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The Relationship of Blood, Intelligence, and Delirium: Perspectives in the Hippocratic Treatises

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In this paper, I will examine how the authors of the Hippocratic Corpus (c.5th – 3rd C. BCE) understood the relationship between the blood and mental faculties of a living person.[2] My aim is to clarify the nature of the relationship between blood and thought in the Corpus, a collection of Greek medical treatises composed by different authors, each with their own ideas about human physiology and pathology. The first part of this paper establishes contextual background for the mind-body debate in ancient Greek thought, and outlines some of the ideas that were prevalent around the time when many of the Hippocratic treatises were composed. It will situate the Hippocratic treatises in the context of these ideas while presenting some important points that must be taken into consideration when analysing the concept of the mind (and soul) in the Hippocratic Corpus. The second part is a text-based study that primarily focuses on two Hippocratic texts, On Breaths and Diseases I, which are the only two Hippocratic treatises that outline a theory of cognition that directly relies on the blood. The idea that blood could be responsible for the mental faculties of a person has a strong tradition in ancient Greek thought. By analysing the significance of its place amongst the medical theories of the Hippocratic Corpus, this study will help us understand more about how these authors, the pioneers of western rational medicine, understood the natural capacities and physiology of the body.[3]

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2 See Craik, 2015, for the dating and an overview of the contents of the Hippocratic treatises. Throughout this paper, I have used the Loeb translations of the Corpus (1923–2018), as cited in the§ reference list.

3 Hippocratic studies currently lacks a concentrated analysis of the views regarding blood and intelligence in On Breaths and Diseases I, especially with a focus on the role and significance of blood; my study aims to remedy this. Of recent scholarship that deals with the mind and body in Hippocratic medicine, and On Breaths and Diseases I in brief, see especially Gundert, 2000, and Thumiger, 2017. See also Lo Presti, 2016, for scholarship on cognition theories in the Corpus.

Section I

Mind-Body Traditions in Ancient Greek Thought and the Hippocratic Corpus

1.1 Soul, Mind and Body

The relationship between the physical body and the mental faculties of a living person was a topic of fierce debate in Greek and Roman antiquity. From Homer onwards, we find ideas on how human intellectual activities link to the soul (ψυχή) and to the body (σῶμα). These ideas incorporate both empirical evidence and theoretical arguments to establish a connection between the mind and body that accounts for faculties such as thought, intelligence, emotions, and sensation. In our surviving literature, we see in Homer the early connection of the varying psychic entities that comprise the mind, emotions, and life-spirit of a person (including νοῦς, κῆρ, θυμός, and ἦτορ) with the area of the chest, and especially the φρένες.[4] After Homer, we see the association of ψυχή with thought and perception in the early natural philosophies and Plato's doctrines, accentuating the soul not only as the life principle of a body but as 'the living person' themself.5

The theories regarding the body and soul that we find in the Hippocratic Corpus are importantly influenced by the early Greek natural philosophers in particular.[6] These philosophers (including prominent figures such as Heraclitus, Anaxagoras, and Empedocles) were a diverse range of thinkers flourishing in the 6th and 5th centuries BCE. They were a part of the Ionian tradition of thought, and undertook inquiries into the natural world that emphasised natural causation above divine or irrational causality, and based the constituents of nature in the natural world. The ideas regarding living beings found in the surviving fragments of their writings and doxographical reports details the ψυχή, a principle of life and thought, as material in nature, and which adheres to the rules and regularities of the different natural theories these philosophers applied to the world.[7] Similarly, the authors of the

4 Darcus Sullivan (1995) 36; see Gundert (2000) 13–15 n. 2–8 for references on scholarship on the soul and mind in early Greek thought, including Homer and the early natural philosophers. Also Holmes (2010) on understanding the body, mind, and embodied experience in Homer, the early philosophers, and the medical writers of the classical period.

5 Gundert (2000) 14f.

6 See Longrigg (1989) on the Ionian influence on Hippocratic medicine.

7 In addition to Gundert's list of scholarship on the ψυχή and soul-like entities in the early natural philosophies and Plato, see also Barnes (1982) and commentaries such as Taylor (1999) Inwood (2001) and Curd (2007).

Corpus present differing views about the nature and capacities of the soul in a living body, yet at its core the soul throughout the Corpus is corporeal, a material life-force that exists within and as part of the physical body.

The authors of the Hippocratic Corpus only rarely discuss the relationship between body and soul in detail. We find that the authors will present a theory of ψυχή-σῶμα relations in three areas: 1) when such an explanation is necessary in their description of the formation of the body (embryology especially), or 2) in an account of how the body functions (physiology, pathology), or 3) in the medical treatment of the body. The treatise On Regimen contains one of the more well-known theories of the soul in the Corpus, and an excellent example of how the soul is crucial to this author's understanding of human physiology and how to treat the body.[8] The author of On Regimen maintains that in order to treat the body, a physician must understand its entire nature, including its components and processes (*Vict. I* II.1–10). The soul has a special primacy in this treatise because it not only is a part of the body, but it also forms the body in utero (Vict. I IX-X), and the elements that comprise the soul have significant associations with the ordering of the natural world, according to this author.[9] The author describes the ψυχή as a flux of fire and water that constantly push each other to their respective maximum and minimum, and is inseparable from the living body.[10] The body and soul are interconnected in such a fundamental way that the capacities of the soul, the ability of the fire 'to move all things always' and of the water 'to nourish all things always' applies both to the soul and to the body (Vict. I III). Similarly, external influences that affect the body – consumed food, for example – also affect the soul.

According to this author's theory of intelligence, the fire-water soul dictates the intelligence (φρονήσιος) of a person. The perfect balance of fire and water results in a soul that is 'the most intelligent' (φρονιμωτάτη) (Vict. I XXXV.14–15), while an imbalance of the elements results in lesser intelligence – a slower, sluggish intelligence for the predominance of water, and fickleness tending to madness for a predominance of fire (Vict. I XXXV). This author's theory of intelligence relies on the careful balance of a 'delicate equilibrium', and the severe prominence of either fire or water, and the consequential diminishing of the other, accordingly results in extreme malfunction of the psychic faculties.[11] This malfunction manifests as insanity or madness (μανίη). In On Regimen, fire is linked to heat, dryness, and

8 Jouanna (2012) 195–227 outlines an overview of scholarship on the ψυχή and cognition in the On Regimen treatises. For discussions on the theories of the On Regimen tract, see Bartoš (2015).

9 Many studies have been done on the ψυχή and cosmos in On Regimen. Schluderer (2018) is one of the more recent and interesting works, and includes a relevant list of references on this topic.

10 Bartoš (2009) 3f.

11 Jouanna (2012) 201.

movement, while water is associated with coolness, moisture, and nourishment. In relation to intelligence, mental instability due to an abundance of fire manifests as frantic madness: the soul moves along the circuits within the body too quickly, sensation is registered by the soul too rapidly, and these cases are notably said to 'inevitably suffer from dreams (ὀνειρώσσειν)' (Vict. I XXXV.26–27).[12] Furthermore, when the soul is already moving too rapidly, the author states that inflammation of the blood, and the consequential overheating of the body, only contributes toward the soul devolving to madness (Vict. I XXXV.15–19).[13] Instability due to water conversely results in sluggishness of the soul and intelligence, and the author outlines a disconnect between what a person 'should' be feeling, and the emotions they display:

> Now the madness (μανίη) of such inclines to slowness; they weep for no reason, fear what is not dreadful, are pained at what does not affect them, and their sensations are really not at all those that sensible persons should feel (Vict. I XXXV.80–83).

Too much water affects a depressive, dissociative mental state, while too much fire will affect the opposite. We can see a physical relation here between the perceived natures of the elements that comprise the soul, as well as the observable attributes of patients suffering from mental instability. When we later turn to On Breaths and Diseases I, I will demonstrate that the substance or part of the body that has the ability to affect intelligence does so in its own unique way, specific to itself and its nature.

The author of On Regimen provides an exceptional amount of detail on the ψυχή. Their explanations include descriptions of the ψυχή, body, and their mental and physical functions both in the state of health as well as when these functions cease working as they should. Here we see descriptions of psychosomatic factors that allow for healthy cognitive functions as well as those that contribute to mental afflictions; the comparison that can be drawn between healthy and unhealthy in this sense aids in the identification of altered cognition. The other authors of

12 The association of heat, and especially feverish heat, with vivid dreams reoccurs throughout the Corpus, see Prorrh. I 5 and Morb. III 72 on vivid dreams and phrenitis, Int. 48 = Dieb.Judic. 3, Epid. I case VIII, Epid. IV 57 on fevers and dreams, and the intriguing statement in Epid. IV 20 where nightmare fevers (ἡπιαλώδεις) are listed among the symptoms occurring during the setting of the Pleiades. Intense febrile heat is also associated with delirium in many cases, and while not all fevers affect the mental faculties, the body severely overheating often results in an impairment of perception, understanding, and thoughts. See Smith (1981).

13 Here the Greek φλεγμονὴν is used for inflammation, drawing on the earlier association of φλέγμα and its cognates with heat and inflammation, see Lonie (1981) 278f. and Craik (1998) 15f. On heated blood causing the rotations along the circuits of the body to increase in speed, see also Vict. II LXVI.26–28.

the Corpus, in contrast, discuss the ψυχή with significantly less frequency and detail. As Beate Gundert notes, the word "ψυχή" is mentioned in the Corpus less than a hundred times, and most of these instances are found in the four On Regimen treatises.[14] Moreover, in the texts that do discuss the ψυχή, the authors' explanations rarely focus on the nature of the soul nor the state of the soul when cognition is functioning healthily; rather, they are primarily concerned with the way the body and soul have been changed when cognition has been altered, and imply a preconceived notion of how the soul and its associated cognitive functions should be.[15] We see so little of the term "ψυχή" and so few details on its nature particularly in treatises where the soul does not require an explicit place in the physiological and pathological discussions. As vital as its presence may be, the soul does not seem to be a primary concern of the physicians until it factors into the authors' medical explanations – and in many of these explanations, it is not needed at all.

I wanted to highlight this difficulty in understanding the significance and capacities of the ψυχή in the Corpus because often when the authors of the Corpus discuss the intellectual activities or emotional responses of a patient, they will do so without reference to the soul. But this absence does not mean that the authors did not believe that the ψυχή was responsible for the rational faculties of a person: just because they do not reference the ψυχή, does not mean the authors are not referring to the psychic phenomena associated with the ψυχή. However, an argumentum ex silentio on this topic would be especially treacherous and outside the scope of this article. Rather than broaching this grey area in Hippocratic studies, I will be turning to the components that the Hippocratic authors did emphasise when they were dealing with understanding the processes of, and problems regarding, rational functions: the physical body and its parts.

1.2 The Physical Body and the Rational Faculties

The physical body is the subject par excellence of Hippocratic medicine; it is the focus of their skill not only because it was the business of these physicians to treat physical human bodies, but also because the physical body was a reservoir of information from which the physicians extracted their knowledge about human functions, physiology, pathology, and behaviour. The author of Places in Man famously states that, 'the nature of the body is the beginning point of medical reasoning' (Loc.Hom. 2). While the body was certainly not the only point of reference when the physicians were constructing ideas about the human body,

14 See Gundert (2000) 15 n. 9.

15 Gundert (2000).

what they observed of the body was an important foundation that was supported and supplemented by theory.[16]

Physiological theories regarding the processes that take place within the body involve organs, structures, fluids, and air. Each component has a particular nature and function that complements and conflicts with those of other components, as well as external influences, in a bid to keep the body alive.[17] Similarly, Hippocratic pathology is based in the constituents and qualities of the body. Everything outside of, and within, the body has the capacity or power (δύναμις) to affect the body.[18] A fundamental balance of the qualities and quantities of the fluids and air in the body is required to keep the body in a state of health, while an imbalance (which could be in terms of excess or deficiency, but also temperature, purity, strength, motion) results in the body becoming ill.

Just as physiology and pathology in Hippocratic medicine are fundamentally based in the physical body, the rational faculties are also inexplicably connected to the physical body.[19] The body, whether functioning healthily or suffering through illness, has a direct affect upon faculties such as intelligence, perception, thought, and emotions, and these faculties likewise can affect the physical body in return. As a result, "mental" afflictions and affections in the Corpus are classified as psychosomatic, soul-body illnesses. For example, melancholia (μελαγχολία, μελαγχολικός) and phrenitis (φρενῖτις) are well-known psychosomatic illnesses in ancient Greek medicine.[20] Melancholia derives its name from black bile (μέλαινα χολή), and while its usage in the Corpus is usually to indicate an overabundance of this fluid, it can also indicate an affection that manifests predominately in terms of behaviour and notable changes to rational thinking (especially fear, depression, and distress, see Aph. VI.XXIII).[21] Phrenitis, which I will be exploring in the second part of this paper, draws its name from φρήν, singular of φρένες, maintaining the etymological link between φρήν and the mental faculties, and was considered a dangerous psychosomatic disease associated with high fevers, madness, and loss of reason.[22] Both diseases were well-known amongst the authors of the Corpus, and both were thought to be caused by physical imbalances in the body – imbalances of substances such as bile and phlegm especially.

16 Jouanna (1999) 248–252. See also Holmes (2010).

17 See Gundert (1992).

18 On the concept of δύναμις in the Corpus, see von Staden (2007).

19 See Simon (1978) 215–268.

20 Thumiger (2013) 62–64. For examples in the Corpus, see Aph. III.XIV, III.XX, and Aër. X.

21 Thumiger (2013) 63; see Jouanna (2007).

22 On phrenitis in ancient medicine, see McDonald (2009).

Conversely, the rational faculties are also able to physically influence the body. Emotions in particular have the capacity to produce physical effects that influence the processes and substances of the body. Two examples from the Epidemics treatises demonstrate this connection. Firstly, in Epidemics VI, the author tells us that, 'anger contracts the heart and the lungs and draws the hot and the moist substances into the head. Contentment releases the heart and those substances' (Epid. VI 5.5). The tightening and release of anger and contentment respectively are interpreted as physical reactions to psychic functions. Secondly, in Epidemics II, we are instructed that, 'it is appropriate to induce anger for the sake of restoring colour and humours, also to induce happiness, fear, and the like' (Epid. II 4.4). Here, emotions seem to have a more complex relationship with the state of the body, able to affect the natures of the substances within the body. The authors of the Epidemics do not give us any psychosomatic theory regarding how these effects take place, but we can clearly see that the authors maintained that essentially "mental" faculties can have a physical effect on the body.[23]

Outlining the relationship between the physical body and the rational faculties is a characteristic of the "rational" ideas the physicians of the Corpus inherited from the Ionian tradition, and for which the collection receives praise. Establishing chains of causation within the body connected the τέχνη (art, skill) of the physicians to the network of channels, processes, and substances within the body. It allowed the physicians to use rational causality to explain what was happening amongst the topography of the interior of the body (or an approximation of) and defend their τέχνη against the claim that health and disease were due to τύχη (fortune, chance) and not the skill or knowledge of the physicians.[24] It also allowed the physicians to establish a connection with the psychic functions, which meant that problems with the rational faculties were treatable through the body. In the theory of intelligence in On Regimen (see above, 1.1), the author tells us plainly that regimen (including diet and exercise) can affect the moistness, dryness, coldness, and warmth of the body, and make the blending of fire and water, and consequently the intelligence and mental stability of a person, better or worse (Vict. I XXXVI).

In certain discussions of "mental" afflictions (often the more detailed ones), the Hippocratic physicians express opinions on what physical part of the body is unwell, and in turn affecting the mental faculties. The authors do so to establish a chain of causation that can connect the locus or epicentre of the affection within the body, to the τέχνη of the physicians outside the body.[25] In theories where the

23 See also Morb.Sacr. XX on the diaphragm reacting to emotions.

24 Schiefsky (2005) 73.

25 See Claus (1981) 153f.

ψυχή is said to contain or maintain thoughts or intelligence, this ψυχή could be considered as the locus of a "mental" affliction. However, despite the material nature of the soul, it is often not the soul that is the direct target of the physicians' τέχνη, but rather an 'intermediary between the body and soul' that is accessible through medicine.[26] This "intermediary" is a physical locus or process that directly affects the rational faculties, whether they be a faculty of the ψυχή, a part of it, or not explicitly associated with the soul at all.[27]

1.3 Locations of the Rational Faculties: The Common Traditions and their Problems

In ancient Greek medical texts, the question of where in the physical body the mental faculties were considered to be "seated", and/or what substances contributed to their maintenance, was discussed extensively both rhetorically and in the context of applicable medicine.[28] Philip van der Eijk opens his chapter on the location of the cognitive processes in antiquity with an interesting passage from Caelius Aurelianus, a Latin medical author (c.5th c. CE) who translated Greek medical texts. The passage in his On Acute Diseases inquires as to what part of the body is affected by phrenitis, and Caelius Aurelianus offers the following list of known views:

> Now some say that the brain is affected, others its fundus or base, which we may translate sessio ['seat'], others its membranes, others both the brain and its membranes, others the heart, others the apex of the heart, others the membrane which incloses the heart, others the artery which the Greeks call aortē, others the thick vein, others the diaphragm (Caelius Aurelianus, Acut. 1.8.53–6).

The general loci mentioned in this list includes the brain and its associated spaces and parts, the heart and its associated parts, the major vessels more generally, and the diaphragm. The reason we are presented with this list is explained subsequently:

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26 Rocca (2003) 17.

27 While we see an identification of this "intermediary" in a few Hippocratic texts (I will demonstrate shortly), many more discuss psychosomatic afflictions such as phrenitis and mania without identifying any particular locus or process that could be responsible for managing the rational faculties, and thus what is being affected in the case of these diseases or symptoms. An excellent example is Prorrhetic I, which has over thirty passages on mental derangement but no explicit pathological theory. Cf. Potter (1995) 167, and Langholf (1990) 223. These texts often rely strictly on empirical observation rather than theory to understand illnesses.

28 See van der Eijk (2005) 120–121.

> For in every case they hold that the part affected in phrenitis is that in which they suspect the ruling part of the soul to be situated (Caelius Aurelianus, Acut. 1.8.53–6).[29]

Van der Eijk rightly warns that applying the idea of the 'ruling part of the soul' (and consequently the ἡγεμονικόν, a traditionally Stoic concept) to every medical writer who expressed ideas regarding the parts of the body that took part in rational thought implies a division or "grading" of the soul that is rarely applicable to these earlier authors, and does little justice to these earlier theories.[30]

What struck me about this passage, however, was how these ideas demonstrated the kind of knowledge that was useful to the physicians. As I mentioned earlier, the Hippocratic authors only discuss the ψυχή when it is necessary in their explanations of the body; in a similar way, the loci listed by Caelius Aurelianus are critical because they connect phrenitis, and the rational faculties that are disturbed in phrenitis, to the physical body. The passage indicates that understanding which parts of the body acted as an "intermediary" for a person's ability to think, perceive, understand, as well as feel emotions, was important in the physician's efforts to treat afflictions that affected these abilities.

The debate in antiquity on the locus, and substances involved in the functioning, of the rational faculties has a few associated traditions.[31] The primary divisions utilised by scholarship to classify the different views we find in our surviving texts are threefold: "encephalocentric", which positions the seat of the mental faculties in the region of the brain,[32] "cardiocentric", which maintains that the heart is the seat,[33] and the "haematocentric" tradition, which classifies intelligence as in (or primarily due to) the blood.[34] This neat division has a few problems, and I will mention here the two I find most significant.[35]

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29 Transl. Drabkin (1950) 34–35.

30 Compare Rocca (2003) 17–47, who applies ἡγεμονικόν in relation to all of the ideas in this debate. See van der Eijk (2005) 119ff. for his commentary on this passage, including the warning that while some of these views were definitely held by previous medical writers (based on the surviving evidence), many more may have been a product of rhetorical debate and not actually held by practicing physicians.

31 On these traditions and divisions, see van der Eijk (2005) 124–126, and Rocca (2003) 17–47.

32 Ancient thinkers include: Alcmaeon of Croton, the Hippocratic treatise On the Sacred Disease, Plato, the Hellenistic physicians Herophilus and Erasistratus, and Galen.

33 The Hippocratic treatises Diseases II and On the Heart, Diocles of Carystus, Praxagoras of Cos, and Aristotle.

34 Homer (possibly. See Onians (1951) 49 on θυμός as a vapour of the blood, and Inwood (2001) 136, Empedocles, and the Hippocratic treatises On Breaths and Diseases I.

35 Thumiger (2017) 32ff. instead offers five divisions for the theories from the 5th to 4th centuries BCE: brain, blood, air/πνεῦμα, an organ or location in the belly, and the ψυχή. This division is an

Firstly, these three classifications fail to include loci that are not the brain, heart, or the blood. I previously mentioned the tradition of associating thought and feelings with the chest in Homer (see 1.1). The φρένες in particular was a physical locus in the chest in which intellectual activity could take place, and the exact position of the φρένες has been associated with the lungs, the parts of the heart, and the diaphragm.[36] After Homer, the link of φρένες with the mind remained in classical literature, however in the Corpus the term is only rarely connected with mental activity.[37] This rarity does not denote absence, though, and we see, for instance, in the small treatise Diseases of Young Girls, the author maintains that the heart and diaphragm are critical places in the female body, and capable of being violently affected by blood that rushes up from the uterus.[38] The relevant passage reads:

> But from the heart (καρδίης) and the diaphragm (φρενῶν) the blood recedes only slowly, since the vessels there are transverse and those places are critical and can bring about derangement and raging. For when these parts are filled, a transient shivering with fever arises. When the situation is such, from the acute inflammation the woman rages, from the putrefaction she becomes murderous, from the darkness she is frightened and afraid, from the compression around their heart they are desirous of throttling themselves, and from the bad state of the blood the mind, being distraught and dismayed, tempts them to evil (Virg. 1).

This treatise incorporates traditional associations of the mind with the diaphragm as well as with the heart, describing critical, central parts of the body that are sensitive to the changes of the substances that flow through them. The three classifications mentioned above problematically lack a place for chest-centric theories, let alone other theories that do not fall into one of these neat distinctions. Thumiger's grouping of "enterocentrism", which includes the καρδίη, φρένες, and liver, is a more preferable and inclusive classification, and localises mental faculties within in the torso, an association that is present in a number of medical and literary texts even when a theory of cognition is not explicitly mentioned.[39]

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improvement, and helps to deal with the first problem I highlight, but still retains some of the complications of the further problem I discuss (see below).

36 Onians (1951) 25, 38; see Darcus Sullivan (1995) 36–37.

37 Thumiger (2017) 400f. The author of On the Sacred Disease even highlights the inappropriate naming of the diaphragm as φρένες (Morb.Sacr. XX).

38 See the commentary of On Diseases of Young Girls by Flemming & Hanson (1998).

39 Thumiger (2017) 36ff.

Secondly, any sort of division by "seat" alone excludes the intricacies of the different theories. For example, On the Sacred Diseases is classified as "encephalocentric" because the author famously argues that the brain is responsible for the rational faculties of a person (see Morb.Sacr. XVII).[40] However in this author's theory, air (and especially πνεῦμα, breath) plays a significant role as the substance that delivers information to the brain; any change in the quality of air affects the quality of information delivered to the brain (Morb.Sacr. XIX). This author's theory of cognition – outlined for the purpose of explaining the causation of epilepsy – involves both an organ and an important substance. Thus, in this sense, by simply stating that On the Sacred Disease is "encephalocentric" does an injustice to the greater theory of rational thought in the treatise.

A similar point can be applied to the classification of Aristotle as "cardiocentric". Aristotle's theory of the soul and body, and their relation in terms of forms, involves a more abstract application of theory that already makes this distinction tenuous.[41] However, akin to On the Sacred Disease, the classification of Aristotle as "cardiocentric" arguably places an unbalanced importance on the seat itself rather than the substances and processes that actually affect the mental faculties. In this case, the classification diminishes the importance of blood. In his Parts of Animals, Aristotle places the locus of the life principle in the heart: 'for it is in the front and centre of the body that the heart is situated, in which we say is the principle of life and the source of all motion and sensation' (Aristotle, De part. an. III 665a7-665a27).42 However, in this work he also indulges in the analysis of blood. We are told how the quality of blood affects intelligence, its association with movement and heat, and its overall suitability for 'ministering to the operations of the soul' (Aristotle, De part. an. II 652a24-653a10). Aristotle situates the life principle in the heart, but also casts blood, which is created in the heart, with a critical role in intelligence, sensation, and emotion.[43]

A further problem deals with the integrated nature of some of these theories. The "cardiocentric" and "haematocentric" traditions are, at times, very closely related, especially if the heart is considered to be the spring or source of the blood. We can see this evident in Aristotle, but also in the "haematocentric" theory of Empedocles. The primary passage from the surviving fragments of his poem on the relation of blood to intelligence is as follows:

40 On the encephalocentrism of On the Sacred Disease, see Lo Presti (2016) 173ff.

41 See van der Eijk (2005) 130; Harris (1973) 166ff. On the relationship of Aristotle's ideas to the Ionian and medical traditions, see Longrigg (1993).

42 Translations of Aristotle according to Barnes (1991).

43 Heart generating blood: Aristotle, De iuv. 480a3-a10.

> [the heart] nourished in seas of blood which leaps back and forth,
> and there especially it is called understanding (νόημα) by men;
> for men's understanding is blood around the heart (Fr. 43, 31B105 DK; 96 I).[44]

In Empedocles' theory of the natural world, based on the blending of fire, water, earth, and air, the living body was a composition of different mixtures of these elements. Blood was the only component that was a perfect ratio of the four, and this mortal, ordinary kind of perfection is what enables the blood to be an organ of understanding.[45] However this fragment of his poem specifies that blood around the heart is understanding, potentially drawing on a significant association of the blood that is located near the heart, perhaps due to warmth, or an association of the heart and the generation of blood.

In addition, as I will discuss shortly, the two Hippocratic treatises that provide us with evidence of "haematocentric" views on intelligence emphasise the movement of the blood as affecting cognition; whether this blood is itself the "intermediary" between body and soul, or if the blood originates from a particular source such as the heart (which would then be considered as the "intermediary", and consequently blood would be an accessory substance), is not explained in these texts.[46] Once again, an argument ex silentio would be unadvisable if only because many of the Hippocratic authors are notorious for being less than comprehensive in the details of their physiological theories. Therefore, in singling out On Breaths and Diseases I as "haematocentric" works, I select the only works in the Corpus that explicitly link blood with intelligence. I disagree with the "haematocentric" classification of these works because, when positioned alongside the terms "cardiocentric" and "encephalocentric", this decision potentially implies that the blood is the locus of the rational faculties.[47] But it is not clear in On Breaths and Diseases I, or even in Empedocles, whether the blood itself is the seat of the rational faculties, or if it is a part of the process that affects them. A comparison could be drawn to the theory of William Harvey in the 1600s, who placed the soul itself in the blood; there is no evidence in the "haematocentric" texts of this kind of infusion.[48] The closest comparison in the Corpus could be On the Nature of Man, where the author states that the body's life principle is in the blood, bile, and phlegm that comprise the body (Nat.Hom. II-IV). However, this work lacks a

44 Transl. Inwood (2001).

45 Inwood (2001) 136.

46 The unsubstantiated assertion that in Diseases I 'mental power is located in the heart' in van der Eijk (2000–2001) (II) 215, demonstrates the problems that can arise as a result of this close association.

47 See Thumiger (2017) 35f.

48 White (1986).

cognitive theory that could suggest any association of these constituents with the functioning of the mental faculties.

Section II

Blood and Cognition in the Hippocratic Corpus

Amongst the sixty-plus treatises of the Hippocratic Corpus, two are distinct in their explicit correlation of blood with the rational faculties of a person, and especially the way the blood acts within the body. These treatises are On Breaths, a sophistic essay on the importance of air in the context of medicine and dated to c.425–400 BCE, and Diseases I, an eclectic medical treatise that discusses injuries as well as illnesses, dated to c.380 BCE.[49] These two treatises will be my primary focus for this part of the paper.[50] I undertake the analysis of the relationship between blood and intelligence in both of these works in two stages: 1) a brief outline of the views on the nature of blood in the Hippocratic treatises to establish some foundational knowledge on this substance, and 2) a study of the relationship between blood and intelligence in On Breaths and Diseases I.

2.1 The Hippocratic Understanding of the Nature of Blood

In the Corpus, blood (αἷμα) is a cornerstone of the living body. Blood is warm, often considered the warmest substance in the body (Morb. I 29), and its colour, temperature, and viscosity are among its most highlighted traits. In humoral theories, it is considered one of the important moistures of the body, a substance responsible for health and illness, and also integral to the survival of the body.[51]

49 Jouanna (1999) 378, 381.

50 In the Corpus, it is not uncommon to find claims concerning disturbances of the blood and the mental faculties in the same case study or theory. The diligence the authors employed when noting observations about their patients often resulted in a plethora of noted symptoms, however this does not mean that the connection between blood and the mental faculties are in any way widespread in the Corpus. Additionally, in many treatises we see blood incorporated into psychosomatic theories without further explanation of the exact significance of the function of the blood, eg. Diseases of Young Girls where blood suffocates the chest area and causes madness, in Epidemics VI where stopping the blood in the vessels results in fainting (Epid. VI 7.2), and in On Regimen III where the blood is said to dissolve in the process of falling asleep (Vict. III LXXI.5–7). For the sake of brevity, and to avoid arguments ex silentio, I have chosen to keep my focus on On Breaths and Diseases I rather than try to read any blood-intelligence theory from other texts of the Corpus.

51 Eg. in On the Nature of Man blood is one of the four primary constituents of the body, and in Diseases IV it is one of the four integral moistures.

Blood is a nourishing fluid, itself derived from nutrients.[52] It is also a substance that traverses the whole body: the Hippocratic authors may not have understood that the blood circulates in a continuous loop, but they recognised that 1) the vessels (veins, arteries) extending throughout the body transport blood and other substances around the body, and 2) functions such as physical movement are affected when the movement of the blood is disrupted.53 For instance, in On the Sacred Disease heat is the blood's primary defence against the cooling effects of phlegm; however, when rogue phlegm encounters thin, watery blood, this blood will cool, congeal, and ultimately still in the vessels (Morb.Sacr. XII.1–6). As a result, the blood blocks the path of φρόνησις being carried through the vessels by the πνεῦμα, causing the cognitive effects of epilepsy, as well as the body's limbs to become paralysed; only when the blood is warmed and able to flow again (and thus release the trapped πνεῦμα) is cognition and motion restored to the patient (Morb.Sacr. VII, X.1–30). We also see a more direct relationship in Diseases II: the author states that when the blood is cooled by bile the patient "becomes paralysed in his other parts, and powerless", only to regain movement again when the blood is once again warmed and set in motion. The author further adds that if the blood does not warm again, "the blood is cooled even more; when it has been cooled completely and given up its heat, it congeals and can no longer move, and the patient dies" (Morb. II 6).

Despite being a substance associated both traditionally and medically with life, vitality, and nutrition, in the medical texts blood also has an interesting relationship to the noxious materials pus (πύον) and ichōr (ἰχώρ). Blood, pus, and ichōr are a trio of substances associated with wounds and injuries; pus is putrid material created from putrefied blood (as well as flesh, or even sometimes phlegm or bile), while ichōr is a thin, serous liquid that collects in the flesh, or flows in the wake of clotted blood.[54] While pus is always explained as having formed from putrefied material, ichōr is treated as a 'serous humour' that flows from the body and is detrimental to the health of the body.[55]

However, the Hellenistic treatise On the Heart claims that ichōr is found along with yellow bile in the empty left cavity of the heart, where intelligence (γνώμη) resides according to this author. This ichōr, and perhaps also the bile, has the important purpose of keeping the heart moisturised so it does not overheat and

52 Formed from nutrients: Alim. XXXVI, Morb. IV 11. Nourishing: Oct. 12, Nat.Puer. 10 & 19, Cord. 12, VC XVI.5–7 & XVIII.1–4. See Flemming & Hanson (1998) 242.

53 On the vascular system in the Corpus, see Harris (1973).

54 Jouanna and Demont (1981) 201. Pus formed from putrefied blood: Morb. I 4 & 21, Ulc. 1, VC XV.19–24, Nat.Puer. 4, Flat. X. On ichōr: VC XIX.12–14, Medic. 7, Mul. I 45, Epid. VII 116 = V 101. Ichōr in the wake of blood: Vid.Ac. 4. Ichōr causing suppuration and growths: Loc.Hom. 32, Gland. 8.

55 Jouanna and Demont (1981) 208–209.

ignite (Cord. 1), but it could also be the 'pure and luminous bath coming from a distillate of the blood' that nourishes the intelligence in the left cavity (Cord. 11). The author does not state whether the ichōr or yellow bile is this distillate, but it seems curious that these two substances are all that remain in the left cavity upon death. Although the text does not contain an explicit connection between On the Heart and Aristotle, the Hippocratic treatise is post-Aristotelian, and could have potentially made use of Aristotle's idea of ichōr as a kind of unconcocted or putrefied form of blood (Aristotle, De hist. an. III 521a33-b3).[56] This use of ichōr as a fluid of nourishment would be extremely rare, but that ichōr is already able to exist within the heart, even if it takes place in a cycle wherein the fluid is continuously flushed through the heart, perhaps indicates a particular use for this otherwise noxious fluid in this treatise – and one that, for the sake of this study, makes an interesting connection between a component of the blood and the intelligence of a person.

Analysing the Hippocratic understanding of the blood's nature, including its relationship with other substances and parts of the body, adds another layer to the understanding of the link between blood and intelligence in the Corpus. Michael Boylan remarks that 'it is important to note that seeing blood as a complicated structure is extremely important in evaluating the biomedicine of these writers'.[57] Although this 'complicated structure' is not as complex as our own understanding of the composition of the blood, it does highlight an added depth to the Hippocratic understanding of the substances of the body. In the Corpus, blood is a dynamic fluid fundamentally associated with moisture, movement, and life, but it is also capable of transformation and able to undergo a separation of its component parts.[58] The authors of On Breaths and Diseases I do not outline an elaborate theory on the blood in their treatises, but their understandings of the nature, tendencies, and capacities of blood draws on many of these characteristics and, as I will demonstrate, are reflected in their theories on cognition.

2.2 Blood and Intelligence: *On Breaths* and *Diseases I*

The relationship of blood and intelligence in On Breaths and Diseases I is outlined in a few key passages. I will follow chronologically by starting with On Breaths, then moving to Diseases I, before making some remarks on the theories present in both treatises.

56 See Harris (1973) 141ff; Peck (1965) 23 n. a.

57 Boylan (2015) 33.

58 Components of the blood: eg. the 'pure and luminous bath coming from a distillate of the blood' (Cord. 11), πνεῦμα rising from heated blood and turning to moisture in the process of sweating (Flat. VIII), the foetus nourished by the 'sweetest part' of the blood (Nat.Puer. 19).

The author of *On Breaths* is a sophist, and the goal of the treatise is to explain the primacy of air in the natural world, and especially the body. Their theory of the breaths (πνεῦμα, ἀήρ, φῦσα) that account for health and disease draws heavily on philosophical traditions (and is reminiscent of the theories of Diogenes of Apollonia), but their view regarding the blood is fundamentally based on two things: the blood's link to intelligence, and the regularity and consistency of this core component of the body. This treatise contains one key chapter for the relation of blood with intelligence, and I have divided this chapter into two segments for ease of examination. The most relevant passage reads,

> Now I hold that no constituent of the body in anyone contributes more to intelligence (φρόνησιν) than does blood. So long as the blood remains in its normal condition, intelligence too remains normal; but when the blood alters, the intelligence also changes (Flat. XIV.4–8).

"Intelligence" here is translated from the Greek φρόνησις, one of the many words the ancient Greeks utilised for the mental faculties, or a type of mental faculty. The term itself is difficult to define accurately in the Corpus because the authors rarely provide us with a clear definition of what exactly φρόνησις is capable of – and if one author does, it would be ill-advised to apply their definition to other treatises of the Corpus.[59] Similarly, other words relating to intelligence and understanding, such as συνέσις (see below, Morb. I 30), νόημα (see 1.3, Empedocles fr. 43), and γνώμη (see 2.1, Cord. 11), are varyingly translated as 'understanding', 'intelligence', 'mind', 'perception', and 'consciousness'. For this study, I am concerned primarily with the fact that these terms are all related to a person's ability to think, to understand, to perceive, and their mental awareness.

In the passage quoted above, the author of On Breaths states that blood contributes to a person's φρόνησις, and it is the nature of the blood that determines whether intelligence 'remains normal' or alters. This theory resembles that of On Regimen (see above, 1.1), where the quality of the ψυχή directly affects the quality of intelligence. As we see in the next passage, in On Breaths the nature or quality of the blood can be altered in terms of temperature, consistency, movement, as well as volume.

> When sleep comes upon the body the blood is chilled, as it is of the nature of sleep to cause chill. When the blood is chilled its passages become more sluggish. This is evident; the body grows heavy and sinks (all heavy things naturally fall downwards); the eyes close; the

59 An exception could be On the Sacred Disease, where φρόνησις potentially means 'consciousness' as opposed to συνέσις, 'understanding', see van der Eijk (2005) 127.

> intelligence alters, and certain other fancies linger, which are called dreams. Again, in cases of drunkenness, when the blood has increased in quantity, the soul and the thoughts in the soul change; the ills of the present are forgotten, but there is confidence that the future will be happy (Flat. XIV.12–24).

In this passage, the author is providing us with proofs for why they believe blood contributes to a body's φρόνησις. Cold blood is said to move slower than its warm counterpart. Parallel to the sluggish movement of the cold blood in the vessels, the body and consciousness also becomes lethargic and heavy to the point that only a small fraction of consciousness lingers, reminiscent of dim emergency lights switching on during a blackout.[60] Drink also increases the quantity of blood in the body, and this change has a direct affect upon the thoughts (φρονήματα) in the ψυχή, and specifically rational thinking. The idea of drink increasing the blood sounds suspiciously like a retrospective explanation of drunkenness, but we also see in On Regimen II the idea of white wines weakening the blood by increasing its opposite, and, as Jacques Jouanna and Paul Demont highlight, the opposite – that dark wine increases the blood – could also be true here (Vict. II LII.17–21).[61] Thus, an accumulative process of building on like-to-like can cause thoughts to change and instil a sense of deluded optimism.

In contrast, Diseases I is a medical treatise with a more professional approach to the body, and it is amongst the few works that incorporate both illnesses as well as injuries into the discussion of the human body.[62] This author discusses intelligence in the blood in the context of phrenitis; the passage reads,

> Phrenitis is as follows: the blood in man contributes the greatest part to his intelligence (συνέσιος), some people say everything; therefore, when bile that has
>
> been set in motion enters the vessels and the blood, it stirs the blood up, heats it, and turns it to serum, altering its normal consistency and motion; now the blood heats all the rest of the body, too, and the person, because of the magnitude of his fever, and because his blood

60 According to the doxographical reports of Aëtius, the idea of consciousness being linked to the temperature of the blood was also present in the ideas of Empedocles, see Empedocles 31A85 DK in Aët. Plac. 5.24.2, 5.25.4, Inwood (2001) 195.

61 The idea of humans possessing blood because of our diet of bread and wine, as opposed to the gods, is present in Homer, see Jouanna and Demont (1981) 203, and Lonie (1981) 58.

62 Its numbering as the first book on diseases is misleading, since all four books titled Diseases were composed by different authors with differing dates (Diseases II itself has two authors, one earlier and one later).

> has become serous and abnormal in its motion, loses his wits and is no longer himself (Morb. I 30).

In this passage, we are told three important things. Firstly, the author tells us that not only does the quality and motion of the blood contribute the greatest part to a person's rational faculties, but also that there is an existing tradition that believes the blood is the sole contributor. It is disappointing that we have little surviving evidence of these theories despite several mentions of thinkers and traditions that hold, for example, blood as the sole contributor to intelligence, as the sole constituent of the body (Nat.Hom. II) or as the soul itself (Aristotle, De an. I 405b5-b7). Regardless of this loss, this passage situates Diseases I firmly within a known and pre-existing tradition that attributes thought to the quality and motion of the blood.

Secondly, the author bases this change of the quality and motion of the blood in a humoral theory which mixes bile and phlegm into the blood. Throughout Diseases I, this theory is utilised to explain both physical (eg. fevers, chills) and psychosomatic (melancholia) illnesses. In the subsequent passage, we are given a comparison between the type of derangement caused by phrenitis and melancholia, the former apparently of lesser severity because the bile that causes phrenitis is weaker than that which causes melancholia (perhaps drawing a contrast here between the strength of yellow or another variety of bile versus black bile).

Thirdly, the author attributes the disordered and heated blood, as well as the overbearing heat of the fever, to the patient's derangement, expressed as παράνοια and μανίη in the Greek.[63] Blood is responsible for the body's warmth in both On Breaths (Flat. VIII) and Diseases I (Morb. I 24), and consequently plays an important role in the fever theory in both treatises. While On Breaths does not mention the effect of feverish heat on the mental faculties, Diseases I not only connects the heat from the blood to the delirium induced in phrenitis and ardent fever, but also makes an interesting comment on the vital importance of blood to the living body.

The fever theory in Diseases I involves bile and phlegm migrating into the vessels and heating the blood flowing there, and as a result causing the rest of the body to overheat as well (Morb. I 23–24).[64] The cause of ardent fever, known as καῦσος in the Greek, is described in similar terms:

63 See Thumiger (2017) 50f.

64 We can also attribute a similar fever theory to Praxagoras, and a blood-related fever theory to Erasistratus in the Hellenistic period, cf. Lewis (2017) 73 & 153, Harris (1973) 108, Yeo (2005) 440.

> Ardent fever… arises as follows: when bile is set in motion through the body, and it happens that the vessels and blood attract some of it—they attract mostly what was previously in the tissues and cavity—the blood, inasmuch as it is by nature the hottest thing in the body, when it has been heated by the bile out of the tissues and the cavity, heats all the rest of the body, too (Morb. I 29).

While the causation of ardent fever is described similarly to regular fevers, the severity of ardent fever is what makes this fever distinct and very dangerous. Ardent fever, or burning fever, is characterised by very cold extremities contrasted with a too-hot interior, feverish heat, sweating, a general drying out of the body, as well as detrimental effects on the mental faculties, such as insomnia, mood swings, intense fear, and delirious ramblings.[65] The nature of ardent fever is considered to be very similar to phrenitis, to the point that the two diseases can be a part of each other's progression, or can easily be confused for one another.

An interesting note made by the author of Diseases I is that ardent fever will burn through the moisture of the body, which is what makes this fever so deadly:

> Patients that die from ardent fever all die as the result of dryness. First their extremities become dry, the feet and hands, then the other parts that tend more towards dryness. When the moisture has been altogether burnt out of and dried up from the body, the blood congeals completely and becomes cold, and the rest of the body dries out; this is how the person dies (Morb. I 33).

After the heat of the fever has run its course, the body dies when the blood cools and congeals completely. This author fundamentally associates life with natural (non-febrile) warmth, and especially the warmth of the blood (see also Morb. I 34), and this connection could have also contributed to the link between blood and cognition in this author's theories. In this passage, the physical decline of the body is outlined in terms of moisture and temperature, a process of drying, cooling, and stilling; it could also reflect the decline of consciousness as the patient dies, with warm, regularly moving blood signifying an active, health mind, and cold, congealed, motionless blood signifying death.

The theories on blood and mental integrity in these two treatises offer an intriguing insight into how the authors perceived the connection between the body and mind of a living person. The same substance (blood) and process (movement) are capable of maintaining cognition and intelligence, and are also

65 Grmek (1989) 294.

responsible for mental disruption. Neither treatise outlines an overarching theory on the blood, or why this substance in particular has such an integral role in the body, however their ideas still reveal some important insights into the nature of the relationship between body and mind, as well as the understanding of the "intermediary" that links both.

As we can see from the quoted passages, in On Breaths and Diseases I thought and understanding rely on the regular movement and consistency of the blood. Adhering to the Hippocratic notion of balance and imbalance in pathology, the regularity of rational thought is upset when the blood is imbalanced in some way. This imbalance could be in quality (through overheating, chilling, or increase), or in motion (by having another substance such as air create stoppages in the vessels, or by stirring up the blood into more of a frantic movement). As a result, in both of these treatises, when blood is spoken of in relation to cognition, it is characterised by three fundamental traits: its temperature, its consistency (including viscosity and purity), and its motion.

As I stated earlier (see 1.3), there is no certainty whether blood acts as the only "intermediary" between the body and the mental faculties in these treatises. This ambiguity is only exacerbated when we turn to Diseases II, which has been classified as "cardiocentric" because of the assertion that a 'patient loses consciousness when phlegm or bile invades his cardia' (Morb. II 5); however, the treatise also states that mental derangement can be caused when blood in the head becomes overheated and 'set in motion more than usual' (Morb. II 3). In *On Breaths* and *Disease I*, it is perhaps because the heart is not mentioned (aside from a list of fatal injuries at Morb. I 3) that we view these treatises as basing their concept of human cognition – including mental stability, thoughts, dreams, and consciousness – on the blood itself.[66] However, even if another organ may be waiting in the wings as the "intermediary" between the body and the rational faculties, the authors of these treatises chose to only discuss intelligence and consciousness in relation to the blood.[67] I believe this choice is significant because it reveals not only the part of the body that is considered most responsible for cognition, but also the part that is most relevant to the physician's τέχνη when dealing with cognitive functions. As I outlined in the first half of this study, the Hippocratic authors often focus their discussions on components of the body (including the soul) that are related to the explanation, and treatment, of the body, and especially components they could influence with their τέχνη. In On Breaths and Diseases I, the blood is especially relevant to explaining how cognition is

66 At Morb. I 18, patients can 'lose consciousness frequently, because of some sudden migration of the blood'.

67 Unless of course discussions on the "seat" could be found in portions of these treatises that have not survived.

maintained or disturbed (in illness as well as drunkenness), and I believe this is why the authors focus on blood in their discussions on cognition.

The authors of On Breaths and Diseases I both assert that blood is the most important contributor to intelligence (φρόνησις and συνέσις respectively). Accordingly, these authors describe consciousness and thinking, as well as delirium and madness, as processes that are heavily characterised by the traits of the blood itself and its capacity within the body. In comparison, On the Sacred Disease and On Diseases of Young Girls both employ different understandings of how intelligence is related to the body, and these are dictated by what substances and parts are involved in the process. On the Sacred Disease focuses on the movement and quality of air and associates the purity of air with clear thoughts being register by the cold brain. In On Diseases of Young Girls, the organs of the chest are static in terms of their location, and function well when their surrounding substances are flowing properly, but suffer when these substances invade their region and hinder their functioning. On Breaths and Diseases I employ an understanding of the "intermediary" as relying on regular movement and consistency because these are important traits of the blood, while On Diseases of Young Girls relies on regular and healthy functioning of the chest organs, and On the Sacred Disease incorporates both because it relies on both a moving substance that can be altered in quality, and an organ whose functions can be hindered by congesting fluids. These examples demonstrate that within the Corpus, a substance or part of the body that has the ability to affect intelligence does so in a way that is specific to its own unique nature.

In ancient Greek medical thought, blood is a vital component of a living body. Like other liquids in the body, it moves, migrates, warms and cools; it sustains life and is capable of aiding in its deterioration. In the treatises of the Hippocratic Corpus, there is nothing inherently special about blood, but many of the authors attribute significant roles to the blood that combine ideas of the blood containing something special and useful, the movement of the blood as a special process, and empirical knowledge of the blood's practical capacity in the body. These ideas were utilised by the authors of On Breaths and Diseases I to explain how a person can think, understand, perceive, and feel emotions. By singling out the blood as an acting "intermediary" between the body and the rational faculties, these authors situated their treatises within an intellectual tradition that valued the movement and quality of blood as imperative to human thought. This tradition is tantalisingly sparse in our surviving literature, and shares an ambiguous boundary with theories that regard the heart as the "seat" of the rational faculties. But the tradition associating blood with cognition also demonstrates some interesting medical ideas about human cognition: for instance, intelligence as a process fundamentally rooted in regularity, and of the connection between thinking and constant movement. It also describes disturbances of the mental faculties

as being characterised by a disruption in the movement of the blood: of heat and frantic motion causing fever and delirium, of increase in the blood deluding the thoughts and triggering dreams, and of the blood cooling and slowing and causing a dimming of consciousness. Thus the link between blood, intelligence, and delirium explored by the authors of the Corpus and other thinkers of early Greek medicine, established a view of how humans think and feel that is rooted in some of the oldest traditional ideas of the primacy and importance of blood.

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