A fundamental of early medicine, temperament, also known as “complexion”, defines the patient’s state of health, which the physician determines by touching the palm of his hand. Anchored in medical practice, this notion was established by the Galenic philosophy, which, in turn, is based on the teachings of Aristotelian physics. Accordingly, the human body, belonging to the sublunary world, is composed of elements. These elements blend into a “mixture” resulting in the balance of their qualities, which defines the temperament. The concept of temperament as a mixture is explained in the theoretical part of medicine, in particular physiology. In the late Renaissance, the term “physiology” became widespread through the eponymous work published by a famous medical figure: the French physician Jean Fernel (1497-1558). Indeed, Fernel wrote a didactic synthesis on the composition and functioning of the healthy body in his Physiologia. Included in the Universa Medicina (1567), this treatise was first expounded in De naturali parte medicinae (1542). Broadly successful in the early modern period, the Physiologia provides a systematization of the Galenic philosophy imbued with Renaissance Platonism.


3 For recent studies on Fernel, see José Kany-Turpin (ed.), Jean Fernel, “Corpus. Revue de Philosophie”, 41, 2002,
Beyond its Platonic character, the *Physiologia* underpins a still unexplored medieval influence. For instance, its structure was inherited from Latin-Arabic medicine, as expressed by the terms of the 1542 edition: “the natural part of medicine”. One can see this framework in an emblematic work of medieval medicine: the *Articella*, a collection of medical texts transmitted by the school of Salerno and first printed in 1476. The opening treatise of the *Articella*, the *Isagoge* of Johannitius (Hunayn ibn Ishaq), organized theoretical medicine into seven “natural things” (*res naturales*): elements, complexions, humors, members, faculties, operations and spirits. Although this structure remained largely unchanged in the seven books of *Physiologia*, Fernel did not refer to it. As a typical Renaissance humanist scholar, he preferred to quote his sources directly from Galen, Aristotle, Hippocrates and Plato. Moreover, the French physician transformed the original Latin title, “the natural part of medicine” into the Greek term *physiologia*. In this regard, Fernel is a striking example of the amalgamation of medieval medicine with a strong humanist influence, through his focus on the original authoritative texts. Such intellectual attitude is typical of the “long medical Renaissance”, that is the medical tradition based on Galen, Hippocrates and Avicenna, flourishing from the late Middle Ages to the sixteenth century.

In this paper, I examine Fernel’s interpretation of temperament as a mixture of elements. Given that the notions of elements, mixture and temperament are all rooted in the framework of the seven “natural things”, I will pay special attention to Fernel’s debt to medieval medicine, in particular Avicenna’s *Canon of Medicine*. In the first section of this paper, I attempt to elaborate previous research on mixture by Anneliese Maier and Norma Emerton. Both historians have stated that the difficult and insoluble problem of mixture stimulated the development of pre-corpuscular theories among medieval and Renaissance Aristotelians. By considering Fernel’s view on temperament as an application of matter theory to medicine, I show that he suggested the discontinuous nature of elements in a Galenic context. In the second section of this paper, I look at temperament as the combination of mixture with a vital substance named “innate heat”. This notion, proper to the living body, involves the Platonic core of Fernel’s philosophy, previously explored by Hiro Hirai concerning his theory of seeds. As I will argue, innate heat is not only an essential component of the body’s living nature, but also has an implicit connection with the notion of mixture.
Temperament as a Mixture of Elements

Fernel developed his interpretation of elements and mixture in the second book of *Physiologia*, “On Elements”. The general structure of this book is based on Galen’s *On the Elements According to Hippocrates*, which combines Aristotle’s theory of elements expounded in *On Generation and Corruption* with Hippocrates’ theory of humors presented in *On the Nature of Man*. Along these lines, Fernel defined the element as a simple body, the smallest (minimum) in division, composing all bodies. From Aristotelian physics, he adopted the doctrine of matter and form, also known as “hylomorphism” 8. The element consists in matter and form, as inseparable and incorporeal principles — matter as a principle of potentiality, and form as a principle of actuality9. Subsequently, Fernel rejected monism in favour of four elements and two pairs of qualities, following Galen’s arguments. On the one hand, he stated that elements are necessarily multiple and contrary, as they are subject to change. Thus, the “turbulent concourse of atoms” has to be dismissed, as it would make impossible the alteration of compounds10. On the other hand, Fernel correlated the number of elements to four tangible qualities: hot, cold, dry and moist. These four “primary” qualities are distributed in two pairs of contraries: active (hot/cold) and passive (moist/dry). Each element is associated to one couple of these qualities: fire (hot-dry), earth (cold-dry), air (hot-moist) and water (cold-moist)11.

Such scheme of matter-form, elements and qualities defines the composition of the human body whose “homeomerous” (similar) parts and “anhomeomerous” (organic) parts result from the mixture of elements12. As a physical union of elements, mixture leads to the transformation of the bodily part, occurring with the formation of the temperament. Fernel expanded this theory following Aristotle’s *On Generation and Corruption*, with special attention to the relation between elemental substances and their primary qualities13. Accordingly, elements mingle through their qualities, in terms of agent and patient. The action-passion process of the contrary qualities, “combatting” each other, results in a unique totality of matter and form. The interaction of elements ends in a balance of their qualities in order to form a homogeneous compound. The forms of the elements then remain in potentiality after mixture.

With this description in mind, Fernel aimed to comply with the Aristotelian definition of mixture, and to avoid subsequent ancient and medieval interpretations, which he considered as deviant. He particularly insisted that the product of mixture does not only consist of qualities, but also of elemental substances. This statement implicitly seeks to answer the scholastic debate explored by Maier: to what extent are the elements preserved in the “mixt”? Such

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10 Ivi, 2.4, pp. 194-195.

11 Ivi, 2.4, pp. 196-197.

12 The subdivision of the bodily parts refers to Aristotle’s books on animals, describing living beings as composed of anhomeomerous parts, e.g. the limbs and the organs, and of homeomerous parts, e.g. flesh, bones, skin, etc., all made of the four elements.


14 Anneliese Maier, *On the Threshold of Exact Science: Selected Writings of Anneliese Maier on Late Medieval Natural*
question gave rise to countless discussions on the status of elements at material and formal levels, during and after mixture. In medical texts from the eleventh century, mixture and temperament were described as a process and a product through the notions of *commixtio* and *complexio*, respectively. Later in the thirteenth and fourteenth centuries, physicians focused on the relation between the substance, qualities and properties of the compound, following the Avicennian, Averroist, Thomist and Scotist views on mixture. This doctrinal background remains in Fernel’s review of ancient and medieval models of mixture. However, he concisely summarized different philosophical stances, and only occasionally related them with precise authors or schools of thought. I will, thus, attempt to identify the main interpretations succinctly appraised in the *Physiologia*.

Having described mixture following the Aristotelian standard, Fernel considered alternative models of the union of elements. By relying on Aristotle’s *On Generation and Corruption*, he rejected the interpretation of mixture as a mere juxtaposition of solid parts or a confusion of liquids. For the same reason, he dismissed the Empedoclean “juxtaposition of small parts” and the Stoic total mixture *per minima*. The French physician disregarded these ancient accounts of mixture mostly for their common description of an assemblage of corpuscles, particles or *minima*. Assimilated to a simple juxtaposition of elements, these models miss the Aristotelian requirement of a continuous and uniform mixture.

Furthermore, Fernel outlined scholastic discussions on mixture concerning the preservation of elements and the final status of the primary qualities in the “mixt”, i.e. the compound. He first criticized a supposedly Thomist definition of mixture: it denies the persistence of the elemental substances after mixture, and only admits their qualities depending on the substantial form of the mixt. In the same way, Fernel turned down the Averroist interpretation of the mixture. He considered it as an inconsistent theory, advocating that the forms of the elements, instead of their qualities, undergo the process of action and passion, then breaking up into a “median and unheard kind”. Both models of mixture are thus invalidated due to their failure to maintain the permanence of the elemental substances in the compound.

Having appraised ancient and medieval accounts on mixture, Fernel provided his own interpretation, suggesting an original view on material change. At first, he claimed to preserve...


16 Danielle Jacquart, *De crasis à complexio: note sur le vocabulaire du tempérament en latin médiéval*, in *Mémoires V*, *Textes médicaux latins antiques*, Centre Jean Palerne, Saint-Etienne 1985, pp. 71-76. In the *Physiologia*, Fernel adopted a somewhat different terminology, as *temperamentum* results from *permistio*.

17 Aristotle, *On Generation and Corruption*, 1.10, 327a30-328b25. Fernel also referred to Plotinus’ *Enneads*, 2.7 concerning the Stoic model of total mixture.


19 *Ivi*, 2.6, p. 200-202: “Videmus apud multos iuniores puerilem verèque inanem percrebuisse sententiam qua iae vetere spreta philosophia decreuerunt, non elementorum substantias, sed qualitatum duntaxat in nobis asseruari. Esse calidum, frigidum, humidum et siccum, ex quibus constamus, non substantiarum, sed qualitibus nomina. Nusquam synceras quatuor rerum naturas haberi, mixtionis expertes…verùm protinus euanescere, quando noua compositi forma ex permixtione succedit.”

20 *Ivi*, 2.8, p. 210: “Rationes istae fortasse Auerrhoidem eò necessitatis adegerunt, ut non commentitium quiddam modò, sed somnio quoque simillimum adferret: qui vt hanc substantiarum permisionem tuetur, elementorum formas à perfectarum substantiarum dignitate et vniverso genere detorsit, vt non in qualitates, sed in medium quoddam et inauditum genus transferret.”
the Aristotelian definition: for their union, the elements undergo a process of opposition through their qualities, and maintain their initial forms in potentia within a homogeneous mixt. However, the French physician also adopted an ambiguous terminology regarding the status of the elements within the mixt. He defined them as “minute parts” close to minima, whose forms are intact, arranged in a somewhat oxymoronic structure: a “continuous juxtaposition”21. What’s more, the gathering of elemental fragments constitutes the material basis of the temperament. It is then achieved by the introduction of a perfect form22.

Fernel’s final verdict on mixture raises many questions, given his previous debunking of the apposition of atoms and minima. If we set these traditional objections aside, his view strongly evokes the Avicennian approach of mixture: the union of intact elemental forms into a compound crowned with a superior form of divine origin23. While the “formal” nature of temperament is investigated in the next section of this paper, let us now examine Fernel’s possible motives for a description of elements as contiguous minute parts.

The interpretation of elements as minimal parts frequently occurred in late medieval and Renaissance natural philosophy, alchemy and medicine. In the context of natural philosophy, Aristotelian physicians from the school of Padua, such as Julius Caesar Scaliger (1484-1558) and Jacopo Zabarella (1532-1589), used the Aristotelian notion of minima naturalia to describe the elemental parts involved in mixture. Such view stimulated the emergence of “Aristotelian corpuscularianism” in the sixteenth century24. Alongside Aristotelian natural philosophy, Galenic medicine also spurred the “minimist” approach to elements25. In On the Elements According to Hippocrates, Galen defined the element as a minimal particle or portion, and stated that the composition in minima facilitates the close union of elemental qualities26. In the second half of the twelfth century, physicians of the medical school of Salerno, such as Bartolomeo of Salerno, continued this interpretation by considering the element as a simple particle, and mixture as a union per minima27. Such understanding of mixture as a juxtaposition of minimal parts was transmitted in a fundamental work of medieval alchemy: the Summa perfectionis of pseudo-Geber (late thirteenth century). As William Newman has shown, this treatise was decisive in the emergence of atomist alchemical theories in the seventeenth century28. In addition, Avicenna played an important role in the Galenic interpretation of

21 Ivi, 2.8, pp. 210-212: “Primùm enim quatuor llae mundi simplices naturae…in exiguas non autem quam minimas portiones se distrahunt, eòque se ordine componunt, vt quaeque tandem alterius diuersique generis cuipiam cohaerescat…Hoc positu exiguæ portiones, suam formam, qualem ante permistionem, integram quaeque retinent…Quanquam igitur substantiae καθόλου temperari nequeunt, sed duntaxat continua appositione connecti: qualitatum tamen consummata est permistio.”

22 Ivi, 2.8, pp. 212: “Quumque haec absoluta fuerit, temperamentum accedit acquabiliter toti conspersum, et noua protinus forma inductur…In hunc modum mistae temperateaque elementorum portiones, materia fit totius simplici formae substrata. Haec autem forma seu perfectio sui vbique persimilis est…Mistum enim iam est horum vnumquodque, totiusque temperamentum accept: nihil igitur prohibet quò minus compositi totius species immigret in omnia.”


26 Galen, De elementis ex Hippocrate, 1.1 and 1.9, ed. Kühn, I, p. 413 and 489.


28 William R. Newman, Atoms and Alchemy: Chymistry and the Experimental Origins of the Scientific Revolution,
elements as minimal parts. In the *Canon*, the elements are presented as simple parts which cannot be further divided, and the temperament as a reduction of elements to contiguous minute parts. Furthermore, Avicenna asserted, in his *Liber primus naturalium: Tractatus primus* and *Liber tertius naturalium: De generatione et corruptione*, that the forms remain unchanged within the compound, as only the elemental qualities are altered during mixture.

Such evidence suggests that Fernel proposed a Galenic definition of elements as contiguous parts or "particles", akin to *minima*, tacitly inspired from the *Canon*. The Avicennian model is particularly suitable for the permanence of intact forms which Fernel advocated. Nevertheless, the French physician’s debt to Avicenna needs further investigation concerning the introduction of a superior form during the formation of temperament. In order to elucidate this, I will now turn to Fernel’s approach of the “whole” temperament.

**The “Whole” Temperament of the Living Body**

At the end of his book “On Elements”, Fernel stated that his definition of mixture pertains to the temperament of homeomerous (similar) parts of the human body. In order to establish the temperament of the whole body, one requires to sum up the temperaments of all its anhomeomerous (organic) parts, made of the homeomerous parts. But Fernel noted that this simple combination of temperaments would actually correspond to the temperament of a corpse, mainly composed of the element earth, as cold and dry. To consider the temperament of the “whole” living body, the French physician added the notion of “innate heat” as an essential feature of living beings.

Fernel’s account of innate heat refers to the nature of life as hot and moist, while death is cold and dry, as reported in Aristotle’s *On Length and Shortness of Life*. Such description suggests the elemental nature of innate heat, following the Galenic interpretation of vital heat as composed of fire and air. However, Fernel sought to show its supra-elemental nature throughout the third book of *Physiologia*, “On Temperaments”. His interpretation is grounded in a famous passage from Aristotle’s *Generation of Animals*, stating that vital heat, transmitted by the seed, is not composed of fire but spirit, whose nature is analogous to the element of the stars. From this, Fernel asserted that innate heat is an “ethereal” nature, thus related to “ether”, a celestial entity additional to the four elements of the sublunary world.
He combined this Aristotelian statement with the Galenic concept of **pneuma** composed of heat and spirit (**spiritus**): a thin hot body coming from blood and inspired air, in charge of operating the physiological functions as an instrument of the soul. Given the fluid nature of spirit, transporting innate heat in the arteries, Fernel considered it as composed of subtle matter, similar to the celestial element.

Having correlated the celestial origin of innate heat and spirit to Aristotle and Galen, Fernel finally exposed the Platonic framework of his interpretation in the fourth book of the *Physiologia*, “On Spirits and Innate Heat”. At first, his Platonic view is applied to the physiological functions of vital heat, in charge of warming up, vivifying and animating the living body. Fernel even compared its ethereal nature to the solar heat, enlightening and diffusing into the living beings. In turn, spirit is similar to a celestial garment, pure, immortal and eternal, covering the material part of the mortal body. Because of its material substrate, the body’s **spiritus** is less pure than the divine and celestial spirit of which it proceeds. In its terrestrial existence, it is “inserted” in the living body and thus named **spiritus insitus**. Comparable to an “outcast in a dark prison”, it waits to be delivered as soon as the body dies, then returning to its celestial home. Fernel referred the duality of spirit to thepseudo-Alexandrian treatise *Problemata*, describing spirit as a bond (**vinculum**) between the celestial and terrestrial worlds within the human body.

Moreover, his interpretation attempts to clarify the passage from Aristotle’s *Generation of Animals*, suggesting the intermediate nature of spirit and innate heat: neither divine, nor elemental, but in some in-between state.

One question still remaining is the proper connection between innate heat and the superior form of the body which achieves the temperament. While Fernel stated in the *Physiologia* that mixture results in the introduction of a perfect form, it is actually in *De abditis rerum causis* [On the Hidden Causes of Things] (1546), that he associated innate heat and spirit to the form of the living body. In this treatise, Fernel distinguished the elemental temperament from the substantial form of the living body, which is transmitted by the “inserted” spirit and innate heat. In turn, spirit and innate heat derive from a celestial entity, namely the world soul (**anima mundi**), also named “giver of forms”, conveyed by the world spirit (**spiritus mundi**). Although this interpretation of the celestial form is inspired by Ficino, it is not devoid of Avicennian overtones. For instance, in the *Canon*, Avicenna stated that

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40 Ivi, 4, ed. Forrester, pp. 258-259.
41 Ivi, 4, ed. Forrester, pp. 262-263.
42 Ibidem.
46 Fernel’s interpretation of the substantial form also implies “occult” properties related to the body’s “total substance”, which I will not address in this paper due to practical constraints. See Massimo Luigi Bianchi, *Occulte e manifesto*...
digested food could exert particular effects on the body through its “specific form” which crowns complexion after the mixture of elements\textsuperscript{47}. In his Liber de philosophia prima sive scientia divina, he established the divine origin of the specific form, coming from a celestial “giver of forms” (dator formarum) as the lowest part of the celestial intelligences\textsuperscript{48}. While Avicenna’s account of the specific form is evident in De abditis rerum causis, it also underlies the interpretation of innate heat in the Physiologia. Indeed, innate heat is associated with the formal dimension of the living body, supervising the physiological functions of its material organism. In the same way as the superior form completes the mixture of elements, innate heat vivifies the whole body and achieves its temperament.

In summary, I have considered Fernel as a proponent of the discontinuous nature of elements in the long medical Renaissance. As I have argued, his approach of temperament denotes an implicit Avicennian influence concerning the material and formal definition of temperament. However, the French physician never related his interpretation of mixture to Avicenna in the Physiologia. As a Renaissance scholar, he preferred to return to the source of Greek texts, exploiting the conceptual gaps of Galen’s and Aristotle’s treatises, rather than quoting medieval “Arabic” authors. Moreover, he included in his medical philosophy the Platonic thought of his time, mostly based on Ficino.

Nevertheless, Fernel’s implicit interest in scholastic medicine is patent in his work. The Universa medicina, as a systematic approach of medicine, both concise and didactic, is proposed as a new Canon, which Fernel sought to improve through a clear structure, organized into physiology, pathology and therapeutics. His project turned out to be remarkably successful, as the Universa medicina became one of the main early modern medical textbooks. Supplanting the traditional collection based on the Canon and the Articella, the Physiologia was widely read and commented upon in the seventeenth-century scholarly world. Moreover, Fernel’s views on temperament, mixture and innate heat inspired prolific discussions by a significant range of Aristotelian, Paracelsian or atomist physicians, such as Andreas Libavius, Daniel Sennert and Isaac Beeckman. Far from being disconnected from early modern innovative theories, Fernel’s interpretation of temperament was thus an important stimulus for the redefinition of material change at the junction of natural philosophy and medicine.

\textsuperscript{47}Avicenna, Liber Canonis, \textit{op. cit.}, 1.2.2.1.15, f. 36 v: “Et sua quidem operans substantia, est illud, quod operatur cum forma sua specifica, quam acquisuit post complexionem, quas quam, cum eius simplicia se commiscuerunt, accidit ex eis res vna praeparans ad recipiendum speciem, et formam additam super illud, quod habent simplicia.”