaphysical implications. In fact, although both the Stoic and the Aristotelian accounts could accommodate more common everyday processes of mixture, their substantial aims and justifications are fundamentally different. For while the Stoic theory seems to be principally used in order to explain divine pneuma's pervasion through passive matter, Aristotle's theory of mixture applies to the formation of uniform compounds, be they inanimate or, more importantly, biological homoeomerous stuff.¹⁹⁹ Moreover, we register a decisive development of the theory of mixture within the Peripatetic philosophical system of the 2nd–3rd century CE, insofar as mixture of underlying natural bodies is used to explain the emergence of the soul's causal powers.

¹⁹⁹ I do not agree with Salles 2008, who sees in Chrysippus a formation of homoeomerous bodies equivalent to Aristotle's account. In the first place, Salles builds a Chrysippean theory of homoeomerous parts by making reference to just one isolated testimony, as he clearly admits; cf. Salles 2008 p. 15 n. 4. There is in fact only one source from which one can infer an account of the generation of the homoeomerous parts from a Stoic mixture of primary elements and that is Galen's *De causis contentivis* CMG Suppl. Or. II 1.1–2.4 pp. 52–54 Lyons, where Galen mentions the Stoics as proponents of the theory that the bodies that Aristotle calls homoeomerous are generated out of the elemental mixture. On closer inspection of the text, however, one notes that although the Stoic theory of mixture is really connected to the formation of “homoeomerous bodies”, (which however recalls Aristotle's formulation) the focus lies, consistent with the Stoic account, on the fact that the active elements (fire and air) work as cohesive cause of the passive elements (earth and water), as has been shown. In second place, one has to note that in Galen's testimony the Stoic account is connected to the medical ideas of Athenaeus of Attalia, the founder of the Pneumatist medical school, who, as Galen reports, was a student of Posidonius (presumably of Apamea, the Stoic philosopher). According to Wellmann, although this medical school draws abundantly on Stoic theories, which are applied to their physiological doctrines (pneuma and its threefold degree of tension—hexis, physis, psyche—, hegemonikon seated in the heart as ruling part of the soul, tonos, theory of the spermatikoi logoi, theory of perception), in some respects it also was influenced by Aristotelian ideas, such as in the case of the theory of reproduction (which corresponds to Aristotle's account, where the male semen works as formal-efficient cause and the female semen as material cause); cf. Wellmann 1895 pp. 131–158. Therefore, Athenaeus' usage of the concept of homoeomerous parts, which in his view are permeated by pneuma (cf. *De caus. content.* CMG Suppl. Or. II 2.5 p. 54 Lyons), may also depend on the influence of Peripatetic ideas and in this he may have followed a more eclectic tendency, which makes its entrance in the middle Stoa with leaders such as Panaetius and Posidonius—who combine Stoic conceptions with Plato's and Aristotle's theories; cf. Sellars 2006 pp. 8–11; cf. Edelstein 1936 p. 288. Finally, but more importantly, it is very hard to believe that Chrysippus would have established a link between mixture and a corresponding equivalent of Aristotle's biological homoeomerous stuff if we think that in the entire *De mixtione* and in the other pieces of evidence relating to the Chrysippean theory of total mixture there are no examples at all where the theory of total mixture is applied to the generation of one of the biological levels of living beings' organic structure; hence it seems more appropriate and far safer to circumscribe the main explanatory justification of this Stoic theory and limit it to the clarification of the immanence of the two Stoic principles, logos and matter, as we did previously.

1.3 Galen's account of the mixture of primary elements

Galen's natural philosophy finds one of its major linchpins in the theory of mixture. In Galen's case, the concept of the mixture of primary elements is fundamental for two main reasons. In the first place, the notion of mixture theoretically underpins Galen's physiology, therapeutics, and dietetics. On the one hand, material substances that are used in the everyday regimen and for therapeutic purposes, such as food, drink, and drugs, have a particular mixture and of hot, cold, dry, and wet. On the other hand, as stated in *De temperamentis*, the nature of a living being *is* a mixture of hot, cold, dry, and wet (*De Temp.* p. 104, 1–3 H.) and, therefore, its health and pathological states are conditioned by the balance or the imbalance of the elemental qualities. That is clearly stated in *De temperamentis*, where Galen claims that the right distribution of the primary elements in the mixture is cause (αἰτία) of *eukrasia*, good mixture, and health (the reference is to the spring *De temp.* 16.15–16 H.). Accordingly, medical treatment consists in the interaction between the mixture of living bodies and food, drink, or drugs, as these substances will replenish or reduce the quantity of hotness, coldness, dryness, or moistness present in the living body so as to re-establish the right proportion.²⁰⁰ However, it cannot be glossed over that mixture is first of all and primarily a physical process, where the primary elements (Galen's fire, water, air, and earth, which are simple by nature, unmixed and unblended, possessing a couple of primary qualities at the extreme degree)²⁰¹ mix together and give rise to all the compound physical bodies, inanimate and animate. As such, the concrete and physical process of mixture is an essential basis for a good understanding of Galen's physical system.

²⁰⁰ Van der Eijk 2008, Van der Eijk 2011, Van der Eijk 2014a.

²⁰¹ *De elem. sec. Hipp.* CMG V 1.2. pp. 112.21–114.4 De Lacy.

1.3.1 Syncretistic approach

But how does this process concretely occur? What does it bring about and how does Galen's account of mixture relate to a long-lasting medical speculation, notably Hippocratic, on the concept of mixture and to its major contemporary models, the Stoic and the Peripatetic? One of the first crucial points to tackle in seeking to unravel Galen's stunningly variegated and protean background is his openly syncretistic approach. For in the texts where he describes his theory of mixture, which he calls total (δι' ὅλων), he equally attributes it to Hippocrates (and the reference is more precisely to the Hippocratic writing *De natura hominis*), Aristotle, and the Stoics. Let us consider the texts (T1-4).

T1 Galen *De elementis ex Hipp.* K. I 489.6–11 De Lacy 136.15–20 :

καὶ μὲν δὴ καὶ ὅπως δι' ὅλων κεράννυται τὰ κεραννύμενα, πότερα τῶν ποιοτήτων μόνων, ὡς Ἀριστοτέλης ὑπέλαβεν, ἢ καὶ τῶν σωματικῶν οὐσιῶν δι' ἀλλήλων ιουσῶν, οὐκ ἀναγκαῖον ἐπίστασθαι τοῖς ἰατροῖς· ὅθεν οὐδ' Ἱπποκράτης ἀπεφήνατό τι περὶ τούτων, ἀλλ' ἠρκέσθη μόνῳ τῷ δι' ὅλων κεκρᾶσθαι τὰ στοιχεῖα.

Moreover, it is not necessary for physicians to understand how things are mixed through and through, whether the mixtures are of qualities only, as Aristotle supposed, or of corporeal substances that pass through each other; that is why Hippocrates said nothing about these matters but was content with the mere fact that the elements are mixed in their entirety. (Transl. De Lacy)

T2 Galen *in Hipp. Nat. Hom. comment.* K. XV 32.1–11 Mewaldt 18.27–19.7:

ὅτι γὰρ οὐχ ἓν ἐστίν, ἀλλὰ πλείω τὰ συντιθέντα τὴν | τοῦ ἀνθρώπου φύσιν, ἐπιδείκνυσιν ὁ Ἱπποκράτης, οὐ μὴν ὅτι γε μηδέν ἐστὶ τῶν τεττάρων στοιχείων εἰλικρινές ἐν τῷ σώματι. τὴν ἀρχὴν γὰρ οὐδὲ λέγουσιν οἱ τῆς δόξης ταύτης

ἡγεμόνες τοῦτο. ἔν δὴ τι παρὰ τὰ τέτταρα, τὸ ἐξ αὐτῶν συγκείμενον, ἀποφαίνονται, ὡς γε τὴν τετραφάρμακον δύναμιν οὔτε κηρὸν οὔτε πίτταν οὔτε ῥητίνην οὔτε στέαρ, ἀλλὰ τι παρὰ ταῦτα ἔν ἄλλο, ὃ ἐξ ἀπάντων κραθέντων γέγονεν, οὔσης πάλιν καὶ αὐτῆς τῆς δόξης διττῆς· ἔνιοι μὲν γὰρ τὰς τέτταρας ποιότητας μόνας κεράννυσθαι δι' ὄλων ἀλλήλαις λέγουσιν, ἔνιοι δὲ <καὶ> τὰς οὐσίας ἀπεφάναντο²⁰², Περιπατητικοὶ μὲν τῆς προτέρας δόξης προστάντες, Στωϊκοὶ δὲ τῆς δευτέρας.

For Hippocrates showed that what constitutes the nature of man is not one thing but many, not that none of the four exists in the body in its pure state. For the leading proponents of this doctrine do not say that this is the principle. Rather they hold that there is one thing over and above the four, and which is constituted from them, just as the power of the *tetrapharmakon* is neither wax, pitch, resin, nor fat, but something else over and above them, which is generated from the mixture of all of them, although this latter doctrine comes in two forms. For some people say that only the four qualities are mixed through-and-through with one another, while others hold that also the substances themselves are (the Peripatetics favour the former doctrine, the Stoics the latter). (Trans. Hankinson; slightly modified)

T3 Galen *De methodo medendi* K. X 16.2–24:

τὸ γὰρ θερμὸν καὶ τὸ ψυχρὸν καὶ τὸ ξηρὸν καὶ τὸ ὑγρὸν Ἴπποκράτης μὲν πρῶτος εἰσηγήσατο, μετ' αὐτὸν δ' Ἀριστοτέλης ἀπέδειξεν· ἔτοιμα δ' ἤδη παραλαβόντες οὐκ ἐφιλονείκησαν οἱ περὶ τὸν Χρύσιππον, ἀλλ' ἐκ τούτων τὰ σύμπαντα κεκρᾶσθαι λέγουσι, καὶ ταῦτ' εἰς ἄλληλα πάσχειν καὶ δρᾶν καὶ τεχνικὴν εἶναι τὴν φύσιν, ἅπαντά τε τὰ περὶ φύσεως Ἴπποκράτους δόγματα προσίενται, πλὴν περὶ μικροῦ τινός ἐστιν αὐτοῖς ἡ διαφορὰ πρὸς Ἀριστοτέλη (..) διαφέρονται δὲ ἐν τῷ τὰς μὲν ποιότητας μόνας τὸν Ἀριστοτέλη δι' ἀλλήλων ἰέναι

²⁰²*De elementis sec. Hipp.* CMG V 1.2 De Lacy p. 136.15–20. On the basis of a comparison with the other analogous passages listed here, where Galen assigns to the Stoics the view that the substances (together with the qualities) can also be mixed—cf. *De meth. Med.* K. X 16.24 “ἀλλὰ καὶ τὰς οὐσίας αὐτὰς”; *De nat. fac.* p. 104, 12 H. “οὕτω καὶ τὰς οὐσίας”—I conjecture a καὶ which, because of the fact that it may have been as usual paleographically abbreviated, might have been omitted at some point in the textual tradition.

καὶ κεράννυσθαι πάντη, τοὺς δ' ἀπὸ τῆς στοᾶς οὐ ταύτας μόνας, ἀλλὰ καὶ τὰς οὐσίας αὐτὰς ὑπολαμβάνειν.

For Hippocrates was the first to propose the hot, the cold, the dry and the moist, and after him Aristotle proved them. And the followers of Chrysippus, when they accepted these things already to hand, were not embroiled in contention. Rather, they say that all the things are compounded from these (four elemental qualities), and that these things are affected by and act on each other, and that nature is craftsman. And they approve all the other doctrines of Hippocrates regarding nature, apart from one minor point which is a difference between them and Aristotle [...]. However, they differ in this: Aristotle held that the qualities alone go through one another and mix together completely, whereas those from the Stoa suppose that not these qualities only but also the substances themselves do this. (Trans. Johnston-Horsley; slightly modified)

T4 Galen *De naturalibus facultatibus* K. II 5.8–17 Helmreich 104.6–15:

καὶ μέντοι καὶ τὸ κεράννυσθαι δι' ἀλλήλων αὐτὰς ὅλας δι' ὅλων Ἱπποκράτης ἀπάντων [ὧν ἴσμεν] πρῶτος ἔγνω· καὶ τὰς ἀρχὰς γε τῶν ἀποδείξεων, ὧν ὕστερον Ἀριστοτέλης μετεχειρίσατο, παρ' ἐκείνῳ πρώτῳ γεγραμμένας ἔστιν εὐρεῖν. εἰ δ' ὡσπερ τὰς ποιότητας οὕτω καὶ τὰς οὐσίας δι' ὅλων κεράννυσθαι χρὴ νομίζειν, ὡς ὕστερον ἀπεφήνατο Ζήνων ὁ Κιτιεύς, οὐχ ἡγοῦμαι δεῖν ἔτι περὶ τούτου κατὰ τόνδε τὸν λόγον ἐπεξιέναι.

Hippocrates was also the first to recognize that all these qualities undergo an intimate mingling with one another; and at least the beginnings of the proofs to which Aristotle later set his hand are to be found first in the writings of Hippocrates. As to whether we are to suppose that the substances as well as their qualities undergo this intimate mingling, as Zeno of Citium afterwards declared, I do not think it necessary to go further into this question in the present treatise. (Trans. Brock)

As we see, in these four passages where Galen's syncretistic approach is glaringly visible, the formulation is analogous and presents only slight variations: in Galen's view, in fact, Hippocrates held that the primary elements mix completely (δι' ὅλων κεράννυσθαι), and only afterwards did Aristotle and Zeno, Chrysippus, or the the Stoics generally get hold of the theory—but there is a difference between them. For the former was convinced that only the qualities totally mix, whereas the latter thought that corporeal substances or substances-cum-qualities also totally mix. In most cases Galen adds that it is not necessary for a physician to understand whether the qualities or the substances-cum-qualities mix. For Hippocrates was merely content with the fact that the primary elements mix totally.

However, the theories that Galen mentions together are really different from one another both in terms of modalities and purposes. First of all, Galen's Hippocrates of *De natura hominis* does not actually set up a theory of mixture of the four elements at all; he rather speaks of a mixture of the four humours, such as blood, yellow and black bile, and phlegm.²⁰³ Second, as we saw, although they both rely on a system of four elements that change into each other, the Aristotelian and Stoic theories are different: the former is based on a progressive division of constituents followed by a unification brought about by a qualitative interaction, and the latter presupposes a coextension of two or more bodies. Moreover, although both models account for the everyday processes of mixture, their main aims and justifications are different. If Aristotle's account points to the generation of homeomerous stuff, biological or inorganic materials, the Stoics from Chrysippus on used the total mixture to explain the complete interpenetration of pneuma and matter.

²⁰³ In this writing the Hippocratic author describes a quadripartite system of humours: blood, yellow and black bile, and phlegm. Each of these humours is assigned two primary qualities: blood is hot and moist, yellow bile is dry and hot, black bile is dry and cold, and phlegm is moist and cold. In this treatise the humoralistic perspective is overtly dominant and the humours are conceived as building blocks of the nature of the human being. They are essential for understanding the physiology and pathology of human beings their health and pathological states depend respectively on a balanced and imbalanced mixture of the four humours. The humoralism of the nature of the human being is clearly spelled out in Ch. 4 CMG I 1.3 pp. 172.13–174.10 Jouanna.

The reason for this syncretistic conflation seems to me to be twofold. On the one hand such an approach can be explained in terms of an argumentative strategy and rhetorical use of the authorities. In fact it is typical of Galen's overall thought to offer purposely syncretistic interpretations and to build shifting alliances in order to pursue his arguments, although he is perfectly aware of the doctrinal discrepancies that exist between the authorities that he quotes and he does this even at the cost of distorting the sources on which he draws.²⁰⁴ For example, if on this occasion he teams up with these authorities, as well as with Aristotle, on the other hand he criticizes them both ferociously and without reservations for having posited the seat of the ruling part of the soul as being in the heart rather than in the brain, as happens in *De placitis Hippocratis et Platonis*²⁰⁵.

However, this attitude and way of setting up theories cannot be reduced to a mere matter of rhetoric insofar as Galen, who had an eclectic philosophical education,²⁰⁶ is ultimately truly and profoundly convinced of the fundamental unity of the major philosophical schools with regards to some central issues and, thus, that their languages are translatable into one another.²⁰⁷ Therefore, in such

²⁰⁴ For Galen's use of the authorities (apart from Hippocrates) cf. Donini 1974; Todd 1977 (on Galen's use of Aristotle's authority and more specifically on the reverberations of Galen's medical ideas in later Peripatetic commentators); Lloyd 1988 (on Galen's usage of authorities in *Quod animi mores*); von Staden 1991 (on Galen's use of the sources, in general and in particular with regard to his acquaintance with Herophilus' original writings and doxographical reports); Vegetti 1999a, 1999b esp. p. 391 (where Vegetti explains the role of Galen's use of the Stoics as regards the total mixture); Tieleman 2003a pp. 39–46 (with reference to the Stoics and poetic tradition); Lloyd 2008, esp. p. 40 ff.

²⁰⁵ See Tieleman 1996a pp. 38–60 (for an analysis of Galen's refutation of Stoics and Peripatetics regarding the seat of the soul in Books 1–3 of *De Placitis Hippocratis et Platonis*); see also Vegetti 1999a pp. 333–357.

²⁰⁶ At Pergamum Galen studied under students of the Platonic Gaius and the Stoic Philopator, and in Smyrna under another Platonist Albinus. He also studied Stoic Logic as a boy; cf. Hankinson 1992 pp. 3505–3507 and Donini 1992. In Rome he met the Peripatetic Eudemus who, according to Moraux, would coincide with the student of the Peripatetic Aspasius under whom Galen studied in Pergamum; cf. Moraux 1984 p. 687 n. 1.

²⁰⁷ In this regard, cf. Manuli 1986; Manuli insightfully studied Galen's lexicon and pointed out Galen's tendency to set up his arguments by making use of a non-homogeneous set of concepts and notions bearing the hallmark of different philosophical systems, such as the Platonic, the Peripatetic, and the Stoic. In this respect Galen would have mirrored syncretistic lexical tendencies that were shared by all the major philosophical schools. However, as Manuli underscores, Galen's apparent multiplicity when it comes to philosophical and scientific languages does not conflict with the idea of an essential conceptual homogeneity at all. In fact, as Manuli shows, this continuous terminological exchange is possible only if the theories expressed by the terminologies respect a more common criterion of truth and ultimately if they are translatable into Hippocrates and Plato's language, on whose agreement Galen's medicine strongly relies; cf. Manuli 1986 pp. 245–247.

cases he tends to minimize the doctrinal differences and to fuse them together, providing the best possible synthesis.²⁰⁸

What, then, would be the point of putting all these diverse theories of mixture together? This is explained well by Vegetti, who has already highlighted the strategic role that this alliance between Hippocrates, Aristotle, and the Stoics plays for the creation of a “friendly tradition” of continuum theories, as were the Aristotelian and the Stoic. If in fact we want to assimilate Galen’s position to one of the two main groups of ancient matter theorists, which, as we saw, are so neatly sketched by Alexander in his *De mixtione*, we can say that Galen was a committed continuist, on a par with Stoics and Peripatetics. Therefore, he could take advantage of this alliance with the Stoics and Peripatetics in order to achieve one of his main polemical objectives, the rejection of older and more recent versions of atomism and corpuscularism, such as that of Asclepiades of Bithynia, who claimed the existence of void and centred his medical theories on the general assumption that the body was made up of invisible particles (*ὄγκοι*) and channels (*πόροι*).²⁰⁹

Furthermore, it has to be stressed that by appealing to Hippocrates’ authority Galen fudges and escapes more contemporary and pressing questions, that is, those concerning the problem of the constituents of the mixture, which,

²⁰⁸ Hankinson 1992, on Galen’s tendency to provide synthetic medical and philosophical theories. In contrast to Donini, who ultimately seems to label Galen’s philosophy as scarcely original; cf. Donini 1992 esp. pp. 3502–3503, Hankinson tries instead to enhance Galen’s unconventional and innovative philosophical outlook and the coherence which underlies Galen’s thought: “All this [Galen’s theoretical syncretism] might give the impression that Galen was simply a collector and hoarder of disparate views, an intellectual magpie. This is far from being the case: Galen’s over-riding concern is for consistency and truth—and his syncretism, far from being uncritical and indiscriminate, represents a conscious attempt to weld together out of the disparate elements provided by the tradition a set of theories of unparalleled explanatory power and accuracy” (p. 3508).

²⁰⁹ Vegetti 1999b p. 390 and p. 392. This is much clearer in a passage from *De nat. fac.* p. 120.7–21 H., where Galen speaks of two *haireseis* that arise in medicine and philosophy: the one school, which supposes that all substance subject to generation and decay, is continuous (*hēnōmenē*) and undergoes alteration (*alloioûsthai*), the second, which assumes substance to be unchangeable, is unalterable and divided into small particles. As Vegetti remarks, the first school would correspond to the Aristotelian, Platonist, and Stoic, whereas the second one (associated with further remarks concerning the lack of teleological explanation, cf. *ibid.* H. 121.23) would be a reference to corpuscularists of any lineage; cf. Vegetti 1999b p. 390 and pp. 391–392. As Vegetti points out, this alliance is determinant for the creation of a “friendly tradition” of the continuum school; cf. Vegetti 1999b p. 391. For Galen’s rejection of atomism cf. also Hankinson 2008a; cf. more recently Kupreeva 2014 pp. 162–172; for an account of the medical system of Asclepiades of Bithynia cf. Vallance 1993; Leith 2009.

as we have seen, at that time profoundly stirred the major philosophical schools and led exponents of the Platonic and Peripatetic schools and also corpuscularist medicine to fight against Stoic corporealism. At first sight, to such questions Galen simply replies that on the basis of Hippocrates' doctrines, what he knows for sure is that the primary elements mix, although he does not want to make any pronouncement regarding how they mix, whether the mixture involves qualities, as Aristotle upholds, or substances-cum-qualities, as the Stoics maintain.

1.3.2 Galen and the Stoic/Peripatetic controversy. Qualities or bodies?

However, an analysis of how Galen tackles this latter issue regarding the constituents of the mixture may be relevant from other points of view. In the first place, it suggests a philosophical reflection upon the causality involved in the mechanism of mixture and the difference between the Peripatetic and Stoic accounts. Second, and more importantly, we can see how Galen copes with doctrinal divergences, namely in ways that are consistent with his general anti-dogmatic outlook and in accordance with the principles of his own epistemology.

It has been said that the aforementioned passages (**T1–4**), where Galen explains the difference between the constituents of the mixture in the Peripatetic and the Stoic schools, have to be considered as a piece of unreliable doxography, as the basic categories of ποιότης (or more precisely, ποιόν, in the case of the Stoics) and οὐσία differed considerably in the Stoic and the Peripatetic traditions.²¹⁰ Actually, while it might be a piece of doxography,²¹¹

²¹⁰ Todd 1976, p. 59. Contrary to Long and Sedley 1987 p. 172, who uses *ousia* as the first genus following Plutarch's usage in *De comm. not.* 1083d, Menn proposes to replace it with *hypokeimenon*, as in Plot. VI.I 25.1–3 and *Simpl. In Categ.* 66.32–67.2 and 67.17–19, where the first genus is not *ousia*, but *hypokeimenon*. For the Stoics *ousia* means matter (SVF I 87 and III 317) and actually Calcidius (SVF I 86) draws a difference between *ousia* (*essentia*, *substantia*) and *hyle* (*silva*) and explains that the first is used *stricto sensu* only for qualityless matter. As Sandbach 1985, p. 41, suggests, the term *hypokeimenon* does not refer to the material substratum, but to “any external object”; cf. Menn 1999 p. 215 with n. 1. Therefore, if *ousia* differently from *hypokeimenon* means matter, Galen's association of *ousia* with *poiotētes* seems to aptly refer to the qualified body, i.e. to the material substratum where the *poiotētes* comes to be.

²¹¹ Todd 1976, pp. 58–59.

and we know that Galen uses doxographic resources,²¹² this does not mean that Galen's report has to be rejected or its significance has to be minimized. After all, the definition "substances-cum-qualities" that Galen attributes to the Stoics and that we also find in Alexander's *De mixtione* as describing the constituents of mixture (*De mixt.* 216.26 Bruns) can refer to the Stoic acceptance of οὐσία as material substrate, whereas the quality identifies a second corporeal entity imbuing matter and capable of affecting it causally. For according to the Stoics, qualities are also bodies and therefore have causal efficacy.²¹³ Moreover, a further confirmation that in those cases Galen refers to the Stoic corporealistic account can be seen in the fact that he alternates between the expression "substances-cum-qualities" and the expression σωματικά οὐσία, that is, corporeal substances, which are said to go through one another (τῶν σωματικῶν οὐσιῶν δι' ἀλλήλων ἰουσῶν).

In the aforementioned passages (T1-4) comes up an interesting problem regarding the notion of mixture, namely: how do the constituents interact during the process of mixture? Is the interaction attributable to the Stoic substances-cum-qualities or corporeal substances, where the qualities are a second corporeal entity imbuing matter and capable of affecting it causally? Or rather, are qualities alone understood *more Aristotelico* as conceptually distinct from the body itself?

This distinction in fact entails a very different process of causation in each case. For in Aristotle the qualities are in fact the formal-efficient cause of the mechanism of mixture, since they first set in motion and carry out the

²¹² As Tieleman has shown (cf. Tieleman 2003a p. 61 ff.), Galen was well acquainted with the *Placita* tradition, i.e. a doxographic tradition which examines texts such as Ps.-Plutarch *Placita philosophorum*, Ps.-Galen *Historia philosopha*, and the cognate excerpts in Stobaeus *Eclogae Physicae*, as well as Theodoret's *Graecarum affectionum curatio*. These texts belong to a tradition that can be traced back to Theophrastus *Physical doctrines*. For Diels' reconstruction of Aetius' hypothesis, cf. Mansfeld and Runia 1997 Ch. 1; a clear schema of the stemma is provided at p. 4. Cf. Van der Eijk 1999a for a clear description of the different "genres" of historiography and doxography in ancient medical literature, esp. pp. 11–19; cf. also Runia 1999. I am thankful to Prof. Tieleman for a discussion on this passage.

²¹³ 45A-D LS = SVF I 90, SVF II 363, SVF I 518 part, SVF II 790 part, for the Stoics in fact incorporeal entities, such as, sayables, void, place and time, lack causal efficacy, whereas *only bodies can act or be acted upon*. For the Stoics the qualities are bodies, as according to Zeno a cause is "that because of which", while the effect (that of which it is the cause) is an accident (*symbebekos*). The cause is the body, the effect is a predicate and the predicate for the Stoics is a sayable, and therefore, incorporeal. For example, it is because of prudence that being prudent occurs, because of soul that being alive occurs, because of temperance that being temperate occurs; cf. LS A 55 = SVF I 89 (for Chrysippus' formulation cf. II 336) with comments *ad loc.*

process of mixture through a qualitative interaction.²¹⁴ On the other hand, in the Stoic theory the question is slightly more complex if one does not want to superimpose the Aristotelian schema on the Stoic theory of causation. As Collette-Dučić and Delcomminette remark, it is always the active principle that plays the role of the causal agent, when it is pure, as in the case of the active principle or god or when it is present in the qualified bodies. However, since the ἀντιπαρέκτασις can be applied both when the constituents balance each other out and when they do not, we have two different state of affairs. In the first case, we can speak of two concomitant causes bringing about an effect (συναίτια). In the second case, for example the case of the well-known Chrysippean paradox of the drop of wine that coextends itself with the entire sea, or the case of the pneuma and passive matter, the first, which transfers its activity onto the other, can be seen as the συνεκτικὸν αἴτιον or cohesive cause, whereas the second only favours and supports the process and, therefore, can only be seen as a cooperant cause (συνεργὸν αἴτιον).²¹⁵ The basic difference between the two processes of causation, however, remains the fact that, in contrast to Aristotle, according to the Stoics only bodies can act and be acted upon, which is the hallmark that they (as the materialists of Plato's Sophist) assign to true beings.²¹⁶

Although Galen gives us the impression of underestimating a discrepancy between the Stoics and the Aristotle, he does mention an issue that goes beyond the subject matter of mixture, reflecting instead a broader key difference between the two schools, the Stoic and the Peripatetic.²¹⁷

²¹⁴ Cf. Mourelatos 1984.

²¹⁵ For the Stoic theory of causation in general, cf. SVF II 351 = LS 55 I, with Long and Sedley's comments pp. 340–343; cf. also Sambursky 1959 pp. 48–56; cf. the collection of texts and comments in Hankinson 1998a pp. 23ff. On the cohesive or sustaining cause, cf. Galen's *De causis contentivis* CMG Suppl. Or. II 1.1–2.4 pp. 52–54 Lyons = LS 55 F with particular reference to Athenaeus' aetiology of disease. On Galen's theory of causation (which stems from a syncretistic conflation between Aristotle's doctrine of the four causes plus an instrumental cause and the original Stoic account plus the introduction—plausibly by Athenaeus—of the concept of preceding cause), cf. Hankinson 1998b, and Hankinson 1994 esp. pp. 1764–1769. As regards the Stoic theory of causation as applied to the Stoic account of mixture, see Collette-Dučić and Delcomminette 2006 pp. 33–34. As Collette-Dučić and Delcomminette sharply note, in the case of unequal bodies blending, the passive body (such as the passive matter which undergoes the effects of the active pneuma) acts as cooperant cause qua active (in the sense that the already qualified matter is not purely passive) and not qua passive, as Todd 1976 p. 43 claims.

²¹⁶ Brunschwig 1988.

²¹⁷ Apart from the polemics that have arisen with reference to the mechanism of mixture in the post-Hellenistic age, Stoic radical corporealism gave rise to vehement criticisms carried out by the Platonic, the Peripatetic, and the Epicurean schools, which ferociously attacked the Stoic

Hence, if Galen had answered this question, i.e. whether it is qualities that mix or corporeal substances-cum-qualities, he would have been compelled to side with one of the two philosophical schools, and this would have conflicted with his own reiterated declarations of philosophical independence, especially with regards to ideas that he cannot be certain about.²¹⁸ In the epistemological gradation of certitude that we find in *On my own opinions*, Galen carefully distinguishes between what he does not know and about which no judgement can be made, what he knows for certain (βέβαιον), and what is simply probable or convincing (πιθανόν), to which he often appeals in order to avoid the *aphasia* of radical Pyrrhonian Scepticism.²¹⁹ And in fact, Galen speaks of this Stoic/Peripatetic controversy in several passages; he knows the difference between the two theories of mixture and the arguments that were used against the Stoic corporealists at the time, and, as we will shortly see, he seems to be determined to enter the Stoic/Peripatetic controversy, as he critically engages with the leading proponents of the two main contemporary models of mixture by taking an active thought anti-dogmatic part in the debate.

First of all, Galen shows that he is aware of the arguments that have been used against the Stoics. In a passage from *De experientia medica* (T5), a treatise handed down not in Greek but in Arabic translation, Galen distinguishes two different and alternative theories of matter, the atomistic and another based on a complete interpenetration, which seems to be the only possible alternative—albeit difficult to imagine. Galen then continues and says

claim that only bodies can have causal efficacy. For a reconstruction of the debate from the post-Hellenistic age to Alexander of Aphrodisias, cf. Kupreeva 2003, pp. 304–315.

²¹⁸ On Galen's anti-dogmatic eclecticism cf. Frede 1987a p. 284; Donini 1992; Hankinson 1992.

²¹⁹ *De propr. plac.* pp. 188.7–13 Boudon-Millot-Pietrobelli “περὶ γὰρ ἄλλων δογμάτων ἀποφαινόμενος ἀπλῶς, τῶν μὲν, ὡς εἰδείην τὴν ἐν αὐτοῖς ἀλήθειαν, τῶν δὲ, ὡς οὐδὲν αὐτῆς εἰδείην, ἐν οἷς ἄρτι διήλθον, ἄχρι τοῦ πιθανοῦ προσέρχομαι, βέλτιον μὲν εἶναι νομίζων, εἴπερ ἐγνώκειν οὕτω περὶ αὐτῶν, ὡς ἀποφαίνεσθαι, καθάπερ ἐπ' ἄλλων, οὐ μὴν ἀναπειθῶν ἑμαυτὸν, ὡσπερ ἕτεροι, βεβαίαν ἔχειν γνῶσιν, ὧν οὐκ ἔσχον ἀπόδειξιν βεβαίαν”. As Nutton notes, in this work Galen's way of presenting his personal beliefs follows a triple schema of knowledge. For there are a) things that he knows to be certain, b) things that he considers plausible but as yet unproven, and c) things which he cannot yet clear up in his mind, such as the nature of the soul or the eternity of the world; cf. Nutton 1999 pp. 45–50. For Galen's usage of πιθανόν cf. *infra* pp. 79ff. For Galen's refutation of Pyrrhonian Scepticism and sceptical ideas in the Empiricists, cf. De Lacy 1991. For more in general on Galen's epistemology, cf. Frede 1987a; Hankinson 2008b and 2009.

that “[f]or that two bodies, or three and often four or five, should occupy the same place is a condition difficult to imagine and to think of.”²²⁰

T5 *De experientia medica* XIX p. 122 Walzer:

As for the view that composite bodies are permeated the one by the other, although nothing remains except this, yet it is something which one cannot easily imagine, and I am far from thinking of it to say, to say nothing of understanding it and knowing it. For that two bodies, or three and often four or five, should occupy the same place is a condition difficult to imagine and to think of. (Trans. Walzer)

Galen does not say whose theory he is attacking but we can glean that it is set against the atomistic theory, and is therefore continuist; in addition, Galen raises objections against the idea that two or more bodies cannot coexist in the same place, in a similar vein to Alexander’s criticism of the Stoic total interpenetration of bodies, as in both the cases coextension is ruled out by making reference to the Aristotelian paradox of two (or more) bodies in the same place.

But Galen takes an even stronger position against the Stoic theory of total mixture, in a passage of *De placitis Hippocratis et Platonis* (**T6**) where he tries to refute two theories of vision:

T6 Galen *De plac. Hipp. et Plat.* K. V 618.1-619.2 De Lacy 452.29–454.7:

Μάλιστα δ' ἂν πεισθεῖη τις τοῦτο γίνεσθαι μαθῶν ὅπως εὐλογόν ἐστιν ὁρᾶν ἡμᾶς. ἀρχὴ δὲ καὶ τοῦδε τοῦ λόγου τοιάδε· τὸ βλεπόμενον σῶμα δυοῖν θάτερον· ἢ πέμπον τι πρὸς ἡμᾶς ἀφ' ἑαυτοῦ σὺν ἐκείνῳ καὶ τὴν ἰδίαν ἐνδείκνυται διάγνωσιν, ἢ εἴπερ αὐτὸ μηδὲν πέμπει, περιμένει τινὰ παρ' ἡμῶν ἀφικέσθαι δύναμιν αἰσθητικὴν ἐφ' ἑαυτό. πότερον οὖν αὐτῶν ἐστὶν ἀληθέστερον ὧδ' ἂν μάλιστα κριθεῖη· διὰ τοῦ κατὰ τὴν κόρην τρήματος ὁρῶμεν, ὅπερ εἰ περιέμενε

²²⁰ I am thankful to Prof. Garofalo for a translation from the Arabic and a discussion on the passage.

πρὸς ἑαυτὸ παραγενέσθαι τινὰ μοῖραν ἢ δύναμιν ἢ εἶδωλον ἢ ποιότητα τῶν ἐκτὸς ὑποκειμένων σωμάτων, οὐκ ἂν τοῦ βλεπομένου τὸ μέγεθος ἐγνώκειμεν, οἷον ὄρους εἰ τύχοι μεγίστου. τηλικούτον γὰρ εἶδωλον ἐνέπιπτεν <ἂν> ἀπ' αὐτοῦ τοῖς ὀφθαλμοῖς ἡμῶν ἠλίκον ἐστὶν αὐτό, ὅπερ παντάπασιν ἄλογον, ἅμα τῷ καὶ κατὰ μίαν ῥοπὴν καιροῦ πρὸς ἕκαστον τῶν ὁρώντων, εἰ καὶ μυρίοι τύχοιεν ὄντες, ἀφικνεῖσθαι. τὸ δὲ ὀπτικὸν οὐχ οἷόν τε τοσαύτην ῥύσιν ἐκτεινόμενον λαμβάνειν ὡς περιχεῖσθαι παντὶ τῷ βλεπομένῳ σώματι· τοῦτο γὰρ ὁμοίον ἐστὶ τῷ τῶν Στωϊκῶν σταλαγμῷ κεραννυμένῳ τῇ πάσῃ θαλάττῃ.

A person would be most convinced that this happens when he has learned the probable account of how we see. This account also begins in the following way. A body that is seen does one of two things: either it sends something from itself to us and thereby gives an indication of its peculiar character, or if it does not itself send something, it waits for some sensory power to come to it from us. Which of these alternative is the more correct may best be judged in the following way. We see through the perforation at the pupil; if this perforation waited for some portion or power or image or quality of the external bodies underlying (our perception) to come to it, we would not discern the size of the object seen, which might be, for example, a very large mountain. An image of the size of the mountain would have come from the mountain and entered our eyes, which is utterly absurd. It is also absurd that at one moment of time the image should reach every viewer, even though they are countless. And the optic pneuma cannot extend itself and acquire such a stream so as to envelop the whole object being viewed; for this is comparable to the Stoic drop that mixes with the whole sea. (Trans. De Lacy)

As we see in this passage, Galen explicitly rejects the Stoic paradox of the drop of wine in the sea by classifying it as absurd. But which aspect of the theory of total mixture is Galen referring to? In the passage it seems that two theories are discussed. The first, according to which the object seen which sends something to us, seems to correspond to the Epicurean theory of

the *eidola*.²²¹ The second, according to which a sensory power which comes from us to the object seen, an optic pneuma extends itself (ἐκτεινόμενον) and pours over (περιχεῖσθαι) the object viewed.

It seems therefore that the pneuma indeed reaches the object seen and it does this in virtue of an extension (οἷόν τε τοσαύτην ῥύσιν ἐκτεινόμενον λαμβάνειν). But what might be the connection between the Stoic total mixture and the pneuma that extends itself? I think that, in Galen's view, as the optic pneuma cannot extend itself and acquire such a stream to pour over the object seen, in the same vein the Stoic drop of wine cannot extend itself and mix with the entire sea, as the total mixture is also seen as a process involving an extension that may or may not be mutual for the constituents, the ἀντιπαρέκτασις. Galen therefore seems to be painting the process of coextension as absurd (ἄλογον), at least the Chrysippean version according to which bodies unequal in bulk can equalize their volumes, as one constituent completely coextends with the other, which is far greater.

On the other hand, on the Peripatetic front, we can instead uncover some traces of Galen's inclination to think that, as Aristotle held, it is qualities that are responsible for the mechanism of mixture. For in contrast to the passages already analysed, Galen's presents his opinion in a less rigid manner where he summarizes his own beliefs, that is, in *De propriis placitis*. In this text Galen tackles the problem again, but he adds something more (T7):

T7 Galen *De propr. plac.* 188.21–189.17 Boudon-Pietrobelli:

ὅτι μὲν ἐκ τῆς τῶν δ' στοιχείων κράσεως ἅπαντα τὰ παρ' ἡμῖν σώματα γίνεταί, βεβαίως γινώσκειν φημί· καὶ προσέτι δι' ὅλων αὐτῶν κεραυνυμένων, οὐχ, ὡς Ἐμπεδοκλῆς ἠγεῖτο, κατὰ σμικρὰ μόρια καταθραυομένων. εἴτε δὲ τῶν σωματικῶν οὐσιῶν ὅλων δι' ἀλλήλων ἰουσῶν, εἴτε τῶν ποιοτήτων μόνων, οὐτ' ἀναγκαῖον εἶναι φημι γινώσκειν, οὔτε ἀποφαίνομαι. πιθανώτερον δὲ εἶναι νομίζω, κατὰ τὰς ποιότητας γίνεσθαι τὰς κράσεις.

²²¹ On the Epicurean theory of *eidola*, cf. Long and Sedley 1987 pp. 76–78 and cf. the clear description provided by Lucretius in *De rer. nat.* IV.722–822 = LS 15 D. I am very grateful to Prof. D. Konstan for a number of clarifying discussions on this passage.

I declare that I know for certain that all our bodies come from a mixing together of the four elements, and besides through their complete mixture, not as Empedocles believed, through being broken up into small particles. But whether (this happens) because the corporeal substances go entirely through one another or only the qualities, I neither consider it necessary to know, nor do I make any definite pronouncement (about it). I think it more likely, however, that the mixtures occur according to the qualities. (Trans. Nutton; slightly modified)

In this passage he initially says that it is not necessary to know whether the mixture occurs when the corporeal substances go entirely through one another or only the qualities, however, (δέ), he adds that he believes it is more likely (πιθανώτερον) that the qualities mix. But what degree of epistemological certitude does the adjective πιθανός have? Debru has studied the use and application of the term πιθανός throughout Galen's corpus and on the basis of her studies she remarks that the adjective can have different meanings in Galen.

On the one hand, Debru shows that Galen's πιθανός can simply mean “persuasive”, “convincing”, but ultimately false. In this regard, sometimes Galen uses this term with reference to his adversaries' opinions or theories, which he commits himself to refuting and dismissing.²²² On the other hand, it can also refer to a likely but still provisional explanation that can turn out to be true or false, a transitory stage in the search for truth (ἐγγὺς ἀληθείας) that needs to be further proved by evidence and still lacks scientific proof (ἐπιστημονικὴ πίστις). Furthermore, Debru adds that contrary to the “plausible which proves to be false”, “the plausible which proves to be true” has degrees of plausibility. For in these cases Galen uses comparatives and superlatives.²²³ Our πιθανώτερον then

²²² Debru 1991, pp. 35–37.

²²³ Debru 1991, esp. pp. 37–38. More recently, Chiaradonna has investigated Galen's notion of *pithanon* and, in contrast to Debru (whose research findings, however, he does not discuss, but see above all the section “La confirmation du plausible vrai” pp. 37–38 with references), he does not seem to attribute to it the same positive epistemological validity, as in his view, according to Galen, it would solely indicate something that is merely “persuasive” and cannot be grasped by Galen's two main epistemological criteria of certainty, that is, reason and experience; Chiaradonna 2014 pp. 72–73. On the possible sources (rhetorical, epistemological, medical) of Galen's usage of *pithanon*, cf. the detailed survey provided by Chiaradonna 2014 pp. 73 ff.

seems to acquire a different status from what is simply πιθανόν. Hence, what in Galen is defined as πιθανόν—or better, πιθανώτερον—is therefore not to be underestimated or despised, since, although it does not coincide with the scientific demonstration, Galen appeals to it very often, as it gives him room for manoeuvre between scepticism and dogmatism and it might turn out to be useful for grasping his own opinions, albeit provisional, especially with reference to popular and controversial topics, such as the relation to the process of causation in the process of mixture²²⁴.

This hint offered by Galen’s usage of πιθανώτερον seems to be further confirmed by a passage from *De elementis* (T8.1). This passage has been often neglected by commentators and scholars, but here we find two important elements worth underlining. First of all, Galen seems to take a position towards the issue of the causality, although indirectly and somewhat allusively; and second, he describes the process of mixture as a progressive division in strikingly similar terms to Alexander’s abovementioned exegesis of Aristotle’s account.

T8 Galen *De elementis sec. Hipp.* K. I 489.13–490.15 De Lacy 136.22–138.14:

(T8.1) εἰρήσεται δὲ κἀν τοῖς τῆς θεραπευτικῆς μεθόδου περὶ τῆς χρείας αὐτῶν ἐπὶ πλεόν, ἐν δὲ τῷ παρόντι τοσοῦτον εἰπεῖν ἀποχρήσει πρὸς τὸν ἐνεστῶτα λόγον, ὅτι τῶν ὑπ’ Ἀσκληπιάδου λεγομένων ἐν τῷ Περὶ στοιχείων βιβλίῳ πρὸς τοὺς ὄλας | δι’ ὄλων κεραυνύοντας ἀλλήλαις τὰς οὐσίας οὐδὲν ἄψεται τῶν κατὰ τὰς ποιότητος μόνας κεράνυσθαι λεγόντων, (T8.2) ὥστ’ εἰ καὶ μὴ δι’ ἄλλο τι, διὰ γοῦν τό ἀσφαλὲς αἰρετέον τὸ δόγμα καὶ λεκτέον, ὡς ἐν τῷ μίγνυσθαι τῷ ὕδατι τὸν οἶνον, εἰ τύχοι, καὶ καταθραύεσθαι μέχρι σμικροτάτων ἐκατέρου τὰ μόρια δρᾶν καὶ πάσχειν αὐτοῖς εἰς ἀλληλα συμβαίνει καὶ μεταδιδόναι τῶν ποιότητων ἀλλήλοις ἐτοιμότερον, ὅσῳ περ ἂν εἰς ἐλάττω καταθραυσθῆ, καὶ διὰ τοῦτο κινουῦσιν ἐπὶ πλεῖστον οἱ μίγνύντες ἀλλήλοις τὰ τοιαῦτα τὴν εἰς ἐλάχιστον διαίρεσιν αὐτῶν μηχανώμενοι. καὶ μὲν δὴ καὶ τὸ μᾶλλον ἐνοῦσθαι τὰς ποιότητος ἀλλήλαις τῶν ἐπὶ πλεόν ἀναμιχθέντων τε καὶ χρονισάντων ὁμολογεῖ τῷ λόγῳ.

²²⁴ Cf. also Nutton 1999 pp. 45–50.

χρόνου γὰρ δεῖται τὰ σμικρὰ μόρια τῶν κεραυνυμένων, ἴν' εἰς ἄλληλα δράση καὶ πάθη τελέως καὶ οὕτως ἐν ἀπεργάσῃ τὸ ὅλον καὶ ὅμοιον ἑαυτῷ πάντα.

(T8.1) And I shall speak at length of the use of mixtures in the books of *Therapeutic method*; but now for this present one, and also it will be enough to say that none of the things that Asclepiades says in his book *On elements* in answer to those who mix substances with each other through and through will touch those who say they (the substances) are mixed in the qualities only; therefore, if for no other reason, at least for safety's sake let us pronounce as our choice the view that (T8.2) in the mixing of wine with water, for example, and in the breaking up of the parts of each into smallest bits, it happens that each of them acts on the other and is acted on by it (καταθραύεσθαι μέχρι σμικροτάτων ἑκατέρου τὰ μόρια δρᾶν καὶ πάσχειν αὐτοῖς εἰς ἄλληλα συμβαίνει), and that they share their qualities with each other the more readily the smaller the bits into which they have been broken (καὶ μεταδιδόναι τῶν ποιότητων ἀλλήλοις ἐτοιμότερον, ὅσῳ περ ἂν εἰς ἐλάττω καταθραυσθῇ); and for that reason those who are mixing such things together agitate them as much as possible, thus contriving that the division be to the smallest parts. Moreover, it is concordant with the reasoning that the qualities of things that have been mixed more thoroughly and for a long time are more closely united. The small parts of the things being mixed need time to complete their interaction and thus make the whole one and the same throughout. (Trans. De Lacy; slightly modified)

As we see, Galen explicitly says that “none of the things that Asclepiades says in his book *On elements* in answer to those who mix substances with each other through and through will touch those who say that *they (the substances) are mixed in the qualities only*”. Galen does not say who Asclepiades' polemical target is nor does he use his standard formulation “corporeal substances” or “substances-cum-qualities”; in this passage he only draws an opposition between those who mix substances and those who mix qualities (τῶν κατὰ τὰς ποιότητας μόνως κεράννυσθαι λεγόντων), which seems to be congruent with the other passages that we have analysed previously, where Galen draws a distinction between Aristotle and the Stoics. This time, however, Galen overtly declares that

at least for safety's sake this opinion has to be favoured because it lies on firmer ground (ἀσφαλές): διὰ γοῦν τό ἀσφαλές αἰρετέον τὸ δόγμα καὶ λεκτέον. The usage of the verbal adjectives in *-teos*, which expresses the idea of duty, strongly emphasizes Galen's choice (αἰρετέον/λεκτέον). However, that is still a somewhat indirect choice, as Galen is not saying roundly that the qualities mix, as Aristotle held, but that arguments that are used against those who mix substances cannot be used against those who mix qualities only, which in a rather ingenious formulation is defined by Galen as a dogma that does not explicitly belong to any dogma.

1.3.3 Galen's κρᾶσις as a progressive division of bodies

We can in any case regard this as a good result, especially if we look at the following description of the mixture of wine and water, that occupies the second section of the passage (T8.2).

In this section Galen does not use Aristotle's technical vocabulary—he does not embed the process in the Aristotelian potentiality–actuality continuum—but nonetheless if we compare Alexander's text (T9) to Galen's (T8):

T9 Alexander of Aphrodisias *De mixtione* 231, 12–19 Bruns = Groisard 33.1–13;

καὶ τοῦτ' ἐστὶν ἡ κρᾶσις· ἡ γὰρ διὰ τοῦ ποιεῖν καὶ πάσχειν τῶν παρακειμένων ἀλλήλοις σωμάτων διὰ μεταβολῆς χωρὶς φθορᾶς αὐτῶν τινος ἔνωσις. Συνεργεῖ δὲ τοῖς ὑγροῖς πρὸς τὴν θάπτω μεταβολὴν τε καὶ κρᾶσιν καὶ τὸ εὐδαιρέτον. διαιροῦντα γὰρ ἄλληλα πρὸ τῆς ἐνώσεως καὶ κατὰ μικρὰ παρατιθέμενα ἀλλήλοις, ῥᾶον καὶ θᾶπτον ἀντιπάσχοντα ὑπ' ἀλλήλων, ταχέως ἔν τι γίνεται σῶμα καὶ κατὰ τὸ ὑποκείμενον καὶ κατὰ τὴν ποιότητα, ἐνεργεῖα μὲν οὐδὲν ὄν τῶν μεμιγμένων, δυνάμει δὲ πᾶν τι, τοσοῦτον ἀπολειπόμενον τοῦ καὶ ἐνεργεῖα σώζειν τὰ ἐν αὐτῷ μεμιγμένα, ὅσον διὰ τοῦ ποιεῖν τε καὶ πάσχειν ἀφήρηται διὰ τῆς δυνάμεως αὐτῶν ἐκάστου.

Mixture, then, can be defined as the unification through interaction of bodies juxtaposed with one another by means of an alteration that excludes their corruption. Contributing to the rapid alteration and mixture of moist bodies is their easy divisibility; for they divide one another before being unified, and are juxtaposed together as corpuscles (διαιροῦντα γὰρ ἄλληλα πρὸ τῆς ἐνώσεως καὶ κατὰ μικρὰ παρατιθέμενα ἀλλήλοις), thus interacting more easily and more quickly (ῥᾶον καὶ θᾶττον ἀντιπύσχοντα ὑπ' ἀλλήλων), and they rapidly become one body both in substrate and quality (ταχέως ἔν τι γίνεται σῶμα καὶ κατὰ τὸ ὑποκείμενον καὶ κατὰ τὴν ποιότητα)—a body not in actuality any of the bodies that have been mixed, but in potentiality all of them, and as long as it is deprived from preserving in actuality the bodies mixed in it, it is removed (from preserving in actuality the bodies mixed) by the interaction caused by their individual power (transl. Todd; slightly modified).

We have some noteworthy resemblances. In the first place in both the accounts mixture is described as a progressive διαίρεσις of the constituents followed by a final unification brought about by a qualitative interaction (Galen in fact says that the parts of the liquids break up into small parts (καταθραύεσθαι μέχρι σμικροτάτων) and that each of them acts on the other and is acted upon by (δρᾶν καὶ πύσχειν)²²⁵ and through this fragmentation process they share their qualities (μεταδιδόναι τῶν ποιοτήτων ἀλλήλοις); this division ends in a final unification which is described some lines below, where Galen says “The small parts of the things being mixed need time to complete their interaction and thus make the whole one and the same throughout (ἐν ἀπεργάσεται τὸ ὅλον καὶ ὁμοιον ἑαυτῷ πάντη)”. On the other hand, as we see, Alexander says that the constituents divide one another before being unified, and are juxtaposed together as corpuscles: “διαιροῦντα γὰρ ἄλληλα πρὸ τῆς ἐνώσεως καὶ κατὰ μικρὰ

²²⁵ The interaction between two objects or qualities is usually denoted by the two verbs ποιεῖν καὶ πύσχειν. Here Galen replaces ποιεῖν with δρᾶν, which is generally used with reference to the actions of persons. As De Lacy and Durling note, these two verbs had already been linked by Plato (*Phaedr.* 270d4–5 and *Tim.* 33d1, both treatises that Galen knew very well). Furthermore, the two verbs were used in combination by Plutarch in a critique of Epicurus’ atomism (*Adv. Col.* 1110c); therefore, as the two scholar note, Galen had already a precedent for using these two verbs to indicate the interaction of objects and qualities; cf. De Lacy 1996 p. 174 comm. *ad De elem. sec. Hipp.* CMG V 1.2. p. 70.16 De Lacy.

παρατιθέμενα ἀλλήλοις”. At the end of the process of division the constituents become one both in substrate and quality, “ἐν τι γίνεται σῶμα καὶ κατὰ τὸ ὑποκείμενον καὶ κατὰ τὴν ποιότητα”). Of course the Stoics also thought that matter is continuously sub-divisible,²²⁶ but it has to be added that the Stoic account of total mixture is assimilated to a progressive infinite division only from Alexander onwards, possibly because for a Peripatetic the mixture does lie in a division and is its characteristic feature.²²⁷ According to Collette-Dučić and Delcomminette, in Stoic physics infinite division would only work *upstream* and *downstream* in the process of mixture and does not coincide with the process itself but only produces bodies able to undergo infinite division as a result.²²⁸

²²⁶ Cf. Diog. Laert. VII 150 = SVF II 482 (part). According to Chrysippus, this division is infinite and would not be *ad infinitum*, for there is no infinite body into which division is converted; rather, this division is incessant (*akatalēktos*). On the Stoic infinite division cf. Todd (1973 pp. 21–23), who is inclined to assimilate the Stoic notion of infinite divisibility to Aristotle’s potential infinite; on this cf. also Long and Sedley 1987 vol. I p. 303. Contrarily, Drozdek (2002 p. 413 n. 29) notes that there is a difference between Aristotle’s conception of potential infinite and Chrysippus’; Chrysippus’ notion of an actual infinity of parts is impossible because in his view there are no ultimate parts (cf. SVF II 483) and not because it is possible only potentially, as Aristotle taught. One could object to Drozdek, however, that it is exactly from this *impasse* that Aristotle wants to extricate himself when, in his criticism of the Atomists, he propounds his notion of infinite division, which is only potentially and not actually possible (cf. *De gen. et corr.* 316b19–21). On the contrary, more recently, Nolan 2006, has attributed a theory of physical continuums (body, space and time) to the Stoics, based on the concept of *gunk*, and leans towards interpreting the evidence as if the Stoics conceived physical body as actually divided into infinite *gunks* (a concept whose core idea is that “all the parts of an *x* physical item can be further subdivisible into parts”); cf. in detail Nolan 2006 pp. 162–172.

²²⁷ Collette-Dučić and Delcomminette 2006 p. 49. In *De mixtione* Ch. 8 (*De mixt.* 221.25–222.25 Bruns) Alexander refutes the Stoic theory of mixture as associated with the infinite division of bodies; cf. Todd’s comments *ad loc.* pp. 204–210. As Todd observes, there seems to be a theoretical incongruence as the whole chapter neglects two Stoic claims: i) that the constituents are preserved in the blend (*De mixt.* 216.3–31 Bruns); and ii) that mixture and juxtaposition of constituents are not the same thing (*De mixt.* 220.3–221.7 Bruns). Now, since, as Todd suggests, the chapter seems to be derived from Aristotle’s claim that only moist and easily divided bodies can be blended (cf. *De gen. et corr.* I 10 328a24, 328b17 and cf. *De mixt.* 221.26–27 Bruns) and that in the blending they divide and initially juxtapose as corpuscles (*De gen. et corr.* 328a33–b2 and cf. *De mixt.* 221.26–27 Bruns), and since this phase of division of bodies becomes one of the main traits of the Peripatetic account, it is not unlikely that the association between total mixture and the divisibility of constituents arose from some form of syncretism between the Stoic and the Aristotelian accounts. After all, Alexander of Aphrodisias himself informs us of such a doctrinal syncretism when he reports that “while some of his [Chrysippus’] successors agree with Chrysippus, others who were later able to hear Aristotle’s theory actually express many of his view on blending”. More precisely, he makes mention of the case of Sosigenes (*De mixt.* 216.9–11 Bruns trans. Todd).

²²⁸ Collette-Dučić and Delcomminette 2006 pp. 47–48. I do not agree with Nolan (2006), who tries to explain total mixture through an infinite division of *gunks* (parts having parts within themselves and so on without ever reaching the ultimate parts) for two reasons: a) textual reasons, as Nolan theorizes the concept of Stoic *gunk* and then in a purely abstract way applies it to the Stoic mixture without finding clear confirmation in the textual evidence at our disposal concerning Stoic mixture (cf. pp. 172–177); b) theoretical reasons, as such a process of *gunky* mixture, understood as a continuous and many-stage division into parts, where “all of the so-far

Moreover, the other account of mixture as infinite division that we have in Plotinus (SVF II 478), as demonstrated by Lacrosse, heavily depends on Alexander’s reception of the Stoic theory.²²⁹ By contrast, in Galen’s account we find two elements, which incontrovertibly point to the Peripatetic model: the reaction due to the qualitative interaction and a two-phases process, where the progressive division of bodies ends up in a final unification.

Furthermore, and more importantly, both the accounts, the Galenic and the Peripatetic, very differently from the Stoic picture, show a strict link between easy-divisibility of the constituents and facility and speed of interaction, as Alexander—following Aristotle²³⁰—also says, “contributing to the rapid alteration and blending of moist bodies is their easy-divisibility”. Right after, it is said that the particles, “interacting more easily and more quickly, rapidly become one body both in substrate and quality” (ῥᾶον καὶ θᾶπτον ἀντιπάσχοντα ὑπ’ ἀλλήλων, ταχέως ἔν τι γίνεται σῶμα καὶ κατὰ τὸ ὑποκείμενον καὶ κατὰ τὴν ποιότητα), whereas in Galen we have the sentence “τὰ μόρια δρᾶν καὶ πάσχειν αὐτοῖς εἰς ἄλληλα συμβαίνει καὶ μεταδιδόναι τῶν ποιοτήτων ἀλλήλοις ἐτοιμότερον, ὅσῳ περ ἂν εἰς ἐλάττω καταθραυσθῆ”, i.e. “each of the—the particles—acts on the other and is acted on by it, and they share their qualities with each other the more readily the smaller the bits into which they have been broken”, where the term ἐτοιμότερον means at the same time more easily—ῥᾶον—and more rapidly—θᾶπτον—. i.e. more readily.²³¹

divided proper parts of the blend contain proper parts of both the blended substances” and which (contrary to the Peripatetic account) never culminates in a final unification, would give rise to an endless multiplication of the number of bodies within a mixture (cf. esp. p. 175), whereas in the Stoic account of mixture the bodies are preserved and their number is not multiplied in the mixture: a body although theoretically infinitely divisible is not—in actuality—composed of infinitely many corpuscles. For the Stoics in fact clearly rejected that the infinitely divisible contains an actual infinity of parts (as Nolan would suggest): Stobaeus I 142.2–6 = SVF II 482 (LS 50A): “Chrysippus said that bodies are divided to the infinity, and likewise things comparable to bodies, such as surface, line, place, void and time. But although these are divided to infinity, *a body does not consist of infinitely many bodies*, and the same applies to surface, line and place” (trans. Long and Sedley; emphasis mine); cf. also comments by Long and Sedley *ad loc.*, cf. Long and Sedley 1987 pp. 301–304. For Nolan’s arguments against Stoic potential infinity cf. Nolan 2006 pp. 179–180.

²²⁹ Lacrosse 2007 pp. 53–66.

²³⁰ *De gen. et corr.* 328a33 “Καὶ μικρὰ δὲ μικροῖς παρατιθέμενα μίγνυται μᾶλλον ῥᾶον γὰρ καὶ θᾶπτον ἄλληλα μεθίστησιν”.

²³¹ Given the strong similarities between Galen’s and Alexander’s accounts, we may indirectly note Alexander does not seem to have originally formulated this model of mixture, if we assume that they did not have contact with each other. However, this does not affect our main concern,

1.3.4 Mixture, change and the ontological status of the primary elements in the mixture (actuality or potentiality?). The example of the τετραφάρμακος and the generation of a *tertium quid*

As we have seen, one of the main differences between the Stoic and the Peripatetic models of mixture concerns the ontological status of the primary elements in the mixture. To briefly sum up the conclusions that we have hitherto drawn, according to Aristotle's theorization the primary elements are preserved in the mixture only in potentiality, whereas they give rise in actuality to a *tertium quid*, the homoeomerous body; on the other hand, in the Stoic total mixture, instead, the active (air and fire, whose mixture in turn generates the pneuma) and passive elements (water and earth, that is, inert matter) interpenetrate each other and are compresent in a pervaded state.

Another further step towards a more thorough comprehension of Galen's account of mixture of primary elements will be to identify Galen's own position concerning the ontological status of the primary elements within the elemental mixture. In order to better sketch its contours, we will begin by considering two parallel passages (**T10** and **T11**), respectively from Galen's *De elementis* and his *Commentary on the Nature of Man*, where the physician-cum-philosopher glosses *De natura hominis' incipit* on the basis of his own textual interpretation²³² and vehemently admonishes those who refuse to believe that fire, water, air, and earth are the primary elements of all living beings:

namely to show that such similarities may be explained by the common Peripatetic *milieu* on which they both drew and relied.

²³² *De nat. hom.* CMG I 1.3 p. 164.3–7 Jouanna: "Ὅστις μὲν οὖν εἴωθεν ἀκούειν λεγόντων ἀμφὶ τῆς φύσιος τῆς ἀνθρωπίνης προσωτέρω ἢ ὅσον αὐτῆς ἐς ἰητρικὴν ἀφήκει, τούτῳ μὲν οὐκ ἐπιτήδειος ὅδε ὁ λόγος ἀκούειν· οὔτε γὰρ τὸ πάμπαν ἡέρα λέγω τὸν ἄνθρωπον εἶναι, οὔτε πῦρ, οὔτε ὕδωρ, οὔτε γῆν, οὔτ' ἄλλο οὐδὲν, ὃ τι μὴ φανερόν ἐστιν ἐνεὸν ἐν τῷ ἀνθρώπῳ· ἀλλὰ τοῖσι βουλομένοισι ταῦτα λέγειν παρήμι". This passage is well known (as it is placed right at the beginning of the treatise, when the Hippocratic author detaches medical science from philosophical discourse and attacks elemental theorists) and the problematic nature of Galen's exegesis. For by propounding a particular philological reading of the text (based on the translation of *πάμπαν* as "wholly" and on the separation of *ἐνεὸν* "to be present within" into *ἐν ἐὸν* "the one thing"), Galen moulds the Hippocratic passage to fit his overall aim, i.e. that of demonstrating that Hippocrates did not actually criticize those who posited fire, air, water and

(1) φαίνεται τοίνυν ὁ μὲν Ἀριστοτέλης τε καὶ Ἱπποκράτης ὡσαύτως διατεθεῖσθαι τὸν λόγον, οἱ δ' ἐξηγηταὶ μὴ παρακολουθεῖν· οὐ γὰρ διὰ τοῦτ' εἶπεν ὁ Ἱπποκράτης οὐκ ἐπιτήδειον εἶναι τὸν λόγον τοῖς εἰωθόσιν ἀκούειν περὶ φύσιος ἀνθρωπίνης προσωτέρω ἢ ὀκόσον αὐτέης ἐς ἱητρικὴν ἀφήκει, διότι καταγιγνώσκει τῶν ἀέρα καὶ πῦρ καὶ ὕδωρ καὶ γῆν στοιχεῖα τιθεμένων, ἀλλ' ἀπ' ἀρχῆς ἄχρι τέλους τοῖς ἐν ὀτιοῦν αὐτῶν εἰποῦσιν εὐρίσκεται | μεμφόμενος, ἐπεὶ ἐκεῖνό γε δεινῶς ἄλογόν ἐστιν, εἰ, διότι μηδὲν τῶν τεττάρων εἰλικρινὲς ἐν τῷ σώματι φαίνεται, διὰ τοῦτ' ἀπιστηθήσεται πάντα· (2) κατὰ γὰρ τὸν αὐτὸν οἶμαι τρόπον ἀπιστήσῃ τις ἐκ κηροῦ καὶ ῥητίνης καὶ πίττης καὶ στέατος συγκεῖσθαι τὴν τετραφάρμακον καλουμένην, ὅτι μηδὲν αὐτῶν ὀλόκληρον καὶ παντελὲς ἐν αὐτῇ περιεχόμενον φαίνεται. [...] μὴ τοίνυν μηδ', ἐπειδὴ καὶ κατὰ τὰ τῶν ζώων σώματα τῶν τεττάρων στοιχείων οὐδὲν εἰλικρινὲς οὐδὲ παντελὲς ἐστιν, ἀπιστῶμεν ἐκ τούτων αὐτὰ κεκρᾶσθαι | μηδὲ διὰ τοῦτο τὸν μὲν κόσμον ἐκ τῶν τεττάρων εἶναι συγχωρῶμεν, ἀφαιρῶμεθα δὲ τὰ ζῶα τῆς ἐκ τούτων γενέσεως, ὥσπερ ἔξωθέν ποθεν ἦκοντα καὶ οὐκ ἐν τῷ κόσμῳ γεγονότα. ἢ δεῖξάί μὲ σοι κελεύεις γῆν ἐν τοῖς τῶν ζώων σώμασιν εἰλικρινῆ καὶ ἄμικτον αὐτὸς μηδ' ἐν τῷ κόσμῳ τοιαύτην δεῖξαι δυνάμενος;

(1) It appears, then, that Aristotle and Hippocrates have ordered their arguments in the same way but that the commentators do not understand them. When Hippocrates says that his discourse is of no use of those who make a habit of listening (to discourses) about the nature of man that go ‘beyond what is relevant to the art of medicine’, he does not say this because he is condemning those who make fire, air, water, and earth the elements; on the contrary, from start to finish we find him censuring those who say that some one of these is the element. For it is frightfully illogical to reject them all because no one of the four is seen in

earth as the basic building blocks of living bodies, but just those who believed that only one of them was the basic element. Jouanna’s translation differs from Galen’s interpretation; cf. Jouanna’s comments *ad loc.* in Jouanna 2002 pp. 225–226 and pp. 229–230. Hankinson (2015 pp. 425 f.) defends Galen’s reading (cf. his translation “Whoever is in the habit of listening to those who discuss the nature of man in terms further from those which pertain to medicine will not find this discourse congenial to him. For I say that man is neither wholly air, nor fire, nor water, nor earth, nor anything else which is not evidently the one thing in man, but rather leave them to those who wish to say such things”).

the body in its pure form; **(2)** by the same reasoning, I fancy a person will not believe that the so-called *tetrapharmakos* is a compound of wax, resin, pitch, and tallow, because none of these is found contained in it as a complete whole [...]. Then let us not refuse to believe that the bodies of animals are a mixture composed of the four elements just because none of the four is either pure or complete in them; and let us not for this reason grant that the cosmos is formed from the four [elements] but exclude animals from generation out of these [elements], as if they came from somewhere outside and were not generated in the cosmos. Or do you ask me to show you earth pure and unmixed in the bodies of animals, when you yourself cannot even show me such earth in the cosmos? (Trans. De Lacy)

T11 Galen in *Hipp. Nat. Hom. comment.* K. XV 17.16–18.7 Mewaldt 11.22–12.2:

(1) τοὺς γὰρ ἐκ πυρὸς καὶ γῆς ὕδατος τε καὶ ἀέρος ἀλλήλοις κραθέντων ἡγουμένους τὰ σώμαθ' ἡμῶν γεγονέναι | μοχθηρῶς ἂν τις ἀξιώσει κρίνεσθαι ὕδωρ ἢ πῦρ ἢ γῆν ἢ ἀέρα δεικνύειν ἐν ἡμῖν ἢ, μὴ δεικνύοντας, ἐξελέγεσθαι φάσκειν. **(2)** ὁμοιον γὰρ τοῦτο τῷ κατὰ τὴν 'τετραφάρμακον' δύναμιν ἀξιοῦν ἦτοι κηρὸν ἢ πίτταν ἢ στέαρ ἢ ῥητίνην εἰλικρινῆ δεικνύειν ἢ, μὴ δυναμένους δεῖξαι, μὴ συγχωρεῖν ἐκ τούτων αὐτὴν συγκεῖσθαι. **(3)** ἐν γὰρ τῷ 'κεκρᾶσθαι' φάναι 'τὰ τέτταρα' τὸ μηδὲν εἰλικρινὲς αὐτῶν εἶναι δηλοῦται.

(1) For one might wrongly think it incumbent upon those who suppose that our bodies are generated from a mixture of fire and earth, water and air either to show that water or fire or earth or air exist separated within us, or, if unable to do so, to admit they have been refuted. **(2)** This is like thinking that, in the case of power of the '*tetrapharmakos*' you must either show it to be pure wax, or pitch, or fat, or resin, or, if you are unable to show this, that you must concede that it is not composed of these things. **(3)** For in saying that these things are mixed, one makes it clear that no one of them exists in its pure state. (Trans. Hankinson; slightly modified).

As Kupreeva has shown, Galen's implicit polemical target in the former passage, which is taken from I 5 *De elementis* (and, in filigree, also of the parallel passage from Galen's *Commentary on Nature of Man*) is the physician Athenaeus of Attalia together with his followers, the Pneumatists.²³³ For Athenaeus of Attalia believed that the four elements of living bodies do not coincide with the cosmic elements (fire, air, water, and earth), but merely with the primary qualities (the hot, the cold, the dry, and the wet), only insofar as they constitute the nature of living beings²³⁴. The main substantive reasons that Athenaeus of Attalia seems to have given for rejecting the cosmic elements are, first of all, that they cannot be manifestly discovered in living bodies by the means of sense-perception and, second, that they fall outside the realm of the medical art and, consequently, cannot be used in order to account for physiological and pathological processes going on in living bodies.²³⁵

By delving a little deeper into Galen's defence of the explanatory validity of the cosmic elements within the domain of medical art, it is possible to gather and bring to light some reflections relating to the ontological status of the primary elements in Galen's mixture in order to answer the following questions: in which state are the primary elements in the mixture? Do they remain as such in the mixture or do they undergo any change? And, if so, do they get completely destroyed? Or are they preserved, and, if so, are they preserved

²³³ Cf. Kupreeva 2014 p. 178.

²³⁴ Cf. *Introd. s. medic.* K. IX XIV 698.5–12 = SVF II 416, cf. Kupreeva 2014 pp. 172–178.

²³⁵ Cf. *De elem. sec. Hipp.* CMG V 1.2 p. 104.6–11 De Lacy "Perhaps the followers of Athenaeus will say that they themselves make no statement about these things because they are outside the medical art; they are content to make hot, cold, dry and wet, which they can clearly point to even in animals (κὰν τοῖς ζῴοις ἐναργῶς δεῖξαι δύνανται), the elements both of bodies and of the whole of medicine" (trans. De Lacy). As Kupreeva maintains, the first line of defense that Galen sets up against Athenaeus and his followers is methodological, as Galen did not methodologically approve of Athenaeus' conviction that the principles of the medical field (and therefore the theory of elements too) should be kept separated from those of natural philosophy. On the contrary, in Galen's opinion the two domains are strictly connected to each other and, more precisely, he clearly says that medicine is a handmaiden of the coming-to-be-and-passing-away; cf. *De elem. sec. Hipp.* CMG V 1.2 pp. 92.26–94.2 De Lacy. The second line of defense he sets up in favour of the cosmic elements, which he clearly distinguishes from the homoeomerous part, is logical, as Kupreeva notes. By possibly drawing on the well-known distinction made in Aristotle's *Categories* between "being said of a subject" (synonymous predication) and "being said in a subject" (inherence), differently from the Pneumatists, Galen distinguishes between the hot, the cold, the dry, and the wet *qua* qualities from the hot, the cold, the dry, and the wet, which by way of inherence can refer to the bodies that have these qualities within them either to the extreme degree (i.e. the primary element) or "by prevalence" (the homoeomerous bodies). Kupreeva 2014 pp. 181–194; cf. *De elem. sec. Hipp.* CMG V 1.2 pp. 114.13–116.5 De Lacy.

in actuality or in potentiality, as, respectively, in the Stoic and in the Aristotelian-Peripatetic account?

In order to start our enquiry, we can glean from the texts previously quoted that Galen argues that it is absurd to believe that bodies of living beings are *not* constituted by fire, air, water, and earth, only because we cannot clearly point to and manifestly identify these in living bodies. For in the mixture the primary elements have become indistinguishable from one another. As Galen says, “no one of the four is seen in the body in its pure form” (cf. **T10.1** “μηδὲν τῶν τεττάρων εἰλικρινὲς ἐν τῷ σώματι φαίνεται”) and further down, “none of the four is either pure or complete” in the body (cf. **T10.2** “οὐδὲν εἰλικρινὲς οὐδὲ παντελὲς ἐστίν”): if the primary elements are mixed, this means that they are not present in their pure form and have become indistinguishable in the mixture and, therefore, do not appear as such in the living beings’ bodies (cf. **T11.3** “for in saying that these things are mixed, one makes it clear that no one of them exists in its pure state (ἐν γὰρ τῷ ‘κεκρᾶσθαι’ φάναι ‘τὰ τέτταρα’ τὸ μηδὲν εἰλικρινὲς αὐτῶν εἶναι δηλοῦται”). The state of indistinctness of the primary elements in the mixture is further clarified by the example of the τετραφάρμακος, a drug made up of four different ingredients (according to LSJ, tallow, wax, pitch, and resin): just as in the τετραφάρμακος, it is impossible to clearly recognize the individual ingredients of which it is composed, as they have become indistinguishable in the mixture; in the same way we cannot discern the cosmic elements whose mixture constitutes every living body (cf. **T10.2** “by the same reasoning, I fancy a person will not believe that the so-called *tetrapharmakos* is a compound of wax, resin, pitch, and tallow, because none of these is found contained in it as a complete whole”). Plus, the mixture has given rise to a power that no longer coincides with its basic constituents but is something over and above them (cf. **T11.2** “This is like thinking that, in the case of power of the ‘*tetrapharmakos*’ you must either show it to be pure wax, or pitch, or fat, or resin, or, if you are unable to show this, that you must concede that it is not composed of these things”).²³⁶ Mixture then coincides with a non-pure state of the primary elements in the mixture: if something is mixed, it cannot

²³⁶ Τετραφάρμακος -ov is properly a compound adjective: it can be used as neuter noun or as adjective referring to the feminine substantive δύναμις; cf. Montanari 2000 s.v.

be seen in its pure state and distinguished from others; if something is visible and in its pure state, it cannot be mixed.²³⁷ Galen complements his argument by adding that saying that our bodies are composed of fire, air, water, and earth does not entail charging the natural philosopher with also demonstrating that simple bodies (fire, air, water, and earth) exist *qua* separated in the mixture (cf. **T11.1** “For one might wrongly think it incumbent upon those who suppose that our bodies are generated from a mixture of fire and earth, water and air either to show (δεικνύειν) that water or fire or earth or air exist separated within us, or, if unable to do so, to admit they have been refuted (τοὺς γὰρ ἐκ πυρὸς καὶ γῆς ὕδατός τε καὶ ἀέρος ἀλλήλοις κραθέντων ἡγουμένους τὰ σώμαθ' ἡμῶν γεγονέναι | μοχθηρῶς ἂν τις ἀξιώσει κρίνεσθαι ὕδωρ ἢ πῦρ ἢ γῆν ἢ ἀέρα δεικνύειν ἐν ἡμῖν ἢ, μὴ δεικνύοντας, ἐξελέγχεσθαι φάσκειν”). For according to Galen, it is possible to think that the living bodies are made up of fire, air, water, and earth, although they do not exist separated within us (κρίνεσθαι [...] ἐν ἡμῖν): if they did, it would be possible to show and to detect them by sense-perception, but they are things that do not noticeably present itself to our senses. What Galen seems to be indicating in using the verb “κρίνεσθαι” with reference to the primary elements is the condition whereby the primary elements do not undergo

²³⁷ As Kupreeva stresses, this argument seems to have been popular in philosophical texts of Galen’s time; Proclus attributes it to the philosopher Numenius, cf. fr. 51 des Places = Proclus, in *Tim.* 9. 4–5 Diehl: “Numenius who believes that everything is mixed and nothing is simple (Νουμήνιος μὲν οὖν πάντα μεμῖχθαι οἰόμενος οὐδὲν οἶεται εἶναι ἀπλοῦν)”, trans. Kupreeva. As Kupreeva observes, Proclus quotes Numenius in a section of his Commentary concerning the text of *Tim.* 31b, where Timaeus describes the demiurgic activity of the Platonic God and says that anything created has to be visible and tangible and, since fire is needed for the creation of anything visible and earth for anything tangible, the Demiurge starts shaping the body of the world out of fire and earth, which, however, need to be bound together by a mean; this mean, as explained further below, is represented by the intermediate elements, air and water (cf. *Tim.* 32b). According to Kupreeva, Numenius’ interpretation of the Platonic passages implies that no one of the cosmic elements exists in its pure form and that all the existent bodies are mixed. Kupreeva contends that Galen’s position in this regard is slightly different, as although Galen admits that it is impossible to discover pure elements in the cosmos, the cosmic elements do exist “for anyone who has intellect”: in fact, they can be only intellectually grasped. Cf. Kupreeva 2014 pp. 195–196. More precisely, cf. *De elem. sec. Hipp.* CMG V 1.2 p. 96.23–98.11 De Lacy, where Galen upholds that there is no pure and unmixed earth (εἰλικρινῆ καὶ ἄμικτον), neither in living bodies nor in the cosmos itself, because any part of the earth (where the predominant quality is the dry) immediately participates or shares (μετέχω) in the other elements. The element pure and unmixed can be in fact envisioned only through a mental act (ἦν δὲ καὶ στοιχεῖον ἐπινοοῦμεν), for the pure earth is dense, heavy, and dry and cold to the extreme degree (ἐσχάτως), and such an element can be only imagined as it does not concretely exist in the universe. In the cosmos, in fact, there are only earthy bodies (γεῶδες σῶμα), which in nature acquire different forms: an earthy body could be not only a stone, but also a part of a living being such as for instance bones, cartilage, or hair.

any change and can be distinctly perceived and indicated in the living body. Therefore, we can glean from Galen's argument against Athenaeus and the Pneumatists that he would reject that the constituents would exist as such and *qua* separated in the mixture. What Galen seems instead to have in mind when he says that no element is preserved as such in the mixture in its pure form and that each of them became indistinguishable in the mixture is that a sort of *change* has taken place in the mixture: a change which has brought about a new and distinct outcome which cannot be identified with the basic constituents and which is comparable to a new and different power arising from a blend of drugs.

For this reason, we will begin by exploring the basics of Galen's theory of change, and then see which place, among the changes, mixture occupies in the Stoic and Peripatetic tradition. Finally, we will describe in which way Galen conceived of mixture as change: this will lead us to respond to our initial question regarding the ontological status of the elements. If in fact we want to show that Galen's model of mixture is philosophically consistent and sets itself in line with an Aristotelian and, more importantly, a contemporary Peripatetic framework, then we have to prove that its main features are all in accord with the Aristotelian/Peripatetic equivalent.

Right at the beginning of his *De naturalibus facultatibus* Galen distinguishes two primary and simple types of motion (κίνησις): qualitative change or *alloiôsis* (the most general category which includes all kinds of qualitative changes between opposites, especially the most basic ones between hot/cold and dry/wet) and transference or *phora*, i.e. change of place. Moreover, Galen adds two compounded qualities of motions, growth (*auxêsis*) and wasting (*phthisis*), which he describes as “when something becomes bigger from having been smaller or smaller from having been bigger, but preserves its proper form” and other two unspecified kinds of motions, generation and corruption.²³⁸

²³⁸ *De nat. fac.* p. 101.16-106.3 H. As Hankinson notes, Galen does not classify generation and corruption as primary (as Aristotle did), but he does think that, as well as qualitative alteration, they involve hot/cold and dry/wet —although perhaps not exclusively; see Hankinson 2014 pp. 957 ff. Generation/corruption and qualitative alteration are considerably different in Aristotle's thought as, according to Aristotle, alteration (*alloiôsis*) is a qualitative change that does not imply a modification in the substratum (as for example when someone healthy becomes sick or a non-musician becomes a musician); cf. *De gen. et corr.* I 4. Even though Galen here evidently relies on Aristotle's theory of change, he probably did not feel the need to embark on such metaphysical

In his continuist physics of elements, Galen's primary elements come to be through the predominance of the four primary qualities in a common underlying substratum, which is qualityless, eternal, ungenerated, and incorruptible,²³⁹ substratum and qualities being distinguished rather as principles (or *archai*) of the primary elements.²⁴⁰ Every element, which is simple by nature, unmixed and unblended, is distinguished by two primary qualities: water is cold and moist, air moist and hot, fire hot and dry, earth dry and cold, although the display more of the first quality than the second.²⁴¹ These four qualities, hot, cold, dry, and wet, which cannot exist separately from the bodies who display the qualities at the extreme degree (the primary elements),²⁴² are responsible for the interaction between the elements themselves²⁴³ by completely altering the

subtleties for the sake of medicine and physiology and does not differentiate in a clear-cut manner generation/corruption from qualitative alteration. Cf. *De temp.* p. 4.5–22 H.: “καὶ γὰρ δὴ καὶ τὴν γένεσιν καὶ τὴν ἀλλοίωσιν καὶ τὴν μεταβολὴν ἐκ τῶν ἐναντίων εἰς τὰ ἐναντία γίνεσθαι. τίς γοῦν εἰπὼν, ὅτι τὸ λευκὸν ἠλλοιώθη τε καὶ μετέβαλεν, ἐγένετο γὰρ θερμὸν, οὐκ ἂν εἴη καταγέλαστος; ἐπιζητεῖ γὰρ ὁ λόγος οὐ τὴν κατὰ τὸ θερμὸν καὶ τὸ ψυχρὸν ἀντίθεσιν, ἀλλὰ τὴν κατὰ τὸ χρῶμα· μεταβάλλει γὰρ τὸ μὲν λευκὸν εἰς τὸ μέλαν, ὥσπερ γε καὶ τὸ μέλαν εἰς τὸ λευκόν, τὸ δὲ θερμὸν εἰς τὸ ψυχρὸν, ὥσπερ αὖ καὶ τὸ ψυχρὸν εἰς τὸ θερμὸν· οὕτω δὲ καὶ τὸ μὲν ὑγρὸν εἰς τὸ ξηρὸν, τὸ δ' αὖ ξηρὸν εἰς τὸ ὑγρὸν. εἰ γὰρ δὴ φάσκοι τις ἠλλοιωῖσθαι τὸ σῶμα τῷ τέως ὑγρὸν ὑπάρχον εἶναι τανῦν λευκὸν ἢ τῷ τέως ξηρὸν ὄν τανῦν φαίνεσθαι μέλαν, οὐκ ἂν ὑγιαίνειν δόξειεν. εἰ δέ γε τὸ ὑγρὸν νῦν ξηρὸν φαίη γεγονέναι ἢ τὸ πρότερον ὑπάρχον μέλαν νῦν εἶναι λευκὸν ἢ ἢ ἐκ θερμοῦ ψυχρὸν ἢ ἐκ ψυχροῦ θερμὸν γεγονέναι, σωφρονεῖν τ' ἂν δόξειεν ὁ τοιοῦτος καὶ λέγειν τὰ εἰκότα. τὸ γὰρ μεταβάλλον, ἢ μεταβάλλει, ταύτη μεταχωρεῖν δεῖ πρὸς τοῦναντίον” (For indeed generation, alteration and change come about from opposites to opposites. If, for example, one were to state that the white had undergone alteration and change, and so become hot, would this not be ridiculous? For the argument requires an opposition of colour, not one in terms of the hot and the cold. The white may change to the black, and indeed the black to white and the hot may change to the cold, as also the cold to the hot. Similarly, too, the wet may change to the dry, or, conversely, the dry to the wet. If someone were to state that the body has undergone alteration in the sense that what was once wet is now white, or in the sense that what was once dry now appears black, this person would seem insane. If, however, one were to say that once wet body has now become dry, or that the body that was previously black is now white, or that it has become cold from (being) hot, or hot from being cold, such a person would seem to be sensible and to say the appropriate things. For what is changing must, in the respect in which it is changing, be moving towards the opposite)” (trans. Singer).

²³⁹ *De elem. sec. Hipp.* CMG V 1.2 p. 90.6–8 and p. 114.16–19 De Lacy.

²⁴⁰ *In Hipp. Nat. Hom. comment.* CMG V 9.1 p. 17.28–18.15 Mewaldt and *De elem.* CMG V 1.2 p. 126.7–12 De Lacy. Hankinson 2008a p. 214 points out that for the distinction between elements and principles Galen is indebted to Aristotle (cf. *De gen. et corr.* 329a27–33).

²⁴¹ Cf. *De elem. sec. Hipp.* CMG V 1.2 112.24–116.5 and cf. also *In Hipp. Nat. Hom. Comm.* CMG V 9.1 p. 49.26–9 Mewaldt. Differently from the Stoics, who assign a quality to each primary element, and similarly to Aristotle (*De gen. et corr.* 330a30331a6 and esp. 331a1–6), Galen attributes two qualities to each element, although he recognizes that the Stoics differ from Aristotle in supposing that air is cold (while for Aristotle air is moist and hot, cf. *De simpl.* K. IX p. 510); cf. Hankinson 2008a p. 215.

²⁴² *De elem. sec. Hipp.* CMG V 1.2 p. 124.19–21 De Lacy.

²⁴³ *De elem. sec. Hipp.* CMG V 1.2 p. 100.22–23 De Lacy “ἀλλὰ καὶ τὰς ποιότητας αὐτῶν, καθ' ὅς εἰς ἄλληλα δρᾶν καὶ πάσχειν πέφυκεν”. As we will see, in more functionalist contexts, instead of the general *poiotês* Galen uses the more specific term *dynamis* (simple ones—hot/cold and

underlying substance so as to cause two qualitative changes or *alloiôseis*: i) the reciprocal transformation of the primary elements into one another (which from an orthodox Aristotelian standpoint would correspond to substantial generation/corruption) and ii) the generation of plants and animals: literally Galen says that the qualities are the artisans of plants and animals²⁴⁴ (that is, mixture).

The first kind of change, that is, the reciprocal transformation of the primary elements into one another, needs a qualityless bodily substrate, i.e. that which changes, and the elemental qualities, which bring about the change through the exchange of qualities. In this way, by altering their internal qualitative composition, the four qualities, subsisting in the material substrate, give rise to four primary elements, which are the result of the conjunction of the two principles, matter and qualities.²⁴⁵ Needless to say, this way of accounting for the elemental transformation is quite far from the Stoic standard elemental change, which Galen knew very well and which was due to processes of contraction and expansion starting from a first primary element, fire, the element

dry/wet—or derivative, as we will see) which indicates a natural capacity co-ordinated to a specific *energeia* or activity. Differently from the Stoics and Aristotle (who strictly distinguish between active—hot and cold—and passive qualities—dry and wet—Aristotle: *De gen. et corr.* II 2 329b24–26 *Mete.* IV I 378b12–26; Stoics: 47D–G LS), Galen considers them all active although he declares that hot and cold are more so: *De nat. fac.* pp. 106.4–107.6 H.; cf. Hankinson 2008a p. 217.

²⁴⁴ *De elem. sec. Hipp.* CMG V 1.2 p. 118.20–21 and *ibid.* p. 128.11–13 “αὐται γὰρ μόναι τὴν ὑποκειμένην οὐσίαν ἀλλοιοῦσαι τῆς τ' εἰς ἄλληλα μεταβολῆς τῶν στοιχείων εἰσὶν αἴτια καὶ φυτῶν καὶ ζώων δημιουργοί (they alone by altering the underlying substance, cause the elements to change into each other, and they are the artisans of plants and animals)” (trans. De Lacy). As Kovačić underscores, the definition of primary qualities as δημιουργοί finds a correspondent in Aristotle; *Mete.* IV 384b26–28, 388a26 ff., 389a27 ff.; cf. Kovačić 2001 p. 99 n. 39.

²⁴⁵ *In Hipp. Nat. Hom. comment.* CMG V 9.1 pp. 17.28–18.15 Mewaldt “However these (the hot, the cold, the dry and the wet) are not yet elements of the nature of man (or anything else), but rather its principles. This was confused already by the ancients, who did not arrive at the distinction between principle and element because they were able to use the term ‘element’ for principles as well. None the less, these two things are clearly distinct from each other, the one being the smallest part of the whole, the other that into which this smallest part itself can be divided conceptually. For one cannot split fire itself into two other bodies and show it to be a mixture of them, just as one cannot with earth or water or air. *But it is possible to conceive of the substance of the changing thing as one thing and the change of it as another, since the body which changes is not the same as the change which occurs in it. For what changes is the substrate, while the change in it comes about as a result of the replacement of qualities:* so when the extreme of heat has come to be in it fire is produced, as too is air when it receives the extreme of moisture. And in the same manner, earth comes to be when this substrate, which is without any of the qualities as far as its own nature is concerned, receives into itself dryness without heat, and so does water when it receives cold” (trans. Hankinson; emphasis mine).

par excellence from which all the others would derive.²⁴⁶ Galen’s description of the reciprocal transformation of primary elements into one another is clearly modelled on Aristotle’s treatment of elemental change in *De generatione et corruptione*, where matter is thought of as inseparable from and always bound up with the contrary qualities of the two contraries (hot/cold and dry/wet; cf. *De gen. et corr.* II 1 329a24–26). When the contrary qualities completely overpower their opposites within the underlying substratum, the primary elements transform into one another: from fire to air, air to water, water to earth, and so on, cyclically and from each one to every other one (*De gen. et corr.* II 4). As Kupreeva rightly emphasizes, this Galenic analysis closely parallels Aristotle’s analysis of change in *Physics* 1.7–9 as based on three principles—form, matter, and privation—although Galen endeavours to harmonize the Aristotelian doctrine with the new ontological background provided by later Peripatetic speculation upon the subject. If in fact Aristotle was more inclined to speak of elemental qualities as *stoicheia*,²⁴⁷ Galen, on the contrary, differentiates in a clear-cut manner element from quality and defines the *stoicheia* as qualified bodies where the corresponding qualities are present to the extreme degree,²⁴⁸ and in this he

²⁴⁶ *De nat. fac.* pp. 106.4–107.7 H. (= SVF II 406), SVF II 413 (Chrysippus’ account) and I 102 (Zeno’s account) and cf. *supra* p. 41 n. 113. It seems important to point out that in his *De elementis* (CMG V 1.2 pp. 87.10–89.22 De Lacy) Galen rejects Presocratic theories of change, which are seen as elemental cycles due to contractions and expansions and as starting from just one element (either water, or air, or earth and fire), and might be interesting to ask whether Galen really wants to denigrate the ancient Presocratic theories of elemental change or whether this rebuttal instead conceals an attack on new up-to-date theories of elemental change which, with the due differences, were owed to processes of evaporations and rarefactions, such as those formulated by the Stoics (whom he could not openly criticize, unless he wanted to renounce his delicate system of anti-atomistic/corpuscularist alliances). Of course, such a claim would need a more detailed and separate study, but it is certainly notable that our physician-cum-philosopher dismisses elemental change theories described in very analogous terms to those set up by the Stoics.

²⁴⁷ *De gen. et corr.* 329b13 and 330a30.

²⁴⁸ CMG V 1.2 pp. 114.25–116.5 De Lacy “καὶ μὴν εἰ τὸ θερμὸν καὶ τὸ ψυχρὸν καὶ τὸ ξηρὸν καὶ τὸ ὑγρὸν ἐλέγετο τριῶς, ἢ ὡς ποιότης ἢ ὡς ἄμικτον ἢ ὡς μεμιγμένον σῶμα, φαίνεται δ’ οὐθ’ ἢ ποιότης στοιχείον οὔτε τὸ κεκραμένον σῶμα καὶ μεμιγμένον, ὑπολείπεται τοίνυν τὸ ἄκρατὸν τε καὶ ἄμικτον σῶμα καὶ ἀπλοῦν ταῖς ποιότησι τὸ στοιχείον εἶναι. πάλιν οὖν ἤκεις ἐπὶ πῦρ καὶ ἀέρα καὶ ὕδωρ καὶ γῆν, ἐν οἷς πρώτοις ἄκρα θερμότης καὶ ψυχρότης καὶ ξηρότης καὶ ὑγρότης ἐστὶ (And if we spoke of hot, cold, dry and wet in three ways, as quality or as unmixed body or as mixed body, and if it is evident that neither the quality nor the mixed and blended body is an element, then what is left is that the body that is unblended and unmixed and simple in its qualities is the element. So you have again come to fire and air and water and earth, which as primary bodies possess extreme heat, cold, dryness, and wetness” (trans. De Lacy).

seems to continue the track pursued by his younger contemporary Alexander of Aphrodisias.²⁴⁹

The second, qualitative change—as we have seen—for which the elements are responsible is the creation of animals and plants and of any other existent being populating our world. Although with due differences, which we have inquired into above, in the Stoic and in the Peripatetic traditions this function is carried out by mixture and, in both cases, mixture is associated with the concept of the change of primary elements. In the Aristotelian/Peripatetic tradition, mixture was essentially regarded as a *particular kind of qualitative change* that did not coincide with generation/corruption, alteration (in the orthodox Aristotelian sense given in *De gen. et corr.* I 4), or growth.²⁵⁰ More precisely, it has been defined as a *two-way* qualitative change,²⁵¹ where the opposites (whose

²⁴⁹ On this cf. Kupreeva 2014 pp. 192–194. For the new hylomorphic status attributed to the *stoicheia* by Alexander of Aphrodisias cf. also *supra* n. 159. Besides, we can observe that, analogously to Alexander (cf. *De an.* 7.9–14 Bruns and *De mixt.* p. 229, 3–6 Bruns) and differently from Aristotle, Galen ascribes causal agency exclusively to the qualitative contrarities present in the substrate, as he points out by endorsing the same Peripatetic formula that will be adopted by Alexander: the primary bodies act and are acted upon *in accordance with* the qualities; cf. *De elem.* CMG V 1.2 p. 100.22–23 De Lacy “ἀλλὰ καὶ τὰς ποιότητας αὐτῶν, καθ’ ἃς εἰς ἄλληλα δρᾶν καὶ πάσχειν πέφυκεν”.

²⁵⁰ Cf. the next footnote.

²⁵¹ Frede 2004 p. 301 and Cooper 2004 p. 321. Cf. also De Haas 1999 p. 29. The particular status given to mixture in the Aristotelian account, which does not coincide with the other changes analysed in depth by Aristotle (generation/corruption, alteration in the Aristotelian orthodox sense, growth/diminution) is made explicit in the opening lines of Aristotle’s exposition of mixture in *De generatione et corruptione* (I 10 327a30–327b10), which we will briefly bring into focus. In this section, Aristotle deals with an initial trilemma against mixture and then carefully distinguishes mixture from generation and corruption, growth and alteration. See *De gen. et corr.* 327a34 ff. Some unnamed objectors held that mixture is impossible as i) either the ingredients persist intact in the mixture, and therefore there cannot be mixture since the constituents do not undergo any change or modification; or ii) one of the ingredients passes away and, therefore this is not mixture either, as it no longer contains both the ingredients; or iii) both the ingredients get destroyed in the mixture and, *a fortiori*, the corruption of both the constituents cannot be mixture either. In order to cope with this trilemma, Aristotle shows how mixture is a *special case of change* and outlines its differences in comparison with all the other mentioned processes of change that he had treated previously. On the one hand, mixture differs from generation and corruption, as in the latter case one thing completely changes into another, as when fire burns wood and, therefore, there is γένεσις of fire and φθορά of wood. On the other hand, mixture does not coincide with growth, as in that case one of the bodies would perish and change into the predominant constituent: the food in fact does not mix with the body but is assimilated by it; *De gen. et corr.* 327b13–14. Cf. also Joachim 1922 p. 179. The last two examples show that mixture is a process different from case ii) of the trilemma (where one of the constituents perishes), while the example given by Aristotle at 327b12, where he claims that burning pieces of wood do not mix with each other would rule out case iii) (where both of the constituents perish in the supposed process of mixture); cf. Frede 2004 p. 291 n. 6; cf. Joachim 1922 p. 178. Finally, according to Aristotle, mixture is not identical with alteration (ἀλλοίωσις) either. If a body becomes white or if a lump of wax takes a particular shape this does not mean that the body has mixed with white or that the lump of wax has mixed with shape: an alteration

nature is preserved in potentiality while in actuality they give rise to a *tertium quid*) destroy each other's excesses and find a common midpoint (or μεταξὺ—the *tertium quid*) by reciprocally assimilating to each other.²⁵² In fact, in contrast to elemental change, where one or two of the contrary qualities within the contrarities completely master and prevail over their opposites (determining in this way the generation of one element and the destruction of the other), in mixture the qualities meet *half-way* and, therefore, generate an *intermediate* body, the homoeomerous part.

In the Stoic tradition, instead, together with σύγχυσις (fusion), σύστασις (condensation—which, as we have seen, regulates Stoic elemental change), and σύμφυσις (natural conjunction—of matter and pneuma), mixture or δι' ὅλων κρᾶσις falls under the changes or μεταβολαί of substance (cf. SVF II 471), but in contrast to Aristotle's account, its constituents (the active elements and the passive elements interpenetrating one another) always remain *distinguishable* in the mixture (cf. SVF II 472—Philo—and SVF II 473—Alexander) and are compresent in a pervaded state (as we have seen, the bodily qualities of each of the constituents of total mixture are said to συνεκφαίνεσθαι, “to show forth together”; cf. *supra*), while, in its continuous inwards and outwards motions and by modifying the density of the matter, the pneuma (the mixture of fire and air)

and not a mixture has taken place, for the thing which is qualified and the quality which qualifies it are both preserved (οὐδὲ τὸ σῶμα καὶ τὸ λευκὸν οὐδ' ὅλως τὰ πάθη καὶ τὰς ἕξεις οἷόν τε μίγνυσθαι τοῖς πράγμασιν · σωζόμενα γὰρ ὀράται); *De gen. et corr.* 327b13–14. Cf. ^also Joachim 1922 p. 179. These examples have the effect of dismissing case i) as a mixture; cf. Frede 2004 p. 292 n. 7. It is important to note with De Haas that although Aristotle very attentively differentiates between mixture and alteration, in the final statement of Chapter I 10 mixture is defined as “the unification of mixables when “altered” (ἡ δὲ μίξις τῶν μικτῶν ἀλλοιωθέντων ἔνωσις), that is to say, it is then the result of a particular kind of *qualitative* change; De Haas 1999 p. 29.

²⁵² While in *De generatione et corruptione* I 10 Aristotle illustrates in general terms the process of interaction between the ingredients during the mechanism of mixture, later on in the same treatise (II 7) he sharpens the focus and applies it to the production of homoeomerous parts. As Aristotle declares, things, which share the same matter as the ingredients involved in the process of mixture, reciprocate and act and are acted upon (“Τὰ μὲν οὖν ἀντιστρέφει, ὅσων ἢ αὐτῆ ὕλη ἐστὶ, καὶ ποιητικὰ ἀλλήλων καὶ παθητικὰ ὑπ' ἀλλήλων”; *De gen. et corr.* 328a19–21), and when there is a certain balance between their ‘powers of action’ (“Ὅταν δὲ ταῖς δυνάμεσιν ἰσάζῃ πως, which we will examine later in this chapter), and none of the constituents can overpower the other, then “each of them changes out of its own nature towards the dominant: yet neither becomes the other, but both become an *intermediate* with properties *common* to both (τότε μεταβάλλει μὲν ἑκάτερον εἰς τὸ κρατοῦν ἐκ τῆς αὐτοῦ φύσεως, οὐ γίνεται δὲ θάτερον, ἀλλὰ μεταξὺ καὶ κοινόν)”, cf. *De gen. et corr.* 328a29–31 (trans. Joachim).

holds the matter together and provides it with unity and qualitative determinations (cf. SVF II 452).

Now, after having introduced Galen's primary elements as qualitatively alterable by the means of the interaction of their primary qualities, and after having seen that this qualitative alteration gives rise to the reciprocal transformation of the primary elements into one another, in order to pursue our main objective, that is to demonstrate that Galen's model of mixture shows stable philosophical coherence, it is crucial to understand how the primary elements act and behave in the case of Galen's mixture.

Galen's treatment of mixture as change also seems to closely resemble Aristotle's picture: as we see in the following texts (**T12**, **T13**, **T14**), the primary qualities are thought of as extremes *with latitude between them* and, in the process of mixture, they do not change into one another (as in the elemental change) but into an intermediate stage or *μεταξὺ* under the influence of their reciprocal interaction.

T12 Galen *In Hipp. Nat. Hom. comment.* K. XV 52.15-18 Mewaldt 29.11–14:

ταῦτα γὰρ ἄκρας ἔχει καὶ ἀμίκτους ποιότητος, ἐξ ὧν ἀλλήλαις κεραυνυμένων τὰ μεταξὺ σώματα πάντα γίνεται κατ' ἐπικράτειαν, οὐ κυρίως ὀνομαζόμενα θερμὰ καὶ ψυχρὰ καὶ ξηρὰ καὶ ὑγρὰ.

For these [four elements] possess the qualities in their extreme and unmixed form, from which, when they are mixed with one another, all the intermediate bodies come to be which are called hot and cold and dry and moist not strictly but in respect of predominance. (Trans. Hankinson)

T13 Galen *In Hipp. Nat. Hom. comment.* K. XV 55.3-11 Mewaldt 30.19–25:

Τοιαύτη, φησίν, οὐ μόνον ἡ τοῦ ἀνθρώπου φύσις ἐστίν, ἀλλὰ καὶ τῶν ἄλλων ἀπάντων, ἐκ θερμοῦ δηλονότι καὶ ψυχροῦ καὶ ξηροῦ καὶ ὑγροῦ κεκραμένη τῶν ἀπλῶν καὶ ἄκρων. τὰ γὰρ ἐν τῷ μεταξὺ πάντα τὴν κρᾶσιν ἐκ τούτων ἔσχηκεν. ἀδιανόητον οὖν γίνεται τὸ λέγειν ἐκ τῶν μεταξὺ τὴν κρᾶσιν

γίνεσθαι τῶν ἐν τῷ μεταξύ. τοῦτο δ' οὐκ αἰσθάνονται λέγοντες οἱ ἐκ τῶν κατὰ τὸ σῶμα βλεπομένων ὑγρῶν καὶ ξηρῶν θερμῶν τε καὶ ψυχρῶν τὴν φύσιν ἡμῶν συγκεῖσθαι φάσκοντες.

‘Such’, he says, is not only the nature of man, but also ‘of everything else’, that is, one mixed from the simple and extreme hot and cold, dry and wet, since all the intermediate things are mixed from these. Thus it becomes unthinkable to say that the mixture of the intermediate things comes to be from the intermediate things; but those who say that our nature is put together from the visible wet, dry, hot and cold things in the body do not realize that this is what they are saying. (Trans. Hankinson; slightly modified)

T14 Galen *De temperamentis* K. I 554.13-555.10 Helmreich 29.4–18:

οὔσης γάρ τινος ἀκράτου καὶ ἀμίκτου ποιότητος, θερμότητός τε καὶ ψυχρότητος καὶ ξηρότητος καὶ ὑγρότητος, ὅσα ταύτας ἐδέξατο σώματα, θερμὰ δηλονότι καὶ ψυχρὰ καὶ ξηρὰ καὶ ὑγρὰ τελέως τε καὶ ἀκριβῶς ἐστί. ταυτὶ μὲν οὖν μοι νόει | τὰ τῶν γιγνομένων τε καὶ φθειρομένων ἀπάντων στοιχεῖα, τὰ δ' ἄλλα σώματα τὰ τε τῶν ζώων καὶ τὰ τῶν φυτῶν καὶ τὰ τῶν ἀψύχων ἀπάντων, οἷον χαλκοῦ καὶ σιδήρου καὶ λίθων καὶ ξύλων, ἐν τῷ μεταξύ τῶν πρώτων ἐκείνων τετάχθαι. οὐδὲν γὰρ αὐτῶν οὔτ' ἄκρως θερμὸν οὔτ' ἄκρως ψυχρὸν οὔτ' ἄκρως ξηρὸν οὔτ' ἄκρως ὑγρὸν ἐστίν, ἀλλ' ἤτοι μέσον ἀκριβῶς ὑπάρχει τῶν ἐναντίων, ὡς μηδὲν μᾶλλον εἶναι θερμὸν ἢ ψυχρὸν ἢ ξηρὸν ἢ ὑγρὸν, ἢ θατέρω τῶν ἄκρων προσκεχώρηκεν, ὡς μᾶλλον εἶναι θερμὸν ἢ ψυχρὸν ἢ μᾶλλον ξηρὸν ἢ ὑγρὸν.

Since there is such a thing as an unmixed and unblended quality—heat, coldness, dryness, and moisture—evidently the bodies that have received these qualities will be hot, cold, dry or wet in the complete and precise sense. Now, I want you to conceive these [bodies] as the elements of all things which are subject to generation and decay, and the other bodies—those of animals, plants and all inanimate things, such as bronze, iron, stone or wood—as having been placed in between those primary ones. None of them is either hot, cold, dry or

wet in the extreme sense; rather, it is either precisely in the middle of the opposites, so that it is to no greater extent hot, cold, dry, or wet, or else it is closer to one or other of the extremes, so that it is hot to a greater extent than it is cold, or dry to a greater extent than it is wet. (Trans. Singer; slightly modified)

Although their contexts are different,²⁵³ all the three texts clarify the difference between primary elements that have within them primary qualities to the extreme degree and elemental composites or mixed bodies. On the one hand, we find the primary elements that possess extreme, simple, and unmixed primary qualities (cf. **T12** “ταῦτα γὰρ ἄκρας ἔχει καὶ ἀμίκτους ποιότητας” and **T13** “τῶν ἀπλῶν καὶ ἄκρων sc. ποιότητων”) in the complete and precise sense (cf. **T14** “τελέως τε καὶ ἀκριβῶς”). On the other hand, when the primary elements mix, they give rise to the mixed bodies and these texts provide us with more evidence so as to determine exactly how the contrary qualities behave during the qualitative change implied by mixture. Analogously to Aristotle’s account, the contrary qualities in the contrarieties (ἐναντιώσεις) are endowed with *latitude*, going from extreme and simple hot to extreme and simple cold (and the same holds for the other contrariety, dry/wet): when they mix (**T12** “ἐξ ὧν ἀλλήλαις κεραυνυμένων”), they come over each other (**T14** cf. the use of the verb προσχωρέω “approaching”, “coming/going over”). They can meet either right at the centre of the opposite extremities (**T14** “μέσον ἀκριβῶς [...] τῶν ἐναντίων”) or closer to each of the extreme poles, in which case the mixed bodies can be called “hot”, “cold”, “dry”, and “wet” by prevalence (κατ’ ἐπικράτειαν). These bodies are called in the Aristotelian fashion *in between or intermediate bodies* (**T12** “τὰ μεταξὺ σώματα”), because they are generated when the primary elements, which are defined as the elements of all things subject to generation and corruption (**T14** “τὰ τῶν γιγνομένων τε καὶ φθειρομένων ἀπάντων

²⁵³ Both (T13), i.e. the commentary on *De nat. hom.* CMG I 1.3. p. 172.2–5 Jouanna and (T14), i.e. the commentary on *De nat. hom.* CMG I 1.3 p. 172.8–9 Jouanna, are inserted in a context of criticism (based on the exegesis of the Hippocratic *De nat. hom.*) of some unnamed physicians who deem the visible forms of hot, cold, dry, and wet contained in the homoeomerous parts to be the primary elements of the nature of the human being (and therefore are charged with mistaking already mixed bodies for primary elements) and that we can now safely identify as the Pneumatists. (T15) is instead taken from *De temperamentis* I 8, where Galen takes stock of the previous arguments and draws a distinction between elements (where the primary qualities are present to the extreme degree) and elemental composites (where the primary qualities are present by predominance) before expounding his system of nine mixtures.

στοιχεῖα”; the use of these terms is an explicit reference to *On generation and Corruption*), meet between their opposites. They coincide with the bodies of living and non-living things: that is, animals, plants and inanimate beings, such as bronze, iron, stone or wood (T14 “and the other bodies—those of animals, plants and all inanimate things, such as bronze, iron, stone or wood—as having been placed in between those primary ones (τὰ δ' ἄλλα σώματα τά τε τῶν ζῴων καὶ τὰ τῶν φυτῶν καὶ τὰ τῶν ἀψύχων ἀπάντων, οἷον χαλκοῦ καὶ σιδήρου καὶ λίθων καὶ ξύλων, ἐν τῷ μεταξὺ τῶν πρώτων ἐκείνων τετάχθαι)”).

But there is more: as in the Aristotelian/Peripatetic model of mixture, the primary elements are instead preserved *in potentiality*, while they give rise *in actuality* to a new product out of themselves. This is very clearly spelled out in our next text:

T15 Galen *De plac. Hipp. et Plat.* K. V 676.5-14 De Lacy 502.14–21:

ἀκριβέστερον <δὲ> φαίνεται καὶ μέντοι καὶ χρησιμώτερον ἰατρῷ περὶ αὐτῶν ὁ Ἱπποκράτης γεγραφώς. ἐκ μὲν γὰρ τῶν τεσσάρων στοιχείων φησὶ γεγονέναι τὸ σῶμα καλῶν τοῦπίπαν ἀπὸ τῶν δραστικῶν ποιότητων αὐτά, τὸ μὲν ξηρὸν, τὸ δ' ὑγρὸν καὶ τὸ μὲν θερμὸν, τὸ δὲ ψυχρὸν· οὐ μὴν κατ' ἐκεῖνά γε τὸν περὶ τῶν νοσημάτων λόγον ἐποίησατο. δυνάμει μὲν γὰρ ἐστὶν ἐν τοῖς σώμασιν, ἐνεργεῖα δὲ οὐκ ἔστιν, ἀλλὰ τὰ ἐξ αὐτῶν γεγονότα διὰ μέσων τῶν τροφῶν, αἷμα καὶ φλέγμα καὶ ἡ ξανθὴ καὶ μέλαινα χολή·

What Hippocrates wrote about these matters is seen to be more precise and indeed more useful to a physician. He says that the body has been generated from the four elements, naming them generally by their active qualities, the one dry, the other moist; the one hot, the other cold. But he did not formulate his account of diseases in terms of these qualities. For the qualities are in the body potentially, not in actuality; in actuality are rather the things generated from the qualities by means of nutriment: blood, phlegm, yellow and black bile. (Trans. De Lacy)

The passage is taken from the 8th Book of *De Placitis Hippocratis et Platonis* where, after a brief summary of the contents of the first six books, Galen proceeds to his theory of elements and underlines the points of contact between Hippocrates' *De natura hominis* and Plato's *Timaeus* extensively quoting from both works. In the present passage, in accordance with his systematic project of updating Hippocratic medicine, Galen tries to convince the reader that although Hippocrates thought of the human body as made up of the four elements (in Galen's view analogously to what Plato's *Timaeus* had said), he formulated his account in terms more suitable for a physician and named the elements by their active qualities (the hot, the cold, the dry, and the wet). This—says Galen—does not hold for the aetiology of disease developed in that treatise, which—Galen is forced to admit—was instead clearly based on the four humours. Galen justifies this discrepancy between a genuinely Hippocratic humoral pathological aetiology and the Galenic image of Hippocrates as four-element-theorist by resorting to the Aristotelian distinction between potentiality and actuality. As he straightforwardly declares, Hippocrates already knew that the qualities are in the body (which arises from the mixture of the four qualities) in potentiality, not in actuality; in actuality we rather have the four humours generated from the qualities by means of nutriment (διὰ μέσων τῶν τροφῶν). This passage, then, gives us further confirmation of what we have been pursuing so far and it represents a key text as it unequivocally provides us with an adequate response to the question concerning the ontological status of the constituents in the mixture. The primary qualities are thus preserved in potentiality in the mixture and, as we see, Galen does not go deeper into accounting for which kind of potentiality he is referring to (as later commentators on Aristotle did): although they are not conserved as such in the mixture, they are not destroyed altogether, but nor do they remain intact and preserved in actuality.²⁵⁴

Finally, there is a last point to which we should call attention. In his *De generatione et corruptione* II 7 Aristotle speaks in passing of a *ratio* or

²⁵⁴ As we see, although analogously to the Aristotelian/Peripatetic account, Galen understands mixture as a type of half-way qualitative change and the qualities as potentially preserved in the mixture, in this text he speaks of the four humours of the Hippocratic tradition as a tertiary product arising from the mixture of primary qualities which, indeed, does not sound as Aristotelian. We will explore the issue in the next section of the present chapter.

proportion that brings about the homoeomerous parts, explaining in this way the great variety of homoeomerous stuff in the physical world, each homoeomerous part corresponding to a specific proportion of the qualities within the mixture: we saw that this λόγος of mixture (i.e. the proportion of the elements in the mixture) has already been considered a rudimental and primitive form of the homoeomerous part (not comparable, however, to the form of living things, conceived as wholes, which is the explanatory cause of this proportional relation). However, in Aristotle's conception hot/cold and dry/wet give rise to μεταξύ bodies or intermediate bodies, that is, bodies that are generated when the opposites meet in a central and broad region. This is one thing; it is something else to say what Galen had stated in the previous passages: i.e. that a single and distinctive power arises out of the mixture and this power no longer coincides with each of its basic constituents. It is over and above them: that is, it is different. Moreover, as we saw at the beginning of this section, Galen sets forth the topic of change within the elemental mixture by recourse to an example which *de facto* falls outside of Aristotle's discourse on mixture, and this is the image of the *tetrapharmakos* and of the power that emerges from this four-fold drug, which is indeed absent from Aristotle's original account. In order to clarify this, we will quote two additional texts belonging to two different contexts²⁵⁵ (one of which

²⁵⁵ In the first case, Galen inserts this statement in a wider context where, commenting on a Hippocratic passage (*De nat. hom.* CMG I.3 pp. 164.8–166.11 Jouanna), he tries to demonstrate that in his *De natura hominis* Hippocrates refuted only those who believed that human nature was made up only of one element and not those who thought it was made up of all the four elements. In the second case, in his *De causis contentivis* he enters into a polemic with the Pneumatist Athenaeus of Attalia, who postulated three kinds of pathological causes (cohesive, prior and external causes); cf. *De caus. cont.* CMG Suppl. Or. II 2.2–3 p. 54 Lyons: "Athenaeus' three types are as follows: first that of the cohesive causes, then that of the prior causes while the third type is comprised of the matter of the immediate cause. This latter term is applied to externals whose function is to produce some change in the body, whatever this change may be. If what is thus produced in the body belongs to the class of what causes disease, then, while it has not yet actually given rise to a disease, it is known as a prior cause. Alterations are produced in the natural spirit (i.e. pneuma) by these causes together with those that are external, leading to moisture, dryness, heat or cold, and these are known as the cohesive causes of disease. For, in Athenaeus' view, the spirit (i.e. the pneuma) having penetrated the homoiomerous parts of the body, changes them through its own change and assimilates them to itself" (trans. Lyons; original italics). As is clarified further below, the cohesive cause is the pneuma whose qualitative composition has been modified, sometimes directly by an external cause (such as for the example the sun's heat) and sometimes indirectly through the mediation of a prior or predisposing cause, which Athenaeus and the Pneumatists locate in the body's humours. More precisely, in the text we cited Galen rejects Athenaeus' view according to which once changed by an external or prior cause the pneuma would in turn change the composition of the homoeomerous parts: in Galen's view, pneuma (in the Stoic view a mixture of fire and air) has to be completely mixed with the other elements in order to give rise to the homoeomerous parts.

has been previously cited; we will reproduce it again with the original numeration for the sake of clarity):

T2 Galen *in Hipp. Nat. Hom. comment.* K. XV 32.1–11 Mewaldt 18.27–19.7:

ὅτι γὰρ οὐχ ἓν ἐστίν, ἀλλὰ πλείω τὰ συντιθέντα τὴν | τοῦ ἀνθρώπου φύσιν, ἐπιδείκνυσιν ὁ Ἱπποκράτης, οὐ μὴν ὅτι γε μηδὲν ἐστὶ τῶν τεττάρων στοιχείων εἰλικρινὲς ἐν τῷ σώματι. τὴν ἀρχὴν γὰρ οὐδὲ λέγουσιν οἱ τῆς δόξης ταύτης ἡγεμόνες τοῦτο. Ἐν δὴ τι παρὰ τὰ τέτταρα, τὸ ἐξ αὐτῶν συγκείμενον, ἀποφαίνονται, ὥς γε τὴν τετραφάρμακον δύναμιν οὔτε κηρὸν οὔτε πίτταν οὔτε ῥητίνην οὔτε στέαρ, ἀλλὰ τι παρὰ ταῦτα ἐν ἄλλο, ὃ ἐξ ἀπάντων κραθέντων γέγονεν, οὔσης πάλιν καὶ αὐτῆς τῆς δόξης διττῆς· ἔνιοι μὲν γὰρ τὰς τέτταρας ποιότητας μόνας κεράννυσθαι δι' ὅλων ἀλλήλαις λέγουσιν, ἔνιοι δὲ <καὶ> τὰς οὐσίας ἀπεφήναντο, Περιπατητικοὶ μὲν τῆς προτέρας δόξης προστάντες, Στωϊκοὶ δὲ τῆς δευτέρας.

For Hippocrates showed that what constitutes the nature of man is not one thing but many, not that none of the four exists in the body in its pure state. But the leading proponents of this doctrine do not say that this is the principle. *Rather they hold that there is one thing over and above the four, and which is constituted from them, just as the power of the tetrpharmakon is neither wax, pitch, resin, nor fat, but something else over and above them*, which is generated from the mixture of all of them, although this latter doctrine comes in two forms. For some people say that only the four qualities are mixed through-and-through with one another, while others hold that also the substances themselves are (the Peripatetics favour the former doctrine, the Stoics the latter). (Trans. Hankinson; slightly modified, italics mine).

T16 *De causis contentivis* CMG Suppl. Or. II 3.2–3 p. 56 Lyons:

For the spirit (i.e. the pneuma) does not preserve its original state at all when it is blended with other bodies in the total intermingling of the four elements. *Rather from the four is produced a fifth substance, which is not identical with*

any one of its ingredients. An illustration of that point is the unguent known as 'The Quadruple' (i.e. the *tetrapharmakos*). When we make this we mix wax, pitch, resin and tallow and as these are completely intermingled none of them remains afterwards in its former state. Rather a fifth medicament is produced which is not the same as any of those four, since in the process of intermingling not one of them preserves and maintains its nature intact. (Trans. Lyons; italics mine)

As Moraux has noted, Galen's mixture is thought of as a type of qualitative change giving rise to a different product which acquires new qualitative determinations that no one of the primary elements possessed before.²⁵⁶ As Moraux rightly observes, he makes use of the example of the *τετραφάρμακος* that we find in the Stoic *Mischungslehre* in order to illustrate what fusion (*σύγχυσις*) is.²⁵⁷ What Moraux does *not* explain, however, is why Galen would have adopted this very example referring to the Stoic fusion and whether this example, taken from the Stoic doctrines, actually dovetails with an overall account, which, as I wish to claim, has its conceptual counterpart in the Aristotelian/Peripatetic model of mixture. Is he lacking of consistency on this very point?

If we sift through the testimonies that we possess, we realize that, in contrast to the Stoic total mixture, fusion is the only mixture in the Chrysippean system in which i) the ingredients (which are always conceived of as qualified bodies going completely through one another; cf. SVF 471 and An. Lon. col. XIV, 18) are jointly destroyed in the mixture: they disappear and vanish completely and are no longer conserved (cf. SVF II 472 "Σύγχυσις δέ ἐστι φθορὰ τῶν ἐξ ἀρχῆς ποιοτήτων" and further down "ἐκάστη μὲν αὐτῶν ἠφάνισται, πασῶν δὲ φθορὰ"; SVF II 473 "δι' ὅλων τῶν τε οὐσιῶν αὐτῶν καὶ τῶν ἐν αὐταῖς ποιοτήτων συμφθειρομένων ἀλλήλαις [...] "κατὰ σύμφθορσιν"; cf. also An.

²⁵⁶ Moraux 1984 p. 739 ff.

²⁵⁷ Moraux 1981a p. 91. To be more precise, while the other sources generically speak of medical drugs or unguents in connection with fusion (SVF II 471, 473), Philo SVF II 472 and the text of Anonymous Londinensis (An. Lon. col. XIV 19–20 Manetti) mention the *tetrapharmakos* as an example of fusion.

Lon. col. XIV, 14²⁵⁸); ii) the elements give rise to a new superior (corporeal) quality out of the mixture (SVF II 471 “Τὴν δὲ σύγχρυσιν δύο ἢ καὶ πλειόνων ποιοτήτων περὶ τὰ σώματα μεταβολὴν εἰς ἑτέρας διαφοροῦσης τούτων ποιότητος γένεσιν”; cf. SVF II 472 “εἰς διαφοροῦσης μιᾶς (sc. ποιότητος) γένεσιν and further down μίαν ἐξάριετον ἄλλην ἐγέννησε δύναμιν”; cf. SVF II 473 “τῶν μιγνυμένων ἄλλου τινὸς ἐξ αὐτῶν γεννωμένου σώματος”; An. Lon. col. XIV, 19–20 “μίαν ὑπεράνω ἀποτελέσει ποιότητα”). As we see, Stoic fusion is considerably at variance with Stoic total mixture, since in the latter the ingredients i) totally bodily interpenetrate each other and qua bodily interpenetrated (and not qua separated, as in the case of unchanging constituents) persist as such and *in actuality* in the mixture; ii) do not give rise, out of the mixture, to a new product ontologically superior in comparison with the original and starting ingredients.

Certainly, if we look more deeply and attentively at Galen’s usage of this Stoic example, we find some additional elements concerning his conception of mixture and, once more, elements which depart from the defining features of the Stoic total mixture. For in contrast to the Stoic total mixture—but analogously to Stoic fusion—the primary elements in the mixture give rise to a new product that is superior to the four elements and even goes beyond them: a product that not only comprehends them all, but also generates an outcome belonging to a higher ontological rank (cf. **T2** “they hold that there is one thing over and above the four, and which is constituted from them, just as the power of the *tetrapharmakos* is neither wax, pitch, resin, nor fat, but something else over and above them, which is generated from the mixture of all of them”; and cf. **T16** “a fifth medicament is produced which is not the same as any of those four”).

However, although the analogy with the Stoic fusion that Galen himself offers in these texts can be taken as a forceful *instrumentum cognoscendi*, we are quite far from saying that Galen’s concept of mixture can be smoothly superimposed on that of Stoic fusion. On the contrary, I am trying to show that, while by making usage of a Stoic example Galen elegantly seeks to wrap his account of mixture in a Stoic cloak, his model of mixture turns out to reveal increasingly deeper links with the Aristotelian/Peripatetic model.

²⁵⁸ On σύμφθαρσις in the Stoic classification of mixture and in particular in connection with fusion, cf. Manetti 1999a p. 552–554.

To begin with, like all the other Stoic changes, fusion too implies corporeal causality and, as we have had occasion to see, Galen casts serious doubts on Stoic corporeal causality²⁵⁹. On the contrary, in the wake of a reinterpreted Aristotelian theory, he never misses the opportunity to remark that it is owing to the primary qualities that primary elements can act and be acted upon and are changeable, i.e. alterable in their entirety. Mixture, too, is regarded following Aristotle as a qualitative change, called *alloiôsis*, whereby the opposite qualities meet half-way between the extreme poles of a contrariety and give rise to a third product out of the mixture, as we have shown.

Second, whereas in the Stoic account of fusion the constituents are not preserved at all, since they totally vanish because of their undergoing a joint-destruction or σύμφοθαρσις, according to Galen, we have seen that as in the Aristotelian/Peripatetic model of mixture, the primary elements are instead conserved *in potentiality*, while they give rise *in actuality* to a new product.

Third, if we think about it, the way in which Galen alludes to the nature of this third product endowed with a set of new *qualitative* determinations (which are compared to an arising *dynamis*), marking off something of distinct type which is no longer identical with the starting basic elements²⁶⁰ again bears striking resemblances (not indeed with the orthodox Aristotelian model of mixture, but) with Alexander of Aphrodisias' notion of the supervenience of a new distinctive form on the matter of the underlying constituents.²⁶¹

²⁵⁹ See supra pp. 86 ff.

²⁶⁰ Cf. T2 “they hold that **there is one thing over and above the four, and which is constituted from them**, just as the power of the *tetrapharmakos* is neither wax, pitch, resin, nor fat, but **something else over and above them**”, and T16 “Rather from the four **is produced a fifth substance, which is not identical with any one of its ingredients**”. An illustration of this point is the unguent known as “The Quadruple” (i.e. the *tetrapharmakos*): “**Rather a fifth medicament is produced which is not the same as any of those four**”.

²⁶¹ As we have seen, in his *De anima* Alexander uses the example of a blend of drugs to express the emergent power of the soul. According to Caston, he echoes the Galenic example of the *tetrapharmakon* here, which generically refers to the notion of emergent power (the three cases we analysed are not set within a psychological context); cf. Caston 1997 p. 350 with n. 102. As we see, whereas in the Stoic doctrine of mixture the account of fusion is suited to illustrating the production of drugs, medicaments, and ointments from various ingredients—among which the *tetrapharmakos* is also mentioned—, Galen instead makes use of this latter Stoic image merely *by way of example* while alluding instead to the elemental mixture. In the textual evidence available to us there is just one case in which Stoic fusion is *not* applied to the production of drugs, and this is not properly a Stoic text. It is a text which in using the Stoic classification of mixtures drew on a source that in turn Galen may have known and used. I am referring to the doxographical section of the medical work by the so-called Anonymous Londinensis, (1st century CE), which consists of three sections. The first parts, partial and mutilated at the beginning, deal

This explanatory model is put into practice by Galen when he has to explain the process whereby the *stoicheia* give rise to the homoeomerous parts. This process is described as made up of progressive and gradual mixtures which are envisioned as qualitative alterations or *alloiôseis* brought about by the four

with the definitions of some important medical concept (cols. 1–4.17). The second part, to which we are now referring, deals extensively with the causes of diseases and formally quotes “Aristotle” as its source (cols. 4.18–21.9) though it was attributed to Aristotle’s pupil Meno by Diels, whose work was usually referred to as *Menoneia*. According to Diels the Anonymous may have known it through the mediation of the work *Areskonta* by Alexander Philaletes (1st century BCE–1st century CE). More recently, Manetti argues—*contra* Diels—that the Anonymous may have used the material directly; cf. Manetti 1999b pp. 99 ff. The third part is a physiological text mainly devoted to theories of digestion and the assimilation of food (cols. 21.10–39); cf. Manetti 1999b p. 98. This second doxographical section can be further subdivided into two parts: the first summarizes the views of physicians who attributed the causes of diseases to the *perittomata* arising from digestion, while the second deals with the physicians who opted for an aetiology of disease based on the equilibrium of the bodily *stoicheia*. Among the second group of physicians, a special place is held by Plato, whose *doxa* is the first and the largest of the second section of the doxography, which relies upon a paraphrasing of the contents of Plato’s *Timaeus* dealing respectively with the formation of the bodily parts from the primary elements (*Tim.* 42e–43a), a summary of Plato’s physiology and anatomy (*Tim.* 73bff.), and his pathologic aetiology (*Tim.* 82aff.); cf. Manetti 1999a pp. 547–548. The first section is of most interest for us, since it explains what is considered to be Plato’s view on the generation of bodily parts from the mixture of the primary elements. According to the text, Plato affirmed that our bodies are made up of the four primary elements, κατὰ σύμφοθαρσιν, i.e. joint-destruction (XIV, 12–14 Manetti). Our author then introduces the Stoic classification of mixtures: joint-destruction or fusion (in the text the corresponding Greek terms are used almost synonymously), juxtaposition (called μίξις), and total mixture (XIV15–25 Manetti), and adds that joint-destruction or fusion (i.e. the kind of mixture then to which he had previously attributed the formation of bodily parts) occurs when the bodies go through one another and give rise to a new superior quality, as in the *tetrapharmakos* (14.14–20 Manetti). As Manetti rightly hypothesizes, the source of this portion of text seems to be a Stoic exegesis of Plato’s *Timaeus*, although it is not yet clear when and how it was originally composed. For a survey of all references to the Stoic classification of mixtures applied to the *Timaeus* cf. Manetti 1999a pp. 554–555. Galen could have known about the application of the Stoic theory of mixture to Plato’s *Timaeus* and he could have known this through two different channels: 1) through the so-called *Menoneia* (in Galen’s time there was a medical work in circulation, the *Medical Collection*, which was attributed to Aristotle but was widely assumed to have been written by his pupil Meno: this work—whether by Meno’s or not—contained the second part of the Anonymous’ doxography on the causes of disease), which he surely knew and quotes as one of the main sources of his element and mixture theory (cf. *In Hipp. Nat. Hom. comment.* CMG V 9.1 p. 15.26-16.2 Mewaldt “If you want to research into the doctrines of the ancient doctors, it is open to you consult the books of the *Medical Collection*, ascribed to Aristotle, but generally agreed to have been written by Meno who was his pupil, for which reason some people refer to these books as ‘Menonian’. For it is clear that this Meno researched diligently into what still survived in his time of the books of the ancients, and collected from them their doctrines”); and 2) through the tradition of commentary on Plato’s *Timaeus* (to which he himself dedicated an exegetical work, in whose fragments, however, we find no evidence of the Stoic classification of mixtures as applied to Plato’s text). This is striking and can help us to understand why does Galen makes use of this Stoic image, referring therefore to Stoic fusion, when expounding his theory of the mixture of the four primary elements. Probably his acquaintance with the application of the Stoic theory of mixtures to the *Timaeus*, whether or not it was mediated by the doxographic tradition, even more than the familiarity with the other Stoic classifications of mixtures *tout court*, was decisive for the formulation of such a theory—particularly one given in such terms that explains the formation of the different parts of human bodies through the image of *tetrapharmakos* (instead of the production of medicaments *et similia*).

basic qualities and their powers. In the process of alteration, the qualitative composition of the basic constituents is affected and the new body is provided with a new set of properties determining the transition ἐξ εἶδους εἰς εἶδος:

T17 Galen *De simp. med. (temp. ac) fac.* K. XI 545f.:

Διπτῶν δ' οὐσῶν τῶν ἀλλοιώσεων κατὰ γένος, τῶν μὲν εἰδοποιῶν, αἱ δὲ καὶ κυρίως καὶ πρώτως ἀλλοιώσεις ὀνομάζονται, τῶν δὲ καταθραυσῶν τε καὶ συναγουσῶν τὰ μέρη τοῦ σώματος ἡμῶν, ἃς καταχρώμενοι μᾶλλον ἢ κυρίως ὀνομάζοντες ἀλλοιώσεις καλοῦσιν, τὰς τῶν φαρμάκων δυνάμεις ἐν ταῖς πρώταις φαρμὰς περιέχεσθαι. μηδενὶ γὰρ δύνασθαι μεταβάλλειν ἐξ εἶδους εἰς εἶδος ἄνευ τοῦ θερμανθῆναι τε καὶ ψυχρανθῆναι καὶ ξηρανθῆναι καὶ ὑγρανθῆναι. λέγω δὲ ἐξ εἶδους εἰς εἶδος, ὅταν ἐξ ἄρτου καὶ πτισάνης καὶ φακῆς αἷμα καὶ φλέγμα καὶ χολὴ γίγνηται ξανθὴ τε καὶ μέλαινα, κῶκ τούτων πάλιν ὄστον καὶ πιμελὴ καὶ νεῦρον καὶ σὰρξ, ἀρτηρία τε καὶ φλέψ, ἕκαστόν τε τῶν ἄλλων τοῦ ζώου μορίων. [...] ἀλλ' ἐν τῷ πέττεσθαι κατὰ τε τὴν γαστέρα καὶ τὰς φλέβας εἰς αἷμα καὶ φλέγμα μεταβάλλων, εἴτ' ἐκ τούτων εἰς ὄστον καὶ σάρκα καὶ τᾶλλα τοῦ σώματος μέρη, κατὰ τὴν οὐσίαν ὅλην ἀλλοιοῦται καὶ τῆς ἀρχαίας ἐξίσταται φύσεως, εἰς ἕτερον εἶδος μεθιστάμενος. οὐ μὴν ἐξ ἄλλου τινὸς ἢ ἐκ τοῦ θερμοῦ καὶ ψυχροῦ καὶ ξηροῦ καὶ ὑγροῦ τὰς εἰς ἕτερον εἶδος οὐσίας ἀλλοιώσεις τε καὶ μεταβολὰς ἐδείχθη δεχόμενα τὰ πάθη τοῦ σώματος σύμπαντα.

And since the alterations are twofold in kind (on the one hand, those that make up the substantial form (of the bodily parts), which we call alterations in the proper sense and primarily, and, on the other, those that break up and bind together our bodily parts, which we call alteration, using the term in an improper sense rather than properly), we say that the capacities of drugs fall within the first group. For [we say] that it is not possible for anything to change from one substantial form to another without being heated, cooled, dried, or moistened. What I mean when saying from one substantial form to another, is when out of bread, barley and lentil are generated blood and phlegm and bile, both the yellow and the black, and out of these [are generated] in turn bone, fat, nerve and flesh, artery and vein, and each of the animal's parts. [...] However, during the

digestion process in the stomach and in the blood vessels, [the food], changing into blood and phlegm, and after that from those into bone, flesh and other parts of the body, alters in its entire substance and leaves its previous nature turning into another substantial form. It was shown that all the affections of the body are subject to change and alteration of the substance into another kind certainly not from anything else than from hot, cold, dry and wet.²⁶²

As we see, in this passage Galen distinguishes a proper (cf. κυρίως καὶ πρώτως) from an improper use (cf. καταχρώμενοι μᾶλλον ἢ κυρίως ὀνομάζοντες ἀλλοιώσεις καλοῦσιν) of the term ἀλλοιώσις. The first is used for the so-called εἰδοποιοὶ qualitative alterations, i.e. the change which allows for a passage ἐξ εἶδους εἰς εἶδος, which is a change like the effects released by a real φάρμακον (cf. τὰς τῶν φαρμάκων δυνάμεις ἐν ταῖς πρώταις φαμέν περιέχεσθαι). By contrast, the second usage of the term can be regarded as a misuse, as it identifies the process whereby parts of the human body have been just broken up and then re-joined and bound together (τῶν δὲ καταθραυσῶν τε καὶ συναγουσῶν τὰ μόρια τοῦ σώματος ἡμῶν). As Galen clarifies afterwards, he refers to medications like a bandage, which after a traumatic event allows the body to close the wound.²⁶³

What is of interest here is that the action of the drug, which by means of the four qualities and their powers (heating, cooling, drying, and moistening) is able to provoke a qualitative alteration within the human body, is likened to the qualitative alterations involved in the formation of the constitutive parts of the human being. Here we face a hierarchical sequence of *alloiōseis* which are deemed to be the kind of change that allows for the transition ἐξ εἶδους εἰς εἶδος and from simpler to more complex bodies:²⁶⁴ bread, barley and lentils (made up

²⁶² As Van der Eijk has noticed, in the syntagm “τὰς εἰς ἕτερον εἶδος οὐσίας ἀλλοιώσεις τε καὶ μεταβολὰς”, οὐσία can be taken either with ἀλλοιώσεις τε καὶ μεταβολὰς or with εἶδος. It is very difficult to decide, but one can surmise that, since Galen is speaking here of the alteration according to the entire substance (κατὰ τὴν οὐσίαν ὅλην), the first option might be preferable.

²⁶³ *De simp. med. (temp. ac) fac.* K. XI p. 546.5 “εἰ δὲ τι τέμνον ἡμᾶς, ὥσπερ ὕαλος ἢ ξίφος, ἢ θλῶν, ὡς λίθος καὶ μόλυβδος, ἢ συνάγων τὰ κεχωρισμένα, καθάπερ ἐπίδεσις ἀλλοιοῖ πῶς τὰ μόρια ταῦτα, οὐκ εἶναι φάρμακα”.

²⁶⁴ In **T17** it is not so straightforward that the transition from εἶδος to εἶδος goes hand in hand with an advancement and a gradual enrichment of the complexity of the bodies involved in the process of alteration. However, **T17** can be partly superimposed on another textual *locus* taken from *De elementis* (*De elem. sec. Hipp.* CMG V 1.2 p. 126, 1 ff. De Lacy), where Galen

of fire, air, water, and air, which are in turn constituted by a material substrate and qualities), through a qualitative alteration, acquire new qualitative determinations (cf. “οὐ μὴν ἐξ ἄλλου τινὸς ἢ ἐκ τοῦ θερμοῦ καὶ ψυχροῦ καὶ ξηροῦ καὶ ὑγροῦ τὰς εἰς ἕτερον εἶδος οὐσίας ἀλλοιώσεις τε καὶ μεταβολὰς ἐδείχθη δεχόμενα τὰ πάθη τοῦ σώματος σύμπαντα”)²⁶⁵ and give rise to the four Hippocratic humours, which, in the same way give rise in turn to the homoeomerous parts, namely bone, fat, nerve, and flesh. At each stage a complete qualitative transformation takes place, so that the body leaves its previous nature and turns into a new body endowed with new properties different in kind (cf. “κατὰ τὴν οὐσίαν ὅλην ἀλλοιοῦται καὶ τῆς ἀρχαίας ἐξίσταται φύσεως, εἰς ἕτερον εἶδος μεθιστάμενος”).²⁶⁶

illustrates the progressive degrees of composition of the organism from the primary *stoicheia* (consisting of a material substrate and qualities) to foods and drinks (made up of primary elements), to the four humours (produced by foods and drinks), to the homoeomerous parts (generated in turn by the four humours). As it is evident, in this ascension each previous level is included in the successive one. The text will be analysed in greater detail in the next paragraph: for the moment we limit ourself to noticing that by comparing the two passages we see that the levels of formal differences correspond to a gradual scale of complexity ranging from the simplest to increasingly more complex bodies.

²⁶⁵ As has been showed in other works, notably in *De elementis*, by means of hot/cold and dry/wet and their respective capacities the *πάθη* of a body undergo alteration and change so the body can acquire a new structure and a new set of properties differing in kind. As we see, Galen uses the term *πάθος* somewhat differently from Aristotle: generally, the term does not designate a specifically different quality (cf. *Top.* 145a3–12, although sometimes it does, cf. *Part. an.* 678a33f.), and in fact in *De gen. et corr.* I 4 the qualitative alteration is seen as a change of *pathe* (the substratum remaining unaltered, as when someone gets sick or from sick becomes healthy again). Galen does not seem to make such a distinction: i) on the one hand he speaks of a change of *pathe* which brings about a new body distinct in kind, while ii) on the other hand he compares this qualitative alteration to that caused by a *pharmakon* which theoretically has to re-establish the healthy condition of the organism.

²⁶⁶ Cf. Galen’s usage of the verb *μεθίστημι* indicates a transformation and a change in the mixing bodies (cf. for a parallel *De gen. et corr.* I 10 328a34 *contra* Rashed 2005, and *contra* Giardina 2008a, who thought of a change of place as the mixing of a bodies’ particles—but the verb indicates the transformation, i.e. the qualitative alteration, of the bodies during the process of mixture; on this cf. Bonitz *s.v.*: at the end of the chapter mixture is in fact defined as “the unification of the mixables that have been qualitatively altered” 328b22). As Kupreeva has shown, the same process of qualitative alteration is adopted in Galen’s account of the emergence of sense-perception from the elemental composites. In his *De elementis* Galen makes it clear that the primary elements can be either perceptive or imperceptive, as Hippocrates did not clearly prove this point; but even if they were imperceptive, the passage from being imperceptive to being perceptive would still be possible thanks to their capability of undergoing *affection* (as they are *παθητικά*), that is, the fact that they can be subject to *change* (*μεταβολή*) and *qualitative alteration* (*ἀλλοίωσις*). As Kupreeva underscores, qualitative alteration and change play an important role in explaining this transition, since it is possible that in the course of many partial qualitative alterations (*ἐν πολλαῖς ταῖς κατὰ μέρος ἀλλοιώσεσι γενέσθαι ποτὲ τὸ αἰσθητικὸν σῶμα*), by changing and altering and mixing continuously, the imperceptive can finally become perceptive (Kupreeva 2014 pp. 169–170 and *De elem. sec. Hipp.* CMG V 1.2 p. 70.12–18 De Lacy). The shift from imperceptive to perceptive, therefore, is possible only because Galen’s elements can undergo change, in contrast to both the Atomists/Corpuscularists and Empedocles.

Let us gather the results of the last section: i) we showed that as in the Aristotelian account Galen conceived of mixture as a two-way qualitative change (he calls it *alloiôsis* without precisely distinguishing it from substantial generation/corruption and mixture in the proper sense); ii) we understood that as in Aristotle's account the basic constituents of the mixture are preserved in potentiality (Galen does not inquire which kind of potentiality this is); iii) we illustrated how, by making usage of a Stoic example, that of the tetrapharmakos, but actually paralleling a Peripatetic development of the theory of mixture, Galen tries to display the emergence, during a process of *alloiôsis*, of new qualitative determinations supervening on a previous structure that determines the generation of a new body distinct in kind.

A central problem, however, still remains. As we have hinted more than once, in the Aristotelian/Peripatetic tradition the tertiary new product arising from the mixture of the primary elements is the homoeomerous part, whereas in the latter texts Galen openly declares that the primary qualities are only in potentiality in the bodies, whereas in actuality they give rise—unexpectedly—to the four humours of the Hippocratic tradition (blood, yellow and black bile, phlegm). If, as I wish to argue, Galen's theory of mixture came from a reworking, which however benefits from variegated contributions (notably Stoic superficial influences), of the Aristotelian/Peripatetic account, we would expect a different formulation. What, then, is the relation between the Hippocratic four humours and the Aristotelian homoeomerous parts? What is the final outcome of Galen's mixture? And how can the primary qualities pass from a stage of potentiality to a stage of actuality by means of digestion (διὰ μέσων τῶν τροφῶν)? We will answer these questions in the next section.

According to Galen, in fact, these theories could not account for such a transition and he elucidates his point with the example of housebuilding: a new house made of bricks, stones, timbers and tiles will never acquire any new different property than those that its constituents have. In the same way, a juxtaposition of constituents cannot allow the structure to acquire any novel property different in kind (ἑτερογενὲς), as can happen in the case of alterable primary elements which by changing and altering continuously can determine the emergence of a novel property different in kind, e.g. sentience (*De elem. sec. Hipp.* CMG V 1.2 p. 72.16–22 De Lacy; cf. Kupreeva 2014 pp. 170–171).

1.3.5 Mixture and generation. Humours or homoeomerous parts?

As we have seen, in Aristotle's account the final product of a mixture, the homoeomerous part, must be homogeneous throughout: any part of the compound must be the same as the whole, just as any part of water is water. Though Aristotle does not develop a descriptive nomenclature, in *Meteorologica* IV 10 he lists several kinds of homoeomerous parts: metallic substances (such as bronze, gold, silver, tin, iron, and the like), animal and vegetal material (which can be solids such as flesh, bone, sinew, skin, intestine, or liquids such as blood, bile, semen, milk, or in the case of plants wood, bark, leaf, and the like).²⁶⁷ In several passages of his works Galen refers to Aristotle's terminology and clearly adopts it (listing among homoeomerous parts animate and inanimate materials),²⁶⁸ although in his *De homoeomerum partium differentia* he criticizes Aristotle's definition because the parts are not only similar (*homoios*) but also specifically identical.²⁶⁹ As we see from the passages of *De elementis* (T18), the

²⁶⁷ *Meteor.* IV 384b30ff. Aristotle distinguishes solid and fluid homoeomerous parts in *De part. an.* II 2 647b10–19. As Lennox notes, the homoeomerous parts are a) matter (moist and dry) for (and also final cause, as they are *for the sake of*) the anhomoeomerous parts and they i) contribute to being and ii) contribute to functioning; b) nourishment for the anhomoeomerous parts (moist); c) residues (*ta perittōmata*) of the moist and dry nutrients (both moist and dry), whether useless such as urine or faeces, or useful such as male semen and menstrual blood, which are formed from the residual blood. Among the homoeomerous parts blood (which is essentially hot, but not intrinsically hot) has a special status insofar as it is the *final nourishment* and, therefore, the *constituent matter* of the other homoeomerous parts, from whence they derive growth and nourishment; cf. *De part. an.* 650b2–12; cf. Lennox 2001 *passim* pp. 185–200, comm. ad 647b20–650b2.

²⁶⁸ Cf. *De hom. part. diff.* I p. 45.1–22 Strohmaier. In several passages of his work Galen acknowledges Aristotle's authorship of the term, for example *De san. tuend.* CMG V 4.2 p. 169.10–11 and *ibid.* p. 184.22–23 Koch. Moreover, it has to be noted that in *Hipp. Nat. Hom. comment.* CMG V 9.1 p. 6.14–15 Mewaldt, Galen also attributes to Aristotle the definition, which is rather Galenic, of homoeomerous parts as *στοιχεῖα πρὸς τὴν αἴσθησιν*, while in *Hipp. Nat. Hom. comment.* CMG V 9.1 p. 6.18–20 Mewaldt, and analogously in *Quod animi mor.* K. IV p. 773.16 Galen claims that Aristotle calls *ὁμοιομερῆ* the first product of the mixture of hot, cold, dry, and wet, which Plato calls *πρωτόγονα* (*Quod animi mor.* K. IV p. 773.14–17 “ἐκ τούτων καὶ χαλκὸς καὶ σίδηρος καὶ χρυσὸς ἢ τε σὰρξ νεῦρόν τε καὶ χόνδρος καὶ πιμελὴ καὶ πάνθ' ἀπλῶς τὰ πρωτόγονα μὲν ὑπὸ Πλάτωνος, ὁμοιομερῆ δ' ὑπ' Ἀριστοτέλους ὀνομαζόμενα γέγονεν”). As Moraux notes, the reference must be to Plato's *Politicus* (288e5 and 289b1), where Plato actually uses the adjective *πρωτογενής* and not *πρωτόγονον*; thus, Moraux hypothesizes a lapsus by Galen, p. 343 n. 29, on Galen's usage of Aristotle's notion of the homoeomerous part. Cf. also Grimaudo 2008 pp. 48–52.

²⁶⁹ *De hom. part. diff.* I p. 47, 19ff. Strohmaier; cf. Moraux 1985 pp. 338–339.

homoeomerous parts are, as in Aristotle, one of the levels of the animals' organic structure:

T18 *De elem. sec. Hipp.* K. I 479.10-480.8 De Lacy 126.1–12 :

φέρει γὰρ ἴν' ἐπ' ἀνθρώπου διέλθω τὸν λόγον, ἐκ πρώτων οὗτος καὶ ἀπλουστάτων αἰσθητῶν στοιχείων ἐστὶ τῶν ὁμοιομερῶν ὀνομαζομένων ἰνὸς καὶ ὑμένος καὶ σαρκὸς καὶ πιμελῆς ὀστοῦ τε καὶ χόνδρου καὶ συνδέσμου καὶ νεύρου καὶ μυελοῦ καὶ τῶν ἄλλων ἀπάντων, ὧν τὰ μόρια τῆς αὐτῆς ἀλλήλοις ἰδέας ἐστὶ σύμπαντα. γέγονε δὲ ταῦτα πάλιν ἔκ τινων ἐτέρων προσεχῶν ἑαυτοῖς στοιχείων, αἵματος καὶ φλέγματος καὶ χολῆς διττῆς, | ὠχρᾶς καὶ μελαίνης, ὧν ἡ γένεσις ἐκ τῶν ἐσθιομένων καὶ πινομένων, ἃ δὴ πάλιν ἐξ ἀέρος καὶ πυρὸς ὕδατός τε καὶ γῆς ἐγένετο, ταῦτα δ' οὐκ ἐξ ἐτέρων σωμάτων, ἀλλ' ἐξ ὕλης τε καὶ ποιότητων ἐστί. καὶ διὰ τοῦτο πυρὸς μὲν καὶ ἀέρος ὕδατός τε καὶ γῆς ἀρχὰς εἶναι λέγομεν, οὐ στοιχεῖα, ταυτὶ δ' αὐτὰ τῶν ἄλλων ἀπάντων στοιχεῖα. μόρια γὰρ ἐστὶν ἐλάχιστα τῶν ἄλλων ἀπάντων ἀπλᾶ καὶ πρῶτα.

Now let me go through the account as it applies to a human being: he is made of the primary and simplest visible elements, those called homoeomerous, fiber, membrane, flesh, fat, bone and cartilage, ligament, nerve, marrow and all the other (structures) whose parts all have the same form. These in turn have been generated from certain other elements closest to themselves, blood, phlegm, and the two kind of bile, yellow and black, their genesis is from the things we eat and drink, which in turn were produced from air, water and earth. And these last are not from other bodies but from matter and qualities. That is why we say that there are first principles, not elements, of fire and water, air and earth, and that the latter are themselves the elements of all other things. (Trans. De Lacy)

As we see from this passage, Galen draws a distinction between primary elements, fire, air, water, and earth, proximate elements (προσεχῆ τοῦ σώματος ἡμῶν στοιχεῖα), that is, the humours, and homoeomerous parts (ὁμοιομερῆ), which he also calls perceptible elements (αἰσθητὰ στοιχεῖα). In other passages

of his work Galen also goes beyond the level of the homoeomerous parts and upholds the existence of the so-called anhomoeomerous parts,²⁷⁰ overtly recalling Aristotle's articulation in *dynameis* (hot, cold, dry, and wet, which in Galen are replaced by the primary elements, fire, air, water, and earth) of homoeomerous and anhomeomerous parts, which Aristotle spells out clearly in his *De partibus animalium*.²⁷¹

However, as we saw in the above quoted passage, in contrast to Aristotle, who locates the humours on the same level as the homoeomerous parts,²⁷² Galen introduces what has been defined by Kovačić as a “Zwischenstufe”:²⁷³ the humours that are in fact defined as “proximate elements”.²⁷⁴ These humours, which are said to be the peculiar elements of the blooded animals,²⁷⁵ directly stem from the Hippocratic tradition and are blood, yellow and black bile, and phlegm.²⁷⁶

²⁷⁰ Galen's articulation into elements–homoeomerous parts–anhomeomerous parts is clearly expressed in *De san. tuend.* CMG V 4.2 p. 184.20–26 Koch; cf. also *De elem. sec. Hipp.* CMG V 1.2 p. 126.19–26; in *Hipp. Nat. Hom. comment.* CMG V 9.1 p. 6.12–20 Mewaldt; *De plac. Hipp. et Plat.* CMG V 4.1.2 p. 500, 4–26 De Lacy; *De morb. diff.* K. VI 841.1–10.

²⁷¹ *De part. an.* II 1 646a13–24.

²⁷² *De part. an.* II 2 647b 10–14 e 30–35, 648a 19–23, II 3 649b 20–650a 2. As shown by Van der Eijk, although Aristotle is acquainted with the four humours of the Hippocratic *De natura hominis* (in *De hist. anim.* 550b9–10 he mentions phlegm and yellow and black bile as residues, together with faeces; this is the only passage where these three humours are listed together), he does not seem to set up a real humoral system, as it occurs in the Hippocratic *De natura hominis*. For, in the first place, Aristotle regards phlegm and the two biles as useless residues and, therefore, it is highly unlikely that he assigned these bodily fluids a pivotal role in determining health and the pathological states of living beings. Second, van der Eijk points out that the Aristotelian notion of perittōma was not even known in the Hippocratic Corpus and was introduced into Greek medicine only after the second half of the fourth century BCE, possibly by Aristotle himself; cf. van der Eijk 2005, pp. 152–155, esp. p. 153.

²⁷³ Kovačić 2001 pp. 98–99.

²⁷⁴ Further down in *De elem. sec. Hipp.* CMG V 1.2 pp. 138.15–140.14 De Lacy, Galen also goes into more detail about this midlevel and clarifies the meaning of “proximate matter”: “It now time to proceed to the second discourse. After Hippocrates had proved that the elements common to all things are the hot, the cold, the dry and the wet, he then passed to another kind of element, no longer primary or common, but peculiar to sanguineous animals. For blood, phlegm, yellow and black bile are the elements of the coming into being of all sanguineous animals, not of man only; peculiar to man are the least parts, which are also called homoeomerous [...]; but between these parts and those [elements] are in men the four humours, and in each of the other animals whatever may be the proximate matter of their coming into being. ‘Proximate’ is the term customarily applied to the matter from which a thing first comes into being when it has no need of any intermediate alteration”.

²⁷⁵ *De elem. sec. Hipp.* CMG V 1.2 p. 138.18 De Lacy.

²⁷⁶ In fact, the two four-humour systems present a few divergences that are worth underlining. In Galen's case, as it is decidedly shown in *De plac. Hipp. et Plat.* (CMG V 4.1.2 p. 502, 22ff. De Lacy), phlegm and the two biles are clearly associated with a couple of primary qualities analogously to the Hippocratic four-humour theory (phlegm is cold and wet; yellow bile hot and dry; black bile cold and dry), but differently from the Hippocratic *De natura hominis* they also have a particular distinguishing primary element (phlegm corresponds to water; yellow bile to

Thus, at first glance, insofar as we can gather from Galen's clearly spelled out articulation of i) primary elements, ii) primary humours, and iii) homoeomerous parts, it seems that the very first outcome of the mixture of primary elements is not the homoeomerous parts themselves, as it occurs in Aristotle, but the primary humours, which in turn form the homoeomerous parts. Furthermore, as Galen defines the humours as the most peculiar elements of all the blooded animals, it seems that the very first building blocks constituting the nature of all the blooded animals are, in lieu of the primary elements, the four humours of the Hippocratic tradition.

Hence, at this point we must tackle two all-important complementary issues, that is, i) whether the four Galenic humours can be compared and correspond to the four Hippocratic humours of *De natura hominis* and, therefore, whether they can also be taken in Galen's case to be the real building blocks of the nature of the human being; ii) in which relation the four humours stand to the homoeomerous parts, which in Aristotle's conception are the result of the elemental mixture.

Therefore, the first question worth asking is: Do these Galenic humours really work in the same way as in the Hippocratic treatise *Nature of Man*, and can they also be conceived in Galen's case as the ultimate structures to which all the blooded animals can be reduced? The answer seems to be negative, first of all for historical reasons, as, over time, during the long period separating Galen

fire; black bile to earth). Moreover, similarly to Aristotle, but differently from *De natura hominis*, blood seems to have a privileged *status* in comparison to the other humours. For in the abovementioned passage from *De Placitis* blood is defined as perfect and it is said to come to be out of a balanced mixture of all the primary elements (ἡ δ' ἐξ ἀπάντων τῶν τεττάρων στοιχείων σύμμετρος κρῆσις ἐγέννησε τὸ ἀκριβὲς αἷμα). In addition, in other passages of his work Galen tends to highlight the special *status* held by the blood: in Galen's commentary on the *Nature of Man* blood is considered to be most closely affiliated to the nature of the human being (*In Hipp. Nat. Hom. comment.* CMG V 9.1 p. 41.2 “οικειότατος ὢν τῇ φύσει χυμῶς”) and the most well-mixed, where no quality predominates over the other (*In Hipp. Nat. Hom. comment.* CMG V 9.1 p. 51.2–3 Mewaldt “τὸ αἷμα [...] εὐκρατότατον”), while in *De temperamentis* it is defined as the most useful and suitable (*De temp.* II 3 p. 59.20–60.5 H. “ὁ μὲν χρηστότατος τε καὶ οικειότατος”). On Galen's system of humours cf. Jouanna 2012b and Schöner 1964, who in fact remarks that differently from the quadripartite system of *De natura hominis*, both in Galen's *In Hipp. Nat. Hom. comment.* (CMG V 9.1 p. 50.19–51.5 Mewaldt) and in *De plac. Hipp. et Plat.* we find an alternative humoral quadripartite schema. In fact although every humour is associated, as in Hippocrates' *De natura hominis*, with a couple of qualities, this does not happen in the case of the blood, which is said to come to be from a balanced mixture of hot, cold, dry, and wet (or the equivalent primary elements fire, air, water, and earth); cf. Schöner 1964 pp. 88–89.

from Hippocratic medicine, the conception of body itself inevitably changed, along with the progress of the medical *techné*.

For in the Hippocratic *De natura hominis*, the human being was conceived as a mere mixture of humours prevailing over one another in accordance with the seasons and with the ages, and health and pathological states were prevalently investigated from a hydromechanic perspective, which was understandably derived from accurate clinical observations of the Hippocratic doctor working on his patients. And the etiology of disease was principally explained on the grounds of excessive or excessively scarce quantities of humours that could be extracted from the organism by means of specific hydragogue drugs.²⁷⁷ However, after Aristotle, who mentions a treatise of his *On dissections*²⁷⁸ and seems to have practiced animal dissection, albeit superficially, over time the medical science also began to explore the solid parts of living beings' bodies, especially in the Hellenistic period with the anatomical discoveries of Erasistratus and Herophilus, who were mainly active in Alexandria and practiced dissection and also vivisection on human subjects. By Galen's time the study of anatomy was an essential part of the medical *curriculum*.²⁷⁹ As is well known, Galen, too, was a great anatomist: he studied anatomy in Pergamum with Satyrus and in Smyrna with Pelops (the student of the great anatomist Numisianus), and afterwards in Alexandria he met

²⁷⁷ *De nat. hom.* CMG I 1.3 ch. 5 p. 176.11–178.2 and ch. 6 p. 178, 10–14 Jouanna.

²⁷⁸ *De hist. an.* 497a32ff., 525a8ff., 566a14ff.; *De gen. an.* 746a14ff.; *De part. an.* 684b4ff.

²⁷⁹ On hydromechanic humoral processes in the Hippocratic *De natura hominis*, on Hippocratic empirical method and clinical observation, on the passage from the Hippocratic purely external investigation to the practise of dissection on living subjects (whose first traces—before Aristotle—can be dated back to the Hippocratic treatise *De morbo sacro*, where the author mentions the possibility of carrying out a post-mortem dissection on the brain of goats, cf. *De morb. sacr.* 11 L. VI 382.6 ff., and which reached its apogee with the dissection and vivisection performed by the Alexandrian anatomists in the Hellenistic age), cf. Lloyd 1979 pp. 146–169. Moreover, on Hippocratic humoralism also cf. Moreno Rodríguez 1991 pp. 92–95 and Jouanna 2002 pp. 39–55 and Jouanna 2012b on the different humoral systems of the Hippocratic Corpus and on the later reception of *De natura hominis*' quadripartite model in ancient Greek medicine. On Erasistratus of Ceos, his life and anatomical discoveries, cf. Garofalo 1988 pp. 17–29; on Herophilus of Chalcedon, his life and dissection/vivisection practises cf. von Staden 1989 pp. 35–43 and pp. 138–153. For the economic, cultural, religious, political, philosophical interactive factors that made possible dissections and, above all, vivisections viable practices in Alexandria see von Staden 1992, esp. pp. 231–234.

Numisianus' son, Herakleianos. He also held anatomical skills in high regard as a fundamental prerequisite of the good physician.²⁸⁰

Therefore, for Galen the bodies of living beings do not reduce to mere congeries of liquids mixing and separating with one another, as over time in the eyes of scientists they gradually acquire volume, shape, and a more solid internal structure. In fact in Galen's representation of the human body the four Hippocratic humours do not fluctuate at all, but are thought of as functional to and playing a pivotal role in the formation and sustenance of the homoeomerous parts.

On the one hand, during the embryonic stage the solid parts of the embryo, the homoeomerous parts, are generated from menstrual blood, which also contains phlegm and the two biles mixed together.²⁸¹ This maternal blood is thought to be responsible for growth and nutrition of the embryo in its first phases of life.²⁸² On the other hand, as argued by Moreno Rodríguez, through the process of digestion of foods and drinks which give rise to the four humours in the body, the primary elements and their primary qualities enter the body²⁸³

²⁸⁰ For Galen's anatomical apprenticeship cf. Manetti and Roselli 1994 pp. 1589–1593 and the accurate overview provided by Garofalo 1994 pp. 1791–1795; moreover, cf. Vegetti 1994 on Galen's commitment to anatomy as part of his medical programme, pp. 1681–1686, and on the spectacular character of Galen's anatomical demonstrations, p. 1690–1695.

²⁸¹ *In Hipp. Nat. Hom. comment.* CMG V 9.1 p. 32.14–25 Mewaldt “Having completed his account of the common elements, he [Hippocrates] now turns to the case of blooded animals, of whom man is one, in the present passage, saying that our original generation comes to be from blood and phlegm and the two biles, and also that our maintenance throughout our lives is derived from them, and that these are the whole nature of man, the humours being contained in the solid parts, and of the solid parts themselves which derive their own generation from them in the first formation of the embryonic animal. For he will show a little later on that all the parts are generated from the menstrual fluid, which is not pure blood, but has within itself both phlegm and the two biles” (Transl. Hankinson); a more precise account of the shaping of the embryo is provided in *De fac. nat.* p. 107.24–112.5 H.; cf. also *De elem. sec. Hipp.* CMG V 1.2 142.14–17 De Lacy. For this cf. also Hankinson 2008a pp. 217–218.

²⁸² *In Hipp. De nat. hom. comm.* CMG V 9.1 p. 50.15 Mewaldt; this maternal blood is always in the body and can be extracted through phlebotomy; cf. *In Hipp. Nat. Hom. comment.* CMG V 9.1 p. 39.23 ff. Mewaldt “But we talk of two types of blood: which is manifestly evacuated as a result of phlebotomy and wounds, and which contains a portion, as we have indicated, of both types of bile and of phlegm; while the other is pure, unadulterated, and unmixed with the humours. And it is from blood in the first sense that it is perhaps correct to say that the foetus is formed” (trans. Hankinson).

²⁸³ In Galen's view food and drink, which are made up of primary *stoicheia*, are turned into chymos in the stomach through an *alloiōsis*. Then the chymos is expelled into the pylorus, and from the duodenum to the jejunum, and afterwards to the liver, the organ responsible for haematopoiesis, through the mesenteric veins; cf. Powell 2003 pp.13–18. It is in the liver that the second process of digestion takes place, leading to the production of blood through an alterative concoction; cf. Moreno Rodríguez 1991, pp. 97–98. For the genesis of blood and yellow bile in the liver cf. *De nat. fac.* p. 182ff. H.; for an account of both black bile (as a residue

and nourish the homoeomerous parts.²⁸⁴ In fact, although Galen makes use of humours in order to explain some pathological processes,²⁸⁵ in his view they do not coincide with the very first and ultimate building blocks of living beings' organic structure but merely provide the link between the cosmic external elements and the homoeomerous parts. In this sense the process of digestion is a key phase in the life of a living being, which allows entrance into the organism of the primary elements and their qualities that, contrary to the view of Hippocratic medicine, are regarded as the very basic building blocks of the organism out of whose mixture living beings and their parts are formed.²⁸⁶

But if the humours do not coincide with the very first building blocks of the nature of the human being, what then is the meaning of this clear-cut articulation of blooded animals' bodily structure that Galen so precisely depicts in his *De elementis*, assigning to the four humours such a special and privileged *status*?

of the digestive process, which escapes alteration and is drawn into the spleen) and phlegm (which is described as a humour that escapes the first digestion and undergoes alteration only when it is carried out through the body), cf. *De nat. fac.* p. 201ff. H., cf. also Moreno Rodríguez 1991 pp. 98-99. The humours are contained in food potentially: if the innate heat is moderate, blood is produced; otherwise phlegm and yellow bile are produced, depending on whether the food or drink is respectively either colder or hotter than the right measure; cf. Powell 2003 p. 13.
²⁸⁴ *De nat. fac.* p. 254.19–255.25 H.

²⁸⁵ Siegel in fact speaks of two complementary aspects of Galen's pathology, the humoral and the morphological (cf. Siegel 1968 pp. 205–215), and accurately classifies Galen's pathological states caused by the imbalance of the four different humours.

²⁸⁶ Moreno Rodríguez 1991 p. 99. Moreno Rodríguez, however, draws a distinction between primary elements and primary qualities by saying that while the first, which are contained in food and drink, have to be considered "elementos de comunicación intraorgánica", it is the second (the qualities) that are assimilated in the organism and play a role in physiological processes (see also Hankinson 2015 pp. 439–440). Galen distinguishes primary qualities from primary elements, where the qualities are present to the extreme degree (and he upholds this by saying that hot, cold, dry, and wet we can mean both; cf. *De elem. sec. Hipp.* CMG V 1.2 pp. 114.24–116.5 De Lacy), but in his polemics against Athenaeus of Attalia he argues that there is no reason to doubt that the very cosmic elements, fire, air, water, and earth, are present in the nature of the human being, although they have become indistinguishable in the mixture; cf. *De elem. sec. Hipp.* CMG V 1.2 102.1–7 De Lacy: "Athenaeus of Attalia made hot, cold, dry and wet the elements of man, and at the same time he claimed that the elements are clearly visible and do not require proof, sometimes calling them qualities and powers, on occasion granting that they are bodies, then afraid to agree that they are water, air, fire and earth"; and more clearly *ibid.* CMG V 1.2 p. 96, 1 De Lacy: "When Hippocrates says that his discourse is of no use to those who make a habit of listening (to discourses) about the nature of man that go /beyond what is relevant to the art of medicine', he does not say this because he is condemning those who make fire, air, water, and earth the elements; on the contrary, from start to finish we find him censuring those who say that some one of these is the element. For is frightfully illogical to reject them all because no one of the four is seen in the body in its pure form; by the same reasoning, I fancy a person will not believe that the so-called tetrpharmakos is a compound of wax, resin, pitch and tallow, because none of these is found contained in it as a complete whole". For Galen's criticism of Athenaeus of Attalia's theory of primary elements, cf. Kupreeva 2014, pp. 172ff.

In my opinion this can be interpreted as a formal rehabilitation of the four Hippocratic humours as first constituents of the nature of the human being and of all blooded animals, especially in one of his treatises where Galen clearly feels the weight of the Hippocratic legacy, and pays homage to the great and highly esteemed physician. In connection to this, Galen's emphasis on the humours as proximate *stoicheia* that are said to be common to all the blooded animals can be regarded as a way to pursue one of the main objectives of his medical program, as we read in his *De optimo medico cognoscendo*: the recovery of Hippocratic knowledge and medical doctrines in order to restore Hippocratic medicine—especially in light of his polemic against the Methodists and above all against the Neronian physician Tesselus, who disregarded Hippocrates' medicine and purported to teach the art of medicine in six months.²⁸⁷

However, despite this strong Hippocratic legacy, it is undeniable that over time, from *De natura hominis* to Galen's medicine, the idea of humours as the constituents of the organism remarkably changed in medical imagery, insofar as they no longer coincided with the real building blocks of the nature of the human being but were fully incorporated into the solid anatomical structure of the human body as the source of growth and nutrition of the homoeomerous parts. As we have seen, Galen's homoeomerous part is not made up *tout court* of a mere mixture of humours, understood as having no link to the external cosmic elements, but of a mixture of primary elemental qualities that enter the body through the humours.²⁸⁸ Therefore, it is understandable that the very first unity

²⁸⁷ *De opt. med. cogn.* CMG Suppl. Or. IV V p. 69.1 ff. Iskandar, As Vegetti shows, one of the fundamental points of Galen's medical programme, which is dealt with in *De optimo medico cognoscendo*, was called good training in the Hippocratic medical works. On the one hand, Galen is profoundly convinced of the fact that they still offer valid doctrinal contents, although they need to be updated. On the other hand, the reference to Hippocrates is regarded by Galen as essential insofar as it guarantees the unity and continuity of the medical tradition and could act as *trait d'union* between the best medical schools, such as the Dogmatist and Empiricist schools, against charlatans or parvenus of the medical science, like the Methodists; cf. Vegetti 1994 p. 1681. For Galen's criticism of Thessalus and the principles of the Methodic medical school, cf. Vegetti 1994 pp. 1672–1682.

²⁸⁸ That is all the more true if we think that Galen sometimes openly says that the homoeomerous parts come to be directly from a mixture of the primary elemental qualities, while he completely skips any reference to the so-called *Zwischenstufe*, as comes to light in *De const. art. med. ad Patr.* CMG V 1.3 p. 86, 3ff. Fortuna: “χρηὴ γὰρ οὐ μόνον, ὅτι θερμοῦ, καὶ ψυχροῦ, καὶ ξηροῦ, καὶ ὑγροῦ κερασθέντων ἕκαστόν τι γίγνεται μόριον, ἐγνωκέναι τὸν ἰατρὸν, ἀλλὰ καὶ κατ' εἶδος ἐπελθόντα, τίς μὲν ἢ τῶν ὁσῶν ἐστὶ κρᾶσις, ὅποια δ' ἢ τῶν σαρκῶν τε, καὶ νεύρων, καὶ φλεβῶν, ἕκαστου τε τῶν ἄλλων τῶν ἀπλῶν (For it is necessary for the physician to know not only that each determined (sc. homoeomerous) part (μόριον) come to be out of a mixture of hot, cold, dry

formed by the primary elements, which Moreno Rodríguez calls the *unidad estechiológica*,²⁸⁹ and which turns out to be essential for Galen to develop his own solidist conception of body, is the Aristotelian homoeomerous part.

Accordingly, we see more clearly why Galen adopted a theory of mixture, which patently draws on the contemporary Peripatetic background and cannot be answered for by the Stoic account. In fact, contrary to the Stoic model, whose main aim seems to be that of clarifying the inner cohesive structure of the cosmos (against which Galen sets up a striking criticism in his *De causis contentivis*),²⁹⁰ the Aristotelian theory of mixture explained the generation of the homoeomerous parts and, therefore, could have a much wider application in the biological and

and wet (θερμοῦ, καὶ ψυχροῦ, καὶ ξηροῦ, καὶ ὑγροῦ κερασθέντων), but also, when he tackles the problem from the point of view of the species, (it is necessary for him to know) which is the mixture of bones, of what sort is that of flesh and of nerves and of veins and of each of the other simple [parts])”. As we clearly see, in this passage Galen speaks of the homoeomerous parts as generated directly out of a mixture of primary qualities, insofar as they constitute their inner structure and composition. And indeed this qualitative understanding of the homoeomerous parts is also clearly put into practice when he concretely deals with the homoeomerous parts, as he focuses on their qualitative composition and points out their differences as regards hot, cold, dry, and wet by comparing them to an ideal (and real, as we will see further below) midpoint where no one of the qualities predominates over one another; cf. the very detailed description of the homoeomerous parts of the human body in evidently qualitative terms of hot, cold, dry, and wet in *De temp.* pp. 57–60 Helmreich.

²⁸⁹ Moreno Rodríguez 1991 p. 91.

²⁹⁰ Galen *De causis contentivis* CMG Suppl. Or. II 6.2–6 pp. 60–62 Lyons (trans. Lyons): “We hear a number of people say that amongst the propositions that are intrinsically acceptable without established proof is that no body in any state whatsoever can exist without having a cohesive cause. They say, though, that this cause is not to be found in all bodies but, rather, it exists in those whose substance it is particularly difficult to resolve and dissipate, such as adamant, rock, bones, iron and other similar things. But this remark of theirs is inconsistent in that, if every single extant thing needs a cohesive cause without which it cannot exist, that cause, as it is one of the existing things, must inevitably have another cohesive cause itself, which, in turn, must have yet another and that will go on *ad infinitum*, nor can we stop at any stage of the process. But they may say that some existing things cohere through their own nature, while others need something else to hold them. It follows that what has an easily dispersed substance is more likely to need a cohesive cause [...] while the need will not affect bodies whose substance is firmly compact. For that reason wood, rock, silver, gold, iron, copper and other similar things are put down without having anything to contain or hold them, while water, wine, vinegar and honey are stored in jars and containers, because they are not self-coherent. It is not logical, then, for solids to need a cohesive cause in that the fact that they are solid and hard depends on this very quality, I mean that of self-coherence. This is one of the criticism that can be levelled against the Stoic theory, I mean that an earthy body, like adamant and rock, should be held together by a substance of the class of the spirit (i.e. pneuma). For we find that this latter is naturally quick to disperse, while the dissolution of the earth is a slow process.” Here we see that Galen sets up a critique of the Stoic theory according to which the active elements (fire and air whose mixture gives rise to the pneuma) hold together the passive and material ones (earth and water) that lie at the very core of the Stoic theory of total mixture. As it is clear from the text, Galen takes this position to be absurd: solid objects are cohesive, he maintains, just because that is exactly what solidity amounts to: “the fact that they are solid and hard depends on this very quality, I mean that of self-coherence”.

medical fields. The homeomerous parts, which are conceived as one of the levels of the organic structure, were in fact particularly suited to embodying a more organic and “solidist” conception of the body, which was dominant after the anatomical discoveries.

But, why was the mere “solidist” view of the Alexandrian anatomists not so satisfying for Galen? As Vegetti points out, the answer lies in the fact that the Alexandrian anatomists limited themselves to what is visible without reaching the very first level of the nature of the human being, the primary *stoicheia*. And for this reason the Aristotelian model was attractive to Galen, because it permitted bringing back the medical discourse to the homoeomerous and hence to the first basic building blocks of the universe, the *stoicheia*—in view of Galen’s polemic against the great anatomists, Herophilus and Erasistratus, whom Galen assimilates to the Dogmatists. In fact, if on the one hand Erasistratus recognized the existence of the *triplokia*, the triplet of nerve, artery, and vein, as the last structure graspable, Herophilus, according to Galen, limited himself to the anatomical evidence and affirmed “ἔστω ταῦτα εἶναι πρῶτα, εἰ καὶ μὴ ἐστὶ πρῶτα”—“be they the first things, although they are not the first”.²⁹¹ Therefore, the recovery of the Aristotelian theory of mixture, its further Peripatetic development and the generation of the homoeomerous parts out of it, can be explained by reference to Galen’s aim of avoiding narrowing the medical

²⁹¹ *De meth. med.* K. X 107.16 = Fr. 50b von Staden. For Galen’s critique of the non-reductionist Alexandrian anatomy, cf. Vegetti 1994 pp. 1702–1704. For Galen’s re-establishment of anatomical knowledge on a reduction to the very first principle of nature, that is the *stoicheia*, and on the Aristotelian causal sequence (elements–homoeomerous parts–anhomoeomerous parts), cf. Vegetti 1994 pp. 1710–1714. As von Staden remarks, it is necessary, however, to draw a distinction between Galen’s portrait of Herophilus and Herophilus’ real methodological outlook, insofar as it can be gathered from the extant evidence. As von Staden shows, giving an accurate and genuine description of Herophilus’ scientific method is a much more difficult task, as the surviving testimonies present three very different emphases. In the first place, there are some testimonies that place Herophilus among the Dogmatists, those physicians who looked for causal explanations and aimed at grasping the invisible by the means of deductive and inductive logical strategies. Another group of texts give a completely different account, as they describe Herophilus as an Empiricist, since he would have relied more on empirical data than theoretical medicine. There is a third group of texts, von Staden notes, which show a more sceptical inflection and according to which Herophilus would have underestimated the investigation of the causal explanation of appearances, which would have represented the last graspable level of reality. Despite these very different accounts of Herophilus’ methodological posture, von Staden has clearly shown that the Alexandrian physician attached high value to the theoretical explanation of the appearances (*phainomena*) in his physiological and pathological theory, and more precisely would have emphasized the suppositional nature of the causes and in so doing may have been influenced by Aristotle’s notion of hypothetical necessity as opposed to absolute necessity; cf. von Staden 1989 pp. 115–137 with references.

investigation to what is visible from the anatomical evidence, but to instead provide medical science with stronger theoretical tools that could conceptually grasp the reality of things.

1.3.6 Mixture and symmetry. Galen and the Hippocratic legacy

As we have seen, in the time between Hippocratic medicine and Galen, knowledge of the human body and its conceptualization changed remarkably—and this holds also for the theory of mixture. As we have noted, after the ground-breaking Alexandrian discoveries relating to the field of anatomo-physiology, the human body was no longer considered a mere mixture of liquid humours postulated on the basis of outward evidence. For the first time, Alexandrian physicians systematically explored the anatomical structure of the human body and described in minute detail its internal organs and their physiopathology, developing a solidist model of body. In Galen's medical outlook there is a perceptible need to render an image of the human body as close as possible to, and competitive with, these new standards. For this reason, Galen adopts the four intertransmutable elements of contemporary continuist (profoundly Peripatetic and certainly anti-atomistic) physics, although he maintains and balances them with the Hippocratic scheme of four humours: in Galen's physiology the four humours, as we have seen, play the most important role in the formation and nourishment of the solid homoeomerous parts, insofar as, in the embryogenesis' phase and through the digestion process, they allow the entrance of the four primary elements and their qualities into the body; on the causal connection, of Aristotelian origin, elements-homoeomerous parts, which are mediated through the four humours of Hippocratic tradition, Galen founds his own peculiar (and different from the Alexandrian) solidist conception of the body.

Insofar as it was the bedrock on which he built his vision of the entire bodily structure, Galen's notion of the mixture of hot/cold and dry/wet also had to bolster a proper and coherent theorization concerning, on the one hand, the

definition of human bodily health and the body's preservation over time and, on the other hand, the insurgence of pathology as well as its clinico-therapeutic treatment—all aspects which pertained more specifically to the medical field. As a matter of fact, in the writings that best explain his theory of mixture, Galen's own considerations on the concepts of health and disease polarise on two interrelated ideas: the ideas of elemental *συμμετρία* or proportion²⁹² and of *εὐκράσια* or good mixture (in the sense that the first causes the second). In his commentary on the Hippocratic *Nature of Man*, Galen plainly declares that *health lies in the *συμμετρία* of the primary elements (hot, cold, dry, and wet) within the mixture (a state which he calls *εὐκράσια*), whereas disease arises whenever this equilibrium is disrupted*. He attributes this formulation to some of the Rationalist doctors and philosophers, and, *in primis*, to Hippocrates, who is designated as the pioneer (*ἡγεμών*) of this theory of health as *συμμετρία* of the

²⁹² As a specialist in the notion of symmetry, H. Weyl, remarks, “the Greeks never used the word ‘symmetric’ in our modern sense [i.e. the case of the bilateral symmetry, or plane symmetry, where the points of a figure are equally distant to the left and to the right of its axis or midline; cf. Weyl 1952, preface pp. 1–2.]. In common usage *summetros* means *proportionate*, while in Euclid it is equivalent to our *commensurable*” (Weyl 1952 p. 75). For the Greek word *συμμετρία* had one fundamental meaning in Ancient Greek: *proportionality*. Originally, in earlier occurrences of the term or of the correspondent adjective (*σύμμετρος*), this sense of the term as “proportionality” occurs in three quite different contexts: a) in literary texts conveying the general meaning of “proportion” in the sense of “of equal measure, similar” (cf. Aesch. *Ch.* 230, Eur. *El.* 533 and fr. 676, cf. Montanari 2000 *s.v.* *σύμμετρος*) or “of the same age, contemporary” (Cf. Aesch. *Ch.* 610, Soph. *Ant.* 387, Eur. *Alc.* 26 Montanari 2000 *s.v.* *σύμμετρος*), which presupposes the operation of *measuring by comparison* or *συμμέτρησις*; b) in mathematical texts conveying the meaning of *commensurability*, the fact that two quantities show a common unity of measure, that is, a rational number resulting from a *proportion* (cf. Plato *Theaet.* 147d and 148a–b; Aristotle *Nic. Eth.* 1112a23 and *Metaph.* 1061b1). The term *συμμετρία* becomes technical in Euclid's treatise *Elements*; cf. Euclid's definition of symmetry as commensurability between geometrical magnitudes—lengths, areas and volumes—in Book 10, def. 1; on this cf. Hon and Goldstein 2008 p. 2 and pp. 70–71); c) in “evaluative” (aesthetic/moral) contexts where *συμμετρία* is conceived as a property of single parts as integrated into a unified whole, since they respect a certain internal proportion so that a mean between excess and deficiency is reached. In these contexts, it means more exactly *due/right proportion* and is applied to two main interrelated subdomains: c.1) that concerning the enquiry into beauty and goodness, on the one hand (cf. Plato *Tim.* 87c–e, where it is argued that a living being must be symmetrical, i.e. well proportioned, in order to be beautiful and that the most important symmetry is that between soul and body, which is fundamental for a healthy life; cf. also *Phil.* 26a; cf. also Aristotle's *Metaph.* 1078b1, where Aristotle defines beauty as resulting from the synergic interaction of “order”, “symmetry”, that is, good proportion of the parts of a unified whole, and “definiteness”; on this cf. Hon-Goldstein 2008 p. 2 and pp. 93–96) and, on the other hand, c.2) the other relating to the idea of suitability, convenience, and appropriateness of someone/something (cf. Aesch. *Eum.* 532, Montanari 2000 *s.v.* *σύμμετρος*. Cf. Plato *Laws* 625d; and *Nic. Eth.* 1104a17–25, where symmetry *qua* appropriateness, i.e. moderation, is viewed as a midpoint between excess and deficiency and is regarded as the leading moral principle ruling good conduct in life; on this cf. Hon and Goldstein 2008 p. 2 and pp. 93–96).

four elements, as we see from passages **T19**²⁹³ and **T20**, and whose position he endorses (**T21**):

T19 Galen *in Hipp. Nat. Hom. comment.* K. XV 60.4-61.3 Mewaldt 33.1–13:

I 20 [CMG I 1.3 172.15-174.2 Jouanna] Ὑγιαίνει μὲν οὖν μάλιστα, ὅταν μετρίως ἔχη ταῦτα τῆς πρὸς ἄλληλα δυνάμεως καὶ τοῦ πλήθους καὶ μάλιστα, ἢν μεμιγμένα ἦ.

Κατὰ πάντας ἰατρούς τε καὶ φιλοσόφους τοὺς τελείους δογματικούς ἢ συμμετρία τῶν στοιχείων ὑγείαν ἐργάζεται. διττῆς δ' οὐσης τῷ γένει τῆς ἐν ταῖς λογικαῖς αἰρέσεσι στοιχειώσεως, ἢ μὲν ἑτέρα κατὰ παράθεσιν τε καὶ περιπλοκὴν τῶν πρώτων σωμάτων τὰς γενέσεις τῶν συνθέτων γενέσθαι φησίν, ἢ δὲ ἑτέρα κατὰ κρᾶσιν. ἢ μὲν οὖν προτέρα τὴν συμμετρίαν ἐν τῇ ποροποιίᾳ τίθεται, ἢ δὲ ἑτέρα κατὰ τὴν εὐκρασίαν τῶν στοιχείων ὑγιαίνειν ἡμᾶς φησιν, ἧς δηλονότι δόξης ὁ Ἱπποκράτης ἐστὶν ἡγεμών. οὐσης δὲ διττῆς συμμετρίας, τῆς μὲν ἐν τῇ δυνάμει τῶν κεραυνυμένων, τῆς δὲ ἐν τῷ ποσῷ τῆς οὐσίας, ἐκατέρας ἐμνημόνευσεν ὁ Ἱπποκράτης εἰπὼν· τῆς τε δυνάμεως καὶ τοῦ πλήθους.

I 20 So it is particularly healthy when these things (*sc.* the four humours) maintain a balance of their power and their quantity in relation to one another, and in particular when they are mixed together.

According to all perfect dogmatic doctors and philosophers, it is the proportionality of the elements (ἢ συμμετρία τῶν στοιχείων) that creates health. But element-theory takes two different forms among the rationalist schools; the one says that the generation of composite bodies comes to be as a result of the juxtaposition and interweaving of the primary bodies, the other as a result of their mixture. The former account locates the proper proportion in the creation of the pores, while the latter doctrine, of which Hippocrates was evidently the

²⁹³ I quote in full just one passage by way of example, as in Galen's work statements like this are recurrent; see also: *In Hipp. Nat. Hom. comment.* CMG V 9.1 pp. 21.25–22, 11 Mewaldt; *De plac. Hipp. et Plat.* CMG V 4.1.2 p. 308.25–34 De Lacy.

pioneer, asserts that we are healthy in relation to the proper blending of the elements (**κατὰ τὴν εὐκρᾶσίαν τῶν στοιχείων** ὑγιαίνειν ἡμᾶς φησιν). Since proportionality takes two forms, one consisting in the power of the things mixed, the other in the quantity of their substance (τῆς μὲν ἐν τῇ δυνάμει τῶν κεραυνυμένων, τῆς δὲ ἐν τῷ ποσῷ τῆς οὐσίας), Hippocrates mentioned both when he said “of their power and their quantity”. (Trans. Hankinson)

T20 Galen *in Hipp. Nat. Hom. comment.* K. XV 61.13-62.5 Mewaldt 33.12–17:

I 21 [CMG I 1.3 174.2–3 Jouanna] Ἀλγέει δ' ὅταν τι τούτων ἔλασσον ἢ πλεόν γένηται ἢ χωρισθῆ ἐν τῷ σώματι καὶ μὴ κεκραμένον ἢ τοῖς πᾶσιν.

Ὡσπερ ἐπὶ τῆς ὑγείας τὴν ἀκριβῆ συμμετρίαν ἐν ποσότητι καὶ δυνάμει καὶ τῇ δι' ὅλων ἔθετο κράσει, κατὰ τὸν αὐτὸν τρόπον καὶ ἐπὶ τῆς νόσου τὰ τούτων ἐναντία τίθεται, τὸ μὲν ἔλασσον ἢ πλεόν εἶς τε τὸ ποσὸν τῆς οὐσίας καὶ τὴν δύναμιν ἀνάγων [...].

I 21 It suffers when one of them becomes either too small or too great, or is separated in the body and is not mixed with all the others.

Just as he located health in the precise proportionality in quantity and power and in the through-and-through mixture, in the same way he locates disease in the contraries of these things, referring the too small and the too great to the quantity of substance and its power [...]. (Trans. Hankinson)

T21 Galen *De sanitate tuenda* K. VI 15.9-15 Koch p. 9.8–13:

συμμετρία γὰρ δὴ τις ἢ ὑγεία κατὰ πάσας ἐστὶ τὰς αἰρέσεις, ἀλλὰ καθ' ἡμᾶς μὲν ὑγροῦ καὶ ξηροῦ καὶ θερμοῦ καὶ ψυχροῦ, κατ' ἄλλους δὲ ὄγκων καὶ πόρων, κατ' ἄλλους δὲ ἀτόμων ἢ ἀνάρμων ἢ ἀμερῶν ἢ ὁμοιομερῶν ἢ ἀνομοιομερῶν ἢ ὅτου δὴ τῶν πρώτων στοιχείων, ἀλλὰ κατὰ πάντας γε διὰ τὴν συμμετρίαν αὐτῶν ἐνεργοῦμεν τοῖς μορίοις.

For health is definitely a balance of some kind, according to all the sects; it is just that in our view it is a balance of wet, dry, hot and cold, while others hold that it is a balance of masses and channels, others a balance of atoms—or of 'unjoints', indivisibles, homogeneous or non-homogeneous parts—or any such primary element. But certainly all agree that it is through the balance of these that we perform our activities with the different parts of the body. (Trans. Singer)

As we can gather from the above-quoted passages, in Galen's view, according to all the Dogmatic schools of medicine and philosophy the health of living beings lies in the *συμμετρία* of the elements. However, he draws a distinction between two forms of this element-theory. According to a first formulation, physical elements can be conceived as juxtaposing and interweaving building blocks (*κατὰ παράθεσιν τε καὶ περιπλοκὴν τῶν πρώτων σωμάτων*),²⁹⁴ such as in the four-element Empedoclean and in the atomistic theories, as well as in the medical theory of Asclepiades of Bithynia and other later corpuscularians, which Galen groups together here without distinguishing “discontinuist” from contiguity theorists, though in contrast to the Atomists, Empedocles did not admit—as is well known—the presence of void in his physical doctrines. According to these theorists, *συμμετρία* consists in *ἐν τῇ ποροποιίᾳ*, i.e. in the creation of pores: this is a technical term from Methodist medicine but is here syncretistically referred to Empedocles and the atomists/corpuscularians.²⁹⁵ According to the second formulation, continuum

²⁹⁴ Cf. also *In Hipp. Nat. Hom. comment.* CMG V 9.1 p. 27.17 ff.

²⁹⁵ At *De meth. med.* K. X 268.9–16 Galen attributes the usage of the terms *ποροποιία* and *μετασύγκρισις* (alluding to a qualitative modification of the pores) to the Methodic physician Thessalus, and remarks that this conception differs from the dogmatic Asclepiades' use (from which, however, it stemmed), which was based on the symmetry of the pores; on this cf. Grimaudo 2008 p. 42 n. 13). Although in the passage I quoted no critique emerges, elsewhere Galen violently criticizes the Methodist theory of health as it presupposes the existence of the void by means of which the *onkoi* can circulate through the *poroi*. For example, in the *Adversus Iulianum*, Galen admonishes the opinion of the Methodist physician who, in a work entitled *On the Physical and Psychological Diseases*, defined health as a well-proportioned and commensured state of “contractions and relaxations” of the human body's structures (cf. *Adv. Iul.* CMG V 10.3 p. 42.2–5 Wenkebach “σύμμετρον δὴ κατάστασιν καὶ μεμετρημένην συναγωγῆς τε καὶ χύσεως ὑποστησάμενοι ἐπὶ τῶν ἀνθρωπείων συγκριμάτων ὄνομα αὐτῇ ἐθέμεθα ὑγείαν”). The usage of the terms *συναγωγή* and *χύσις* is equivalent to that of *στέγνωσις* and *ῥύσις*, the conditions to

theorists (i.e. the above-mentioned “friendly tradition of the continuum”, constituted by Hippocrates as forerunner and, after him, the Peripatetic and Stoic schools)²⁹⁶ envision health as a symmetry of the four intertransmutable elements, that is, their good mixture or *eukrasia* (κατὰ τὴν εὐκρασίαν τῶν στοιχείων ὑγιαίνειν ἡμᾶς). Furthermore, Galen asserts that there are two kinds of συμμετρία: i) “one consisting in the power of the things mixed (ἐν τῇ δυνάμει τῶν κεραυνυμένων)” and ii) “the other in the quantity of their substance (τῆς δὲ ἐν τῷ ποσῷ τῆς οὐσίας)”. Galen adds that Hippocrates had already recognised these, as in *De Natura hominis* the Hippocratic author says that the body is healthy “when these things maintain a balance of their power and quantity in relation to one another (ὅταν μετρίως ἔχη ταῦτα τῆς πρὸς ἄλληλα δυνάμεως καὶ τοῦ πλήθους)”—the original Hippocratic text referring, on the one hand, to the capacity or *dynamis* of each of the four humours (i.e. a capacity which can be stronger or weaker) and, on the other, to their concentration in the body or *plēthos*.²⁹⁷ What Galen precisely intends when he mentions this twofold symmetry we will clarify further below, but it is evident that in contrast to the Hippocratic author he clearly refers to the primary elements. Moreover, as Galen reports, Hippocrates would have located instead disease in the asymmetry of hot/cold and dry/wet, that is, when the quantity of their substance and their power are too small or too great (cf. **T20** “τὸ μὲν ἔλασσον ἢ πλεόν εἷς τε τὸ ποσὸν τῆς οὐσίας καὶ τὴν δύναμιν ἀνάγων”). As we gather from (**T16**), Galen underwrites the second view, i.e. the idea of health as a symmetry of four intertransmutable bodily elements (and conversely disease as an asymmetry of primary elements) and ascribes it to Hippocrates’ *De natura hominis* as precursor.

which the simplistic Methodist pathological aetiology ascribes the arising of diseases; cf. Grimaudo 2008 p. 43 n. 15.

²⁹⁶ Cf. *De plac. Hipp. et Plat.* CMG V 4.1.2 p. 308.25–34 De Lacy.

²⁹⁷ Cf. *De nat. hom.* CMG I 1.3 pp. 172.15–174.2 Jouanna. It has to be pointed out that whereas in the Hippocratic passage, the Hippocratic author is referring to the four humours, as we infer from **T16**, Galen extends this reasoning to the primary elements, hot/cold and dry/wet, which he claims that Hippocrates discovered and which are the constitutive building blocks of the four humours, cf. *supra*. On the connection between *dynamis* and the verb *dynamai* in the Hippocratic corpus, cf. Plamböck 1964 p. 64: “Überhaupt hat man sich die Beziehung zwischen Substantiv und Verbum als sehr eng vorzustellen; *dynamis* ist nichts weiter als die Substantivierung der im Verbum präsenten Vorstellung, und im Verbum ist nach allem, was sich erkennen läßt, der Begriff ‘Können, Vermögen’ nicht sekundär und erst abzuleiten, sondern ursprünglich angelegt. Mit gleicher Ursprünglichkeit bezeichnet daher auch *dynamis* substantivisch das allgemeine ‘Vermögen (etwas zu tun)’”.

In defining health as a symmetric or well-proportioned mixture or *eukrasia* of the opposite constituents, Galen's primary elements of hot/cold and dry/wet, and disease as arising from their asymmetric or disproportionate mixture, Galen relies, as has been noted by Vegetti,²⁹⁸ on an "archaic" and even "pre-Aristotelian" aetiological account of health and disease, which lies at the very root of Ancient Greek medicine.

In fact, in early Greek medical texts, ranging from a fragment attributed to Alcmaeon of Croton (V BCE, D.-K. 24B4) to various medical works belonging to the *Corpus Hippocraticum* (such as, for instance *De vetere medicina*, *De victu*, *Aphorismi*, and *De natura hominis*, all dating back to the end of the 5th century BCE or the beginning of the 4th century BCE), the notions of μέτρον and συμμετρία make their appearance. These notions are implemented in the idea of a living organism conceived of as constituted by different opposite bodily constituents,²⁹⁹ which are mixed with one another and correlated to, and influenced by, the external physical forces governing nature, thought of as the macrocosm interacting with the human body's microcosm: the measure and symmetry of the opposites, with regard to their quantity and quality, are in fact regarded as the most fundamental factors that allow the generation of a new and healthy living organism and that, if preserved through dietary regimen (based basically on the consumption of foods and drinks and on the execution of physical exercises), guarantee over time the maintenance of its state of health and well-being.³⁰⁰ Although the concept of συμμετρία as applied to the medical

²⁹⁸ Vegetti 1994 pp. 1712–1713 and Grimaudo 2008 pp. 53–55.

²⁹⁹ Tracy 1969 pp. 67–68 and ff. In his analysis of the general theory of health and disease common to many pre-Aristotelian medical writers who have in common the idea of health as symmetry/due proportion, Tracy singles out different kinds of bodily opposite constituents (variously named: ποιά, δυνάμεις, χυμοί, and στοιχεῖα) depending on the medical author: i) Alcmaeon of Croton: hot, cold; bitter, sweet; moist, dry etc., ii) Menecrates: blood and bile (hot), breath and phlegm (cold), iii) Petron of Aegina: the hot (dry), the cold (moist), iv) Philistion of Locri (whose elementary system stems directly from the Empedoclean one): fire (hot), air (cold), water (moist), earth (dry), v) the Hippocratic author of *Ancient Medicine*: bitter, sweet; acid, astringent; salt, insipid; hot, cold etc., vi) the Hippocratic author of *Nature of Man*: phlegm (moist and cold), blood (moist and hot), yellow bile (dry and hot), black bile (dry and cold), vii) the Hippocratic author of *Airs, Waters, Places*: hot, cold, dry and wet, viii) *Regimen I*: fire (hot and dry), water (cold and moist).

³⁰⁰ Triebel-Schubert 1989 pp. 194 ff; cf. Alcmaeon of Croton D.-K. 24B4, who provides us with the first Greek definition of the notions of health and disease: "Α. τῆς μὲν ὑγείας εἶναι συνεκτικὴν τὴν ἰσονομίαν τῶν δυνάμεων, ὑγροῦ, ξηροῦ, ψυχροῦ, θερμοῦ, πικροῦ, γλυκέος καὶ τῶν λοιπῶν, τὴν δ' ἐν αὐτοῖς μοναρχίαν νόσου ποιητικὴν: φθοροποιὸν γὰρ ἑκατέρου μοναρχίαν. καὶ νόσον συμπίπτειν ὡς μὲν ὑφ' οὗ ὑπερβολῆι θερμότητος ἢ ψυχρότητος, ὡς δὲ ἐξ οὗ διὰ πλῆθος

τροφῆς ἢ ἔνδειαν, ὡς δ' ἐν οἷς ἢ αἷμα ἢ μυελὸν ἢ ἐγκέφαλον. ἐγγίνεσθαι δὲ τούτοις ποτὲ κακῶν ἔξωθεν αἰτιῶν, ὑδάτων ποιῶν ἢ χώρας ἢ κόπων ἢ ἀνάγκης ἢ τῶν τούτοις παραπλησίων. τὴν δὲ ὑγείαν τὴν σύμμετρον τῶν ποιῶν κρᾶσιν”. In the text, the bodily organism is conceived as a complex of uncountable opposite powers (*dynameis*), each of which is opposed to another (moist/dry; hot/cold; bitter/sweet, etc.). The health or well-being of the living organism is thought to depend on the dynamic equilibrium of the opposite powers counterbalancing each other (ισονομίαν τῶν δυνάμεων), whereas disease occurs when one of the constituents of the pair of opposites prevails over the other (τὴν δ' ἐν αὐτοῖς μοναρχίαν νόσου ποιητικὴν). At the end of the fragment, health is defined as the symmetric/well-proportioned mixture of the qualities, τὴν δὲ ὑγείαν **τὴν σύμμετρον τῶν ποιῶν κρᾶσιν**. Although this last reading has been questioned by several philologists and has been considered as due to a later interpolation of the text in this process of transmission (for a discussion on this please refer to Montanari 1979 pp. 190–194), and despite the highly metaphorical political lexicon of the rest of the fragment (the usage of both *ισονομία* and *μοναρχία* has a strongly political flavor; cf. Vlastos 1953 pp. 337–366; cf. Tracy 1969 p. 23 with n. 4; Cambiano 1983; Kouloumentas 2014 pp. 873–874), it is true that Alcmaeon’s definition of health and disease conveys the idea, common to all subsequent Hippocratic speculation, that, while disease is caused by the excess or the deficiency of one of the opposite *dynameis*, health lies in the perfect mean between these two extremes. As Grimaudo has shown, the concept of symmetry in medical texts of the Hippocratic collection proves to be extremely ductile and lends itself to various conceptualizations concerning the arising of health and pathological states that build on different theoretical starting points; cf. Grimaudo 2008 p. 36 ff. As for the main Hippocratic texts where this versatile notion of measure and symmetry emerges, cf. *De vetere medicina*, where the Hippocratic author seeks to establish criteria for a good proportion between dietetic prescriptions and the particular individual constitution of the patient (whose body’s *response* to the medical treatments, τοῦ σώματος τὴν αἴσθησιν, is regarded as a **μέτρον**, a practical-empirical norm marking off the right quantity and blend of nutriment from the excessive and deficient; cf. *De vet. med.* CMG I 1 p. 41.19–22 Heiberg). In *De vet. med.* CMG I 1 p. 39, 6–26 Heiberg, the notion of symmetry emerges as soon as the author states that nutriments, of whichever type (solid foods, gruels, or liquid potions depending on the health state of the patient), should be proportionate in their blend and quantity (ταῦτα τῆσι **τε κρήσσει καὶ τῷ πλήθει** [...] **ὡς μετρίως ἔχοι**); cf. also *Aph.* V 62 L. IV 556 (where it is affirmed that the uterus’ symmetric/well-proportionate mixture of either qualitative oppositions, hot/cold and dry/wet—**ἔξ ἀμφοτέρων τὴν κρᾶσιν** [...] **ζύμμετρον**—makes women fertile); and *De nat. hom.* CMG I 1.3 pp. 170.11–172.2 Jouanna, where the Hippocratic author explains that the four primary qualities have to be proportionate and equal to each other—**μετρίως πρὸς ἄλληλα ἔξει καὶ ἴσως**—in order to make possible the generation of a new living being; *ib.* CMG I 1.3 pp. 172.13–174.3 Jouanna: a key passage of the treatise where the author focuses on the humoral constitution of the human being and clarifies that humans are healthy when the four humours are well-proportioned as regards quality and quantity—**ὀκόταν μετρίως ἔχη ταῦτα τῆς πρὸς ἄλληλα δυνάμιος καὶ τοῦ πλήθους**—, whereas the organism is diseased when one of the humours, whose quantity increases or decreases excessively, separates off from and is no longer mixed with the others. The reflections of the Hippocratic author of *De victu* focus on the pivotal role played by food and physical exercise in the determination of a healthy state: a reciprocal and balanced relation between diet and physical activity is regarded as the main factor generating health; cf. *De victu* CMG I 2.4 pp. 200.30–202.2 Joly (ἔστι δὲ προδιάγνωσις μὲν πρὸ τοῦ κάμνειν, διάγνωσις δὲ τῶν σωμάτων τί πέπονθε, πότερον τὸ στίον κρατεῖ τοὺς πόνους, ἢ οἱ πόνοι τὰ σιτία, ἢ **μετρίως ἔχει πρὸς ἄλληλα**: ἀπὸ μὲν γὰρ τοῦ κρατέεσθαι ὀκοτεροῦν νοῦσοι ἐγγίνονται· ἀπὸ δὲ τοῦ ισάζειν πρὸς ἄλληλα ὑγίει πρόσεστιν”); cf. also *ib.* CMG I 2.4 p. 190, 25–27 Joly); cf. also *ib.* CMG I 2.4 p. 124.17–21 Joly, where it is added that if it were possible to establish the exact quantity of food and physical exercises for each patient, this would help us to find the path to health (“εἰ μὲν γὰρ ἦν εὐρετὸν ἐπὶ τούτοις πρὸς ἐκάστην φύσιν **σίτου μέτρον καὶ πόνων ἀριθμὸς σύμμετρος μὴ ἔχων ὑπερβολὴν μήτε ἐπὶ τὸ πλεον μήτε ἐπὶ τὸ ἔλασσον**, εὐρητο ἂν ἡ ὑγίει τοῖσιν ἀνθρώποισιν ἀκριβῶς”).

field might have mathematical roots,³⁰¹ in early medical texts the term and its derivatives indicate, more specifically, a condition of *due or right proportion*, which cannot be expressed in precisely mathematical terms,³⁰² between opposite

³⁰¹ According to Triebel-Schubert, the spread of this notion of symmetry to the medical field would have occurred in line with the insurgence of new mathematical developments in the doctrine of proportions under the primary influence of Pythagorean mathematical thought, and would have been due to intense processes of interaction between the mathematical and life sciences. This phenomenon has to be seen as rooted in the wider cultural framework of this age, which is characterized by a tendency to “mathematize” various aspects of reality: from the 6–5th century BCE onwards, in fact, this “mathematizing” tendency (and the notion of symmetry/proportion into the bargain) started to flourish and pervaded the socio-political dimension (together with its moral/aesthetic implications), several disciplines, including natural philosophy and medicine; as a consequence, it would have surfaced also in early medical texts; cf. Triebel-Schubert 1989 pp. 190–192.

³⁰² Triebel-Schubert sees the reference to symmetry in medical texts as strictly mathematical and draws a distinction between two different notions of symmetry recognizable in early Hippocratic texts: an “arithmetisch bestimmbar gemeinsamen Maß” and a “qualitativ bestimmbar Maß, dass durch einen gemeinsamen λόγος für als inkommensurabel erkannte Größen definiert sein soll”; as regards the second type, whose traces seem to her to be recognizable in the medical theories propounded by the author of *De vetere medicina*, she brings it back to the work of Hippocrates of Chios (5th century BCE), who, by proposing the first documented solution to the cube-doubling problem, extended the *Proportionslehre* to the incommensurable quantities for the first time; cf. Triebel-Schubert 1989 pp. 192–193. *Pace* Triebel-Schubert, however, this latter Hippocratic text leads us with Schiefsky to interpret the issue in another way. For *De vetere medicina* 9 (the same chapter quoted by Triebel-Schubert in her account) contains the core of the author’s argument according to which, on the one hand, the level of medical ἀκρίβεια or accuracy attainable is limited while, on the other hand, since there is an infinite variety of human natures, in the definition of an healthy diet, the stochastic art of medicine must aim at a “measure” (Δεῖ γὰρ μέτρον τινὸς στοχάσασθαι) that cannot be expressed in terms of weight units and precise quantities (οὐδὲ σταθμὸν, οὐδὲ ἀριθμὸν). Rather, this measure coincides with what he defines as “τοῦ σώματος τὴν αἴσθησιν” (i.e. the reaction of the individual’s body to the medical treatments; for an exhaustive summary of the different interpretations of this expression cf. Schiefsky 2005 pp. 196 ff.), which can help the doctor to understand whether he has acted in the right way. In the first place, Schiefsky remarks that here the term μέτρον undergoes a “shift in meaning” (which is to be expected from an author striving to express abstract thoughts in the absence of a strictly technical medical terminology). In fact, the meaning of this term approximates that of the term μέτριον (*due measure or mean between excess and defect*; cf. Plato *Polit.* 284e2–8). Second, Schiefsky observes that although the term μέτρον may also refer to the measure of content of the dietary prescriptions, the point of the Hippocratic author seems instead to be a negative one: as human nature is too complex and at variance from one individual to another, and is not explainable in terms of a small set of elements or philosophical *hypotheses*, there is also no indication of a precise and exact—mathematical—measure as regards quantity or weight (in a word: a standard and absolute criterion valid for all) to which to appeal in order to match the dietetic needs of a patient’s constitution—except the empirical response of each individual body to medical cures and regimen (cf. also the abovementioned passage in the previous footnote, from *De victu* CMG I 2.4 pp. 200.30–202.2 Joly); cf. Schiefsky 2005 pp. 186–188 and p. 193; cf. Grimaudo 2008 p. 38. It has to be noted, moreover (although in his commentary Schiefsky neglects this detail), that in the passages from *De vet med.* the notion of quantity of food (*De vet. med.* CMG I 1 p. 39.6–26) is not expressed by recourse to the term ἀριθμὸς, which individuates quantity as arithmetically measurable, but by the term πλῆθος, which stems from the same root as the verb πίμ-πλη-μι “to fill”, and indicates, less precisely, the “great quantity/abundance” of something (cf. German *Fülle*), often in the sense of “concentration” or “multitude” (said often of human beings); cf. Frisk 1973 s.v. πίμπλημι. The same term is referred to the quantity of humours in the passage of *De nat. hom.* quoted by Galen (*De nat. hom.* CMG I 1.3 pp. 172.13–174.3 Jouanna).

factors so that a dynamic equilibrium (μετριότης) between extremes is established.³⁰³ as long as the various bodily constituents are symmetric with each other, in the evaluative sense of being *well-proportioned*, the body is healthy and vigorous, but as soon as this proportion is altered and the balance is broken, as one of the constituents prevails over the other, pain and ailment occur and the organism is diseased.³⁰⁴ All the more, in Hippocratic medicine it is the notion of mixture itself, i.e. κρῆσις, of various constituents that proves to be inextricably bound up with that of μετριότης, i.e. with the idea of equilibrium and right proportion: in Hippocratic writings κρῆσις is essentially regarded as an intrinsically well-balanced and well-proportioned mixture (be it a process or a state). To labour the point, in the Hippocratic corpus κρῆσις does not mean *every proportional relation* among bodily or cosmic constituents within the mixture, *but only the good, positive, healthy ones*.³⁰⁵

In his text dedicated to the theory of mixture, the *De temperamentis*, Galen puts into practise this “archaic” conception of health as a symmetry of basic bodily constituents (his primary elements), but at the same time he innovates it by combining it with a gradualist account of health and disease: this implies an account of symmetry which, although it has the Hippocratic model as its basic starting point, is enriched – differently from what Vegetti thought - with new (markedly Aristotelian) connotations.

In *De temperamentis*, Galen envisions his κρῆσις as constituted by “portions” or μοῖραι of hot/cold and dry/wet in the contrarieties or ἀντιθέσεις, which can be equal (ἴσος)³⁰⁶—a condition which is called ἰσομοιρία, or equal portioning/distribution of hot/cold and dry/wet in the mixture, a term of

³⁰³ Tracy 1969 pp. 67–68 and ff.

³⁰⁴ This “archaic” account of health and disease, on which Galen is patently drawing, will not remain confined but will spread outside the strictly Hippocratic medical field. In fact, it will only later be taken up by prominent philosophers (notably Plato, Aristotle, and the Stoics) in order, on the one hand, to study human nature in the broader context of cosmology, physics, and physiology as closely interrelated with psychological investigation, and in order to be used as a powerful analogy in the realm of ethical and political field in explaining the individual’s moral life and the collective life of the state, cf. Grimaudo 2008 p. 39 with n. 9 for the references.

³⁰⁵ Tracy 1969 p. 73. We will refer to the point concerning the Hippocratic notion of κρῆσις as balanced mixture in the section dedicated to the terminology of mixture, cf. *infra* p. 213.

³⁰⁶ *De temp.* p. 1.2 H. *et alibi*.

Hippocratic origin:³⁰⁷ in this case the mixture will be defined as εὐκρατος,³⁰⁸ ἀρίστη,³⁰⁹ μέση,³¹⁰ or a εὐκρασία³¹¹ or well-proportionate mixture, i.e. a σύμμετρος³¹² κρᾶσις. When instead one or two of the portions of hot/cold and dry/wet is greater (πλείων)³¹³ than the other opposite, or when one or two of them prevail over the other (the verbs used to express such a concept are mainly πλεονεκτεῖν,³¹⁴ κρατεῖν,³¹⁵ and ἐπικρατεῖν³¹⁶), the mixture will be defined as badly mixed δύσκρατος,³¹⁷ a δυσκρασία³¹⁸ or a disproportionate mixture, i.e. a ἄμετρος κρᾶσις.³¹⁹ Let us consider in detail how Galen accounts for the insurgence of disease as resulting from a disproportionate or bad mixture:

T22 Galen *De temperamentis* K. I 520.12-522.1 Helmreich 8.4–27:

(1) ἔστω γὰρ εὐκρατον εἶναι τὴν ὑγρὰν καὶ θερμὴν, ὥσπερ αὐτοὶ βούλονται. παραλελοίπασιν ἄρα τὴν ἀντικειμένην τῇ ψυχρᾷ καὶ ξηρᾷ δυσκρασία, ἐν ἣ τὸ ὑγρὸν πλεονεκτεῖ καὶ τὸ θερμὸν. ἀλλ' αὐτῇ, φασίν, ἐστὶν ἡδε. καὶ πῶς ἐνδέχεται καὶ πλεονεκτεῖν ἅμα καὶ μὴ πλεονεκτεῖν τὸ θερμὸν | καὶ κρατεῖσθαι καὶ μὴ κρατεῖσθαι τὸ ψυχρὸν; εἰ μὲν γὰρ εὐκρατός ἐστιν, οὐδὲν οὐδενὸς ἀμέτρως ἐπικρατεῖ, εἰ δὲ δύσκρατος, ἀνάγκη πλεονεκτεῖν τι τῶν ἐκ τῆς ἀντιθέσεως. (2) ἀλλ' αὐτὸ τοῦτο, φασίν, ἴδιόν ἐστι τῆς εὐκράτου τὸ κρατεῖν ἐν

³⁰⁷ *De temp.* p. 16.15 H. cf. also 12.13 H. (referred to the spring), *et alibi*. The usage of this term in Galen stems from a Hippocratic expression. In *Aer.* CMG I 1.2 p. 54.4–20 Diller, the Hippocratic author establishes a comparison between Europe and Asia and says that Asia is more cultivated and the habits of people are more moderate as a result of “the good mixture of the seasons (ἡ κρῆσις τῶν ὥρέων)”, a condition which coincides with an equal portioning of the elementary forces governing nature (*isomoiriē*).

³⁰⁸ *De temp.* p. 7.4, p. 7.12, 7, 27, 8.3, 40.4 H., *et al.*

³⁰⁹ *De temp.* p. 24.17 H., *et al.*

³¹⁰ *De temp.* p. 24.17 H., *et al.*

³¹¹ *De temp.* p. 9.12 H., *et al.*

³¹² *De temp.* p. 40.4 H., *et al.*

³¹³ *De temp.* p. 1.20 H., *et al.*

³¹⁴ *De temp.* p. 1.19, p. 2.2, p. 8.7, p. 8.8–9, 8.11–12, 8, 22 H., *et al.*

³¹⁵ *De temp.* p. 8, 9–10, 8.14, 8.17 H., *et al.*

³¹⁶ *De temp.* p. 8.11, 9.25–26, 11.11, 16.12–13 H., *et al.*

³¹⁷ *De temp.* p. 8.11 H., *et al.*

³¹⁸ *De temp.* p. 8.7 H., *et al.*

³¹⁹ *De temp.* p. 13.11 H., *et al.* As is well known, in his *De temperamentis* Galen distinguishes an exactly symmetric and thus perfect mixture from eight asymmetric and thus bad mixtures (four simple, resulting from the prevalence of one element: hot mixture, cold mixture, wet mixture, dry mixture, and four composite, resulting from the prevalence of one element of each contrariety: hot and wet mixture, hot and dry mixture, cold and wet mixture, cold and dry mixture). On this scheme of mixtures and its origins *amplius infra* pp. 210 ff.

αὐτῇ τὸ μὲν θερμὸν τοῦ ψυχροῦ, τὸ δ' ὑγρὸν τοῦ ξηροῦ. κρατήσαντος γὰρ δὴ τοῦ ψυχροῦ μετρίως μὲν, οὐκ ἀγαθὴν εἶναι τὴν κρᾶσιν, ἔτι δὲ μᾶλλον, νόσον ἤδη γίνεσθαι, καθάπερ, εἰ καὶ σφοδρῶς κρατήσῃ, θάνατον. οὕτω δὲ καὶ τοῦ ξηροῦ συμπίπτει ἐν ἀρχῇ μὲν δυσκρασίαν, ἐπὶ πλεόν δὲ νόσον, ἐπὶ πλεῖστον δὲ κρατήσαντος θάνατον, ὥσπερ οὐχὶ καὶ τῆς ὑγρᾶς καὶ θερμῆς ταῦτα συμπίπτοντα. **(3)** τίς γὰρ οὐκ ἂν ὁμολογήσειεν, ἐπειδὴ μὲν ἐπ' ὀλίγον ἢ τὸ θερμὸν τοῦ ψυχροῦ τύχη πλεονεκτῆσαν ἢ τὸ ὑγρὸν τοῦ ξηροῦ, δυσκρασίαν οὕτω γιγνομένην, ἐπειδὴ δ' ἐπὶ πλεόν, νόσον, ἐπειδὴ δ' ἐπὶ πλεῖστον, θάνατον; ὁ γὰρ αὐτὸς ἐπ' ἀμφοῖν λόγος. ἢ μηδὲ τὰς ἀμέτρως ὑγρᾶς καὶ θερμᾶς καταστάσεις αἰτιώμεθα μηδ' ὅσα μεθ' ὑγρότητος ἀμέτρου νοσήματα συνίσταται θερμά, μηδὲ ταῦθ' ὁμολογῶμεν εἶναι νοσήματα.

(1) Let it be granted that the well-mixed is the wet and hot mixture, as they themselves claim. In that case they have omitted the bad-mixture which is opposed in nature to the cold and dry one, in which there is a predominance of the wet and the hot. But, they say, that is the same one. But how can it be allowed that the hot can be both predominant and not predominant, and that the cold can be both dominated and not dominated? For if it is well-mixed, then there is no immoderate dominance of one thing over another; if badly-mixed, then one element of the opposition must be predominant. **(2)** But, they say, this is precisely the specific characteristic of the well-mixed mixture, that in it the hot dominates the cold, and the wet the dry. They say that with a moderate dominance of the cold, the mixture is not good; with a greater one, sickness comes about; and, with a very strong dominance, death (κρατήσαντος γὰρ δὴ τοῦ ψυχροῦ μετρίως μὲν, οὐκ ἀγαθὴν εἶναι τὴν κρᾶσιν, ἔτι δὲ μᾶλλον, νόσον ἤδη γίνεσθαι, καθάπερ, εἰ καὶ σφοδρῶς κρατήσῃ, θάνατον). And so too with the dry: they say that to begin with there arises a bad-mixture; if it increases, sickness; and if it dominates to a very high degree, death (οὕτω δὲ καὶ τοῦ ξηροῦ συμπίπτει ἐν ἀρχῇ μὲν δυσκρασίαν, ἐπὶ πλεόν δὲ νόσον, ἐπὶ πλεῖστον δὲ κρατήσαντος θάνατον), as if these things did not also arise in the case of the wet, hot mixture. **(3)** Surely everyone would concede that if there happens to be a slight predominance of hot over cold, or of wet over dry, a bad-mixture comes about; if that predominance is greater, sickness; and if it is very great indeed,

death (ἐπειδὴν μὲν ἐπ' ὀλίγον ἢ τὸ θερμὸν τοῦ ψυχροῦ τύχη πλεονεκτῆσαν ἢ τὸ ὑγρὸν τοῦ ξηροῦ, δυσκρασίαν οὕτω γιγνομένην, ἐπειδὴν δ' ἐπὶ πλεόν, νόσον, ἐπειδὴν δ' ἐπὶ πλεῖστον, θάνατον)? Exactly the same argument applies in both cases. Otherwise we would not even attribute ill effects to those states which are immoderately wet and hot (τὰς ἀμέτρως ὑγρὰς καὶ θερμὰς καταστάσεις); nor concede that those hot diseases which come about in conjunction with immoderate wetness (μεθ' ὑγρότητος ἀμέτρου) are diseases at all. (Trans. Singer)

The passage is set within the context of an overview of the most distinguished mixture-theorists, among the doctors and philosophers who preceded Galen. More precisely, Galen is attacking some of them, who remain anonymous, and who think that the mixtures are four (hot and wet, hot and dry, cold and wet, and cold and dry) and that the εὔκρατος and ἀρίστη κρᾶσις coincides with the hot and wet mixture (T22.1). These thinkers claim that “with a moderate dominance of the cold, the mixture is not good; with a greater one, sickness comes about; and, with a very strong dominance, death”, and the same applies to the case of the predominance of the dry element over the wet (T22.2). Galen approves this reasoning but, in contrast to his opponents, he extends it to the hot and wet mixture (T22.3).

As we anticipated, Galen “archaically” conceives of disease as arising due to an imbalance or disproportion in the elementary composition of the mixture but also embraces a gradualist account of the pathological aetiology. For he, as well as the medical thinkers to whom he refers, distinguishes three different degrees of disproportionate mixture: i) a slight (ἐπ' ὀλίγον) predominance of one or two elements in the contraries corresponds to a state of δυσκρασία or bad-mixture (which does not entail disease and in fact, elsewhere, is also defined ὑγιεινὴ δυσκρασία³²⁰); ii) a greater (ἐπὶ πλεόν) predominance of one or two elements in the contraries, which corresponds to a state of νόσος or sickness, elsewhere defined νοσώδης δυσκρασία;³²¹ iii) a very great predominance one or two elements, where (ἐπὶ πλεῖστον) θάνατος or death takes place. On the

³²⁰ *De temp.* p. 63.13–14 H.

³²¹ *De temp.* p. 63.18 H.

contrary, as Galen states later in *De temperamentis*, the equal distribution of hot/cold and dry/wet is the cause of εὐκρασία and health (ἡ τῆς τῶν τεττάρων κράσεως ἰσομοιρία τῆς τ' εὐκρασίας αὐτοῦ καὶ τῆς ὑγείας αἰτία).³²²

But how can the physician distinguish between a ὑγιεινή and a νοσώδης δυσκρασία? As we see in **T23**, the gap between healthy and morbid *dyskrasia* cannot be measured in mathematical terms, but has to be reckoned on the basis of the level of the impairment of the living being's activities.

T23 Galen *De temperamentis* K. I 609.1-610.1 Helmreich 63.3–19:

(1) ἐπιδέδεικται γὰρ ἡμῖν καὶ δι' ἄλλων, ὡς ἀναγκαῖόν ἐστιν οὐ σμικρὸν ὑποθέσθαι πλάτος τῆς ὑγιεινῆς καταστάσεως· ἀλλὰ καὶ νῦν φαίνεται σχεδὸν ἐν ὄλῳ τῷ λόγῳ τὴν μὲν εὐκρατόν τε καὶ μέσην φύσιν οἷον κανόνα τινὰ τῶν ἄλλων αἰεὶ τιθεμένων ἡμῶν, ὅσαι δ' ἐφ' ἐκάτερα τῆσδε, δυσκράτους ἀποφαινόντων· ὅπερ οὐκ ἂν ἦν, εἰ μὴ τὸ μᾶλλον τε καὶ ἥττον ἢ ὑγιεινὴ κατάστασις ἐδέχετο. ἄλλη μὲν γὰρ ἐστὶν ἡ ὑγιεινή, ἄλλη δ' ἡ νοσώδης δυσκρασία· νοσώδης μὲν ἢ ἐπὶ πλεῖστον ἀποκεχωρηκυῖα τῆς εὐκράτου, ὑγιεινὴ δ' ἢ ἐπ' ὀλίγον. (2) ὀρίσαι δ' οὐδ' ἐναυθὰ μέτρῳ καὶ σταθμῷ τὸ ποσὸν ἐγχωρεῖ, ἀλλ' ἰκανὸν γνώρισμα τῆς ὑγιεινῆς δυσκρασίας τὸ μηδέπω μηδεμίαν ἐνέργειαν τοῦ ζῶου βεβλάφθαι σαφῶς. ὅσον δ' οὖν μεταξὺ τοῦ τ' ἄκρως ἐνεργεῖν καὶ τοῦ βεβλάφθαι σαφῶς ἐνέργειαν ὑπάρχει, τοσοῦτον καὶ τῆς ὑγείας τὸ πλάτος ἐστὶ καὶ τῆς κατ' αὐτὴν δυσκρασίας. τούτῳ δ' ἐφεξῆς ἐστὶν ἡ νοσώδης δυσκρασία, ὅταν γε διὰ δυσκρασίαν νοσῇ τὸ ζῷον.

(1) It has also been shown by us in other works that it is necessary to posit a considerable latitude of the healthy state (ὑποθέσθαι πλάτος τῆς ὑγιεινῆς καταστάσεως); but it is apparent, now too, in practically the whole of the argument, that we always set up the well-mixed, middle nature as a kind of standard (τὴν μὲν εὐκρατόν τε καὶ μέσην φύσιν οἷον κανόνα τινὰ), any deviations from which, in either direction, we declare to be badly-mixed. Now,

³²² *De temp.* p. 16.15–16 H.

this would not be so if it were not the case that the healthy state admitted of different degrees (εἰ μὴ τὸ μᾶλλον τε καὶ ἥττον ἢ ὑγιεινὴ κατάστασις ἐδέχεται); for a healthy bad-mixture and a morbid bad-mixture are two different things, the deviation from the norm being a great one in the latter case and a small one in the former. (2) Here again, it is not possible to define the quantitative determination through measure and weight units (ὀρίσαι δ' οὐδ' ἐνταῦθα μέτρῳ καὶ σταθμῷ τὸ ποσὸν ἐγχωρεῖ); but (the fact that) there is not yet any clear damage to any of the animal's activities is a sufficient indicator of the healthy bad-mixture. And so whatever there is between best performance and clear damage to an activity represents the extent of the latitude of health and of the healthy bad-mixture (ὅσον δ' οὖν μεταξὺ τοῦ τ' ἄκρως ἐνεργεῖν καὶ τοῦ βεβλάφθαι σαφῶς ἐνέργειαν ὑπάρχει, τοσοῦτον καὶ τῆς ὑγείας τὸ πλάτος ἐστὶ καὶ τῆς κατ' αὐτὴν δυσκρασίας). Next after this comes the morbid bad mixture, which is when the animal is actually sick because of bad-mixture. (Trans. Singer; translation modified)

Galen posits the well-mixed and middle nature as a kind of standard (κανὼν) on the basis of which we can define all the others: if there is any deviation from this precise standard, it will be defined as badly mixed. But there are healthy and morbid *dyskrasiai*, the difference being that while the healthy *dyskrasia* shows a small deviation from the standard, the morbid *dyskrasia* shows a greater deviation (cf. T23.1). For between perfect health and real disease there are different degrees (τὸ μᾶλλον τε καὶ ἥττον) within a certain range or latitude (πλάτος cf. T23.1–2) and the passage from a healthy to a morbid *dyskrasia* cannot be measured in mathematical terms (cf. T23.2 “οὐδ' ἐνταῦθα μέτρῳ καὶ σταθμῷ”) but has as its indicator (γνώρισμα) the impairment of activity. In fact, in Galen's view, health not only coincides with a perfect equilibrium between opposites, that is, the perfectly healthy state, but between this and disease there are slight deviations on both the sides of the equilibrium point, a *Breite der Gesundheit*, as Almberg defines it with explicit reference to Galen's gradualist approach to health and disease in *De temperamentis*.³²³ More precisely, Galen says that there is a latitude of health and of the healthy *dyskrasia*

³²³ Almberg 1949 pp. 22 and f.

(τῆς ὑγείας τὸ πλάτος ἐστὶ καὶ τῆς κατ' αὐτὴν δυσκρασίας—we will come back to this expression). Within this broad latitude we find all the concrete realizations of an individual's health, which, although distant from the absolute healthy state, are in any case counted as healthy conditions as long as the individual's activity is not clearly impaired.³²⁴

The notion of τῆς ὑγείας πλάτος is tied up with the issue of the elemental symmetry of the elements within the bodily mixture insofar as it is the elemental symmetry that creates health.³²⁵ As we have seen (T19), Galen affirms that “Hippocrates” had already recognized two symmetries: one according to πλῆθος and one according to δύναμις, and he re-interprets “Hippocrates” words as referring to τὸ ποσὸν τῆς οὐσίας and to δύναμις τῶν κεραυνουμένων. But how should we interpret Galen's conception, given that (differently from the Hippocratic one) it refers to the state of the primary elements within the mixture? As we have seen, in the passage from his *Commentary on the Nature of Man* Galen does not go into this question; therefore, we must look elsewhere in order to answer it. Again, the first book of Galen's *De temperamentis*, which in its second part (Ch. 6–9) investigates the μέση or σύμμετρος κρᾶσις in its twofold sense, turns out to be extremely helpful.

T24 Galen *De temperamentis* K. I 546.5-548.7 Helmreich 23.24-25.4:

(1) ἐπειδὴν μὲν ἀπλῶς οὐσία τις εὐκρατος λέγεται καὶ ταύτης δὲ τις ἐτέρα ξηροτέρα καὶ θερμοτέρα καὶ ψυχροτέρα καὶ ὑγροτέρα, τὴν μὲν εὐκρατον ἐναυθὰ τὴν ἐκ τῶν ἐναντίων ἀκριβῶς ἴσων συνελθόντων ὀνομάζομεν, ὅσον δ' ἀπολείπεται τῆσδε καὶ πλεονεκτεῖ κατὰ τι, τῷ τοῦ πλεονεκτοῦντος ὀνόματι προσαγορεύομεν· (2) ἐπειδὴν δ' ἦτοι φυτὸν εὐκρατον ἢ ζῶον ὀτιοῦν εἴπωμεν, οὐκέθ' ἀπλῶς ἀλλήλοις ἐν τῇ τοιαύτῃ λέξει τἀναντία παραβάλλομεν, ἀλλὰ πρὸς

³²⁴ The issue concerning the τῆς ὑγείας πλάτος is systematically tackled by Galen in his *De sanitate tuenda*, among other works; cf. Grimaudo 2008 pp. 73–97. As Grimaudo remarks (in Grimaudo 2008 p. 85 with n. 20), in his *Ars medica* Galen describes a sort of graphic where he posits as the two extremes as the perfect healthy state and the diseased condition, while in the middle are the intermediate healthy states; cf. *Ars med.* pp. 284.20–286.3 Boudon-Millot. As Boudon-Millot refers, real graphics illustrating Galen's notion of health-latitude have indeed been handed down to us in some of the manuscripts containing Galen's *Ars medica*; cf. Boudon 1994 p. 1481 with n. 41.

³²⁵ Cf. *De san. tuend.* CMG V 4.2 pp. 7.35–8.3 and p. 8.15–20 Koch.

τὴν τοῦ φυτοῦ φύσιν ἢ τὴν τοῦ ζώου τὴν ἀναφορὰν ποιούμεθα, συκῆν μὲν εὐκρατον. εἰ τύχοι, λέγοντες, ὅταν, οἷα μάλιστα πρέπει τὴν φύσιν ὑπάρχειν συκῆ, τοιαύτη τις ἦ, κύνα δ' αὖ καὶ σὺν καὶ ἵππον καὶ ἄνθρωπον, ἐπειδὴν καὶ τούτων ἕκαστον ἄριστα τῆς οἰκείας ἔχη φύσεως. **(3)** αὐτὸ δὲ δὴ τοῦτο τὸ τῆς οἰκείας φύσεως ἔχειν ἄριστα ταῖς ἐνεργείαις κρίνεται. καὶ γὰρ καὶ φυτὸν καὶ ζῶον ὅτιοῦν ἄριστα διακεῖσθαι τῆνικαὐτά φαμεν, ὅταν ἐνεργήσῃ κάλλιστα. συκῆς μὲν γὰρ ἀρετὴ βέλτιστά τε καὶ πλείστα τελεσφορεῖν σῦκα· κατὰ ταῦτα δὲ καὶ τῆς ἀμπέλου τὸ πλείστα τε καὶ καλλίστα ἐκφέρειν σταφυλάς, ἵππου δὲ τὸ θεῖν ὠκύτατα καὶ κυνὸς εἰς μὲν θήρας τε καὶ φυλακὰς ἄκρως εἶναι θυμοειδῆ, πρὸς δὲ τοὺς οἰκείους πρῶτατον. **(4)** Ἄπαντ' οὖν ταῦτα, τὰ τε ζῶα λέγω καὶ τὰ φυτά, τὴν ἀρίστην τε καὶ μέσην ἐν τῷ σφετέρῳ γένει κρᾶσιν ἔχειν ἐροῦμεν οὐχ ἀπλῶς, ὅταν ἰσότης ἀκριβῆς ἦ τῶν ἐναντίων, ἀλλ' ὅταν ἢ κατὰ δύναμιν αὐτοῖς ὑπάρχῃ συμμετρία. τοιοῦτον δὲ τι καὶ τὴν δικαιοσύνην εἶναι φαμεν, οὐ σταθμῶ καὶ μέτρῳ τὸ ἴσον, ἀλλὰ τῷ προσήκοντί γε καὶ κατ' ἀξίαν ἐξετάζουσιν. ἰσότης οὖν κράσεως ἐν ἅπασι τοῖς εὐκράτοις ζώοις τε καὶ φυτοῖς ἐστίν, οὐχ ἢ κατὰ τὸν τῶν κερασθέντων στοιχείων ὄγκον, ἀλλ' ἢ τῆ φύσει τοῦ τε ζώου καὶ τοῦ φυτοῦ. πρέπει δ' ἔσθ' ὅτε τὸ μὲν ὑγρὸν τοῦ ξηροῦ, τὸ δὲ ψυχρὸν τοῦ θερμοῦ πλεον ὑπάρχειν. οὐ γὰρ ὁμοίαν χρῆ κρᾶσιν ἔχειν ἄνθρωπον καὶ λέοντα καὶ μέλιτταν καὶ κύνα. πρὸς δὲ τὸν ἐρόμενον, ἥστινός ἐστι κράσεως ἄνθρωπος ἢ ἵππος ἢ βοῦς ἢ κύων ἢ ὅτιοῦν ἄλλο τῶν πάντων, οὐχ ἀπλῶς ἀποκριτέον.

(1) When some existent object is called well-mixed in absolute terms, and some other is called drier, hotter, colder or wetter than it, the one that we are calling well-mixed, in this context, is that [which is composed] from a precise equality of opposites coming together (ἐκ τῶν ἐναντίων ἀκριβῶς ἴσων συνελθόντων), while whatever has some deficiency or predominance in relation to this we refer to by the term for whatever predominates. **(2)** When, however, we speak of a well-mixed plant or animal, we are not with this kind of verbal expression comparing opposites with each other in the absolute sense, but rather using as our point of reference the nature of the plant or animal in question. We would say, for example, that a fig-tree was well-mixed, if it were one possessed of that nature which is most appropriate to a fig-tree; and the same of a dog, pig, horse or human being when each of these, similarly, was in the best state with

regard to its own nature (τῆς οικείας ἔχει φύσεως). **(3)** And this matter of ‘being in the best state with regard to its own nature’ is evaluated in terms of the activities (αὐτὸ δὲ δὴ τοῦτο τὸ τῆς οικείας φύσεως ἔχειν ἄριστα ταῖς ἐνεργείαις κρίνεται). And we say in fact that both a plant and an animal of any kind are best disposed precisely when they perform their activities at best (ὅταν ἐνεργήσῃ κάλλιστα) The excellence (ἀρετὴ) of a fig-tree, for example, consists in its bringing to fruition the most and the best figs; in exactly the same way, that of a vine [consists in its] producing the most and the best grapes; that of a horse in running very fast, and that of a dog in extreme spiritedness in hunting and guarding, combined with very great docility towards the members of its own household. **(4)** We will, then, speak of all these—I mean, animals and plants—as having the best, middle type of mixture within their own genus, not in the absolute sense (τὴν ἀρίστην τε καὶ μέσην ἐν τῷ σφετέρῳ γένει κρᾶσιν ἔχειν ἐροῦμεν οὐχ ἀπλῶς), when there is a precise equality of opposites, but when they have that good balance which accords with their capacity (ἀλλ’ ὅταν ἢ κατὰ δύναμιν αὐτοῖς ὑπάρχῃ συμμετρία). We state that justice, too, is something of this kind, in that it examines what is fair not by a fixed rule, but according to what is fitting and appropriate. And so, in the case of all well-mixed animals and plants, their equality of mixture is not that [defined] by the volume of the elements in the mixture, but that appropriate (πρέπουσα) to the nature of that animal or plant. Sometimes it is appropriate (πρέπει) for there to be more wet than dry, or more cold than hot (δ’ ἔσθ’ ὅτε τὸ μὲν ὑγρὸν τοῦ ξηροῦ, τὸ δὲ ψυχρὸν τοῦ θερμοῦ πλέον ὑπάρχειν). For it is not right for a human being, a lion, a bee and a dog to have the same sort of mixture. Indeed, when someone asks, what is the mixture of a human being, or of a horse, an ox, dog or any other creature at all, the question cannot be answered in absolute terms (πρὸς δὴ τὸν ἐρόμενον, ἧστίνος ἐστὶ κράσεως ἄνθρωπος ἢ ἵππος ἢ βοῦς ἢ κύων ἢ ὅτιοῦν ἄλλο τῶν πάντων, οὐχ ἀπλῶς ἀποκριτέον). (Trans. Singer; slightly modified)

In this passage Galen indeed identifies two kinds of symmetry: an absolute symmetry, i.e. ἀπλῶς, according to the whole substance, and a non-ἀπλῶς, one

according to the living beings (animals and plants).³²⁶ On the one hand, within the whole category of the substance or οὐσία (which is the highest genus comprehending within it, apart from inanimate things, living beings and plants),³²⁷ there is a precise, perfect, complete, and absolute elemental symmetry that coincides with the “precise equality of opposites coming together” (ἐκ τῶν ἐναντίων ἀκριβῶς ἴσων συνελθόντων),³²⁸ that is, the condition of *isomoiria*, to which we have previously referred, which leads to the precise middle between all the extremes (τὸ τῶν ἐσχάτων ἀπάντων ἀκριβῶς μέσον).³²⁹ This kind of symmetry seems to be directly translatable into mathematical terms as it implies an ἰσότης ἀκριβῆς τῶν ἐναντίων,³³⁰ a precise equidistance from the extremes. On the other hand, in the realm of living organisms, plants and animals, the midpoint is not absolute and not mathematically determinable but is assessed from the capacity or *dynamis* of the animal or plant in question, performing at best their distinctive activities.

As Almberg notes, in this passage Galen echoes the Aristotelian distinction, made in the *Nicomachean Ethics*, between an absolute τοῦ πράγματος and a relative πρὸς ἡμᾶς μέσον. The first μέσον is one and the same for everyone and it is determinable by an arithmetic proportion, in the same way in which six is the middle between two and ten. On the other hand, the second μέσον is not one and the same for all, but has to be assessed πρὸς ἡμᾶς “in relation to us”: for example, a good trainer has to administer the right quantity of food to her athletes not by taking into account the exact arithmetic middle, but by considering their own special needs. If in fact the middle between ten and two minas of food is six minas of food, even this quantity can be excessive or deficient depending on the individual: for Milo, who is a skilful athlete, this

³²⁶ Cf. *De temp.* pp. 19–27 H. Galen’s discourse here is dense in teleological implications, which will be tackled in the next chapter. Here we shall focus on Galen’s notion of twofold symmetry and its reference models.

³²⁷ Cf. *infra*. pp. 219 ff.

³²⁸ *De temp.* p. 23.26–27 H.

³²⁹ The connection between *isomoiria* and the precise equality of opposites is made explicit in the summary of the first book, which Galen sets up at the beginning of the second book; cf. *De temp.* p. 40.18–19 H.

³³⁰ *De temp.* p. 24.18 H.

quantity would be insufficient, but, on the contrary, for a novice the same quantity would prove instead to be excessive.³³¹

For although the physician may have knowledge of the absolute and mathematical criterion of judgement (and, as we will see, Galen has this in mind), when he has to judge the health of a living organism, he has to do it by considering the very nature of the organism, which can be healthy not in an absolute sense but to a certain extent. In fact, as in Aristotle's speculation, health, as well as justice (analogously to all the other *poia* and then moral virtues) cover “the more and the less”, i.e. admit of degrees within a relative symmetry.³³² there are the healthier and the less healthy but nonetheless healthy within a certain

³³¹ *Eth. Nic.* 1106a28–b5 “τὸ δ' ἴσον μέσον τι ὑπερβολῆς καὶ ἐλλείψεως. λέγω δὲ τοῦ μὲν πράγματος μέσον τὸ ἴσον ἀπέχον ἀφ' ἑκατέρου τῶν ἄκρων, ὅπερ ἐστὶν ἓν καὶ τὸ αὐτὸ πᾶσιν, πρὸς ἡμᾶς δὲ ὁ μήτε πλεονάζει μήτε ἐλλείπει· τοῦτο δ' οὐχ ἓν, οὐδὲ ταῦτόν πᾶσιν. οἷον εἰ τὰ δέκα πολλὰ τὰ δὲ δύο ὀλίγα, τὰ ἐξ ἑκάστης λαμβάνουσι κατὰ τὸ πρᾶγμα· ἴσῳ γὰρ ὑπερέχει τε καὶ ὑπερέχεται· τοῦτο δὲ μέσον ἐστὶ κατὰ τὴν ἀριθμητικὴν ἀναλογίαν. τὸ δὲ πρὸς ἡμᾶς οὐχ οὕτω ληπτέον· οὐ γὰρ εἰ τῶν δέκα μναῖ φαγεῖν πολλὸν δύο δὲ ὀλίγον, ὁ ἀλείπτῃς ἐξ ἑκάστης προστάξει· ἔστι γὰρ ἴσως καὶ τοῦτο πολλὸν τῶν ληψομένων ἢ ὀλίγον· Μίλωνι μὲν γὰρ ὀλίγον, τῶν δὲ ἀρχομένων τῶν γυμνασίων πολὺ. ὁμοίως ἐπὶ δρόμου καὶ πάλης”. Cf. Almberg 1949 and Grimaudo 2008 p. 106–107. This very passage has been thoroughly analysed by Brown (1997 pp. 77–93). Brown's aim is to subvert the general assumption that the expression “the mean relative to us” means “relative to the individual” understood as the individual (moral) agent. On the contrary, Brown argues that the expression can instead be explained as “relative to us as human beings”, and that this interpretation better squares with Aristotle's theory of *êthikê arête*; cf. esp. pp. 80–81. Although Brown's point may be correct, however, in the abovementioned passage of Galen's it is remarked that the physician should assess the symmetry of the mixture on the basis of the best state with regard to one's own particular nature (τὸ τῆς οἰκείας φύσεως ἔχειν ἄριστα); therefore, Galen would intend this *meson* to zero in on the particular nature of the living being and to refer to the midpoint of its species and genus.

³³²Cf. *Categ.* 10b26–11a5. The close connection between Galen's theory of health *platos* and this Aristotelian passage from the *Categories* is pointed out by Grimaudo 2008 pp. 93–95. Cf. also *Eth. Nic.* 1173a23–28. Even if it is true that the idea of health admitting of degrees is to be found in Aristotle's work, the awareness of the arising of disease as a gradual transition from the normal to the pathological sporadically emerges before this, in the treatises of the Hippocratic corpus. If on occasion the Hippocratic doctors thought of the passage from the normal to the pathological state as due to a sudden and triggering *metabolê* (cf. Jouanna 1999 pp. 328–331), on other occasions they seem to be perfectly convinced that health is instead a matter of degree. Jouanna reports some interesting examples: i) a first example from *On joints* where the Hippocratic author says that people suffering from the outwards dislocation of both thighs, whether from birth or through trauma, can enjoy reasonably good health (*ikanôs hugiêroi*) if there are no further complications; cf. *Art.* 56 pp. 200.12–201.7 Kühlewein L. IV 242.19–244.10; ii) an example from *Aphorisms* where the persons whose nostrils are naturally watery, and whose seed is watery, are defined as “below the average when in health” (*hugiainousi noseróteron*); cf. *Aph.* VI 2 L. IV 562.11–12 ii) a third illuminating example from *De veteri medicina*, where the Hippocratic author observes that whereas the great majority of men do not suffer from discomforts of a change in the rhythm of their daily meals, others do, as they are weaker. He adds: “a weak man is but one step removed from a sickly man, but a sickly man is weaker still, and is more apt to suffer distress whenever he misses the due season”; cf. *De vet. med.* CMG I 1 p. 43.23–27 Heiberg. As Jouanna remarks, this first Hippocratic formulation was to reappear as the Broussais' principle in the 19th century in the work of the philosopher Auguste Comte; cf. Jouanna 1999 pp. 333–335. Cf. also Grimaudo 2008 pp. 65–66.

degree. Hence, health cannot be judged on the basis of a fixed and numerically translatable reference point, but on the basis of the specific nature of the animal or plant and of what is fitting and appropriate (τῷ προσήκοντί γε καὶ κατ' ἀξίαν) to that nature. And what is fitting and appropriate for the nature of a certain plant or an animal has to be evaluated on the basis of activities (ταῖς ἐνεργείαις κρίνεται)³³³ such that, therefore, “the excellence (ἀρετὴ) of a fig-tree, for example, consists in its bringing to fruition the most and the best figs; in exactly the same way, that of a vine [consists in its] producing the most and the best grapes; that of a horse in running very fast, and that of a dog in extreme spiritedness in hunting and guarding, combined with very great docility towards the members of its own household”.

Almberg’s claim, in my view, is correct, but on both the sides of the question (that of the absolute and that of the relative τὸ σύμμετρον or μέσον³³⁴) there are a few points to be added and clarified.

³³³According to Aristotle, in fact, health as well as every moral excellence of the soul or virtue lies in the middle between excess and deficiency and can be judged from the respective activities of the body and of the soul (cf. *Nicomachean Ethics* 1104a11–27); for the analogy between health and moral excellence of the soul, cf. Tracy 1969 pp. 222–231.

³³⁴When Galen speaks of midpoint, τὸ μέσον and τὸ σύμμετρον have the same meaning, that is, the equilibrium point between excess and deficiency. The mathematical concept of συμμετρία as commensurability/proportion is strictly linked to that of μεσότης. The term, which derives from the same root as μέσον (i.e. “that which finds itself in the middle”, “middle”, “mid-point” as referred to space, time, quantity, or social classes, age, or morality; cf. Frisk 1973 and Montanari 2000 s.v. μέσον), plus the feminine suffix for abstract nouns -της, has different meanings in Ancient Greek language and especially in Ancient Greek mathematics. *In primis*, in Ancient Greek language it designates the abstract condition of *being at the centre of something* (Montanari 2000 s.v. μεσότης, cf. Plato *Laws* 746a). Second, it indicates an *intermediate position (of a certain condition, quality, or quantity) between two extremes* with regard to the process of sense-perception (Cf. Arist. *De an.* 424a4; cf. Montanari 2000 s.v. μεσότης), virtue (Montanari 2000 s.v. μεσότης; cf. Arist. *Nic. Eth.* 1106b27), or stylistic register (Montanari 2000 s.v. μεσότης; cf. Dion. *Dem.* 3.3). In regard to mathematical texts, μεσότης first designates *the middle space* in general (cf. Pythagorean *Occellus* D.-K. 48.8). Moreover, it can indicate *the mean* mathematically understood as the middle term in a three-member progression, that is, the midpoint between two extremes (D.-K. 44A24, 32). Third, the common mathematical meaning of μεσότης is *proportion or progression*. This is in fact “the oldest word for proportion of any kind however determined” (Burnet 1900 pp. 69–70, quoted in Tracy 1969 p. 344.) and designates the first three types of proportions—arithmetic, geometric, harmonic—that are usually traced back to Pythagoras: in fact, its meaning would later on have also covered that expressed by the term ἀναλογία, which originally referred exclusively to geometric proportion. Therefore, when the term μεσότης is applied to mathematics, it indicates the relationship between two extremes joined by a mean (i.e. a mathematical proportion), as the whole proportion or only the middle terms, and when this notion is instead applied to physical realities, it rather describes, analogously to one of the meanings of symmetry, a physical state in which extremes of any kind are balanced in a mean, based on the notion of μεσότης in Ancient Greek mathematics; cf. Tracy 1969 p. 344 ff.

In the first place, that is in the case of the absolute elemental symmetry, rather than resorting to arithmetic proportions, in his *De temperamentis* Galen describes the perfect midpoint by appealing to powerful spatial conceptualizations envisaging the two contrarities hot/cold and dry/wet as one-dimensional and numerically computable spatial extensions and the parts of elemental substance as equal volumes within the mixture. In *De Temperamentis* I 9, Galen teaches how to re-create a perfect midpoint between hot and cold and dry and wet:

T25 Galen *De temperamentis* K. I p. 560.17-562.3 Helmreich p. 32.27-33.20:

(1) ἀπὸ γὰρ τοῦ θερμοτάτου πάντων τῶν εἰς αἴσθησιν ἠκόντων, οἷον ἦτοι πυρὸς ἢ τινοσ ὕδατος ἄκρως ζέοντος, ἐπὶ τὸ ψυχρότατον καταντῶντες ἀπάντων ὧν ἴσμεν, οἷον ἦτοι κρύσταλλον ἢ χιόνα, **νοήσαντές τι διάστημα, μέσον ἀκριβῶς τοῦτο τέμνομεν.** οὕτω γὰρ ἐξευρήσομεν τῇ νοήσει **τὸ σύμμετρον, ὅπερ ἑκατέρου τῶν ἄκρων ἴσον ἀπέχει.** (2) ἀλλὰ καὶ κατασκευάσαι πως αὐτὸ δυνάμεθα **τὸν ἴσον ὄγκον** κρυστάλλου μίξαντες ὕδατι ζέοντι. τὸ γὰρ ἐξ ἀμφοῖν κραθὲν ἴσον ἑκατέρου τῶν ἄκρων ἀφέξει τοῦ τε καίοντος καὶ τοῦ νεκροῦντος διὰ ψῦξιν. οὐκ οὐκ οὐδὲ χαλεπὸν ἔτι τοῦ κραθέντος οὕτως ἀψαμένους ἔχειν τὸ μέσον ἀπάσης οὐσίας ἐν τῇ κατὰ τὸ θερμὸν τε καὶ ψυχρὸν ἀντιθέσει καὶ μεμνησθαι τούτου καὶ κρίνειν ἅπαντα τᾶλλα καθάπερ τινὶ κανόνι παραβάλλοντας. (3) καὶ μὲν δὴ καὶ ξηρὰν γῆν ἢ τέφραν ἢ τι τοιοῦτον ἕτερον ἀκριβῶς ἀνυψηρὸν ἀναδεύσας **ὑδατι κατὰ τὸν ὄγκον ἴσῳ** τὸ μέσον ἐργάση σῶμα τῆς κατὰ τὸ ξηρὸν τε καὶ ὑγρὸν ἀντιθέσεως. οὐκ οὐκ οὐδ' ἐνταῦθα χαλεπὸν οὐδὲν ὄψει θ' ἅμα καὶ ἀφῆ τὸ τοιοῦτον σῶμα διαγνόντα παραθέσθαι τῇ μνήμῃ καὶ τούτῳ κανόνι τε καὶ κριτηρίῳ χρῆσθαι πρὸς τὴν τῶν ἐλλειπόντων ἢ πλεοναζόντων ὑγρῶν τε καὶ ξηρῶν διάγνωσιν. ἔστω δὲ δηλονότι τὸ κρινόμενον σῶμα συμμέτρως θερμὸν.

(1) We start from the hottest of all things that reach our senses, such as fire, or water at its extreme boiling point, and go down to the coldest of all those we know, such as ice or snow; we conceptualize a line (τι διάστημα) between them; and we divide this line at its precise midpoint. In this way we will find out conceptually the point of good balance, which is equidistant from each of the extremes (οὕτω γὰρ ἐξευρήσομεν τῇ νοήσει τὸ σύμμετρον, ὅπερ ἑκατέρου τῶν ἄκρων ἴσον ἀπέχει). (2) But we can also in a way create it physically, by combining an equal volume of ice and boiling water (τὸν ἴσον ὄγκον κρυστάλλου μίξαντες ὕδατι ζέοντι). For that which is made from a mixture of both these will be equidistant from the two extremes, that which burns and that which causes death by cold. And so it is no difficult matter, either, to touch the product of this mixture and so to hold that which is at the midpoint amongst all existent objects (τὸ μέσον ἀπάσης οὐσίας) as regards the opposition of hot and cold, and to remember this, and to evaluate all other objects by using this as a standard (καθάπερ τινὶ κανόνι) with which to compare them. (3) Furthermore, if you add dry earth, ash, or some other such thing that is in the precise sense dried-out, to an equal volume of water (ὑδατι κατὰ τὸν ὄγκον ἴσῳ), you will produce a body that is in the middle with regard to the opposition of dry and wet. Here, too, it is no difficult matter to distinguish such a body by both sight and touch, to consign it to the memory and to use the object as the yardstick and criterion (κανόνι τε καὶ κριτηρίῳ) for the distinguishing of objects which are deficiently or excessively wet and dry. Of course, the body that one is evaluating should be hot to a well-balanced extent. (Trans. Singer; slightly modified)

As we see from the passage, τὸ σύμμετρον, the perfect *Gleichgewichtspunkt* between the extremes with respect to the whole substance (τὸ μέσον ἀπάσης οὐσίας) can be obtained either mentally or physically. In the first case, one should conceptualize a spatial extension (νοήσαντές τι διάστημα cf. T25.1) between the extremes of hotness and coldness which can be experienced through sense-perception (corresponding, for example, respectively to fire or snow/ice); this extension has to be divided at its precise middle: in this way it is possible to visualise a perfect midpoint that is equidistant from extreme hot and extreme cold (ὅπερ ἑκατέρου τῶν ἄκρων ἴσον ἀπέχει). In the second

case, although human beings cannot totally mix the primary elements with each other as the Demiurge or Nature can in order to create natural homoeomerous parts (as opposed to artificial)³³⁵ they can physically re-create and re-produce (cf. the usage of the verbs in **T25.2** κατασκευάζειν, and in **T25.3** ἐργάζεσθαι) the midpoint by mixing equal volumes (cf. the usage of ὄγκος cf. **T25.2** and **T25.3**) either of ice and of boiling water (in order to reach τὸ σύμμετρον between hot and cold) or of dry earth and water (in order to reach τὸ σύμμετρον between dry and wet, given the equilibrium in the other contrariety; cf. **T25.3**). The term ὄγκος (which here of course has no connection with Asclepiades' theories) indicates, more precisely, “bulk”, “mass”, or, perhaps more correctly in the case of Galen's usage, “volume”, i.e. a physical magnitude quantifiable through a precise numerical measurement.³³⁶ This procedure reproduces in greater scale what happens in the case of elemental mixtures performed by nature or God, where the perfect midpoint or τὸ σύμμετρον is reached when there is a perfect equality according to the bulk/volume of the elements within the mixture (ἰσότης κατὰ τὸν τῶν κερασθέντων στοιχείων ὄγκον)³³⁷ that can, at least theoretically,

³³⁵ *De temp.* 34.5–7 H.; for more on this see the next section.

³³⁶ The term occurs frequently in Plato, where it indicates the bulk, mass, or volume of a body or also a sum of elements translatable into numbers; cf. μήτε ὄγκῳ μήτε ἀριθμῷ as referring to something that cannot increase or decrease, *Th.* 155a; τὸν αὐτῶν ὁ. τοῦ ἀριθμοῦ δεῖ τάξασθαι, “it is necessary to establish their total number” (in reference to citizens), *Lg.* 737c; τὸν τῶν σαρκῶν ὁ. *ib.* 959c; συμκρᾶς πόλεως ὁ., a city of small size, *Pl.* 259b; in the *Timaeus* the term refers to the mass of the solid figures, cf. *Tim.* 32a. In contrast to Cornford (who interprets the word as probably referring to cubes, that is, cubic numbers, in combination with *dynamis* or squares (cf. Cornford 1935 pp. 44–51 with n. 1 at p. 50), Tracy observes that the translation of ὁ. as “physical masses” or “bulks” of the cosmic solids, fire, air, water, and earth (cf. Tracy 1969 p. 79–81 with n. 6), is indeed confirmed by other passages in *Timaeus* where the term is referred to the mass of the cosmic elements (cf. 54d and 56c (referring to the four elements), 56d (referring to water and air), 58e and 59a (referring to water), 60c and 60e (referring to earth) *et al.*). The term occurs also in Aristotle, where it often indicates the volume or the space occupied by a body; cf. *Ph.* 203b28; *De gen. et corr.* 321a11 (where the point is the increase of volume occupied by a certain mass of water when it turns to air); and *De gen. et corr.* 326b20, where the meaning is clearly volume, as Aristotle says that for every body there will be a void equal to its volume (esp. παντὶ σώματι τὸν ὄγκον ἴσον ἔσται κενόν).

³³⁷ *De temp.* p. 24.24 H. The point is also made in *De temp.* p. 25.13–14 H. We have already pointed out that Galen's primary *stoicheia* are formed by two *archai*, a material substrate and four opposite qualities (which are inseparable from one another); cf. *In Hipp. Nat. Hom. comment.* CMG V 9.1 p. 17.28–18.15 Mewaldt; and endowed with the alterative capacities or powers (*dynamis*) of heating, cooling, drying, and wetting (*De nat. fac. pp.* 109.13–110.6 H.). In Galen's notion of symmetry according to τὸ ποσὸν τῆς οὐσίας, the qualitative aspect, however present (as inseparable from the material substrate), does not play the major role, as the focus is on the quantitative units of the elemental substance joining together in the mixture. This is another Aristotelian feature of Galen's physics: although Aristotle had conceived his primary *stoicheia* in privileging their qualitative aspects, as we have seen, in his *De gen. et corr.* he clearly differentiates the numerically determinable quantity (τὸ ποσόν) of the simple bodies from

be translated into precise measure units.³³⁸ Galen’s idea of absolute and perfect symmetry with regard to the quantitative aspects of the genus of the whole substance (which in his commentary on *Nat. Hom (T19)* he defines as symmetry according to τὸ ποσὸν τῆς οὐσίας) and as applied to the primary elements within the *krasis* undergoes a process of mathematization and spatialization. Here there are two different spatial visualizations are at work: i) the first envisions each contrariety as a numerically measurable one-dimensional spatial extension, that is, a line (διάστημα)³³⁹ at whose extremes there are hotness and coldness or dryness and wetness of the *krasis*, and at the centre of which are their midpoints; ii) the second explains the four elements within the perfect symmetric mixture as equal and calculable three-dimensional volumes (*onkoi*) of the elemental substance.³⁴⁰

In so doing, Galen’s model of mixture distances him from both the Hippocratic and the Aristotelian/Peripatetic model, taking a peculiar position.

On the one hand, Galen recovers the generic Hippocratic notion of τὸ σύμμετρον as a well-proportioned mean between excess and deficiency, as applied to the building blocks of human nature and giving rise to health and well-

their *dynamis* or power of action; cf. *De gen. et corr.* 333a20–23: “If it is meant that they are comparable in their amount (κατὰ τὸ ποσόν), all the ‘comparables’ must possess an identical something whereby they are measured. If, e.g. one pint of Water yields ten of Air, both are measured by the same unit; and therefore both were from the first an identical something” (trans. Joachim)—where by τὸ ποσόν Aristotle seems to intend the volume of the simple bodies, that is, the space they occupy that can be measured as some unit, in this case the pint.

³³⁸ On Galen’s τὸ σύμμετρον with respect to the whole substance as mathematically determinable cf. also Grimaudo 2008 p. 106. Grimaudo, however, attributes only inanimate things to Galen’s genus of *ousia*, whereas here Galen is discussing, on the contrary, the absolute mean in relation to all ὄντα, that is, all existent things, including plants and animals. So much so that, apart from the present example, which Galen makes for illustration’s sake, this absolute σύμμετρον with respect to all physical bodies subjected to generation and corruption, coincides, as we will clarify later on, with the skin of the hand; cf. *De temp.* p. 37 H.

³³⁹ The term is technical in Euclides’ geometry and means “radius” (of a circle; cf. *El.* 1.1 *et al.*), but, as regards the present passage, I perfectly agree with Singer’s translation, as here διάστημα seems to mean “spatial extension”; cf. Arist. *Phys.* 209a4 where διαστήματα are the three-dimensions, length, breadth, and depth.

³⁴⁰ There are two main reasons why I interpret Galen’s *onkos* as referring to what for us is volume (as distinct from mass): i) a logical one: let us think of equal masses instead of equal volumes in the mixture: we would obtain a disproportionate mixture as equal masses of fire, air, water, and earth cannot of course be of equal volume, or, therefore, dimension (in fact when water turns to air its volume considerably increases), whereas an equal volume and therefore dimension of the elemental substance would normalize the equilibrium in the mixture; ii) Galen’s Aristotelian physical background: like Aristotle, Galen speaks of the τὸ ποσόν of fire, air, water, and earth, and when in *De gen. et corr.* (a text that, as we have seen, Galen knew very well) Aristotle, like Galen, distinguishes between τὸ ποσόν and *dynamis* of simple bodies and identifies the quantitative aspects of the simple bodies with the measure of their volume rather than their mass.

being; but, on the other hand, in contrast to the Hippocratic authors, he contrives to mathematize it. If in fact the Hippocratic authors strove, without success, to find real μέτρον and ἀριθμὸς to determine the correct quantity of food, drink, and physical exercise for the patient or to better understand the dynamics of the bodily constituents (humours, *dynameis*, qualities) at play within the living organism, Galen's idea of absolute and perfect symmetry is backed up by forceful numerically measurable and spatializing visualizations of the perfectly symmetric midpoint between the elemental constituents of the human body.

On the other hand, in bringing out an absolute and numerically determinable mean, in certain respects he also goes beyond the Aristotelian and the Peripatetic accounts of mixture. In fact, neither in Aristotle's model of mixture (*De gen. et corr.* I 10 and then II 7-8) nor in Alexander of Aphrodisias' account (*De mixtione* 13-15) can we find any such parallels. Although Galen thinks of his *stoicheia* from a Peripatetic standpoint and thus as endowed with extreme qualities within one contrariety, by means of which the elements are able to act and be acted upon and find an equilibrium point during the interaction process, he is much more precise in his determination of the absolute and perfect mean.

Both accounts, in fact, the Aristotelian and the Peripatetic, underscore the importance of an equal balance of their constituents (as regards both quantity and powers of action)³⁴¹ which, by balancing each other out and, hence, establishing a certain ratio or *logos* between them,³⁴² meet at an intermediate point—but this mean was above all envisaged as a “gradual” mean, because it is described as having considerable reach and not as indivisible,³⁴³ an account that was instrumental for explaining the extreme variety of homoeomerous parts in the world, each one arising from a different elemental combination.

Though Galen shares this gradual account of the mean, it is noteworthy and meaningful that in their accounts of mixture neither Aristotle and Alexander labour to find the exact middle or symmetric point³⁴⁴ as meticulously and as

³⁴¹ *De gen. et corr.* 238a23–28; *De mixt.* 230.29–30 Bruns.

³⁴² *De gen. et corr.* 334b8–17.

³⁴³ *De gen. et corr.* 334b26–30.

³⁴⁴ The perfect middle mixture is not described in both the accounts. Solmsen observes that only in this textual locus of the sections concerning the exposition of the model of mixture does Aristotle refer to a proportion or *logos* between the contraries, as he was more interested in

minutely as Galen does by providing abstract and (at least theoretically) numerically translatable conceptualizations for thinking the matter. In all likelihood this is attributable to the powerful influence that logico-mathematical knowledge exerted on Galen's thought,³⁴⁵ on his accurate method of reasoning (which is based on an axiomatic method consisting of definitions—obtained through a dialectic procedure—and *a priori* truths),³⁴⁶ but, more deeply still, also on the actual ontological structure of the world as he conceived of it.³⁴⁷ Galen's point is here not only to make as intelligible as possible the kernel of his physics, the perfect and absolute mixture of opposites, but also, and more importantly, to found his art of medicine on more solid bases, since identifying the absolute midpoint between hot and cold and between dry and wet, and, therefore, the

developing the qualitative aspects of his physics, in contrast to Empedocles (who set up proportions of fire, air, water, and earth within the human body) and to the mathematical structure underpinning Timaeus' world, where mathematical proportions inform matter (whose primary elements take the shape of solid figures made up of basic triangles) and constitute all-pervading principles of unity of both the cosmic and the human body (on the usage of Plato's theory of proportions and of the mean as applied to the physiology of the *Timaeus* cf. Tracy 1969 pp. 77–156); cf. Solmsen 1960 pp. 375–377. It is also true that in *De generatione et corruptione* there is another passage in which Aristotle tries to pave the way for a mathematical abstraction of physical facts. For, when in *De gen. et corr.* 322b32 ff. he speaks of contact (the preliminary condition for mixture, as we have seen), he states that the notion of contact can properly (κυρίως) be applied to both physical bodies and to mathematical objects, i.e. to “things which have ‘position’. And ‘position’ belongs only to those things which also have a Place” (trans. Joachim). This hint at the mathematization of physical phenomena is, however, not pursued systematically in *De generatione et corruptione*, and, apart from the above-quoted fleeting mention of the proportion or *logos* between the qualities it does not play a central role in Aristotle's account of mixture.

³⁴⁵ Cf. Vegetti: “Galeno indica con chiarezza a più riprese quale sia il modello epistemologico che il suo programma di rifondazione della medicina assume con riferimento costante. Si tratta del sapere matematico, tanto nelle sue versioni teoricamente più pure, come la geometria e l'aritmetica quanto in quelle che presentano aspetti osservativi ed applicativi, come l'astronomia e l'architettura: un sapere costituitosi attraverso la gloriosa tradizione di Euclide, Ipparco, Archimede, Aristosseno e Aristarco, cui Galeno si riferisce come ai massimi tra gli antichi (*De methodo medendi* I 1 K. X 12). Il carattere fondamentale del modello matematico consiste secondo Galeno nella sua capacità di costruire un sapere saldo e unificato, dotato di certezza nei limiti del possibile, ed esente perciò dalle *diaphoniai* che lacerano tanto la filosofia quanto la medicina. Questo risultato è possibile in virtù della struttura epistemologica che governa le matematiche”, in Vegetti 1978 p. 21. Cf. Hankinson 1991 p. 20: “The mathematical principles are important in two respects. Firstly, they show that Galen's respect for mathematics was not merely idle and peripheral, but deep-seated and influential; mathematical axioms can be put to use even in practical science like medicine. And secondly, it shows the strength of Galen's belief that the logical theories of the Stoics and the Peripatetics need to be supplemented by form of reasoning to be found among the mathematicians, and which will not yield comfortably to the strictures of either Peripatetic categorial syllogistic or the Stoic sentential calculus”, Hankinson 1991 p. 20.

³⁴⁶ Hankinson 1991, pp. 15–22; on the connection between Galen's demonstrative method and the logico-mathematical model cf. also Hankinson 2008b, pp. 165–169.

³⁴⁷ Hankinson 1991 p. 21.

perfect mixture with respect to the whole substance, served to provide an absolute standard (canon, yardstick, reference model) to which to compare and judge all other mixtures in an absolute way.³⁴⁸ The perfect mixture generated by the midpoint between hot and cold, dry and wet, respectively, represents the heart of Galen’s natural philosophy and medicine and it is not only a pure abstraction insofar as it has a real physical counterpart, a part of the human body: the skin of the hand, but of a *particular* hand, a hand that is not to be judged but which has to judge the qualitative composition of whichever physical body is subject to generation and corruption, as we will see later on in the next chapter.

Now, let us tackle the second type of symmetry, i.e. the *κατὰ δύνανμιν συμμετρία*. Amberg has the great merit of having brought to light the ethical Aristotelian background of Galen’s *De temperamentis* and the theory of health gradualism; however, two additional points need to be made, at least.

On the one hand, it has been noted that, although according to Galen an actual μέτρον does really exist (and coincides with the most exact *symmetron*), when it comes to assessing the health conditions of a patient (or of any other living being), Galen’s puts aside mathematical measurements and closely scrutinizes the nature of the living being—which is not solely due to the influence of the Aristotelian ethical works, but has also much in common with the observations in this respect of the Hippocratic author of *De vetere medicina* 9.³⁴⁹ In fact, in the passage we quoted above, Galen emphasizes the importance of appraising the peculiar “nature” of the living being.³⁵⁰

³⁴⁸ Cf. *amplius infra*. pp. 219 ff.

³⁴⁹ Cf. Grimaudo 2008 pp. 107–111. As well as the author of *De vetere medicina*, Galen values and acknowledges the importance of the *stochazesthai* in order to hit the mean between what the body lacks and what has in excess. As Vegetti observes, in fact the high profile of Galen’s medicine (which is cited in the great philosophical debates, benefits from the axiomatic demonstrative method, and holds logico-mathematical foundations) has to coexist with the lower profile of medicine, to which also pertains the dimension of the conjectural/stochastic art of the physician: “una medicina dal 'profilo basso' non più impegnata nei grandi dibattiti ideologici, incapace di usare il linguaggio della teleologia e della teologia [...]. Affiora intanto, sul piano epistemologico, il carattere *stocastico*, congetturale della *techne*, costretta a procedere per tentativi e per approssimazioni in assenza di una scienza certa dei sintomi”, Vegetti 1981, pp. 57–59. However, in the case of the *stochazesthai* too, Galen tries to find a common midpoint between exact knowledge and rough approximation and works out what he himself defines as *τεχνικὸς στοχασμός*, i.e. a skilful conjecture, which over time is progressively refined in order to find the right proportion in dietary regimen; on this aspect cf. Grimaudo 2008 pp. 116–122.

³⁵⁰ In this stance, Galen follows the Hippocratic physicians. The statements of the Hippocratic author of *De loc. in hom.* 2 are famous: “The nature of the body is the beginning point of medical reasoning”. As Jouanna reports, Galen was familiar with this formula: “Galen attributed it to

On the other hand, even though Almgren focuses on the Aristotelian ethical concept of the “mean relative to us”, he does not spell clearly out the physical and physiological side of the question which is stringently linked to Galen’s theory of mixture as dependent on the Aristotelian/Peripatetic model: clarifying the physical and physiological articulation (mixture–*dynamis*–*energeia*) turns out to be vital for understanding what exactly this κατὰ δύνανμιν συμμετρία consists in.

As is well known, the concept of nature is multiform in Galen’s thought, but, as has been highlighted, the most important and primary sense, which Galen attributes to “Hippocrates”, is that which is most in keeping with *ousia* of the nature itself, that is, the “mixture of hot/cold and dry/wet”. In his *De temperamentis* Galen points out: “when I say ‘nature’ (*physis*) I mean the entire substance (*ousia*) and mixture (*krasis*) from the primary elements: hot, cold, dry and wet”.³⁵¹ Therefore, for the physician, considering the peculiar nature of

Hippocrates himself and reproached his contemporaries for praising the precept without following it. He remarked ironically upon this situation in the following terms: ‘They devote themselves with such ardor to this task that they disregard in the case of each part of the body not only its substance, its texture, its shape, its size, and its connection with adjacent parts, but even its position’ (cf. *Med. Phil.* 1)”, Jouanna 1999 p. 345. Jouanna remarks that by *physis* the Hippocratic writers meant “human nature” *par excellence*, although the term does not refer to just any human nature but predominantly to the healthy one at every level of its organisational patterns (elementary, anatomical, physiological): nature is the “natural organisation” of the body. The Hippocratic physicians also knew that these natures changed considerably from individual to individual (and in this sense the term would also mean “constitution”) and in relation to different factors (climate, places, age, regimen, diseases); cf. *De fract.* 7 and *De hum.* 16. Moreover, Jouanna identifies the birth of the principle of *natura medicatrix* in the Hippocratic Collection: the nature that cures herself, for example in *Epidemics VI* 5.1: “The body’s nature is the physician in disease. Nature finds the way for herself, not from thought. For example, blinking, and the tongue offers its assistance, and all similar things. Well trained, readily and without instruction, nature does what is needed”. These pre-teleological statements about nature will be brought to completion by Aristotle, according to whom, as is well known, “final cause and the Good is more fully present in the works of Nature than in the works of Art”; cf. *De part. an.* 639b19–21. For the Hippocratic concept of nature cf. Jouanna 1999 pp. 344–347 and, more specifically, for the plurality of individual natures in the Hippocratic Collection cf. Andó 2002.³⁵¹ Cf. *De temp.* p. 104.1–2 H. In his classical essay on Galen’s concept of nature, Jouanna distinguishes several meanings of the word *physis* in Galen’s work: i) the most important one, i.e. *ousia* or *krasis* of hot/cold and dry/wet; ii) the visible form of the body or possibly the arrangement of its parts. Now, these two first meanings were adopted by later Alexandrian commentators of Hippocrates and Galen (6th–7th century CE), who added other two definitions of nature: iii) an organising ability (τὴν διοικοῦσαν τὰ σώματα) and iv) an impulse of souls (ὁρμὴν τῶν ψυχῶν). Jouanna recognizes the source of the Alexandrians’ third definition in Galen’s *Commentary on Hippocrates’ Epidemics VI*, where Galen defines nature by saying: “by the word *physis* we should understand the ability (*dynamis*) residing in the very bodies that were organised by her” (“ἐνοικοῦσαν αὐτοῖς τοῖς σώμασι τοῖς διοικουμένοις ὑπ’ αὐτῆς”, cf. Gal. *In Hipp. Epid. VI comment.* 5.1 CMG V 10.2.2 p. 253.19–21 Wenkebach). In this sense the term *physis* would mean the organising principle of the world and the existent things within it according to a teleological design; cf. Jouanna 2012c p. 288 ff. with references.

whichever living being or of its own constitutive parts consists primarily in evaluating the *ousia qua krasis* of hot/cold and dry/wet. But what is *dynamis* and what is its connection with *energeia* or activity? And, above all, what is the link between mixture and *dynamis*? We will explain gradually this articulation in order to make clear the close connection between a mixture conceived of *more Aristotelico* and Galen's theory of gradual health.

To begin with, we have seen that the only perfect midpoint or *to symmetron* within the realm of all bodies subjected to generation and corruption is the skin of the hand, and we have also seen that all the other bodies generated from the primary elements are Aristotelically called "*metaxu*" bodies (whose midpoint between hot/cold and dry/wet cannot coincide with the most exact one: we have only one perfect midpoint): we infer three relevant points from this. i) No other bodies, except the precise midpoint, are generated when the qualities encounter the precise middle of the contrariety; ii) all the other bodies are generated from a particular qualitative combination of the elements, i.e. when the constituents find a relative midpoint, for one quality in a contrariety does not have to completely overcome the other, as in that case there would be destruction (or when referred to living beings, from a medical perspective, simply death); and iii) the possibility of the manifold and different qualitative combinations explains the variety of all the "*metaxu*" bodies subjected to generation and destruction.

Second, as we have seen, the primary qualities hot/cold and dry/wet involved in the mixture, which meet in a broader central region (Aristotelically conceived, as we have seen), dispose of and act in accordance with basic causative powers or the *dynamis*³⁵² of heating, cooling, desiccating, and

³⁵² What exactly is *dynamis*, then, according to Galen? As Van der Eijk perceptively remarks, Galen's usage of the term *dynamis* is rather ambiguous insofar as it has both a medical and philosophical background and has both a passive sense (of *undergoing* a change, for example the capacity of becoming hot; cf. *De temp.* pp. 87.1–90.21 H.) and, above all, an active sense (of *bringing about* a change, the capacity to cause something else to become hot); cf. Van der Eijk 2005 pp. 295–297. In his *De simpl. med. (temp. ac)*, Galen defines *dynamis* as an αἰτία δραστηκή, an "active cause", which in turn is divided into two interrelated stages: i) a *dynamis* "being about to" (ἐν τῷ μέλλειν ἐστίν), which, if everything runs smoothly, gives rise to ii), a *dynamis* κατ' ἐνέργειαν (a *dynamis* in action); cf. *De simp. med. (temp. ac) fac.* K. XI p. 380. The concept of *dynamis*, we see, is strictly correlated to that of *energeia*: "all genuine *energeiai* presuppose the existence of a co-ordinate *dynamis*: *energeia* is a *dynamis* in action", as Hankinson observes (Hankinson 2014 p. 952). Hankinson also clarifies the differences between Galen's and Aristotle's notions of *dynamis*: "Galen characteristically will have nothing to do with such

moistening. According to their particular combination, which, as we have seen, can vary within a certain gradual *range* within the *krasis*, these basic *dynameis* are responsible for a proliferation of myriads of further derivative *dynameis*³⁵³ which, in turn, are responsible for the *energeiai* or activities, which in turn produce some appropriate outcomes, i.e. *erga* or products.³⁵⁴ For example, in the phase of embryogenesis, the mixture of the four basic *dynameis* depend,³⁵⁵ on the one hand, on derivative *dynameis* such as those of bone-producing, nerve-producing, cartilage-producing (which once in action become real *energeiai*),³⁵⁶ and, on the other hand, on the products of these *energeiai*, i.e. *erga*, such as “bone”, “nerve”, “cartilage”, and so on³⁵⁷. This holds for the embryogenesis and, as we see, explains the generation of the homoeomerous parts of the organism: analogously, on these general powers or *dynameis* of hot/cold and dry/wet depend the many specific powers involved also in growth, nutrition (the entire *De naturalibus facultatibus* is devoted to investigate these *dynameis*), and the functioning of every organ of the body, including all the individual’s psychological characteristics.³⁵⁸

metaphysical extravagances as pure actuality. Galen’s concept, then, is not exactly Aristotle’s; and in any case *dynamis*, in a variety of senses, had a long philosophical, and indeed medical, history independent of Aristotle, with which Galen was intimately familiar. No significant role is played in Galen by the notion of the *actualization* of potential *states*; and as a consequence we find no echo of the Aristotelian distinction between first and second potentiality. In its central Galenic sense, an *energeia* is something which something *does*, where merely existing or persisting is not, as such, a matter of actually doing anything”, Hankinson 2014 p. 952.

³⁵³ The point is clearly made by Hankinson: “Galen tackles these issues in more detail at *Nat. Fac.* II 11–19 = 108.21–114.17. Dealing first with generation, he says (rather vaguely) that once conception has taken place in the animal (or germination in the case of a seed) ‘very many parts become constituted in the substance undergoing generation, which differ in moisture, dryness, heat and cold, and all the other qualities which are derivative of these’ (11, = 108.25–109.3), which include those distinguished by touch: hardness, softness, viscosity, brittleness, lightness, weight, rarity, density, smoothness, roughness, thickness, thinness ‘which are well discussed by Aristotle’ (12, = 109.7–12). The derivatives associated with taste, smell and sight are too well known to be worth enumerating (12, = 109.12–13)”, Hankinson 2014 p. 960.

³⁵⁴ On the causal link between *dynamis*, *energeia*, and *ergon* cf. *De nat. fac.* p.107.15–22 H.

³⁵⁵ The causal link between the mixture of the four (elements endowed with four basic *dynameis*) and *energeia* is made explicit at *De nat. fac.* p. 106.4–6 H.: “It seems to me that the vein and each of the other parts act in the way it does as a result of some particular mixture of the four (Ἐμοὶ μὲν οὖν καὶ ἡ φλὲψ καὶ τῶν ἄλλων ἀπάντων ἕκαστον διὰ τὴν ἐκ τῶν τεττάρων ποιῶν κρᾶσιν ὡδί πως ἐνεργεῖν δοκεῖ)”. Hankinson explains this relation as the emergence or supervenience of derivative specific powers upon the basic ones; cf. Hankinson 2014 p. 969, we have already tackled this issue in 1.3.4 and we will shortly come back to this topic in 1.3.7.

³⁵⁶ *De nat. fac.* pp. 109.13–110.6 H.

³⁵⁷ *De nat. fac.* pp. 105.10–106.1 H.

³⁵⁸ Hankinson 2014 pp. 957–967.

Given this causal link between mixture, *dynamis*, and *energeia*, we can understand the reason why (T24.4) “sometimes it is appropriate (πρέπει) for there to be more wet than dry, or more cold than hot (δ' ἔσθ' ὅτε τὸ μὲν ὑγρὸν τοῦ ξηροῦ, τὸ δὲ ψυχρὸν τοῦ θερμοῦ πλέον ὑπάρχειν) For it is not right for a human being, a lion, a bee and a dog to have the same sort of mixture”. Every *energeia* of every living being (plant or animal) ultimately depends on a “particular mixture”, a ποιὰ κρᾶσις (i.e. a *krasis* with a particular qualitative composition; a *krasis* where the midpoint is not perfectly symmetric), and the variety of possible particular *kraseis* explains the variety of *erga* and *energeiai* of each living being:³⁵⁹ as long as the living being works and works well (physically and psychically), we should infer that this living being is healthy³⁶⁰ and its *krasis* (which is not the most perfect and symmetric *krasis*) has found a relative equilibrium state between the opposites:³⁶¹ it has matched its proper κατὰ δύναμιν συμμετρία. On the contrary, if it departs from this relative equilibrium point its activity will be impaired (**the healthy dyskrasia also has a latitude and degrees**; cf. T23.2 “πλάτος τῆς κατ' αὐτὴν [health] δυσκρασίας”); as long as the *krasis* hits the target of relative symmetric mean, everything functions properly, but as soon as the *krasis* is disproportioned and

³⁵⁹ Cf. *De san. tuend.* CMG V 4.2 p. 9.4–8 Koch. An illuminating passage: “εἴπερ οὖν αἱ διαφοραὶ τῶν ἐνεργειῶν ταῖς τῶν κράσεων διαφοραῖς ἀκολουθοῦσιν, ἀνάγκη τοσαύτας εἶναι τὰς τῶν κράσεων διαφοράς, ὅσαιπὲρ εἰσι καὶ αἱ τῶν ἐνεργειῶν”

³⁶⁰ We have to note that this focus on the good functioning of the *energeiai* as criterion for judging the healthy state of the living being has an impact on Galen’s definition of health: archaic definitions of health as symmetry in fact coexist with a more modern definition of health as τὸ τῆς χρείας ἀπαρεμπόδιστον; cf. *De san. tuend.* CMG V 4.2 pp. 10.34–11.25 Koch (whereas, conversely, the discrimen between health and disease was defined as the “perceivable damage of an activity”; cf. one example, among many, from *De san. tuend.* CMG V 4.2 p. 12.20–22 Koch “ἢ τῆς ἐνεργείας αἰσθητὴ βλάβη”), providing the first functionalist definition of health in Western thought; cf. Grimaudo 2008 pp. 57–59.

³⁶¹ That there is a causal relation between *krasis* and *energeia* is all the more clear from the fact that, as has brought to light by Van der Eijk, in his *De temperamentis* Galen mentions the *energeia* (either of the entire organism or of a part of it) as a criterion for assessing the bodily mixture (apart from i) the sense of touch, ii) inferences from external signs and symptoms, iii) theoretical reasoning about causes or *logismos*, and iv) the more invasive methods of venesection and dissection), Van der Eijk 2015a pp. 691–692. In our terminology, as well as in Galen’s, there is a certain ambiguity in the usage of the term *krasis*. As we can see in all the texts quoted, it refers either to the *krasis* of a part (with a corresponding *energeia*) or to the *krasis* of an entire living being; cf. T18.4: “Indeed, when someone asks, what is **the mixture (and not the mixtures)** of a human being, or of a horse, an ox, dog or any other creature at all, the question cannot be answered in absolute terms (πρὸς δὴ τὸν ἐρόμενον, ἥστινός ἐστι κράσεως ἀνθρώπου ἢ ἵππου ἢ βοῦς ἢ κύων ἢ ὀτιοῦν ἄλλο τῶν πάντων, οὐχ ἀπλῶς ἀποκριτέον)”.

loses its relative balance, the activity in question is impaired: the healthy *dyskrasia* oversteps its relative *platos* and turns into a ill *dyskrasia*.

If in fact we look at the issue more closely, all Aristotle's *poiá* (in contrast to substance or *ousía*) and therefore also hot/cold and dry/wet admit of degrees by "the more and the less."³⁶² Therefore, although Almberg unravels Galen's references to Aristotelian ethical theories, this notion of gradual health can now

³⁶² As Lennox has shown, in fact, the Aristotelian concept of "the more and the less" can be also applied to Aristotle's biological issues and, more specifically, to the formation of the parts of animals. The concept has its roots in Plato's *Philebus* and, more specifically, in the discussion concerning the mixture of the limited and the unlimited, during which Socrates affirms that "drier and wetter, higher and lower, quicker and slower, greater and smaller, and everything that we brought together a while ago as belonging to that kind of being which admits of the more and the less" (25c5–8). As Lennox remarks, Aristotle's "the more and the less" play an important role in distinguishing the categories of substance, quantity, and quality. In *Categories* 3b33, it is said that substance does not admit of degrees, whereas quality does; cf. *Cat.* 10b26–28 (where it is declared that "qualities" admit of a more and less; for one thing is called more or less pale than another). Therefore, as Lennox notes, while Socrates cannot be more or less *human* than Callias, he can be more or less *pale* than the latter. Lennox tries to harmonize the achievements of *Metaphysics* with the doctrine of the *Categories*, which is still free from the matter/form distinction. In reporting a passage from *Metaphysics* H.3 ("just as a number does not possess the more and the less, neither does the substance in virtue of the form (*kata to eidos*), but if it does possess the more and less, *it is substance with the matter that does so*; cf. *Metaph.* 1044a10–11), Lennox observes that of course, as already noted, Socrates cannot be more or less *human* than Callias *kata to eidos*, "that is, the account which refers to them in abstraction from the different ways in which they actually embody human characteristics will not mention the more/less variations between them. But Socrates and Callias are 'this matter and this form here, and humans are such taken generally' (*Metaph.* Z.8 1033b24–6, 10 1035b28–32, 11 1037a5–7); and as such—as substances with matter (*ousia meta tês hulês*)—they can differ by the more and the less", Lennox 1987 p. 345. Given these theoretical premises, Lennox goes on to explain the different formations of homoeomerous parts themselves out of hot/cold and dry/wet and therefore also the specific *differentiae* of the parts of animals (ultimately constructed out of the primary elements—hot, cold, dry, and wet, and out of the second-order qualities, such as lightness, heaviness, density, rarity, roughness, smoothness, and so on which follow from the primary; cf. *De part. an.* 646a13–21) and even the specific functioning of their organs with respect to a certain *genos* (cf. esp. p. 346 and p. 357–358) as depending on the perceptible qualities, which—like all the other *poiá*—admit of degrees and of the more and the less; cf. Lennox 1987 p. 346: "thus, should one wish to distinguish one sort of bird from another, it will be in part by noting the differences in degree between the parts of one and the parts of another—thicker or thinner bone or blood, heavier or lighter body, thicker or thinner beak, and so on". For this is in turn the premise that permits us to think both the individual's *differentiae* within a certain species (*eidos*) and the *differentiae* of one species within a certain genus (*genos*), as based on the principle of the more and the less; cf. Lennox 1987 pp. 346 ff. (cf. Lennox's statement on p. 347: "not only can the differentiating features be said to differ in degree from one form of a kind to another—the forms of the kind themselves can be said to differ by degree, or by the more and the less, from each other", where *kind* translates *genos*). Galen does not clearly appeal to Aristotle's metaphysical matter/form distinction in his reasoning, as applied to the biological *genos/eidos* progressively divisional and variable account (cf. Lennox 1987 p. 348) but, from his functionalist perspective, he certainly echoes this since, as in Aristotle's biological works, it is "the more and the less" principle as applied to the primary contraries of hot/cold and dry/wet that determines the *individual's* activities and outcomes (*energeiai* and *erga*), stemming from the mixture, that can be evaluated on the basis of the relative symmetric midpoint of a certain species and genus.

be more deeply linked i) to the fact that *within the very physical mixture* there are different degrees that distance themselves on both the sides from an absolute midpoint; and ii) to the fact that specific *dynameis* depend on the many possible particular qualitative compositions or *diaphorai* of the *kraseis* (i.e. *kraseis* with a relative midpoint admitting of degrees) and, therefore, *energeiai* (and *erga*) of living beings.

There is a last point to which we will briefly refer. We have said that Galen “archaically” thinks of health as a symmetry and disease as an asymmetry of the bodily constituents. This prompts the question as to what to do in case of a possible imbalance of the bodily constituents. In this Galen proves to be very “archaic” insofar as he conceives, like the Hippocratic physicians, the treatment of the imbalance of the bodily constituents as a “correction” and “re-balancing” of the bodily *quanta* and *qualia*³⁶³ through dietetic and pharmacological prescriptions. He calls this correction ἐπανόρθωσις,³⁶⁴ that is, a “correction” aiming at obtaining again an “*orthē*” *krasis*. The mixture of the body in fact becomes “right” when the physician intervenes in order to “right” it, i.e. “to set it upright”. The adjective ὀρθός is largely used in Ancient Greek in both literal and figurative senses and in geometry is said of “right angles”.³⁶⁵ The usage of this term seems to have Hippocratic origins: in *De arte* it refers to a metaphor of the prodigious, demiurgic, correcting power of the medical art to raise a patient

³⁶³ In his review of the Hippocratic pre-Aristotelian writers, Tracy highlights this aspect. See his discussion in Tracy 1969 pp. 32–67. In Hippocratic medical texts the identification of the right proportion as regards quantity and quality was to be taken into account for the preservation of health. i) The Hippocratic author of *De vetere medicina*: in this treatise the physician aims at finding a diet proportionate to the stronger or weaker constitutions of the patients and for this reason he tries to find the right proportion (which as we have seen, had to be based on the reaction of the individual body) with regard to the *quantity* of food and with regard to the *quality* (not too strong and not too weak), by recourse to processes of mixture and concoction; cf. *De vet. med.* V; ii) the Hippocratic author of the companion piece to *De nat. hom.*, the so-called *Regimen in Health* (whose unity with the rest of the treatise, *De nat. hom.*, has been strenuously defended by Jouanna (2002 pp. 34–35)), states that the physician should establish the right quantity and quality of food and drink depending on the season: since a certain season in fact determines the abundance and the strength of the correspondent humour, the diet should act quantitatively and qualitatively in order to counterbalance the effects of the predominance of a particular humour within the body (Ch. 1–4). For example, Chapter 1 states that in order to reach a re-balancing of the body, during the winter (the cold and moist season which favours the production of phlegm) one has to eat as much and drink as little as possible (plus dry and minus wet); the food must be bread and roasted meats (plus dry) and the drink preferably wine (plus warm); cf. Tracy 1969 esp. pp. 37–39 and pp. 50–51.

³⁶⁴ Cf. among other examples *Adv. Lyc.* CMG V 10.3 p. 6.9 Wenkebach and *De meth. med.* K. X 940.7-8 (where it is used the corresponding verb ἐπανορθόω).

³⁶⁵ Cf. Chantraine 2002 s.v.

suffering from an obscure disease by “shaping his body aright”.³⁶⁶ As Vegetti aptly remarks, a physician cannot “create” a physical body from the elements as the demiurgic activity of a god or nature can, but (besides re-creating the mixture only in a secondary sense), he can “correct” the bodily mixture: his intervention consists in a “readjustment” (i.e. is an *epanorthotikos* intervention)³⁶⁷ of the *qualia* and *quanta* of a body.

T26 Galen *De elementis sec. Hipp.* K. I p. 474.2-17 De Lacy pp. 118.23-120.9:

(1) [...] ἵνα σώζηται, διττῆς καὶ τῆς ἐπανορθώσεως δεῖται, τῆς μὲν ἐτέρας τὸ ὑπερβάλλον ἐν ταῖς ποιότησι κολαζούσης, τῆς δὲ λοιπῆς τὴν τοῦ κενουμένου βάσιν ἀναπληρούσης. (2) ἢ μὲν καθαιροῦσα τὴν ἀμετρίαν ἐναντία δῆπου ποιότης ἐστὶ τῆς πλεοναζούσης, ἀλλ', ἢ δὲ τὸ λεῖπον ἀναπληροῦσα ποιότης ἐναντία μὲν οὐκ ἔστιν, ὁμοιοτάτην δ' εἶναι χρὴ τῇ κενωθείσῃ πρότερον οὐσίᾳ· μέλλει γὰρ ἀντ' ἐκείνης ἔσεσθαι τῷ ζῳῷ. τουτὶ μὲν οὖν ἐστὶ τὸ τρέφεσθαι τοῖς σώμασιν ἔκ τινος οὐσίας ὁμοίας τῇ πρότερον κενωθείσῃ γιγνόμενον. ὄθεν οἶμαι καὶ τὴν οὐσίαν ἐκείνην τροφήν ὀνομάζομεν. (3) ἠνίκα δὲ κατὰ ποιότητα μόνον ἀλλοιοῦν βουλόμεθα τὸ ὑποκείμενον, οἷς μὲν τοῦτο δρῶμεν, οὐ τροφάς, ἀλλὰ φάρμακα προσαγορεύομεν. οὐκ ἔχοντες δ' εὐρεῖν χωρὶς οὐσίας οὐδὲ μίαν ποιότητα σὺν ταῖς οὐσίαις αὐτὰς ἀναγκαζόμεθα παραλαμβάνοντες ἐπιφέρειν τοῖς δεομένοις σώμασιν.

(1) [...] in order to be preserved [the substance of all the bodies subjected to generation and corruption] needs a double correction, one that curbs excess in the qualities, the other that refills the place of that which was lost. (2) But the

³⁶⁶ Cf. the beautiful passage from *De arte* XII describing the θαῦμα of the medical techne: “Now the power of the art, when it raises a patient suffering from an obscure disease, is more surprising than its failure when it attempts to treat incurables [...] And the arts that are worked in materials easy to shape aright using in some cases wood, in others leather, in others—these form the great majority—paint, bronze, iron and similar substances—the articles wrought, I say, through these arts and with these substances are easily shaped aright (Ἐπεὶ τῆς γε τέχνης τὴν δύναμιν, ὁκόταν τινὰ τῶν τὰ ἄδηλα νοσεύντων ἀναστήσῃ, θαυμάζειν ἀξιώτερον, ἢ ὁκόταν ἐγχειρήσῃ τοῖς ἀδυνάτοις [...] τοῖσιν εὐεπανορθώτοις σώμασι δημιουργεῦνται μετὰ τούτων δημιουργεύμενα εὐεπανόρθωτα)” (trans. Jones). Here the compound adjective εὐ-επανόρθωτος is used, while the verb ἐπανορθόω is used at *De arte* I. These are the only occurrences within the Hippocratic Collection.

³⁶⁷ Vegetti 1981 p. 58.

(quality) that purges the imbalance is of course the opposite of the excessive quality, whereas that which supplies the lack is not a quality but must have the closest resemblance to the substance that was lost earlier; for it will be its replacement in the animal. This is [what is meant by] the feeding of bodies; it comes from some substance similar to that which was lost earlier, and that, I think is why we call that substance food. (3) But when we want to change the substrate in quality only, what we use for this we do not call food, but drugs. Yet since we cannot find even one quality apart from substance, we are compelled to take the qualities with the substances and administer to the bodies that need them.

As we see from passage **T26.1**, the correction (ἐπανόρθωσις) is regarded as twofold (in the same way as the symmetry is twofold): it is i) quantitative (active on the *quantum* of the bodily substance in order to replenish the volume-deficit, τῆς δὲ λουπῆς τὴν τοῦ κενουμένου βάσιν ἀναπληρούσης) and ii) qualitative (τῆς μὲν ἑτέρας τὸ ὑπερβάλλον ἐν ταῖς ποιότησι κολαζούσης). The primary elements are Aristotelically conceived as a substrate that changes, where the change comes about as a result of an exchange of qualities (**T26.3** “κατὰ ποιότητα μόνον ἀλλοιοῦν [...] τὸ ὑποκείμενον”), the substrate being bound up with the contrarities (**T26.3** “οὐκ ἔχοντες δ' εὐρεῖν χωρὶς οὐσίας οὐδὲ μίαν ποιότητα”). The archaic aspect, however, clearly stands out, insofar as here two original Hippocratic principles are at work in order to restore the quantitative and qualitative symmetries: that of the i) *contraria contrariis* and that of the ii) *similia similibus*.³⁶⁸ The first correction is associated with a change as regards

³⁶⁸ *Similia* and *contraria* are categories that emerged in pre-scientific/popular thought (in collections of sayings and proverbs, in the Homeric poems); in the wake of the birth of scientific thinking, they are adopted by Pre-Socratic philosophers to explain the formation and destructions of the cosmos (Empedocles' Love and Strife, Heraclitus' harmony of contraries). The “similar” is closely associated with the idea of growth, addition, attraction, whereas the “contrary” is closely associated with the sense of harmony, of symmetry, of health conceived as balanced *krasis* of opposite constituents (Ferrini 1996 pp. 15–18). The principles of the similar and the contrary also underpin (although not exclusively) the method of therapeutic treatment of disease in the Hippocratic Corpus, even though the remedy of the *contraria contrariis* is much more predominant than that of *similia similibus* (which in the Corpus is predominantly used to understand physical phenomena). In *De loc. in hom.* 42, 8–10, two therapeutic principles are straightforwardly announced together: i) αἱ ὀδύναί γίνονται ὑγιαίνονται τε αἱ ὀδύναί τοῖσιν ὑπεναντίοισιν and ii) Ἄλλος ὁδε τρόπος: διὰ τὰ ὅμοια νοῦσος γίνεται, καὶ διὰ τὰ ὅμοια προσφερόμενα ἐκ νοσεύτων ὑγιαίνονται (cf. the other examples from many Hippocratic

the quality of the body: “the (quality) that purges the imbalance is of course the **opposite** of the excessive quality” (cf. **T26.2** “ἡ μὲν καθαιροῦσα τὴν ἀμετρίαν ἐναντία δὴπου ποιότης ἐστὶ τῆς πλεοναζούσης”): these remedies are called drugs. The second correction is envisioned as a replenishment of the volume-deficit of the bodily substance by adding a substance that has to be the **most similar** to the one lost (cf. **T26.2** “ὁμοιοτάτην δ’ εἶναι χρὴ τῇ κενωθείσῃ πρότερον οὐσίᾳ”): here is the quantitative aspect which counts, τὸ ποσὸν τῆς οὐσίας): these remedies are called foods.³⁶⁹

Let us take stock of the findings we have attained in this section. Galen indeed displays some “archaic”, “Hippocratic”, and “pre-Aristotelian” traits:

i) Health conceived as a symmetry or balance and disease conceived as an asymmetry of bodily constituents within the mixture.

ii) Attention to the individual nature of the organism in the evaluation of the condition of the patient: in this case exact numerical measurements are not useful.

iii) Therapeutic treatment seen as “correction” in the sense of restoration and re-balancing the bodily constituents as regards “quantity” and “quality” through dietetics and pharmacology.

iv) Adoption of the Hippocratic therapeutic principles of *similia similibus* and *contraria contrariis*.

However, as we have seen, by drawing on deeply Aristotelian and Peripatetic physical (and ethical) doctrines, Galen innovates this “archaic” notion of health as a symmetry of the bodily constituents within the mixture:

writings which Ferrini extensively quotes, among others *De victu*, *De nat. hom.*, *De morbo sacro*, *Epidemics*; cf. Ferrini 1996 pp. 22–35).

³⁶⁹ The third book *De temperamentis* is dedicated to the therapeutic aspects of food and drugs, i.e. to the mixtures in potentiality—but this goes beyond the scope of this thesis. Knowledge of the *qualia* and the *quanta* of substances are at the basis of Galen’s method of healing. As Van der Eijk notes, in his *Therapeutics to Glaucon* the first requirements are that the physician must have knowledge of i) the quality and the quantity of the remedies (poiotês kai posotês tôn boêthêmatôn); ii) the mode of their application; and iii) the ability to discern the right time of application (the *kairos*, this is also a typically Hippocratic concept; as Van der Eijk notes this echoes the first Hippocratic Aphorism, “Occasion is fleeting”, *kairos oxus*); cf. Van der Eijk 2008 p. 288.

i) He distinguishes an absolute and mathematical (spatialized and, at least theoretically, numerically calculable) symmetric midpoint within the mixture (according to the quantity of the substance) from a relative and not mathematically determinable symmetric *meson* (according to the *dynamis*).

ii) He builds on the Aristotelian ethical notion of a “mean relative to us” to develop his gradualist theory of health: when it comes to health, there is no absolute and mathematical mean, but only a mean in relation to the individual’s nature (but we have seen that the germinal roots underlying this theory can be found in the Hippocratic corpus and we have also understood that Galen shares this gradual account of health with some other unnamed physicians).

iii) We have also seen that Galen’s mixture has a *platos* (analogous to the Aristotelian extended *meson* of the mixture): the variety of the mixtures explain the variety of *dynamis* and, hence, of the activities of the living being (see the causal connection between mixture–*dynamis*–*energeia*): each particular mixture with its relative midpoint generates a particular (*dynamis* and then) *energeia*.

iv) Every healthy mixture with a relative midpoint (therefore a healthy *dyskrasia*) has a *platos* and admits of degrees: if one bodily activity works well, this signifies that the mixture hits its relative mean (otherwise the activity would be impaired); hence, the *platos* of the healthy *dyskrasia* and its relation to the good functioning of the living organism are also factors to take into account when we speak of Galen’s gradualism: this account enables us to keep track of what happens on the physical/physiological level.

In sum, if in fact the first symmetry (quantity) is the key to the “perfect”, “absolute”, and “exact” knowledge of the quantitative aspects of the *krasis* of every physical body (i.e. **which quantity of hot, cold, dry, and wet possesses a certain *krasis***), the second (the *dynamis* and hence the correspondent activity) is an “imperfect” and “relative” but “functionalist” symmetry. This relative symmetry of hot/cold and dry/wet can be assessed from the external activities and it is functional since, although not completely accomplished and not numerically

measurable, in any case it allows the living organism to live well and according to its own nature and to perform its various activities, physical and psychical, at its best. Though relative and imperfect, this is a “whatever works” symmetry.

1.3.7 The reversibility of the process of mixture

So far we have been dealing with different aspects of the mixture of primary elements (activators, process of progressive division, ontological status of the elements in the mixture, alteration and generation of a *tertium quid*, absolute and relative equilibrium point of the constituents) and we have examined the strict dependence of Galen’s model of mixture on the Peripatetic model (although it presents some further developments permitting him to adapt his account of mixture to his medical and philosophical system). It is now time to analyse what happens in the case of the reversibility of the process of mixture: that is, the moment in which one recovers the constituents of the mixture.

Before properly approaching the phase of reversibility, we should first point out that Galen distinguishes two types of mixtures: i) those performed by God and/or Nature and ii) those also performed by human beings. This will lead us to better understand where to situate Galen’s theory of mixture within his general world view. We can see this distinction in the next text.

T27 Galen *De temperamentis* K. I pp. 562.15-563.13 Helmreich p. 34.5-19:

Τὸ μὲν οὖν ὅλα δι' ὅλων αὐτὰ κεράσαι, τὸ θερμὸν λέγω καὶ τὸ ψυχρὸν καὶ τὸ ξηρὸν καὶ τὸ ὑγρὸν, ἀδύνατον ἀνθρώπῳ. γῆ γὰρ ὑγρῶ | φυραθεῖσα μέμικται μὲν, ὡς ἂν τῷ δόξειε, καὶ οὕτω κέκραται πᾶσα παντί, παράθεσις μὴν ἐστὶ τὸ τοιοῦτον κατὰ σμικρὰ καὶ οὐ δι' ὅλων κρᾶσις, ἀλλὰ τὸ δι' ὅλων ἄμφω κεράσαι θεοῦ καὶ φύσεως ἔργον, ἔτι δὲ μᾶλλον, εἰ καὶ τὸ θερμὸν καὶ τὸ ψυχρὸν ὅλα δι' ὅλων ἀλλήλοις κεραννύοιτο. τὸ μέντοι παράθεσιν ἐργάσασθαι τοιαύτην, ὡς

ἐκφεύγειν τὴν αἴσθησιν ἕκαστον τῶν ἀπλῶν σωμάτων, οὐ φύσεως τοῦτό γε μόνης ἢ θεοῦ τοῦργον, ἀλλὰ καὶ ἡμέτερόν ἐστιν. οὐδὲν γὰρ χαλεπὸν ὑγροῦ καὶ ξηροῦ μέσον ἐργάσασθαι πηλὸν ἐκ τῆς τοιαύτης μίξεως, ὡσαύτως δὲ καὶ θερμοῦ καὶ ψυχροῦ, καὶ σοι φανεῖται τὸ τοιοῦτον σῶμα καὶ τῇ θερμότητι μὲν εὐκρατον, ἀλλὰ καὶ σκληρότητος καὶ μαλακότητος ἐν τῷ μέσῳ.

The total mixing of one with the other, I mean of hot, cold, dry and wet, is not possible for a human being. When earth is kneaded together with [something] wet, it seems to one that it has been combined, certainly, and in this sense a whole has been mixed with a whole; but in fact such a process is a placing alongside each other of very small parts, not a total mixture; the total mixing of the two is the work of God, and of Nature, especially in the case where the hot and the cold undergo total mixture with each other. However, to bring about a setting-alongside such that each of the simple bodies escapes perception, is not the work of Nature alone, nor of God, but is achievable by us too. For it is not at all difficult by this kind of combination to produce clay which is at the midpoint between wet and dry and also between hot and cold; and such a body will appear to you well-mixed in terms of hotness, as well as at a midpoint between hardness and softness. (Trans. Singer)

As we see from the text, Galen distinguishes between i) a mixture, which, as we have seen, using a Stoicizing terminology, he calls total (α δι' ὅλων κρᾶσις), which is due to the work of nature **and/or** God; and ii) a mixture which he calls παράθεσις [...] κατὰ σμικρὰ, that is, a juxtaposition of small particles: this is not only the product of Nature and/or God but is also attainable by human beings (οὐ φύσεως τοῦτό γε μόνης ἢ θεοῦ τοῦργον, ἀλλὰ καὶ ἡμέτερόν ἐστιν). Within this second mixture each of the simple bodies escapes sense-perception (ὡς ἐκφεύγειν τὴν αἴσθησιν ἕκαστον τῶν ἀπλῶν σωμάτων).

In order to appreciate the difference between these two kinds of mixture we have to clarify i) what Galen means when he mentions Nature and God in this passage; ii) why he says that these total mixtures of hot/cold and dry/wet can

be performed by Nature **and/or** God; and iii) which different products bring these two kinds of mixtures about.

When Galen wrote *De temperamentis*, he had already written, during his first sojourn in Rome, the first book of *De usu partium*, completing it during his second sojourn in Rome in all likelihood after the writing of *De temperamentis*.³⁷⁰ As is well known, in his *De usu partium* Galen speaks *more Platónico* of a good and wise Demiurge who would have shaped the world and the bodies of inanimate and animate beings within it.³⁷¹ When in the passage under consideration Galen speaks of a θεός who shapes the material elements in order to give form to living beings, it is plausible that he is referring to the same demiurgic entity as that present in *De usu partium*, although in *De temperamentis* the presence of such a divine principle is only touched upon. As highlighted by Kovačić, in *De usu partium*, Nature is described as a good, sapient, and creative agent (that which Kovačić calls ΦΥΣΙΣ, which stands in a synonymical relation with the divine Demiurge) that, however, actualizes itself *more Aristotelico* in an immanent principle that shapes a particular organism specifically different from within (that which Kovačić calls φύσις) according to a general teleological plan (that which Kovačić names Φύσις).³⁷²

As noted by Van der Eijk, *De temperamentis* (and more generally Galen's attempts to give an account of human nature) shows a striking combination of “top-down” and “bottom-up” explanatory strategies. As Van der Eijk remarks:

On the one hand, [in his account of ‘human nature’] Galen highlights the presence of formal, formative and unifying principles that are of a ‘higher’, even ‘divine’ origin, that are at work within the material structure of the human body and without which the explanation of its functioning and organic unity is not possible or at any rate not complete. Yet alongside these undeniable Platonist and Aristotelian tenets, we also encounter tendencies that rather belong to a ‘materialistic’, or at least anti-metaphysical framework. There is a marked

³⁷⁰ Ilberg 1892 pp. 512–513.

³⁷¹ Moraux 1984 pp. 326–327 with references.

³⁷² Kovačić 2001 pp. 210–210 and pp. 86–87. These meanings are summarized in the fourth definition of physis given by Galen and singled out by Jouanna; cf. the previous footnote n. 351.

tendency, especially in Galen's works on human physiology and pathology, to explain physical structures, systems and processes predominantly in terms of elements, elementary qualities, and their proportions.³⁷³

Galen's conception of God and nature as creative agents which—by making use of the primary qualities as if by moulding them—give form to specifically different existent beings, would fall within the framework of a “higher level” teleological explanation as opposed to a “lower level” material explanation.³⁷⁴ However, as we can observe in the text under consideration, Galen declares that this total mixture is produced (cf. the use of the term ἔργον) by Nature **and/or** God; therefore he seems to be raising doubt regarding whether it has a natural or divine origin.³⁷⁵ I believe that this total mixture has to be identified with the capacity that Nature and/or God possess of giving rise to every existent animate and inanimate being within the cosmos out of a mixture of hot/cold and dry/wet (that is, of giving rise to their homoeomerous, constitutive parts).³⁷⁶ When it comes to the formation of human beings, in his *De temperamentis* Galen speaks of a *shaping capacity* which by following a teleological design or *prôtos logos* is present in nature and uses the primary

³⁷³ Van der Eijk 2014a p. 97.

³⁷⁴ The difference between the two levels can be straightforwardly seen, as Van der Eijk remarks (cf. van der Eijk 2014a pp. 117–118), when Galen draws a distinction between bodily characteristics necessarily following from the mixtures of the body and those that are instead part of the so-called “the original plan”. *De temp.* p. 69.14–22: “But the hair on the head, in the eyebrows and in the eyelashes is already present in childhood; for this is generated not in the manner of the grass, but in the manner of plants that have been fashioned by nature in the original plan (*kata prôton logon hupo tês phuseôs apeirgasménais*): they are not a necessary consequence of mixtures (*ouk ex anankês hepomenais tais krasésin*), as has been shown, too, in *The Usefulness of the Parts*. Nonetheless, even in this case, though their existence is due to the craft of nature (*tên tês phuseôs technên*), their being black or red—or having any other distinct characteristic – is a necessary consequence of the mixture due to age” (trans. Singer). In this remarkable passage, we note the opposition between features that have been shaped, in the manner of plants, by a demiurgic nature *kata prôton logon* (i.e. the teleological organization of nature; cf. Jouanna 2012c pp. 292 ff. and *De plac. Hipp. et Plat.* CMG V 4.1.2 p. 360, 13 De Lacy), whose features necessarily (i.e. in the manner of the grass) follow from the mixtures (such as the color of the hair). As Jouanna clarifies, the same analogy between grass/plants and features that are a necessary consequence of the bodily mixtures/features that are part of the original plan is re-used by Galen in his *De usu part.* p. II.159.21 ff. H.; cf. Jouanna 2012c pp. 293–294. For the meaning and possible translations of the expression *kata prôton logon hupo tês phuseôs* cf. Jouanna 2012c p. 294 f.

³⁷⁵ I owe some reflections on this point to my supervisor, Prof. Ph. Van der Eijk.

³⁷⁶ Later on, in fact, Galen refers to the skin of the hand as the end product of the mixture of hot/cold and dry/wet performed by nature or God; cf. *De temp.* p. 34, 20–35.2 H.

qualities as its instruments (literally *organa*) in order to fashion the animal's parts in accordance with the soul traits and create, therefore, an individual living being specifically different (a thing that is impossible for human beings) and whose origin—Galen thinks—may be divine and come from above.³⁷⁷ It is

³⁷⁷ In two main passages of *De temperamentis*, Galen deals with the shaping capacity of Nature and wonders whether it may come from the mixtures themselves or whether it has a divine origin and comes from above. i) *De temp.* p. 36.20–24 H.: “for the man who is ‘well-fleshed’ to this degree is not just in the middle state with regard to moisture and dryness, but has also got an excellent shaping, which may be possibly follow from the good mixture of the four elements, but perhaps has some other source of a more divine nature, from above (οὐ μόνον γὰρ ὑγρότητός τε καὶ ξηρότητος ἐν τῷ μέσῳ καθέστηκεν ὁ οὕτως εὖσαρκος ἄνθρωπος, ἀλλὰ καὶ διαπλάσεως ἀρίστης τετύχηκεν, ἴσως μὲν ἐπομένης τῇ τῶν τεττάρων στοιχείων εὐκрасία, τάχα δέ τινα θειοτέραν ἀρχὴν ἐτέραν ἐχούσης ἄνωθεν)” ii) *De temp.* p. 79, 20–28 H.: “[the shaping capacity] is present in nature and is like a craftsman and shapes the parts in a way which is in accordance with the character traits of the soul (τῆς διαπλαστικῆς ἐν τῇ φύσει δυνάμεως οὐ μέμνηται τεχνικῆς τ’ οὐσης καὶ τοῖς τῆς ψυχῆς ἡθεσιν ἀκολουθῶς διαπλαττούσης τὰ μόρια)”. Concerning this capacity, Aristotle too, raised the question of whether this capacity perhaps derives from some more divine cause (θειοτέρας τινὸς ἀρχῆς), rather than simply that found in the hot, the cold, the dry, and the wet. Those who make rash assertions on this difficult issue, attributing this shaping to the physical qualities alone, therefore seem to me to be wrong. For it is logical that these latter are only the instruments by which it takes place, while that which actually does the shaping is something different (εὐλογον γὰρ ὄργανα μὲν εἶναι ταύτας, τὸ διαπλάττον δ’ ἕτερον). Cf. the comments on these passages made by Van der Eijk (2014a pp. 118 ff). However, I do not agree with Van der Eijk when he affirms that the shaping capacity is completely distinct from mixtures (Van der Eijk 2014a p. 119 and later p. 120), as one in fact has to distinguish i) the first shaping of an organism by nature and/or God, which make use of a total mixture of hot, cold, dry, and wet, so as to mould the parts of an individual in accordance with its soul-traits (together with all the features that are solely due to the shaping principle, such as eyelashes, eyebrows, etc.) and ii) the further physical and psychological consequences that afterwards necessarily follow from the mixtures themselves. In fact, only once a complete organism specifically different is entirely shaped (by the means of hot/cold and dry/wet), do other physical and psychological characteristics necessarily follow from the bodily mixtures of the whole organism or of its constitutive parts (i.e. the lower-level material explanation), which preserve a certain degree of autonomy—working in the manner of the grass, to use the Galenic metaphor (and in this sense I agree with Van der Eijk’s words: “an autonomy that becomes manifest in the extent to which states of the body can depart from this standard [the excellent shaping] and in the variations to this extent—variations that are the product of life-style, environmental and habitat, that are due to the peculiar history of the individual [...] and can be influenced by food, drinks and drugs operating in virtue of the same elementary qualities hot, cold, dry and wet”, Van der Eijk 2014a p. 122). In order to back up his argument, Van der Eijk quotes a passage from *De temperamentis* (p. 80.9–11 H.; cf. van der Eijk 2014a p. 120 n. 78), where Galen says: “It is also possible that this kind of feature [i.e. having a snub or a hook nose] is *work/product* [this is the same term Galen used before, when he spoke of total mixture, i.e. *ergon*; here I disagree with Singer’s translation, preferring *function*] of the shaping capacity, rather than of mixture. If, however, it were in fact a distinctive sign (*gnôrisma*) of mixture, it would only be an indicator of that [mixture] in the nose, not of that in the body as a whole”. The passage in question is difficult, but if we read carefully we understand that Galen wants to speak against those people who want to infer things about the mixture of the whole body from just a part of it (*De temp.* 79.19–20 H.). As Galen notes, his adversaries do not consider the role of the shaping capacity, which makes use of hot/cold and dry/wet as its instruments (*organa*) in order to shape the parts of the animal in conformity with the soul-traits (*De temp.* 79.20–28 H.). A certain characteristic (in this case the snubness or aduncity of the nose) can in fact be a product (*ergon*) of this shaping capacity (obtained through a total mixture of hot/cold and dry/wet), but can also follow necessarily from (in the abovementioned sense of *hepesthai*, cf. for example *De temp.* p. 60.6–12 H.) that particular mixture of that particular bodily part (and I have the impression that it is

probably for this reason that Galen uses the coordinating conjunction **καὶ/and** and then also the disjunctive particle **ἢ/or**, because in this treatise he is plausibly concerned with the origin (divine or natural, i.e. external and from above or immanent and present in nature) of this shaping capacity which makes use of hot/cold and dry/wet as its *organa*. In his *De usu partium*, he clearly attributes this shaping activity to a good and sapient divine Demiurge, which is described by Galen as acting as efficient cause on the dry and wet (the material cause) by means of the active qualities, hot and cold (the instrumental cause).³⁷⁸ It is

in this last sense that, in the passage quoted by Van der Eijk, Galen speaks of *krasis*). But since it is very difficult to judge whether the former or the latter case is correct, the physician has to be adhering to the evaluation of the particular qualitative composition of that part independently from its innermost origin (*De temp.* p. 80, 22–24 H.). Therefore, when we talk about mixture in Galen we should draw a distinction between i) total mixtures brought about by nature and/or God so as to shape an individual being belonging to a certain species according to a teleological plan (higher-level of explanation); ii) a mixture of the body or mixtures of its constitutive parts which, after the complete formation of the organism, work independently within the organism and produce effects on the organism’s psycho-physiological working (lower-level of explanation), which is the specific field of enquiry of Galen’s physio-psychology; and iii) mixtures brought about by humans in order to prepare everything the human being needs to conduct her life (food, drinks, drugs, etc.).

³⁷⁸ As Donini has shown, Galen adopts the Aristotelizing Platonist scheme of five causes (final, efficient, material, instrumental, formal); cf. Donini 1980 pp. 358 ff. Cf. *De usu part.* pp. I.343.1–344.3 H.: “ἡμεῖς μὲν γὰρ ἀπάντων οὐχ ἔν αιτίας γένος, ἀλλὰ σύμπαντα λέγομεν, ἐν μὲν τὸ πρῶτον τε καὶ κυριώτατον, ὅτι βέλτιον οὕτως, ἐφεξῆς δ’ αὐτῶ τὰ ἀπὸ τῶν ὀργάνων καὶ τῆς ὕλης, οἷς χρώμενος ὁ δημιουργὸς εἰς τὸ βέλτιον εἶδος ἕκαστον τῶν γιγνομένων ἄγει [I follow Donini’s understanding of the passage “used by the creator to lead to the better each form of everything he brings into being”, which is different from May, who construes εἶδος as βέλτιον and translates the passage as “used by the creator to confer the better form on everything he brings into being”] τὰς μὲν ἀρτηρίας τοῦ πνεύμονος μανάς, τὰς δὲ φλέβας ἐργασάμενος στεγανὰς δὲ ἦν εἶπαμεν αἰτίαν· ἐπεὶ δ’ οὕτως ἦν ἐργάσασθαι βέλτιον, ἐκ μὲν τῶν ἀρτηριωδῶν μορίων τῆς καρδίας ἐκφύσας τὰς φλέβας, ἐκ δὲ τῶν φλεβωδῶν τὰς ἀρτηρίας· ἐπεὶ δ’ ὕλην ἑκατέραις χορηγεῖν ἔδει τὴν πρέπουσαν, εἰς μὲν τὴν τοῦ πνεύματος κοιλίαν τὰς ἀρτηρίας, εἰς δὲ τὴν ἑτέραν τὰς φλέβας ἀναστομώσας· ἐπεὶ δ’ ἦν ἄμεινον τὸ δυσπαθέστερον αὐταῖς σχῆμα [i.e. the structure] περιθεῖναι, στρογγύλας ἐργασάμενος· ἐπεὶ δ’ ἐξ ὕλης τε καὶ δὲ ὀργάνων ἐχρῆν αὐτὰς δημιουργῆσαι, τὸ μὲν ὑγρὸν ἀναμίξας τῷ ξηρῷ καὶ τινὰ χυμὸν ἐξ ἀμοιβῶν οἷον κηρὸν εὐτύπωτον ἐργασάμενος ὕλην ταύτην τοῖς ἐσομένοις ὑπεβάλετο· τὸ δὲ θερμὸν τῷ ψυχρῷ κέρασας, ὄργανα ταῦτα δραστικὰ περὶ τὴν ὕλην παρεσκευάσατο, καὶ τούτων ἤδη, τὸ μὲν τι ξηραίων τῆς ὕλης τῷ θερμῷ, τὸ δὲ τι πηγνὺς τῷ ψυχρῷ, τὸ δὲ τι γεννήσας εὐκρατον πνεῦμα τῇ τούτων μίξει κάπειθ’ οὕτω διαφυσήσας τε καὶ διαστήσας τὴν ὕλην, ἀγγεῖον κοῖλον πρόμηκες ἐδημιουργήσατο, πλεόν μὲν τῆς ὕλης ἐπάρδων, ᾧ βέλτιον ἦν γενέσθαι παχύτερω, μείον δ’, ᾧ λεπτοτέρω. **ἔχεις ἀπάσας ἤδη τῷ λόγῳ τὰς αἰτίας, τὴν ἐκ τοῦ τέλους, τὴν ἐκ τοῦ δημιουργοῦ, τὴν ἐκ τῶν ὀργάνων, τὴν ἐκ τῆς ὕλης, τὴν κατὰ τὸ εἶδος.** Donini closely analyses this textual locus, where Galen explains the generation of the homoeomerous parts of the human being through the doctrine of five causes, which in this passage he declares to be i) τὴν ἐκ τοῦ τέλους, ii) τὴν ἐκ τοῦ δημιουργοῦ, iii) τὴν ἐκ τῶν ὀργάνων, iv) τὴν ἐκ τῆς ὕλης, and v) τὴν κατὰ τὸ εἶδος. The final cause is seen as “the better” in view of which the Demiurge operates, the efficient cause is the Demiurge himself, the material cause is identified by the dry and the wet, which mixed together by the Demiurge give rise to τινὰ χυμὸν ἐξ ἀμοιβῶν οἷον κηρὸν εὐτύπωτον (cf. 343.15–19), while the instrumental cause corresponds to the active qualities of hot and cold which act on the matter. As regards the last cause, Donini observes that it would make better sense to interpret Galen’s mention of **εἶδος** (343.5: “οἷς χρώμενος ὁ δημιουργὸς εἰς τὸ βέλτιον εἶδος ἕκαστον τῶν γιγνομένων ἄγει”) not as referring to a species of things but, ontologically, as referring to form as opposed to matter

plausible, therefore, that Galen brought *De usu partium* to completion after writing *De temperamentis* (as Ilberg also seems to notice). As Moraux has underscored, however, Galen himself does not know for sure what this entity is, whether it is corporeal or incorporeal or where it is located.³⁷⁹ As Moraux remarks, this demiurgic activity is not incompatible with the idea of an immanent natural principle which shapes the organism from the very beginning (that is, during the phase of embryogenesis) and structures it from within according to a teleological “evolutionary programme” of the species (the expression is taken from Moraux).³⁸⁰ As we have seen, during this first stage of development, the menstrual blood of the mother (containing within it phlegm and black and yellow bile, which in turn derive from the assimilation of the primary elements contained in food and drink) progressively form all the solid homoeomerous parts (as we have seen: through the manifold secondary and derivative *dynameis* depending upon the four basic ones, such as bone-producing, nerve-producing, flesh-producing, and so on). This shaping takes place through a progressive chain of mixtures and leads to the formation of all the parts of a completely new organism, which is then altogether made up of a mixture of hot/cold and dry/wet.

On the other hand, Nature and/or God are also responsible for the generation of all the other products generated when the basic homoeomerous parts mix in turn (such as in the case of drinks, food, and drugs): the difference is that the second type of mixture is achievable by means of humans acting as a part of the wider natural realm: for this reason, Galen says that these kinds of mixtures are achievable by humans too (in order to distinguish them from natural mixtures, we can call them artificial mixtures). As we see from the text, human beings are not able to use hot/cold and dry/wet to give rise to natural homoeomerous parts (such as stones, metals, or the biological constitutive parts of living beings: this is impossible for human beings. They cannot “create” from the primary elements and substitute themselves for Nature or God, but they can bring about mixtures that can only be defined as *paratheseis*, i.e. juxtapositions.

(*contra*, Garofalo, who translates this as “realizza il meglio di tutte le **specie** di cose che vengono fatte”): if so, it would correspond to the fifth of the causes that Galen lists at the end of the passage (otherwise Galen’s allusion to a cause *κατὰ τὸ εἶδος* would be less intelligible).

³⁷⁹ Moraux 1984 pp. 326–327 with references.

³⁸⁰ For the compatibility between an external demiurgical entity and the immanent natural principle of development, see Moraux 1984 pp. 332–333.

For they will never give rise to a natural homoeomerous part constituted by hot/cold and dry/wet: in natural homoeomerous parts it is not possible to recover the pure primary elements either mechanically or chemically insofar as pure primary elements do not exist for Galen within the cosmos—in fact they can be known only through an intellectual act; cf. *De elem.* I 5).³⁸¹ However, as in the total mixture, the simple bodies cannot be seen distinctly either, such as in the abovementioned case of clay or as in the case of the preparation of food, drinks, or pharmaceuticals.³⁸²

Now, after having made clear the main differences between these two types of mixtures, let us take a closer look at the conclusion of a passage whose preceding section we analysed above (cf. **T8**), where the moment of the recovery of the constituents from the mixture is described in detail.

T28 Galen *De elem. sec. Hipp.* K. I p. 490.13-491.4 De Lacy p. 138.7-14:

χρόνου γὰρ δεῖται τὰ σμικρὰ μόρια τῶν κεραννυμένων, ἵν' εἰς ἄλληλα δράση καὶ πάθη τελέως καὶ οὕτως ἐν ἀπεργάσῃται τὸ ὅλον καὶ ὁμοιον ἑαυτῶ πάντη. διὰ ταῦτά τοι κὰν τῷ παραχρῆμα μὲν οἷόν τε διαχωρίσαι πάλιν ἀπ' ἀλλήλων ἔνια τῶν ἀναμιχθέντων· εἰ δ' ἐπὶ πλέον χρονίσειεν | ὥς ἐνωθῆναι τὸ πᾶν, ἀμήχανον ἔτι διακρίναί τε καὶ διελεῖν ἀπὸ θατέρου θάτερον· ἀλλὰ περὶ μὲν τοῦ τρόπου τῆς δι' ὅλων κράσεως εἰρήσεται κὰν τοῖς Περὶ φαρμάκων.

The small parts of the things being mixed need time to complete their interaction and thus make the whole one and the same throughout. That is why it is possible immediately [after mixing] to separate again some of the ingredients from each other; but if a longer time has passed so that the whole has become one, there is no longer any way to divide and separate the one from the other. But we shall speak also in our work *On drugs* about the method of mixing through and through. (Trans. De Lacy)

³⁸¹ As we have already seen, see footnote 232, Kupreeva (2014 pp. 195 ff.), who connects Galen's view and a fragment by Numenius; cf. also Moraux 1984 pp. 302–303. The idea can be already found in Aristotle *De gen. et corr.* 330b21ff., which Galen knew very well.

³⁸² Boudon-Millot (2011 pp. 269 ff.) explains the connection between the *parathesis* mentioned in this very passage and the production of drugs.

In this important passage, Galen explains the phase of recovery of the ingredients. As we see, on the one hand, Galen describes this account (where—as we noted above—he describes the mixture of water and wine) as analogous to the preparation of pharmaceuticals, as we understand from the mention of the work *On drugs* which, as we pointed out, has to be identified with the work *On simple drugs*. On the other hand, we should not underestimate the fact that this key passage explaining the concrete process of mixture of the primary elements is strategically placed between the two *logoi*,³⁸³ the first centred on the exposition of the doctrine of the primary elements (the first building blocks of human nature) and the second focusing on the four humours (the secondary building blocks of human nature)—as we have seen, the mixture of the former give rise to the latter.³⁸⁴ Therefore, it also represents his general model of mixture.

In the passage in question there are some noteworthy elements: i) the reversibility of the process of mixture takes place through a process of re-division and re-separation of the constituents occurring after the unification (cf. the verbs used: διαχωρίσαι πάλιν, διακρίναι, διελεῖν); ii) the relevance of the time-variable: right after mixing it is possible to separate the ingredients from one another (although here Galen does not say how, chemically or mechanically, this re-separation process could be possible to put into practise³⁸⁵); in this sense human beings' mixtures are *paratheseis*, because—although a unification takes place at the end of the process of mixture—it is possible to recover the previous ingredients. If instead a longer time has passed it is not possible to re-gain the

³⁸³ As De Lacy points out, although Galen refers to his *De elementis* as a unique book, he divides it into two *logoi*; cf. De Lacy 1996 pp. 43–45.

³⁸⁴ As we see, this model of mixture is valid both for so-called “basic” homoeomerous parts (those deriving from the mixtures of the primary elements) and “complex” homoeomerous parts (those deriving from a mixture of—previous—mixtures). According to Fine (1995 pp. 301–302), Aristotle did not draw a distinction between the two. But if we inspect his account of mixture in *De gen. et corr.* (I 10, II 7–8), we see that Aristotle puts both kinds on an equal footing: bones, flesh (*De gen. et corr.* 334b30), the mixture of wine and water (*De gen. et corr.* I 10 328a27), or the alloy of tin and copper (*De gen. et corr.* 328b8). In his *De mixtione* Alexander follows the same path.

³⁸⁵ In his *De mixtione*, as we saw in footnote n. 170, Alexander is much more precise and gives us some examples of (chemical and mechanical) separation of the mixture.

ingredients and the mixture will be indissoluble: this kind of mixture (like that one that only Nature and/or God can perform) is called total mixture (δι' ὅλων κράσεως), a definition that is clearly applied to the preparation of drugs (as if the physician's work could be assimilated to that of Nature or of God, creating new beings out of the primary elements). In this mixture the constituents have been welded together over time such that it is not possible to go back.

At any rate, one question remains: in the case of reversible mixtures, once recovered, will the constituents be the very same as those which gave rise to the mixtures? As we have learned, the difference between the Stoic and the Peripatetic accounts is that the Stoics claim to recover the very same ingredients of the mixture, whereas Alexander stated that the recovered constituents can only be specifically identical. What is then Galen's position in this regard?

T29 Galen *De elementis sec. Hipp.* K. I pp. 495.16-497.3 De Lacy 142.17-144.7:

(1) ἔν μὲν γάρ τι φαίνεται τὸ αἷμα καθάπερ καὶ τὸ γάλα. διδάσκει δ' ὁ λόγος οὐχ ἔν ὑπάρχειν αὐτὸ καθότι μηδὲ τὸ γάλα. τὸ μὲν γὰρ ἄκρως ἐστὶν ὀρρῶδες καὶ λεπτὸν ἐν τῷ γάλακτι, τὸ δ' ἄκρως τυρῶδες καὶ παχύ. ταῦτα δ' ἕως μὲν ἐκέκρατο πρὸς ἄλληλα, μέσον ἀπειργάζετο τὸ γάλα τυροῦ καὶ ὀρροῦ, διακριθέντα δὲ τὴν τ' οἰκείαν ἰδέαν ἐνεδείξατο καὶ τὴν τοῦ γάλακτος ἔδειξε φύσιν, ὡς οὐκ ἄρ' ἐν ἧν ἀκριβῶς, ἀλλ' ἐξ ἐναντίων τε καὶ διαφερόντων συγκείμενον. (2) ὡς οὖν ἐν τῷ γάλακτι τὸ μὲν ἐστὶν ὀρρός, τὸ δὲ τυρός, οὕτως ἐν αἵματι τὸ μὲν οἷον ἰχώρ αἵματος ἀνάλογον ὀρρῷ γάλακτος, τὸ δ' οἷον ἰλύς τις καὶ τρυξ ἀνάλογον τῷ τυρῷ. [...] τὸ μὲν γὰρ ἐρυθρὸν ἀκριβῶς φαίνεται, τὸ δὲ ξανθότερον τούτου, τὸ δὲ μελάντερον. ἔστιν ὅτε δὲ καὶ σαφῶς ἐπανθεῖ τι λευκὸν αὐτῷ καὶ ποτε πελιδνὸν ἅπαν | ἐφάνη καὶ νῆ Δία γε πολλάκις ἐγγὺς τῷ μέλανι καθάπερ τις πορφύρα κατακορῆς, ὥστ' οὐχ ἔν ἀκριβῶς τὸ αἷμα.

(1) For blood, like milk, appears to be some one thing; but reason teaches us that it is not one thing, just as milk is not. One part of milk is extremely serous and thin, another is extremely cheese-like and thick. As long as they were mixed together they produced milk midway between cheese and whey; but when

separated they exhibited their own proper form and revealed the nature of milk, that it was in fact not just one thing but a composite of opposite and differing things. (2) As then in milk there is whey and there is cheese, so in blood there is a kind of serum analogous to the whey in milk, and there are dregs, as it were, and lees analogous to the cheese. [...] one (blood) is pure red in appearance, another is yellower than that, another darker. At times there is a clearly white efflorescence in it, and sometimes the whole of it appears livid, and often, by Jove, nearly black, like some deep purple dye; therefore, blood is not just one thing.

As we see from the text, Galen establishes an analogy between blood (more precisely, the menstrual blood of the mother, which is a mixture of blood, phlegm, and yellow and black bile; cf. **T29.2**) and milk (which is created when cheese and whey meet half-way; cf. **T29.1** “μέσον ἀπειργάζετο τὸ γάλα τυροῦ καὶ ὀρροῦ”, the same example Alexander gives at *De mixtione* 231,30, where, in addition, he also speaks of a catalyst, a heated stone cast into the milk, forcing the separation). Both are in fact regarded as a seemingly homogeneous mixtures made up of different constituents; when Galen describes the separation process of milk into whey and cheese, he declares that the components “when separated they exhibited their own proper form and revealed the nature of milk” (cf. **T29.1** “διακριθέντα δὲ τὴν τ' οἰκείαν ἰδέαν ἐνεδείξατο καὶ τὴν τοῦ γάλακτος ἔδειξε φύσιν”). As we see, the term ἰδέα (which here does not refer to the Platonic meaning, given that it does not refer to eternal and superspatiotemporal essences³⁸⁶) probably indicates the external and visible appearance of both the constituents, whey and cheese.³⁸⁷

In this case, we can say that is very hard to pinpoint Galen’s own position in this regard, that is, whether by making usage of the example of the separation of milk into whey and cheese he means that is possible to recover the very same

³⁸⁶ On the Platonic theory of ideas see Baltes and Lakmann 2005 pp. 1–23. As De Lacy remarks, Galen sometimes uses this term with reference to Plato’s conception; cf. De Lacy 1991 p. 294.

³⁸⁷ A possible objection would be that milk is a natural homoeomerous part (therefore, a product of a total mixture) that can instead be separated into cheese and whey. Indeed, in the case of milk it is not possible to recover its basic constituents (i.e. fire, air, water, and earth). But we can hypothesize that Galen wants to explain the causal mechanism of separation and the generation of two resultant components (which we claim would be only *similar*, and not identical) without properly dealing with the recovery of the previous constituents; the same happens in Alexander—cf. *De mixt.* 231.30–232.3 Bruns; cf. Kupreeva 2004a pp. 311–312.

constituents that gave rise to milk or whether he intends to say that these constituents are only specifically the same. We can observe that Galen once more takes an anti-dogmatical position against this last critical point concerning the reversibility of the constituents: he does not explicitly say that the recovered constituents can be specifically identical, but, on the other hand, he says that the constituents will have to be the same, at least according to their *ιδέα* or external form/appearance, a claim which—although anti-dogmatic—seems again to be in line and consistent with the Peripatetic account, as in Aristotelian thinking the external form *ιδέα/μορφή* is in any case linked to the internal structure of a composite belonging to a certain species.³⁸⁸

However, we register a development in comparison to the Aristotelian/Peripatetic model. If (as we have seen), Aristotle declares that is possible to recover the constituents and does not explain how, and if Alexander offers some examples of chemical and mechanical separation in order to show that in contrast to the Stoic account, the recovered constituents can be only specifically different (although Alexander does not discuss the case of the reversibility of a natural homoeomerous part), Galen also contemplates the possibility of non-reversible mixtures: so-called total mixtures.

On the one hand, Galen singles out a total mixture performed by Nature and/or God whose products are the homoeomerous parts of compound natural bodies (inanimate and animate). Ultimately, in living beings this gives rise to a chain of mixtures bringing about the complete formation (*diaplasia*) from within of a new organism belonging to a certain species. We underlined that Galen assigns to Nature and/or God (as we saw, at the time of *De temperamentis* he is still in an enquiring phase) the power of making use of hot/cold and dry/wet, totally mix them and giving rise to every existent being from within through a series of progressive mixtures whose particular combinations/proportions always bring about increasingly new supervening higher-level qualitative determinations (**as we have seen: from food and drink to the four humours present in the menstrual blood, from these to homoeomerous parts, up to the formation of the entire living being belonging to a certain species according**

³⁸⁸ Cf. *Metaph.* 1029a3f.

to an overall teleological plan). And in this sense his speculation is perfectly in line with the Peripatetic thought of his time. These mixtures are irreversible simply because one cannot recover the primary elements they are made up of: as we have shown, primary elements cannot even exist in their pure state within Galen's cosmos.

On the other hand, he also assigns a prominent role to the mixtures that human beings can produce, yielding the generation of food, drinks, drugs, and every other product obtained by means of human action. In contrast to the philosophical tradition he patently draws on (which does not stress this point), he establishes a neat separation between these two kinds of mixtures, as he wants to call attention to the fact that human beings *too* can bring about mixtures. In fact, Galen was a physician, and for a physician, who needs to deal with the preparation of drugs or with dietary prescriptions, it was crucial and all-important to mix the ingredients well in order to produce drugs, foods, and drinks and to know their nutritive and curative properties. Among all the possible mixtures that human beings can produce, a special status is held by medicaments. Like the total mixtures performed by Nature and/or God, they are not reversible into their initial constituents, as if they were also a "creative" act comparable to those of a demiurgic entity; but this is not strange at all in Galen's world-view which as we will see in the next chapter it is not only anthropocentric but even "doctor-centric"—its centre and perfect midpoint between hot/cold and dry/wet and in comparison with all the bodies subject to generation and corruption is the hand of the physician.

Chapter II

From the mixture to the mixtures. Galen's system of nine mixture.

2.1 Galen's *De temperamentis* Book I and his system of nine mixtures

Galen's *De temperamentis* Book I provides a smooth transition from his elementary Physics and theory of elemental mixture, seen from a physical standpoint (which is mainly given throughout his *De elementis* and his *Commentary on Hippocrates' Nature of Man*), to his account of mixture as applied to physiology (*De temperamentis* Book II), and to the basis of his pharmacological doctrines (Book III). More precisely, in this first book Galen

aims to find out “all the distinct types of mixtures: how many there are, and of what kind, as one separates them by genus and species”;³⁸⁹ in this case, not the mixtures that human beings can bring about but the bodily mixtures of animals (ζῷα) understood both as those which generate out a complete new organism specifically different (at a higher level of explanation) and as physiological structures autonomously working within a specific organism (and whose functioning does not affect the very essence of that organism, at a lower level of explanation).

Although we have demonstrated the strict dependence of Galen’s own account of mixture on the Peripatetic model of mixture of his times (which was harmonically integrated with a revised theory of the four humours of Hippocratic origin), in their accounts of mixture, neither Aristotle nor Alexander (or any other preceding Peripatetic) develop a precise classification of the typologies of mixtures. That is probably due to the fact that a classification of mixtures is needed above all for medical purposes (recognizing the type of imbalance within a certain mixture meant finding an adequate therapeutic treatment), whereas the theoretical rationale of Aristotle’s account of mixture was that of explaining the extreme variety of chemical combinations and of biological tissues, while Alexander’s main justification in his *De mixtione* was instead that of developing a systematic critique against the oncoming Stoic alternative. Hence, Galen had to look elsewhere to work out a proper and original classification that could be adjusted to his own medical and philosophical theories.

In fact, as we will see in this chapter, on the one hand Galen deals with the earlier medical and philosophical traditions and recaps the opinions of his predecessors and, on the other, he engages in a fervent polemic against the Pneumatists and the founder of the school, Athenaeus of Attalia, on the most well-mixed mixture. In this second chapter, we will bring to the foreground Galen’s earlier and later medical and philosophical *milieus* in order to reconstruct the historical and theoretical sources of his scheme of nine mixtures (eight bad mixtures and one good mixture) and weigh up his original contributions to the earlier philosophical and medical tradition. Moreover, we will show that the scheme of mixtures is not fixed but, on the contrary, can

³⁸⁹ *De temp.* p. 1.7–8 H.

change from species to species and from genus to genus and that this has direct implications on Galen's teleological outlook concerning not only the generation and development of a single living organism as specifically different (as we have seen) but, more broadly, his entire world-view.

2.2 Galen against his predecessors and contemporaries and his criticism of Athenaeus of Attalia and his followers in *De temperamentis* Book I

Galen begins the exposition of Book I of *De temperamentis* by pointing out that the best among the ancient physicians and philosophers had already demonstrated that the bodies of living beings are made up of a mixture of hot, cold, dry, and wet, in unequal parts.³⁹⁰ Although Galen does not give the names of the authorities to which he is referring, he seems to be referring to past authorities, as he calls them “παλαιοὶ”.³⁹¹ More precisely, in *De temperamentis* I 1 Galen identifies two groups of thinkers: i) a first group according to which there are four mixtures: a **wet and hot** one as opposed to a **wet and cold** one, and a **dry and cold** one as opposed to a **dry and hot** one, and ii) a second group according to which it is impossible to have a hot and wet and a cold and dry mixture, whereas there are instead only two types of mixtures: a **hot and dry** mixture and a **cold and wet** mixture.³⁹²

On the one hand Galen dedicates two of incisive lines to a description of the second system, made up of two types of mixtures: as he maintains, these thinkers would have said that “when the hot is dominant the wetness will be consumed by it and thus the body will become hot and dry (δαπανᾶσθαι μὲν γὰρ ὑπὸ τοῦ θερμοῦ κρατοῦντος τὴν ὑγρότητα καὶ οὕτω θερμὸν ἅμα καὶ ξηρὸν γίγνεσθαι τὸ σῶμα); but in bodies where the hot is weak, the wetness remains undigested and unable to be processed (μένειν δ' ἄπεπτόν τε καὶ ἀκατέργαστον); so that it is necessary that dryness will follow in cases of dominant hotness, and

³⁹⁰ *De temp.* p. 1.1–4 H..

³⁹¹ *De temp.* p. 1.3–4 H. “παλαιοῖς ἀνδράσιν ἰκανῶς ἀποδέδεικται φιλοσόφων τε καὶ ἰατρῶν τοῖς ἀρίστοις”; cf. also *De temp.* 7.3–4 H.

³⁹² *De temp.* p. 2.4–12 H.

wetness will be the consequence in cases of predominant coldness (ὥστ' ἀναγκαῖον εἶναι θερμότητος μὲν ἐπικρατούσης ἔπεσθαι ξηρότητα, ψυχρότητος δὲ πλεονεκτούσης ἀκολουθεῖν ὑγρότητα). In this way, then, these people have persuaded themselves that there are in total two distinct types of mixture³⁹³ a hot/dry one and a cold/wet one.³⁹⁴

³⁹³ *De temp.* p. 2.14–21 H.

³⁹⁴ Although, as I have hinted, Galen does not name these ancient authorities who theorized this bipartite scheme of mixtures, this description echoes some passages of *De Victu*, a treatise which Galen knew (although he rejects it as not genuinely Hippocratic, probably because of a binary elemental system—cf. Smith 1992 p. 263 ff.). As is well known, in *De victu*, a well-balanced mixture of fire and water makes up the physical constitution of the healthiest man (*Vict.* I CMG I 2.4 Joly I 32 p. 148, 3–4) as well as his soul (CMG I 2.4 p. 142, 6–8 Joly). Each of these two elements, fire and water, is associated with two primary qualities: fire is hot/dry and water is cold/wet: neither fire and water exist in separation but are always mixed with each other since they preserve something of the other element; water has the dry from fire and fire has the wet from water (CMG I 2.4 p. 128.20–22 Joly “τούτων δὲ προσκεῖται ἐκατέρῳ τάδε· τῷ μὲν πυρὶ τὸ θερμὸν καὶ τὸ ξηρὸν, τῷ δὲ ὕδατι τὸ ψυχρὸν καὶ τὸ ὑγρὸν· ἔχει δὲ ἀπ' ἀλλήλων τὸ μὲν πῦρ ἀπὸ τοῦ ὕδατος τὸ ὑγρὸν· ἐνὶ γὰρ ἐν πυρὶ ὑγρότης· τὸ δὲ ὕδωρ ἀπὸ τοῦ πυρός τὸ ξηρὸν”). For these two elements, fire (which is said to move everything) and water (which is said to nourish everything), seem to be compresent within the same mixture and show a dynamic relation so that each dominates and is dominated in turn, by alternately reaching the greatest minimum and the greatest maximum (CMG I 2.4 126.10–11 Joly “ἐν μέρει δὲ ἐκάτερον κρατεῖ καὶ κρατεῖται ἐς τὸ μῆκιστον καὶ τὸ ἐλάχιστον ὡς ἀνυστόν”). The fire reaches its maximum by going over the last part of water, but it lacks of nourishment (which it has as it consumes the water) and turns back to where it will again find nourishment; the water reaches its maximum by going over the last part of fire, and when this happens, the water stays still. But when it stays still, it is no longer dominant, but is consumed and becomes nourishment for fire, which assails it (CMG I 2.4 126.11–15 Joly “τὸ μὲν πῦρ ἐπεξιὸν ἐπὶ τὸ ἔσχατον τοῦ ὕδατος, ἐπιλείπει ἢ τροφή, ἀποτρέπεται οὖν ὅθεν μέλλει τρέφεσθαι· τὸ δὲ ὕδωρ ἐπεξιὸν ἐπὶ τὸ ἔσχατον τοῦ πυρός, ἐπιλείπει ἢ κίνησις, ἵσταται οὖν ἐν τούτῳ, ὅταν δὲ σπῆ, οὐκέτι | ἐγκρατές ἐστίν, ἀλλ' ἤδη τῷ ἐμπίπτοντι πυρὶ ἐς τὴν τροφήν καταναλίσκεται”). On the fire/water relation in *De victu* cf. Bartoš 2014 pp. 293–295. So even if these two elements can assume various forms (CMG I 2.4 p. 126.23 Joly “πολλὰς καὶ παντοδαπὰς ιδέας”), and they are different to one another in respect to appearance and power (CMG I 2.4 p. 126, 24–25 Joly “οὐδὲν ὁμοίων ἀλλήλοισιν οὔτε τὴν ὄψιν οὔτε τὴν δύναμιν”), they can in turn reach a maximum and a minimum and give rise to two distinct elements: fire (hot/dry) when fire is at its maximum and water (cold/wet) at its minimum, and when the opposite takes place, water. Their relation is comparable to Aristotle's potentiality/actuality relation between contraries, only here we have an elemental binary system where the hot/dry element preserves a wet component and the cold/wet element preserves a dry component. And it is thanks to this dry/wet contrariety that both the elements prevail in turn over one another. It is important to point out that we will never have two pure primary elements; they will be always mixed with each other: we can see that the boundaries between **elements** and **elemental mixture** are extremely blurry. As we have seen, the very same relation is assumed in the case of Aristotle's simple bodies, which are always thought of as *miktá* (with the others); cf. *De gen. et corr.* 330b22 ff. And whereas fire and earth are conceived as extremes, air and water are thought of as “intermediate and **more** mixed (μέσα δὲ καὶ μεμιγμένα μᾶλλον 330b24). It seems to me that there are elements of similarity between *De victu*'s theory of mixture and Galen's account of the predecessor(s) who theorized two types of mixture: a) there are two couples of qualities (hot/dry and cold/wet), which are indissolubly linked with one another: the hot co-exists only with the dry and the cold only with the wet; b) the two couples of qualities are both present in the mixture but only one is dominant, while the other one is dominated (cf. the use in *De victu* of the verb κρατέω in reference to hot dry fire and wet cold water and in *De temperamentis* of ἐπικρατέω and πλεονεκτέω in reference to heat, which also has the power of drying moisture, and to coldness, which has also the power of moistening dryness); c) the cold/wet is consumed

On the other hand, Galen describes the arguments of those who do not accept what he calls the *πρῶτον ἀξίωμα*, i.e. that moisture would be dried out by the prevailing heat.³⁹⁵ For they think that “the function of the hot is to heat, as that of the cold is to cool, of the dry to dry, and of the wet to moisten (*πρῶτοι τοῦ θερμοῦ μὲν ἔργον εἶναί φασι τὸ θερμαίνειν ὥσπερ τοῦ ψυχροῦ τὸ ψύχειν, τοῦ ξηροῦ δ' αὖ τὸ ξηραίνειν ὥσπερ τοῦ ὑγροῦ τὸ ὑγραίνειν*)”. According to Galen, these thinkers would affirm that each quality has its own inalienable function (*ἐν ἑκατέρας κἀνταῦθα ποιότητος ἔργον ἐχούσης ἀχώριστον*), and it does not necessarily follow that that which is hot also dries at the same time. Galen marshals several examples to back up this line of reasoning aimed at separating the power of heat from a drying action and the power of cold from a moistening action: a) he lists various examples taken from common sense-perception, e.g. bodies which are naturally dry and hot, which heat in virtue of their hotness and dry in virtue of their dryness (“*καὶ διὰ τοῦθ' ὅσα μὲν σώματα θερμὰ τὴν φύσιν ἐστὶν ἅμα καὶ ξηρὰ [...] ἧ μὲν θερμά, θερμαίνειν, ἧ δὲ ξηρά, ξηραίνειν*”), like a fire, or the double power of the summer sun as it not only

by the hot/dry—when the hot/dry is weak, the cold/wet remains stagnant (*De victu*: fire consumes water; *De temperamentis*: the dominant heat consumes the moisture by a drying action; *De victu*: when water is predominant, reducing the power of fire, the water keeps still—*ἴσταται/σῆ*; *De temperamentis*: when the heat is weak, the moisture remains uncooked and undigested—*μένειν δ' ἄπεπτόν τε καὶ ἀκατέργαστον*); d) further, in *De victu* LXXIX CMG I 2.4 p. 210, 24–27 Joly, right at the beginning of the chapter it is said: “*διαχωρῆει τὸ στίον αὐτέοισιν ὑγρὸν ἄπεπτον [...] πάσχουσι δὲ τοῦτο μάλιστα αἱ κοιλίαι ὅσαι ὑγραὶ καὶ ψυχραὶ εἰσιν· διὰ μὲν τὴν ψυχρότητα οὐ ξυνεψεῖ, διὰ δὲ τὴν ὑγρότητα διαχωρῆει* (their food passes watery and undigested; [...]) It is especially bowels that are cold and moist that show these symptoms. The coldness prevents digestion, and the moistness makes the bowels loose [therefore, the lack of hotness produces humidity and reduces the capacity of digestion]”; e) the fact that in *De Victu* the author is speaking of mixture seems to be clear from the fact that when he accounts for the relationship between fire and water, he also claims that these two elements are always changing into this or to that (*De victu* CMG I 2.4 p. 126.25–26 Joly “*ἀλλ' αἰεὶ ἀλλοιούμενα ἐπὶ τὰ καὶ ἐπὶ τὰ*”) and that they change by mixing or being separated (CMG I 2.4 p. 126, 27–28 “*συμμισγόμενα δὲ καὶ διακρινόμενα ἀλλοιοῦται*”), in addition saying later on that in his opinion these two terms are really what he means (CMG I 2.4 p. 128.6–11 Joly “*Ὅ τι δ' ἂν διαλέγωμαι γενέσθαι ἢ ἀπολέσθαι, τῶν πολλῶν εἵνεκεν ἐρμηνεύω· ταῦτα δὲ ζυμμίσεσθαι καὶ διακρίνεσθαι δηλῶ· ἔχει δὲ ὧδε· γενέσθαι καὶ ἀπολέσθαι τῶντῶ, ζυμμιγῆναι καὶ διακριθῆναι τῶντῶ, ἀξηθῆναι καὶ μειωθῆναι τῶντῶ, γενέσθαι, ζυμμιγῆναι τῶντῶ, ἀπολέσθαι, μειωθῆναι, διακριθῆναι τῶντῶ, ἕκαστον πρὸς πάντα καὶ πάντα πρὸς ἕκαστον τῶντῶ, καὶ οὐδὲν πάντων τῶντῶ· ὁ νόμος γὰρ τῆ φύσει περὶ τούτων ἐναντίος*”). I am grateful to Hynek Bartoš for drawing my attention to the fact that, in the abovementioned passage from *De temperamentis*, Galen speaks of hot and dry and a cold and moist *mixtures*, while in *De victu* fire and water are *elements*; but, as we have seen, fire and water do not seem to be conceived as separated—they are always together as indissoluble parts of a whole, the mixture, which reaches the greatest maximum (extreme hotness and dryness or extreme coldness and moisture) and a greatest minimum.

³⁹⁵The section I am referring to is *De temp.* p. 2.22–5.20 H.

heats but also dries out the body of people who spend too much time outside during the summer; moreover, he quotes the case of hot and wet bodies that at the same time heat and moisten, such as hot water, which Galen calls “sweet” waters (ὡσπερ τὰ λουτρὰ τῶν γλυκέων ὑδάτων); b) examples from the literature: for Galen in fact makes recourse to a Homeric quotation (Il. XXI 346-7) that testifies the presence of a wind that is cold and dry at the same time, Borea; c) a pharmacological example: the power of cooling and drying at the same time in poppy juice; d) an argument taken from Aristotle’s account of change, according to which “what is changing must, in the respect in which it is changing, be moving towards the opposite (τὸ γὰρ μεταβάλλον, ἢ μεταβάλλει, ταύτη μεταχωρεῖν δεῖ πρὸς τοῦναντίον)”.³⁹⁶ According to these thinkers, as Galen declares at the conclusion of this section, reasoning and examples demonstrate that there could be a mixture of hot and wet and cold and dry (ἅμα δ' ὑγρὸν τι καὶ θερμὸν καὶ ψυχρὸν ἅμα καὶ ξηρὸν εἶναι δυνατόν, ὡς ὁ τε λόγος ἀπέδειξε καὶ τὰ μικρῶ πρόσθεν εἰρημένα παραδείγματα), in contrast to those who held this to be impossible.³⁹⁷

³⁹⁶ Cf. the following footnote.

³⁹⁷ It is very difficult to point to a precise reference but this group of ancient physicians and philosophers to which Galen refers seems to place itself within what Galen regarded as a genuinely Hippocratic theoretical framework which, according to Galen, matches Aristotle’s physical doctrines. In fact, the separation of the four actions of cooling, heating, drying, and moistening seems to be attested to in Chapter 2 of *De natura hominis*, where the author raises a criticism not only towards those who think that there is only one element from which everything comes to be, but also against those who think that there is a unique substance modified by the contrariety of hot and cold from which all the other couples of opposites are generated: sweet/bitter, black/white, and so on. The Hippocratic author assimilates this theoretical position to that of the monists, as it is declared that these thinkers believe in the existence of a unique substance that is progressively modified by a first couple of contrariety (hot/cold), although it does not seem to be possible to recognize with certitude the polemical target of the Hippocratic author (CMG I 1.3 p. 166.15–168.2 Jouanna: “Τῶν δὲ ἰητρῶν οἱ μὲν τινες λέγουσιν, ὡς ἄνθρωπος αἷμα μόνον ἐστίν, οἱ δ' αὐτέων χολήν φασιν εἶναι τὸν ἄνθρωπον, ἐνιοὶ δὲ τινες φλέγμα: ἐπίλογον δὲ ποιεῦνται καὶ οὗτοι πάντες τὸν αὐτόν: ἐν γὰρ τι εἶναι φασιν, ὃ τι ἕκαστος αὐτέων βούλεται ὀνομάσας, καὶ τοῦτο ἐν ἐὸν μεταλλάσσειν τὴν ἰδέην καὶ τὴν δύναμιν, ἀναγκαζόμενον ὑπὸ τε τοῦ θερμοῦ καὶ τοῦ ψυχροῦ, καὶ γίνεσθαι καὶ γλυκὸν καὶ πικρὸν καὶ λευκὸν καὶ μέλαν καὶ παντοῖον”; cf. also Jouanna comm. *ad loc.*). By contrast, the author says that there are four main powers (heating, cooling, drying, and moistening), reciprocally interacting, because of which the body gets sick (CMG I 1.3 p. 168.2–8 Jouanna: “Ἐμοὶ δὲ οὐδὲ ταῦτα δοκεῖ ὧδε ἔχειν· οἱ μὲν οὖν πλείστοι τοιαῦτά τινα καὶ ἐτι ἐγγύτατα τουτέων ἀποφαίνονται. Ἐγὼ δὲ φημι, εἰ ἐν ἧν ὁ ἄνθρωπος, οὐδέποτε ἂν ἤλγεεν· οὐδὲ γὰρ ἂν ἦν ὑφ' ὅτου ἀλγήσειεν ἐν ἐόν· εἰ δ' οὖν καὶ ἀλγήσειεν, ἀνάγκη καὶ τὸ ἰώμενον ἐν εἶναι· νυνὶ δὲ πολλὰ· πολλὰ γάρ ἐστιν ἐν τῷ σώματι ἐνεόντα, ἃ, ὀκόταν ὑπ' ἀλλήλων παρὰ φύσιν θερμαίνηται τε καὶ ψύχεται, καὶ ξηραίνηται τε καὶ ὑγραίνηται, νόσους τίκτει· ὥστε πολλὰ μὲν ἰδέαι τῶν νοσημάτων, πολλὴ δὲ καὶ ἡ ἴησις αὐτέων ἐστίν”). In order to support the previous statement that each of the qualities has its own inseparable action and, therefore, the hot cannot also have a drying function, as the cold cannot also have a moistening function, Galen gives the example,

Galen mentions a third group of thinkers according to which there are four mixtures, but accounted for in a different manner. In their view, heat not only

clearly appealing to Aristotle's physical doctrines (which in Galen's views are totally in agreement with Hippocrates, cf. the beginning of I 5 in *De elem. sec. Hipp.*), of a qualitative change from the opposite poles of a contrariety so as to show that if something changes, it changes into its opposite, i.e. white turns into black in the same way that hot turns into its opposite, cold (*De temp.* p. 4.7–13 H.—“we say that a person became, or is becoming, skilled in music. Evidently [he does so] from [a state of] not being skilled in music; and similarly, someone becomes skilled in reading and writing from [a state of] not being skilled in this way, and someone becomes skilled in public speaking from [a state of] not being skilled in this way”; see *De temp.* p. 4.22–26 H. and for a parallel *De gen. et corr.* 323b19 ff.). This qualitative change or *alloiōsis* is put on equal footing with the half-way qualitative change occurring in the mixture when the hot and the cold assimilate to each other and find a midpoint; in fact, as we have already noted, in Galen's oversimplified Aristotelian Physics no distinction is drawn between what, according to Aristotle, is *alloiōsis* and what is mixture (nor, as we have seen, between these changes and the substantial generation). Moreover, this group of thinkers Galen speaks of, although having recognized that each quality has its own distinctive power, is reported to have identified four different mixtures: i) hot/wet, ii) hot/dry, iii) cold/dry, and iv) cold/wet. In this case too, we find a correspondence between the Hippocratic and Aristotelian traditions. Indeed, in the *Nature of Man*, the human being is regarded as a mixture of the four humours where each of the humours (which alternatively prevails over all the others due to external or internal factors) is associated with a *couple* of primary qualities, so that we altogether have four bodily mixtures: i) phlegmatic (cold/wet), ii) sanguineous (hot/wet), iii) bilious (hot/dry), and iv) melancholic (cold/dry). On the other hand, in his elemental theory, mainly expressed in his physical writing *De gen. et corr.*, although Aristotle does not work out a scheme of mixtures, as we have noted, the simple bodies themselves are conceived as “mixed” insofar as they never exist in a pure state. Therefore we have a quadripartite system of “mixtures” (if we think of the simple bodies as “mixed”): i) a fiery body (where hot and dry prevail over the others), ii) an airy body (where hot and wet predominate over the others), iii) a watery body (where cold and wet prevail over the others), and iv) an earthy body (where cold and dry prevail over the others). A further point can be made in favour of our reading: in Galen's view there is another treatise of the Hippocratic Collection that is regarded as perfectly in agreement with the *Nature of Man: On air, waters, places*. This is because it is based on the theory of mixture of hot/cold and dry/wet as primary building blocks of the cosmos (cf. *Quod animi mor.* K. IV p. 799). This treatise provides us with two passages that parallel the section of Galen's *De temperamentis* which lists, among other examples, that of hot sweet waters (*De temp.* p. 3.6–9 H.) and that of the wind Boreas (*De temp.* p. 3.20–26 H.). On the one hand, the Hippocratic author of *On air, waters, places*, when he describes the sun's double power of drying and heating as applied to the process of formation of the rain water, analogously to Galen's passage, compares the process of the formation of rain to the evaporation of sweat due to the drying action of the sun (cf. *Aer.* CMG I 1.2 p. 40.17 ff. Diller); moreover, analogously to Galen's passage, in the same textual locus, the Hippocratic author speaks of hot “sweet” waters which are the result of sun's heating power, as the sun's heat would exert a “sweetening” function on the remaining part of the water which does not evaporate (cf. *Aer.* CMG I 1.2 p. 42.1 ff. Diller). On the other hand, however, in the same text the northerly wind, Boreas, is described as having a drying and cooling action (cf. *Aer.* CMG I 1.2 p. 50.5 Diller); in Galen's text too there is a reference to Boreas' power of cooling and drying which is supported by the Homeric quotation, as we have noted. To sum up, although in Galen's section no mention is made of the genuine Hippocratic (in Galen's view) doctrinal core nor of Aristotle's physical doctrines, the correspondences we have found are striking and noteworthy. For if our reading of the text is plausible, then we can infer some important points from it: i) Galen does not quote directly his predecessors because he does not want to appear in open contrast with them and indeed he is not: as we showed, he inherits both these archaic traditions (although updating and aligning them with his own times) and, ii) Galen uses the sources quite peculiarly: behind the reference to a group of thinkers there is no a single medical or philosophical tradition or authority, but a smooth abridgement of Hippocratic and Aristotelian physical doctrines which seems to be consistently re-worked so as to bring out an alleged quadripartite system of mixtures (which is indeed absent in the writings Galen would refer to).

has the power of warming, but also the power of drying, because it is the most active of the four qualities (ὑποκειμένου τοῦ θερμοῦ δραστικωτάτου τῶν τεττάρων); but this double power of heat does not prevent a new-born animal from having a hot and wet mixture at the moment of its first generation. Over time, however, bodily moisture is consumed by heat: consequently, the body dries out and gets hot and dry rather than hot and wet (ἀεὶ γὰρ ἐξικμαζόμενον ὑπὸ τοῦ θερμοῦ τὸ ὑγρὸν ἐν τῷ χρόνῳ ξηρὸν ἀποδείξει τὸ σῶμα καὶ οὕτως οὐκ ἂν ἔτι θερμὸν καὶ ὑγρὸν, ἀλλὰ θερμὸν εἶη καὶ ξηρὸν). But over a much longer period of time, the adult animal's hot and dry mixture becomes cold and dry because, as soon as the heat has entirely consumed the moisture of the body, it will begin to fade out, no longer abounding from the nourishment from which it was kindled (ἐπειδὴν γὰρ ἐκβοσκήσεται τὴν ἰκμάδα πᾶσαν αὐτοῦ τὸ θερμὸν, ἄρχεσθαι τοῦντεῦθεν ἤδη φασὶ καὶ αὐτὸ μαραίνεσθαι μηκέτ' εὐποροῦν τροφῆς, ὅθεν ἐξήπτετο). As we see, therefore, the latter two groups of thinkers (both attacking the former theory of two mixtures) hold different opinions on the powers of the qualities: according to the first group, a quality could have only one corresponding power, the hot the power of heating, the cold the power of cooling, the dry the power of drying, the wet the power of moistening. That is, 1 quality = 1 power. The second group of thinkers instead stresses the pivotal role played by heat, which is deemed to be the most active quality, having not one but two powers (1 quality = more powers), and describes a sort of “biological cycle of mixtures” according to which the first stage would correspond to the hot and wet mixture of the new-born animal, which is regarded as the best mixture (cf. *De temp.* p. 8 Helmreich). After this, the hot will progressively exert its drying function, the mixture of the adult animal will become hot and dry, but over time the heat will suffer from a lack of nourishment (moisture) and will fail, finally bringing about the old animal's dry and cold mixture (δυνατὸν δὲ καὶ τῷ χρόνῳ προϊόντι γενέσθαι τὴν τέως ὑγρὰν καὶ θερμὴν κρᾶσιν αὖθις ξηρὰν καὶ θερμὴν, ὥσπερ αὖ πάλιν τὴν ξηρὰν καὶ θερμὴν ἀποσβεννυμένου τοῦ θερμοῦ ψυχρὰν καὶ ξηρὰν ἀποτελεσθῆναι).³⁹⁸

³⁹⁸ *De temp.* p. 5.13–6.13 H. The biological cycle of mixtures which Galen describes bears some resemblances with Aristotle's account of the ageing process, which is due to the progressive extinction of the innate or vital heat (for the various names Aristotle makes use of to refer to the same concept, cf. Bartoš 2014 p. 290 with n. 3) which is principally and directly responsible for

After having summarized the opinions of the most illustrious physicians and philosophers before him regarding mixture, in *De temperamentis* I 3 Galen begins a polemic against the group of thinkers who think there are four types of mixture: for in their account they have left out the best mixture, which in Galen's opinion is an essential reference point from which to judge all others.³⁹⁹ Some

the functions of the vegetative soul (digestion, growth, reproduction). In *De gen an.* Aristotle defines old age as a cold and dry age and describes the ageing of hair as a process deriving from the deficiency of heat (*De gen an.* 784a23ff. "But as to their colour, it is the nature of the skin that is the cause of this in other animals (and also of their being unicoloured or varicoloured); but in man it is not the cause, except of the hair going grey through disease (not through old age), for in what is called leprosy the hairs become white; on the contrary, if the hair is white because of old age, the whiteness does not derive from the skin. The reason is that the hair grows out of skin; if, then, the skin is diseased and white the hair becomes diseased with it, and the disease of hair is greyness. But the greyness of hair which is due to age results from weakness and deficiency of heat. For as the body declines in vigour we tend to be cold at every time of life, and especially in old age, this age being cold and dry"). Even closer is a passage taken from Aristotle's *De long.*, a treatise belonging to the so-called *Parva naturalia* (which Galen knew; cf. Moraux 1984 p. 293–295): "We must remember that an animal is by nature humid and warm, and to live is to be of such a constitution, while old age is dry and cold, and so is a corpse. This is plain to observation. But the material constituting the bodies of all things consists of the following: the hot and the cold, the dry and the moist. Hence when they age they must become dry, and therefore the fluid in them requires to be not easily dried up (δεῖ γὰρ λαβεῖν ὅτι τὸ ζῶόν ἐστι φύσει ὑγρὸν καὶ θερμόν, καὶ τὸ ζῆν τοιοῦτον, τὸ δὲ γῆρας ξηρὸν καὶ ψυχρόν, καὶ τὸ τεθνηκόσ· φαίνεται γὰρ οὕτως· ὅλη δὲ τῶν σωμάτων τοῖς ζῴοις ταῦτα, τὸ θερμόν καὶ τὸ ψυχρόν, καὶ τὸ ξηρὸν καὶ τὸ ὑγρὸν. ἀνάγκη τοίνυν γηράσκοντα ξηραίνεσθαι· διὸ δεῖ μὴ εὐξήραντον εἶναι τὸ ὑγρὸν): a warm humidity is in fact cause of growth—of the body—and of life (τῆς τε γὰρ αὐξήσεως ἢ θερμῆ ὑγρότης αἰτία καὶ τῆς ζωῆς)" (*De long.* 466a18 ff.). In Galen's picture two main elements lead us to establish a link between Galen's picture and Aristotle's account of the ageing process: i) the fact that the animal passes from a hot wet constitution to a dry and cold constitution; ii) the paramount role played by the innate heat throughout this process which, on the one hand, dries up the humidity in the body and, on the other hand, tends to quench over time, leading to a cold and dry constitution. As we saw from the abovementioned Galenic text, the hot is regarded by these thinkers as the most active of the four qualities (τοῦ θερμοῦ δραστηκωτάτου τῶν τετάρων) and its relation to the biological development of the organism through time points to the hot as the most active of the qualities within the innate heat; in *De naturalibus facultatibus* Galen explicitly attributes this view both to Hippocrates and Aristotle, and describes how activities such as digestion, nutrition and, more importantly, growth are due to the action of the innate heat (*De nat. fac.* p. 165.7ff. H.). Indeed, with the due differences, some connections between Aristotle's notion of "innate heat" and an emergent analogous concept within the Hippocratic corpus have been already noted (for an overview of the previous literature and a deeper analysis of this issue cf. Bartoš 2014). When Galen then speaks of this further "group" of thinkers, we can conjecture that he is referring to the biological cycle of the organism and the progressive transition from a hot wet constitution to a cold and dry one, as theorized more systematically by Aristotle. Galen himself in II 2 *De temperamentis* deals with the state of the mixture throughout the different ages of a human being and seems to take up this account entirely. For, as well as the abovementioned supposed "group of predecessors", he describes a biological cycle of mixture that from the childhood to old age sees the the mixture of the body pass from a hot and wet mixture to a dry and cold mixture as the bodily parts get drier and drier, insofar as they are no longer nourished due to a deficiency of heat (cf. *De temp.* p. 45, 26 H.). Old age is compared, as in Aristotle, with a dried plant (*De temp.* p. 46, 10–11 H. "καλῶς Ἀριστοτέλης εικάζει τὸ γῆρας ἀβανομένῳ φυτῶ"; the image of the dried plant is present in Aristotle's *De resp.* 478b27–28) and death with the extinction of the innate heat (*De temp.* p. 47 1–2 H. "ὁ θάνατος σβέσις ἐστὶ τῆς ἐμφύτου θερμασίας").

³⁹⁹ *De temp.* p. 7.3–22 H.

of them, instead, maintain that the best mixture has not been put aside at all, as it coincides with the hot and wet one.⁴⁰⁰ But Galen declares that the hot/wet constitution, if hotness and moisture are brought to excess, is extremely harmful and, in this regard, he mentions the violent reaction of a contemporary group of physicians, the followers of Athenaeus of Attalia, the Pneumatists (whose position Galen assimilates the group under discussion), who maintained that the best mixture is hot and wet.

T1 Galen *De temperamentis* K. I pp. 522.2-523.17 Helmreich p. 8.28-10.3 = fr. 49 Coughlin:

(1) Πρὸς δὴ τοὺς τοιοῦτους λόγους ἀπομαχόμενοι τινες τῶν ἀπ' Ἀθηναίου τοῦ Ἀτταλέως ὁμόσε χωροῦσιν οὔτε κατάστασιν ὑγρὰν καὶ θερμὴν μέμφεσθαι λέγοντες οὔθ' εὐρεθῆναι τι νόσημα φάσκοντες ὑγρὸν καὶ θερμὸν, ἀλλὰ πάντως ἢ θερμὸν καὶ ξηρὸν ὑπάρχειν ὡς τὸν πυρετόν, ἢ ψυχρὸν καὶ ὑγρὸν ὡς τὸν ὕδρον, ἢ ψυχρὸν καὶ ξηρὸν ὡς τὴν μελαγχολίαν. (2) ἐπιμέμνηται δ' ἐνταῦθα καὶ τῶν ὥρων τοῦ ἔτους, ὑγρὸν μὲν καὶ ψυχρὸν εἶναι τὸν χειμῶνα φάσκοντες, ξηρὸν δὲ καὶ θερμὸν τὸ θέρος καὶ ψυχρὸν καὶ ξηρὸν τὸ φθινόπωρον, εὐκρατον δ' ἅμα καὶ θερμὴν καὶ ὑγρὰν ὥραν εἶναι φασὶ τὸ ἔαρ. (3) οὕτω δὲ καὶ τῶν ἡλικιῶν τὴν παιδικὴν εὐκρατον θ' ἅμα καὶ θερμὴν καὶ ὑγρὰν εἶναι φασιν. δηλοῦσθαι δὲ τὴν εὐκρασίαν αὐτῆς νομίζουσι κάκ τῶν ἐνεργειῶν τῆς φύσεως ἐρρωμένων τηνικαῦτα μάλιστα. καὶ μὲν δὴ καὶ τὸν θάνατόν φασιν εἰς ξηρότητα καὶ ψύξιν ἄγειν τὰ τῶν ζώων σώματα. καλεῖσθαι γοῦν ἀλίβαντας τοὺς νεκροὺς ὡς ἂν οὐκέτι λιβάδα καὶ ὑγρότητα κεκτημένους οὐδεμίαν, ἐξατμισθέντας θ' ἅμα διὰ τὴν ἀποχώρησιν τοῦ θερμοῦ καὶ παγέντας ὑπὸ τῆς ψύξεως. ἀλλ' εἴπερ ὁ θάνατος, φασί, τοιοῦτος, ἀναγκαῖον ἤδη τὴν ζωὴν, ὡς ἂν ἐναντίαν οὔσαν αὐτῷ, θερμὴν τ' εἶναι καὶ ὑγρὰν· καὶ μὴν εἴπερ ἡ ζωὴ, φασί, θερμὸν τι χρῆμα καὶ ὑγρὸν, ἀνάγκη πᾶσα καὶ τὴν ὁμοιοτάτην αὐτῇ κρᾶσιν ἀρίστην ὑπάρχειν· εἰ δὲ τοῦτο, παντί που δῆλον, ὡς εὐκρατοτάτην, ὥστ' εἰς ταῦτόν συμβαίνειν ὑγρὰν καὶ θερμὴν φύσιν εὐκράτῳ καὶ μηδὲν ἄλλ' εἶναι τὴν εὐκρασίαν ἢ τῆς ὑγρότητός τε καὶ θερμότητος ἐπικρατούσης. οἱ μὲν δὴ τῶν ἀμφὶ τὸν Ἀθήναιον λόγοι τοιοῖδε. (4) δοκεῖ δὲ πως ἢ αὐτὴ δόξα καὶ Ἀριστοτέλους εἶναι τοῦ φιλοσόφου καὶ Θεοφράστου γε μετ'

⁴⁰⁰ *De temp.* p. 7.22–24 H.

αὐτὸν καὶ τῶν Στωϊκῶν, ὥστε καὶ τῷ πλήθει τῶν μαρτύρων ἡμᾶς δυσωποῦσιν. ἐγὼ δὲ περὶ μὲν Ἀριστοτέλους, ὅπως ἐγίνωσκεν ὑπὲρ θερμῆς καὶ ὑγρᾶς κράσεως, ἴσως ἄν, εἰ δεηθεῖην, ἐπὶ προήκοντι τῷ λόγῳ δείξαιμι· δοκοῦσι γάρ μοι παρακούειν αὐτοῦ.

(1) In defence against such arguments, certain of the followers of Athenaeus of Attaleia counter by saying that they do not find fault with any wet and hot state, and stating that no disease has been found which is wet and hot, disease being without exception either hot and dry, like fever, or cold and wet, like dropsy, or cold and dry, like melancholy. (2) And in this context they also make mention of the seasons of the year, stating that winter is wet and cold, summer dry and hot, and autumn cold and dry; but they state that spring is at once both a well-mixed, and a hot and wet, season. (3) In the context of ages, too, they state childhood to be both well-mixed and at the same time hot and wet; and they think that its good-mixture is indicated also by the fact that the natural activities have their greatest vigour at this time. Furthermore, they state that death leads to dryness and coldness in animal bodies; and indeed, [they argue], dead bodies are referred to as corpses (*alibas*), on the grounds that they no longer possess any moisture (*libas*) and wetness, having at once lost their vapours because of the departure of the hot, and having been solidified by the cooling. If, then, their argument goes, these are the characteristics of death, then life, since it is opposite to death, will necessarily be hot and wet. Now, if life, they say, is something hot and wet, then it is absolutely necessary that the mixture that approximates most to this will be the best; and if it is the best, then it is evident to anyone that it is also the best-mixed. Thus, the wet and the hot nature and the well-mixed coincide; and good-mixture is nothing other than that in which wetness and hotness are dominant. Such, then, are the arguments of the followers of Athenaeus. (4) The same belief somehow seems to be shared by the philosopher Aristotle, and, indeed by Theophrastus after him, and also by the Stoics; so that they shame us with the multitude of their witnesses. Well, regarding Aristotle, I may perhaps show what his understanding was regarding the hot wet mixture, if required, as the argument progresses; for they seem to me to misinterpret him.

As we see from the text, the Pneumatists present a series of arguments aimed at demonstrating that the well-mixed mixture is the hot and wet one: i) the Pneumatists affirm that there are no hot and wet diseases (T1.1 “οὐθ' εὐρεθῆναι τι νόσημα φάσκοντες ὑγρὸν καὶ θερμὸν, ἀλλὰ πάντως ἢ θερμὸν καὶ ξηρὸν ὑπάρχειν ὡς τὸν πυρετόν, ἢ ψυχρὸν καὶ ὑγρὸν ὡς τὸν ὕδρον, ἢ ψυχρὸν καὶ ξηρὸν ὡς τὴν μελαγχολίαν”); ii) they make reference to the correspondence, clearly drawing on the Hippocratic *De natura hominis*, between seasons and qualities, so that the winter is defined as cold and wet, the summer hot and dry, autumn cold and dry, and spring, they say, is well-mixed (T1.2 “εὐκρατον δ' ἅμα καὶ θερμὴν καὶ ὑγρὰν ὥραν εἶναι φασι τὸ ἔαρ”)⁴⁰¹; iii) they also refer to the biological cycle of mixtures as they hold childhood to be hot and wet, whereas the old age would be cold and dry; moreover, the Pneumatists establish a connection between mixture and activities, since they affirm that the εὐκρασία is also indicated by the fact that natural activities have their greatest vigour during childhood (T1.3 “οὕτω δὲ καὶ τῶν ἡλικιῶν τὴν παιδικὴν εὐκρατον θ' ἅμα καὶ θερμὴν καὶ ὑγρὰν εἶναι φασιν. δηλοῦσθαι δὲ τὴν εὐκρασίαν αὐτῆς νομίζουσι καὶ τῶν ἐνεργειῶν τῆς φύσεως ἐρρωμένων τηνικαῦτα μάλιστα”): therefore, logically, if old age—and hence death—is cold and wet, childhood—and hence life, its contrary—is hot and wet and, for this reason, it is absolutely necessary that the mixture “that approximates most to this [life] will be the best; and if it is the best, then it is evident to anyone that it is also the best-mixed”; iv) in order to support their reasoning, they appeal to several authorities, including Aristotle, Theophrastus, and the Stoics.

We have already pointed out that the Pneumatic school of medicine was founded by Athenaeus of Attalia and that the Pneumatists’ medical doctrines explicitly rely on Stoic physical tenets and, above all, on their account of pneuma as the unifying principle of physical bodies (in its threefold degrees of tension—*hexis*, *physis*, *psyche*). Indeed, analogously to Stoic pneuma, the

⁴⁰¹ Cf. *De nat. hom.* CMG I 1.3 p. 182.4–186.12 Jouanna, where every season is associated with a humour and a couple of qualities (winter/phlegm is cold and wet; spring/blood is hot and wet; summer/yellow bile is hot and dry; autumn/black bile is cold and dry).

Pneumatists' pneuma is conceived of as an in-born enlivening force which entirely pervades the living organism, flows both in the veins and in the arteries (though the latter would contain more pneuma) and is involved in physiological (such as growth, sense-perception, thinking) as well as pathological (such as the variety of diseases caused by an alteration of the innate pneuma) processes.⁴⁰² However, from the passage above, it is evident that Galen establishes a correlation between the groups of earlier illustrious physicians and philosophers supporting the quadripartite scheme of mixtures (which we set within a Hippocratic/Aristotelian framework) and the contemporary medical sect of the Pneumatists who, in contrast to other contemporary medical sects, such as the Empiricists and the Methodists, clearly adopt a classification of mixtures in order to explain physio-pathological processes. Moreover, in their system of mixtures, the Pneumatists assign a special status to the hot and wet mixture, which is deemed to be the best mixture, their argument strengthened by being anchored to some authorities of the past, which—as we see—do not coincide with the Stoics alone. In fact, one should also weigh up and assess contributions of different provenance, medical and philosophical, such as the Hippocratic (which is implied by the reference to the qualitative composition of the four seasons) and the Aristotelian (who is mentioned together with his pupil Theophrastus and the Stoics).

In fact, *De temperamentis* I 4 and I 5 should be regarded as complementary to the aforementioned passage, where Athenaeus is mentioned (and, therefore, essential for a fuller understanding of the fragment in *De temperamentis* I 3). For in *De temperamentis* I 4 Galen lambasts the Pneumatists (although he does not explicitly mention them) for the correlation they draw between the four seasons and the primary qualities and, above all, for the statement according to which the spring is hot and wet and therefore well-mixed, by recourse to other Hippocratic texts (*Aphorisms* and *Epidemics*). Moreover, in *De temperamentis* I 5, Galen explains how to interpret Aristotle's opinion on the hot and wet mixture (the *Pneumatists* in fact mention the biological cycle of mixture, which, as we saw, seems to imply a reference to Aristotle's biological

⁴⁰² Wellmann 1865 pp. 137 ff.

theories). It is important to underline the main points of Galen's criticism of Pneumatic medicine in *De temperamentis* I 4 and I 5 for different reasons: i) it testifies to the importance that the debate on εὐκρασία or good mixture had gained in Galen's time among two contemporary medical mainstreams, the Pneumatic and the Galenic; ii) it gives us useful insight into the logical-dialectical strategies which Galen displays and into the way in which Galen interprets his sources with the aim of reprehending his adversaries; and iii) it helps us to shed light on under-investigated topics concerning the theoretical foundations of Pneumatic medicine.

In *De temperamentis* I 4, Galen begins his argument against the Pneumatists by saying that when they define the spring as hot and wet and, therefore, as well-mixed, "their mistake is in fact twofold, consisting first in the desire to find the fourth pairing of mixtures in the seasons at all costs, and secondly in their taking spring to be hotter than winter and wetter than summer".⁴⁰³ For indeed, on the one hand, the Pneumatists tend to strictly superimpose the binary coupling of primary qualities to the four seasons without caring too much about the real correspondence between a certain season and its qualitative composition. On the other hand, they take the spring to be hot and wet as compared to winter and to summer, such that spring appears *hotter* than winter and *wetter* than summer. By contrast, the kernel of Galen's argument aimed at underlining the two errors made by the Pneumatists is condensed and makes recourse to the original Platonic distinction between two classes of entities (*onta*), καθ' αὐτά and πρὸς τι entities.⁴⁰⁴ As he notes, in fact the

⁴⁰³ *De temp.* p. 10.12–15 H. (trans. Singer)

⁴⁰⁴ The distinction is drawn by the Eleatic Stranger in the *Sophist* (255c), Plato's ontological masterpiece, when he seeks to refute Parmenides' doctrine according to which non-being does not exist by showing that instead non-being does have an existence, although is not an existence *per se* but a *relative existence* describing the condition of *being other than that in connection with which it is said to exist*. As is well known, such a distinction, which is created within the framework of, and is instrumental for, the identification of five "kinds"—being, motion, rest, sameness, difference—represents a turning point in and a development of Plato's theory of ideas (in comparison, for example, with Phaedo's account). As Berti underscores, it is from this original Platonic distinction that Aristotle develops his doctrine of the categories; cf. Berti 2004 pp. 264–272 with references at n. 53. As De Lacy observes (1972 pp. 27-39), Galen was also well acquainted with this dialogue, as he was fully conversant with Plato's *corpus* and he also wrote extensively on Plato; as De Lacy points out, in his *De libris propriis* he writes a list of his works on Plato. Together with his *Quod animi mores* and his *De placitis Hippocratis et Platonis*, he mentions a work (now lost) on Plato's school: Περὶ τῆς Πλάτωνος αἰρέσεως. Second, he also lists a commentary on the medical passages in the *Timaeus*, περὶ τῶν ἐν τῷ Πλάτωνος Τιμαίῳ ἰατρικῶς εἰρημένων. Third, he mentions a work (now lost) which apparently is a defense of the

Pneumatists define spring as hot in relation to winter and as wet in relation to summer, yet this comparison is to be considered incomplete: for if one takes the other opposition, spring can be also defined as dry and cold, dry in relation to winter and cold in relation to summer; therefore, spring will be at the same time hot, cold, dry, and wet. As he affirms: “If they are to be permitted to take just one half of each [opposition], and thus to declare it [the spring] wet and hot, then we may equally be permitted to take the other half, and state to the contrary that it is dry and cold: dry in relation to winter (**πρὸς τὸν χειμῶνα**) and cold in relation to summer (**πρὸς τὸ θέρος**). And so spring will be all these things, wet and dry and cold and hot. But even they will admit the impossibility of the four qualities’ dominating in one and the same object. It is not, then, right to compare spring with summer or winter, but to investigate it in its own right (οὐκ οὐτε θέρει παραβάλλειν οὐτε χειμῶνι τὸ ἔαρ, ἀλλ’ αὐτὸ καθ’ ἑαυτὸ σκοπεῖσθαι δίκαιον).⁴⁰⁵

And in fact, the first strategy that Galen adopts to refute the Pneumatists is that of considering spring, and therefore, the concept of *eukrasia*, of which spring is the atmospheric reification *per se*. As Galen remarks, if one considers spring *per se*, and—as we will see briefly further below—from Galen’s standpoint that signifies considering something by means of both sense-perception and reasoning, Such that spring is neither hot nor wet, but in a

theory of Ideas. The fourth writing is on Plato’s logical theories, *περὶ τῆς κατὰ Πλάτωνα λογικῆς θεωρίας*, whereas the fifth is a collection of summaries of Plato’s dialogues in eight books, *Πλατωνικῶν διαλόγων συνόψεως ὀκτώ*. Finally, he includes two works (now lost): *On the transitions in the Philebus* (*περὶ τῶν ἐν Φιλήβῳ μεταβάσεων*) and *On the parts and faculties of the soul* (*περὶ τῶν τῆς ψυχῆς μερῶν καὶ δυνάμεων τρία*); On this occasion one should note that Galen’s ontology differs from the Platonic one, according to which only the true beings are the eternal and transcendent and super-spatiotemporal ideas. For Galen implements the Platonic logical–dialectical distinction between *per se* and *in relation to something else* in a very different ontological framework: when Galen in fact declares that one needs to investigate spring *per se*, he intends to make an enquiry not about a Platonic abstract universal, “springness”, but about what he often calls its “*oikeia physis*”, endowed with an essence-specifying *krasis*, that is, its proper/particular nature/substance (cf. *De temp.* p. 11.22 H.)—an enquiry which, as we will see (and we have already pointed this out), from an epistemological point of view can be conducted through a joint-methodology involving both sense-perception and reasoning. More studies on Galen’s ontology still seem to be a *desideratum*.

⁴⁰⁵ *De temp.* p. 11, 4–13 H. “εἰ δ’ ἔξεστιν ἐκείνοις ἐξ ἑκατέρας αὐτῶν ἡμισυ λαβοῦσιν ὑγρὸν ἀποφαίνειν αὐτὸ καὶ θερμὸν, ἔξεσται δὴπου καὶ ἡμῖν ἐπὶ θάτερον ἡμισυ μετελθοῦσι ξηρὸν καὶ ψυχρὸν ἀποφῆναι, ξηρὸν μὲν ὡς πρὸς τὸν χειμῶνα, ψυχρὸν δ’ ὡς πρὸς τὸ θέρος. ἅπαντ’ οὖν οὕτως ἔσται τὸ ἔαρ, ὑγρὸν καὶ ξηρὸν καὶ ψυχρὸν καὶ θερμὸν. Ἀλλ’ οὐδὲ | κατ’ αὐτοὺς ἐκείνους οἷον τ’ ἔστιν ἐν ἐνὶ καὶ ταυτῷ πράγματι τὰς τέτταρας ἐπικρατῆσαι ποιότητας. οὐκ οὐτε θέρει παραβάλλειν οὐτε χειμῶνι τὸ ἔαρ, ἀλλ’ αὐτὸ καθ’ ἑαυτὸ σκοπεῖσθαι δίκαιον.

precisely middle position with respect to all the excesses. Now, as we have previously hinted, the “seasons” example seems to be taken from the Hippocratic *De natura hominis*, a text which, despite to what has been said above, seems therefore to have played a role in the construction of the Pneumatists’ scheme of mixtures.⁴⁰⁶ There are two reasons which lead us to think that, in the text we quoted above, the implied reference is the Hippocratic *De natura hominis*: i) the first is that in Galen’s Commentary on *De natura hominis*, he comments on the Hippocratic passage relating to the hot/wet qualitative composition of the spring (= CMG I 1.3 pp. 182,15-184,2 Jouanna) and declares that—as was stated in the first book *De temperamentis*—it is better to describe spring as well-tempered, and for this reason some doctors and philosophers are reluctant to call it hot and wet⁴⁰⁷ (we can, therefore, infer that even in this passage Galen is taking a sideswipe at the Pneumatists); ii) on the other hand, in *De temperamentis* I 4, Galen makes use of several Hippocratic statements (taken from other Hippocratic writings and not from *De natura hominis*) in order to demonstrate that according “Hippocrates” himself, spring is not hot and wet but, on the contrary, a hot and wet (disproportionate) mixture of the ambient air brings about various sorts of diseases:⁴⁰⁸ for Galen is fully aware of the fact that in *De natura*

⁴⁰⁶ Smith (1979 pp. 232–233) seems to underestimate the importance that the Hippocratic medicine had for the Pneumatists, especially for the theorization of their system of mixtures: “I point out and emphasize the Pneumatic theorists’ lack of attention to Hippocrates in order to correct past habits of reading medical history through Galen’s eyes. It is not true that, as Galen saw it, everyone was a ‘follower’ or ‘enemy’ of Hippocrates and so oriented his medicine. The Pneumatics must have been aware of books of the Corpus, but they do not appear to have claimed that those books contained their science of elemental *eucrasia* and *dyscrasia*”. On the contrary, although there are no accurate studies yet, the importance of Hippocratic medicine for the Pneumatists is clear. On the one hand, it has already been noted that in the *Corpus Hippocraticum* there are some later texts, such as *De alimento* or *De medico*, which seem to be wholly permeated by Pneumatic influences: the *De alimento*, for example, exhibits a physiological system analogous to the Pneumatists’ one (Kudlien 1962 pp. 424 ff.; Manuli and Vegetti 1977 pp. 165–166; Nutton 2004 pp. 202–203; Nutton 2006b). On the other hand, the Pneumatists linked their account of pneuma to the “archaic” Hippocratic theory of mixture of four humours, each of which is associated with a couple of primary qualities; Wellmann 1865 pp. 138–139, pp. 160–161.

⁴⁰⁷ *In Hipp. Nat. Hom. comment.* CMG V 9.1 pp. 43, 24 ff. Mewaldt.

⁴⁰⁸ In *De temp.* I 4 Galen introduces several quotations from other Hippocratic writings so as to demonstrate that i) the Pneumatists blunder, because of the fact that they rigidly associate the four primary qualities with the four seasons: a) spring is well-mixed not because it is hot and wet (as the Pneumatists think), but because none of the primary qualities predominates, as “Hippocrates” already recognizes (in his *Aphorisms* he states: ‘Spring is most healthy and least fatal’; trans. Singer, *De temp.* p. 11.12–14 H. = *Aph.* III 9 L. IV 488); b) a fixed pairing between a couple of primary qualities and the seasons does not hold in the case of autumn, which, according to Hippocrates himself, is not cold and dry but has an uneven mixture: “But autumn, too, is less hot than summer, while it is less cold than winter. From this point of view, then, it is

hominis the spring is defined as hot and wet, but he does not dare to contradict the Hippocratic text (which—as we have seen—for him represents a crucial reference). Hence, by exhibiting one of his characteristic exegetical moves, i.e. to explain “*Hippocratem ex Hippocrate*”, Galen re-interprets (distorts and garbles) the Hippocratic *De natura hominis* and confutes the Pneumatists by appealing to what seems—with good probability—to be the Hippocratic authority.⁴⁰⁹

Galen’s criticism of the Pneumatists is not only useful for disclosing and bringing to light the influences exerted by an “archaic” Hippocratic text on the Pneumatic system of mixtures, it is also very enlightening and instructive for unravelling the dispute, in the medical field, relating to the most well-mixed or

neither hot nor wet in absolute terms: it is both things, and neither in the extreme sense. But there is another, additional ill associated with autumn, which Hippocrates, too, indicated in his *Aphorisms*, when he said: ‘When there is an alternation between warmth and cold on the same day, one must expect the diseases of autumn’ (*Aph.* III 4 = L. IV 486.). And it is this that makes autumn so particularly conducive to illness: the unevenness of the mixture” (trans. Singer, *De temp.* p. 12.8–16 H.). ii) On the other hand, Galen wants to disqualify the Pneumatists’ claim according to which there are no hot and wet diseases by bringing as witnesses other Hippocratic pieces of evidence taken from the Epidemics: a) *De temp.* p. 14, 12–17 H. = *Epid.* II 1.1 L. V 72.: Pustules in Kranon in summer. “There was constant, violent rain in burning-hot weather. This happened more with the south wind, after which there was accumulation of fluids under the skin. These being trapped within were then heated, which caused irritation. Subsequently blisters came up like burns; and they had the sensation of burning beneath the skin” (transl. Singer). The passage describes an atmosphere where a hot and wet mixture of the ambient air predominates (“There was constant, violent rain in burning-hot weather”), whence there is an incidence of pustules that were evidently the result of a putrefaction of the secretions of the body, which then gave rise to certain excessively hot, wet fluids; b) Galen reports four quotations from the third book of the *Epidemics* (*Epid.* III 3.2 L. III 66 Kühlewein p. 224.7; III 3.2 L. III 68 Kühlewein p. 224,18-19; III 2.4 L. III 72-74 Kühlewein p. 225,18-20; III 2.7 L. III 84 Kühlewein p. 228,5-7) where the case of a great plague due to a protracted, year-long, hot and wet mixture of the ambient air is described.

⁴⁰⁹ For this Galenic practise in his commentary on the Hippocratic works cf. von Staden 2002 pp. 115–117. It is worth underlining that here Galen is using a commentary technique in a text that is not a commentary. The most reasonable explanation is that he indeed is commenting on an implied “Hippocratic” passage (that from *De natura hominis* concerning the qualitative composition of the seasons). This claim is corroborated by the abovementioned cross-reference to the section from Galen’s commentary on *De natura hominis* where he comments on the Hippocratic passage of *De nat. hom.*, in which it is said that spring is hot and wet and refers to the discussion apropos of the seasons in the first book of *De temperamentis* (i.e. exactly our I 4 *De temperamentis*). Hence, Galen also uses this technique in other kinds of writings (*De temperamentis* is not a detailed line-by-line commentary of a Hippocratic work: in *De ord. libr. suor.* K. XIX p. 56 (p. 85.20ff. Müller) the three books *De temp.* are defined as *hypomnēmata*, but as is well known, the term *hypomnēma* covers different meanings and may refer to both detailed commentaries composed for a wider public and personal notes written for further later elaboration; cf. Flemming 2008 pp. 325 f.) and in this case, with good probability, he is referring to a Hippocratic passage of a text which here, in his *De temperamentis*, he does not want to overtly fault as it represents an ancient authority on which he will rely to create his scheme of mixtures.

good mixture and the way Galen himself, differently from his predecessors and contemporaries, constructs his own system of mixtures. He clearly builds on a quadripartite scheme of what he will call composite mixtures (hot/wet; hot/dry; cold/wet; cold/dry),⁴¹⁰ which he ascribes to a supposedly concordant and abridged Hippocratic/Aristotelian physical-biological framework; but in developing his polemics against the Pneumatists' school, he surpasses and outdistances them by singling out a kind of mixture which they have left aside, and which, like the spring, does not admit of any excess, the well-mixed state of which can be discovered both empirically and rationally: "For we are able to learn manifestly from our senses that spring is a perfectly well-mixed season; and from rational argument to find out that it is healthy for this reason, namely that none of the four dominates".⁴¹¹

The second logical strategy that Galen adopts in *De temperamentis* I 5 is exactly opposed to the first one displayed in *De temperamentis* I 4, and consists in *relativizing* the interpretation of the Pneumatists, who, by calling Aristotle as a witness affirm that living beings (and therefore, life itself) are hot and wet such that, hence, the well-mixed mixture can be defined as hot and wet. In fact, although the Pneumatists regard themselves as exponents of the Dogmatic "school(s)" of medicine, they not only do not rely on experience, but, more importantly for a Dogmatic school, they do not undertake a theoretical study of nature by basing it on logical reasoning: consequently, they fall back into *sophismata*⁴¹² and, ultimately, end up misunderstanding Aristotle's doctrines.⁴¹³ More precisely, the point at issue is Aristotle's definition of living bodies as hot and wet (as opposed to old age and death, which are cold and dry). For Galen and the Pneumatists, who, as we have seen, refer both to what I have defined the "biological cycle of mixtures" (from the hot and wet mixture of the new-born animal to the cold and dry mixture of a corpse), both seem to draw on Aristotle's

⁴¹⁰ *De temp.* p. 32.2 H.

⁴¹¹ *De temp.* p. 16.9–12 H. The combination of empirical observation and theoretical reasoning in the determination of the bodily mixture (while hotness can be assessed simply on the basis of the sense of touch, wetness is recognized by the sense of touch in conjunction with the sense of sight and logical reasoning or *logismós*; cf. *De temp.* 59.24–60.5 H.) is also stressed by Van der Eijk 2015a p. 689.

⁴¹² Singer translates the term as "fallacious reasoning"; I'd be much more inclined to interpret the word as "errors in logic"; Montanari 2000 *s.v.* has "ragionamento fallace o capzioso".

⁴¹³ *De temp.* 16.28–17, 5 H.

biological doctrines (the Pneumatists explicitly quote Aristotle in this regard and, in Galen's case, we have already pinpointed some references in Aristotle's work, in particular in the *Parva Naturalia*, which seem to provide a parallel to Galen's account) which could have been a source of tension and a collision field between the two medical strands.

In his argument against the Pneumatists, Galen emphasizes the logical fallacies espoused by the Pneumatists. In the first place, they do not recognise that, according to Aristotle, hot, cold and dry, wet are said in many senses (*pollachôs*), whereas they intend them always in the same way. Second, as Galen highlights, the Pneumatists misinterpret Aristotle's teachings because, on the one hand, Aristotle saw a difference between connate and proper hot and an acquired, external hot, and on the other hand, he—as well as his pupil Theophrastus—precisely indicated the reference point that used to define something as well- or badly mixed⁴¹⁴.

As Tassinari points out in their commentary on *De temperamentis*,⁴¹⁵ Galen probably has in mind Aristotle's discourse on heat (analogously applied by Aristotle to cold, dry, and wet, too), *Pollachôs legomenon*, which is specifically analysed at I 2 *De partibus animalium* (648b35-649b7).⁴¹⁶ This

⁴¹⁴ *De temp.* 17, 7–13 H. “For Aristotle is well aware that [the terms] hot, cold, dry and wet are used in a plurality of senses; yet these people do not interpret him as [using the terms] in a plurality of senses, but always in the same way. Indeed, Aristotle even discussed the way in which it is not the same thing for hot to be present in virtue of a hot that is connate and proper or in virtue of an acquired, external hot. Even this, though, they misinterpret him as [using the terms] in a plurality of senses, but always in the same way. Indeed, Aristotle even discussed the way in which it is not the same thing for hot to be present in virtue of a hot that is connate and proper or in virtue of an acquired, external hot. Furthermore Aristotle, and similarly Theophrastus, have said precisely by reference to what one should take [something] to be well- or badly-mixed in its nature” (trans. Singer).

⁴¹⁵ Tassinari 1997 p. 80 n. 7.

⁴¹⁶ Cf. *De part. an.* 648b11–16 “Is the hot, then, spoken of without qualification or in a number of ways? Surely one needs to grasp what the function of the hotter is or, if there are many, how many. i) In one way that which makes what touches it hotter is said to be hotter; ii) in another way that which arouses greater sensation during touching, especially if accompanied by pain. But it seems that at times this can be deceptive; for sometimes it is the state of the perceivers that is the cause of their feeling pain. Again, iii) of the meltable and combustible, the more meltable and more combustible are said to be hotter” (transl. Lennox). As we have seen, Aristotle backs up his reasoning with a plethora of examples, where “is hotter” is not treated as a core-related homonymous predication, because we understand different things by the predication “is hotter” if we paraphrase Aristotle's sentences: i) x which touches y is said to be hotter than y in the sense that *it releases the effect of a qualitative alteration*; ii) x it is said to be hotter than y, which touches it *in the sense that it burns and at the same time harms*; iii) x is said to be hotter than y *in the sense that is more meltable/combustible*. As we see, these examples are very different from an example of core-dependent homonymy (such as Aristotle's favourite example of health; cf. *Metaph.* 1003a34–b4a: if we consider the sentence i) “Socrates is healthy”, there will be a series

section indeed strikingly corresponds to Galen’s few lines on the issue, since, on the one hand, Aristotle analyses the predication “is hotter” in more depth by calling into question the fleeting category of relation or πρὸς τι (in order to make clear that if something is defined as hotter—or colder—, it is important to indicate the respect in which something is defined so⁴¹⁷) and, on the other, he brings out, by contrast, a clear-cut difference between an external/ἀλλότριος or κατὰ συμβεβηκός, such as boiling water, and a proper/οἰκεῖος or καθ’ αὐτὸ heat (a hot that pertains to the very essence of something), such as a burning flame,⁴¹⁸ with the main aim of preparing the ground for the statement, made in I 3, that blood is hot only accidentally and not essentially.⁴¹⁹

Having briefly winnowed out Aristotle’s argument in *De partibus animalium* I 2, we will now seek to answer a more urgent question, which concerns the reason why Galen feels the need to recall the Aristotelian distinction between an acquired/accidental and an internal/essential hot (or cold, dry, or wet) and, second, to identify a continuously shifting reference point on the basis of which to define something hot (or cold, dry, or wet) and, certainly, what this has to do with his polemics against the Pneumatists. His criticism is summarized in the following passage (T2).

of core-dependent predications stemming from the first core-instance of predication, like: ii) “Socrates’ complexion is healthy; iii) Socrates’ diet is healthy”; iv) “Socrates’ weight is healthy”; etc. Therefore, “is healthy” is a core-dependent homonymous predication because all its secondary predicative instantiations rely on the first, without which they would not make any sense at all; we see that this type of predication expresses an order in multiplicity and lies exactly in the middle between simple univocity and rank non-univocity).

⁴¹⁷ *De part. an.* 648b24–34 “One thing is said to be hotter than another, then, in at least this many ways, if not more; but it is impossible that being hotter is predicated of the same thing in all these ways [I dissent from Lennox’s translation of “τούτους δὲ τοὺς τρόπους ἀδύνατον ὑπάρχειν τῷ αὐτῷ πάντας” as “but it is impossible that being hotter belong in all these ways to the same thing”; for ὑπάρχειν + dative I prefer the more technical sense “to be predicated of”—cf. Montanari 2000 *s.v.*; for a parallel cf. *Post. Anal.* 25a13. For boiling water heats more than flame does, and flame burns and melts the combustible and meltable, while water does not. Again, boiling water is hotter than a small fire, but hot water cools and more than a small fire; for fire does not become cold, but all water does. Again, boiling water is hotter to the touch, but cools and solidifies more quickly than oil. And again, blood is hotter to the touch than water and oil, but solidifies more quickly. Again, stones, iron, and such things heat up more slowly than water, but once hot burn more intensely” (trans. Lennox; slightly modified). As Lennox notes at 648b26–34, in every example x is hotter than y in one respect, but y hotter than x in another; cf. Lennox 2001 pp. 193–194.

⁴¹⁸ *De part. an.* 648b35ff. As Tassinari (1997 p. 80 n. 78) observes, the difference between a proper and an acquired heat is treated also in *Meteor.* IV 379a17–19, where decay is defined as the “destruction of a moist body’s natural heat (*oikeias [...] thermostêtos*) by heat external (*allotrias*) to it, that is, the heat of its environment” (trans. Lee).

⁴¹⁹ Cf. Lennox’s commentary on 649a17, Lennox 2001 p. 194.

(2.1) ὅταν ἀκούσωσί που λεγόντων αὐτῶν ὑγρὸν εἶναι καὶ θερμὸν τὸ ζῷον ἢ τὴν τοῦ παιδὸς κρᾶσιν ὑγρὰν καὶ θερμὴν, οὐθ' ὅπως εἴρηται ταῦτα συνιᾶσιν ἐμπλήκτως τε μεταφέρουσι τὸν λόγον ἐπὶ τὰς ὥρας ὥσπερ ταῦτόν ὄν ἀλλ' οὐ μακρῶ διαφέρον ἢ τὴν οἰκείαν κρᾶσιν ὑγρὰν εἶναι καὶ θερμὴν ἢ τὴν τοῦ περιέχοντος ἡμᾶς ἀέρος. οὐτε γὰρ ταῦτόν ἐστιν οὐθ' ὁμοίως ὑγρὰ καὶ θερμὴ ζῶου κρᾶσις ἀέρος ὑγρᾶ καὶ θερμῆ κράσει λέγεται. (2.2) [...] ἔπεται τοιγαροῦν ἤδη καὶ τάδε τὰ σοφίσματα τῶ μὴ διελέσθαι περὶ τῶν σημαιομένων ὀρθῶς, ἀλλ' οἰηθῆναι τὸ θερμὸν λέγεσθαι διχῶς, τὸ μὲν ὡς ἄκρατον καὶ ἄμικτον καὶ ἀπλοῦν, τὸ δ' ὡς ἐν τῇ πρὸς τοῦναντίον ἐπιμιξία πλεονεκτοῦν. ὅτι δὲ καὶ παραβάλλοντες ἐτέρα κράσει πολλάκις ἐτέραν ἀποφαινόμεθα τὴν ἐτέραν αὐτῶν εἶναι θερμὴν ἐν ἴσῳ τῶ θερμότεραν, ἐπιλανθάνονται τοῦδε. καὶ μὴν οὕτω τὰ ζῶα θερμὰ καὶ ὑγρὰ λέγεται πρὸς τῶν παλαιῶν, οὐ κατὰ τὴν ἰδίαν κρᾶσιν ἀπλῶς, ἀλλὰ τοῖς τε φυτοῖς καὶ τοῖς τεθνεῶσι παραβαλλόμενα. καὶ γὰρ τῶν τεθνεώτων τὰ ζῶα καὶ τῶν φυτῶν ἐστιν ὑγρότερα καὶ θερμότερα.

(2.1) When they read some statement in those authors [Aristotle and Theophrastus] that the animal is wet and hot, or that the mixture of children is wet and hot, they do not understand how these [terms] have been used, and transfer the argument idiotically to the seasons, as if it were the same thing—and not, in fact, something very different indeed—to say that our own, proper mixture is wet and hot and that the air that surrounds us is wet and hot. For it is not the same thing, nor are [the terms] wet and hot applied in the same way to the mixture of an animal and to the mixture of the air. (2.2) [...] And these fallacious reasonings in turn follow from a failure to make the correct distinctions between meanings, and from thinking that ‘hot’ is used in [only] two senses, that of ‘unmixed’, ‘uncombined’ and ‘simple’, and that of a

predominance over the opposite in a combination. What they forget is that when comparing one mixture with another, we frequently assert one of them to be ‘hot’, in an equivalent sense to ‘hotter’. But in fact this is the sense in which animals are referred to as hot and wet by the ancients, not in absolute terms by reference to their own peculiar mixture, but by comparison with plants and dead bodies. For indeed animals are wetter and hotter than both dead bodies and plants. (trans. Singer).

As we see, Galen attacks the Pneumatists on two different but interrelated fronts. In the first place, Galen seems to find fault with the fact that, in contrast to Aristotle (and Theophrastus), the Pneumatists do not distinguish between a proper/*oikeia* hot and wet mixture and the external/*allogria* mixture of the ambient air (T2.1 “ὡσπερ ταῦτόν ὄν ἀλλ’ οὐ μακρῶ διαφέρον ἢ τὴν οἰκείαν κρᾶσιν ὑγρὰν εἶναι καὶ θερμὴν ἢ τὴν τοῦ περιέχοντος ἡμᾶς ἀέρος”). For, as Galen points out, if in fact they are focusing on the proper/essential mixture of the living being (in this case human beings, and especially children), they cannot make any further inferences by idiotically referring this reasoning to the seasons (T2.1 “ἐμπλήκτως τε μεταφέρουσι τὸν λόγον ἐπὶ τὰς ὥρας”), because if they consider their principal object of enquiry to be the mixture of the living being, the mixture of the ambient air surrounding us will automatically have to be treated as external. Second, it is logically erroneous to define the living being as hot and wet in an absolute sense as if they were so essentially and according to their own mixture (cf. T2.2 “οὐ κατὰ τὴν ἰδίαν κρᾶσιν ἀπλῶς”). The Pneumatists, in fact, forget that something can be defined as hot (as well as cold, dry, and wet) in relation to something else, as Aristotle in the abovementioned passage from *De partibus animalium* defined, for example, boiling water as hotter than, that is in relation to, *pròs ti*, a small fire. As Galen remarks, “in fact this is the sense in which animals are referred to as hot and wet by the ancients, not in absolute terms by reference to their own peculiar mixture, but by comparison with plants and dead bodies. For indeed animals are wetter and hotter than both dead bodies and plants” (T2.3 “καὶ γὰρ τῶν τεθνεώτων τὰ ζῶα καὶ τῶν φυτῶν ἐστὶν ὑγρότερα καὶ θερμότερα”). The conclusion is that the Pneumatists are then mistaken in thinking of the living being, especially human

beings and above all children, as essentially hot and wet without any qualification and in an absolute sense. The question, for Galen, as we will see, is much more complex.

Galen's critique of the Pneumatists reveals itself to be crucial for different reasons. First, in taking account of *De temperamentis* I 4 and I 5, we saw concretely that Pneumatic medicine benefitted from different contributions, Hippocratic and Aristotelian, which fall outside of Stoic physics. Second, we brought to light the hot debate concerning *eukrasia* between two medical strands, the Pneumatic and the Galenic, relying on a system of mixtures to explain the behaviour of an organism as well as related physio-pathological facts; and we also dealt with Galen's way of overtly manipulating (in the case of several Hippocratic writings) or making use of (in the case of Aristotle's multiple senses of hot in *De part. an.*) his sources to knock his adversaries down. Finally, we saw that while criticizing the Pneumatic concept of *eukrasia*, Galen makes use of the Aristotelian category of *pròs ti* and this, as we will show in the last section of this chapter, will be his keystone argument for defining a binary (an absolute and a relative) system of mixtures which is indeed required to underpin his teleological, anthropocentric, and even doctor-centric world-view (i.e. going beyond the birth and development of the single individual as specifically different).

However, before giving a full account of Galen's general world-view, we will tackle Galen's nine typologies of mixtures, its origins, the innovations brought by Galen in comparison with the speculations of his predecessors and, again, Galen's relation to the Pneumatists, who—before Galenic medicine—worked out a well-defined system of nine mixtures. This will lead us to a deeper comparison between the elemental foundations of Galenic and Pneumatic medicine.

2.3 Galen's additions to the theories of the predecessors. The good mixture and the simple mixtures

As we have hinted, in his *De temperamentis* Galen makes us believe that, like his other predecessors, the Pneumatists distinguished four typologies of mixtures; he places them among the second subgroup of the second group of physicians and philosophers (those opting for a four-mixtures scheme along with the biological cycle of the mixtures). This is confirmed by another statement that Galen makes at *De temperamentis* I 9: “Now, the majority of doctors and philosophers, as we also mentioned above, recognize these latter four [types of] bad-mixture. But, for some reason which I cannot understand, they omit (οὐκ οἶδ’ ὅπως παραλείπουσιν) the other four, which come about from one half of each of these, just as they also omit the first mixture of all the best”.⁴²⁰ As Galen emphasizes, the majority of doctors and philosophers (he rather ambiguously does not specify whether they are predecessors or contemporaries) to his astonishment ignore the four simple mixtures (mixtures in which only one quality predominates: hot, cold, dry, or wet) and the best mixture.⁴²¹ “And if, indeed, this is the case, as we have shown that it is, we may now confidently say that there are nine different kinds of mixture in all: one well-mixed, the [other] eight not well-mixed; and of these eight, four which are simple bad-mixtures (wet, dry, cold and hot), and another four composite bad-mixtures (wet and hot, dry and hot, cold and wet, cold and dry)”.⁴²²

However, we have yet to reveal that in presenting things in this way here, Galen is aiming to manipulate the reader. For although in his key work concerning mixtures he ascribes the formulation of this system of nine mixtures to himself, Galen betrays himself in a passage in *De locis affectis*, where he inform us that in dealing with a case of memory loss (*De loc. aff.* K. VIII p. 147 “Εἰς ἀνάγκην οὖν ποτε καταστάς ἀνακτήσασθαι τινος ἀπολωλυῖαν μνήμην”), he came to know that Archigenes (of Apamea, the Pneumatist who lived between the 1st and 2nd century CE and studied under Agathinos, a student of Athenaeus)⁴²³ had written a book on this very issue (*De loc. aff.* K. VIII p. 148). For Galen wanted to know which type of mixture was the cause of the disease:

⁴²⁰ *De temp.* p. 30.6–10 H.

⁴²¹ Cf. the end of *De temp.* I 8, where the entire scheme of mixtures is enunciated for the first time.

⁴²² *De temp.* pp. 31.27–32.4 H.

⁴²³ Nutton 2006c.

in fact, since Galen knew the medical school to which the Archigenes belonged, he also knew that this school recognized eight types of *dyskrasiai*, four simple and four composite (*De loc. aff.* K. VIII p. 149 “ἐζήτουν δ' ἐγνωκέναι, τίνα δυσκρασίαν αὐτῆς αἰτίαν ἡγεῖται εἶναι τοῦ πάθους. οὐδὲ γὰρ ὅτι δυσκρασίαν τινὰ εἶναι νενόμικεν, ἠμφίβαλλον, εἰδὼς τὴν αἴρεσιν τοῦ ἀνδρός: **ἀλλ' ἐπειδὴ δυσκρασίας ἦδεν ὀκτὼ καθ' ἕκαστον μόριον συνισταμένας, τέτταρας μὲν ἀπλᾶς, τέτταρας δὲ συνθέτους**”). More precisely, Galen wanted to know whether, according to Archigenes, the disease was brought about by a (simple) cold or a wet mixture of the pneuma residing in the heart, or a composite cold and wet, or dry and cold one (cf. *De loc. aff.* K. VIII p. 149 “ἐπεθύμουν γνῶναι, τίνα τούτων ὁ Ἀρχιγένης ἀπεφήνατο τῆς βεβλαμμένης ἐνεργείας αἰτίαν εἶναι, **πότερα ψύξιν ἢ ὑγρότητα τοῦ κατὰ τὴν καρδίαν πνεύματος, ἢ σύνθετον ἐκ ψύξεως τε καὶ ὑγρότητος, ἢ ξηρότητα μετὰ ψύξεως ὑπολαμβάνει δύνασθαι τὸ πάθος ἐργάσασθαι τοῦτο**”).⁴²⁴

It was exactly this passage that led Max Wellmann to affirm that Galen's scheme of nine mixtures was “entirely dependent on the Pneumatic School (*Galen ist in dieser Theorie völlig von der Pneumatischen Schule abhängig*)”.⁴²⁵ I intend to demonstrate that Wellmann was right in one respect and wrong in another. Indeed, it is true that Galen distinguishes eight types of bad mixtures, like the Pneumatists, and one good mixture, which in Galen's case corresponds to a mixture where all the excesses are neutralized. However, if we say that a theory is entirely dependent on an earlier model, we must also assume that the theoretical foundations of the two theories match, meaning that even the elemental doctrines have to be the same. And this is not the case.

As I repeatedly emphasized throughout the first main chapter, Kupreeva has systematically (in comparison to previous contributions on this issue) dealt with Galen's elemental theory and has brought to light the way in which Galen's elemental theory aligns with the Peripatetic. Whereas Aristotle was disinclined to speak of *stoicheia* as substances and rather stressed their qualitative aspects, Galen goes further and shows that the *stoicheia* are ontologically conceived of as qualified bodies (more precisely, Kupreeva defines them as the “most basic

⁴²⁴ I am grateful to Matyas Havrda, who drew my attention to this passage from *De locis affectis*.

⁴²⁵ Wellmann 1895 p. 145 n. 5.

qualified alterable bodily structures”⁴²⁶), and this conception, which also agrees with a hylomorphic analysis, resembles that provided by his (younger) Peripatetic contemporary Alexander of Aphrodisias.⁴²⁷ Coherently with these theoretical premises, we showed that, in every respect Galen’s theory of mixture conforms to the contemporary Peripatetic model of mixture and finds its innermost justification within an Aristotelian/Peripatetic bio-teleological framework, although in his account, Galen endeavours to incorporate the Hippocratic four-humour theory.

By contrast, as very recent scholarship has made ever more clear, the Pneumatists’ *Elementenlehre* relies on very different theoretical foundations. The founder of the Pneumatic school wrote a long treatise on medicine, now lost, *Peri boêthêmatôn* or *On remedies*, which Galen seems to know and refers to in his *De elementis*.⁴²⁸ It has been underlined by David Leith that Athenaeus’ definition of the elements of the medical art (preserved in Ps.-Galen, *Definitiones Medicae* 31 xix 356 K.) establishes an analogy between the Stoic infinite cycles of *cosmic* generations and *ekpyrôseis* and the biological cycle of the human being. Just as the cosmos comes out of the primary elements at the beginning of the cosmic cycle, and then dissolves into them again at the end of every cycle, in the same way the human being is made up of hot, cold, dry, and wet, and, after its passing away, faces dissolution into these elements once again.⁴²⁹ However, there is a great difference between the cosmic elements and the elements constituting human beings: both are the last, the simplest, and the most basic constituents but, in contrast to the former, the latter are defined as “φαινόμενα” (i.e. apparent or perceptible to the senses).⁴³⁰ Therefore, according

⁴²⁶ Kupreeva 2014 p. 192.

⁴²⁷ Kupreeva 2014 pp. 192–193.

⁴²⁸ Cf. Kupreeva 2014 pp. 171–172; cf. *De elem. sec. Hipp.* CMG I 1.2 p. 102.7–9 De Lacy.

⁴²⁹ In his account, Leith, however, does not distinguish – as Cooper does, cf. p. 44 n. 117 – between the proto-elements of the cosmogony and the real primary elements.

⁴³⁰ Cf. Leith (2015c), who has recently delivered a paper on Athenaeus’ elemental theory. Ps.-Galen, *Definitiones Medicae* K. XIX p. 356 “τί ἐστι στοιχεῖον; στοιχεῖόν ἐστιν ἐξ οὗ πρώτου καὶ ἀπλουστάτου τὰ πάντα γέγονε καὶ εἰς ὃ ἀπλούστατον τὰ πάντα ἀναλυθήσεται ὃν ἔσχατον. Ἀθηναῖος δὲ ὁ Ἀτταλεὺς ἐν τῷ τρίτῳ βιβλίῳ φησὶν οὕτως. τίνα ἐστὶ τῆς ἰατρικῆς στοιχεῖα; στοιχεῖά ἐστι τῆς ἰατρικῆς, καθάπερ τινὲς τῶν ἀρχαίων ὑπέλαβον, τὸ θερμὸν καὶ τὸ ψυχρὸν καὶ τὸ ὑγρὸν καὶ τὸ ξηρὸν, ἐξ ὧν πρώτων φαινομένων καὶ ἀπλουστάτων καὶ ἐλαχίστων ὁ ἄνθρωπος συνέστηκε καὶ εἰς ἃ ἔσχατα φαινόμενα καὶ ἀπλούστατα καὶ ἐλάχιστα τὴν ἀνάλυσιν λαμβάνει (What is an element? An element is the first and simplest thing from which everything has come to be, and the simplest and last thing into which everything will be resolved. Athenaeus of Attaleia speaks thus in the third book. What are the elements of medicine? The elements of

to the Pneumatists, the two fields of Physics/Cosmology and Medicine are rigorously separate and rely on different theoretical grounds.

But what exactly does it mean to say that the elements of medicine are “perceptible to the senses”? In his *De elementis*, Galen extensively criticizes Athenaeus’ view on the primary elements of the medical art. Kupreeva and, more recently, Leith have delved deeper into this very intricate criticism and unfolded some remarkable findings concerning Athenaeus’ elemental theory. On the one hand, Leith makes the very important point that Galen’s criticism starts out from a defence of a particular reading of the Hippocratic treatise *De natura hominis*, according to which, when “Hippocrates” speak of the hot, the cold, the dry, and the wet, he is indeed referring to the corresponding primary elements (fire, air, water, and air). However, Galen attacks Athenaeus for propounding a rival interpretation of the text according to which the Hippocratic author instead wants to point out that the cosmic elements, although they exist, fall outside the field of medical investigation and, therefore, that the doctor should fall back on the mere “organic” qualities of the hot, the cold, the dry, and the wet, i.e., insofar as they constitute the bodies of the living beings. These elements are defined by Galen as proximate (**προσεχῆ**), evident, and not requiring proof (**ἐναργῆ φάσκων εἶναι τὰ στοιχεῖα καὶ ἀποδείξεως μὴ δεῖσθαι**).⁴³¹ In his reading of the

medicine are, as some of the ancients believed, hot, cold, wet and dry. The human being has been put together out of these first, apparent, simplest and least things, and has its resolution into these last, apparent, simplest and least things)” (trans. Leith); cf. SVF II 580; cf. Wellmann 1895 pp. 131–133. For the problem of the attribution to Athenaeus of this definition-pair and its philological implications cf. Coughlin 2016 <http://www.ancientmedicine.org/home/2016/1/5/the-medical-definitions>. In a second definition, Athenaeus introduces what is thought of as fifth element: the pneuma (although in Stoic thinking, more precisely in the Chrysippean formulation, pneuma is a mixture of the active elements, fire and air; SVF II 841, 310, 442, 786 and Galen *Quod animi mor.* K. IV p. 784.7–12); Ps.-Galen, *Introd. s. medic.* K. XIV p. 698 Petit p. 21: “κατὰ δὲ τὸν Ἀθήναιον στοιχεῖα ἀνθρώπου οὐ τὰ τέσσαρα πρῶτα σώματα, πῦρ καὶ ἀήρ καὶ ὕδωρ καὶ γῆ, ἀλλ’ αἱ ποιότητες αὐτῶν, τὸ θερμὸν καὶ τὸ ψυχρὸν καὶ τὸ ξηρὸν καὶ τὸ ὑγρὸν, ὧν δύο μὲν τὰ ποιητικὰ αἷτια ὑποτίθεται, τὸ θερμὸν καὶ τὸ ψυχρὸν, δύο δὲ τὰ ὑλικά, τὸ ξηρὸν καὶ τὸ ὑγρὸν, καὶ πέμπτον δὲ παρεισάγει κατὰ τοὺς Στωικοὺς τὸ διήκον διὰ πάντων πνεῦμα, ὑφ’ οὗ τὰ πάντα καὶ συνέχεσθαι καὶ διοικεῖσθαι (According to Athenaeus the elements of man are not the four primary bodies (fire, air, water and earth), but their qualities (hot, cold, dry and wet), of which he posits that two are productive causes (hot and cold), and two are material (dry and wet). He introduces a fifth (element), in accord with the Stoics, namely the pneuma which permeates everything, by which everything is held together and regulated)” (transl. Leith).

⁴³¹ The Galenic passages Leith quotes are: i) *De Elem. sec. Hipp.* CMG V 1.2 p. 102 De Lacy “οὐ παρακολουθοῦντες δὲ οἱ πολλοὶ τῇ κατὰ τὸν λόγον ὁμωνυμία συγγέονται καὶ ταράττονται, καθάπερ καὶ Ἀθήναιος ὁ Ἄταλεύς, ἅμα μὲν στοιχεῖα τιθέμενος τὰνθρώπου τὸ θερμὸν καὶ τὸ ψυχρὸν καὶ τὸ ξηρὸν καὶ τὸ ὑγρὸν, ἅμα δ’ ἐναργῆ φάσκων εἶναι τὰ στοιχεῖα καὶ ἀποδείξεως μὴ δεῖσθαι, καὶ ποτὲ μὲν ὀνομάζων αὐτὰ ποιότητας καὶ δυνάμεις, ἐνίοτε δὲ σώματα συγχωρῶν

ὑπάρχειν, εἴτα δεδιῶς ἀέρα καὶ πῦρ καὶ ὕδωρ καὶ γῆν ὁμολογήσαι. (But most men, not understanding this, are confused and upset by the verbal ambiguity [N.B. Galen is referring to a passage from *De natura hominis*]; thus *Athenaeus of Attaleia made hot, cold, dry and wet the elements of man, and at the same time he claimed that the elements are clearly visible and do not require proof, sometimes calling them qualities and powers, on occasion granting that they are bodies, then afraid to agree that they are fire, air, water and earth*)” (trans. De Lacy); ii) *De Elem. sec. Hipp.* CMG V 1.2 p. 104 De Lacy “ἀλλ’ ἴσως φήσουσιν οἱ ἀπ’ Ἀθηναίου μηδ’ αὐτοὶ περὶ γε τούτων ἀποφαίνεσθαι μηδέν, ἐπέκεινα γὰρ εἶναι τῆς ἰατρικῆς τέχνης, ἀρκεῖν δ’ αὐτοῖς τὸ θερμὸν καὶ ψυχρὸν καὶ ξηρὸν καὶ ὑγρὸν, ἃ κὰν τοῖς ζώοις ἐναργῶς δεῖξαι δύνανται, στοιχεῖα καὶ τῶν σωμάτων ὑποθέσθαι καὶ τῆς ὅλης ἰατρικῆς. τὸ μὲν οὖν ὡσπερ ζῶου τῆς ἰατρικῆς τέχνης ὑποθέσθαι στοιχεῖα τὸ θερμὸν καὶ τὸ ψυχρὸν καὶ τὸ ξηρὸν καὶ τὸ ὑγρὸν ὅσης ἀλογίας ἔχεται, τί ἂν ἐγὼ νῦν ἐπεξίωμι; κεκωμῶδηται γὰρ ὑπὸ πολλῶν ἤδη τὸ δόγμα καὶ ψόγον καὶ καταγέλωτα οὐ μικρὸν ἔτι τε πρὸς τούτοις ἀπιστίαν οὐκ ὀλίγην τῷ παλαιῷ προσετρίψατο λόγῳ (Perhaps the followers of Athenaeus will say that they themselves make no statement about these things because they are outside the medical art; they are content to make hot, cold, dry and wet, which they can clearly point to also in animals, the elements both of bodies and of the whole of medicine. Why should I now dwell on the utter absurdity of making hot, cold, dry and wet the elements of the medical art, as if it were an animal? It is a view that has been ridiculed by many before now and has subjected the ancient account to no small amount of blame and derision, and no little distrust besides)” (trans. De Lacy); iii) *De Elem. sec. Hipp.* CMG V 1.2 p. 110 De Lacy “ἐθαύμαζον δὲ καὶ πῶς οὐκ αἰσθάνεται συγγέων ἑαυτὸν ὁ Ἀθηναῖος, ὃς θερμὸν μὲν καὶ ψυχρὸν καὶ ξηρὸν καὶ ὑγρὸν ὀνομάζων ἀπαξιῶι πῦρ εἰπεῖν καὶ ἀέρα καὶ γῆν καὶ ὕδωρ. ναί φησι. **τὰ γὰρ προσεχῆ λαμβάνω τῶν ζώων**, οὐχὶ τὰ κοινὰ πάντων σωμάτων στοιχεῖα. καλοῦσι δὲ προσεχῆ τὰ οἷον ἴδια καὶ μηδενὸς ἄλλου τῶν ἀπάντων. ἐμοὶ δὲ καὶ κατ’ ἀρχὰς εὐθὺς εἴρηται πάμπλου διαφέρειν τὰ φαινόμενα στοιχεῖα τῶν ὄντως στοιχείων. ἔοικα δὲ καὶ νῦν ἐρεῖν ὑπὲρ αὐτῶν διὸ μακροτέρων. εἴπερ ἐλάχιστόν τι καὶ ἀπλούστατόν ἐστι μόνιον τὸ στοιχεῖον, εἴη ἂν ὡς πρὸς τὴν αἴσθησιν ὅστοῦν καὶ χόνδρος καὶ σύνδεσμος καὶ ὄνυξ καὶ θριξὶς καὶ πιμελὴ καὶ σὰρξ καὶ νεῦρον καὶ μυελὸς ἴνες τε καὶ ὑμένες καὶ ἀπλῶς εἰπεῖν ἅπαντα τὰ ὁμοιομερῆ στοιχεῖα τῶν ἀνθρωπίνων σωμάτων. ἄρ’ οὖν ὁ Ἀθηναῖος ἔθετό που ταῦτα στοιχεῖα; καὶ μὴν αὐτός ἐστιν ὁ γράφων ἕκαστον μὲν τῶν ὁμοιομερῶν ἐκ τῶν πρώτων γεγονέναι στοιχείων, ἐκ δὲ τῶν ὁμοιομερῶν ἤδη τᾶλλα συγκεῖσθαι τοῦ ζῶου μόρια (I was amazed that Athenaeus does not see that he is confusing himself when he names hot and cold and dry and wet but avoids naming fire and earth and water and air. ‘Yes,’ he says, ‘because I am taking the proximate elements of animals, not the elements common to all bodies’ – and by proximate they mean ‘peculiar to’ and ‘of nothing else at all’. But I said right at the start that apparent elements are far different from true elements; it seems to me that this is the time to discuss this difference at greater length. If the element is some least and simplest part, it would be on the visible level bone, cartilage, ligament, nail, hair, fat, flesh, nerve, marrow, fibres too, and membranes, and in a word all the homoeomerous parts would be elements of human bodies. But did Athenaeus make these the elements? He is the very one who writes that each of the homoeomerous parts has come into being from the first elements, and that the other parts of the animal are then formed from the homoeomerous parts)” (trans. De Lacy); iv) *Gal. Hipp. Elem.* CMG V 1.2 p. 116 De Lacy “τὸ δὲ διὰ τοῦτο δεδιέναι ταῦθ’ ὁμολογεῖν εἶναι στοιχεῖα, διότι μήτ’ ἐξαιροῦμεν ἐκ τοῦ σώματος αὐτῶν τι μήτ’ ἐντίθεμεν, ἐσχάτως ἠλίθιον ἐστὶ· τὰ γὰρ ἐκ τῶν στοιχείων γεγονότα προσφερόμενοι πάντως δήπου καὶ τὰ στοιχεῖα τοῖς σώμασιν ἡμῶν ἐντίθεμεν. ἀλλ’ οὐκ εἰλικρινῆ, φασίν, οὐδὲ μόνα. κακῶς οὖν ἐλέγετο <τὸ> μήτ’ ἐξαιρεῖν μήτ’ ἐντιθέναι στοιχεῖον· ἐχρῆν γὰρ οὐχ ἀπλῶς οὕτως εἰπεῖν, ἀλλ’ ὅτι μὴ μόνον μηδ’ ἄμικτον μηδ’ αὐτὸ καθ’ αὐτό. καίτοι καὶ τοῦτ’ αὐτὸ τί ποτε βούλεται περαίνειν αὐτοῖς; οὔτε γὰρ ἄχρηστος ἢ περὶ τῶν στοιχείων θεωρία διὰ τοῦτ’ ἂν εἰκότως νομισθεῖη, διότι μηδὲν αὐτῶν ἄμικτον ἐτέρου τοῖς σώμασιν ἡμῶν προσφέρομεν, οὔτε διὰ τοῦτο πῦρ καὶ ἀήρ καὶ ὕδωρ καὶ γῆ κακῶς εἴρηται στοιχεῖα, διότι τοῖς μὲν ἐξ αὐτῶν χρώμεθα γεγονόσι, μόνον δ’ αὐτῶν ἕκαστον ἴδια καὶ καθ’ ἑαυτὸ παντάπασιν ἄχρηστον ὑπάρχει (*To be afraid to grant that they are elements for the reason that we neither take any of them out of the body nor put any of them into it is utterly stupid; for when we eat and drink the things that have been generated from the elements we most certainly put the elements too into our bodies. But not in a pure form, they say, and not alone.* Then it was incorrect to say that we neither take out nor put in an element; this statement should not have been made without qualification in that way, but with the qualification ‘not alone or unmixed or itself by itself’. And yet even with this qualification what does it aim to achieve for them? *It is not reasonable that speculation about the elements be considered useless because*

Galenic passages, Leith points out that according to the Pneumatists, although the cosmic elements indeed exist and are the elements common to all, when it comes to the medical art and to the close inspection of the nature of human beings, they are not useful at all for dietetic or therapeutic purposes. In adopting this approach, Athenaeus follows a strictly medical tradition whose roots have to be recognized in the tendency, amply displayed by “archaic”, i.e. Hippocratic, and Hellenistic medicine, to separate natural philosophy as the highest form of theoretical *hypotheseis* from medical *technē* that starts its enquiry at the sense-perceptible level (a tendency rejected by Galen himself). Like the earlier medical tradition, although conscious of the existence of the ultimate constituents of the cosmos, the physician should instead appeal to the *proximate* elements (according to Leith, the adjective *προσεχής* reflects Athenaeus’ awareness of the existence of true primary elements), i.e., the concrete and perceptible (*ἐναργῆ/φαινόμενα*) instantiations of the cosmic elements: the temperature of bodies or their degree of humidity.⁴³²

By analysing Galen’s criticism of Athenaeus’ theory of elements in his *De elementis*,⁴³³ Kupreeva unearths not only the main features of Galen’s theory of primary elements, but also some new and noteworthy reflections on both i) the

we do not take into our bodies any one of them unmixed with another; and it was wrong to deny that fire and air and water and earth are elements for the reason that we use things that have been generated from them, but each of them alone, separate and by itself, is completely useless” (trans. De Lacy).

⁴³² As I have hinted, Leith enquires into the theoretical framework within which Athenaeus’ speculation relating to the primary elements is situated. On the one hand, he convincingly argues that Athenaeus’ position may have developed from his reading of the treatise *De natura hominis* (as can be inferred from Galen’s *De elementis*): for right at the beginning, the Hippocratic author declares – as Leith underlines – that he will not deal with the nature of the human being in a way that will trespass on what strictly pertains to the art of medicine; in fact, as the Hippocratic author affirms, he will not consider the nature of the human being as made up of air, water, and earth, “or any other thing which is not evident (*φανερὸν*) in human beings” (*De nat. hom.* I 1.3 p. 164, 1 ff. Jouanna). On the other hand, Leith underscores the influence the Alexandrian anatomists may have exerted on Athenaeus. Analogously to Athenaeus, Herophilus and Erasistratus, who are sometimes defined by Galen as semi-Dogmatists, did not enquire into the nature of the ultimate cosmic building blocks of the nature of the human being. On the one hand, according to Erasistratus the first theoretical structure constituting the nature of man is the well-known triplet of nerve, artery, and vein (which in any case was the theoretical reproduction of perceptible uniform parts). On the other hand, Herophilus limits his medical investigation to the first visible structures in the anatomical evidence (in a passage from the Anonymus Londinensis these primary constituents are defined *phainomena*; cf. Anon. Lond. XXI 18–23, 32–35 = pp. 45–46 Manetti = T50a von Staden; cf. also Gal. *De meth. med.* K. X p.107 = T50b von Staden). On this cf. also Leith 2015a.

⁴³³ I have summarized the main lines of Galen’s criticism of Athenaeus’ elemental theory throughout 1.3.4 pp. 85ff.

ontological status of Athenaeus' primary elements and ii) their place within the Pneumatists' medical system.

On the one hand, according to Galen these sense-perceptible elements of human nature would have to be identified only with the homoeomerous parts (that is, the body in which a certain quality inheres by prevalence), whereas Athenaeus is reported to have said that, by contrast, the homoeomerous parts come out of the hot, the cold, the dry, and the wet (so according to the Pneumatists, they would not coincide with the homoeomerous parts).⁴³⁴ Kupreeva, not irreconcilably with Leith, sheds more light on the connections between the Pneumatists' so-called sense-perceptible, evident and proximate elements, which are always to be understood as corporeal, and the Stoic cosmic elements.⁴³⁵ Kupreeva notes that, according to the Stoics, the soul's ontogenesis takes place through a process they refer to as a "hardening" or *στόμωσις*: it consists in the sudden refrigeration of the internal hot pneuma.⁴³⁶ Now, as Kupreeva shows, in an account provided by Antyllus, a Pneumatist who was Galen's contemporary, the connatural pneuma is thought of as continuously in motion and as producing a friction which re-kindles the vital heat:⁴³⁷ a kind of adventitious, secondary, and *proximate* heat which, as Kupreeva points out, would coincide neither with the *pyr technikón* (the active principle which by acting on the passive generates the whole cosmos) nor with the elemental fire (which is produced only secondarily during the cosmogonic process). Therefore, as Kupreeva states, "the Pneumatists thus have philosophical reasons, taken from Stoic physics, to argue that vital heat present in the human body is not identical

⁴³⁴ Galen *De elem. sec. Hipp.* CMG V 1.2 p. 110–112.2 De Lacy.

⁴³⁵ However, in contrast to Leith, Kupreeva identifies the *προσεχῆ* elements as the humours (cf. Kupreeva 2014 p. 174), although in her account of the Pneumatists' elemental theory this does not emerge in a clear-cut way.

⁴³⁶ Plut. *Stoic. Rep.* 1053c4–d1 "ἄτοπος οὖν φαίνεται τῆ περιψύξει νῦν μὲν ἐξ ἀναισθήτων ποιῶν ἔμψυχα, νῦν δ' εἰς ἀναισθητα καὶ ἄψυχα μεταβάλλον τὸ πλεῖστον μέρος τῆς τοῦ κόσμου ψυχῆς. ἄνευ δὲ τούτων ὁ περὶ ψυχῆς γενέσεως αὐτῶ λόγος μαχομένην ἔχει πρὸς τὸ δόγμα τὴν ἀπόδειξιν. γίνεσθαι μὲν γὰρ φησι τὴν ψυχὴν, ὅταν τὸ βρέφος ἀποτεχθῆ, καθάπερ *στομώσῃ* τῆ περιψύξει τοῦ πνεύματος μεταβαλόντος, ἀποδείξει δὲ χρήται τοῦ γεγονέναι τὴν ψυχὴν καὶ μεταγενεστέραν εἶναι μάλιστα τῶ καὶ τὸν τρόπον καὶ τὸ ἦθος ἐξομοιοῦσθαι τὰ τέκνα τοῖς γονεῦσι; *Plut. Comm. Not.* 1084d7–e4 Ἀλλὰ ταῦτα μὲν παρὰ τὰς κοινὰς βιάζονται προλήψεις· ἐκεῖνα δ' ἤδη καὶ παρὰ τὰς ἰδίας, τὸ θερμώτατον περιψύξει καὶ πυκνώσει τὸ λεπτομερέστατον γεννῶντες. ἢ γὰρ ψυχὴ θερμώτατόν ἐστι δῆπου καὶ λεπτομερέστατον· ποιοῦσι δ' αὐτὴν τῆ περιψύξει καὶ πυκνώσει τοῦ σπέρματος οἷον *στομώσῃ* τὸ πνεῦμα μεταβάλλοντος, ἐκ φυτικῶν ψυχικῶν γενόμενον. γεγονέναι δὲ καὶ τὸν ἥλιον ἔμψυχον λέγουσι, τοῦ ὑγροῦ μεταβάλλοντος εἰς πῦρ νοερόν. ὦρα καὶ τὸν ἥλιον διανοεῖσθαι περιψύξει γεννώμενον".

⁴³⁷ Cf. Oribasius *Coll. Med.* CMG VI 1.1 p. 163.11–15 Raeder.

with the cosmic heat. This makes all the proximate qualities dependent on the pneumatic motion, and accounts for the difference between these qualities and their cosmic counterparts (earth, air, fire, water), although presumably there is some sort of relation between these cosmic qualities (which are identical with cosmic elements in the Stoic system) and the proximate qualities”.⁴³⁸ Moreover, with regard to the role these perceptible elements play within Pneumatism, Kupreeva recognizes that in their refusal to speak of the cosmic elements as constitutive of the medical *techne*, the Pneumatists situate themselves alongside the Rationalists and the Empiricists. For they share with the Rationalists the conviction that there is a limited number of basic principles to which we can have recourse in medical enquiry (although in Galen’s view these ultimate constituents of all the natural bodies have to be found through conceptual investigation and not through sense-perception), and with the Empiricists the inclination to limit themselves to the external experience given by the senses.⁴³⁹

As we can see, both the scholars proceed in the same direction as they tend, on the one hand, to enhance the link between the Pneumatists’ primary elements and Stoic physics (although with due differences between the Stoics’ corporeal cosmic elements and the Pneumatists’ sense-perceptible elements) and, on the other hand, the distance between Galen’s Rationalist approach (which makes of the cosmic elements of natural philosophy as the building blocks of medicine) and the semi-Dogmatic Pneumatists’ approach, which rigidly marks the difference between these two disciplines and assigns them different basic constituents. We can easily note that the two elemental systems are very different from one another and for two main reasons: i) on the one hand, the corporeal sense-perceptible qualities of the Pneumatists of Stoic origin do not coincide with Galen’s primary elements, which are based on an antidogmatic qualitativist physics of Aristotelian origin (although not declared); and ii) the severe exclusion of natural philosophy, broadly understood, from medicine leaves the Pneumatists unable to work out a comprehensive philosophical world-view within which to place their scheme of mixtures, which was exclusively used for medical – pathophysiological – purposes (differently from Galen, as we will

⁴³⁸ Kupreeva 2014 p. 175–176.

⁴³⁹ Kupreeva 2014 p. 178.

see). We can therefore reach the following conclusion. From the point of view of natural philosophy (which is our narrowed field of enquiry), on the one hand Galen inherits from the Pneumatists the pure and empty scheme of nine mixtures, which he applies to a notion of elemental mixture – which, as we saw in detail, has nothing to do with the Stoic model of mixture (apart from some superficial redundancies), and which he fundamentally derives from the contemporaneous Peripatetic physics. And, on the other hand, this scheme is profoundly anchored to his unified (although with antidogmatic limits) medical-cum-philosophical system, where medicine is thought of, as Kupreeva stresses, as the “handmaiden” of natural philosophy,⁴⁴⁰ and where a strongly teleological order entirely informs his understanding of the physical world – on a small but also on a large scale.

2.4 A twofold εὐκράσια (good mixture). The midpoint according to substance, genus, and species, its consequences and teleological implications

In his 1981 essay *Modelli di medicina in Galeno*, Mario Vegetti argues that in Galen’s *De temperamentis* it is impossible to recover traces of a teleological language. According to Vegetti, the Nature pervading this Galenic treatise takes on the appearance of a *natura peccans* insofar as Galen opposes to one good mixture eight types of bad mixtures, which are to be considered literally as “natural failures” leading to degenerative phenomena and pathological predispositions: a badly mixed *krasis* would depend on a compositional error, i.e. a convoluted assemblage executed by what can be also seen as a fallible artist, i.e. nature.⁴⁴¹

In this discussion, I intend to subvert Vegetti’s claim by showing not only manifest evidence of a teleological framework in *De temperamentis* (an aspect which Philip Van der Eijk has brought to light⁴⁴²), but also that Galen’s scheme of nine mixtures is the skeleton for such a framework. We will start by returning

⁴⁴⁰ Kupreeva 2014 p. 179, comments on Galen *De elem. sec. Hipp.* CMG V 1.2 pp. 92.26–94, 2 De Lacy.

⁴⁴¹ Vegetti 1981 pp. 56–57.

⁴⁴² Van der Eijk 2010 and 2014a.

to Galen’s definition of hot, cold, dry, and wet, then we will recall the research findings gained in the previous chapter concerning Galen’s notion(s) of *eukrasia* and, finally we will apply these to his general world-view (on which we developed a somewhat different account in comparison to the classical essay by Hankinson⁴⁴³).

Moraux has already underlined that in Galen’s view hot, cold, dry, and wet can be said *trichōs*, i.e. in three ways: a) as a quality; b) as unmixed body, i.e. the pure element, that is fire, air, water, and earth, where the primary qualities (hot, cold, dry, and wet) are present to the extreme degree; and c) as a mixed body (i.e. the homoeomerous part in which the quality is prevalent).⁴⁴⁴ Kupreeva goes further still, showing that behind this threefold distinction lurks Galen’s logical background, insofar as Galen differentiates between these three senses of the hot, the cold, the dry, and the wet by appealing to the distinction, drawn by Aristotle in his *Categories* (a text that he knew very well and on which he even wrote a commentary in four books), between “being said of a subject” (synonymous predication) and “being said in a subject” (inherence).⁴⁴⁵ We intend to go even further since, to this logical distinction, Galen adds the category of relation and makes it more complex, as we see in **T3**:

T3 Galen *De temperamentis* K. I p. 542.13-544.14 Helmreich pp. 21.20–22.26:

(1) εἰς δὲ τὰ παρόντα, τῶν ποιῶν σωμάτων τριχῶς λεγομένων, ἐπισκοπεῖσθαι προσήκει, πῶς ἐν ἐκάστη ῥήσει κέχρηται τις τῆ προσηγορία, πότερον ὡς ἀπλοῦν τι καὶ ἄμικτον δηλῶν ἢ ὡς πρὸς τὸ σύμμετρον ὁμογενὲς ἢ ὁμοειδὲς παραβάλλον | ἢ ὡς πρὸς τὸ τυχὸν ὀτιοῦν· (2) οἷον ὅταν ὀστοῦν εἴπη τις ξηρὸν ἢ ψυχρὸν ἀπλῶς οὕτως ἴσον ὀνομάσας ἄνευ τοῦ προσθεῖναι λέοντος ἢ κυνὸς ἢ ἀνθρώπου, δηλόν, ὡς πρὸς τὴν ὅλην φύσιν ἀποβλέπων ἀπάντων τῶν ἐν τῷ κόσμῳ σωμάτων ἐπινοεῖ τι μέσον, ὃ παραβάλλον αὐτὸ ξηρὸν εἶναι φησιν.

⁴⁴³ Hankinson 1989.

⁴⁴⁴ Moraux 1984 p. 303 cf. *De elem. sec. Hipp.* CMG V 1.2 pp. 114.24–116.5 De Lacy.

⁴⁴⁵ Kupreeva 2014 pp. 181 ff. with references.

ἂν δέ γ' εἶπη τὸ τοῦ λέοντος ὄστουν [ἢ τοῦ ἀνθρώπου ἢ τοῦ κυνός] ξηρὸν εἶναι, δῆλον, ὡς ἐν αὐτοῖς πάλιν τοῖς τῶν ζώων ὄστοις τῷ μέσῳ παραβάλλει. καὶ χρὴ κἀνταῦθά τι νοῆσαι, πάντων τῶν ζώων τῶν μὲν μᾶλλον τῶν δ' ἥττον ἐχόντων ὅστ' αἱ ξηρά, μέσον εἶναι τὴν κρᾶσιν ὄστουν ἐν τινὶ γένει ζώων, οἷον ἀνθρώπων, εἰ τύχοι, καὶ τούτῳ τᾶλλα παραβαλλόμενα τὰ μὲν ξηρά, τὰ δ' οὐ ξηρὰ προσαγορεύεσθαι. καὶ μὲν δὴ κἀν τοῖς ἀνθρώποις αὐτοῖς πάλιν ὁ μὲν τις ξηρὸν, ὁ δ' ὑγρὸν ὄστουν ἔχειν λεχθήσεται, τῷ μέσῳ παραβαλλόμενος ὡς ἐν ἀνθρώποις. Ὅτι δ' ἐν ἅπασιν τοῖς οὐσί τοῦ μέσου τῶν ἄκρων ἐστὶ τὸ σύμμετρον τε καὶ κατ' ἐκεῖνο τὸ γένος ἢ εἶδος | εὐκρατον, ἀεὶ χρὴ προσυπακούειν ἐν ἅπαντι τῷ λόγῳ, κἀν παρελθόντες ποτὲ τῇ λέξει τύχωμεν αὐτό, καὶ δὴ καὶ τούτων οὕτως ἐχόντων, ὅταν ὑγρὰν εἶναι τις εἶπη τήνδε τὴν κρᾶσιν ἢ θερμὴν, ἐρωτᾶν, ὅπως εἴρηκεν, ἄρα γε τῷδέ τινι παραβάλλον ἀφορισμένως ἐνί, καθάπερ, εἰ τύχοι, τῷ Πλάτῳ τὸν Θεόφραστον, ἢ κατὰ γένος ὅτιοῦν ἢ εἶδος· [ἢ γὰρ ὡς ἀνθρωπον ἢ ὡς ζῶον ἢ ὡς οὐσίαν ἀπλῶς]. **(3)** τὸ γὰρ δὴ τρίτον σημαινόμενον ἐκάστου τῶν τοιούτων ὀνομάτων, ὅπερ ἀπλοῦν ἐλέγομεν εἶναι καὶ ἄμικτον, οὐκ ἔστιν ἐν τοῖς κεκραμένοις, ἀλλ' ἐν αὐτοῖς τοῖς πρώτοις, ἃ δὴ καὶ στοιχεῖα προσαγορεύομεν, ὥστε τριχῶς ἐκάστου τῶν ποιῶν σωμάτων λεγομένου τῶν δύο μόνων ἡμᾶς χρῆζειν εἰς τὴν περὶ κράσεων πραγματείαν ἢ πρὸς τὸ τυχόν ὅτιοῦν παραβάλλοντας ἢ πρὸς τὸ σύμμετρον ὁμογενές.

(1) For the present, since the term 'qualified bodies' may be used in one of three senses, we ought to consider, in each statement, how the appellation has been used, whether to indicate something absolute and uncombined, or in comparison with that which is at the point of good balance within the genus or species as a whole, or in comparison with anything [else] (πότερον ὡς ἀπλοῦν τι καὶ ἄμικτον δηλῶν ἢ ὡς πρὸς τὸ σύμμετρον ὁμογενές ἢ ὁμοειδές παραβάλλον | ἢ ὡς πρὸς τὸ τυχόν ὅτιοῦν). **(2)** When, for example, someone says that bone is dry, or cold, in the absolute sense, without adding that it is the bone of a lion, or of a dog or of a human being, then it is evident that he has in mind some midpoint when considering the whole of nature [consisting] of all the bodies in the cosmos; and it is by comparison with this that he states it to be dry (ὡς πρὸς τὴν ὅλην φύσιν ἀποβλέπων ἀπάντων τῶν ἐν τῷ κόσμῳ σωμάτων ἐπινοεῖ τι μέσον, ᾧ παραβάλλον αὐτὸ ξηρὸν εἶναι φησιν). If, however, he says that the bone of a

lion is dry, then it is evident that he is, in this case, comparing it with the middle [item] within the bones of animals themselves. And here too there is something [else] that one should realize: that, as all animals have dry bones to a greater or lesser degree, the middle [type of] bone in terms of mixture occurs in some particular species of animal, such as humans, for example, and that the others are referred to as dry or not dry in comparison with that. And indeed within the human species, similarly, some will be said to have dry bones, and some wet bones, the comparison here being with the middle [type] within human beings. Throughout the whole argument it must be borne in mind that the mid-point between the extremes for all beings is the state of good balance, and of good-mixture within that particular genus or species, even though we may sometimes ignore this in our actual verbal expression. And this being so, whenever someone calls a mixture wet or hot, one should ask in what sense that term has been used. Is it in comparison with one specific [item], in particular, as if, say, one were comparing Theophrastus with Plato? Or is it by reference to a particular genus or species? **(3)** For indeed the third meaning of each of these terms, the one which we called absolute and uncombined, does not exist in [objects that] consist of a mixture, but only in the primary [objects], those, indeed, to which we also refer as ‘elements’. Thus, though there are, in the case of each qualified body, three senses in which the terms may be used, we only require two in the study of mixtures, where we are either making a comparison with any chance [body], or with the state of good balance within the genus. (Trans. Singer; slightly modified)

After having summarized the theories of his predecessors in *De temperamentis* I 1–3 and given polemics against the Pneumatists in I 4–5, in I 6 Galen lays the path for the study of mixtures of living beings (and, of course, especially of human beings). As we see in **T3.1**, he focuses on the *poia sômata*, or qualified bodies (that is, on the non-synonymous predication or predication by way of inherence, putting aside synonymous predication) and states that, when a body is defined as hot, cold, dry, or wet, this can indicate a) either something absolute and uncombined where the quality is present to the extreme

degree (cf. **T3.1** ἀπλοῦν τι καὶ ἄμικτον, i.e. the element); or b) a qualified body which is said to be hot, cold, dry, and wet by way of prevalence: b.1) in comparison with that which is at the point of good balance within the same genus or species (cf. **T3.1** πρὸς τὸ σύμμετρον ὁμογενὲς ἢ ὁμοειδὲς παραβάλλων), or b.2) in comparison with any random object (cf. **T3.1** πρὸς τὸ τυχὸν ὀτιοῦν).

Afterwards, in **T3.2**, Galen elucidates more clearly what he has in mind when he speaks of *poia sômata* by way of prevalence. In the first place, Galen says that when someone declares that bone is dry without qualification or term of reference (ἀπλῶς) (i.e. without adding that it is the bone of a lion, or of a dog or of a human being), it is clear that he is comparing this bone to the unique absolute midpoint among all the physical bodies subjected to generation and destruction, and it is by comparison with this that he affirms this bone to be dry (i.e. it is dry in an absolute sense) (cf. **T3.2** “then it is evident that he has in mind some midpoint when considering the whole of nature [consisting] of all the bodies in the cosmos; and it is by comparison with this that he states it to be dry (πρὸς τὴν ὅλην φύσιν ἀποβλέπων ἀπάντων τῶν ἐν τῷ κόσμῳ σωμάτων ἐπινοεῖ τι μέσον, ᾧ παραβάλλων αὐτὸ ξηρὸν εἶναί φησιν”). In the preceding chapter, we singled out this absolute symmetric midpoint where hot and cold, dry and wet meet at their very centre (i.e. the case in which hot/cold and dry/wet are exactly equidistant from one another and the volumes of their elemental matter are equal): it is the skin of the palm of the hand which is defined as the yardstick or *gnômôn* (i.e. reference point, also called κανὼν and κριτήριον *De temp.* p. 33, 19) of all the perceptible objects⁴⁴⁶ and which indicates a state of absolute *eukrasia*.

Second, if one specifies that the dry bone in question is the bone of a lion, it is evident that one is comparing the lion’s bone to the bone that is the midpoint of the same genus (i.e. animals): thus, the lion’s bone will be defined as dry when compared, for example, to the bone of the human being (cf. **T3.2** “**If, however, he says that the bone of a lion is dry, then it is evident that he is, in this case, comparing it with the middle [item] within the bones of animals themselves.**

⁴⁴⁶ *De temp.* p. 34.20 ff. H. “τοιούτου δ’ ἐστὶ καὶ τὸ τῶν ἀνθρώπων δέρμα, μέσον ἀκριβῶς ἀπάντων τῶν ἐσχάτων, θερμοῦ καὶ ψυχροῦ καὶ σκληροῦ καὶ μαλακοῦ, καὶ τούτου μάλιστα τὸ κατὰ τὴν χεῖρα. γνῶμων γὰρ αὕτη πάντων ἔμελλεν ἔσεσθαι τῶν αἰσθητῶν”.

And here too there is something [else] that one should realize: that, as all animals have dry bones to a greater or lesser degree, **the middle [type of] bone in terms of mixture occurs in some particular species of animal, such as humans, for example**, and that the others are referred to as dry or not dry in comparison with that (ἄν δέ γ' εἶπη τὸ τοῦ λέοντος ὀστοῦν ξηρὸν εἶναι, δῆλον, ὡς ἐν αὐτοῖς πάλιν τοῖς τῶν ζώων ὀστοῖς τῷ μέσῳ παραβάλλει. καὶ χρηὴ κἀνταῦθά τι νοῆσαι, πάντων τῶν ζώων τῶν μὲν μᾶλλον τῶν δ' ἥττον ἐχόντων ὀστᾶ ξηρά, μέσον εἶναι τὴν κρᾶσιν ὀστοῦν ἐν τινι γένει ζώων, οἷον ἀνθρώπων, εἰ τύχοι, καὶ τούτῳ τᾶλλα παραβαλλόμενα τὰ μὲν ξηρά, τὰ δ' οὐ ξηρά προσαγορεύεσθαι)”; or else, although it is not specified in **T3**, the bone of a lion can be defined as dry compared to the midpoint of its own species (lion), whence the meaning of the non-synonymous predication will be different – the difference is given by the reference term. In the first case, the bone will be called dry if compared – within the genus of animals – to the human being’s bone (i.e. it will then be defined as dry with respect to the genus of animals); in the second case, the bone will be called dry compared to the bone of the lion that is in the middle of the species of lions (i.e. the bone will be then defined as dry with respect to the species of lions).⁴⁴⁷ Finally, a mixed body can be defined as hot, cold, dry, or wet compared to whichever other random mixed body (i.e. without reference to genus or species), when for example we compare Theophrastus to Plato (cf. **T3.2** “And this being so, whenever someone calls a mixture wet or hot, one should ask in what sense that term has been used. Is it in comparison with one specific [item], in particular, as if, say, one were comparing Theophrastus with Plato? Or is it by reference to a particular genus or species? (τῷ Πλάτῳ τὸν Θεόφραστον, ἢ κατὰ γένος ὀτιοῦν ἢ εἶδος)”. In fact, as Galen clarifies at the end of the passage, for the study of mixtures one needs to analyse them either in comparison to a) whichever random body one encounters or b) to the midpoint according to the same genus (cf. **T3.3** “εἰς τὴν περὶ κρᾶσεων πραγματείαν ἢ πρὸς τὸ τυχόν ὀτιοῦν παραβάλλοντας ἢ πρὸς τὸ σύμμετρον ὁμογενές”).

⁴⁴⁷ *De temp.* p. 20, 16–22 H. “A hot animal, for example, is one that is hotter than the middle animal, in terms of its mixture; a hot horse is one that is hotter than the middle horse. And the middle [items] in each genus or species are also the well-balanced ones: they are equidistant from each of the extremes within that particular genus or species. **Animal, for example, is a genus; horse, ox and dog, species. Furthermore, the human being is middle, in its mixture, within the genus of animals as a whole**” (transl. Singer).

As we saw in the last two cases, which – as we will see later on – especially relate to living bodies (plants and animals), the category of relation comes into play here.

On the one hand, when a body *x* is compared with some random body *y*, “it is possible for the same thing to be referred to by opposite [terms], for example for Dion to be referred to as drier than Theon and Memnon but as wetter than Ariston and Glaucon”.⁴⁴⁸ Of course, Aristotle would deny that Dion can be classed among the relatives if he is considered *qua* individual substance, but he is a relative *qua* drier than Theon and Memnon or *qua* wetter than Ariston and Glaucon.⁴⁴⁹ Dion is a relative on both an ontological (something is said to be **drier** or **wet-ter in relation to another being**) and a logical level (one has to specify the reference term: Dion is **drier than** Theon and Memnon, or he is **wetter than** Ariston and Glaucon); and ontologically grounded relatives (which are also logically grounded) are contemporaneous by nature: they cannot exist without each other (Dion cannot be **drier** if we do not think of comparing him to someone else).⁴⁵⁰ At the same time, he can be **both drier and wetter** given that we change the reference terms.

On the other hand, and more importantly, the physician has to enquire into the *oikeia physis* of the body under investigation and we have already seen that, analogously to Aristotle’s biological approach (on Lennox’s reading), the differences between single individuals that are specifically different are marked off by the rule of “the more and the less” (I refer to what I have defined as Galen’s functionalistic physical/physiological articulation mixture-dynamis/eis-energeia/ai: in sum, the differences among the single individuals and their activities are due to the proportions of hot/cold and dry/wet within a certain essence-specifying range).⁴⁵¹ What we left open there will now be clarified: for the *oikeia physis* of every living body should be evaluated, and, therefore, defined as hot/dry, hot/wet, cold/dry, cold/wet (composite mixtures), or hot,

⁴⁴⁸ *De temp.* p. 23.4–7 H. (transl. Singer).

⁴⁴⁹ *Cat.* 7 8a16–18.

⁴⁵⁰ *Cat.* 7b15–b22 “Relatives seem to be simultaneous by nature; and in most cases this is true. For there is at the same time a double and a half, and when there is a half there is a double, and when there is a slave there is a master; and similarly with the others. Also, each carries the other to destruction; for if there is not a double there is not a half, and if there is not a half there is not a double. So too with other such cases” (transl. Barnes).

⁴⁵¹ Cf. *supra* pp. 137 ff.

cold, dry, wet (simple mixtures), or well-mixed (*eukratos*) on the basis of a comparison between the individual body in question and the symmetric midpoint of the same species and genus (i.e. the best *physis* within that species or genus).

But what does Galen mean by species and genus? In *De temperamentis* I 6 he describes the cosmos as being made up of three concentric realms. For there is the highest genus (*anôtátô ti génos*), that of the substance or *ousía*, within which falls everything animate or inanimate, and this is the common genus of human being, dog, plane tree, fig tree, stone, bronze, iron, and all the rest.⁴⁵² The genus of substance in turn includes the genus of the plants and within this latter that of the animals, the genus of the plants being higher than that of the animals (as we saw, analogously to Alexander, from the simplest to increasingly more complex bodies).⁴⁵³ Below the highest genus of the substance there are many other genera: “that of ‘animal’, including bird and fish; that of ‘plant’, including tree and herb; ‘bird’ includes eagle and raven; and ‘fish’ bass and wrasse. And in exactly the same way the genus ‘tree’ contains olive and fig, while that of ‘herb’ contains pimpnel and peony. These are the ultimate genera (*ἔσχατα γένη*), which are also referred to as species (*εἶδη*), such as raven, wrasse, fig and pimpnel; and of this sort too are human, ox and dog”.⁴⁵⁴ Now, in relation to this subdivision into three concentric realms (substances, plants, animals), an unspecified substance (which, as we have seen, can be either inanimate or animate) can be said to be hot, cold, dry, and wet, or well-mixed in an absolute sense, whereas, by contrast, if it is a plant or an animal, this definition is no longer sufficient as the physician must consider its *oikeia physis* in comparison

⁴⁵² *De temp.* p. 26.18 ff. H.

⁴⁵³ *De temp.* p. 23.16 ff. H. “Of these, the comparison with another man is a comparison within the same species, while the comparison with bees or ants is one within the same genus, as, equally, is the comparison with any plant. The genus in question in the latter case is a higher (*anôtérô*) one than that of animals; so, in the same way, that which includes stone, iron and bronze is even higher than that” (transl. Singer).

⁴⁵⁴ *De temp.* p. 26, 23 ff. H. (transl. Singer). As we see, Galen speaks only of the ultimate *gené* more precisely as *eidé* rather than with recourse to a systematic *γένος/εἶδος* analysis that can be used at various levels of generality; although he seems to be well aware of the Aristotelian usage: *De temp.* 27.1–6 H. “As one proceeds from the higher categories downwards, these are the ultimate genera, which are therefore also referred to as species;⁴⁵⁴ as one proceeds upwards from the individual existent objects, on the other hand, they are the first. **And it has been shown in another work how the ancients reasonably referred to all these items between the individual and the first genus as both species and genera**” (the reference to this writing may be to *Differ. puls.* VIII.601 and 630 K.). On Aristotelian diairetical process in biological works and on *γένος/εἶδος* analysis cf. Balme 1987c and Lennox 1987 pp. 348 ff.

with the midpoint of the same genus or species.⁴⁵⁵ Therefore, the physician is endowed, so to speak, with two pairs of eyes when he deals with physical bodies: an *absolute* pair and a *relative* pair. In the first case, every physical body is judged on the basis of an absolute reference point (i.e. within the highest genus of substance and by referring its own mixture to the quantitatively determinable *onkoi* of the elements; therefore, to put it simply, by comparing the mixture of whichever physical body, be it animate or inanimate, to the *absolute well-mixed mixture*, i.e. the yardstick or the palm of the hand). In the second case, living bodies' mixtures are judged on the basis of the relative midpoint according to their own species and genus and the state of good-mixture is evaluated in functionalistic terms, that is on the basis of activities: as we saw, even if a plant or an animal does not have an absolute well-mixed mixture (i.e. the amounts of the elements are not equal), it has a *relative well-mixed mixture* because it performs its activities best.⁴⁵⁶ We see that, only in the first case, on an absolute scale, do we have just one well-mixed mixture or absolute *eukrasia* (and this

⁴⁵⁵ *De temp.* p. 23, 24 ff. H. “But let us just make this distinction amongst them: that **when some existent object** is called well-mixed in absolute terms, and some other is called drier, hotter, colder or wetter than it, the one that we are calling well-mixed, in this context, is that [which is composed] from a precise equality of opposites coming together, while whatever has some deficiency or predominance in relation to this we refer to by the term for whatever predominates. **When, however, we speak of a well-mixed plant or animal**, we are not with this kind of verbal expression comparing opposites with each other in the absolute sense, but rather using as our point of reference the nature of the plant or animal [in question]” (trans. Singer).

⁴⁵⁶ *De temp.* p. 24.3–25.14 H.: “We would say, for example, that a fig-tree was well-mixed, if it were one possessed of that nature which is most appropriate to a fig-tree; and the same of a dog, pig, horse or human being when each of these, similarly, was in the best state with regard to its own nature. **And this matter of ‘being in the best state with regard to its own nature’ is evaluated in terms of the activities [...]** We will, then, speak of all these – I mean, *animals and plants* – as having the best, middle [type of] mixture within their own genus, not in the absolute sense, when there is a precise equality of opposites, but when they have that good balance which accords with their capacity. [...] And so, in the case of all well-mixed animals and plants, their equality of mixture is not that [defined] by the amount of the elements in the mixture, but that appropriate to the nature of that animal or plant. Sometimes it is appropriate for there to be more wet than dry, or more cold than hot. **For it is not right for a human being, a lion, a bee and a dog to have the same sort of mixture.** Indeed, when someone asks, what is the mixture of a human being, or of a horse, an ox, dog or any other creature at all, the question cannot be answered in absolute terms. For, if one answers in a single way on things that are spoken of and evaluated in many ways, one cannot avoid criticism. One must, rather, do one of two things: either go through all the different senses, or ascertain which one the person was asking about, and speak of that one alone. **If, for example, one were to ascertain that [he was asking] what mixture it had within [the genus of] animals, then one should make one’s response by reference to that animal which is in the middle position with regard to all animals; if he was posing the question in absolute terms, with reference to every existent object, in that case one would have to compare the opposites amongst those things in the animal with each other and make one’s investigation by referring its mixture, not to the activities, but to the amounts of the elements”** (transl. Singer).

account would correspond to Vegetti's view: one *eukrasia* and infinite natural failures in a world completely devoid of any intrinsic teleology); but in the second case, when we see the world from a relative and functionalistic standpoint, the relative *eukrasiai* grow out of all proportion because an animal or a plant does not need to have the absolute best mixture to perform its functions properly.

Now, contrary to what has been said by Vegetti, a cosmos so conceived is imbued with an inner teleological order. In his classical essay on the nature of Galen's teleological explanation, Hankinson has underlined the differences between Aristotelian and Galenic teleology. In the first place, in contrast to the Galenic view, which has recourse to a creative Demiurgic entity inspired by Plato's *Timaeus*, Aristotelian teleology does not involve direction.⁴⁵⁷ Second, whereas Aristotle's teleology is limited (because although he often repeats the motto that "Nature does nothing in vain", it is true that there are some parts of animals, such as the gall-bladder, which cannot be explained teleologically – cf. *De part. an.* 677a12–19), Galen stresses much more cogently the all-pervading perfection of nature's design (for example, as Hankinson remarks, in contrast to Aristotle, he explains the function and nature of the gall-bladder teleologically – cf. *De usu part.* p. I.272–6 Helmreich).⁴⁵⁸ Notwithstanding such differences, on the strength of the account provided by Moraux and Kovačić, we have shown that the presence of a Demiurge is not at all irreconcilable with the idea of an Aristotelian immanent natural principle that shapes an organism specifically different since, from its very beginning, i.e. during the phase of embryogenesis, it structures it from within in accordance with a teleological plan. Now, another aspect, which remains controversial, of Aristotle's teleology concerns its anthropocentric character, at least according to the much-debated interpretation provided by David Sedley.⁴⁵⁹ This interpretation, if indeed it is in doubt and is nevertheless arguable for Aristotle himself, certainly identifies a more prominent feature of the nature of Galen's teleological explanation as exhibited in his *De temperamentis*. Let us consider two texts from *De temperamentis*, **T4** and **T5**:

⁴⁵⁷ Hankinson 1989 p. 213.

⁴⁵⁸ Hankinson 1989 p. 214.

⁴⁵⁹ Sedlely 1991.

T4 Galen *De temperamentis* K. I. 565.3-566.3 Helmreich p. 35.17–36.6:

Ἐπιστήσαντες οὖν πάλιν ἐνταῦθα τὸν λόγον ἐπισκεψώμεθα, τίς ἄριστα κέκραται πάντων ἄνθρωπος, ὃν καὶ τῆς ὅλης μὲν οὐσίας, ἔτι δὲ μᾶλλον ἀνθρώπων τε καὶ τῶν ἄλλων ζώων ἐν τῷ μέσῳ χρῆ τὰξαντας, καθάπερ τινὰ κανόνα καὶ γνώμονα, τοὺς ἄλλους ἅπαντας τούτῳ παραβάλλοντας θερμοὺς καὶ ψυχροὺς καὶ ξηροὺς καὶ ὑγροὺς ὀνομάζειν. δεῖ δὲ συνδραμεῖν ἐς ταῦτ' ἐπὶ τοῦδε πολλὰ γνωρίσματα. καὶ γὰρ ὡς πρὸς τὴν ὅλην οὐσίαν ἐξετάζοντι μέσον χρῆ φαίνεσθαι τὸν τοιοῦτον, ἔτι δὲ μᾶλλον ὡς πρὸς ἀνθρώπους τε καὶ ζῷα. τὰ μὲν οὖν ἀπάσης τῆς οὐσίας κοινὰ γνωρίσματα προεῖρηται· τὰ δ' ὡς ἐν ζώων εἴδεσιν ἐνεργείας τελειότητι κρίνεται τῆς ἐκάστῳ πρεπούσης. πρέπει δ' ἀνθρώπῳ μὲν εἶναι σοφωτάτῳ, κυνὶ δὲ πραοτάτῳ θ' ἅμα καὶ ἀλκιμωτάτῳ, λέοντι δ' ἀλκιμωτάτῳ μόνον, ὥσπερ γε καὶ προβάτῳ πραοτάτῳ. καὶ μὲν γε καὶ ὡς τὰς τοῦ σώματος ἐνεργείας οἰκείας εἶναι προσήκει τῷ τῆς ψυχῆς | ἦθει, δέδεικται μὲν καὶ πρὸς Ἀριστοτέλους ἐν τοῖς περὶ ζώων μορίων, δέδεικται δὲ καὶ πρὸς ἡμῶν ὑπὲρ αὐτῶν οὐδὲν ἥττον.

So let us again focus our argument at this point and consider: which human being has the best mixture of all? We should place this human being in the middle with respect to all existent objects, and even more so in relation to human beings and other animals; and using him as a kind of standard and yardstick, should call all others hot, cold, dry or wet by comparison with him. Many indicators must point in the same direction here. For indeed, when one conducts the examination in relation to all existent objects, it must be apparent that such a person is in the middle, and this must be the case even more so in relation to human beings and animals. Now, the common indicators that apply to all existent objects have been stated already; those applicable to animal species, on the other hand, are evaluated on the basis of the perfection of the activity appropriate to each. It is appropriate for a human being to be very intelligent; for a dog to be both very docile and very brave [...] Moreover, that the activities of the body should be appropriate to the character of the soul has been shown by Aristotle in the *Parts of Animals*, and no less by us too. (Transl. Singer)

T5 Galen *De temperamentis* K. I p. 546.15-547.9 Helmreich p. 24.4–15:

εἰ τύχοι, λέγοντες, ὅταν, οἷα μάλιστα πρέπει τὴν φύσιν ὑπάρχειν συκῆ, τοιαύτη τις ἦ, κύνα δ' αὖ καὶ σὺν καὶ ἵππον καὶ ἄνθρωπον, ἐπειδὴν καὶ τούτων ἕκαστον ἄριστα τῆς οἰκείας ἔχη φύσεως. αὐτὸ δὲ δὴ τοῦτο τὸ τῆς οἰκείας φύσεως ἔχειν ἄριστα ταῖς ἐνεργείαις κρίνεται. καὶ γὰρ καὶ φυτὸν καὶ ζῶον ὅτιοῦν ἄριστα διακεῖσθαι τηνικαῦτά φαμεν, ὅταν ἐνεργήσῃ κάλλιστα. συκῆς μὲν γὰρ ἀρετὴ βέλτιστά τε καὶ πλεῖστα τελεσφορεῖν σῦκα· κατὰ ταῦτα δὲ καὶ τῆς ἀμπέλου τὸ πλείστας τε καὶ καλλίστας ἐκφέρειν σταφυλάς, ἵππου δὲ τὸ θεῖν ὠκύτατα καὶ κυνὸς εἰς μὲν θήρας τε καὶ φυλακὰς ἄκρως εἶναι θυμοειδῆ, πρὸς δὲ τοὺς οἰκειοὺς πρᾶτότατον.

We would say, for example, that a fig-tree was well-mixed, if it were one possessed of that nature which is most appropriate to a fig-tree; and the same of a dog, pig, horse or human being when each of these, similarly, was in the best state with regard to its own nature. And this matter of ‘being in the best state with regard to its own nature’ is evaluated in terms of the activities. The excellence of a fig-tree, for example, consists in its bringing to fruition the most and the best figs; in exactly the same way, that of a vine [consists in its] producing the most and the best grapes; that of a horse in running very fast, and that of a dog in extreme spiritedness in hunting and guarding, combined with very great docility towards the members of its own household. (Trans. Singer)

As we have seen, the bodily mixture is responsible for the living being’s specific behaviour and its distinctive bodily activities and these in turn – as Galen states – should be appropriate to the character of the soul, as shown also by Aristotle in his *De partibus animalium* (cf. **T4** “καὶ μὲν γε καὶ ὡς τὰς τοῦ σώματος ἐνεργείας οἰκείας εἶναι προσήκει τῷ τῆς ψυχῆς | ἦθει, δέδεικται μὲν καὶ πρὸς Ἀριστοτέλους ἐν τοῖς περὶ ζῴων μορίων, δέδεικται δὲ καὶ πρὸς ἡμῶν ὑπὲρ αὐτῶν οὐδὲν ἥττον”). As Schiefsky has aptly highlighted in an article on the Galenic teleological explanation, both in Aristotle and in Galen the body and

its parts (and hence the bodily mixture) are teleologically thought of as existing for the sake of the soul in the sense that the whole organism has an explanatory priority over its constitutive parts.⁴⁶⁰ However, if we look ahead and beyond the teleological explanation regarding the single individual specifically different, we see from all the texts we have considered so far that, within anti-dogmatic boundaries,⁴⁶¹ Galen envisages his cosmos (of which, unfortunately, in his *De temperamentis*, we catch only passing glimpses), in the first place as permeated by a unified teleological order, in which the characteristic activities of animals and plants are thought of as at the service of human beings. The anthropocentric nature of Galen's teleological explanation undoubtedly stands out in our **T5**, where it is clearly said that the excellence (the word *aretê* – taken from Aristotle's moral philosophy – can be paraphrased as “the nature of the being in the best condition with regard to its own nature”) of plants and animals can be measured by how far they serve human beings. On the one hand, the best fig tree (the fig tree *par excellence*, i.e. the midpoint within the species of fig trees), for example, is such because it produces the most and the best figs, its natural end being the fact that human beings can eat its fruits; and the best vine (the vine *par excellence*, i.e. the midpoint within the species of vines) is such because it produces the most and the best grapes. On the other hand, the same reasoning is valid for the species of animals: the best horse is that which runs very fast in order to be used by human beings as a means of transportation, whereas the best dog is endowed with extreme spiritedness in order to serve for the purpose of helping human beings in hunting and guarding their homes. Hence, as we see, the human being is at the centre of Galen's sublunary cosmos. In fact, as can be easily gleaned from **T4**, the human being, i.e. the best human being or the most well-mixed human being, is in the middle with respect to all existent beings belonging to the highest genus of the whole substance, and *a fortiori* in relation

⁴⁶⁰ Cf. Schiefsky 2007 pp. 369-400. Schiefsky's essay is devoted to exploring the relation between Galen's teleology and the functional explanation. One of his nodal points is in fact the distinction between *energeia* and *chreia*. As Schiefsky underscores, while *energeia* is defined by Galen as an “active motion”, the *chreia* is “what is commonly called the utility (*euchrestia*)” (*De usu part.* p. II. 437.8–15 H.), that is, the beneficial contribution of an activity to the organism's life that is threefold (as in Aristotle): i) for life itself, ii) for better life, iii) for the preservation of the race (cf. *De usu part.* p. I.318.8–11 H.).

⁴⁶¹ As Moraux observes, Galen does not take a position on the thorny doctrinal question dividing philosophical schools concerning whether the cosmos is generated or not or whether there exists an extra-cosmic void (cf. Moraux 1984 p. 327 with n. 324 with references).

to all human beings and other animals (cf. **T4** “τίς ἄριστα κέκραται πάντων ἄνθρωπος, ὄν καὶ τῆς ὅλης μὲν οὐσίας, ἔτι δὲ μᾶλλον ἀνθρώπων τε καὶ τῶν ἄλλων ζώων ἐν τῷ μέσῳ χρῆ τάξαντας”) and should be regarded as a kind of canon or yardstick on the basis of which to call all other bodies hot, cold, dry, or wet (again, cf. **T4** “καθάπερ τινὰ κανόνα καὶ γνώμονα, τοὺς ἄλλους ἅπαντας τοῦτῳ παραβάλλοντας θερμούς καὶ ψυχρούς καὶ ξηρούς καὶ ὑγρούς ὀνομάζειν”).⁴⁶²

Now, because of its being a standard and a yardstick, it is not by chance that Galen establishes a well-known comparison between the most well-mixed human being, which is clearly a man (women are not considered, since by nature they have a cold mixture⁴⁶³) and the Canon, the celebre statue of Polyclitus, as we see from **T6**:

T6 Galen *De temperamentis* K. I 566.8-567.9 Helmreich pp. 36.12–37.1:

(1) οὕτω γοῦν καὶ πλάσται καὶ γραφεῖς ἀνδριαντοποιοί τε καὶ ὄλως ἀγαλαματοποιοί τὰ κάλλιστα γράφουσι καὶ πλάττουσι καθ' ἕκαστον εἶδος, οἷον ἄνθρωπον εὐμορφότατον ἢ ἵππον ἢ βοῦν ἢ λέοντα, τὸ μέσον ἐν ἐκείνῳ τῷ γένει σκοποῦντες. καὶ πού τις ἀνδριάς ἐπαινεῖται Πολυκλείτου κανὼν ὀνομαζόμενος, ἐκ τοῦ πάντων τῶν μορίων ἀκριβῆ τὴν πρὸς ἄλληλα συμμετρίαν ἔχειν ὀνόματος τοιοῦτου τυχών. ἐστὶ μὲν οὖν ἐπὶ πλεόν, ὄν νῦν ἡμεῖς ζητοῦμεν, ἢ ὁ κανὼν οὗτος.
(2) οὐ μόνον γὰρ ὑγρότητός τε καὶ ξηρότητος ἐν τῷ μέσῳ καθέστηκεν ὁ οὗτος

⁴⁶² At any rate, attention must be drawn to the fact that although the human being remains at the centre of Galen’s sublunary cosmos, its importance should be brought into perspective and scaled down when – as has been pointed out – considers the marvellous grandeur of the supralunary regions and, therefore, the powerful intelligence penetrating the celestial bodies, such as the sun, the moon, and all the stars (cf. *De usu part.* pp. II.441–447 H. in Van der Eijk 2014a pp. 98–101; cf. also Van der Eijk 2017. For a precise and schematic overview of Galen’s *scala naturae* from the primary elements to divine Demiurge cf. Kovačić 2001 pp. 207–209. The passage from *De usu partium* is rightly famous: various scholars (Donini 1980 pp. 334–335; Moraux 1981b p. 101 ff. and 1984 pp. 327–328; Kovačić 2001 pp. 202–204 with nn. 35 and 44) have seen that in his theorizing of such an intelligence permeating, in the first instance, the celestial bodies and then gradually reaching, although less intensely, the earthy bodies, Galen approximates the views expressed by the pseudo-Aristotelian author of the treatise *De mundo*.

⁴⁶³ For, as Galen states, women are fatter than men and this is taken to be an indication of their cold mixture due to their natural constitution or a lazy lifestyle; cf. the only passage in *De temperamentis* where Galen deals with women’s constitution, *De temp.* p. 62.8–11 H. “σπάνιον μὲν οὖν ἐπ’ ἀνδρῶν τὸ τοιοῦτον, ἐπὶ δὲ γυναικῶν καὶ πάνυ πολλάκις εὐρισκόμενον. ἐστὶ γὰρ καὶ φύσεως ψυχροτέρας καὶ ἀργότερου βίου τὸ τοιοῦτον γνώρισμα”.

εὔσαρκος ἄνθρωπος, ἀλλὰ καὶ διαπλάσεως ἀρίστης τετύχηκεν, ἴσως μὲν ἐπομένης τῆ τῶν τεττάρων στοιχείων εὐκρασία, τάχα δέ τινα θειοτέραν ἀρχὴν ἐτέραν ἐχούσης ἄνωθεν. **(3)** ἀλλὰ τό γε πάντως εὐκρατον εἶναι τὸν τοιοῦτον ἐξ ἀνάγκης ὑπάρχει· τὸ γὰρ ἐν εὐσαρκία σύμμετρον εὐκρασίας ἐστὶν ἔκγονον. εὐθὺς δ' ὑπάρχει τῷ τοιούτῳ σώματι καὶ ταῖς ἐνεργείαις ἄριστα διακεῖσθαι καὶ σκληρότητός τε καὶ μαλακότητος ἔχειν μετρίως θερμότητός τε καὶ ψυχρότητος.

(1) And indeed it is in this way, too, that sculptors, painters, makers of human statues, and makers of images in general, achieve the greatest beauty in their painting or sculpting of each species, for example, the most well-formed human being, or horse, or ox, or lion, by aiming for the middle within that particular genus. And indeed, there is a certain statue that is much admired and which is named the Canon of Polyclitus; it has acquired this name from the fact that all its parts are in a precise state of good balance with each other. The [canon] that we are now seeking is, broadly speaking, this Canon⁴⁶⁴ **(2)** For the man who is well-fleshed in this way is not just in the middle state with regard to wetness and dryness, but has also got an excellent shaping, something which is possibly dependent on the good-mixture of the four elements, but may perhaps

⁴⁶⁴ In contrast to Helmreich's text (ἐστὶ μὲν οὖν ἐπὶ πλεόν, ὃν νῦν ἡμεῖς ζητοῦμεν, ἢ ὁ κανὼν οὗτος), Singer's translation omits ἢ (which in Helmreich's critical apparatus is omitted by the ms. Marcianus (M), whereas, as the philologist Vito Lo Russo notes, in the Laurentianus (L), the most authoritative ms., ἢ seems to be added by a different hand and might be a later scribal insertion) and translates the reconstructed sentence "ἐστὶ μὲν οὖν ἐπὶ πλεόν, ὃν νῦν ἡμεῖς ζητοῦμεν, ὁ κανὼν οὗτος". This translation leads to a new interpretation according to which the Canon of Polyclitus is equivalent to Galen's well-fleshed man. This is not, however, the only interpretation of the passage. In fact, according to a second interpretation, in line with Helmreich's text, Galen's well-fleshed man would even be superior to Polyclitus' Canon, the translation of Helmreich's sentence being the following: "Now (the canon) that we are looking for at present is something more than this Canon (of Polyclitus)". There is also a third interpretation of the passage. M in fact omits ἢ and writes the genitive relative pronoun οὗ instead of ὃν, to be taken as 'than the one whom'. In this case, the translation would be: 'Now this Canon (of Polyclitus) is something that goes beyond the (canon) that we are looking for at present. For the man who is well-fleshed in this way (i.e. as demonstrated by Polyclitus) does not just occupy a middle position as regards wetness and dryness, but he has also received an outstanding shaping, which is perhaps a consequence of the good balance between the four elements, but which perhaps has a certain different, divine origin from above'. According to this third translation, the Standard of Polyclitus would seem to be superior to the body Galen is looking for. For a thorough discussion on this textual locus and its different interpretations cf. Van der Eijk 2014a pp. 113 ff. with n. 68.

have some other, more divine, source, from above (οὐ μόνον γὰρ ὑγρότητός τε καὶ ξηρότητος ἐν τῷ μέσω καθέστηκεν ὁ οὕτως εὐσαρκος ἄνθρωπος, ἀλλὰ καὶ διαπλάσεως ἀρίστης τετύχηκεν, ἴσως μὲν ἐπομένης τῇ τῶν τεττάρων στοιχείων εὐκρασία, τάχα δὲ τινα θειοτέραν ἀρχὴν ἐτέραν ἐχούσης ἄνωθεν). (3) But at any rate, it will necessarily be the property of such a person that he is completely well-mixed; for good balance with regard to well-fleshedness is a product of good mixture (ἀλλὰ τό γε πάντως εὐκρατον εἶναι τὸν τοιοῦτον ἐξ ἀνάγκης ὑπάρχει· τὸ γὰρ ἐν εὐσαρκία σύμμετρον εὐκρασίας ἐστὶν ἔκγονον.). It will also automatically be the property of his body that it is in the best state as regards its activities, as well as being in a well-moderated position with respect to hardness and softness, hotness and coldness (εὐθὺς δ' ὑπάρχει τῷ τοιούτῳ σώματι καὶ ταῖς ἐνεργείαις ἄριστα διακεῖσθαι καὶ σκληρότητός τε καὶ μαλακότητος ἔχειν μετρίως θερμότητός τε καὶ ψυχρότητος). (Trans. Singer; slightly modified)

The sculpture Galen is referring to, the Canon, i.e. the Standard, is also known as the Doryphoros ('spearmthrower'), by the fifth century sculptor Polyclitus, who also wrote a treatise with the same title (as can be inferred from *De plac. Hipp. et Plat.* p. 308 De Lacy).⁴⁶⁵ In his study on ancient aesthetics, Jackie Pigeaud observes that this statue represented a great innovation in Greek art because it posed the problem of the articulation and harmony of the human body, of measure and commensurability (*symmetría*), bestowing for this reason proper dignity on both the part and the whole of the statue.⁴⁶⁶ As the scholar perceptively remarks, in his *De temperamentis* (but also in many other passages of his works),⁴⁶⁷ Galen makes use of the Canon of Polyclitus to translate his idea

⁴⁶⁵ Cf. Pigeaud 1995 p. 29; cf. Van der Eijk 2010 pp. 3–4.

⁴⁶⁶ Cf. Pigeaud 1995 p. 29 cf. also Van der Eijk 2010 pp. 3–4.

⁴⁶⁷ Cf. *De opt. corp. constit.* p. 13.2 H.; *De meth. med.* K. X p. 463-8 ff.; *De san. tuend.* CMG V 4.2 p. 56.24 ff. Koch where Galen even finds a geographical collocation for perfect bodies comparable to the Canon (the central well-tempered region including Rome and Greece): “ξηροὶ μὲν γὰρ καὶ ἰσχυροὶ καὶ οἷον ἐσκελετευμένοι γίνονται κατὰ τὰς θερμὰς χώρας οἱ ἄνθρωποι, ἀνώμαλοι δὲ ταῖς κράσεσιν, ὡς τὰ μὲν ἔξω ψυχρά, τὰ δὲ ἔνδον τε καὶ κατὰ τὰ σπλάγχνα θερμὰ περαιτέρω τοῦ προσήκοντος ἔχειν, οἱ τῶν ψυχρῶν χωρίων οἰκίητορες. τὸ δ' ἄριστον σῶμα, περὶ οὗ νῦν ὁ λόγος, ὡσπερ ὁ <Πολυκλείτου> κανὼν ἐστίν, ᾧ κατὰ μὲν τὴν ἡμετέραν χώραν, ὡς ἂν εὐκρατον ὑπάρχουσαν, ὅπται πολλὰ παραπλήσια σώματα, παρὰ δὲ Κελτοῖς ἢ Σκύθαις ἢ Αἰγυπτίοις ἢ Ἀραβῶν οὐδ' ὄναρ ἐστὶν ἰδεῖν τοιοῦτον σῶμα. καὶ αὐτῆς δὲ τῆς ἡμετέρας χώρας ἰκανὸν ἐχούσης πλάτος, εὐκρατότατόν ἐστι τὸ μεσαίτατον, οἷόνπερ ὑπάρχει τὸ κατὰ τὴν

of the midpoint into images, which would serve as a standard on the basis of which to compare and to assess all the other existent bodies.⁴⁶⁸ Such a body is defined as εὔσαρκος – “well-fleshed” – and, as Galen explains, that means both that he is the midpoint between hot/cold and dry/wet and that he has got an excellent shape (*diaplasia*), which can be dependent either on the *eukrasia* of the four primary elements (in the sense that it would be an outcome of this) or on a more divine source (**T6.2**).⁴⁶⁹ At any rate, as Galen states, it is the good-mixture that produces, on the one hand, well-fleshedness (or *eusarkia*) and, on the other hand, is εὐθὺς, immediately responsible also for the best activities of the organism, as we have underscored (**T6.3**).

However, one point remains unclear: is the standard, on the basis of which we are to compare all the other bodies, the best human being, or is it the palm of the hand? In fact, as we have seen, Galen defines both as canon (*kanôn*) and yardstick (*gnomon*). The issue is not trivial at all, because if, on the one hand, we have previously examined the anthropocentric character of Galen’s teleology, we now want to press the question a little further to find the very core of Galen’s sublunary cosmos.

It is Galen himself who, when recapping the contents of the first book in *De temperamentis* II 1, explains the relation between the human being as the

<Ἰπποκράτους> πατρίδα· καὶ γὰρ χειμῶνος αὕτη καὶ θέρου ἐστὶν εὐκρατος, ἔτι δὲ δὴ μᾶλλον ἤρὸς τε καὶ φθινοπώρου”.

⁴⁶⁸ Pigeaud 1995 pp. 29–38 and esp. p. 37: “Mais le *Canon* que cherche Galien est plus difficile, car il doit rendre compte à la fois de la crase et de la forme (*diaplasia*). Cette *reductio* du *Canon* de Polyclète à la moyenne implique bien davantage qu’une référence convenue au topos polyclétéen quand il s’agit de *symmétria*. Le *Doryphore* comme homme moyen est une chose apparemment nouvelle. Elle correspond à une tentative pour homogénéiser les questions de la matière et celles de la forme. Le *mésôn* est un cas d’égale entre les extrêmes, cas particulier de la *symmétria*”. Cf. also the chapter on Galen’s Aesthetics, pp. 127–153, and on Galen’s usage of the Canon, pp. 139–143.

⁴⁶⁹ As we see in this passage (**T6**) concerning the Canon of Polyclitus, Galen ascribes the excellent shaping (*διαπλάσεως ἀρίστης*) either to the good-mixture of the four elements (on which such a shaping would be dependent in the sense of a necessary physical/physiological consequence; cf. ἐπομένης τῆ τῶν τετάρων στοιχείων εὐκρασία) or to a more divine source, coming from above (which in any case – as we have shown – had to make use of the four elements to shape an organism specifically different from within, according to a teleological programme or *kata prôton logon*). In fact, we have pointed out that one has to draw a clear-cut distinction between i) the first shaping of an organism (i.e. the shaping capacity Galen refers to in this section) which we identified as the total mixture of hot, cold, dry, and wet, performed by a demiurgic Nature or God, and which moulds the parts of an individual in accordance with its own soul, and ii) the further physical and psychological consequences which afterwards necessarily follow (in the sense of *hepesthai*) on the mixtures themselves (and it is to this that Galen refers when he speaks of features necessarily following on the *eukrasia* of the four elements).

midpoint of the highest genus of substance and the part of the human body which is the most well-mixed with respect to all its parts:

T7 Galen *De temperamentis* K. I 575.4-15 Helmreich pp. 41.24–42.7:

(1) Δέδεικται γὰρ δὴ πρόσθεν, ὡς ἄνθρωπος ἐστὶν οὐ τῶν ζώων μόνον ἢ φυτῶν, ἀλλὰ καὶ τῶν ἄλλων ἀπάντων εὐκρατότατον. ἐπεὶ δ' ἐκ πολλῶν καὶ διαφερόντων σύγκειται μορίων, εὐδηλον, ὡς τὸ μέσον ἀπάντων τῆ κράσει τοῦτο καὶ ἀπλῶς ἐστὶν εὐκρατον. τὸ γὰρ τοῦ μέσου τῆ κράσει ζώου μέσον μόριον ἀπάντων ἀπλῶς εὐκρατότατον ἔσται. (2) ἐδείχθη δὲ τοῦτ' ἐν ἀνθρώπῳ τὸ καλούμενον δέρμα καὶ μάλιστα τοῦ δέρματος τὸ τῶν χειρῶν ἐντός, ὅταν, οἷον ὑπὸ τῆς φύσεως ἀπειργάσθη, τοιοῦτον φυλάττηται. καὶ μὲν δὴ καὶ ὡς οὐ παντὸς ἀνθρώπου τὸ δέρμα μέσον ἀπλῶς ἐστὶν ἀπάσης οὐσίας, ἐδείχθη πρόσθεν, ἀλλ' ὅστις ἂν εὐκρατότατος ᾖ·

(1) For indeed it has been shown above that the human being is the most well-mixed [being], not just among animals or plants, but also among all others. Since, however, it is composed of many different parts (ἐπεὶ δ' ἐκ πολλῶν καὶ διαφερόντων σύγκειται μορίων), it is quite evident that that part which is in the middle of all of them with regard to mixture will also be well-mixed in the absolute sense (τὸ μέσον ἀπάντων τῆ κράσει τοῦτο καὶ ἀπλῶς ἐστὶν εὐκρατον). For, of the animal which is in the middle with regard to mixture, the middle part will be the most well-mixed of all, in the absolute sense (τὸ γὰρ τοῦ μέσου τῆ κράσει ζώου μέσον μόριον ἀπάντων ἀπλῶς εὐκρατότατον ἔσται). (2) And it was shown that within human beings this part was that known as 'skin', and more especially the skin the palm of the hand – provided that this has remained as it was crafted by Nature. It was, however, also shown above that not every human being's skin is in the middle of all existent object[s], but only that of the one who is most well-mixed. (Transl. Singer)

As Galen has it, there is a part of the human being, that which is in the middle with regard to mixture, which is in the middle with regard to all its other parts and, therefore, in the middle in the absolute sense: this part is, as Galen puts it, τὸ μέσον μόριον τοῦ μέσου ζώου and, therefore, the most well-mixed in the absolute sense, i.e. ἀπλῶς εὐκρατότατον (T7.1). In fact, by comparing this part, the skin of the palm of the hand, to the other parts of the most well-mixed body it is possible to understand the standard qualitative composition of each part: an operation which Galen himself undertakes at the end of I 9 when he analyses the main bodily parts individually (from the humours to the flesh of the various organs) and describes their qualitative composition by comparing them to the skin.⁴⁷⁰ As Galen goes on to clarify in T7.2, he is not speaking of every human being's skin but of that belonging to the most well-mixed human being, that has remained as it was, shaped by the work of Nature. At I 9 of *De temperamentis*, however, Galen is much more precise in outlining the defining traits of the possessor of such a bodily part, giving us detailed pieces of information on i) his social status and ii) the specific function that such a bodily part has, as we can understand from T8:

T8 Galen *De temperamentis* K. I pp. 567.11-568.16 Helmreich p. 37.1-24:

καὶ ταῦθ' ὑπάρχει [ἅπαντα] τῷ δέρματι καὶ τούτου μάλιστα τῷ τῆς χειρὸς ἐντός, ὅταν γε μηδένα τύλον ἔχη τοιοῦτον, οἷος τοῖς ἐρέττουσί τε καὶ σκάπτουσι γίνεται. διττῆς γὰρ ἔνεκα χρείας τῶν χειρῶν γεγενημένων, ἀφῆς καὶ ἀντιλήψεως, αἱ μαλακαὶ μὲν εἰς τὴν τῆς ἀφῆς ἀκρίβειαν, αἱ σκληραὶ δ' εἰς τὴν τῆς ἀντιλήψεως ἰσχὺν ἐπιτηδειότεραι. Καὶ δὴ καὶ τὸ δέσμα τὸ μέσον οὐ μόνον ἀπάντων τῶν τοῦ ἀνθρώπου μορίων, ἀλλὰ καὶ τῆς ὅλης οὐσίας ἀπάντων τῶν ἐν γενέσει τε καὶ | φθορᾷ σωμάτων οὐ τὸ τετυλωμένον ἐστὶ καὶ σκληρὸν καὶ λιθῶδες, ἀλλὰ τὸ κατὰ φύσιν ἔχον, ᾧ δὴ καὶ μάλιστα φαμεν ἀκριβοῦσθαι τὴν ἀφήν. [...] εἰ δὴ τοῦτο κανόνα τε καὶ οἷον κριτήριον ἀπάντων τῶν τοῦ ζώου μορίων προστησάμενος ἐξετάζοις τε καὶ παραβάλλοις αὐτῷ τᾶλλα, τὰς ὀκτὼ διαφορὰς εὐρήσεις τῶν δυσκρασιῶν ἐν αὐτοῖς.

⁴⁷⁰ *De temp.* pp. 38-39 H.

These also will be the properties [the equidistance between hot/cold and dry/wet] of the skin, and especially of the skin on the inside of the hand (provided that it does not have any callus of the sort suffered in rowing or digging). For there are two functions for which hands came into being, that of touching and that of holding; soft hands are better equipped for accuracy in the sense of touch, hard hands for strength in grasping objects. The skin which is middle, not just with regard to all the parts of the human being, but with regard to all existent objects – all bodies that are subject to generation and decay – is not that which is callused, hard and stone-like, but rather that which has preserved its natural state; and it is by virtue of this, we say, that its sense of touch is made especially precise. [...] If, then, you take skin as a standard and, as it were, criterion against which to examine all other parts of the animal, and compare these with it, you will find the eight distinct types of imbalance within those parts (Trans. Singer)

As is clear from the text, the skin of the hand that Galen has in mind is not that which is callused, hard and stone-like (οὐ τὸ τετυλωμένον ἐστὶ καὶ σκληρὸν καὶ λιθῶδες) and which can belong to particular social actors, i.e. working-class people devoted to more generally banausic practises, such as rowers or diggers (ὅταν γε μηδένα τύλον ἔχη τοιοῦτον, οἷος τοῖς ἐρέττουσί τε καὶ σκάπτουσι γίγνεται), but the soft hand (αἱ μαλακαὶ μὲν εἰς τὴν τῆς ἀφῆς ἀκρίβειαν) that is preserved in its natural state (τὸ κατὰ φύσιν ἔχον) and which, for this reason, is endowed with an extremely precise sense of touch (ᾧ δὴ καὶ μάλιστα φαμεν ἀκριβοῦσθαι τὴν ἀφήν). Now, touch (ἀφή) has been considered a powerful diagnostic tool since Hippocratic medicine and, in Galen's text too, it is described as an irreplaceable instrument used by the doctor for recognizing and assessing the mixtures in living bodies. For it is sufficiently straightforward that the palm of the hand, which represents the midpoint with respect to all bodies subject to coming-to-be and passing-away, is that of the aspiring *physician*, whom Galen wants to train in the study of mixtures. Thus he suggests taking skin as a standard and criterion against which to compare all parts of animals and find out the eight other *dyskrasiai* (εἰ δὴ τοῦτο κανόνα τε καὶ οἷον κριτήριον

ἀπάντων τῶν τοῦ ζῴου μορίων προστησάμενος ἐξετάζοις τε καὶ παραβάλλοις αὐτῷ τᾶλλα, τὰς ὀκτὼ διαφορὰς εὐρήσεις τῶν δυσκρασιῶν ἐν αὐτοῖς).⁴⁷¹ The conclusion, then, is that the *meson* of the *meson*, the centre of Galen's universe, that is, the middle part of the middle human being, coincides with the palm of the hand of the physician. By applying it to whichever body, and above all, to the body of the patients the doctor cures, he is enabled to gain an empirical absolute knowledge concerning the very essence of whichever physical body, inanimate and animate, i.e. its mixture or qualitative composition, its being hot, cold, dry, or wet on an absolute scale. On the other hand, by using the *logiké theoria* acquired through his long logical training and by comparing it to the corresponding relative midpoint, he can heal his patients, equating the patients' own *oikeia physis* to the *meson* of the species or genus in order to restore the relative *eukrasia* of living bodies.

To take stock of the results gained in this last section contributing to our analysis of Galen's scheme of nine mixtures, its roots and function within his natural philosophy, we can say, first of all, that the physician should begin the study of the mixtures in living beings with considerations on qualified bodies, especially those of plants and animals, by comparing them either a) to whichever random body or b) to the midpoint according to species or genus. Second, we have seen that Galen's sublunary cosmos is made up of three concentric physical realms (substance, plants, and animals), with humans, the most well-mixed of all (comparable to Polyclitus' Canon), at its centre as the natural end of the activities of all other living beings. Third, we found out that there is a part of this most well-mixed human that is deemed the *meson* of the *meson*, namely the skin of the palm of the hand, whose possessor is an upper-class doctor making use of it as tool for recognizing mixtures in living beings. Finally, throughout the whole section we showed, on the one hand, that Galen's *De temperamentis* resorts to teleological (anthropocentric) explanation and, on the other hand, that his system of nine mixtures fits in with this insofar as, if we look at Galen's cosmos from a relative point of view, we do not have only one absolute *eukrasia*, but, on the contrary, myriads of relative, functional, and functionalistic *eukrasiai*.

⁴⁷¹ On Galen's account of the sense of touch as a fundamental instrument used by doctors for the determination of bodily mixtures cf. Van der Eijk 2015a pp. 681 ff.

PART TWO

Chapter III

The terminology of mixture. Galen's words for mixture: κρᾶσις and μίξις.

3.1 A vexata quaestio. Κρᾶσις versus μίξις

The Ancient Greeks did not express the concept of mixture univocally – Ancient Greek has a range of verbs (and cognates) indicating or pertinent to the mixing of different constituents: κεράννυμι, μείγνυμι, φύρειν and κυκᾶν⁴⁷². Leaving

⁴⁷² Schmidt 1886, p. 645. As far as the meanings of the latter two verbs are concerned, it is likely that φύρειν (“to mix up, to wet, to soak”) etymologically stems from a pre-Greek root, since it is impossible to reconstruct an IE etymology. This verb originally indicated a mixture between powder grains and liquids, such as the mixture of earth and water (Hesiod *Erga* 60–62); cf. Schmidt 1886, pp. 658–659. See also Beekes 2010, s.v. φύρειν. Hence it also developed the meaning of “soaking”, “wetting”, as it is possible to infer from the Homeric expression δάκρυσι εἴματ' ἔφουρον (Ω 162); cf. Schwabe 1980, p. 40; cf. also Schmidt 1886 p. 659. The deverbative φουρᾶν also belongs to this family, but in contrast to φύρειν it chiefly has the meaning of “kneading”, whereas φύρειν could also mean “to dirty, to confuse, to mingle”; cf. Passow 1841-1857, s.v. φύρειν. Cf. also Schmidt 1886 p. 659. As for κυκᾶν, whose etymology could derive either from an IE or from a pre-Greek root (cf. Beekes 2010, s.v. κυκᾶν), it means from Homer onwards “to mix” or “to stir”, and is said with

aside the latter *κυκᾶν* and *φύρειν*, in this context we will zoom in mainly on the former and on the *nomina actionis* stemming from these, *κρᾶσις* and *μίξις*. For in Galen’s texts the concept of mixture of primary elements is principally expressed using the latter two words.

Etymologically speaking, the word-family of *κεράννυμι* has a Greek root, *κερᾶ-/κρᾶ-* (*κρη-*), stemming from the *IE* **kerh*□ / **k̑rh*□. From the root *κρᾶ-* derive Ancient verbal forms, such as the passive aorist *ἐκρᾶθην* (Ion. *ἐκρήθην*), the passive future *κρα-θήσομαι*, or the passive perfect *κέ-κρᾶ-μαι* (Ion. *κέκρημαι*). Among many nominal derivatives stemming from the root *κρᾶ-*, it is worth mentioning the most important ones here: the nomen *actionis* *κρᾶ-σις* “mixture”, the noun *κρα-τήρ* “mixing bowl” (present also in Myc. *ka-ra-te-ra*⁴⁷³), and the adjective (*ᾶ*)-*κρᾶ-τος* “unmixed” or “pure”, which corresponds linguistically to the Sanskrit participle *á-śīr-ta*, “mixed”.⁴⁷⁴ The *-vu-* present *κεράννυμι* (<**kera-s-nu*) is a secondary verbal form arising from the root *κερᾶ-* of the sigmatic aorist *ἐ-κέρᾶ-σ-α*, as well as *κεραίω* and *κεράω*.⁴⁷⁵ There are several nominal derivatives of the root *κερᾶ-*, such as *κεραστής*, “mixer”, *κέρασμα*, “result of a mixture”, and *κατακέρᾶσις*, which describes the restoration of a certain mixture and is also used (together with its derivative adjective *κατακεραστικός*) in the medical field. The archaic nasal present *κίρνημι* (Lesb. *κέρνᾶμι*, Hom. *κίρνᾶω*) is from **k^r-nāmi*, which contains a schwa secundum.⁴⁷⁶ This form used to be related by linguists to the Sanskrit *śrīṇāti*, usually translated as “mixes, cooks”.⁴⁷⁷ But this has recently been called into question and the form has instead been connected to the *IE* root **kreiH* “to shine, to excel”⁴⁷⁸ On the

reference to liquids and solids. *Κυκᾶν* differs from *φύρειν* insofar as it describes more precisely an action of “stirring” that does not necessarily entail the mixing of different constituents (as for example in E 903 where the verb is employed with reference to milk). The word-family, however, seems to show a connection with the concept of mixture as well, since the verb is also employed to describe the preparation of the so-called *κυκεών* (a word which belongs to the same word-family), a drink made of wine and ground cheese (Λ 638); see Schmidt 1886, p. 660.

⁴⁷³ MY Ue 611.2. On this cf. Lejeune 1960, p. 21.

⁴⁷⁴ Beekes 2010; Chantraine 2002; Frisk 1973; Boisacq 1950, s.v. *κεράννυμι*.

⁴⁷⁵ Rix 2001, s.v. **kerh*□. Chantraine 2002, s.v. *κεράννυμι*.

⁴⁷⁶ Beekes 2010, s.v. *κεράννυμι*.

⁴⁷⁷ Pokorny 1959, pp. 1020–1021; Chantraine 2002; Frisk 1973, s.v. *κεράννυμι*; Montanari 1979, pp. 95–98.

⁴⁷⁸ Narten 1987, pp. 270–196, where the scholar argues that the *edic* verb *śrī* is semantically separate from the *IE* root **kerh*□, to which the words *ā-śīr*, “mixture”, and *ā-śīr-ta*, “mixed”, belong instead. According to Narten, this *vedic* verb, *śrī*, has neither the meaning of “mixing” nor the meaning of “cooking”, but etymologically belongs to the noun *śrī*, meaning “beauty, splendour, radiance”. Therefore, it is instead connected to the *IE* root **kreiH* “to shine, to excel, to stand out”, and

other hand, the Old Avestan *sārā-ntē* “to unite”, “to merge” med. present 3pl seems to belong to the IE root **kerh₂* / **k₂rh₂*,⁴⁷⁹ where the connection with Western languages is questionable.⁴⁸⁰

The verb *μείγνυμι* stems from the Greek root *μειγ-/μυγ-*, which in turn derives from the IE root **m(e)ik̑*, reflected in the Sanskrit *mīś-rá*, “mixed”.⁴⁸¹ It is likely that the *-vu-* present in *μείγνυμι*, which is very frequent in manuscripts and can be hesitantly considered an original zero-grade form, occurred later than the full-grade form *μείγνυμι*. The present *μίσγω* must be understood as a form with the *-σκ-* inchoative suffix (< *μίγ-σκ-ω* < *μίσγω*),⁴⁸² which is also well represented in Western languages: Latin: *misceō* (cf. the form *misc* in CIL 560 “mix!” imp. 2s.); Old Irish: *mescaid*; “mixes, confuses, immerses”; Old High German: *miscan*; Modern High German: *mischen* (<**miska*, if it is not a Latin loanword). Sanskrit has a reduplicated s-formation *mī-mikṣati*, “to mix”, probably an original desiderative, perfect *mimikṣé*, causative *mekṣayati*.⁴⁸³ As we can see, while the other IE languages have a voiceless root-final stop (**m(e)ik̑*), in Greek it is voiced and is reflected by *μίσγω* and is also present in other forms, such as the passive aorist *μυγῆναι*. Although the voiced root-final stop is difficult to explain, it is perhaps unnecessary to assume an IE root *meiǵ/k̑*. In this regard, Beekes remarks that with the exception of the inchoative present, all the Greek formations with a voiced root-final stop *-γ-* are probably analogical

corresponds to the Greek *κρείων, κρέων*, “ruler, lord, master”. On this cf. also Beekes 2010, s.v. *κεράννυμι* and Rix 2001, s.v. **kerh*□.

⁴⁷⁹ Therefore, in Old Avestan the IE root would have the meanings of “uniting” and “mixing with” (cf. also Cheung 2007 s.v. *sarH²*), although Frisk and Chantraine are convinced that the meaning carried by this Old Avestan form should be drawn apart from the Greek semantic field; see Chantraine 2002 and Frisk 1973, s.v. *κεράννυμι*. More recently scholars have highlighted a connection between the Greek and the aforementioned Old Avestan form; see Beekes 2010, s.v. *κεράννυμι*, cf. also Rix 2001, s.v. **kerh*□ (Beekes, however, claims that the vocalic outcome *ā* of Old Avestan *sārā-ntē* remains unexplained); Pokorny 1959, pp. 1020–1021; Boisacq 1950, s.v. *κεράννυμι*. See also Wackernagel and Debrunner 1942, p. 174.

⁴⁸⁰ Pokorny 1959, p. 1021. Pokorny seems to claim that Western languages preserve the IE root as well, where the laryngeal as usual has different vocalic outcomes: Old English; *hrēran*; Old High German: (h)ruoren; German: *rühren*, “to stir”, or more generally “to set in motion”, Rhur (river in Western Germany). This connection, however, is not so straightforward. Boisacq 1950 s.v., establishes a comparison between the terms related to the Germanic area and the Old Avestan without mentioning a connection with the Greek *κεράννυμι*; on the other hand, Frisk 1973, Chantraine 2002, Rix 2001, and Beekes 2010 do not draw comparisons with the Germanic linguistic area.

⁴⁸¹ Beekes 2010, s.v. *μείγνυμι*.

⁴⁸² See Frisk 1973; Chantraine 2002, s.v. *μείγνυμι*. For a detailed discussion cf. Montanari 1979, pp. 80–82.

⁴⁸³ Beekes 2010, Rix 2001, s.v. **meik̑*.

to forms with a voiced consonant or made to the aorist *μῆξιαι*,⁴⁸⁴ where the -ξ- of the sigmatic aorist infinitive ending (-σ-αι) could be considered as stemming either from a voiceless -κ- or from a voiced root-final stop -γ-. As for the nominal derivatives, the term *μισγ-άγκεια*, “place where the valleys meet”, is made to the present the root *μίσγ-*, whereas from the root *μυγ-* stem, among other nominal derivatives, the nomen actionis *μίξις* (also *μῆξις*), “mixture”, and the noun *μῆγμα*, “result of a mixture”.

As for the *nomina actionis* *κρᾶσις* and *μίξις*, their first occurrences do not appear in the Homeric poems; we find the term *κρᾶσις* for the first time in a fragment by Sappho⁴⁸⁵ and *μίξις* in a fragment by Anacreon.⁴⁸⁶ In both occurrences the terms already carry figurative meanings. Therefore, they are likely to have already been in use before Sappho’s and Alcaeus’ times, and, as Schwabe argues, certainly the first ancient Greek philosophers to elaborate different element theories already had these terms at their disposal to express the concept of the mixture of primary elements.⁴⁸⁷ As we have observed, they are *nomina actionis* formed by the suffix -σις. This suffix stems from an IE suffix -ti-, which occurs in the most ancient Greek texts and plays a great role in the construction of the vocabulary of Ancient Greek prose. Generally this IE suffix -ti- is employed for the formation of verbal abstracts, although this general rule is not always valid and there are many exceptions to it.⁴⁸⁸ This IE suffix gives rise in Ancient Greek to the suffix -τις, which over time passes into -σις.⁴⁸⁹ Differently from the nouns in -τις, the nouns in -σις seem to gain an increasingly

⁴⁸⁴ Beekes 2010, Frisk 1973, s.v. *μείγνυμι*.

⁴⁸⁵ Fr. 148 Lobel - Page, where *κρᾶσις* indicates the metaphorical blending of wealth and virtue.

⁴⁸⁶ Fr. 32 Page, where the term is used with reference to sexual union. On the first occurrences of the terms cf. also Holt 1940, p. 97 and p. 100; Schwabe 1980, p. 18.

⁴⁸⁷ Schwabe 1980, p. 18.

⁴⁸⁸ For forms with this suffix can also designate a noun which is at the same time abstract and concrete, such as *βάσις*, which means both “basement” and “stepping”. It can also distinguish a *nomen agentis*, although this usage remains quite isolated: *μάντις*, “diviner”, “seer”, etc. Furthermore, some derivatives in -ti- designate an instrument, for instance *κνήστις*, “grater”, or *ἄρυστις*, “cup”. Cf. Debrunner 1917 § 370–373; Chantraine 1933, § 217; Holt 1940, § 7.

⁴⁸⁹ Chantraine 1933, § 217. The conservation of the dental consonant *t* is exceptional and the passage from *t* to *s* is perhaps due to the ionic-attic influence. For in some phonetic contexts the *t* before *i* is assibilated, contrary to what happens in Western Greek dialects (cf. dor. *δίδωτι* corresponding to ion.-att. *δίδωσι*). Cf. Chantraine 1933 § 218; Holt 1940 § 8. According to Holt, the conservation of the suffix -tis, at least in some of the nouns belonging to this small group, also occurs for semantic reasons: these nouns in fact express a process set in motion not by an individual but by an impersonal *dynamis*. Cf. Holt 1940, § 16.

abstract verbal component over time.⁴⁹⁰ In Homeric Greek, the nouns in -σις carry the meaning of an action in progress, i.e. a process that has not yet been brought to completion, but in post-Homeric Greek they designate a pure and simple action independently from whether it has been brought to completion or not.⁴⁹¹ Therefore, a *nomen actionis* can indicate not only the action, but also the result of the action. And indeed κρᾶσις and μίξις do not merely express the action of mixing qua process in progress, if we consider both terms from a more general point of view (i.e. without specifying which kind of mixture they indicate. As regards κρᾶσις for example, Franco Montanari's dictionary indicates, under κρᾶσις, that the term can mean both the action of mixing and the result of this action.⁴⁹²

Since the domains of these two word-families are so semantically close that they seem almost synonymous, they have received a great deal of attention from modern lexicographers. These scholars very often sought to explain the meaning of these two words by contrasting them with one another, which gave rise to what has been defined as “un luogo comune lessicografico”, i.e. a lexicographical commonplace.⁴⁹³ According to this commonplace, which has been pinpointed by Elio Montanari, κρᾶσις indicates a deep and absolute mixture obtained by precise qualitative proportions, leading to the formation of a new homogenous body, whereas μίξις refers to a far more superficial and disordered mixture where the constituents are well recognizable.⁴⁹⁴ In modern times, the discussion of the meanings of κρᾶσις and μίξις seems to have been first raised in Stephanus' *Thesaurus Linguae Graecae*.⁴⁹⁵ In Montanari's view, Stephanus' definition of κρᾶσις and its implicit opposition to μίξις spawned subsequent

⁴⁹⁰ Holt 1940, § 136.

⁴⁹¹ Holt 1940, § 138.

⁴⁹² Montanari 2000, s.v. κρᾶσις. See also Montanari 2015 s.v. Schwabe makes this a little more complex. In fact, according to him, κρᾶσις and μίξις show a rather wide *Bedeutungsspielraum* as they can equally mean: *das Mischen, die Weise des Mischens (or Sich-Mischens), die Gemischtheit (or der Vermischungszustand, τὸ κεκρᾶσθαι), das Gemisch*; see Schwabe 1980, p. 20. As we can see more clearly by maintaining the German terms, the first and last meanings correspond to the action of mixing and the final result of this action, i.e. the mixture qua product of the mixture. The second meaning instead stresses the way one mixes with reference to the relation or proportion in which the different constituents stand to each other. The third meaning indicates the state or condition of that which is mixed, conceived in terms of its abstract and internal structure. This scheme goes back to den Dulk 1934, p. 11 ff.

⁴⁹³ Montanari 1979, p. 23.

⁴⁹⁴ Montanari 1979, p. 24.

⁴⁹⁵ Stephanus 1831–1865, s.v. κρᾶσις.

speculation in modern lexicography on the difference in meaning between these two word-families, which led to the creation of a lexicographical *locus communis*.⁴⁹⁶

Under the entry κρᾶσις, Stephanus lists several meanings. First of all, according to him, the term particularly refers to the mixture of wine and water (*mixtio, mixtura: peculiariter de ea qua aqua vino miscetur*). More specifically it could directly refer to the ratio of water to be added to the wine (*de ratione aquae vino miscendae*). Hence this semantic shift would have yielded the meaning “ratio of the mixing”, such as, for instance, in the expression οἴνου κρᾶσις.⁴⁹⁷ More generally the term also means any kind of mixture (*generaliter vero de quavis mixtura et temperatura s. temperamento dicitur*) and can be referred, for instance, to the preparation of drugs and colour pigments. Furthermore, the term designates the mixture of the primary elements and of the human body (*dicitur etiam de temperie s. temperamento corporis humani et elementorum*), with particular reference to the healthy state, which depends on a balanced mixture or constitution of the body (*ex aequabilis corporis temperamento s. constitutione sanitas existit*), such as in the expression “τῆς ὑγείας ἐκ συμμέτρου κράσεως οὔσης”.⁴⁹⁸ The term could also refer to the external surrounding air, such as in the expression κρᾶσις ἀέρος,⁴⁹⁹ and in this case would correspond to the Greek κατάστασις. It is remarked in Stephanus’ dictionary that sometimes the term should be rendered in Latin as *cinnus* or *commixtio*,⁵⁰⁰ and in this case it would indicate a mixture where two or more different constituents coalescing and hence becoming unified give rise to one new quality (*Qualitas commixta e duobus aut pluribus, licet a se invicem discrepantibus, ita coalescentibus, ut unum quippiam tantummodo videatur*). As Stephanus reports, the same process would also happen in the case of the vocalic crasis, where two vowels or diphthongs merge into one new vowel.

⁴⁹⁶ Montanari 1979, pp. 25–26.

⁴⁹⁷ Plutarch *Amat.* 752 D.

⁴⁹⁸ Ps.-Alexander *Probl.* I 35.5.

⁴⁹⁹ Theophrast, *Hist. Plant.* IV 1 5.5.

⁵⁰⁰ As Montanari rightly observes, this rendering of *cinnus*, which according to Nonius defines a drink made out of different ingredients (cf. Nonius *De comp. doct.* 43.17 and 59.29) is rather questionable, since the Ciceronian textual *locus* brought forward by Nonius and then quoted by Stephanus (in order to support the translation *cinnus*), preserves *vicinus* instead of *ut cinnus*. Furthermore, this term, which occurs *ex conjectura* only once in Arnobius’ text, could not exist and could even have been invented. Cf. Montanari 1979, pp. 25–26; Ernout and Meillet 1979, s.v. *cinnus*.

Under the entry μίξις, beside the Latin translation (*Mistio, Permistio*) in Stephanus, we find a passage from the Byzantine Suida lexicon, which in turn refers to the Commentary on Aristotle's *Topica* by Alexander of Aphrodisias.⁵⁰¹ In Suida's lemma, as well as in Alexander's passage, μίξις is regarded as the general term, the γένος, including within it κρᾶσις as its εἶδος. In order to explain Aristotle's passage according to which "μίξις is not always κρᾶσις (for the μίξις of dry constituents is not κρᾶσις)", Alexander remarks that μίξις is the γένος to which κρᾶσις belongs and not the contrary, as some say. For, he continues, if something is mixed in terms of κρᾶσις (κέκραται) it is also mixed in terms of μίξις (μέμικται). Conversely, however, not all that is μεμιγμένον is also mixed in terms of κρᾶσις (οὐ μὴν πᾶν τὸ μεμιγμένον καὶ κέκραται), for κρᾶσις is not a mixture of dry constituents. The conclusion is therefore that according to Alexander, κρᾶσις solely consists of a mixture of liquids, although this is not explicitly expressed in this Alexandrian locus, while μίξις includes mixtures of both dry and liquid constituents. Thus, Alexander's passage seems to be aimed at explaining the difference between κρᾶσις and μίξις and at clarifying what is the main γένος of the mixtures and what is the εἶδος, mainly for people who think differently. Therefore, even though the lexicographer does not venture to take a personal position on the issue, he patently wants us to understand that the debate on the difference in meaning of κρᾶσις and μίξις had already arisen in antiquity.

What seems noteworthy, therefore, which Montanari fails to report or simply undervalues, ultimately altering our understanding of the problem, is not that Stephanus' dictionary establishes a pattern for future discussions on the topic, but rather that this issue had already germinated in Ancient Greek philosophical texts and hence also spread to Byzantine lexicographical literature.

⁵⁰¹ Suida s.v. μίξις = Alexander in *Top.* 315.27–316.3 "ἀλλὰ καὶ ὁ τῆς μίξεως τὴν κρᾶσιν γένος λέγων τὸ γένος ὑποτίθησι τῷ εἶδει· ἐπὶ πλέον γὰρ ἢ μίξις τῆς κράσεως· εἰ μὲν γὰρ τι κέκραται, καὶ μέμικται τοῦτο, οὐ μὴν πᾶν τὸ μεμιγμένον καὶ κέκραται· ἢ γὰρ τῶν ξηρῶν μίξις οὐκ ἔστι κρᾶσις". The passage of Aristotle's *Topica* on which Alexander comments (*Top.* 122b26–31) is the following: "οὔτε γὰρ ἡ μίξις ἅπασα κρᾶσις (ἢ γὰρ τῶν ξηρῶν μίξις οὐκ ἔστι κρᾶσις)". As we can infer from the Prolegomena to Adler's edition of the Suida lexicon, Suida's lemma is not a direct quotation from Alexander's text, but rather a quotation from some philosophical excerpts also including, besides passages from Alexander's Commentary on *Topica*, doxographical sections of Diogenes Laertius' and John Philoponus' commentary on Aristotle's *De anima*. The structure of these quotations is the same as that of the excerpts preserved in the manuscript Vatican 268; cf. Adler 1928-1938 pp. XXI–XXII.

Moreover, Stephanus' dictionary adds a reference to a scholion on Euripides' *Hecuba*, where the scholiast explains that κρᾶσις is generally used with reference to the mixture of liquids, such as the mixture of water and wine, whereas μίξις indicates a mixture of different kinds of grains, such as grain and barleycorn.⁵⁰² Both the passages quoted by Stephanus' dictionary and the way they explain the difference between κρᾶσις and μίξις seem to have had a great bearing on future depictions of the semantic question, at least in three of the most important Ancient Greek lexicons: Passow, Pape, and Liddell and Scott.

Passow explains the semantic difference between κρᾶσις and μίξις in these terms:⁵⁰³ “Mischung, Vermischung, Temperatur: der Unterschied zwischen κρᾶσις und μίξις wird so bestimmt, dass bey der κρᾶσις verschiedene Stoffe so innig verbinden, dass sie ihre eigne Natur verlieren, und zusammen einen neuen Stoff bilden, wie Wein und Wasser, bey den μίξις aber bloss eine Durcheinandermengung statt findet, wobey die einzelnen Stoffe ihre eigne Natur beybehalten, wie wenn man Hafer und Gerste mengt”. As we can see, the examples given by Passow to illustrate the difference between κρᾶσις and μίξις (which will be removed in the following edition of the lexicon⁵⁰⁴) seem to draw closely on the examples presented in the scholion quoted by Stephanus' dictionary (for κρᾶσις is conceived as a mixture of wine and water, while μίξις is explained as a mixture of grain and barleycorn). Passow's dictionary interprets the semantic difference as an opposition between a kind of mixture where the constituents are so deeply mixed that they give rise to another new substance and another mixture, μίξις, where the constituents are simply juxtaposed, such as grains for example, such that they preserve their own nature. In the same vein, Pape's lexicon explains the semantic difference between the two terms. For κρᾶσις is said “von jeder Mischung (μίξις, Mengung) durch welche die gemischten Stoffe sich so innig verbinden, dass sie ihre eigene Natur verlieren und zusammen einen neuen Stoff bilden”.⁵⁰⁵ As for the several editions of the Liddell and Scott Greek–English lexicon, the first edition's formulation is the following: κρᾶσις is “a mixing of two things, so that they are quite blended and

⁵⁰² *Schol. in Eur. Hec.* 216.

⁵⁰³ Passow 1831, *s.v.* κρᾶσις.

⁵⁰⁴ Passow 1841-1857 (2004) *s.v.* κρᾶσις.

⁵⁰⁵ Pape 1914 *s.v.* κρᾶσις.

form a compound, as wine and water; whereas μίξις is a mere mixing so that they can be separated again as two sorts of grains; (or we might say, κρᾶσις is chemical, μίξις is mechanical mixture)".⁵⁰⁶ This definition of κρᾶσις seems to have been substantially modified in the New Edition, as well as in later revised editions (since it has been removed the opposition κρᾶσις vs μίξις). Afterwards the term κρᾶσις is defined as “mixing, blending of things which form a compound, as wine and water, opp. mechanical mixture (defined as an εἶδος μίξεως in which the constituents are liquids, Arist. Top. 122b26 Stoic. 2.153 [...])”.⁵⁰⁷

As becomes clear from this short overview of the different accounts provided by modern lexicons, what has been mistaken for a modern lexicographical commonplace, actually proves to have older roots; more precisely it seems that the debate on the semantic difference between κρᾶσις and μίξις can be traced back to Ancient Greek texts. We could even say that the two passages quoted by Stephanus’ dictionary in order to make the meaning of κρᾶσις clear in opposition to μίξις go straight to the heart of the question by offering two very different explanations of the meaning of μίξις, while seeming to agree on κρᾶσις as a mixture of liquids. For from Aristotle’s account as reinterpreted by Alexander, we can infer that μίξις (insofar as it is the *genos*) is a mixture of both dry and liquid constituents, whereas κρᾶσις is supposed to be only a mixture of liquids (the *eidos*). However, to put it simply, according to Aristotle these two mixtures do not coincide with a mechanical mixture of

⁵⁰⁶ Liddell and Scott 1845, s.v. κρᾶσις. See also Montanari 1979, pp. 26–27.

⁵⁰⁷ Liddell, Scott and Jones 1940, s.v. κρᾶσις (cf. also Liddell, Scott and Jones 1996, s.v. κρᾶσις). To be thorough, it would have been very useful to also take the new Greek-Spanish Dictionary (DGE) into consideration, which was produced under the direction of F.R. Adrados, in order to understand how the scholars involved in the project coped with this semantic issue. Unfortunately, at present we have only the entries from α to ε at our disposal. In any case, it is perhaps worth referring to the lemmas ἄκρατος and ἄμικτος in order to seek to conversely grasp the meanings attributed to κρᾶσις and μίξις. The adjective ἄκρατος refers to different kinds of liquids, such as wine, blood or milk (*sin mezcla, puro del vino; de la sangre αἷμα, ἄ. γάλα la leche entera*); it is also applied to the medical field and it can refer to the humours (χυμός) and bodily constituents. Furthermore, the adjective is employed with reference to colours, odours, abstract nouns (such as justice, grace, freedom, peace, and so on), and the psychological sphere, carrying the meaning of “uncontrolled, unrestrained” (*inmoderado, destemplado, desmedido*). As for ἄμικτος, the adjective refers to abstract nouns (courage, pleasure) or to thoroughbred animals (*de animales de pura sangre*). With the corresponding nomen actionis μίξις, it is also used in social contexts and in this case it refers to sexual abstinence or to unsociable or intractable individuals (unsociable, intractable), cf. Adrados 1980-1997 s.v. ἄκρατος and ἄμικτος.

constituents, which he calls σύνθεσις.⁵⁰⁸ For contrary to a mechanical mixture they both lead to the formation of a homogenous final product that is defined as a homeomerous part.⁵⁰⁹ On the other hand, the above-mentioned scholion on Euripides' *Hecuba* provides a very different explanation by describing μίξις as a mechanical mixture of two different kinds of grains. This twofold interpretation of the meaning of μίξις has also been highlighted by den Dulk. In a section of his monograph committed to exploring the concept of κρᾶσις τῶν στοιχείων, den Dulk tackles the problem of the semantic difference between κρᾶσις and μίξις.⁵¹⁰ The scholar starts to unravel the question by quoting the very same passage from the abovementioned passage from Aristotle's *Topica* and the corresponding passage of Alexander's commentary. First he defines κρᾶσις as a kind of μίξις, i.e. a mixture of liquids or "chemical mixture". As for the term μίξις, he argues that it refers instead to a mixture of both liquids and solids and has both the meanings of "chemical" and "mechanical" mixture, since μίξις is the more general term. On the one hand, den Dulk is aware of the fact that Aristotle draws a distinction between μίξις and σύνθεσις and that the latter corresponds to a mechanical mixture where each of the constituents preserves its own nature.⁵¹¹ On the other hand, he brings forward some other passages in order to support his idea that μίξις can also express a mechanical mixture of different constituents which remain well recognizable.⁵¹² Therefore, it seems that according to den Dulk the term μίξις ultimately refers either only to a mechanical mixture or to a combination of mechanical and chemical mixture.⁵¹³

The etymological dictionary by Chantraine distances itself from the preceding lexicographical tradition by defining κρᾶσις as a mixture obtained by

⁵⁰⁸ *De gen. et corr.* 328a7–9 “δῆλον ὡς οὔτε κατὰ μικρὰ σωζόμενα δεῖ τὰ μινύμενα φάναι μεμίχθαι. Σύνθεσις γὰρ ἔσται καὶ οὐ κρᾶσις οὐδὲ μίξις, οὐδ' ἔξει τὸν αὐτὸν λόγον τῷ ὅλῳ τὸ μόριον”.

⁵⁰⁹ *De gen. et corr.* 328a10–12 “Φαμὲν δ', εἴπερ δεῖ μεμίχθαι τι, τὸ μίχθῃν ὁμοιομερὲς εἶναι, καὶ ὥσπερ τοῦ ὕδατος τὸ μέρος ὕδωρ, οὕτω καὶ τοῦ κραθέντος”.

⁵¹⁰ Den Dulk 1934, pp. 31–39.

⁵¹¹ Cf. den Dulk 1934 p. 34: “Nu doet echter merkwaardige moeilijkheid voor, dat de hierboven vastgestelde, op Aristoteles zelf gegronde onderscheiding van μίξις en κρᾶσις in strijd is met de plaats bij Aristoteles, waarvan we zijn uitgegaan. Daar immers wordt gezegd dat, wanneer bij een vermenging de kleine deeltjes den aard van de stof behouden, wij niet alleen niet mogen spreken van en κρᾶσις, maar ook niet van een μίξις”.

⁵¹² Anon. Lond. XIV 20 ff.; Alexander *De mixt.* 228.25 Bruns.; *Schol. in Eur. Hecuba* 216 (the same scholion already cited by Stephanus).

⁵¹³ “Het begrip μίξις ὁφ' uitsluitend mechanische vermenging inhoudt, ὁφ' een samenvatting van mechanische en chemische”; cf. Den Dulk 1934, p. 35.

a certain proportion, while leaving the meaning of μίξις in a way undifferentiated: “Sens: ‘mélanger dans un certain équilibre’ notamment pour l’eau et le vin, se dit aussi des caractères, des climats, etc.: se distingue de μείγνυμι ‘mêler’ de sens plus vague, qui peut se dire de combattants, de l’union sexuelle, etc.”⁵¹⁴ As we can see, contrary to the previous definitions Chantraine places emphasis on the proportionality distinguishing the mixture, called κρᾶσις, and concisely describes the semantic domains pertaining to this term (the convivial mixture of wine and water, the mixture of the surrounding air, i.e. the climate, the reference to the meaning the word acquires in the psychological sphere). The term κρᾶσις is once again set against the term μίξις, but this opposition remains convoluted, since is not assigned any precise meaning to μίξις (“μείγνυμι ‘mêler’ de sens plus vague”).

The scholar Wilhelm Schwabe seems to align himself with Chantraine’s interpretation. According to Schwabe, it seems possible to find traces of an opposition between κρᾶσις and μίξις already in Homeric Greek. The first term would refer primarily to the mixture of wine and water obtained by precise proportions that brings about positive effects on men. For, by conveniently diluting the wine, men could mitigate its excesses and at the same time enjoy its benefits. More generally, the term is applied in post-Homeric contexts to any mixture obtained by precise proportions (“geordnete, gute Mischung, harmonische Vereinigung”). Furthermore, in his analysis of the development of the post-Homeric κρᾶσις-Vorstellung, Schwabe points out that the term can refer not only to liquids, such as in the case of metals in the liquid state, colours, drugs, and humours, but also to the condition of the air in the meteorological field or to the relation between dynameis, among which there is also “the dry”.⁵¹⁵ The term μίξις instead defines a confused, disordered mixture (conceived *stricto sensu* as “wirre, schlechte Mischung, Vermengung”), such as the mingling of the combatants in the battlefield⁵¹⁶ or sexual intercourse considered as a passionate and disordered union.⁵¹⁷ Apart from this pejorative understanding, this term, however, preserves a more general meaning which can be found in Aristotle,

⁵¹⁴ Chantraine 2002, s.v. κεράννυμι.

⁵¹⁵ Schwabe 1980, p. 31.

⁵¹⁶ Schwabe 1980, pp. 24–25.

⁵¹⁷ Schwabe 1980, p. 34.

according to which μίξις designates any kind of mixture of different constituents leading to a new whole whose previous constituents, however, are not completely destroyed and can be recovered.⁵¹⁸

To sum up, it seems that interpretations of the problem relating to the semantic difference between κρᾶσις and μίξις can be *in nuce* summarized as follows: on the one hand the difference is interpreted as an opposition between a mixture of liquids, κρᾶσις, and a mixture of dry constituents, μίξις (with the latter, μίξις, as a mechanical mixture – Passow, Pape, Liddell and Scott, den Dulk – or not – Liddell, Scott and Jones, den Dulk). On the other hand, the opposition κρᾶσις/μίξις is formulated in terms of proportion/disproportion, order/disorder, balance/imbalance, such as in Chantraine’s and Schwabe’s accounts. Moreover, in Schwabe’s view κρᾶσις has a positive value, while μίξις has a negative value – the latter of which would carry, however, the more neutral meaning of “mixture” without *Wertakzent*. Further, according to Schwabe the term κρᾶσις, which would originally have exclusively referred to the mixture of liquids, especially wine and water, over time freed itself from the reference to liquids, in order to also be applied to other semantic fields, for instance meteorology.

We can look more closely at the meaning of both terms by turning to Homer, i.e. to the deepest stratum of Ancient Greek in our possession, in order to compare the two semantic fields by analysing their original meanings. Here I will refer, very briefly, to Montanari’s research on the topic, which proves to be extremely helpful since he linguistically and philologically analyses all occurrences of the terms relating to these two word-families in Homer. This will help us grasp the original meaning of both the roots.⁵¹⁹ Montanari claims that the two word-families do not seem to completely semantically overlap in the Homeric Greek. In Mycenaean Greek there are no occurrences of the two word-families, apart from ka-ra-te-ra, as we have seen.

Montanari adopts the method of componential analysis, i.e. a structuralist semantic analysis that assigns a list of more basic semiotic components to the lexeme⁵²⁰ and for each word-family isolates their basic semantic traits. On the

⁵¹⁸ Schwabe 1980, p. 22.

⁵¹⁹ Montanari 1979 pp. 39–144.

⁵²⁰ “Semiotic component” is the literal translation of Montanari’s expression “componente semiotico”. As pointed out, this notion stems from the componential semantic analysis. From

one hand, with regard to the word-family of μείγνυμι, he recognizes three basic semantic traits, which represent the basic set of meanings of μείγνυμι, and therefore, of its *nomen actionis* μίξις: “to mix (generally)”, “to come into close contact”, “to confuse”.⁵²¹ On the other hand, with regard to the Greek word-family of κεράννυμι, it (and therefore κρᾶσις) shows not only the general meaning (carried out also by the IE root) “to moderate”, “to temper”, but also “to mix with water”, “to dilute”, “to water down”, and indicates the action of mixing (said specifically, but not *exclusively*, of liquids) in order to moderate the power they release, such as in the case of the mixture of wine and water.⁵²²

In conclusion, by looking at the lexicological findings together, alongside Montanari’s etymological work, we can safely say that μίξις seems to indicate any type of mixture (mechanical or “chemical”) (“to mix generally”) that can be brought about by contact among the constituents (“to come into close contact”, for this reason the term can be applied to the social sphere), and can be connoted negatively (to confuse). With regard to κρᾶσις, it seems instead to be a mixture *prevalently* of liquids (“to mix with water”), aiming at moderating or tempering excesses, and is connoted positively as good mixture (“to moderate”, “to temper”).⁵²³

now on we will refer to this notion with the term “semantic trait”, which in being more general carries the lightest burden of theory; it is used in lexical semantics to indicate the most basic meanings of a word making up the set of meanings of a single word; see Cruse 1986, p. 16, for a discussion concerning different denominations (such as “semantic components” and “semantic features”); cf. *ibid.* p. 22 n. 17. For a historical overview of the origin and development of the componential analysis cf. also Geeraerts 2010, p. 70 ff.

⁵²¹ Montanari 1979 pp. 37–92.

⁵²² Montanari 1979 pp. 93–144.

⁵²³ We say **prevalently** and not **exclusively** of liquids because as Montanari also notes, there is a Homeric passage where the mixture regards not solely liquids but also their qualitative properties in terms of mixing together and finding an equilibrium point, that is, k 360–3, where Circes is portrayed as mixing hot and cold water and pouring it over Odysseus’ head and shoulders (“αὐτὰρ ἐπεὶ δὴ ζέσσειεν ὕδωρ ἐνὶ ἥνοπι χαλκῷ, ἔς ῥ’ ἀσάμινθον ἔσασα λό’ ἐκ τρίποδος μέγαλοιο, **θυμῆρες κερᾶσασα**, κατὰ κρατός τε καὶ ὤμων, ὄφρα μοι ἐκ κάματον θυμοφθόρον εἴλετο γυίων”). Montanari in fact speaks of the application of the verb to the thermic sphere; Montanari 1979 pp. 141 ff.

3.2 Terminologies for mixtures: The Hippocratic authors, Aristotle and the Peripatetics, and the Stoics

After having enquired into and understood the meanings of κρᾶσις and μίξις, we will briefly review the terminology (and summarize the research findings so far) of the main theoretical models of mixture which Galen had in mind when formulating his own conception: the Hippocratic, the Aristotelian and Peripatetic, and the Stoic, with the main aim of grasping the influence that this terminology had on the texture of Galen's scientific lexicon of mixture.

In Hippocratic medicine, the term κρῆσις can indicate either a **process** or the **result of this process**, i.e. a state; as a technical term it is used to indicate 1) the process of mixing different ingredients⁵²⁴ and 2) the qualitative composition that is the result of an act of mixing (the basic building blocks of the cosmos and of the nature of human beings), and can be applied 2.1) to the whole body as made up of qualities, *dynamies*, or humours; 2.2) to a part of the body; or 2.3) to the meteorological climate.⁵²⁵ What is important to underline is that, as Jouanna

⁵²⁴ As Festugière (1948 pp. 37–38) points out, the notion of κρῆσις acquires different shapes throughout the Hippocratic corpus. In *De vetere medicina* food and drinks are conceived as containing various juices (bitter, salty, acid, etc.), and if they are consumed pure and unmixed, cause pain and disease to the organism (cf. CMG I 1 p. 46.4–8 Heiberg). For this reason, according to the Hippocratic author, these pure and strong *dynamies* of foods' and drinks' juices have to be weakened through processes of concoction and mixture (κρῆσις) in order to be suitable for the living organism's constitution (cf. CMG I 1 p. 39.22 Heiberg). The task of the physician is to find a diet proportional to the individual constitution of the patient; therefore he has to modify, on the one hand, the quantity of the foods and, on the other, their quality by mixing the right amount of "strong" food with the right amount of weak food, potentially through a process of concoction (cf. CMG I 1 p. 39.6–26 Heiberg). 1) The κρῆσις is therefore regarded as a procedure through which the physician mixes together different quantities of strong and weak substances in order to reach a moderate qualitative mean between the extremes; cf. Tracy 1969 pp. 37–38.

⁵²⁵ In *De vetere medicina* the term κρῆσις also signifies the bodily mixture of potentially infinite couples of *dynamies* (CMG I 1 p. 47.15 Heiberg, corresponding to those contained in food and drinks, cf. CMG I 1 45.25–26 Heiberg): the health of the living body is determined by an inner state of equilibrium of the these *dynamies*, whereas whenever this state of balance is disrupted and one of them either separates off or grows excessively to the detriment of its opposite, the organism is affected by diseases and illnesses (cf. CMG I 1 p. 46.1–4 Heiberg). In other Hippocratic writings, this basic idea of a well-proportioned mixture or κρῆσις is continuously reshaped and reformulated; it is connected, on the one hand, to the **primary qualities**, that is hot, cold, dry, and wet (cf. *Aph.* V 62 L. IV 556 Jones p. 174: "Ὀκόσαι ψυχρὰς καὶ πυκνὰς τὰς μήτρας ἔχουσιν, οὐ κῦσκουσιν· καὶ ὀκόσαι καθύγρους ἔχουσι τὰς μήτρας, οὐ κῦσκουσιν, ἀποσβέννυται γὰρ ὁ γόνος· καὶ ὀκόσαι ξηρὰς μᾶλλον καὶ περικαέας, ἐνδείη γὰρ τῆς τροφῆς φθείρεται τὸ σπέρμα· ὀκόσαι δὲ ἐξ ἀμφοτέρων τὴν κρᾶσιν ἔχουσι ζύμμετρον, αἱ τοιαῦται ἐπίτεκνοι γίνονται"). In this text, qualitative disproportions of the uterus' are described, such as hot/cold and dry/wet, which are able to impede pregnancy; while it is declared that a symmetric/well-proportionate mixture in the uterus' of either qualitative opposition (ἐξ

remarks, the term κρῆσις in the Hippocratic Collection presents the term as meaning balanced mixture, “mélange équilibré”, that is, a mixture that is already an intrinsically good, balanced, and moderated mixture, to put it simply, a good mixture; and it is said not only of liquids but also of the primary qualities mixing together and finding a good, positive, and healthy balance.⁵²⁶

Aristotle’s and the Peripatetic speculation regarding mixture (whose inner justification, the generation of inanimate and animate elemental compounds, we dealt with extensively in the first main chapter) seems to be extremely relevant for terminological purposes too. In fact, Aristotle’s terminological remarks (and the interpretation provided by his greatest commentator, Alexander of Aphrodisias) are at the origin of the lexicographical commonplace which opposed κρᾶσις to μίξις. Joachim notes that Aristotle draws a distinction between mechanical mixture and what he calls “chemical combination” (that is, a kind of mixture giving rise to a uniform tertiary product). According to Joachim, Aristotle refers to the first type of mixture as σύνθεσις even though he recognizes that it is sometimes less technically referred to as μίξις (cf. *De gen. et corr.* 328a2). Throughout the *De generatione et corruptione* and especially in I 10, the general term Aristotle adopts to indicate the kind of mixture that gives rise to a homoeogeneous product, the homoeomerous part, is μίξις, although, as is clarified in *Topica* 122b30–31, “οὔτε γὰρ ἡ μίξις ἅπαντα κρᾶσις (ἢ γὰρ τῶν ξηρῶν μίξις οὐκ ἐστὶ κρᾶσις)”: for, according to Aristotle, whereas μίξις can be of both solids and liquids (insofar as is the genus), κρᾶσις, being the species, cannot also be of solids (for it is said of liquids, which in any

ἀμφοτέρων τὴν κρᾶσιν ... ξύμμετρον) makes women fertile. In this case therefore the term refers to the good and proportioned qualitative composition of a **part of the body**, the uterus. In addition to *Aphorisms*, *De natura hominis* describes the conditions in which birth can take place and reports that generation cannot take place if there is not due proportion between hot/cold and dry/wet (cf. *De nat. hom.* CMG I 1.3 pp. 170.11–172.2 Jouanna “Καὶ πάλιν, εἰ μὴ τὸ θερμὸν τῶ ψυχρῶ καὶ τὸ ξηρὸν τῶ ὑγρῶ μετρίως πρὸς ἀλλήλα ἔξει καὶ ἴσως, ἀλλὰ θάτερον θατέρου πουλὺ προέξει καὶ τὸ ἰσχυρότερον τοῦ ἀσθενεστέρου, ἢ γένεσις οὐκ ἂν γένοιτο. Ὡστε πῶς εἰκὸς ἀπὸ ἐνός τι γεννηθῆναι, ὅτε γε οὐδ’ ἀπὸ τῶν πλείονων γεννᾶται, ἢν μὴ τύχη καλῶς ἔχοντα τῆς κρήσιος τῆς πρὸς ἀλλήλα”). The term can also designate the good and healthy mixture of the **seasons**, that is, the qualitative composition of the external environment (cf. *Aer.* CMG I 1.2 p. 54.4–13 Diller). On the other hand, κρῆσις is linked to the theory of the **four humours** (*De nat. hom.* CMG I 1.3 p. 172.1 Jouanna), which in this Hippocratic treatise are regarded as the constitutive elements of the nature of the human being and are each associated with a couple of primary qualities (which are seen as constitutive of all the other physical bodies), and which over time will become canonical and will give rise to the theory of the four temperamental constitutions depending on the prevailing humour; cf. Festugière 1948 p. 38 n. 25.

⁵²⁶ Jouanna 1996 pp. 294–295 with references.

case are the most mixable, as they divide more readily into particles; see *De gen. et corr.* 328a33 ff.).⁵²⁷ Therefore, Aristotle recognizes that the term μίξις is more popularly used to indicate a kind of mixture that is actually a juxtaposition (a mechanical mixture), whereas he uses the term technically with the sense of “chemical” combination, including the mixture of solids and of liquids, and employs κρᾶσις as a technical term restricted solely to liquids (and this would be the reason why, coherently with his own statements, Aristotle mainly adopts κρᾶσις when he deals with physiological issues⁵²⁸).

In the abovementioned passage from his commentary on Aristotle’s *Topica*, Alexander underlines that, in contrast to what other people think (though it is not clear to whom he is referring here – perhaps to the Stoics), the μίξις is the genus of κρᾶσις, which represents the species.⁵²⁹ But as Joachim points out, in his *De mixtione*, Alexander seems to have interpreted Aristotle’s *genos/eidos* distinction differently from the Stagirite. In fact, differently from Aristotle, Alexander under the general head of μίξις he differentiates i) σύνθεσις of unlike with unlike (for example, a heap of grains of wheat and grains of barley); from ii) κρᾶσις of liquids, which is the only type of mixture leading to the generation of a uniform compound (this would neutralize Aristotle’s distinction between *genos* and *eidos*). Moreover, Alexander singles out a second type of σύνθεσις, a mechanical mixture of like with like (such as, for instance, a heap of grains of wheat), which would not coincide with μίξις at all.⁵³⁰ In Alexander’s case μίξις designates a type of mixture that coincides with a type of juxtaposition of unlike with unlike (what Aristotle would have simply called σύνθεσις, referring either

⁵²⁷ Joachim 1904 p. 73.

⁵²⁸ Cf. van der Eijk 2004, cf. also Tracy 1969 pp. 163-174.

⁵²⁹ *In Top.* 315.25 ff. “ἀλλὰ καὶ ὁ τῆς μίξεως τὴν κρᾶσιν γένος λέγων τὸ γένος ὑποτίθησι τῷ εἶδει· ἐπὶ πλέον γὰρ ἡ μίξις τῆς κρᾶσεως· εἰ μὲν γὰρ τι κέκραται, καὶ μέμικται τοῦτο, οὐ μὴν πᾶν τὸ μεμιγμένον καὶ κέκραται· ἡ γὰρ τῶν ξηρῶν μίξις οὐκ ἔστι κρᾶσις”.

⁵³⁰ Cf. Joachim 1904 p. 73; cf. *De mixt.* 228.25 ff. Bruns “τούτου τοίνυν διωρισμένου μετὰ ταῦτα ἄξιον ἐπιστῆσαι, πότερον ταῦτόν ἐστι μίξις τε καὶ κρᾶσις, ἢ διαφορὰν ἔχει τινά. ἔοικε δὴ διαφέρειν, ἢ τὸ μὲν κοινότερόν ἐστιν ἡ μίξις, ἢ δὲ κρᾶσις ἰδικώτερον. ποία γὰρ μίξις ἢ κρᾶσις. τῶν γὰρ μίξεων ἢ μὲν τις κατὰ παράθεσιν τῶν οὐσιῶν καὶ ἀφήν γίνεται, ἢν λέγομεν τῆς μίξεως γίνεσθαι κατὰ σύνθεσιν (οὐ πᾶσα μὲν γὰρ σύνθεσις μίξις· σύνθεσις μὲν γὰρ καὶ τῶν ὁμοίων τε καὶ ὁμοειδῶν γίνεται, ἢ δὲ μίξις ἐκ διαφερόντων τε καὶ ἐν διαφέρουσι· διὸ ὁ μὲν τῶν πυρῶν σωρὸς κατὰ μόνην σύνθεσιν, ὁ δὲ τῶν πυρῶν τε καὶ κυάμων ἤδη τῇ συνθέσει καὶ τὴν μίξιν προσεἰληφεν), ἢ δὲ ὡς κρᾶσις μίξις γίνεται, οὐ σωζομένων ἔτι τῶν μιγνυμένων καὶ οὕτως ἀλλήλοις παρακειμένων, ἀλλ’ ἐνομένων κατὰ τὸ ὑποκείμενον. διὸ ἐν τοῖς εὐορίστοις τε καὶ ὑγροῖς ἢ ὡς κρᾶσις μίξις ἐστίν. ὥσπερ δὲ οὐχ ἢ τῶν τυχόντων σύνθεσις μίξις ἦν, οὕτως οὐδὲ ἢ τῶν τυχόντων ὑγρῶν ἔνωσις κρᾶσις τε καὶ μίξις. οὐ γὰρ ὕδωρ ὕδατι κερνάται, καίτοι ἐνούμενον αὐτῷ, οὐδὲ ἔλαιον ἐλαίῳ, ἀλλ’ οὐδὲ ἔλαιον ὕδατι· ἀλλὰ τοῦτο μὲν διὰ γλισχρότητα”.

to the juxtaposition of like with like or to that of unlike with unlike). The privileged term for indicating a “chemical” mixture is therefore κρᾶσις, although Alexander puts it under the general heading of μίξις. Though we do not need to hypothesize any Stoic influence on Alexander’s terminology (although it is very likely), we can safely say that for a Peripatetic of Alexander’s age the technical term to designate a complete mixture bringing about a new whole (the homoeomerous part) was κρᾶσις (and it is in fact this the term that is applied throughout *De mixtione* or περὶ κράσεως to designate what Aristotle called more generically μίξις).

We have mentioned the Stoics, Alexander’s great adversaries and Galen’s polemical target, who – as we have seen – (in particular Chrysippus), worked out a classification of mixture using specific terminology, which we shall now examine. This task is extremely challenging because of the fragmentary evidence that we have at our disposal. As Groisard remarks, Alexander of Aphrodisias attributed a classification of mixtures to the Stoics in *De mixtione* (Ch. 3) (which we have already analysed in detail), where under the general heading of μίξις we find the three different Chrysippean mixtures: παράθεσις or juxtaposition, σύγχυσις or fusion, and κρᾶσις or total mixture.⁵³¹ As Groisard notes, this fragment seems to be a quotation from a work by Chrysippus,⁵³² from which we can therefore extract some technical terms. For the first mixture the technical term seems to be καθ’ ἀρμῆν, “by juncture”, for the second σύγχυσις, “fusion”, and σύμφθορσις, “simultaneous destruction”, and for the third, which is regarded as mixture in the strict sense of the term (ιδίως cf. *De mixt.* 228.25 ff.), δι’ ὅλων κρᾶσις and ἀντιπαρέκτασις, or coextension, where the expression δι’ ὅλων suggests the Stoic total interpenetration of the

⁵³¹ Groisard 2016 p. 97, cf. *De mixt.* 216.18 Bruns “τὰς μὲν παραθέσει μίξεις γίνεσθαι [Chrysippus] λέγει, δύο τινῶν ἢ καὶ πλείονων οὐσιῶν εἰς ταῦτόν συντεθειμένων καὶ παρατιθεμένων ἀλλήλαις, ὡς φησιν, καθ’ ἀρμῆν, σωζούσης ἐκάστης αὐτῶν ἐν τῇ τοιαύτῃ παραθέσει κατὰ τὴν περιγραφὴν τὴν οἰκείαν οὐσίαν τε καὶ ποιότητα, ὡς ἐπὶ κυάμων φέρε εἰπεῖν καὶ πυρῶν ἐν τῇ παρ’ ἀλλήλους θέσει γίνεται, τὰς δὲ τινὰς συγχύσει δι’ ὅλων τῶν τε οὐσιῶν αὐτῶν καὶ τῶν ἐν αὐταῖς ποιότητων συμφθειρομένων ἀλλήλαις, ὡς γίνεσθαι φησιν ἐπὶ τῶν ἰατρικῶν φαρμάκων κατὰ σύμφθορσιν τῶν μιγνυμένων, ἄλλου τινὸς ἐξ αὐτῶν γεννωμένου σώματος· τὰς δὲ τινὰς γίνεσθαι μίξεις λέγει δι’ ὅλων τινῶν οὐσιῶν τε καὶ τῶν τούτων ποιότητων ἀντιπαρεκτεινομένων ἀλλήλαις μετὰ τοῦ τὰς ἐξ ἀρχῆς οὐσίας τε καὶ ποιότητος σώζειν ἐν τῇ μίξει τῇ τοιαύτῃ, ἦντινα τῶν μίξεων κρᾶσιν ἰδίως εἶναι λέγει”.

⁵³² Groisard 2016 p. 83 with n. 135.

bodies *as wholes* from part to part.⁵³³ In contrast to Chapter Three of *De mixtione*, according to two other testimonies of the classification –Philo’s *De confusione linguarum* and the *Anonymus Londinensis* –, μίξις indicates the mechanical mixture or παράθεσις as opposed to σύγχυσις or fusion, and δι’ ὄλων κρᾶσις or total mixture where the opposition κρᾶσις/μίξις is understood as the opposition liquid/solid.⁵³⁴ Yet again different is the terminology used by Arius Didymus in a fragment that was afterwards integrated into Stobaeus’ *Anthology* in the chapter περὶ μίξεως καὶ κράσεως, belonging to Book I, dedicated to physics (with which we have already dealt).⁵³⁵ Here, the term μίξις is used to

⁵³³ Groisard 2016 p. 83. Apart from *De mixtione*, cf. also Arius Didymus (SFV II 471 = Ar. Did. Fr. 28); SVF II 472 (Philo *De conf. ling.* 264.23 ff. Wendland) and An. Lond. XIV 16–23 Manetti do not attribute the classification to Chrysisppus.

⁵³⁴ Philo *De conf. ling.* p. 264.23 ff. Wendland “ἀλλ’ ἡ μὲν μίξις ἐν ξηραῖς, ἡ δὲ κρᾶσις ἐν ὑγραῖς οὐσίαις δοκιμάζεται. μίξις μὲν οὖν σωμάτων διαφερόντων ἐστὶν οὐκ ἐν κόσμῳ παράθεσις, ὥσπερ ἂν εἴ τις σωρὸν ποιήσῃ κριθᾶς καὶ πυροῦς καὶ ὀρόβους καὶ ἄλλ’ ἄττα εἶδη τῶν σπαρτῶν εἰς ταῦτ’ εἰσενεγκόν, κρᾶσις δ’ οὐ παράθεσις, ἀλλὰ τῶν ἀνομοίων μερῶν εἰς ἄλληλα εἰσδυομένων δι’ ὄλων ἀντιπαρέκτασις, ἔτι δυναμένων ἐπιτεχνήσει τινὶ διακρίνεσθαι τῶν ποιοτήτων, ὡς ἐπὶ οἴνου καὶ ὕδατος φασὶ γίνεσθαι· συνελθούσας μὲν γὰρ τὰς οὐσίας ἀποτελεῖν κρᾶσιν, τὸ δὲ κραθὲν οὐδὲν ἦττον ἀναπλοῦσθαι πάλιν εἰς τὰς ἐξ ὧν ἀποτελέσθη ποιότητα· σπόγγῳ γὰρ ἡλαιομένῳ τὸ μὲν ὕδωρ ἀναλαμβάνεσθαι, τὸν δ’ οἶνον ὑπολείπεσθαι· μήποτε ἐπειδήπερ ἐξ ὕδατος ἡ σπογγῆς γένεσις ἐστὶ, τὸ μὲν οἰκεῖον, ὕδωρ, πέφυκεν ἀναλαμβάνεσθαι πρὸς αὐτῆς ἐκ τοῦ κράματος, τὸ δ’ ἄλλότριον ὑπολείπεσθαι, ὁ οἶνος· σύγχυσις δὲ ἐστὶ φθορὰ τῶν ἐξ ἀρχῆς ποιοτήτων πᾶσι τοῖς μέρεσιν ἀντιπαρεκτεινομένων εἰς διαφερούσης μιᾶς γένεσιν, ὡς ἐπὶ τῆς ἐν ἰατρικῇ τετραφαρμάκου συντέτευχε· κηρὸς γὰρ καὶ στέαρ καὶ πίττα ῥητίνη τε, οἶμαι, συνελθόντα ταύτην ἀποτελεῖ, συνθεθείσης δὲ ἀμήχανον ἐπὶ τὰς ἐξ ὧν συνετέθη διακριθῆναι δυνάμεις, ἀλλ’ ἐκάστη μὲν αὐτῶν ἠφάνισται, πασῶν δ’ ἡ φθορὰ μίαν ἐξαιρέτον ἄλλην ἐγέννησε δύναμιν”. Cf. also *An. Lond.* XIV 16–23 Manetti. On this cf. Groisard 2016 p. 97.

⁵³⁵ Groisard 2016 pp. 95–96; cf. Ar. Dyd. Fr. 28 “Χρύσιππος δὲ τοιοῦτόν τι διεβεβαιοῦτο· εἶναι τὸ ὄν πνεῦμα κινεῖν ἑαυτὸ πρὸς ἑαυτὸ καὶ ἐξ αὐτοῦ, ἢ πνεῦμα ἑαυτὸ κινεῖν πρόσω καὶ ὀπίσω· πνεῦμα δὲ εἴληπται διὰ τὸ λέγεσθαι αὐτὸ ἀέρα εἶναι κινούμενον· ἀνάλογον δὲ γίνεσθαι κάπτι τοῦ αἰθέρος, ὥστε καὶ εἰς κοινὸν λόγον πεσεῖν αὐτά. Ἡ τοιαύτη δὲ κίνησις κατὰ μόνους γίνεται τοὺς νομίζοντας τὴν οὐσίαν πᾶσαν μεταβολὴν ἐπιδέχεσθαι καὶ σύγχυσις καὶ σύστασις καὶ σύμμιξις καὶ σύμφυσις καὶ τὰ τούτοις παραπλήσια. Διαφέρειν γὰρ ἀρέσκει τοῖς ἀπὸ τῆς Στωϊκῆς αἰρέσεως παράθεσις, μίξις, κρᾶσις, σύγχυσις. Παράθεσις μὲν γὰρ εἶναι σωμάτων συναφὴν κατὰ τὰς ἐπιφανείας, ὡς ἐπὶ τῶν σωρῶν ὀρώμεν, ἐν οἷς πυροῖ τε καὶ κριθαὶ καὶ φακοὶ καὶ εἴ τινα τούτοις ἄλλα παραπλήσια περιέχεται καὶ τῶν ἐπὶ τῶν αἰγιαλῶν ψήφω καὶ ἄμμων. Μίξις δ’ εἶναι δύο ἢ καὶ πλειόνων σωμάτων ἀντιπαρέκτασις δι’ ὄλων, ὑπομενουσῶν τῶν συμφυῶν περὶ αὐτὰ ποιοτήτων, ὡς ἐπὶ τοῦ πυροῦς ἔχει καὶ τοῦ πεπυρακτωμένου σιδήρου, ἐπὶ τούτων γὰρ <δι’> ὄλων γίνεσθαι τῶν σωμάτων τὴν ἀντιπαρέκτασις. Ὁμοίως δὲ κάπτι τῶν ἐν ἡμῖν ψυχῶν ἔχει· δι’ ὄλων γὰρ τῶν σωμάτων τῶν ἡμῶν ἀντιπαρεκτείνουσι, ἀρέσκει γὰρ αὐτοῖς σῶμα διὰ σώματος ἀντιπαρήκειν. Κρᾶσις δὲ εἶναι λέγουσι δύο ἢ καὶ πλειόνων σωμάτων ὑγρῶν δι’ ὄλων ἀντιπαρέκτασις τῶν περὶ αὐτὰ ποιοτήτων ὑπομενουσῶν. [Τὴν μὲν μίξις καὶ ἐπὶ ξηρῶν γίνεσθαι σωμάτων, οἷον πυροῦς καὶ σιδήρου, ψυχῆς τε καὶ τοῦ περιέχοντος αὐτὴν σώματος· τὴν δὲ κρᾶσιν ἐπὶ μόνων φασὶ γίνεσθαι τῶν ὑγρῶν] συνεκφαίνεσθαι γὰρ ἐκ τῆς κράσεως τὴν ἐκάστου τῶν συγκραθέντων ὑγρῶν ποιότητα, οἷον οἴνου, μέλιτος, ὕδατος, ὄξους, τῶν παραπλησίων. Ὅτι δ’ ἐπὶ τοιούτων κράσεων διαμένουσι αἱ ποιότητες τῶν συγκραθέντων, πρόδηλον ἐκ τοῦ πολλάκις ἐξ ἐπιμηχανήσεως ἀποχωρίζεσθαι ταῦτα ἀπ’ ἀλλήλων. Ἐὰν γοῦν σπόγγον ἡλαιομένον καθῆ τις εἰς οἶνον ὕδατι κεκραμένον, ἀποχωρίσει τὸ ὕδωρ τοῦ οἴνου, ἀναδραμόντος τοῦ ὕδατος εἰς τὸν σπόγγον. Τὴν δὲ σύγχυσις δύο

designate the total coextensive mixture of dry bodies, whereas κρᾶσις more precisely indicates a total and coextensive mixture of liquid bodies. We can note that, in the testimonies we have at our disposal (and which we have to examine rather carefully, since not all of them are literal quotations but rather abridgements and summaries of Chrysippus' tripartition), μίξις may indicate a) a general heading (as in Alexander); b) a mechanical mixture of grains (as in Philo and in Anonymus Londinensis); or c) a total mixture of solids (here in Stobaeus); whereas κρᾶσις indicates unmistakably the total mixture, especially of liquids. However, the opposition solid/liquid might be an authentic element of the Stoic doctrine, although it is absolutely clear that the term *par excellence* (ιδίως), which Chrysippus uses to indicate the total mixture, is δι' ὅλων κρᾶσις. As Groisard remarks, it is possible that in his *De mixtione* Alexander neglected to point out the opposition κρᾶσις/μίξις as liquid/solid total mixture (and followed his own terminology, where μίξις is just the general heading of all the types of mixtures), and then, in this regard, it is possible that the Stoics were influenced by the Aristotelian doctrine according to which μίξις is said both of solids and of liquids and κρᾶσις is said solely of liquids, but then certainly privileged the latter.⁵³⁶ Personally, I would consider an explanation for the Stoic privileged usage of the term κρᾶσις to describe the total mixture of primary elements in general, and this has to do with the Stoic cosmogony. As we have seen, in Zeno's cosmogony, the real elements come to be from a pre-elemental stage of pure water (which is the discrimen between the pre-elements and the real elements): in Diogenes Laertius' cosmological report (VII 135–136) it is said that “[i]n the beginning he [God] was by himself; he transformed the whole of substance through air into water, and just as in animal generation the seed has a moist vehicle, so in cosmic moisture God, who is the seminal reason of the universe, remains behind in the moisture as such an agent, adapting matter to himself with a view to the next stage of creation. Thereupon he created first of all the four elements, fire, water, air, earth (εἶτα ἀπογεννᾶν πρῶτον τὰ τέσσαρα στοιχεῖα πῦρ, ὕδωρ, ἀέρα, γῆν)”.⁵³⁷ The real elements then come to be from a

<ἦ> καὶ πλειόνων ποιότητων περὶ τὰ σώματα μεταβολὴν εἰς ἑτέρας διαφορῶσης τούτων ποιότητος γένεσιν, ὡς ἐπὶ τῆς συνθέσεως ἔχει τῶν μύρων καὶ τῶν ἱατρικῶν φαρμάκων”.

⁵³⁶ Groisard 2016 pp. 97–98.

⁵³⁷ Cf. Hahn 1977 p. 57 and cf. Diogen. Laërt. VII 135–136 = SVF I 102.

state of water, that is, from a liquid, and they then mix together so as to create all the existent beings within the cosmos. *Ab origine*, then, the Stoic primary elements mix together out of a watery stage such that perhaps, for this reason, the Stoics naturally adopted the term κρᾶσις (which was adopted, as we have seen, before Chrysippus) to refer to such a mixture.

3.3 Galen's usage of κρᾶσις

This section will explore Galen's usage of the term κρᾶσις throughout our primary sources. First of all, we have pointed out that the term κρᾶσις can indicate either a **process** or the **result of a process**, i.e. a **state**.

We will first deal with places where Galen uses the term κρᾶσις to indicate the **process of mixture** either of primary elements (which would be a work of nature and/or God) or of ingredients in order to produce medicaments (which would be a work performed by a human being, and specifically, by the doctor).

In the first place, as we saw in the first chapter, nature and/or God perform a total mixture of the primary elements in order to generate every existent being; and we have seen that in living beings this total mixture coincides with an act of shaping the individual from within, which over time fully develops according to a teleological design. The **act of completely mixing these primordial ingredients, performed by nature and/or God**, is defined either using a Stoic vocabulary, **δι' ὅλων κρᾶσις**,⁵³⁸ or simply by the word **κρᾶσις**.⁵³⁹ The distinctive feature of such a process is that it is not reversible, as we have demonstrated.

⁵³⁸ *De temp.* p. 34.5–12 H “Τὸ μὲν οὖν ὅλα δι' ὅλων αὐτὰ κεράσαι, τὸ θερμὸν λέγω καὶ τὸ ψυχρὸν καὶ τὸ ξηρὸν καὶ τὸ ὑγρὸν, ἀδύνατον ἀνθρώπῳ. γῆ γὰρ ὑγρῷ | φυραθεῖσα μέμικται μὲν, ὡς ἂν τῷ δόξειε, καὶ οὕτω κέκρται πᾶσα παντί, παράθεσις μὴν ἐστὶ τὸ τοιοῦτον κατὰ σμικρὰ καὶ οὐ **δι' ὅλων κρᾶσις**, ἀλλὰ τὸ δι' ὅλων ἄμφω κεράσαι θεοῦ καὶ φύσεως ἔργον, ἔτι δὲ μᾶλλον, εἰ καὶ τὸ θερμὸν καὶ τὸ ψυχρὸν ὅλα δι' ὅλων ἀλλήλοις κεραννύοιτο”. Cf. also *In Hipp. Nat. Hom. comment.* CMG V 1.9 p. 33.14–21 Mewaldt.

⁵³⁹ *In Hipp. Nat. Hom. comment.* CMG V 1.9 p. 21.15–18 Mewaldt “γενήσεται γὰρ ἢ ἐκ τούτων δόξα τὴν γένεσιν ἡμῶν ἐν ποιᾷ συνθέσει τῶν αἰδίων ἐκείνων σωμάτων τιθεμένη, καθάπερ ἢ Ἰπποκράτους ἐν τῇ **κράσει τῶν τεσσάρων στοιχείων**, ἣν Ἀριστοτέλης τε καὶ οἱ Στωϊκοὶ προσήκοντο”; cf. *ibid.* p. 27.20–27, p. 33.4–13.

Second, we have also seen that the physician can perform a **δι' ὄλων κρᾶσις**, that is, an **act of completely mixing the ingredients to obtain a drug** (cf. *De elem. sec. Hipp.* CMG V 1.2 p. 138.11–14 De Lacy “εἰ δ' ἐπὶ πλέον χρονίσειεν | ὡς ἐνωθῆναι τὸ πᾶν, ἀμήχανον ἔτι διακρῖναί τε καὶ διελεῖν ἀπὸ θατέρου θάτερον· ἀλλὰ περὶ μὲν τοῦ τρόπου τῆς δι' ὄλων κράσεως εἰρήσεται κὰν τοῖς **περὶ φαρμάκων**”).⁵⁴⁰ In this case the term κρᾶσις included within the Stoic-flavoured expression δι' ὄλων κρᾶσις indicates a process of production of medicaments whose distinctive feature is their non-reversibility.

The word κρᾶσις can indicate a **state, that is, the result of the process of elemental mixture**: all other occurrences of the word in our primary sources point to this meaning. In contrast to the first use of κρᾶσις as process of mixture, this second use of κρᾶσις as a state resulting from the mixture presents a connection with the notion of φύσις (a connection which Boudon-Millot fails to notice). For Galen affirms that **when he says φύσις he means κρᾶσις and the whole substance**: “φύσιν δ' ὅταν εἶπω, τὴν ὅλην οὐσίαν τε καὶ κρᾶσιν λέγω τὴν ἐκ τῶν πρώτων στοιχείων, θερμοῦ καὶ ψυχροῦ καὶ ξηροῦ καὶ ὑγροῦ” (*De temp.* p. 104.1–3 Helmreich). This equivalence of φύσις with οὐσία and κρᾶσις can be interpreted in two different ways: as essence (that which makes something what it is) or as natural condition (understood as the physical constitution of something).⁵⁴¹

As to the first case, as the lexicographer den Dulk also notes (although he does not establish a relation with the abovementioned sense of κρᾶσις as a state resulting from the mixture), κρᾶσις indicates *more Aristotelico* form *qua* essence.⁵⁴² It is therefore clear why, philosophically, φύσις is the οὐσία and κρᾶσις: mixture is form and essence (that is, οὐσία in the primary sense, in the sense of *Metaph.* VII 11) and, therefore, nature *qua* essence (in the sense of *Metaph.* V 4 1015a) is the κρᾶσις. Thus, we can understand why all existent beings, animate and inanimate, and even their parts, are endowed with a κρᾶσις,

⁵⁴⁰ This represents progress with respect to Boudon-Millot's account, according to which solely μίξις would have been used in pharmacology.

⁵⁴¹ For this distinction cf. van der Eijk 2014a pp. 89–90.

⁵⁴² Den Dulk 1934 pp. 90 ff. Cf. *Quod animi mor.* K. IV p. 773.

that is, an **essence** (what makes something what it is), resulting from a proportion of hot/cold and dry/wet.⁵⁴³

As for second case, when φύσις is intended as the “natural condition” of whichever unspecified substance or οὐσία interpreted as the highest genus (including inanimate or animate beings), κρᾶσις indicates the **“condition or state resulting from the process of mixture” of whichever natural substance (therefore its “natural state”), made up of primary elements (Galen’s hot, cold, dry, and wet, and not the humours) reaching a relative equilibrium point.** In contrast to the Hippocratic κρῆσις which – archaically – indicates an intrinsic “good mixture”, Galen’s κρᾶσις indicates **any relative equilibrium** reached by the constituents. For he distinguishes eight varieties of mixtures, pointedly calling them δυσκρασία or hot, cold, dry, or wet or hot/dry, hot/wet, cold/dry, or cold/wet **κρᾶσις** and one good mixture; if for Hippocrates κρῆσις already meant good and healthy mixture, now Galen uses a composite to emphasize this idea, i.e **εὐκρασία**.

Under this general heading of κρᾶσις as a natural “condition or state resulting from the mixture”, we find many terminological articulations, which we will treat separately

1) **A physical/physiological meaning.** Galen speaks of a φυσικὴ κρᾶσις, meaning the **natural bodily state, said exclusively of living bodies, and resulting from the process of mixture** of hot/cold and dry/wet.⁵⁴⁴ This natural

⁵⁴³ Cf. for example the passage where Galen seeks the midpoint in inanimate and animate, therefore, unspecified, *substances*; cf. *De temp.* p. 26.5–10 H. or *De temp.* p. 32.5–14 H.. For κρᾶσις as the essence of parts of a body cf. *De usu part.* pp. I.18.25ff. H.: “αὐται (sc. *the mixtures*) γὰρ τὴν ἰδίαν οὐσίαν τῶν μορίων συμπληροῦσιν. ὅτι γὰρ ὧδέ πως ἔχει θερμότητος τε καὶ ψυχρότητος καὶ ξηρότητος καὶ ὑγρότητος τὸ σῶμα, διὰ τοῦτο τοιόνδε τὴν φύσιν ἐστί. **τὸ γὰρ εἶναι σαρκὶ τῆ σαρκὶ καὶ νεύρῳ τῷ νεύρῳ καὶ τῶν ἄλλων ἐκάστῳ τοῦθ', ὅπερ ἐστί, διὰ τὴν ἐκ τῶν εἰρημένων τεττάρων ποιὰν κρᾶσιν ἐγένετο.** ταῦτα μὲν οὖν αὐτοῖς κατὰ τὸν τῆς οὐσίας ὑπάρχει λόγον [...] ὅταν οὖν τις ἀκριβῶς ἐθέλη βασανίσαι τὴν χρεῖαν ἀπάντων τῶν ὑπαρχόντων τοῖς ὀργάνοις, πρῶτον μὲν ἐξετασάτω, καθ' ὃ τὴν ἐνέργειαν ἐκτίησάτω. τὰ πολλὰ μὲν γὰρ εὐρήσει κατὰ τὴν ἰδίαν οὐσίαν”.

⁵⁴⁴ Cf. *De temp.* p. 52.5–21 H. “ἔσται δ' ἡ κρίσις [ἡμῖν] ἀρίστη καθ' ἑν καὶ ταῦτὸν σῶμα βρέφους ἐνός. οὐ γὰρ ἀδύνατον ὅποια τέ τις ἢ θερμασία διετεῖ τὴν ἡλικίαν ὑπάρχοντι προὑπῆρχεν αὐτῷ μεμνήσθαι καὶ ὅποια νῦν ἐστί δυοῖν ἢ τριῶν ἐτῶν, εἰ τύχοι, μεταξὺ γενομένων. εἰ γὰρ ὅλως φαίνοιτο μεταβολὴ τις ἐπὶ τὸ θερμὸν ἢ ψυχρὸν γεγονέναι τῷ βρέφει, χαλεπὸν οὐδὲν ἔτι συλλογίζεσθαι τὴν ἕως τῆς ἀκμῆς ἐσομένην ὑπεροχὴν. εἰ δὲ καὶ πλείω παιδία πολλοῖς ἀκμάζουσιν ἐθέλοις παραβάλλειν, ἰσχνὰ μὲν ἰσχνοῖς, εὐσαρκα δ' εὐσάρκοις καὶ παχέα παχέσι παράβαλλε· οὕτω δὲ καὶ χροᾶς ὡσαύτως ἔχοντα καὶ τῶν ἄλλων ἀπάντων ὡς οἶόν τε. τὴν γὰρ ἐν ταῖς ἡλικίαις διαφορὰν ἐξευρεῖν ζητῶν ἐπὶ τῶν ὁμοίων ὡς ἐνὶ μάλιστα φύσεων ἀσφαλέστερον ἂν ἐπισκέπτοιο. **τὸ δ' ἐπὶ τῶν ἐναντιῶν ἐξετάζειν οὐ μικρὸν ἔχει τὸν παραλογισμόν, οὐ διὰ τὴν ἡλικίαν ἐνίστε τῆς τῶν δοκιμαζομένων σωματῶν διαφορᾶς ἀλλὰ διὰ τὴν φυσικὴν**

state can change on the basis of age, customs, dietetic or pharmacological prescriptions, and external factors. This produces an opposition between a connate (σύμφυτος) and an acquired (ἐπίκτητος) κρᾶσις. Physiological facts can be based on both (the verb used is *hepesthai*), such as thickness and thinness⁵⁴⁵ or the hairiness⁵⁴⁶ of the body, to confine ourselves to those treated in Book II of *De temperamentis* (that dedicated to the physiology of mixture). Now, this state, resulting from the relatively balanced mixture of hot/cold dry/wet, similarly to Hippocratic medicine, relates either to the whole body or to a part of it. In several passages of *De temperamentis* Galen indeed speaks often of a κρᾶσις τοῦ σώματος (as opposed to a mixture of the single part), indicating **the natural state of the entire body resulting from the process of mixture of**

ὑπαρχούσης κρᾶσιν (And the evaluation will be best [carried out] on one single body, that of an infant. For it is perfectly possible to remember what its heat was like at two years old, in relation to what it is now, after an interval of, say, two or three years. If a general change is detected, whereby the infant has become either hotter or colder, it is then no difficult matter to deduce the further increase that will take place up to the prime of life. If, on the other hand, you wish to compare many children with many people in their prime, then compare thin examples of both, or well-fleshed, or fat; and, similarly, make sure that they have the same colour, and all other characteristics, as far as is possible. In seeking to discover the difference due to different ages your investigation will be conducted more reliably on the basis, in brief, of natures which are as similar to each other as possible. **To perform an examination on the basis of opposite types of nature involves a considerable distortion, as the difference is sometimes not due to age, but to the naturally obtaining mixture, of the bodies being tested**)” (trans. Singer); *De temp.* p. 75.20–21 H. “ἡ φυσικὴ δ’ οὐκ εὐθὺς ὑπαλλάγησεται κρᾶσις οὐθ’ ἥπατος οὔτε καρδίας οὔτε τῶν ἄλλων σπλάγγων”. Den Dulk translates the word κρᾶσις as “natuurlijke gesteldheid” (den Dulk 1934 p. 81).

⁵⁴⁵ *De temp.* p. 60.9 ff. H.: “ἀλλὰ καὶ παχύτητες ἕξωος καὶ λεπτότητες ἔπονται κράσεις, οὐ ταῖς συμφύτοις μόνον, ἀλλὰ καὶ ἐξ ἕθους μακροῦ τις ἐπίκτητος γένηται. πολλοὺς γὰρ καὶ τῶν φύσει λεπτῶν ἐθεασάμην παχυνθέντας καὶ τῶν παχέων λεπτυνθέντας τοὺς μὲν ἀργία τε καὶ τῷ ἀβροδιαίτῳ τὴν ὅλην κρᾶσιν ὑπαλλάξαντας ἐπὶ τὸ ὑγρότερον, τοὺς δ’ ἐν ταλαιπωρίαις πλείοσι καὶ φροντίσι καὶ διαίτῃ λεπτῇ καταξηρανθέντας. εἰρήσεται δὲ καὶ τούτων τὰ γνωρίσματα. κάλλιον γὰρ ἡμᾶς αὐτοὺς ἐκ τινῶν σημείων ὀρμωμένους, πρὶν παρ’ ἐτέρου πυθέσθαι, δύνασθαι γνωρίζειν, εἰ φύσει τοιοῦτος ἦν ὁ ἄνθρωπος ἢ ἐξ ἕθους ἐγένετο”.

⁵⁴⁶ Cf. *De temp.* p. 64.14–18 H.: “Δασεῖα μὲν ἢ θερμὴ καὶ ξηρὰ κρᾶσις ἐστίν, ἀλλ’ αὕτη μὲν ἐσχάτως· μετρίως δ’ ἢ θερμὴ μὲν, σύμμετρος δὲ κατὰ τὴν ἐτέραν ἀντίθεσιν, ὥσπερ γε καὶ ἡ ξηρὰ μὲν, εὐκρατος δὲ κατὰ τὸ θερμόν τε καὶ ψυχρόν· ἐστὶ γὰρ καὶ ἡδε μετρίως δασεῖα. ψιλὰ δὲ τριχῶν αἰ ψυχραὶ πᾶσαι κράσεις, εἴτ’ οὖν ἀμέτρως ἔχοιεν ὑγρότητος εἴτε μετρίως”. Cf. also *De temp.* p. 64.19–23 H.; *De temp.* p. 67.22 H.; *De temp.* p. 68.16–18 H.

hot/cold and dry/wet,⁵⁴⁷ which den Dulk defines as “**constitution**”.⁵⁴⁸ But does this constitution also involve a mixture of humours? In *De temperamentis* Galen mentions people with “melancholic mixtures” (μελαγχολικαὶ κράσεις), meaning **natural constitutions where there is an abundance of black bile.**⁵⁴⁹ In fact,

⁵⁴⁷ The alternation between the expression κρᾶσις τοῦ σώματος and κρᾶσις τῶν μορίων emerges in *De temperamentis* II 6 when Galen attacks a group of adversaries because they purport to infer the κρᾶσις of the whole body from the κρᾶσις of one single part; *De temp.* p. 71.1 ff. H.: “Ἀκριβῶς δὲ χρῆ προσέχειν τῷ λεγομένῳ τὸν νοῦν, ὅπως μὴ λάθωμεν ἡμᾶς αὐτοὺς παρακούσαντες τι καὶ σφαλέντες, οἷα δὴ πολλοὶ τῶν πάνυ δοκούντων ἀρίστων ἰατρῶν εἶναι σφάλονται, εἴ τις ἐστι φαλακρός, εὐθὺς τοῦτον οἰόμενοι ξηρὰν ἔχειν ἅπαντος τοῦ σώματος τὴν κρᾶσιν. οὐ γὰρ δὴ ἀπλῶς οὕτως εικάζειν ἐχρήν, ἀλλὰ διορίζεσθαι πρότερον ἄμεινον ἦν, ὡς τῶν ἀνθρώπων τὸ σῶμα τῶν μὲν ὁμαλῶς κέκρται σύμπαν, ἐνίων δὲ καὶ οὐκ ὀλίγων τούτων ἀνωμάλως διάκειται. τὰ μὲν γὰρ τινα τῶν μορίων αὐτοῖς ὑγρότερα τοῦ συμέτρου τε καὶ προσήκοντός ἐστι, τὰ δὲ ψυχρότερα, τὰ δὲ ξηρότερα, τὰ δὲ θερμότερα, τὰ δὲ καὶ παντελῶς εὐκρατά τε καὶ σύμμετρα. δεῖ δὲ προσέχειν μάλιστα τούτῳ τὸν νοῦν, ἐπειδὴν ἐπισκέπτῃ σώματος κρᾶσιν. εἰ μὲν γὰρ ὁμαλῶς εὐρυθμον ὅλον ἐστὶν ἀπάσας τε τῶν μορίων ἀποσῶζον τὰς πρὸς ἀλληλα συμμετρίας ἐν μήκει καὶ πλάτει καὶ βάθει, δύναιτ' ἂν ὅλον ὁμοίως κερᾶσθαι τὸ τοιοῦτον. εἰ δὲ τι σῶμα θώρακα μὲν ἔχει καὶ τράχηλον καὶ ὦμους μεγίστους, ἰσχνὰ δὲ καὶ σμικρὰ τὰ κατ' ὀσφὺν καὶ σκέλη λεπτά, πῶς ἂν ὁμοίως εἴη τοῦτο διακείμενον ἅπασιν τοῖς μορίοις; “The point under discussion requires precise attention. There is a danger here that we may without noticing it fall into a certain misinterpretation and mistake – a mistake made by many of those who have a great reputation for excellence as doctors – namely **to think that someone who is bald must automatically have a dry mixture of the body as a whole.** One should not draw the inference thus, in absolute terms; one ought first to have made **a distinction between those whose body consists of an even mixture throughout and those – a large number, in fact – whose body is in an uneven state.** For in these some of the parts are wetter than the appropriate state of good balance, some colder, some drier, some hotter – and indeed, some completely well-mixed and well-balanced. **You must pay particular attention to this matter whenever you consider the mixture of a [particular] body. If the whole body is evenly well-proportioned, preserving good balance in all respects between the different parts, in terms of length, width and depth, then it is possible that such a body consists of the same kind of mixture throughout. But if a body has a very large chest, neck and shoulders, but is thin and small in the region of the loins, and has thin legs, how can this body have the same kind of state in all its parts?**” (Trans. Singer) Moreover, from this passage emerges an opposition between a evenly mixed body (when the body maintains the same state throughout) and an unevenly mixed body (when the parts of the body do not have the same qualitative composition)”; cf. *De temp.* II 6. For the occurrences of κρᾶσις τοῦ σώματος in *De temperamentis* cf. *De temp.* p. 73.5; p. 73.13; p. 73.16; p. 74.16; p. 77.14–15; p. 80.24; p. 80.27–28; p. 81.5 H. For the occurrences of κρᾶσις referred to the parts cf. p. 72.22; p. 73.25; p. 73.28; p. 74.5; p. 74.9; p. 74.15; p. 75.20–21; p. 75.23; p. 77.24; p. 78.25; p. 78.27; p. 79.6–7; p. 81.3–4; p. 83.17; p. 105.29 H.

⁵⁴⁸ Den Dulk notes that κρᾶσις can be used alternatively with διάθεσις, ἕξις, κατάσταση τοῦ σώματος (pp. 82–85) and translates the word κρᾶσις as “lichaamsgesteldheid” “constitutie” without making the logical passage from mixture to constitution clear. This passage is difficult to understand insofar as κρᾶσις is referred to the whole body to indicate its state resulting from the mixture of hot/cold and dry/wet, where the state concerns the entire body of the organism. Once this is clarified, it is evident that Galen is referring to the physical constitution of the body. As den Dulk rightly points out, this meaning survives in New Greek, p. 85 and p. 89.

⁵⁴⁹ *De temp.* 83.1–24 H.: “μὴ τοίνυν, εἰ δασύς τις ἰκανῶς ἐστίν, εὐθὺς τοῦτον οἰώμεθα μελαγχολικὸν ὑπάρχειν, ἀλλ' εἰ μὲν ἀκμάζων, οὐπω τοιοῦτον· εἰ δὲ παρακμάζων, ἤδη μελαγχολικόν· εἰ δὲ γέρων, οὐκέτι. γίνονται μὲν γὰρ αἱ μελαγχολικαὶ κράσεις ἐκ συγκαύσεως αἵματος. οὐ μὴν, ἐπειδὴν ἄρξῃται τοῦτο πάσχειν, εὐθὺς καὶ κατώπτηται τελῶς. ἀλλ' ἐν τάχει μὲν ἰκανῶς ἐστὶ δασύς ὁ θερμὸς καὶ ξηρὸς, εἴ τι μεμνήμεθα τῶν ἐμπροσθεν λόγων, οὐκ εὐθέως δὲ μελαγχολικός· ἢ γὰρ τοῦ δέρματος πύκνωσις εἴργουσα τῶν παχυτέρων περιτωμάτων τὴν διέξοδον ἀναγκάζει συγκαίεσθαι κατὰ τὰς ἄκρως θερμὰς κράσεις, ὥστε τοιοῦτον αὐτοῖς

Galen does not exclude the presence of humours in the human body (during embryogenesis the homoeomerous parts are formed out of them), although in *De temperamentis* he privileges a qualitative understanding of the bodily mixture and of the human being's bodily parts, since the bodily fluids are thought to be integrated with the solid parts of the body.⁵⁵⁰

2) **A physical/pharmacological-dietetic meaning.** As we have seen, each substance, inanimate and animate, has its own κρᾶσις, but in the case of the pharmacological or alimentary ingredients Galen draws a further distinction of strongly Aristotelian flavor: as he himself declares that something has a hot, cold, dry, or wet mixture “when it is not yet of that kind, but may very readily become of that kind by virtue of a natural tendency that that object has for this to happen” (*De temp.* p. 32.17–19 H.; trans. Singer).⁵⁵¹ In this case, κρᾶσις indicate not a process but a “**potential natural state**” (which is differentiated from an **actual natural state**) of any substance which, when its inner potentialities are freed,

ὑπάρχειν ἤδη τὸ περιττώμα τὸ φύον τὰς τρίχας, οἷον ἐν τοῖς ἀγγείοις ἔσεσθαι μέλλει προελθόντος τοῦ χρόνου. Καὶ ταῦτ' οὖν ἡμέληται τοῖς ἔμπροσθεν ἔτι τε πρὸς τούτοις, ἐπειδὴν ἐκ τῆς φύσεως τῶν περιττωμάτων ἀδιορίστως ὑπὲρ τῶν κράσεων ἀποφαίνονται. νομίζουσι γὰρ ἀνάλογον ἔχειν τὰς κράσεις τῶν μορίων τῇ φύσει τῶν περιττωμάτων. τὸ δ' οὐχ ὅλως ἀληθές ἐστιν, ἀλλ' ἐγχωρεῖ ποτε περιττώμα μὲν ἀθροίζεσθαι φλεγματοῶδες, ὑγρὸν δ' οὐκ εἶναι τὸ μόριον, ἀλλὰ ψυχρὸν μὲν ἐξ ἀνάγκης, οὐ γὰρ δὴ ἄλλη γέ τις ἢ τοῦ φλέγματος γένεσις, ὑγρὸν δ' οὐκ ἐξ ἀνάγκης· ἐγχωρεῖ γὰρ καὶ ξηρὸν εἶναι. τὸ δ' ἀπατήσαν αὐτοὺς εὐφώρατον. οὐ γὰρ ἐνενόησαν, ὡς ἐκ τῶν σιτίων, οὐκ ἐξ αὐτοῦ τοῦ σώματος ἡμῶν γίνεται τὸ φλέγμα “We should not, then, think, just because someone is quite hairy, that he is automatically melancholic. This does not hold if he is still in the prime; it does hold if he is at the stage after the prime; and again does not hold in old age. For **melancholic mixtures** come about as a result of the burning of the blood; but when this process has just begun, the ‘baking’ effect is not a complete one. One who is hot and dry will very quickly become hairy (if we recall the earlier arguments); he will not, however, immediately become melancholic. For in extremely hot mixtures, the closeness of the skin impedes the expulsion of the thicker secretions, necessarily causing burning; and this means that the secretion responsible for the production of hair is already of that quality which will obtain in the vessels some time later. **These facts, too, have been neglected by our predecessors; another area of neglect is in their making assertions on mixtures on the basis of the nature of the secretions, without making any distinction between the two. For they think that the mixtures of the parts are in proportion to the nature of the secretions.** This is very far from being the case: it is quite possible in some cases for a phlegmatic secretion to accumulate, but for the part not to be wet. This part *will* necessarily be cold – there is no other way in which phlegm can be generated – but it will not necessarily be wet. It is quite possible also for it to be dry. The point that has deceived them is very easily discovered: they have failed to realize that phlegm is produced from foods, not from our actual bodies”, (Trans. Singer)

⁵⁵⁰ I do not agree with den Dulk (1934 pp. 79–80) who, by privileging a modern train of thought promulgated by historians of medicine, translates the expression (of which he reports old occurrences such as Aristotle 30 *Probl.* 954b and Galen in *Hipp. Prorrheticum* K. XIV p. 793) as “melancholish temperament” (esp. p. 92). Here Galen is not speaking of psychological characteristics, which is made all the more evident by his reference to melancholic residues produced by a melancholic bodily mixture (!).

⁵⁵¹ Galen analyses the way drugs and foods release their potentials (passing therefore from a mixture in capacity to that one in actuality) throughout *De temperamentis* III.

can become hot, cold, dry, or wet, or hot/dry, hot/wet, cold/dry, cold/wet, or well-mixed.

3)A **physical/meteorological meaning.** Galen uses the term κρᾶσις, meaning the natural state resulting from the mixture, applying it to the qualitative composition either of the four seasons⁵⁵² or of the ambient air.⁵⁵³ In these cases, the term κρᾶσις refers to the *temperature*, either understood as “thermic degree” (balance between hot and cold) or as “humidity degree” (balance between wet and dry), or, meteorologically, as the *atmospheric state* with reference to heat, coldness, dryness, and moisture.⁵⁵⁴ As we have seen, Montanari points to the meaning “temperature” in the Homeric Greek, with reference to the pleasant effects obtained by mixing hot and cold water. In this case the verb κεράννυμι conveys the meaning of “tempering/mitigating” applied to the thermic sphere: the two opposites reach in fact a common midpoint, i.e. temperate water.⁵⁵⁵ As

⁵⁵² As we have seen, in *De temperamentis* I 3 and in more in detail I 4 – and also in the sections of Galen’s *Commentary on Hippocrates’ the Nature of Man* where the author comments on Hippocrates’ theory of the prevalence of one of the four humours in accordance with each of the seasons (CMG V 1.9 pp. 43-49 Mewaldt) –, the two different treatises display striking thematic similarities, as well as cross-references; they can also, as we have seen, be interpreted in light of Galen’s polemic against the Pneumatists. Cf. in *Hipp. Nat. Hom. comment.* CMG V 1.9 p. 46.31–32 Mewaldt (the well-balanced κρᾶσις of the spring); *De temp.* p. 12.16 H. (the uneven κρᾶσις of autumn); *ibid.* 13.5–9 (hot and wet κρᾶσις of spring and cold and dry κρᾶσις of autumn, according to his adversaries); p. 16.15–16 (well-balanced κρᾶσις of spring).

⁵⁵³ Cf. *De temp.* p. 13.23; p. 14.26; p. 17.19; p. 17.20–21 H.

⁵⁵⁴ den Dulk 1934 pp. 51–52.

⁵⁵⁵ As den Dulk confirms, when the term κρᾶσις is applied to the thermic/hygro-metric/meteorological field it refers to the state of the mixture, i.e. what den Dulk calls the “*vermengingstoestand*”; cf. Den Dulk 1934 p. 53–65. In his enquiry into the field of meaning of the word κρᾶσις, den Dulk tries to reconstruct the process through which the term and its family would have undergone a semantic shift, i.e. a passage from the meaning “mixture of opposites in a proper balance” to the meaning “temperature” as thermic temperature or understood in a climatological sense, i.e. as climate or atmospheric state. Den Dulk puts forward two alternatives. On the one hand, this semantic shift might be attributable to a metaphorical process. For this metaphorical usage would have led the meaning of the word from indicating a concrete process of mixture between liquids, i.e. the mixture of hot and cold water bringing about more temperate water, to referring to a metaphorical mixture of primary elements/qualities and then to meaning both temperature and climate; den Dulk 1934, p. 66. On the other hand, the term may refer to state brought about by a real mixture, i.e. a mixture of the primary qualities, which, he argues, were originally conceived as mixing liquids; den Dulk pp. 66–67. This semantic process, which led the word-family of κεράννυμι to be applied to the thermic/meteorological field and which may be attributable to a metaphoric or to a real mixture of the primary elements/qualities, finds a remarkable parallel in the Latin semantic field related to the verb *temperare*. In his article on the Latin notion of *tempus*, Benveniste underlines that *temperare* is a denominative of *tempus*, just like *generare* is denominative of *genus*. As Benveniste observes, *temperare* corresponds to the gr. κεράννυμι and means in the first place to mix a liquid (it is especially said of the mixture between water and wine) in order to mitigate and to temper it. Like κεράννυμι, the verb is applied to the meteorological field. For *temperatura* (preclass. and postclass. for *temperatio*) also belongs to this word-family; cf. the expression *caeli temperatura*, or *temperies* (the way in which the weather is) and its contrary *intemperies* and *tempestas* from

Jouanna remarks, the oldest occurrence of κρᾶσις as indicating the good and healthy meteorological conditions of the seasons is that in *De aere aquis locis* where the Hippocratic author speaks of κρῆσις τῶν ὥρέων.⁵⁵⁶ However, in contrast to this first occurrence, Galen’s usage also covers cases where such a state resulting from the mixture is not well-balanced at all, but indicates **any atmospheric state** of the seasons.⁵⁵⁷

3.4 Galen’s usage of μίξις

The occurrences of μίξις in our primary sources represent only 3%, against uses of κρᾶσις, at 97% – just 5 compared to 171 of the latter (this confirms the

**tempesti-tas* and *tempus*. The first meaning of *tempus* that Benveniste recostrues is “right proportion of a mixture, required dosis for a combination” (Benveniste 1940, p. 12). However, in the first place *tempus* and especially its derivatives qualify the atmospheric state as derived from a mixture, i.e. the proportion of the elements that brings about the state of the atmosphere (Benveniste 1940, p. 13 and p. 15). In this sense *tempus* initially means “atmospheric mixture”. Hence it has also undergone a semantic shift from meaning “good atmospheric state” to meaning “favourable moment” and then also “occasion to use”; cf. Benveniste 1940 p. 15. In its meteorological sense it was applied to the seasons – cf. *primus tempus*, i.e. spring, or *hibernum tempus*, i.e. winter. According to Benveniste, it is possible to draw a comparison between *temperare* and κερᾶννυμι and between *tempus* and καιρός. For Benveniste attributes a reconstrued meaning to the latter, **“atmospheric mélange”*, and then “exact or critical time”, “season”. As Montanari observes, the connection between κερᾶννυμι and καιρός is far from being certain; cf. Montanari 1979, p. 136–137. Cf. also Chantraine 2002 s.v. καιρός. Scholars have recently called the meaning of *tempus* as stemming from the same root of *temperare* into question; cf. Rix 2001 s.v. **temp*, which means “to stretch” < *tempus* = stretch of time, i.e. occasion. However, Benveniste’s analysis concerning *temperare* and its correspondence with κερᾶννυμι may be useful in shedding light on κερᾶννυμι as applied to ancient meteorological concepts. In the first place, both the verbs mean “to mix ingredients proportionately”. Further, they both are applied to the meteorological field and they both refer to the mixture of the elements in the atmosphere bringing about particular meteorological conditions. Instead of comparing *tempus* with καιρός, we can note some similarities between the members of the word-family of *temperare*, such as *temperatura* or *temperies* and κρᾶσις, indicating the atmospheric state in relation to the seasons. To sum up, in Greek–Roman culture the notion of weather seems to be connected to a mixture of the elements.

⁵⁵⁶ Cf. Jouanna 1996 p. 295. In this Hippocratic writing this expression (CMG I.2 p. 54.13 Diller = CMG I 1 p. 67.22 Heiberg) indicates the good, healthy, and more temperate climate of a region in Asia, on account of which the character of the inhabitants is milder and gentle. In this region, in fact, “nothing is forcibly predominant, but equality in every respect prevails (ἀλλὰ παντὸς ἰσομοιρῆ δυναστεύη). Asia, however, is not everywhere uniform; the region, however, situated midway between the heat and the cold is very fruitful, very wooded and very mild; it has splendid water, whether from rain or from springs. While it is not burnt up with the heat nor dried up by drought and want of water, it is not oppressed with cold, nor yet damp and wet with excessive rains and snow”; cf. *Aer.* CMG I 1.2 ed. Diller 54.12 ff., trans. Jones.

⁵⁵⁷ As we have seen, in *De temp.* p. 12.16 H. Galen uses the term κρᾶσις to indicate the uneven atmospheric condition of autumn, in which it is much hotter at midday than at dawn or dusk, but is not precisely at the midpoint between wetness and dryness either, since it tends to be drier.

general picture of a clear-cut predominance of κρᾶσις over μίξις given by Boudon-Millot). In this section, I shall be commenting on these occurrences and, given their scarcity, will back up my claims by recourse to other remarkable examples concerning the word-family of μείγνυμι taken from Galen's entire corpus.

Analogously to κρᾶσις, the term μίξις can indicate either a **process** or a **state resulting from such a process**. Furthermore, as we have seen in the lexicographical overview, combined with Montanari's etymological work on the Ancient Greek root, μίξις can more generically indicate either a mechanical mixture or a "chemical" mixture and, therefore, can be used either when the constituents remain solid and just enter into contact with each other or when, because of a minimum of moisture, they merge together.

In the case of **μίξις as a process**, a couple of occurrences of μίξις seems to point to a kind of mixture that starts with a juxtaposition and ends up in a homoeogeneous state. Let us consider the following occurrences:

T1 Galen *De temperamentis* K. I pp. 560.13-561.13 Helmreich pp. 32.24–33.13:

Ἐπειδὴ τοίνυν τὸ μέσον ἐν ἅπαντι γένηται καὶ μάλιστα κατὰ τὰς συμπάσας οὐσίας ἐκ τῆς τῶν ἄκρων μίξεως γίγνεται, χρὴ καὶ τὴν νόησιν αὐτοῦ καὶ τὴν διάγνωσιν ἐξ ἐκείνων συνίστασθαι. τὸ μὲν δὴ τῆς νοήσεως ῥᾶστον. ἀπὸ γὰρ τοῦ θερμοτάτου πάντων τῶν εἰς αἴσθησιν ἠκόντων, οἷον ἦτοι πυρὸς ἢ τινος ὕδατος ἄκρως ζέοντος, ἐπὶ τὸ ψυχρότατον καταντῶντες ἀπάντων ὧν ἴσμεν, οἷον ἦτοι κρύσταλλον ἢ χιόνα, νοήσαντές τι διάστημα, μέσον ἀκριβῶς τοῦτο τέμνομεν. οὕτω γὰρ ἐξευρήσομεν τῇ νοήσει τὸ σύμμετρον, ὅπερ ἐκατέρου τῶν ἄκρων ἴσον ἀπέχει. ἀλλὰ καὶ κατασκευάσαι πως αὐτὸ δυνάμεθα τὸν ἴσον ὄγκον κρυστάλλου μίξαντες ὕδατι ζέοντι. τὸ γὰρ ἐξ ἀμφοῖν κραθὲν ἴσον ἐκατέρου τῶν ἄκρων ἀφέξει τοῦ τε καίοντος καὶ τοῦ νεκροῦντος διὰ ψύξιν. οὐκ οὐκ οὐδὲ χαλεπὸν ἔτι τοῦ κραθέντος οὕτως ἀψαμένους ἔχειν τὸ μέσον ἀπάσης οὐσίας ἐν τῇ κατὰ τὸ θερμόν τε καὶ ψυχρόν ἀντιθέσει καὶ μεμῆσθαι τούτου καὶ κρίνειν ἅπαντα τᾶλλα καθάπερ τινὶ κανόνι παραβάλλοντας.

Now, since the middle in any genus, and most obviously in the whole of existent objects, arises **from a mixing together of the extremes**, our conception and distinguishing of it must also be composed on the basis of those. Well, as far as the conception of it is concerned, the matter is very simple. We start from the hottest of all things that reach our senses, such as fire, or water at its extreme boiling point, and go down to the coldest of all those we know, such as ice or snow; we conceptualize a line between them; and we divide this line at its precise midpoint. In this way we will find out conceptually the point of good balance, which is equidistant from each of the extremes. But we can also in a way create it physically, by combining an equal volume of ice and boiling water. For that which is made from a mixture of both these will be equidistant from the two extremes, that which burns and that which causes death by cold. And so it is no difficult matter, either, to touch the product of this mixture and so to hold that which is at the midpoint amongst all existent objects as regards the opposition of hot and cold, and to remember this, and to evaluate all other objects by using this as a standard with which to compare them. (Trans. Singer)

T2 Galen *De temperamentis* K. I pp. 562.15-563.13 Helmreich p. 34.5-19:

Τὸ μὲν οὖν ὅλα δι' ὅλων αὐτὰ κεράσαι, τὸ θερμὸν λέγω καὶ τὸ ψυχρὸν καὶ τὸ ξηρὸν καὶ τὸ ὑγρὸν, ἀδύνατον ἀνθρώπῳ. **γῆ γὰρ ὑγρῷ | φυραθεῖσα μέμικται μὲν, ὡς ἂν τῷ δόξειε, καὶ οὕτω κέκραται πᾶσα παντί, παράθεσις μὴν ἐστὶ τὸ τοιοῦτον κατὰ σμικρὰ καὶ οὐ δι' ὅλων κρᾶσις, ἀλλὰ τὸ δι' ὅλων ἄμφο κεράσαι θεοῦ καὶ φύσεως ἔργον, ἔτι δὲ μᾶλλον, εἰ καὶ τὸ θερμὸν καὶ τὸ ψυχρὸν ὅλα δι' ὅλων ἀλλήλοις κεραννύοιτο.** τὸ μέντοι παράθεσιν ἐργάσασθαι τοιαύτην, ὡς ἐκφεύγειν τὴν αἴσθησιν ἕκαστον τῶν ἀπλῶν σωμάτων, οὐ φύσεως τοῦτο γε μόνης ἢ θεοῦ τοῦργον, ἀλλὰ καὶ ἡμέτερόν ἐστιν. οὐδὲν γὰρ χαλεπὸν ὑγροῦ καὶ ξηροῦ μέσον ἐργάσασθαι πηλὸν **ἐκ τῆς τοιαύτης μίξεως,** ὡσαύτως δὲ καὶ θερμοῦ καὶ ψυχροῦ, καὶ σοὶ φανεῖται τὸ τοιοῦτον σῶμα καὶ τῇ θερμότητι μὲν εὐκρατον, ἀλλὰ καὶ σκληρότητος καὶ μαλακότητος ἐν τῷ μέσῳ.

The total mixing of one with the other, I mean of hot, cold, dry and wet, is not possible for a human being. **When earth is kneaded together with**

[something] wet, it seems to one that it has been combined, certainly, and in this sense a whole has been mixed with a whole; but in fact such a process is a placing alongside each other of very small parts, not a total mixture; the total mixing of the two is the work of God, and of Nature, especially in the case where the hot and the cold undergo total mixture with each other. However, to bring about a setting-alongside such that each of the simple bodies escapes perception, is not the work of Nature alone, nor of God, but is achievable by us too. For it is not at all difficult **by this kind of combination** to produce clay which is at the midpoint between wet and dry and also between hot and cold; and such a body will appear to you well-mixed in terms of hotness, as well as at a midpoint between hardness and softness. (Trans. Singer)

As we see, the term μίξις is used in **(T1)** to indicate the mixture of boiling water and ice and in **(T2)** to refer to the mixture of earth with something liquid. Now, in **(T2) the process of mixture is defined as μίξις** and as **παράθσεις**; therefore we can assume that this process coincides with a mechanical mixture of particles of earth and liquid, which – in contrast to total mixtures – are recoverable. *De facto*, in Galen’s terminology of mixture the word-family of μείγνυμι can convey the meaning of a mechanical mixture of solids, such as in the case of a heap of grains (which in Aristotle’s technical terminology would more precisely correspond to *synthesis*).⁵⁵⁸ But in this case the juxtaposition is

⁵⁵⁸ More precisely, this sense of μείγνυμι as indicating a juxtaposition of constituents emerges when Galen accounts for the transformation of the primary elements leading to the generation of a perceptive body. In this regard, in his *De elementis* Galen remarks that thinkers “who hold that when fire and water and air and earth are changed and mixed and altered through and through (μεταβαλλόντων τε καὶ κεραννυμένων καὶ ἀλλοιουμένων δι’ ὄλων), some one of the bodies formed from them becomes sentient, are stating possibilities; but those (who hold that this happens when the components) remain such as they are and are **merely mixed up** together as though in a heap of wheat and barley and chickpeas and beans are attempting the impossible (ὅσοι δὲ μενόντων, οἷά περ ἔστι καὶ **μόνον ἀναμειγνυμένων** ἀλλήλοις οὕτως ὥσπερ ἐν σωρῶ πυρῶν καὶ κριθῶν ἐρεβίνθων τε καὶ κυάμων, ἀδυνάτοις ἐπιχειροῦσιν)”; cf. *De elem. sec. Hipp.* CMG V 1.2 I 3 pp. 72.23–74.3 De Lacy (trans. De Lacy). In this passage the verb ἀναμείγνυμι (“to mix up”) indicates a mechanical mixture where the components remain such as they are (μενόντων, οἷά περ ἔστι), as there is no qualitative interaction between them. In other words, it indicates a juxtaposition, and this seems to be confirmed by the image of the heap of wheat grains, barley, chickpeas, and beans. For in this mechanical mixture of dry bodies, only the external surfaces of the grains are in contact; they do not merge and give rise to a homogeneous compound. In his *Commentary on Hippocrates’ De natura hominis*, Galen also employs ἀναμείγνυμι and μείγνυμι to describe the mechanical mixture of the Empedoclean primary elements, as is clear from the following passage: “And prior to them, Empedocles believed that the nature of compound bodies was generated from the four elements in an unchanged state, **the**

just the beginning of the process (which coincides with its reversibility phase): as we demonstrated in the first chapter, in Galen’s account of mixture (*De elementis* I 9) a process of progressive division takes place according to which at the very beginning the substances enter into contact and are merely juxtaposed; then their particles begin to progressively divide until they merge together, giving rise to a homogeneous product whose constituents may (as in the case of the every-day mixtures for the preparation of foods and drinks) or may not (as in the case of total mixtures) be recoverable.⁵⁵⁹ In (T1) the two phases of the process are even spelled out with a terminological alternation: the preliminary stage of a mixture of boiling water and ice is called μίξις, whereas, by contrast, the second stage leading to the formation of a homogeneous compound is described by resorting to the participle from the other word-family, τοῦ κραθέντος.⁵⁶⁰

primary things mixing up with one another (οὕτως ἀναμειγμένων ἀλλήλοις τῶν πρώτων) in the same way as if someone were to mix rust, bronze, cadmium and copper (ὥσει τις λειώσας ἀκριβῶς καὶ χνοῶδη ποιήσας ἰὸν καὶ χαλκίτην καὶ καδμείαν καὶ μίση μίξειεν) after grinding them down to a powder so that none of them was capable of being grasped without another”; cf. *In Hipp. Nat. Hom. comment.* CMG V 9.1 p. 19.7–12 Mewaldt (trans. Hankinson; slightly modified). A further proof of the fact that in this context ἀναμείγνυμι and μείγνυμι are meant to indicate a juxtaposition can be found in a parallel *locus* taken from the same treatise. In this passage we find a juxtaposition of Hippocrates’ and Empedocles’ elemental theories. As Galen observes, although Empedocles was convinced that every earthy body comes to be from the same elements that Hippocrates postulated, in his opinion **such elements are not mixed through and through, but rather juxtaposed in very small particles that touch one another (οὐ μὴν κεκραμένων γε δι’ ἀλλήλων, ἀλλὰ κατὰ σμικρὰ μόρια παρακειμένων τε καὶ ψαύόντων)**. We see that in the very same context Galen replaces ἀναμείγνυμι with παράκειμαι, which unambiguously indicates a juxtaposition of constituents sitting side by side. Another important element is the reference to contact (ψαύω), which confirms the link between juxtaposition and contact and ultimately also the already-known semantic link between the terms related to the word-family of μείγνυμι and the idea of contact. For this wording, based on the verbs παράκειμαι and ψαύω, explains the very same concept that was previously illustrated by the usage of ἀναμείγνυμι and μείγνυμι. Moreover, it seems that juxtaposition by contact and total mixture of the primary elements do not exclude each other. For the primary elements are not only said to be mechanically mixed with one another (μόνον ἀναμειγμένων), but also to undergo a change (μεταβολή), a κρᾶσις, and a complete qualitative alteration (ἀλλοίωσις); cf. *In Hipp. Nat. Hom. comment.* CMG V 9.1 p. 27.20 Mewaldt. The same rhetoric structure, “οὐ μόνον ... ἀλλὰ καὶ”, which stresses this point, can also be found in a passage of *De temperamentis*, where Galen accounts for the generation of the skin of the hand. As Galen explains, the skin of the hand comes to be out of an equal proportion of the primary qualities, which **are not only mechanically mixed, but also totally mixed (καὶ δὴ καὶ γέγονεν ἐκ τῆς τούτων ἀπάντων ἰσομοιρίας οὐ μυχθέντων μόνον, ἀλλὰ καὶ δι’ ὅλων ἀλλήλοις κερασθέντων)**; cf. *De temp.* pp. 34.26–35.2 H.
⁵⁵⁹ Cf. *supra* pp. 174 ff.

⁵⁶⁰ The alternation between the two word-families is even present on a greater scale at (and seems to be confirmed by) *De elementis* I 9, where Galen describes more in detail the fragmentation of the particles leading to the final unification; cf. *De elementis sec. Hipp.* CMG V 1.2 pp. 136.22–138.14 De Lacy “εἰρήσεται δὲ κἂν τοῖς τῆς θεραπευτικῆς μεθόδου περὶ τῆς χρείας αὐτῶν ἐπὶ πλεόν, ἐν δὲ τῷ παρόντι τοσοῦτον εἰπεῖν ἀποχρήσει πρὸς τὸν ἐνεστῶτα λόγον, ὅτι τῶν ὑπ’ Ἀσκληπιάδου λεγομένων ἐν τῷ Περὶ στοιχείων βιβλίῳ πρὸς τοὺς ὅλας | δι’ ὅλων κεραννύντας

The term μίξις (or its derivatives) seems to indicate a **generic mixture broadly understood**: in fact, **under this general heading we find mixtures of solids** (such as in the case a heap of grains; in this, Galen distances himself from Aristotle’s technical terminology), **of solids and liquids** (earth and liquid, cf. **T2**), or **of liquids** (such as hot and cold water that we obtain when the ice melts, cf. **T1**, or in the case of a μίξις of humours⁵⁶¹). Thus, the term μίξις can indicate not only a mechanical mixture of solids (such as in the case of a heap of grains), but as we see in (**T1**) it can also represent **the starting point of a process that culminates in a complete and thorough κρᾶσις**. Now, if in the κρᾶσις the previous constituents are so homogeneously mixed that are no longer distinguishable (even though they may or may not be recoverable), we can infer that **in the very extensive domain of μίξις it is still possible to conceive the constituents as distinguishable**.

This seems to be confirmed by a text from Galen’s *De elementis* (**T3**). In *De elementis* I 5 Galen tackles the issue of the fact that we never find pure primary elements in our cosmos – they are all always mixed:

ἀλλήλαις τὰς οὐσίας οὐδὲν ἄψεται τῶν κατὰ τὰς ποιότητας μόνας κεράννυσθαι λεγόντων, ὥστ' εἰ καὶ μὴ δι' ἄλλο τι, διὰ γοῦν τὸ ἀσφαλὲς αἰρετέον τὸ δόγμα καὶ λεκτέον, ὡς ἐν τῷ μίγνυσθαι τῷ ὕδατι τὸν οἶνον, εἰ τύχοι, καὶ καταθραύεσθαι μέχρι σμικροτάτων ἑκατέρου τὰ μόρια δρᾶν καὶ πάσχειν αὐτοῖς εἰς ἄλληλα συμβαίνει καὶ μεταδιδόναι τῶν ποιότητων ἀλλήλοις ἐτοιμότερον, ὅσῳ περ ἂν εἰς ἐλάττω καταθραυσθῆ, καὶ διὰ τοῦτο κινουῦσιν ἐπὶ πλεῖστον οἱ μίγνύντες ἀλλήλοις τὰ τοιαῦτα τὴν εἰς ἐλάχιστον διαίρεσιν αὐτῶν μηχανώμενοι. καὶ μὲν δὴ καὶ τὸ μᾶλλον ἐνοῦσθαι τὰς ποιότητας ἀλλήλαις τῶν ἐπὶ πλέον ἀναμιχθέντων τε καὶ χρονισάντων ὁμολογεῖ τῷ λόγῳ. χρόνου γὰρ δεῖται τὰ σμικρὰ μόρια τῶν κεραννυμένων, ἵν' εἰς ἄλληλα δρᾶση καὶ πάθη τελέως καὶ οὕτως ἐν ἀπεργάσῃται τὸ ὅλον καὶ ὅμοιον ἑαυτῷ πάντη”. **As we see from the text, the final stage of the process is described by recourse to κεράννυμι (τῶν κεραννυμένων, ἵν' εἰς ἄλληλα δρᾶση καὶ πάθη τελέως καὶ οὕτως ἐν ἀπεργάσῃται τὸ ὅλον καὶ ὅμοιον ἑαυτῷ πάντη), whereas the initial stage of the process is treated using words belonging to the family of μείγνυμι (ἐν τῷ / μίγνυσθαι τῷ ὕδατι τὸν οἶνον; οἱ μίγνύντες ἀλλήλοις; τῶν ἐπὶ πλέον ἀναμιχθέντων). But at the end of the description Galen uses the verb κεράννυμι (τῶν κεραννυμένων) in order to designate a stage of the process where the parts have been minutely crushed and their interaction is complete (δρᾶση καὶ πάθη τελέως): in this way they make the whole one and the same throughout, i.e. they give rise to something homogeneous, a unity (οὕτως ἐν ἀπεργάσῃται τὸ ὅλον καὶ ὅμοιον ἑαυτῷ πάντη).** As Galen makes clear, however, the final κρᾶσις between water and wine is only a provisional unification, as it is possible to separate mixed substances from one another again (διὰ ταῦτα κὰν τῷ παραχρήμα μὲν οἶόν τε διαχωρίσαι πάλιν ἀπ' ἀλλήλων ἓνια τῶν ἀναμιχθέντων). Therefore, differently from the mixtures of primary elements/qualities performed by God or Nature, the unity to which these substances give rise in the physical process of mixture, which is expressed by recourse to κεράννυμι, seems to be only provisional and temporary. For beyond the appearances this mixture of substances, the only one that humans can perform, turns out to be just a juxtaposition (a parathesis, as Galen says in *De temperamentis*), as it is possible to recover the previous constituents.

⁵⁶¹ As it occurs in *In Hipp. Nat. Hom. comment.* CMG V 1.9 p. 51 Mewaldt.

T3 Galen *De elementis sec. Hipp.* K. I pp. 453.10-454.11 De Lacy p. 98.2-15 :

ἀλλ' οἷον ἐν τῷ κόσμῳ τὸν λίθον ἐπιδεικνύεις μοι σὺ γεῶδες σῶμα, τοιοῦτον ἐν τοῖς ζώοις ἐπιδείξω σοι τό τε τῶν ὀστέων γένος καὶ τὸ τῶν χόνδρων καὶ τὸ τῶν τριχῶν. ἐκ τούτου δὲ τοῦ γένους ἐστὶ κἀν τοῖς ὀστρακοδέρμοις ζῶοις τὸ καλούμενον ὀστρακον, ἀκριβῶς εἰς γῆς ἰδέαν ἀπεξηραμμένον καὶ πεπιλημένον, ὥστ', εἰ ζητεῖς ἐν τοῖς ζώοις γῆν, ἔχεις θεάσασθαι τοιαύτην, οἷαν κἀν τῷ | κόσμῳ, τὴν δ' ἄμικτόν τε καὶ παντελεῖ καὶ μόνην οὐκ ἂν οὐδ' ἐν ἐκείνῳ ῥαδίως ἐξεύροις, ὥσπερ οὐδ' ὕδωρ καθαρὸν καὶ ἀμιγῆς ἀπάντων τῶν ἄλλων οὐδὲ πῦρ οὐδ' ἀέρα· νερόθενται γὰρ ἅπαντα τοῖς ἑτερογενέσι καὶ ἀναμέμικται καὶ μετείληφεν ἢ μᾶλλον ἀλλήλων ἢ ἑἴτων. ἀλλὰ τοι κἀν τῇ μίξει τοῖς γε νοῦν ἔχουσιν ἢ τοῦ κρατοῦντος ἰδέα φαίνεται. μὴ τοίνυν μηδ' ἐν τοῖς τῶν ζώων σώμασιν ἄμικτόν τι ζητεῖ, ἀλλ' ἀρκείτω σοι τουτὶ μὲν ψυχρὸν καὶ ξηρὸν καὶ πυκνὸν ἰδόντι τὸ μόριον ἀναμνησθῆναι γῆς, τουτὶ δ' ἀραιὸν καὶ ὑγρὸν καὶ ῥυτὸν εἰς ἔννοιαν ὕδατος ἀφικέσθαι.

But the stone that you point out to me as an earthy body in the cosmos is of the same description as the classes of the bones and of the cartilages and of the hairs that I shall point out to you in animals. To this same class belongs also the so-called shell of hard-shelled animals, which is dried and compacted precisely to the form of earth that you see also in the cosmos; but earth that is unmixed (ἄμικτόν), complete, and by itself (παντελεῖ καὶ μόνην) you would not easily find even in the cosmos; similarly you would not see water that is pure (καθαρὸν) and not mixed (ἀμιγῆς) with all the rest, and the same is true of fire and air; all have been adulterated by other kinds of things (νερόθενται γὰρ ἅπαντα τοῖς ἑτερογενέσι) and mixed (ἀναμέμικται) with them, and they have all received a larger or smaller share of each other. But **even in the mixture** (κἀν τῇ μίξει) a sensible person recognizes that what is visible is the form of the prevailing (element). Do not then look for anything unmixed (ἄμικτόν) in the bodies of animals either, but be content, when you see that part rarefied and wet and fluid, to think of water. (Trans. De Lacy)

As we see from (T3), Galen’s terminology polarizes into: i) that relating to the purity of the element taken singularly (ἄμικτόν, παντελῆ καὶ μόνην, καθαρὸν, ἀμιγῆς); and ii) that (νερόθενται γὰρ ἅπαντα τοῖς ἑτερογενέσι, ἀναμέμικται, κὰν τῆ μίξει) describing the state of the element resulting from the mixture; Galen’s usage of expression **κὰν τῆ μίξει** shows that he is referring to **the state resulting from mixture** and not to the process. Although it has a slightly negative connotation (which is in line with the original meaning of the word-family),⁵⁶² this state is envisioned as a **heterogeneous mix** of components where, however, a sensible person is still able to recognize the visible appearance (ιδέα) of the prevailing element (**τοῖς γε νοῦν ἔχουσιν ἢ τοῦ κρατοῦντος ιδέα φαίνεται**): everything comes out of the primary elements but if we strive to imagine a physical body as the result of this heterogeneous mix of constituents (i.e. μίξις) rather than as the indistinguishable homoeogeneous outcome that we indeed see (i.e. κρᾶσις), we are still able to single out the predominant constituent whose visible appearance presents itself to our senses (cf. T3 **‘μὴ τοῖνον μὴδ’ ἐν τοῖς τῶν ζώων σώμασιν ἄμικτόν τι ζητεῖ, ἀλλ’ ἀρκείτω σοι τουτὶ μὲν ψυχρὸν καὶ ξηρὸν καὶ πυκνὸν ἰδόντι τὸ μόριον ἀναμνησθῆναι γῆς, τουτὶ δ’ ἀραιὸν καὶ ὑγρὸν καὶ ῥυτὸν εἰς ἔννοιαν ὕδατος ἀφικέσθαι (Do not then look for anything unmixed (ἄμικτόν) in the bodies of animals either, but be content, when you see that part rarefied and wet and fluid, to think of water’’).** We have seen before that, **in the physical process, μίξις alternates with and gives way to κρᾶσις**, but if we instead zoom in on **the state resulting from an act of mixing**, in this case **this condition can be seen either as a μίξις**, i.e. when

⁵⁶² As we see, the terminology used for this mixture is formulated in terms of impurity, alteration, and contamination with heterogeneous things. According to LSJ the verb νοθεύω means “to corrupt”, “to adulterate”, “to be spurious”, whereas the adjective νόθος means “bastard”, i.e. born of a slave or concubine; it can also convey the more general meaning of “spurious”, “counterfeit”, “supposititious” in reference to persons and things. In this context, the term belonging to the word-family of μείγνυμι seems to convey the image of a bad and deteriorating mixture that contaminates and adulterates the state of purity of the primary element. The third component of the original basic set of meanings of the word-family of μίξις, as pinpointed by Montanari, is “to come into close contact”, which give rise to all the meanings connected to the social sphere, such as “sexual intercourse”; this is also present in Galen’s corpus (*Comm. in Hipp. Nat. Hom.* comment. CMG V 9.1 p. 170.8 ff. Mewaldt, where the term ἐπιμίξις indicates the mating of animals), but we do not treat them here for two main reasons: i) on the one hand, in our primary sources, there are no occurrences of μίξις with such a meaning; and ii) these occurrences of the other cognates are not relevant for Galen’s theory and terminology of mixture intended as physical process of mixing substances; on this cf. Boudon-Millot 2011 pp. 272–274.

we perceive the heterogeneous constituents of the body as distinct, **or as a κρᾶσις** if we regard the body as a final result where the constituents *are*, as a matter of fact, completely indistinguishable.⁵⁶³

Having reviewed Galen's usage of the terms κρᾶσις and μίξις as applied to his theory of the mixture of primary elements, we shall turn to the relation between Galen's lexicon and the terminology used in the Hippocratic, Aristotelian, and Stoic traditions and the difference between κρᾶσις and μίξις in Galen's terminology.

In the first place, as we have seen, in the Hippocratic tradition, κρᾶσις, or better its Ionic form κρῆσις, preserves the archaic meaning of "good and well-balanced mixture" of opposite forces (be they qualities, humours, *dynamies*), whereas Galen classifies each κρᾶσις (intended as "natural state") on the basis of the predominant element. Therefore with κρᾶσις he indicates **a relative equilibrium point reached by hot/cold and dry/wet**. Second, we have seen that Aristotle carefully distinguishes μίξις from σύνθεσις, which he claims is a mechanical mixture of items (the case of the heap of grain remains paradigmatic). Clearly, Galen does not make use of Aristotle's technical terminology: he employs the word-family of μίξις and μίξις itself to indicate either a juxtaposition of solid items or a juxtaposition of micro-particles of substances before (and after) the final unification. Rather, analogously to the

⁵⁶³ The connection between μίξις and its word-family and the distinguishability of the ingredients is confirmed by a further occurrence at *De simp. med. (temp. ac) fac.* K. XI p. 586.13 ff. "εἰ γὰρ ἀναμίξας ἀκριβῶς ἴσον ἀψινθίου καὶ μέλιτος ὄγκον ἐπιθείης τῇ γλώττῃ, γλυκύπικρον, ὥσπερ οἱ ποιηταὶ τὸν ἔρωτα προσαγορεύουσι, φανεῖται σοὶ τὸ μικτὸν ἐξ ἀμφοῖν, οὐκ ἐν ἄλλῳ μὲν τι χρόνῳ μέλιτος αἰσθανομένης τῆς γλώττης, ἐν ἄλλῳ δὲ ἀψινθίου, οὔτε θατέρου μόνον, ἀλλὰ διὰ παντὸς ἀμφοῖν ἀήθη τινὰ μίξιν μεμιγμένην". As we see from the text, in the case of the mixture of absinth and honey, which is defined as γλυκύπικρον (of course, with reference to Sappho's definition of love as a "bittersweet invincible creature"), the tongue perceives its double flavour (the sweet and the bitter) continuously and not in two different moments; the term used is μίξις and the point of the passage is the fact that we perceive the ingredients (the absinth and the honey and their capacities) as distinct – cf. Boudon-Millot 2011 pp. 270–271. Of course, it is also possible that μίξις indicates the state (and not the process) resulting from the act of mechanically mixing the constituents (to put it simply, the state of a heap of grains), and indeed in Galen's work we find such a case. In his work *On Simple Drugs (De simp. med. (temp. ac) K. XII p. 183.17 ff.)*, Galen describes the properties of the Samian earth, and on this occasion he claims (analogously to *De elementis* I 5) that pure earth does not really exist in the cosmos and, for this reason, one should carefully inspect the mixture of the things that are accidentally contained within it (ἐπεὶ δ' ἀδύνατόν ἐστιν ἄμικτον εὐρεῖν ἀκριβῶς τι σῶμα, προσεπισκέπτεσθαι προσήκει τὴν μίξιν τῶν συμβεβηκότων αὐτῇ κατὰ τε τὰς ἐν κουφότητι καὶ βαρύτητι διαφορὰς καὶ τὰς ἐν τῇ γεύσει). In this case, the term μίξις indicates the state of being mixed, the particles of the material that accidentally stick to the earth and which have to be cautiously analysed. It does not seem to be a process, but rather a state.

contemporary Peripatetic terminology (which we see mirrored in Alexander's *De mixtione*), μίξις works as general term for mixture although, contrarily to Alexander, Galen does not draw the specific distinction between mechanical mixtures of like with like and of unlike with unlike. Three differences, however, between Galen's usage of μίξις and that of κρᾶσις remain: i) μίξις can indicate a mechanical mixture of items; κρᾶσις cannot (**they are in opposition in this regard**). ii) μίξις is used to refer to the first part of the process of fragmentation of the particles, whereas κρᾶσις is used to indicate the final phase of the process (terms belonging to both word-families are alternated in describing the two different stages of the mixture – where **μίξις gives way to κρᾶσις**). iii) Whereas κρᾶσις indicates a homogeneous and complete mixture in which it is not possible to distinguish the previous ingredients (usage of the image of the *tetrapharmakon* is central), we have seen that μίξις is used by Galen to express a mix of heterogeneous components making up every physical body (**they refer to the very same mixture but from different perspectives: μίξις underlines the heterogeneity of the mix, κρᾶσις the unity produced by the tempering of constituents – a tempering which constitutes the essence and the nature of whichever physical body, a concept which is never expressed by μίξις**). Finally, even though the Stoic terminology is difficult to reconstruct (especially when it comes to usage of the term μίξις), we can safely say with Groisard that the expression δι' ὅλων κρᾶσις for total mixture and the term σύγχυσις for fusion were originally Stoic. Now, we have already demonstrated that Galen's theory of mixture differs considerably from the Stoic account of δι' ὅλων κρᾶσις, although Galen uses this Stoic expression fairly often. However, Boudon-Millot approximates Galen's μίξις to the Stoic σύγχυσις,⁵⁶⁴ but this is inaccurate, for two main reasons: i) μίξις can indicate a recoverable mixture, whereas in the Stoic fusion the ingredients are no longer recoverable; and ii) even within the limits of his antidogmatism, Galen's physics is based on Aristotelian/Peripatetic elementary physics, where the qualities are not corporeal (as they are in Stoic physics and, therefore, also in the Stoic fusion).

Certainly we can say that κρᾶσις is more prevalent in Galen, to the detriment of μίξις (the difference in the number of occurrences is clear evidence

⁵⁶⁴ Cf. Boudon-Millot 2011 pp. 276–277.

of this), for a number of potential reasons. First, in Hippocratic medicine, the Ionic variant of κρᾶσις was used to convey the idea of balance among the constituents and was applied, in Galen's favourite Hippocratic reference model of mixture, *De natura hominis*, to the mixture of physiological liquids. This made the term suitable for physiological purposes. Second, it is undeniable that the Stoic terminology greatly influenced Galen, given his usage of the Stoic expression δι' ὅλων κρᾶσις. Third, as witnessed by *De mixtione*, in Galen's time κρᾶσις was a common term, also adopted by the Peripatetics to refer to a mixture leading to the generation of homoeomerous parts. It is reasonable to think that, given that Galen knew these three theoretical models of mixture very well and made extensive use of them in the definitions of his own account, the corresponding terminologies played a role in the creation of Galen's vocabulary of mixture.

3.5 Problems of translation

As is evident, the semantic closeness of these two word-families makes hard work for a translator, as it proves to be extremely difficult to render the meanings of two quasi-synonyms, such as κρᾶσις and μίξις, in a modern language. Here I will offer some reflections on problems of translation.

Certainly, when κρᾶσις and μίξις indicate a mixture of ingredients (although, as we have seen, in a different manner), a translator should both render the meaning of mixture and try to make their difference intelligible. With regard to κρᾶσις, Singer is very consistent, and tends to translate the word as "mixture"; whereas in the case of μίξις he is rather flexible: for example, he translates the expression "ἐκ τῆς τῶν ἄκρων μίξεως" in (T1) as "from a mixing together of the extremes", and the expression "ἐκ τῆς τοιαύτης μίξεως" in (T2) as "by this kind of combination". The translation of μίξις as combination (which corresponds to Joachim's standard translation of Aristotle's μίξις) might baffle the reader. For "combination" does not seem particularly suitable for indicating a mixture: two or more colours can be combined, two or more items can be combined, i.e. put together, and even two or more abstract concepts can be mentally combined. It would be helpful to use a word indicating a mixture but which is distinct from

mixture and which gives the sense of the type of mixture Galen intended. When κρᾶσις and μίξις indicate mixture, I propose to render the first as “**mixture**” (although the root of this word belongs to that of μίξις; the more exact “temperament” – if we consider the Latin etymology – must be discarded for other reasons) and the second, μίξις, as “**mix**”. This could be a fitting solution because mixture can convey the sense of the homogeneousness of the mixture (in Italian this would be “miscela”; in English also “blending”; whereas by contrast mix (which in Italian would correspond to “miscuglio”) indicates a mixture (which can be also a mechanical mixture) where the elements are heterogeneous and may be recognizable.

Second, however, because of its special link with the essence and the nature of things, Galen’s κρᾶσις goes beyond what is simply a mixture. It has philosophical, physiological, pharmacological, and meteorological implications. A solution could be to translate them all as “crasis”, resemantising a word which in English mainly refers to a type of vocalic contraction, and leaving the task of distinguishing difference senses of the word to the reader. Another solution may instead be to make the terminology more explicit by translating it with the term to which Galen seems to be referring; in our account of Galen’s usage of the word we highlighted the complexity of his terminology. That seems to be particularly helpful in the cases of the meteorological and physiological acceptations of the term.

On the one hand, when Galen speaks of κρᾶσις of the seasons or of the surrounding air, one could render it as “climate” or better as “temperature” (the Latin verb *temperare* in fact represents the closest equivalent to the Greek κεράννυμι⁵⁶⁵). On the other hand, when κρᾶσις indicates the state resulting from

⁵⁶⁵ Differently from Benveniste 1940 (who in his account interprets *temperare* as denominative of *tempus*, which would have originally meant “right proportion of a mixture” as applied to the meteorological weather cf. footnote n. 548) Pariente 1957 gives another interpretation and holds that *temperare* would have been made to the locative *temperē*, which means “at the right position/moment”. The original meaning of the verb, therefore, seems to be “to put something in the right position” (“poner algo en el punto adecuado”). When applied to the context of mixture, this meaning would have naturally led to a later semantic shift “to give the right proportion to the constituents of a mixture” (“dosificar los elementos de una mezcla en la proporción debida”) and then “to mix in the right proportion”. In any case both the scholars establish a correspondence between *temperare* and the Greek κεράννυμι because of their semantic similarities, as both the verb mean “to mix proportionately” as also Montanari stresses, cf. Montanari 1979, p. 135.

the mixture of the entire body, it clearly indicates its “constitution”. Translations such as “temperament” and “complexion” (which correspond to *temperamentum* and *complexio*, which in turn correspond to the translations into Latin language of Galen’s treatise *περὶ κράσεων*, “*De temperamentis*” and “*De complexionibus*”⁵⁶⁶) seem to be inappropriate for rendering what is instead a physiological state, i.e. the physical or bodily constitution. In fact, the term complexion, although in the Middle ages it was used to indicate the entire physical constitution, is restricted today to the appearance of the face,⁵⁶⁷ whereas the word “temperament” (whose Italian equivalent, “temperamento”, Tassinari uses systematically in his 1997 translation of *De temperamentis*) covers a field of character study and psychology.⁵⁶⁸ For the term “temperament” seems to strongly allude to psychological aspects of the personality. Even though Galen theorizes a body-soul interaction – which clearly stands out in his later treatise *Quod animi mores corporis temperamenta sequantur* – the term *κρᾶσις* does not show this meaning in Galen. For although it develops synonymical relations with terms indicating the physical constitution as a whole, *κρᾶσις* does not refer to personality and psychological features, as it always points to the material basis of the physical constitution, that is, the mixture of the primary elements, hot, cold, dry and wet.

⁵⁶⁶ Cf. Fichtner 2015 s.v. *De temperamentis*.

⁵⁶⁷ Thorndike 1958 p. 398.

⁵⁶⁸ Cf. Irwin 1947 p. 45.

CONCLUSION

1 Conclusion – Part I

As was made clear in the Introduction, this dissertation is split into two main parts: the first comprises the first two main chapters and is devoted to an investigation of Galen’s theoretical model of mixture and his system of nine mixtures as connected to his general world-view; the second is dedicated to the exploration of Galen’s terminology of mixtures. In this first concluding section, we will review and summarize the research findings of the first part of the thesis.

As was pointed out in the Introduction and *Forschungsstand*, the scholarship expresses very conflicting views on the issue of the historical and theoretical sources of Galen’s theory of mixture. Vegetti (1995) is convinced that in his formulation of the theory of mixture, Galen draws on an “archaic”, i.e. Hippocratic, and even “pre-Aristotelian” background. Other scholars, for example Gill (2010) and Boudon-Millot (2011), have hypothesized that Galen’s theory of mixture may have been influenced by the Stoic notion of $\delta\iota\ \omicron\lambda\omega\nu\ \kappa\rho\tilde{\alpha}\sigma\iota\varsigma$ or total mixture, whereas, including Moraux (1984) and Cordonier (2007), and, ultimately, also the recent contribution by Groisard (2016), understand Galen’s model of mixture merely as a syncretistic conflation of the Stoic and Peripatetic models of mixture without taking his Hippocratic *milieu* into consideration. In this investigation, I aimed to surpass previous contradictory accounts and to describe a model of mixture that shows a clear internal logic – and to find its historical and theoretical sources. Differently from previous scholarship, which proves to have achieved partial and still

unsatisfactory research results, I brought to light the neat coherence of Galen's model of mixture. For if we go beyond its syncretistic surface or its flimsy Stoic echoes, Galen's model of mixture in every respect reveals itself to be perfectly consistent with the contemporary Peripatetic account of mixture without renouncing some due integrations coming from the archaic, Hippocratic, backdrop, i.e. the four-humour theory. In what follows, we will recount in more detail the findings attained in this research.

First of all, from section 1 to section 1.2 of the first main chapter, I summed up the Stoic and Peripatetic accounts of mixtures analysed from an historical standpoint, i.e. from Zeno to Chrysippus, whose account, at Galen's time, was credited with representing the general Stoic model of mixture, and from Aristotle to Alexander of Aphrodisias, Galen's contemporary, who – as we underscored – in his *De mixtione* engages in a violent polemic against the Stoic doctrine of total mixture. At the same time, we brought to light the inner justifications of both these theories. Whereas the Stoic model of total mixture finds its inner justification in the explanation of the interpenetration of the two corporeal principles, matter and pneuma, Aristotle's account explains the formation of the homoeomerous parts, i.e. organic and inorganic basic materials. Moreover, we delved deeper into the evolution of the mixture-theory within the Peripatetic philosophical system of Alexander – which, in contrast to Aristotle's account, explains the soul itself as a power arising from the mixture of the primary elements.

After having summarized Galen's contemporary philosophical models of mixture, we went into detail regarding Galen's theory, which, as we clarified, is analysed as a physical process and as the essential basis of Galen's elementary physics. In 1.3.1, "Syncretistic approach", I pointed to the twofold reason why Galen presents his own account of mixture in a syncretistic way. In fact, as we saw, he declares that "Hippocrates", Aristotle, and the Stoics were in substantial agreement in holding that the hot, the cold, the dry, and the wet mix in their entirety (which in Stoic terminology he calls a $\delta\iota'$ ὅλων mixture); although, as we pointed out, these three theories, if considered singularly, differ significantly from one another. On the one hand, I explained Galen's syncretistic approach to mixture by underlining that it is typical of Galen's general approach to group

several authorities together when he needs to back up an argument. On the other hand, apart from the rhetorical use of these authorities, there is a deeper reason why Galen builds an *ad hoc* strategic alliance between the Stoics and the Peripatetics: both these philosophical schools were continuist, like Galen, and one of the objectives of his medical-cum-philosophical system was the rebuttal of older and more recent versions of atomism/corpuscularism. However, in order to bring out the inner coherence of Galen's model of mixture and its deeper historical and theoretical sources, we had to go beyond this syncretistic formulation; first of all, we tackled the issue of the activators of the mechanism of mixture, a point regarding which the Stoics and the Peripatetics expressed different views.

In 1.3.2 "Galen and the Stoic/Peripatetic controversy. Qualities or bodies?" we dealt with an aspect connected to the theory of mixture that proves to have relevant implications regarding Galen's epistemology. For, as Galen knows perfectly well, the Stoic and the Peripatetic schools provide two very different explanations when it comes to the causal factor involved in the mechanism of mixture: according to the Aristotelians the qualities alone set in motion and carry out the process of mixture, whereas the Stoics, in conformity with their own corporeal physics, attribute this role to the substances-cum-qualities (this controversy, which powerfully comes to the fore in Alexander's *De mixtione*, is actually part of a far-reaching debate that set different schools from the post-Hellenistic period onwards – the Platonic, the Peripatetic, and even the Epicurean – against the Stoics and their corporealism. In this section, we highlighted that despite his own reiterated declarations of philosophical independence, Galen actively (although anti-dogmatically) enters this historical debate in accordance with his own epistemological principles. On the one hand, although he does not want to be officially grouped with the Aristotelians, he affirms (in his *De propriis placitis*) it to be *πιθανώτερον* that the qualities mix, and insists (in his *De elementis*), that it is *ἀσφαλές*, saying that the arguments that are used against those who mix substances (i.e. the Stoics) cannot be used against those who mix qualities alone.⁵⁶⁹ This of course does not mean that

⁵⁶⁹ Cf. *supra* pp. 86 ff.

Galen is certain that the qualities are responsible for the activation of the process of mixture: such a statement would have meant a commitment to a specific philosophical school; moreover, in order to be βέβαιον, this claim would have needed to be corroborated by scientific demonstration or empirical evidence, which has not noticeably been given. Rather, it means that Galen develops a vision of this issue that is *consistent* with the view of the Aristotelians. And it is so consistent and coherent that, like the Aristotelians of his age, we have seen that Galen casts serious doubt on and even ridicules the notion of *antiparektasis* or bodily interpenetration, as well as Stoic corporealism, in a way very similar to Alexander's criticism of the Stoics in his *De mixtione*.

But this was just the beginning and, so to speak, the tip of the iceberg. For in 1.3.3, "Galen and the Peripatetics. Galen's κρᾶσις as a progressive διαίρεσις", we saw, in agreement with Groisard, that analogously to the Peripatetic model mirrored in Alexander's *De mixtione*, Galen's account of the process of mixture is envisaged as progressive division (διαίρεσις) of the constituents followed by a final unification brought about by a qualitative interaction; moreover, both the models, the Peripatetic and the Galenic, show a strict link between the easy divisibility of the constituents and the speed of qualitative interaction.⁵⁷⁰ However, in contrast to Groisard (and Moraux), we demonstrated that every aspect of Galen's model of mixture fits into a Peripatetic framework, to which we must also attach some additional elements from Galen's Hippocratic background (which, as stated, both the aforementioned scholars completely neglect).

In 1.3.4, "Mixture, change and the ontological status of the primary elements in the mixture (actuality or potentiality?). The example of the τετραφάρμακος and the generation of a *tertium quid*", we reached three main research results: i) first, we exposed how, as in the Aristotelian and Peripatetic accounts, Galen thought of mixture as a two-way qualitative change (which he calls *alloiôsis* without precisely distinguishing it from substantial generation/corruption and mixture in the proper sense):⁵⁷¹ the hot, the cold, the

⁵⁷⁰ Cf. *supra* pp. 96 ff.

⁵⁷¹ As an aside, we should mention that throughout the whole of section 1.3.4 we saw that Galen's elementary physics bases itself on a revised version of Aristotle's elementary physics: if in fact

dry, and the wet meet in a broader central region and give rise to “*metaxu*” bodies; ii) in contrast to Groisard, who is inclined to think that, analogously to the Stoic fusion, corporeal hot, cold, dry, and wet get destroyed in the mixture, we demonstrated, by putting forward more Galenic textual evidence, that in the Aristotelian and the Peripatetic accounts the basic constituents of the mixture are preserved in potentiality; iii) we saw how, by resorting to the Stoic example of the *tetrapharmakos*, Galen actually seeks to exemplify the supervenience, during the process of mixture, of new qualitative determinations on the previous structure, which brings about the generation of a new body distinct in kind (this transition, ἐξ εἶδους εἰς εἶδος, finds a precise correspondence in the *scala naturae* – from the simplest to more complex bodies – as exhibited in Alexander’s *De anima*): as we have seen, when the primary elements mix, they make up (apart from other inorganic substances) foods and drinks; these in turn acquire new qualitative determinations through a qualitative alteration taking place during digestion, and give rise to the four Hippocratic humours, which, in the same way, in turn give rise to the homoeomerous parts: bone, fat, nerve, and flesh.

In 1.3.5, “Mixture and generation. Humors or homoeomerous parts?”, we came to a conclusion regarding a dilemma posed by the preceding section: if Galen’s theory of mixture draws on the Peripatetic account, why does a mixture of the primary elements give rise to the four Hippocratic humours (which are viewed by Galen as the building blocks of all the blooded animals) and these in turn to the homoeomerous parts? For in Aristotle’s speculation, who is well aware of the four humours of the Hippocratic tradition, these are located on the same level as the homoeomerous parts and not, as in Galen’s case, on an intermediate level between the real primary elements and the homoeomerous parts. In this section, we showed that Galen’s four humours differ from the

in his treatise *De generatione et corruptione* Aristotle carefully distinguishes between generation/corruption, qualitative alteration or *alloiōsis*, and mixture, Galen does not: for him the most important thing to underline is that, according to him, these three changes are ruled by a μεταβολή ἐκ τῶν ἐναντίων εἰς τὰ ἐναντία. This does not seem to be dependent on any Stoic influence (as Cordonier supposes by recalling that Zeno describes the elemental change or *tropè* as a mixture that takes place through a *metabolè* of the interpenetrating elements; cf. SVF I 102; cf. intr. p. 35) since as we have seen Galen speaks against the Stoic process of bodily interpenetration. The conflation is probably better explained through an oversimplification of the Aristotelian physics due to Galen’s attempt to grasp the common principle underlying them, that is, the change from opposites to opposites.

Hippocratic ones, since Galen's are conceived of as integrated into, and a functional part of a solidist conception of the body which, in contrast to that developed by the Alexandrian anatomists, is based on the homoeomerous part as its first and fundamental unity. To prove this point, we mainly relied on two previous contributions, Moreno Rodríguez 1991 and Vegetti 1994, although neither presupposes the strict dependence of Galen's model of mixture on the Peripatetic one.

In 1.3.6, "Mixture and symmetry. Galen and the Hippocratic legacy", we explored the issue of balance among the constituents within the mixture. For according to the Aristotelian and the Peripatetic accounts of mixture, there should be an equal balance of the ingredients that mix, with regard to both quantity and powers of action.⁵⁷² However, this idea of balance between the *quanta* and *qualia* of elemental components can be traced back to early Greek medicine, especially Hippocratic, and is instrumental in explaining states of health and disease of the human organism. In this section we showed that by drawing on "archaic", i.e. Hippocratic but also Aristotelian doctrines and re-working them, Galen develops a conception of twofold symmetry of the elemental constituents: i) a symmetry according to τὸ ποσὸν τῆς οὐσίας, i.e. the absolute and, at least theoretically, numerically determinable midpoint between hot/cold dry/wet; and ii) a symmetry κατὰ δύναμιν, which has to be evaluated with respect to the *oikeia physis* of the individual and which is directly connected to Galen's own speculation on health and disease. As we have demonstrated, within the mixture there is no one absolute midpoint between hot/cold and dry/wet, but many relative midpoints within a wider central region where hot/cold and dry/wet meet. For since hot/cold and dry/wet are Aristotelically thought of as admitting of degrees and hence of "the more and the less", there can be myriads of different qualitative combinations that explain the great variety of *dynameis* (and related *energeiai*) of different species of living beings: as long as the living being works and it works well (physically and psychically), we should infer that this living being is healthy and its *krasis* has found a relative

⁵⁷² *De gen. et corr.* 238a23–28; *De mixt.* 230.29–30.

equilibrium state between the opposites, matching its proper *κατὰ δύνανμιν συμμετρία*.

After dealing with the activators, the process of progressive division, the ontological status of the elements in the mixture, the alteration and generation of a *tertium quid*, and the absolute and relative equilibrium point of the constituents of the mixture, in 1.3.7, “The reversibility of the process of mixture”, we tackled the recoverability of the constituents of the mixture. In this section, we pursued a deeper investigation into the inner justification of Galen’s theory of mixture. For the general model of mixture as progressive division we have so far brought to light explains different kinds of mixture: i) mixtures performed by God and/or nature (*De temperamentis*’ formulation shows a slight hesitation on this point); and ii) mixtures that human beings too can perform. The first type is defined as a “total mixture” and, as we saw, coincides with a progressive chain of mixtures producing increasingly new supervening higher-level qualitative determinations: from foods and drinks to the four humours present in the menstrual blood, from these to homoeomerous parts, up to the formation of the entire living being belonging to a certain species. In contrast to what has been said so far, we recognized a correspondence between this “total mixture” and the shaping capacity of God and/or nature. For these total mixtures are brought about by God and/or nature, which use hot/cold and dry/wet as their instruments or *organa*, so as to shape an individual being belonging to a certain species according to a teleological plan (once the organism is shaped, these mixtures work independently within the organism and produce effects on the organism’s psycho-physiological workings). The second type is divided into two sub-types: i) mixtures that human beings can create (to produce, for example, foods and drinks): these are called *paratheseis* and are recoverable; ii) mixtures created by the doctor (to produce medicaments) which – analogously to the mixtures performed by God and/or nature – are called “total mixtures”: the ingredients of these mixtures are not recoverable. As regards mixtures whose ingredients are recoverable, we have seen that Galen’s position is consistent with the Peripatetic account, although he does not clearly declare, as an Aristotelian would have done, that the recovered ingredients are specifically different: for although it is not said that, once recovered, the ingredients are specifically the same (as in the

Peripatetic model), Galen declares that they are the same, at least according to their *ιδέα* or external form/appearance (this is coherent with the Peripatetic model too, as according to Aristotle the external form *ιδέα/μορφή* is linked to the internal structure of a composite belonging to a certain species).

In the second main chapter, by analysing Galen's first book *De temperamentis* more deeply, I sought to reconstruct the historical and theoretical sources of Galen's scheme of nine mixtures (eight bad mixtures and one good mixture) so as to assess his original contributions in comparison with the earlier philosophical and medical tradition and with more contemporary medical strands, such as Pneumatic medicine.

In the first part of 2.2, "Galen against his predecessors and contemporaries and his criticism of Athenaeus of Attalia and his followers in *De temperamentis* Book I", we identified the doctrines to which Galen is referring when he speaks of past authorities, the "παλαιοί", working out bipartite or quadripartite schemes of mixtures. We identified the first "group" of two-mixture theorists with the theories exposed by the Hippocratic author in first book of *De victu*. Moreover, we saw that behind the other two supposed "groups" of four-mixture theorists there are, respectively, i) an abridgement of Hippocratic and Aristotelian physical doctrines that seem to be consistently re-worked so as to bring out an alleged quadripartite system of mixtures; and ii) a summary of Aristotle's doctrine concerning the biological cycle of the organism, i.e. the progressive transition from a hot wet constitution to a cold and dry one; in this transition, the concept of innate heat, the most active quality, whose first formulation Galen ascribes to both "Hippocrates" and Aristotle, plays a pivotal role.

In the second part of section 2.2, we dealt with Galen's criticism of the Pneumatists, whose position Galen assimilates to that of the four-mixture theorists, and according to whom the best mixture or *εὐκράσια* would coincide with the hot and wet one (as we saw from a fragment from *De temperamentis* I 3). As we demonstrated, this analysis of *De temperamentis* I 4 and I 5 sheds new and novel light on the fragment taken from *De temperamentis* I 3 for three main reasons. First of all, in analysing *De temperamentis* I 4 and I 5, we brought to

light the vigorous dispute on εὐκρασία or good mixture that flourished in Galen's time among two contemporary medical mainstreams: the Pneumatic and the Galenic. Second, we saw that Galen adopts two opposite logical-dialectical strategies against the Pneumatists by appealing to the original Platonic distinction between καθ' αὐτά and πρὸς τι entities. Finally, section 2.2 cast light on another under-researched topic concerning the theoretical foundations of Pneumatic medicine, which does not only rely on Stoic physical doctrines, but – at least for the definition of the concept of εὐκρασία – draws on Hippocratic and Aristotelian teachings.

In 2.3, “Galen's additions to the theories of the predecessors. The good mixture and the simple mixtures”, we saw that although Galen assimilates the Pneumatists' position to that of a “group” of four-mixture theorists, they instead developed a scheme of nine mixture (four simple mixtures, four composite, and a good mixture – a hot and wet one –, as Max Wellmann also notes). As we saw, Galen inherits this scheme but, against Wellmann's declaration, does not completely depend upon it as he makes three major changes: i) differently from the Pneumatists, according to Galen the εὐκρασία is not a hot and wet mixture but a mixture where none of the qualities predominates; ii) furthermore, whereas the Pneumatists' *Elementenlehre* is based on Stoic corporealist physical tenets (although the Pneumatists' elements of medicine are defined as sense-perceptible), Galen's elementary physics grounds itself on Peripatetic bases and his primary elements indeed coincide with the cosmic and ultimate elements; iii) whereas the Pneumatists rigorously separate physics and cosmology from medicine and, therefore, do not apply this scheme of mixture to a more general world-view, Galen does.

It is to this latter topic that the final paragraph of this second main chapter, “A twofold εὐκρασία (good mixture). The midpoint according to substance, genus and species, its consequences and teleological implications”, is dedicated. In the first place, I showed that Galen's cosmos is made up of three concentric realms, which include all existent beings from the simplest to the more complex. The highest genus (*anôtátô ti génos*) is that of the substance or *ousía*, within which everything that is animate or inanimate falls; below this is the genus of plants; within this latter is the genus of the animals – the genus of

the plants being higher than that of the animals, and each of these genera containing the ἔσχατα γένη, which are also referred to as species or εἶδη, such that the genus of animals contains within it dog, horse, and human being. Second, we showed that within a cosmos so constituted the physician is endowed, so to speak, with two pairs of eyes when he deals with physical bodies: an *absolute* pair and a *relative* pair. In the first case, any physical body belonging to the highest genus of substance is defined as hot/wet, hot/dry, cold/wet, cold/dry (composite mixtures), hot, cold, wet, or dry (simple mixtures) when it is compared to the unique *absolute well-mixed mixture*, i.e. the yardstick or canon, which is identified with the palm of the doctor's hand. According to Mario Vegetti, a cosmos so envisioned seems to be completely devoid of any teleological order as it presents only one *eukrasia* and infinite natural failures. By contrast, we have seen that in the case of living bodies (plants and, more importantly, animals), the mixtures are assessed through a comparison with the relative midpoint of the genus and/or species to which the individual belongs: in this case, the state of good-mixture or *eukrasia* is judged on functionalistic bases, that is, on the basis of the activities. Hence, even if a plant or an animal does not possess an absolute well-mixed mixture, it has a *relative well-mixed mixture*, because it performs its activities as well as possible. In a universe so envisaged, the number of relative *eukrasiai* spirals and it is possible to get a glimpse of signs of a teleological design even in a work, such as *De temperamentis*, which deals mainly with the lower-level elementary structures of living beings. We have seen that Galen's directed teleology does not clash but harmonizes itself with the idea of an Aristotelian immanent natural principle that shapes an organism specifically different, from within in conformity with a teleological plan. As we have demonstrated, another feature of Galen's teleological explanation, which emerges from our reading of *De temperamentis* Book I, is its anthropocentric nature insofar as the natural end of the characteristic functions of living beings, animals, and plants, coincides with the advantages that human beings may take from them. In fact, human beings, and especially the *meson* or midpoint within the genus of animals, the most well-mixed human being, which Galen compares to Polyclitus' famous Canon, are at the centre of Galen's sublunary cosmos. However, we did not confine ourselves to this point but pushed the question of

the centre of Galen's sublunary cosmos further and found that there is a part, the middle part of the middle animal (τὸ μέσον μόνιον τοῦ μέσου ζώου), which lies in the middle of all the bodies subjected to generation and decay. This part is the soft skin of the palm of the hand and, as we have seen, it belongs to an upper-class aspiring doctor who therefore represents the very centre of Galen's sublunary universe. Such a hand should be regarded as an instrument of knowledge and a diagnostic tool: for, as Galen teaches in his *De temperamentis*, the physician must take it as *kanôn* and *gnômôn* and use it to compare all parts of animals and find the eight other *dyskrasiai*.

2. Conclusion – Part II

In the third main chapter, we examined Galen's scientific terminology of mixture and, more precisely, Galen's usage of κρᾶσις and μίξις, the two main words that he uses to indicate the mixture of primary elements. As we pointed out in the second part of our Introduction, the only study specifically devoted to Galen's terminology of mixture, Boudon-Millot 2011, has evident shortcomings. In the first place, Boudon-Millot does not in fact examine accurately Galen's terminology in relation to the original meaning of κρᾶσις and μίξις. Second, she far simplistically envisages the difference between κρᾶσις and μίξις as a difference between a mixture of *qualities* which are preserved (performed by God and/or Nature) and a mixture of *substances* (performed by humans) which give rise to a new (mainly pharmacological) product. Third, she establishes a terminological and conceptual correspondence between Galen's use of κρᾶσις and μίξις and the Stoic, specifically Chrysippean, classification of mixtures, but she does not broaden the research focus to the Peripatetic and the Hippocratic terminologies and corresponding models of mixtures. For before dealing with Galen's usage, we found it useful, first of all, to determine as accurately as possible the meaning of κρᾶσις and μίξις and, second, to analyse all the terminological aspects of the theoretical models of mixture that Galen presupposes and by which he may have been influenced.

In 3.1, “A *vexata quaestio*. Κρᾶσις *versus* μίξις”, we reviewed the meanings that etymological and Ancient Greek lexicons attribute to κρᾶσις and μίξις. Furthermore, in order to pinpoint with precision the original meanings of the roots of κρᾶσις and μίξις, we examined the research of Elio Montanari, who investigated the two word families to which the words belong in Homeric Greek. By comparing the lexicological findings with Montanari’s etymological work, we identified μίξις with any general type of mixture, either mechanical or “chemical”, involving solids or liquids, which can be produced through contact among the constituents and connoted negatively as bad mixture. By contrast, κρᾶσις would identify a mixture prevalently of liquids that balance each other out and reach a common midpoint by tempering one another’s excesses; this mixture is connoted positively as good mixture. Since both the words as *nomina actionis* are endowed with the suffix -σις, they can indicate either an action in progress or a state resulting from the action.

After a brief section – 3.2, “Terminologies for mixtures: the Hippocratic authors, Aristotle and Peripatetics, the Stoics” – in which we investigated the terminology of mixture used by the Hippocratic, Aristotelian and Peripatetic, and Stoic traditions (whose findings we will sum up later on), in 3.3 we dealt with Galen’s use of the term κρᾶσις, and in 3.4 with Galen’s use of the term μίξις (although the two terms occur in our primary sources in very different proportions: in a total of 176 occurrences of κρᾶσις and μίξις, κρᾶσις occurs 97% of the time and μίξις only 3%), whereas in 3.5 we specifically tackled some problems of translation of the terms. In 3.3 we showed, on the one hand, that Galen uses the term κρᾶσις to refer to the process of mixture, either of primary elements (which would be a work of nature and/or God) or (differently from Boudon-Millot’s account) of ingredients to produce medicaments (which would be a work performed by the humans, especially by the doctor). In this process of mixture, the constituents find a relative common midpoint by tempering each other’s excesses; the result is a mixture that is complete, homogeneous and thorough: this mixture may be irreversible and, in this case, as we have seen, Galen uses the Stoic expression δι’ ὅλων κρᾶσις. When, by contrast, κρᾶσις indicates the state resulting from the mixture, then, as we have pointed out, the term presents a connection with the notion of φύσις and with that of οὐσία

(which Boudon-Millot does not bring to light), which can be construed in a twofold manner. On the one hand, κρᾶσις indicates the form and essence of something (that is, the οὐσία in the primary sense) and, therefore, refers to the nature *qua* essence (i.e. that which makes something what it is and not something else). On the other hand, by using the term κρᾶσις Galen means the “condition or state resulting from the process of mixture” of any natural substance or οὐσία (thus, its “natural state”) made up of hot, cold, dry, and wet, which temper each other’s excesses and find a relative equilibrium point. We have seen that this differs slightly from the meaning the term has in the archaic phase of the Greek language: the Hippocratic term κρησις indicates already a good, healthy, and well-balanced mixture. We have also seen that under the general meaning of κρᾶσις as “natural state” we find several terminological articulations, as κρᾶσις indicates: a) the “natural state” of the entire body, i.e. the κρᾶσις τοῦ σώματος (as opposed to the natural state of one of its parts), and therefore its physical constitution; b) the “natural state” in potentiality (as opposed to a natural state in actuality), i.e. the κρᾶσις δυνάμει, of whichever substance which can be used for dietetic or pharmacological purposes; c) the “natural state” of the seasons or of the ambient air: in this case the term κρᾶσις would indicate the temperature or the atmospheric conditions of the weather.

In 3.4, “Galen’s usage of μίξις”, we saw that the term μίξις seems to indicate a generic mixture broadly understood. For, on the one hand, we highlighted that Galen uses the term μίξις to mean a generic process of mixture understood either as a mechanical mixture of solids (such as in the paradigmatic case of a heap of grains) or as a “chemical” mixture of liquids –in this case, as we have seen, it can also represent the starting point of a process of fragmentation and progressive division of particles that culminates in a complete and thorough unification or κρᾶσις (this statement is supported by the fact that while describing this process Galen alternates the two terms or terms belonging to the two word-families). On the other hand, we have pointed out that, when μίξις indicates the result (as opposed to the action of mixing), it means a state of mixture where *either* the constituents *are actually* distinguishable (as in a juxtaposition of items) *or*, when they have already undergone a unification or κρᾶσις, are *simply thought of* as well-recognizable. As we have underlined, in

Galen's terminology κρᾶσις and μίξις indicate two very different kinds of mixture depending not on the constituents, *qualities vs substances* (as Boudon-Millot would maintain), but on the stage of the process and on the degree of recognisability of the constituents. In the first place, Galen's μίξις can indicate a mechanical mixture of items, whereas κρᾶσις is never used to indicate this. Second, Galen uses μίξις and κρᾶσις to indicate two very different phases of the process of mixture, the progressive division and the final unification bringing about a new outcome: in this case, the two terms are used alternatively and one type of mixture, μίξις, gives way to the other, i.e. κρᾶσις. Finally, κρᾶσις and μίξις can refer to the very same mixture but from two different points of view: whereas the usage of the term μίξις underscores the heterogeneity of the mix constituting every physical body, the usage of κρᾶσις points more to the unity produced by the tempering of constituents; a tempering which constitutes the very essence and nature of whichever physical body, a meaning which, as we noted, is never expressed by the term μίξις.

The difference between Galen's usage of κρᾶσις and μίξις and the preponderance of the former over the latter led us to the following two reflections.

On the one hand, we can observe that theory and terminology go hand in hand and are ultimately nothing other than two faces of the same coin insofar as the two terms (when used alternatively and with reference to the very same process of mixture) correspond to two different phases of Galen's general model of mixture which, as we saw, is patently of Peripatetic derivation (and it is not drawn from the Stoic corporeal physics): μίξις (apart from indicating whichever type of mixture, even the mechanical) can in fact refer to the very first stage of the progressive division of components into micro-particles, whereas the term κρᾶσις more specifically designates the final phase of unification of constituents within the mixture bringing about a new superior unity. It is important to point out that in this two-phase (μίξις-κρᾶσις) process it is always the qualities that carry out the mechanism of mixture.

On the other hand, we have shown that Galen's terminology of mixture betrays the influences of three major theoretical models, the Hippocratic, the

Peripatetic, and the Stoic. For, apart from the fact that κρᾶσις and μίξις have different meanings, Galen’s prevalent choice of κρᾶσις over μίξις, as we saw, may have depended on different factors: i) the influence exerted by Hippocratic medicine, and especially by the Hippocratic treatise *De natura hominis*, where the Ionic variant of κρᾶσις was employed to mean the good and healthy mixture of bodily humours and was particularly appropriate for application to physiological uses; ii) the impact that Stoic terminology had on Galen’s terminology, given his abundant use of the Stoic expression δι’ ὅλων κρᾶσις (and derivatives); iii) finally, the fact that in Galen’s time κρᾶσις was the common term, which even the Peripatetics adopted to indicate a mixture leading to the generation of the homoeomerous parts. Furthermore, Galen’s use of the term μίξις as a general heading indicating both a mechanical and a chemical mixture (or its initial stages) seems to distance itself from the Aristotelian usage (as we saw, Aristotle adopts exclusively the term σύνθεσις to indicate a juxtaposition of items) and to approximate, although with the due differences, the Peripatetic usage testified in Alexander’s *De mixtione*.⁵⁷³ As we have underlined, these three terminologies of mixture, the Hippocratic, the Stoic, and the Peripatetic, plausibly contributed to and played a part in shaping the texture of Galen’s scientific terminology of mixtures.

The last paragraph of the third main chapter (3.5, “Problems of translation”) was devoted to issues concerning the translation of both κρᾶσις and μίξις. As we saw, a problem occurs when both the terms refer to a mixture, although of a different type (therefore not in cases in which κρᾶσις indicates the essence and the nature of something). Thus, in order to enhance their difference, we proposed to render κρᾶσις as “**mixture**” (although the root of this word belongs to that of μίξις; the more exact “temperament” – if we consider the Latin etymology – must be discarded because as we saw it has unhappy psychological connotations) and the second term, μίξις, as “**mix**”. This could be convenient because the first term, **mixture**, can convey the sense of the homogeneity of a mixture where by tempering one another the constituents reach a (relative) equilibrium point; whereas the second term, **mix**, indicates a mixture (which can

⁵⁷³ Cf. supra pp. 254 ff.

be also a mechanical mixture) in which the constituents are heterogeneous and are seen or thought of as distinct and distinguishable.

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