



## Philosophy and Medicine: Some Early Interactions

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# PHILOSOPHY AND MEDICINE

## SOME EARLY INTERACTIONS

BY JAMES LONGRIGG

A STUDY of philosophy and medicine in ancient Greece reveals important cases of interaction between them. I propose to consider these interactions under three headings: (1) The beneficial influence of philosophy upon medicine; (2) The pernicious influence of philosophy upon medicine; (3) (to which I shall give most weight) the fruitful influence of medicine upon philosophy.

### I. THE BENEFICIAL INFLUENCE OF PHILOSOPHY UPON MEDICINE

Some records of early medicine in Babylon, Assyria, and Egypt have survived. Although our evidence is in an incomplete and fragmentary state, it is still possible to gain some overall impressions from it. We find no indication that anything of the real nature of disease was discovered by the ancient physician. Diseases were regarded as being marks of the displeasure of the gods or were held to be caused by the intrusion of a demon. The prime purpose of the physician was to appease the god or drive out the demon which had "possessed" the sick man's body. In order to do so he employed prayers, supplications, sacrifices, spells, and incantations. The Egyptian medical papyri which have survived consist, for the most part, of prescriptions of drugs, and are interspersed with magical spells which were believed to impart efficacy to the prescriptions which follow. Many of the remedies prescribed contain noxious or offensive ingredients. The intention was, presumably, to make them as unpalatable as possible to the possessing spirit and so give it no inducement to linger in the patient's body. Coprotherapy is much in evidence. A good example of this practice is to be found in the *Hearst Papyrus* (85):

O ghost, male or female, thou hidden, thou  
concealed one, who dwelleth in this my flesh,  
in these my limbs. Lo, I brought thee  
excrements to devour! Beware, hidden one,  
be on your guard, concealed one, escape!

In ancient Egypt and Mesopotamia the views of the physician on the causes of disease and the operation of remedies were so linked with the belief in supernatural forces that a rational understanding of the organs and functions of the body or of the operation of the remedies applied to it was impossible.

There is, however, one medical treatise, dating from early antiquity, which makes us hesitate in dismissing Egyptian medicine, at least, as completely dominated by magic. This is the famous *Edwin Smith Surgical Papyrus*, named after its modern purchaser, which was copied in the seventeenth century B.C. from a work written during the third millennium B.C. This treatise is organized in a systematic manner and seems to be free from the magical elements which pervade other Egyptian medical papyri such as the *Ebers Papyrus* and the *Hearst Papyrus*. Breasted, the best modern editor and translator of the papyrus, has claimed that the work is in the true sense scientific.<sup>1</sup> This claim has by no means been universally accepted, and it is still a subject of controversy whether the treatise can be so described. It has been argued, contra Breasted, that there are magical elements in the text of the treatise.<sup>2</sup> It is maintained that when we find the following formula: "It is a malady which I will contend with" or "wrestle with," these words clearly imply belief in magic, and that the author was still a magician at heart. This conclusion, however, does not necessarily follow. The author here could be merely expressing himself figuratively or, more probably, adopting a familiar and traditional mode of expression. The surgeon would be dealing with observable physical causes, and it is hardly likely that he would regard their effect as due to possession by a demon with whom he would have to "wrestle." Moreover, in the papyrus we have two cases which deal with a similar complaint: Case 21 is that of a split in the temple; Case 18 is that of a wound in the temple. The surgeon "contends" with the former, yet merely "treats" the latter. Are we then to believe that the surgeon would consider the one to be of a mysterious magical origin, the other the result of an observable physical cause?

It is my opinion that this controversy cannot be definitely settled upon the available evidence. I am, for my part, disinclined to accept Breasted's claim, and believe that it derives its plausibility from the fact that, unlike the physician, the surgeon had to deal with afflictions which were the result of observable physical causes<sup>3</sup> and had little or no connection with the malignant demons of disease. A wound caused by a weapon, fall, or tool would be well understood and treated by rational means, whereas the causes of fever, for example, would be quite

mysterious and their effect would be regarded as due to the patient's being possessed by some demon or other. Since belief in magic is prevalent throughout the rest of the Egyptian medical papyri and pervades our earliest surviving medical literature generally, we see no good reason to doubt that this particular surgeon was a true child of his times and also believed in the powers of the supernatural. Although it must be acknowledged that the systematic organization of the treatise approximates to a scientific presentation of empirical data, it seems most unlikely that scientific medicine had its origin in Egypt.

Magic and superstition are found in Greek medicine also. They are, however, rare in the Hippocratic *Corpus*, and the majority of the works contained in the *Corpus* are completely free from both mythological conjecture and magical intervention. In them we find a striking contrast in outlook with previous medical literature. The emancipation of medicine from superstition and its subsequent development as a science was the outcome of precisely the same attitude of mind which the Ionian philosophers were the first to apply to the world about them. Their attempt to explain the world in terms of its visible constituents brought about the transition from mythological conjecture to rational explanation.<sup>4</sup> As Jaeger well points out<sup>5</sup>, the clearest evidence of this relationship is the fact that the medical literature of the fifth and fourth centuries is in Ionic. Although the inhabitants of Cos spoke Doric, Hippocrates and his school wrote in Ionic.

Here there can be seen the first and most advantageous influence of philosophy upon medicine. In two treatises in the *Corpus*, *Airs Waters Places* and *The Sacred Disease*, this rational attitude is especially marked. In these works it is emphasized that all diseases arise through natural causes. Both of them lay particular stress upon the moistening of the brain as a cause of disease.<sup>6</sup> The former work attempts to expound the effects of climatic and topographical considerations upon health. In the latter treatise the uniformity of nature is stressed in the sense that no disease can be any more "divine" than any other. It is argued that all diseases arise through natural causes and that men think some are of divine origin only because of their inexperience and their wonder at the peculiar symptoms which characterize them. We quote the following passages from this work to illustrate the rational outlook derived by medicine from philosophy.

But this disease [epilepsy] is in my opinion no more divine than any other; it has the same nature as other diseases, and the [same] cause that gives rise to individual diseases. It is also curable, no less than other diseases, unless by long lapse of time it be so ingrained as to be more

powerful than the remedies that are applied. Its origin, like that of other diseases, lies in heredity . . . Another strong proof that this disease is no more divine than any other is that it affects the naturally phlegmatic, but does not attack the bilious. Yet, if it were more divine than others, this disease ought to have attacked all equally, without making any difference between bilious and phlegmatic. (Ch. 5)

This disease styled sacred comes from the same causes as others, from the things that come to and go from the body, from cold, sun, and from the changing restlessness of wind. These things are divine. So that there is no need to put the disease in a special class and to consider it more divine than the others; they are all divine and all human. Each has a nature and power of its own; none is hopeless or incapable of treatment.

(Ch. 21)<sup>7</sup>

It should, however, be pointed out that the influence of Ionian natural philosophy brought about no sharp cleavage in the history of medical thought. As we said, magic and superstition are found also in Greek medicine. The practice of "incubation" in the temples affords a good illustration of this. Aelian preserves for us the following account of the historian, Hippys of Rhegium (*H.A.* IX. 33):

A woman had a worm and the cleverest of the physicians despaired of curing her. So she went to Epidaurus and begged the god to free her from the parasite. The god was not there, but the attendants made her lie down where the god was in the habit of healing the suppliants and she lay quiet as she was enjoined. But the servants of the god began to treat her and removed her head from her neck. Then one of them inserted his hand and drew out the worm, a great brute of a beast. But they were no longer able to fit the head in place and restore it to its usual fitting. Then the god arrived and was angry with them for undertaking a task beyond their wisdom and he himself with the irresistible power of a god restored the head to the body and raised up the suppliant.

We also find Aristophanes in the *Plutus* (665ff.) burlesquing these temple rites and giving a farcical account of the proceedings in the temple of Asclepius.

## II. THE PERNICIOUS INFLUENCE OF PHILOSOPHY UPON MEDICINE

In spite of this first, beneficial influence of philosophy upon medicine, its later influence was far from advantageous, and the subordination of the latter study to philosophy greatly hampered its development. In the middle of the fifth century B.C. the philosophers sought to extend their views about the world at large to man himself and as a corollary to this

began to base their medical theory upon their philosophical postulates. (The idea that man and the outside world are made of similar materials and behave according to similar rules, already to some extent implicit in Anaximenes' thought, can be clearly discerned in Heraclitus, who believes that man's very life is bound up with his surroundings. But it was not until the middle of the fifth century, curiously enough as a result of an increased interest in medicine, that the implications of this idea were fully drawn out.)

Empedocles affords the best illustration of the manner in which the attempt was made to base medicine upon a philosophical postulate. That he had medical interests is undoubted. His fame as a doctor, which is suggested by his own words,<sup>8</sup> is confirmed by references to him in later medical works. Again from his own words we see that he by no means lacked confidence in his own abilities.<sup>9</sup> Wellmann speaks of him as the "founder" of the Sicilian school of medicine.<sup>10</sup> Burnet goes even further and claims that Galen actually made Empedocles the founder of the Italian school of medicine.<sup>11</sup> But neither Galen nor any other ancient authority states this. The passage of Galen which Burnet cites (*de methodo medendi* I 1 X5K) does not, as he believes, offer any support to his claim. He has overpressed the evidence here. Empedocles' theories exercised a considerable and harmful influence upon later medical doctrine, particularly in Sicily and southern Italy. But whether he actually founded a school such as that on the island of Cos cannot be definitely ascertained. Wellmann's attempts to find other members of the school are not plausible. However that may be, our evidence clearly reveals how Empedocles extended his views from the world at large to man himself. We find that the same four components which form the world also give rise by their mixture to man's flesh, blood, bones, and so on.<sup>12</sup> In this way medical theory came to be based upon a philosophical hypothesis.

Another philosopher whose theories exercised a strong adverse influence upon medicine is Diogenes of Apollonia. Theophrastus has preserved for us a short account of his theory of health.<sup>13</sup> Brief though our information is, it is nevertheless apparent that he, too, based his theory upon his philosophical postulate. According to Diogenes, who may actually have been a doctor himself and may even have written a medical treatise,<sup>14</sup> health was the result when a large amount of air in a normal condition mingled with the blood and lightened it, penetrating throughout the whole of the body. Whenever the condition of the air was not normal and failed to mix with the blood, the latter coagulated, became weaker and denser, and sickness ensued.

The attempt to apply philosophical postulates to medicine in such a manner is vigorously attacked by the author of the Hippocratic treatise *Ancient Medicine*. In this remarkable little work we find for the first time some recognition of the distinction between science and philosophy. The author is clearly conscious of the opposition between the dogmatic method of the natural philosopher and the more empirical method of the physician. This is especially apparent in the first two chapters of the work, where he carefully points out that

[medicine] has no need of a "new-fangled" postulate, as do insoluble mysteries, which necessarily require the use of a postulate, if an attempt be made to discuss them, for instance the mysteries of heaven and of the regions below. If anyone were to express his opinion about the condition of these, it would not be plain either to the speaker himself or to the audience whether the statements were true or not. For there is no test the application of which would bring certain knowledge. But medicine has long had everything to hand, with a principle and method already discovered, by which many excellent discoveries have been made over a long period; while what remains will be discovered, if the inquirer be competent and familiar with discoveries already made, conducting his researches with these as his starting point. But whoever spurns and rejects all these, attempting to conduct research after a different method and fashion, and then declares that he has made some discovery, deceives and is deceived. He attempts the impossible.<sup>15</sup>

Again, in chapter 12, we find him declaring proudly that medicine has been able to rise by reasoning from deep ignorance to approximate exactness and therefore its discoveries should be admired as being the result of excellent and correct research, not of chance.

In *Ancient Medicine* Empedocles is made to represent the objectionable influence of the "philosophical" approach to medicine. The work begins with a polemic against those who seek to introduce their philosophical postulates into medicine, and an example of such a postulate is given, viz. that there are four powers active in the human body, the hot, the cold, the moist, and the dry. That Empedocles should be directly named and this particular example of a postulate chosen seems to offer some support to the view that he arrived at his four element theory by identifying these four opposites each with the appropriate cosmic mass.<sup>16</sup> Thus it may well have been Empedocles' immediate influence which fixed these two pairs of opposites as the canonical *δυνάμεις* in Sicilian medicine. A successor to Empedocles' medical views and another western Greek, Philistion of Locri, clearly did associate these specific *δυνάμεις* with the four elements.<sup>17</sup>

Notwithstanding the vigorous polemic delivered by the author of *Ancient Medicine* against the attempt to found medical theory upon the basis of a philosophical postulate, there are several works to be found in the Hippocratic *Corpus* which clearly show the adverse influence of philosophy upon medicine. Since the philosophical influences upon certain works in the *Corpus* are already well known, we shall content ourselves with a brief mention of them.

The influence of Empedocles may be traced in the treatise *The Nature of Man*,<sup>18</sup> where the number of humours is limited to four, viz. blood, phlegm, yellow bile, and black bile. This view is the counterpart of the four element theory, and it seems to have been the influence of the latter which led to the restriction of the number of the humours to four. Moreover, like the four elements themselves, these four humours are each characterized by the quality hot, cold, moist, or dry.

Diogenes' influence is marked in two of the Hippocratic works, *Breaths* and *The Sacred Disease*. The former work is more of a sophistic essay than a serious medical treatise. As Jones suggests,<sup>19</sup> the work may have been presented by its sophist author to the library of the medical school at Cos. It apparently became known as a Hippocratic work at quite an early date, for it is referred to in Meno's *Iatrica* (Chapters 5 and 6) and is in the list of Erotian. The author has no genuine interest in medicine and is even more guilty of making dogmatic assertions and failing to verify or reject them by experiment than the philosophers themselves. Like Diogenes, he believes that air, which is of fundamental importance in the world generally, is instrumental in causing diseases. In addition to this major influence, there are one or two minor reminiscences of Diogenes in the medical work. In Chapter 3 its author puts forward the theory that the sea has air in it which is breathed by fish and other aquatic creatures. This theory is apparently derived from the philosopher (cf. Aristotle *de Respiratione* 2, 471a3 DK64A31). At the very end of the same chapter we find the poetic description of air as the γῆς ὄχημα. This expression is also found in Euripides' *Troades* 884. If the author of *Breaths* is not simply imitating Euripides, they could both be copying some famous utterance of Diogenes. We know that the latter's thought was well known in Athens at this period, for his views are parodied by Aristophanes in the *Clouds* (225ff.).

*The Sacred Disease* is a work written expressly to explain on rational grounds the nature and causes of epilepsy and at the same time to combat the superstitious beliefs held about this disease. The author is strongly influenced by philosophy and attempts to apply a philosophical hypothesis to medicine in a manner which would have brought down

upon his head the wrath of the writer of *Ancient Medicine*. Like many other medical writers of this period the author of *The Sacred Disease* is an eclectic, and the psychological theory contained in his work reflects in some aspects the influence of Alcmaeon as well as that of Diogenes. The latter, however, is undeniably eclectic himself and the influence of the former on the medical work may have been at second hand. Alcmaeon's physiological researches had led him to the belief that the brain was the essential organ of intelligence and perception.<sup>20</sup> Diogenes had revived the monistic theory of Anaximenes and assumed air as his first principle. He conceived of it as psychical in nature, so that for him it was not only the primary substance but the principle of intelligence as well. (The immediate influence of Anaxagoras may be found here.) Upon the basis of these two theories, that the brain is the seat of the intelligence and that air is the source and principle of intelligence in the organism, is elaborated a comprehensive explanation of disease. Epilepsy, the most important of these for the medical author's present purpose, is caused by the stoppage of air in the veins by a flow of phlegm from the brain.

Diogenes' influence may also have made itself felt in the account of the venous system outlined in Chapter 3 of *The Sacred Disease*. Aristotle preserves Diogenes' own account (*Hist. Anim.* III 2.511b30 DK64B6) and there are close similarities between them. Later in the work (Chapter 16 Littré) the doctrine is advanced that moisture is harmful to thought. This theory, too, seems to have been derived from Diogenes, who appears himself to be indebted to Heraclitus for it.<sup>21</sup> Theophrastus in *de Sensibus* 44 (DK64A19) tells us that Diogenes believed that moisture (*ἰκμὸς*) hampered the intellect. This word appears to have been a technical term used by Diogenes himself. The word is rare in Attic and occurs a further three times in the tradition relating to Diogenes; viz. in Alexander (*Quaest. Nat.* II 23 DK64A33), the Scholium on Apollonius Rhodius IV, 269 (DK64A18) and in Aristophanes' parody of Diogenes' theories at *Clouds* 225 (DK64C1).

The influence of Heraclitus is also marked in the *Corpus*. In the treatise *Nutriments*, a later Heraclitean, skilfully copying his master's aphoristic style, applies the theory of perpetual change to the assimilation of food by a living organism. *Regimen* I is also written in the Heraclitean style, and reminiscences of Anaxagoras and possibly Empedocles and Archelaus can be found in the work.<sup>22</sup> The influence of Pythagorean numerology may be traced in the work *Sevens* (see especially Chapter 5) and *Fleashes* (Chapters 12–15), and perhaps in the im-

portance assigned to "critical days" generally, since Celsus actually refers to them as "Pythagorici numeri."<sup>23</sup>

### III. THE FRUITFUL INFLUENCE OF MEDICINE UPON PHILOSOPHY

The impulse to turn from the macrocosm to the microcosm was considerably quickened by the influence of medicine. Although one result, as we have seen, was that the development of medicine itself was gravely hampered, there was a more fruitful influence in the reverse direction, and it can be seen how medical interests coloured philosophical thinking. The influence of medicine upon philosophy in this way is especially marked in the middle of the fifth century B.C., and, as Burnet rightly points out, "it is impossible to understand the history of philosophy from this point onwards without keeping the history of medicine constantly in view."<sup>24</sup>

It is unfortunate that no Greek medical literature prior to the Hippocratic *Corpus* has survived. Alcmaeon is the only pre-Hippocratic Greek medical writer whose views have survived in any form.<sup>25</sup> That they survived at all may, as Heidel suggests,<sup>26</sup> have been sheer accident. Alcmaeon's interests seem to have been primarily medical and physiological, but like so many of the Greeks of his time, his interests were wide.<sup>27</sup> Some of the problems he considers either had engaged or were to engage the interest of the natural philosophers. Aristotle, therefore, took note of his opinions and he was later dutifully included by Theophrastus in his *Physical Opinions*. It is curious that there is no mention of him at all in Meno's *Iatrica*. It may have been Theophrastus' inclusion of him among the physicists which led to his exclusion from the medical history.

Alcmaeon is a figure of importance in the study of interrelations between medicine and philosophy. His influence upon later philosophical thought was, we believe, considerable. It is unfortunate that our evidence is so deficient that we cannot even date him with any degree of certainty.<sup>28</sup> Again owing to our lack of pre-Hippocratic medical literature in Greek, it is impossible to say whether or not he was the actual originator of the medical theories he expresses. Our evidence, however, strongly suggests that he was an original and independent thinker. Whether or not Alcmaeon actually originated these theories is of subsidiary importance to us here. What is important is that it seems to have been Alcmaeon's influence which stimulated the interest of later philosophers in them.

Alcmaeon's main interests, as we have said, seem to have been

primarily medical and physiological. Aëtius has preserved for us some information about his medical theory.<sup>29</sup> According to this account, Alcmaeon regarded health as due to the equilibrium (*ἰσονομία*) of the "powers" composing the body, while the supremacy (*μοναρχία*) of any one of them caused disease.<sup>30</sup> This medical theory exercised a wide influence. In Empedocles' thought it is fruitfully combined with his philosophical hypothesis. Man's flesh and blood are made up of the four world-components on the pattern of *ἰσομοιρία*, and where this gives way to inequalities, deviations from perfect health and wisdom occur.<sup>31</sup>

The influence of this medical theory, combined with the Empedoclean thesis identifying the four elements with the components of the body, can be traced, through Philistion,<sup>32</sup> to Plato.<sup>33</sup> Its influence on the latter was particularly strong; for, as Taylor well points out,<sup>34</sup> his ethical theory of pleasure and pain, most fully expounded in *Republic* IX and in the *Philebus*, but equally implied in the *Protagoras*, *Gorgias*, and *Timaeus*, represents an attempt to apply this medical formula in psychology.<sup>35</sup>

Alcmaeon's physiological interests, and in particular his researches into the nature of the sense-organs, seem to have had an even more important effect upon philosophical thought. His preoccupation with these matters stimulated the interest of later philosophers in them, and after him psycho-physiological enquiries became almost a standard topic of investigation.<sup>36</sup> These interests had important repercussions upon their philosophy.

Most of our information concerning Alcmaeon's physiological researches comes from Theophrastus,<sup>37</sup> who appears to have had access only to limited information. Chalcidius, however, has preserved for us some additional information,<sup>38</sup> which he may have obtained from Posidonius, who can be shown to have drawn freely on Academic and other sources of learning.

In the course of his dissections Alcmaeon appears to have discovered that certain passages or "pores" led from various sense-organs to the brain. From this discovery he inferred that all the senses are somehow connected with the brain and that therefore the brain must be the seat of the intelligence. He observes that, if the brain moves or shifts its position, perception is impaired since the pores through which the sensations pass are blocked.

Empedocles, too, employs pores in his theory of perception. His theory is that perception arises when effluences from the object perceived fit into the requisite pores of the sense organ.<sup>39</sup> Pores also play an important part in his explanation of the process of respiration. We learn

from Aristotle<sup>40</sup> that he described them as "bloodless tubes of flesh extended over the surface of the body." Burnet<sup>41</sup> and Taylor,<sup>42</sup> followed by Vlastos,<sup>43</sup> claim that Empedocles adopted his theory of pores from Alcmaeon. This view seems plausible, but is by no means self-evident as these scholars appear to think. The term *πόρος*, being a word of general application, unfortunately offers no support to their claim. Moreover, it could be argued that Alcmaeon was referring to the more obvious passages in the head such as the nostrils and eustachian tubes and that his further discovery of the "passages" leading from behind the eyes (presumably the optic nerves) had led him to the too swift generalization that all the sense-organs were connected to the brain by such passages. Support for this argument could, perhaps, be derived from Theophrastus, who tells us that in the case of touch where there are no discernible passages Alcmaeon was silent.<sup>44</sup> However, in the preceding chapter Theophrastus informs us that he attempted to give an account of taste. Here, too, there are no obvious passages. We also learn from the *de Sensibus* that Alcmaeon held that all the senses were connected to the brain.<sup>45</sup> If, as seems likely, his discovery of the passages reaching from behind the eyes to the brain had led him to the general theory that all the sense-organs were connected to the brain in such a fashion, his treatment of taste, where there are no passages apparent to the eye, suggests that his "pores" could vary in size and that in this instance, at least, they resembled those of Empedocles.

The latter did not confine his use of pores to explaining purely physiological phenomena. They also play an important role in his physics generally. In order to circumvent the impasse caused by the Eleatic arguments, Empedocles postulated four "roots" or elements, each of which bears a close resemblance to the Parmenidean One in that it is uncreated and cannot be destroyed. All things come into being and pass away through the mixture and interchange of these four elements. According to Aristotle he held that mixture was only possible between things whose pores were of the same size and shape.<sup>46</sup>

In view of the fact that Alcmaeon employs a pore-theory to explain perception and Empedocles makes elaborate use of pores for the same purpose, it is likely that the latter extended the theory from the sphere of sense-perception and physiology to the world at large, rather than vice versa. Consequently, although Empedocles is censured by the author of *Ancient Medicine* for seeking to apply his philosophical hypothesis to medicine, his medical and physiological interests were not without their influence upon his physics and thereby played an important role in his attempt to free philosophy from the sterile bonds of

Parmenides' logic. We may also point out that one of his moving causes, Love, which plays so important a role in his physics, is the selfsame impulse towards union that is found in human bodies. He looks upon it from a physiological viewpoint, declaring that no mortal has yet noticed that the same Love, which men recognize in their own bodies, performs an identical function in the world at large.<sup>47</sup>

Those physiological interests which began, after the time of Alcmaeon, increasingly to engage the attention of the philosophers are even more apparent in Anaxagoras' thought, and medicine had a much more comprehensive effect upon his physics than it had upon Empedocles'. Anaxagoras appears to have been particularly interested in nutrition. A paraphrase by the scholiast on Gregorius Nazianzanus preserves for us the problem with which Anaxagoras considered himself to be faced.<sup>48</sup> "How," he asks, "could hair come to be from what is not hair and flesh from what is not flesh?"

The answer which he felt he had to find was one which would satisfy the canons of Parmenidean logic. Presumably he did not think Empedocles' prior attempts to meet the Eleatic arguments successful.<sup>49</sup> Perhaps his objection was that, according to the latter, in any division of a compound body a stage would be eventually reached where, instead of the original body, the four constituent elements would exist separately, e.g. if bone were divided far enough, one would arrive at its constituent elements in their different proportions. In this way Empedocles' theory leaves itself open to confutation by the Eleatic elenchus. For it can be seen that at some stage bone comes into being which did not exist before and we have generation of bone from what strictly is not bone. Anaxagoras would require a solution which did not render him liable to be confuted in such a manner.

His answer to this problem is preserved for us by Aëtius.<sup>50</sup> His solution was to claim that everything pre-existed in our nourishment:

it seemed to him quite impossible that anything should come into being from the non-existent or be dissolved into it. At any rate we take in nourishment that is simple and homogeneous, such as bread or water, and by this are nourished hair, veins, arteries, flesh, sinews, bones and all other parts of the body. Which being so, we must agree that everything that exists is in the nourishment we take in, and that everything derives its growth from things that exist. There must be in that nourishment some parts that are productive of blood, some of sinews, some of bones, and so on . . .

In Simplicius further evidence is found that Anaxagoras was concerned with the problem of nutrition and growth.<sup>51</sup> It seems likely that he

arrived at his general theory as a result of his preoccupation with these very problems. This view that Anaxagoras' physiological interests influenced his physics seems to be strengthened by his use of *σπέρμα* as a new technical term.<sup>52</sup> And Simplicius tells us (*Physics* 460,28) that Anaxagoras "passed from the mixture in the individual to the mixture of all things." Here, then, a fruitful influence of medicine upon philosophy may be traced, since it seems to have been his physiological interests which suggested to Anaxagoras a way to circumvent the Parmenidean impasse.

If we are correct in our analysis of the thought of Anaxagoras and Empedocles, it will be seen that there is a dramatic reversal in outlook between them. Empedocles largely applies his theories about the world at large to man; since the whole world is composed of four elements, these elements are also the basic constituents of man himself. Anaxagoras, on the other hand, applies to the macrocosm theories evolved through the study of the microcosm.\* Both are clearly influenced by their medical interests. Why, then, should there be this reversal in the trend of thought? Is it possible to give a specific reason for it? We think that it is possible and suggest that Anaxagoras' philosophical outlook has been influenced not only by medicine in general but also by one medical treatise in particular.

Between the extant fragments of Anaxagoras and the treatise *Ancient Medicine* there exist some striking similarities both in thought and wording.<sup>53</sup> In the medical work is put forward a theory of indefinitely numerous *δυνάμεις* (see esp. Chapters 14 and 15), which, though harmless when mixed or compounded with another, when they are separated off and stand alone become apparent and hurt a man:

Ταῦτα μὲν μεμιγμένα καὶ κεκρημένα ἀλλήλοισιν οὔτε φανερά ἐστιν οὔτε λυπείι τὸν ἄνθρωπον, ὅταν δέ τι τούτων ἀποκριθῇ καὶ αὐτὸ ἐφ' ἑωυτοῦ γένηται, τότε καὶ φανερόν ἐστι καὶ λυπείι τὸν ἄνθρωπον.

The similarities between this passage and Anaxagoras seem particularly close.<sup>54</sup> The assertion that when things are mixed together they are not apparent (*φανερά*), but when one of them is separated off (*ἀποκριθῇ*) and stands alone (*αὐτὸ ἐφ' ἑωυτοῦ γένηται*) it then becomes apparent, is paralleled in Anaxagoras, who stated that when things were all mixed together, nothing was plain, but when they had been separated off, each thing became that which preponderated in it. In Chapter 14 of *Ancient Medicine* it seems to be implied that a *δύναμις* is capable of a separate and absolute existence. This, however, is emphatically denied in the

\* Cf. W. Jaeger, *The Theology of the Early Greek Philosophers* (Oxford 1947) p. 157.

following chapter, where the author pours scorn on the idea that there could be an absolute hot or cold or moist or dry. It is also stressed that there are, for example, many kinds of hot things possessing many opposite powers. Accordingly, it appears that when the author of *Ancient Medicine* speaks of something separating off and being *αὐτὸ ἐφ' ἑωυτοῦ*, he really means that a particular *δύναμις* then becomes predominant over the others, though it can have no separate existence of its own. This is precisely the theory put forward by Anaxagoras (Fragments B8 and B12), who believes that, although things are separated off, nothing is completely separated from anything else (except *Nous*).

Vlastos asserts that in the treatise it is considered that the multiplicity of powers which are in man are also in other things, not only in nutriment, but in leather, wood, and many other things (*καὶ ἐν σκύτει καὶ ἐν ξύλῳ καὶ ἄλλοισι πολλοῖς*), and this is the view of Anaxagoras. It is true that we are told that there are in man "the salt, bitter, sweet, acid, astringent, insipid and a vast number of other things possessing powers of all sorts in number and in strength," but it is uncertain that this view was extended from man to things like leather and wood. This passage which Vlastos quotes from Chapter 15 clearly does not support his claim. The medical author is here concerned to point out that there is no such thing as an absolute hot or cold or moist or dry; but that each hot thing, for example, also possesses other qualities such as the insipid or astringent, which bring about diverse effects. He points out that the hot and astringent, when applied, has the opposite effect to the hot and insipid, although both medicaments possess the same quality of heat. He seeks to illustrate further his argument by pointing out that these diverse effects are also produced upon less sensitive media than the human body. As Festugière remarks,<sup>55</sup> it is a characteristic trait of the author of *Ancient Medicine* to try to explain what happens in man by a reference to external phenomena.

Other and perhaps more cogent parallels are drawn by Vlastos. He points out that while the *ἄκρητον* is spoken of as *ἰσχυρόν* in the medical work, Anaxagoras declares that Mind *ἰσχύει μέγιστον* because it is absolutely unmixed (Fragment B12). He also points out that Anaxagoras' only known medical doctrine is that *χολή* is the cause of acute disease,<sup>56</sup> while in the medical work what is apparently a similar disease is caused by the efflux of *ξανθὴ χολή*.<sup>57</sup> Vlastos argues in addition that Anaxagoras' doctrine that all sensation is accompanied by pain would be easily understood if he, too, held a doctrine of *κράσις* whose disturbance pains the man and assumed that the sensation of any quality involved the concurrent predominance of that quality in the organism. Theophrastus'

objection to the belief that all sensation is accompanied by pain, however, seems to tell against such a claim:

ἀλλὰ μὴν οὐδὲ αἱ τῶν αἰσθητῶν ὑπερβολαὶ καὶ τὸ τοῦ χρόνου πλῆθος οὐδὲν σημείον ὥς μετὰ λύπης ἐστίν, ἀλλὰ μάλλον ὥς ἐν συμμετρίᾳ τινὶ καὶ κράσει πρὸς τὸ αἰσθητὸν ἢ αἰσθησις.<sup>58</sup>

Were Vlastos correct, we would expect to find *μόνον* rather than *μάλλον* here.

On the basis of the foregoing arguments, Vlastos claims that the medical author may have read one of Anaxagoras' physiological treatises or, failing this, have been influenced by someone who had taken over parts of Anaxagoras' doctrine. He considers it "chronologically most unlikely" that the author of the medical work could have influenced Anaxagoras, for "an Ionian treatise which combats Empedoclean influence on medicine could hardly have preceded the formulation of Anaxagoras' theory."

Vlastos' claim that there is some interaction here between philosophy and medicine is convincing, but his dismissal of the possibility of the latter's influencing the former is too hasty. We believe that it can be shown that there is no good reason why *Ancient Medicine* could not have been written at a time early enough to have influenced Anaxagoras and, secondly, granted the influence between them, that it is more likely that the medical work influenced the philosopher than vice versa.

The difficulties in assigning precise dates to certain events in the fifth century B.C. are enormous. In the first place the exact dates of Empedocles are uncertain. Apollodorus fixes his *floruit* in Ol. 84 (444-441), the date of the foundation of Thurii. His methods are well known, and it is most likely that he arrived at this answer simply by assuming that Empedocles was forty years old when Thurii was founded. This date he apparently selected as that of Empedocles' *floruit* solely on account of the statement made by the biographer Glaucus of Rhegium that Empedocles visited the city shortly after its foundation (cf. D.L. VIII 51 DK31A1). From Aristotle<sup>59</sup> and Theophrastus<sup>60</sup> we learn that Empedocles was a younger contemporary of Anaxagoras. Rather more is known about the latter, but even so the tradition presents conflicting accounts and it is difficult to assign a definite chronology to the various events in his life. However, the dates 500/499-428/7 which have been assigned to his lifetime<sup>61</sup> may well be approximately correct. Empedocles' *floruit* in that case may be considered to have been somewhere around the middle of the fifth century B.C. It is impossible to determine how old he was when he wrote his work *On Nature*.

The difficulty of assigning dates to works in the Hippocratic *Corpus* is notorious. All that can be said with any confidence is that *Ancient Medicine* was definitely and Anaxagoras' work most probably written after Empedocles' poem, *On Nature*. It seems most unlikely that Anaxagoras' work was written any later than 440 B.C., for Socrates remarks in the *Phaedo* (97B ff.) that he had read his work as a young man and was disappointed in him. It is possible that Empedocles could have written his work as early as c. 460 B.C. and Anaxagoras his as late as c. 440 B.C. But could *Ancient Medicine* have been written in the interval and influenced Anaxagoras?

Jones thinks not and claims that the date of the composition of the treatise falls between 430 and 400 B.C.<sup>62</sup> His claim rests on the argument that the author of *Ancient Medicine* lived after Empedocles, Anaxagoras, and Protagoras. As we saw, the similarities between the medical work and the fragments of Anaxagoras, pointed out more recently at greater length by Vlastos, had previously been noticed by Jones, who is likewise of the opinion that it was the philosopher who influenced the medical work. His claim that the treatise was written after Protagoras' work is based upon an allusion to the πάντων μέτρον ἄνθρωπος of Protagoras which he believes he has found in Chapter 9 of the medical treatise:

μέτρον δὲ οὔτε ἀριθμὸν οὔτε σταθμὸν ἄλλον, πρὸς ὃ ἀναφέρων εἴση  
τὸ ἀκριβές, οὐκ ἂν εὖροις ἄλλ' ἢ τοῦ σώματος τὴν αἴσθησιν.

Jones also sees in the words θηριώδεις διαίτης in Chapter 3 a reminiscence of Democritus. His reference is to the sketch of the rise of human culture preserved in the history of Diodorus Siculus,<sup>63</sup> which Reinhardt originally suggested should be attributed to Democritus. This view, however, has been contested by other scholars on the ground that the sketch contains no clear reference to atomism. Although this objection does not preclude the possibility of Democritus' being its source, since much of his biological thought, for example, is not explicitly based on his hypothesis, the sketch may be pre-atomic or perhaps more probably have been written by some eclectic who drew from earlier thinkers ideas which served his own purpose. Jones' argument that the medical work is post-Democritus is not a strong one. The Atomist could just as well have been influenced by the medical author, and, in any case, the idea that men initially lived a primitive animallike life was certainly in the air before the middle of the fifth century B.C.<sup>64</sup>

Wanner also believes that the treatise is later than Protagoras, and claims to have found certain sophistic elements in it.<sup>65</sup> He argues in addition that the author has adopted from Protagoras elements akin to

those which Plato attributes to the sophist in the dialogue of his name<sup>66</sup> and made use of them for his presentation of the old theory of medicine. Finally, like Jones, he believes that the Protagorean theory of relativity is in evidence.

The first two arguments of Wanner are not convincing. In the first place the treatise contains no trace of the artificialities which are usually associated with sophistic rhetoric, although here and there we find a few touches which are very mildly rhetorical. Little significance can be attached to these, for, as Finley has shown,<sup>67</sup> there is evidence of some degree of rhetoric in Greek literature at least as early as 442 B.C. Secondly, there is absolutely no reason to assume that the medical author could not have put forward on his own account the parallel between the doctor of his own day who prescribes a diet for the sick and the man who originally replaced a savage, brutish mode of life by a more suitable form of nourishment without having been influenced by the sophist. Wanner's last argument is the most important of the three and will be given closer attention.

First, however, it may be noticed that Taylor,<sup>68</sup> followed by Festugière,<sup>69</sup> maintains precisely the opposite thesis. He argues that Protagoras' "relativity formula" could not have made enough headway for our writer to have taken it into account; for if it had been widely accepted, it would have gravely affected his contention that medicine, while relying on αἰσθησις, is nevertheless a surely established τέχνη. He also claims that the treatise contains "no trace of the scepticism about science, which was so characteristic of the time of the Archidamian war." Two other considerations help Taylor to fix the date of the work. On the one hand, since it treats Empedocles' four element theory as the latest and favourite cosmological speculation, it cannot be much earlier than the middle of the fifth century; on the other (Taylor argues), since the cosmologists are spoken of simply as σοφισταί, it may be assumed that the name had not yet been specially appropriated to describe those itinerant educators of men.

The author of *Ancient Medicine* uses the term "new-fangled" (καινῆς)<sup>70</sup> to describe the procedure of those who sought to base medical theory upon a hypothesis such as the hot, the cold, the wet, and the dry. The use of this term seems to imply that the treatise was written not long after the influence of Empedocles' thought had made itself felt. We can also agree with Taylor that the term σοφιστής does not bear here the technical sense of "Professor of Wisdom, who informs for money," but is used rather in the old sense of "sage" or "expert."<sup>71</sup> But, as Festugière points out,<sup>72</sup> no conclusion can be drawn from this concerning the

date of *Ancient Medicine*, because the word continued to be employed in the sense simply of "sage" for a long time after the advent of the sophists.<sup>73</sup>

As we saw, the argument was advanced that the medical treatise was written after the *Ἀλήθεια* because of an alleged allusion to the Protagorean formula in Chapter 9. But the meaning of this passage seems to be not that there are no objective standards at all but rather that they are inapplicable in the case of medicine. As Festugière well says,<sup>74</sup> what these words seek merely to show

c'est qu'il n'y a pas, en médecine, de critère d'une sûreté absolue comme lorsqu'il s'agit de nombrer, de mesurer des grandeurs ou des poids, il n'y a pas d'autre critère que l'*αἴσθησις* corporelle. Mais le corps se comporte généralement de la même manière en telle et telle circonstance, on peut donc observer, voire expérimenter, et c'est cette méthode d'observation que notre auteur préconise.

In Chapter 20 the writer argues that cheese does not harm all men alike, for some can eat their fill of it and are thereby strengthened, whereas others come off badly. But here, too, there is absolutely no need to assume that he is under the influence of Protagoras, for there is nothing here which could not quite naturally have occurred to someone who practised medicine.

The argument of Taylor and Festugière, on the other hand, that the medical work was written before the "relativity formula" had made sufficient headway for the writer to have taken account of it, as otherwise it would have affected his claim that medicine was an established *τέχνη*, is very doubtful. The tradition that he drew up the laws for Thuri<sup>75</sup> suggests that he believed in the possibility of a *πολιτικὴ τέχνη* at least, and a belief in sheer subjectivism would hardly recommend him for the post.

In the *Theaetetus* (161e) the question is asked how, if man is the measure of his own knowledge, as he himself says, Protagoras could set himself up to be wiser than others. Protagoras answers:

For I do indeed assert that the truth is as I have written: each of us is a measure of what is and what is not; but there is all the difference in the world between one man and another just in the very fact that what is and appears to one is different from what is and appears to another . . . By a wise man I mean precisely a man who can change any one of us, when what is bad appears and is to him, and make what is good appear and be to him.  
(166d-167c)<sup>76</sup>

In view of the fact that it is particularly emphasized that this is the answer Protagoras himself would have made had he been alive, and that

it is accepted as such by Theodorus, an old admirer of Protagoras, it may be inferred that it is put forward as an honest attempt to explain what the latter meant and how his theory was not incompatible with his claim to be a practical teacher.<sup>77</sup> Taylor's argument, then, cannot stand, as there is nothing in Protagoras' thought which would have affected the author of *Ancient Medicine's* claim that medicine was an established τέχνη. Taylor's other argument that scepticism about the sciences is characteristic of the time of the Archidamian War is equally unconvincing. It is true that at this period social and ethical problems increasingly engaged the attention and interest of thinkers, but this is not to say that there was a general scepticism about science.

Although Taylor's arguments in support of his claim that *Ancient Medicine* was written before Protagoras' views became widespread are unacceptable, his general viewpoint may, in fact, be correct. For it is not impossible that the medical work could have influenced the sophist. In Chapter 9 the medical author points out (perhaps, as Festugière suggests, in reaction to Empedocles) that in medicine there are no exact standards, reference to which would give exact knowledge; there is only the αἴσθησις of the body which is the μέτρον in this case. Protagoras could have extended this view and claimed that there are, in fact, no absolute standards at all and that the αἴσθησις τοῦ σώματος (or ἄνθρωπος) is the μέτρον in every case.<sup>78</sup> If this were so, he would be expected to be inimical to the idea that there could be such standards as number and weight. It may, then, be significant that we learn from Aristotle,<sup>79</sup> whose information comes perhaps from Protagoras' own treatise *Περὶ τῶν μαθημάτων*, that he attacked the geometers and in particular their assertion that the tangent touched the circle only at a point. Moreover, the definition of a "wise man" given in the *Theaetetus* is at least consistent with Protagoras' having been influenced here by medicine, for the doctor is cited as an example of such wisdom. It is also interesting to note that Aristotle in the *Metaphysics*, where he is conjecturing as to the origin of the formula, puts forward the possibility of a medical origin.<sup>80</sup>

By the foregoing arguments we hope to have shown, at least, that the possibility of *Ancient Medicine's* having influenced Anaxagoras should not be too hastily dismissed. Now let us turn to our second claim that, granted the influence between them, it would be natural to assume that the medical work influenced the philosopher rather than vice versa.

Before doing so, it may be advisable to anticipate an objection. "How is it possible," one might ask, "that a work in the Hippocratic *Corpus* could have been written early enough to have influenced Anaxagoras?"

Our answer is simple. It must not be assumed that, because the collection of medical treatises is termed the "Hippocratic *Corpus*," "Hippocratic" medicine itself sprang into being fully grown. Hippocrates himself must have had teachers, and there are works in the *Corpus* which are considered by some scholars as pre-Hippocratic.<sup>81</sup> The similarities between *Ancient Medicine* and those writings in the *Corpus* which are generally assigned by scholars to Hippocrates himself, e.g. *Prognostic*, *Epidemics* I and III, and especially *Regimen in Acute Diseases*,<sup>82</sup> could easily be explained if the former were the honoured work of an older colleague.

Both Littré<sup>83</sup> and Steckerl,<sup>84</sup> however, believe that *Ancient Medicine* was written by Hippocrates himself. They base their argument on the supposed resemblance between *Phaedrus* 270 C-D and part of Chapter 20. Granting their claim, if the traditional date of Hippocrates' birth be accepted (c. 460 B.C.),<sup>85</sup> then the treatise could not have been written at the time we claim. This passage in the *Phaedrus*, however, is extremely controversial, and another interpretation<sup>86</sup> implies that it is necessary for the physician to know cosmology — a view which is emphatically rejected in *Ancient Medicine*. (Galen,<sup>87</sup> it may be added, believes that Plato is here referring to *Nature of Man*.)

Two considerations seem to us to weigh very heavily against the possibility of the author of *Ancient Medicine*'s being influenced by Anaxagoras. In the first place, it would be thoroughly disingenuous of him to stress repeatedly throughout the treatise that medicine is an established art with its own methods of research and based upon long practical experience, if he had, in fact, derived his theory from Anaxagoras. It might be countered that while the overrestrictive hypothesis of Empedocles is vigorously attacked by the medical writer, the much less economical theory of Anaxagoras, with its indefinitely numerous "powers," would have appealed more to his outlook; for we see that, while in the first chapter of the treatise its author is bitterly opposed to the idea that it is possible to "narrow down the primary cause of men's diseases and death by postulating one thing or two as the same cause for all," he stresses in the fourteenth chapter that the constituents of men are "salt, bitter, sweet, acid, astringent, insipid, and countless other things, possessing powers of all kinds in number and in strength." But this objection is clearly invalid. In addition to his hostility towards the philosophical postulate generally, we have his express statement that "medicine has long had everything to hand, with a principle and method already discovered, by which many excellent discoveries have been made over a long period; while what remains will be discovered, if the

inquirer be competent and familiar with discoveries already made, conducting his researches with these as his starting point. But whosoever spurns and rejects all these, attempting to conduct research after a different method and fashion, and then declares that he has made some discovery, deceives and is deceived." Moreover, if the author of *Ancient Medicine* had been indebted to Anaxagoras for his theory, in view of his emphatic denial of the possibility of knowledge about τὰ μετέωρα,<sup>88</sup> some disavowal of Anaxagoras' attempt to extend his theory to cover this sphere, too, would have been expected.

The theory outlined in the medical work is basically that propounded by Alcmaeon, who holds that when the various powers are mixed and blended there is *ἰσονομία*, but when one of them has been "separated off" and "stands alone" it then gains *μοναρχία* over the others and causes a man pain. An origin as early as this, or even earlier, is consistent with the author's claim that medicine is an established art based upon long practical experience.

Finally, as we noted above, there is the reversal in outlook between Empedocles and Anaxagoras. The former largely argues from macrocosm and applies his theories about the world at large to man himself, whereas the latter, influenced by such physiological problems as growth and nutrition, argues from microcosm to macrocosm, almost as if he were giving heed to the assertion in Chapter XX of *Ancient Medicine* that clear knowledge about natural science can be acquired only from medicine:

νομίζω δὲ περὶ φύσιος γινῶναι τι σαφές οὐδαμῶθεν ἄλλοθεν εἶναι ἢ ἐξ ἱητρικῆς . . .

We hope to have shown by the above arguments how philosophy is here indebted to contemporary medical theory. But even if these arguments are not accepted, it is still apparent that Anaxagoras' physiological interests, aroused by the widening influence of medicine, exercised an enormous influence upon his physics; for it was these interests which suggested to him a way round the Eleatic elenchus.

#### APPENDIX A

Our sole testimony to Alcmaeon's date is Aristotle at *Metaphysics* A5 986a29 (DK24A3). The text as it stands is obviously corrupt. Ross, in his edition of the *Metaphysics*, regards the words ἐγένετο τὴν ἡλικίαν and ἐπὶ γέροντι Πυθαγόρα, which are omitted by one MS and ignored by Alexander, as later additions. He believes, however, that the statement is

likely enough to be true and appeals to the evidence of Iamblichus *V.P.* 104, where Alcmaeon is included among the contemporaries of Pythagoras "young in his old age." But as this same list also contains the names of Philolaus, Archytas, and Leucippus it is of no value as evidence. Ross argues that the suspiciousness of these words is further increased by the fact that Aristotle only once mentions Pythagoras elsewhere and nowhere claims any knowledge of his date. This argument is doubtful. Aristotle wrote a work on the Pythagoreans, now unfortunately lost, in which he did mention Pythagoras (cf. *Frag.* 5). Moreover, this is the obvious context where Aristotle would assign a date to Alcmaeon; only here (984a11) does he "date" Anaxagoras and Empedocles. Even if Ross's facts were correct, his reasoning is unsound. It is a curious argument to claim that Aristotle only once mentions Pythagoras elsewhere and nowhere claims any knowledge of his date and on the basis of this one other context reject the passage where he is named and apparently "dated." Heidel claims ("The Pythagoreans and Greek Mathematics," *A.J.P.* 61, 1940, p. 5) that we have here a marginal note carelessly embodied in the text, perhaps derived from Porphyry (*sic*; Iamblichus, he should have said). It is also possible that this statement rests on no more firm a basis than that someone (perhaps Sotion?) had fitted him into a line of succession. Even if this dating does represent the opinion of an interpolator and not that of Aristotle himself, as Raven points out (*The Presocratic Philosophers* [Cambridge 1957] p. 232 n.1), there is no reason why it should not be approximately correct. If these words bracketed by Ross (in agreement with Zeller and Jaeger) are in fact a gloss, a curious repetition in the text must then be explained. Diels reads:

καὶ γὰρ ἐγένετο τὴν ἡλικίαν Ἀλκμαίων (νέος) ἐπὶ γέροντι Πυθαγόρᾳ ἀπεφάνητο δὲ παραπλησίως τούτοις.

This reading does get round the latter difficulty.

Until quite recently it was the generally accepted opinion that Alcmaeon was a Pythagorean, although Wachtler (*De Alcmaeone Crotoniata*, diss. Leipzig 1896, p. 104) stoutly declared "assecla non fuit." Later writers have been more guarded, with the exception of Zafriropulo (*Empédocle d'Agrigente* [Paris 1953] p. 60) and Sambursky (*The Physical World of the Greeks* [London 1956] p. 53), both of whom refer to him unreservedly as a Pythagorean. This claim is based upon the following evidence: Alcmaeon lived at Croton, where Pythagoras first established his Order; Diogenes Laërtius tells us that he "heard Pythagoras" (καὶ οὗτος Πυθαγόρου διήκουσε, VIII 83 DK24A1). Finally there is this assertion of Aristotle in the *Metaphysics* that Alcmaeon may have derived his theory of opposites from the Pythagoreans.

Diogenes' remark that Alcmaeon "heard Pythagoras" may mean no more than that someone fitted him into a line of succession. Burnet's assumption (*Early Greek Philosophy* p. 194) that he dedicated his treatise

to the Pythagoreans, though accepted by Ross (note on *Metaphysics* A5 986a27ff.) and even Heidel (*A.J.P.* 61, 1940, p. 4), has been shown by Vlastos to be misguided. He points out that we have no parallels for dedications at this period, and a discourse which takes the form of a personal address, like that of Empedocles to Pausanias, does not necessarily imply agreement with the views held by the person to whom it is addressed ("Isonomia," *A.J.P.* 74, 1953, p. 344 n.25). Finally we turn to the passage in the *Metaphysics* where Aristotle declares that Alcmaeon either derived the theory of opposites from the Pythagoreans or they from him. Far from being evidence that Alcmaeon was a Pythagorean, this passage surely implies that Aristotle did not regard him as such. The notion that the world displays a perpetual contrast between opposites is a common one. Alcmaeon could have considered this idea confirmed by medical practice without being influenced by Pythagorean philosophy. Furthermore, as Vlastos points out (*ibid.*, p. 345), two pairs of opposites which, on any view, are characteristic of Pythagoreanism, viz. the Peras-Apeiron and Odd-Even, are conspicuously absent from those of Alcmaeon and, moreover, are alien to all that is known of Alcmaeon's thought. The only point of contact, in fact, between the two groups is that of "the good and the bad," which is too commonplace to be significant. Why Aristotle should consider that such a natural point of view must have been borrowed by either from the other — especially as he himself has just emphasized the importance of the role of certain contraries in Ionian thought — is a mystery. It would, we may note, be much less of a mystery if the relative dating of Alcmaeon and Pythagoras in this passage of the *Metaphysics* were that of Aristotle himself.

## APPENDIX B

Empedocles' use of pores to get round one aspect of the Eleatic *elenchus* seems, at first sight, to be quite an ingenious solution. Yet, on closer examination, it proves to be not quite such a happy solution, for there are seen to be fundamental inconsistencies in it. It is, in the first place, a curious assertion that only those things can mix whose pores are symmetrical (*de Gen. et Corr.* A8 324b26, DK31A87). It would be easy to understand if, for example, one body had pores and the other was fluid. But it is not thought that sponges are good at absorbing sponges. It has been suggested that what Empedocles really meant was that one of the constituents was porous and the other fissible into particles, which could then fuse with the pores. This explanation, however, is unsatisfactory, for if, as Empedocles says, "it is with earth that we see earth, water with water etc." (Fragment 109), why should one lump of earth, for example, have different qualities, i.e. porous, from another, i.e. fissible into parts?

Aristotle asks (*de Gen. et Corr.* A8 326b6) whether the pores are empty or full. They can hardly be empty in view of Empedocles' emphatic denial

of the void (Fragments 13 and 14). But if they are full Aristotle considers that they are then superfluous. Perhaps Aristotle is a little unfair here and Philoponus preserves for us Empedocles' own answer (178, 2 DK31A87):

ἴσμεν δὲ ὅτι οἱ τοὺς πόρους ὑποτιθέμενοι οὐ κενούς ὑπετίθεντο τούτους, ἀλλὰ πεπληρωμένους λεπτομερεστέρου τινὸς σώματος ὅσον ἀέρος.

and 154, 5:

διαφέρουσι δὲ τοῦ κενοῦ οἱ πόροι, διότι οἱ τοὺς πόρους εἰσάγοντες κενὸν εἶναι οὐκ ἔλεγον.

For it is unlikely that Empedocles would have made his pores full of "what is not."

As a theory, then, it seems upon superficial examination plausible enough. Upon closer examination, however, serious inconsistencies appear. In Fragment 109 it is claimed that perception is of "like by like" and that with air we perceive air. But this is surely ridiculous; for air apparently has within it pores filled with air into which air fits. Similarly in his physics air would be able to mix with air because the pores of each part of air (already filled with air) are symmetrical. Aristotle (*de Gen. et Corr.* A8 324b26) claims that Empedocles held the theory that it is possible to see through air, water, and diaphanous things generally because they have numerous pores arranged in rows all over them, invisible owing to their smallness. The more pores a body has the more transparent it is. If Aristotle is correct and Empedocles did put forward this theory to explain the transparency of some bodies, the same inconsistencies again appear. If Empedocles claims that we can see through air because it has numerous invisible pores, then these pores must be either full or empty. If they are empty, Empedocles has fallen into the very error he is attempting to avoid; if they are full, they are filled with air. Thus we have the ridiculous explanation that air is transparent because it has numerous pores all filled with air!

## NOTES

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1. J. H. Breasted, *The Edwin Smith Surgical Papyrus* (Chicago 1930) vol. I p. 14.

2. Cf. Warren R. Dawson, "Egypt's Place in Medical History" in *Science, Medicine and History, Essays in Honour of Charles Singer* (Oxford 1953) vol. I p. 58.

3. It has been suggested from the nature of the wounds described in the papyrus that its author was a surgeon in the army.

4. It may be pointed out here that in the Greek view of the origin of medicine (by contrast with astronomy and mathematics) no debt to Egypt or Mesopotamia is acknowledged (cf. *Ancient Medicine* Chapter 3 and *Republic* 405f.).

5. *Paideia* (Eng. trans.) vol. 3 Book 4 p. 4.

6. Cf. *Airs Waters Places* III and *The Sacred Disease* VIII.

7. W. H. S. Jones' translation, Loeb *Hippocrates* vol. II.

8. Cf. Fragment 112.

9. Cf. Fragment 111. M. Wellmann, *Fragmentsammlung der griechischen Ärzte* vol. I *Die Fragmente der Sikelischen Ärzte* (Berlin 1901) p. 29 n.1, claims that when the author of *The Sacred Disease* speaks slightly of "magicians and purifiers and charlatans and quacks" (Chap. 2 Littre) he is speaking of Empedocles. There certainly seem to be affinities between the above fragment and chapter 4 of this work. This view is strengthened when we find the author stressing that it is with the brain that our "pleasures, joys, laughter and jests as well as our sorrows, pains, griefs and tears arise," and later attacking the view that we think with the heart and that it feels pleasure and pain. Compare Chapters 14 and 17 (Littre) with Empedocles' Fragments 102-109, especially 105 and 107.

10. Wellman (above, n.9) pp. 68ff.

11. J. Burnet, *Early Greek Philosophy* (London 1930) p. 200.

12. Cf. Fragments 84, 96 and 98; Aëtius V, 22, 1 (DK31A78); Theophrastus *de Sens.* 7 (accepting *καὶ ὄσωρ* with Diels after Karsten) and 10-11 (DK31A86).

13. *Theophr. de Sens.* 43 DK64A19.

14. Galen, in *Epid.* VI, *comm.* II (XVII A 1006, 8 Kühn DK64B9), tells us that while almost all the doctors agreed that the male was not only formed before the female but was also the first to move, Rufus said that Diogenes alone disagreed with this. (Rufus' assertion is inconsistent with Censorinus' statement at *de die nat.* 9, 2 DK64A26.) This passage is by no means conclusive in itself that Diogenes was a doctor. We have, however, further hints as to his medical interests. Again from Galen (*On Medical Experience* XXII 3, translated from the Arabic by R. Walzer [Oxford 1944]), we learn that "Diogenes, writing more briefly and compendiously than you (sc. Asclepiades), has collected the diseases and their causes and remedies in one treatise." This Diogenes may be the Apolloniate. From Theophrastus (*de Sens.* 43) and from another medical writer ([Galen] *de humor.* XIX 495 KDK64A29a) we learn that the latter held views about the possibility of diagnosis by the tongue and the colour of the patient.

15. W. H. S. Jones' translation (with slight modification) in *Philosophy and Medicine in Ancient Greece* (Baltimore 1946) p. 65f.

16. It may be noted here that the suggestion has been made that there is evidence of the four element theory before Empedocles. O. Gigon (*Untersuchungen zu Heraklit* [Leipzig 1935] p. 99) writes: "Man kann kaum Frg. 126 für Heraklit beanspruchen und zugleich die Vier-Elementenlehre ihm absprechen" and uses this fragment as evidence for accepting air as Heraclitean in Frg. 76. K. Reinhardt (*Parmenides* [Bonn 1916] p. 223) even goes so far as to hold that since no one can have known of the four elements as early as the traditional date of Heraclitus, this date must be wrong and the latter was actually younger than Parmenides. G. S. Kirk, however, rightly points out (*Heraclitus: The Cosmic Fragments* [Cambridge 1954] pp. 342-44) that the mention of air in Frg. 76 is almost

certainly due to Stoic influence and that Frgs. 31 and 36 show sufficiently clearly that Heraclitus held that there were three, not four, world masses.

17. Cf. *Anon. Lond.* XX, 25: "Philiston thinks that we are composed of four 'forms,' that is, of four elements — fire, air, water, earth. Each of these too has its own power (*δύναμις*): of fire, the power is the hot, of air it is the cold, of water the moist, and of earth the dry."

18. Chapters 4 and 5.

19. Jones (above, n.7) vol. II p. 225.

20. Theophrastus, we may note, in the *de Sensibus* 39ff., informs us that Diogenes held that the sense-organs were connected with the brain. This belief the latter may have derived from Alcmaeon.

21. Cf. *de Sens.* 25ff. DK24A5 and Aët. IV, 17, 1 DK24A8. Cf. Clem. *Strom.* VI, 16 (DK22B36); Stob. *Flor.* III, 5, 7 (DK22B117) and III, 5, 8 (DK22B118).

22. Cf. Chapter 4ff.

23. *On Medicine* Bk. III 4, 15.

24. Burnet (above, n.11) p. 201 n.4.

25. It is possible that a few genuine fragments have survived. See Diels/Kranz, *Die Fragmente der Vorsokratiker*<sup>8</sup>, vol. I pp. 214f.

26. W. A. Heidel, *Hippocratic Medicine* (New York 1941) p. 42.

27. In addition to his medical and physiological interests, we have evidence that he was also interested in astronomy (Aët. II 16, 2.3, II 22, 4, and 29, 3, DK24A4) and the nature of the soul (Aristotle *de Anima* A2.405a29 and Aët. IV 2, 2, DK24A12).

28. See Appendix A.

29. V 30, 1 (DK24B4): 'Αλκμαίων τῆς μὲν ὑγείας εἶναι συνεκτικὴν τὴν "ἰσονομίαν" τῶν δυνάμεων, ὑγροῦ, ξηροῦ, ψυχροῦ, θερμοῦ, πικροῦ, γλυκεῖος καὶ τῶν λοιπῶν, τὴν δ' ἐν αὐτοῖς "μοναρχίαν," νόσου ποιητικὴν. φθοροποιὸν γὰρ ἐκατέρου μοναρχίαν.

30. The terms *ἰσονομία* and *μοναρχία*, if actually used by him, mark the application of politico-social concepts to the physical sphere in the manner of Anaximander and Heraclitus cf. Heidel (above, n.26) p. 47, and G. Vlastos, "Equality and Justice in Early Greek Cosmologies," *Class. Phil.* 42 (1947) pp. 168ff. It should be noticed, however, that other terminology in the passage, viz. *συνεκτικὴν*, is late.

31. Cf. Simplic. *Phys.* 32, 3 (DK31B98); Aët. V 22, 1 (DK31A78); and Theophr. *de Sens.* 10-11 (DK31A86).

32. Cf. *Anon. Lond.* XX 25.

33. Cf. *Timaeus* 81e6ff.

34. A. E. Taylor, *Commentary on Plato's 'Timaeus'* (Oxford 1928) p. 448.

35. Medicine exercised another important influence upon ethics. As Jaeger has convincingly shown, Aristotle employs medicine as his model for the conduct of ethical enquiry ("Aristotle's Use of Medicine as a Model of Method in his Ethics," *J.H.S.* 77, 1957, pp. 54-61).

36. Parmenides' interest in these matters may be significant. If he could show in the *Way of Opinion* how an equally or even more plausible explanation could be given to the old problems first mooted by the cosmologists and, what is more, how even the most "modern" biological and physiological queries could be plausibly answered upon such a simple, albeit erroneous basis, he would have considerably reinforced his opinion in the *Way of Truth*. After Alcmaeon, we find such physiological questions as the nature of the semen, sex differentiation, the reason for the sterility of mules, the cause of sleep, the mode of nourishment

of the embryo etc. almost standard topics of enquiry among the physicists.

37. Cf. *de Sens.* 25f. (DK24A5).
38. Cf. in *Timaeum* ed. Wrobel p. 279 (DK24A10).
39. Cf. Theophr. *de Sens.* 7 (DK31A86) and Plato *Meno* 76C (DK31A92).
40. Cf. *de Respiratione* 473b1ff. (DK31B100).
41. J. Burnet, *Greek Philosophy from Thales to Plato* (London 1914) p. 75.
42. Taylor (above, n.34) p. 282.
43. Cf. Vlastos' review of F. M. Cornford's *Principium Sapientiae* in *Gnomon* 27 (1955) p. 69.
44. Theophr. *de Sens.* 26.
45. *Ibid.*
46. Cf. *Aristotle de Gen. et Corr.* A8, 324b26 (DK31A87). See Appendix B.
47. Cf. Fragment 17, l. 22ff.
48. S. in *Gregor. Naz.*, XXXVI 911 Migne (DK59B10).
49. The more probable interpretation of *Metaphysics* A3, 984a11 (DK59A43): *Ἀναξαγόρας δὲ ὁ Κλαζομένιος τῇ μὲν ἡλικίᾳ πρότερος* (sc. Empedocles), *τοῖς δ' ἔργοις ὕστερος* . . . is, in our opinion, that Anaxagoras, though older than Empedocles, was later in his philosophical activity. Theophrastus further informs us that Empedocles was "born not much later than Anaxagoras" (cf. Simplicius *Physics* 25, 19 from Theophr. *Phys. Opin.* frag. 3 Dox. 477.17 DK31A7). The latter half of Aristotle's statement is ambiguous and Alexander (in *Metaph.* 28.1-10) interprets *ὕστερος* as meaning "inferior" or "second-rate." This interpretation, though possible, seems to us the less probable of the two. Three reasons lead us to our opinion. In the first place, if *πρότερος* and *ὕστερος* did have a purely temporal connotation, there would be a greater sense of balance in the sentence. Aristotle would then be giving a good reason why he was considering Empedocles' theories before those of Anaxagoras, viz. despite the fact that the latter was the older of the two, the younger man's work was actually written earlier. Finally, we may notice that Anaxagoras does apparently find a place in his system for Empedocles' four elements. Aristotle tells us that, unlike Empedocles, he did not regard them as primary substances but rather as mixtures of seeds (*de Caelo* III 3, 302a28 DK59A43). Moreover, Fragment B8, where it is maintained that the things in one world are not divided the one from the other, neither the hot from the cold, nor the cold from the hot, seems to be a direct polemic against Empedocles (cf. Burnet [above, n.11] p. 262, and G. Vlastos, "The Physical Theory of Anaxagoras" *Phil. Rev.* 59, 1950, p. 38). Diogenes Laërtius records that the sophist Alcidas claimed that Empedocles was a "hearer" of Anaxagoras (VIII 56DK14.5). The further claim that Empedocles also "heard" Pythagoras is sufficient to discredit the value of this passage as evidence (cf. Vlastos' review of F. M. Cleve's *The Philosophy of Anaxagoras* [New York 1949] in *Phil. Rev.* 59, 1950, p. 125 n.1). In the Paris MS. of *Metaphysics* A, 985a20-30 the reading is: *Ἐμπεδοκλῆς μὲν οὖν παρὰ τοὺς πρότερον πρῶτος ταύτην τὴν αἰτίαν διελὼν εἰσήνεγκεν* . . . which seems to testify to the priority of Empedocles' work. The variant reading *τὸ τὴν αἰτίαν διελεῖν*, however, is given by the Laurentian. For a recent discussion of the relative dating of Empedocles and Anaxagoras, which draws the opposite conclusion, see C. H. Kahn, *Anaximander and the Origins of Greek Cosmology* (New York 1960) p. 163.
50. Aët. 1, 3, 5 (DK59A46).
51. *Physics* 460, 4 (DK59A45).
52. Cf. Vlastos, "The Physical Theory of Anaxagoras," p. 32.

53. These similarities, previously noticed by W. H. S. Jones (*Philosophy and Medicine in Ancient Greece* [above, n.15] p. 78) and F. Heinimann (*Gnomon* 24, 1952, p. 272), are pointed out at length by Vlastos in his review of Cornford's *Principium Sapientiae* (above, n.43) p. 67 n.2.

54. Vlastos, *ibid.*, points out that although A.-J. Festugière (*Hippocrate l'ancienne médecine* [Paris 1948] p. 53) adduces a number of instances of *αὐτὸ ἐφ' ἑωυτοῦ* in the other Hippocratic writings, these refer to things like bread, meat, fish, honey, etc., and not to their constituent *δυνάμεις*. The only two references to the latter are in the fragments of Anaxagoras and in *Ancient Medicine*.

55. Festugière (above, n.54) p. 54 n.56.

56. Cf. *de Partibus Animalium* D2 677a5 (DK59A105).

57. Cf. Chapter 19.

58. Cf. Theophr. *de Sens.* 32.

59. *Metaphysics* A3, 984a11 (DK31A6).

60. *Phys. Op.* Frag. 3 *apud Simplicium Physics* 25, 19 (DK31A7).

61. Adopting Scaliger's emendation *ὀγδοηκοστῆς ὀγδότης* and reading, with Taylor, *ἐπὶ Καλλιάρχου* for *ἐπὶ Καλλίου* in the Diogenes Laërtius passage (II, 7 DK59A1).

62. Jones (above, n.15) p. 47. The majority of modern scholars are at least agreed that the treatise was written in the fifth century B.C. Hans Diller, however, has argued for a considerably later dating and seeks to show that *Ancient Medicine* was written during the period of Plato's later writings "zwischen dem späten Platon und Aristoteles" ("Hippokratische Medizin und attische Philosophie," *Hermes* 80, 1952, pp. 385-409); but see J.-H. Kuehn, "System- und Methodenprobleme im Corpus Hippocraticum," *Hermes Einzelschriften* 11 (1956) pp. 46-56, and, more recently, F. Heinimann's article "Eine vorplatonische Theorie der *Τέχνη*," *Museum Helveticum* 18 (1961) fasc. 3 p. 112 n.32.

63. Book I chapters 7 and 8 (DK68B5).

64. Cf. Prometheus' speech in Aeschylus' *Prometheus Bound* 450ff. (written presumably between 467-458 B.C.).

65. H. Wanner, *Studien zu περὶ ἀρχαίας ἱητρικῆς*. Diss. Zürich 1939 *Sophistisches* pp. 81-92.

66. *Protagoras* 320 C.

67. Cf. J. H. Finley, "The Origins of Thucydides' Style," *Harvard Studies in Classical Philology* 50 (1939) p. 53.

68. Taylor (above, n.34) p. 524.

69. Festugière (above, n.54) p. 59 n.69.

70. Chapter I *sub. fin.* Jones adopts the reading of M *κενῆς* (Loeb *Hippocrates* vol. I p. 12 and *Philosophy and Medicine* [above, n.15] p. 50). But see Festugière (above, n.54), p. 33 n.12.

71. Cf. Herod. I 29 and IV 95; Aesch. *P.V.* 62 and 944 and Pind. *Isthm.* V 28.

72. Festugière (above, n.34) p. 56.

73. Cf. for example, Xen. *Mem.* I, 1, 11; *Hipp. Maj.* 281d; *Meno* 85b3. The historian Androtion calls the Seven Sages "sophists" (Aristid. 46 [II 407 Dind.] DK79 1): so too Aristotle, *Frag.* 5 Rose.

74. Festugière (above, n.54) p. 60. As Festugière says, this passage may be a direct reaction to Empedocles, who sought to introduce this notion of measure into the composition of bodily tissues (*ibid.* p. 43).

75. Diog. L. IX 50 (DK80A1).

76. F. M. Cornford's trans., *Plato's Theory of Knowledge* (London 1935) p. 70f.

77. Theodorus does at one point complain that they are running Protagoras too hard, but this occurs later in the dialogue (171C-D) where Socrates has turned from his defence of the formula to a criticism of it.

78. If we are correct, then Burnet's query why Protagoras should have used the term μέτρον is easily answered (above, n.41, p. 114). Burnet is correct that the phraseology is odd. Cf. Sextus *Pyrrh. Hypot.* 1 216ff. DK80A14.

79. Aristotle *Metaphysics* B2, 997b32 (DK80B7).

80. *Ibid.* 1062b12ff.

81. E.g., *Prorrhetic* 1, *Prenotions of Cos*, and *Sevens* (see Jones's Introduction [above, n.7] vol. I p. xii for further references). The dating of this last work is extremely controversial. W. H. Roscher ("Die hippokratische Schrift von der Siebenzahl," *Studien zur Geschichte und Kultur des Altertums* VI, Paderborn 1913) has argued for a mid-sixth-century date, but few, if any, other scholars now accept his views (cf., e.g., Abel Rey, *La Jeunesse de la science grecque*, Paris 1933, pp. 437-438; Franz Boll, *Das Lebensalter*, Leipzig and Berlin 1913, pp. 54-58; and H. Diels, in *Deutsche Literaturzeitung* XXXII, 1911, cols. 1861-66).

82. Cf. Jones (above, n.7) vol. I p. 3, and *Philosophy and Medicine* (above, n.15) p. 96, additional note E.

83. E. Littré, *Oeuvres complètes d'Hippocrate* (Paris 1839-61) vol. I pp. 294-310.

84. F. Steckerl, "Plato, Hippocrates and the Menon Papyrus," *Class. Phil.* 40 (1945) pp. 166-180.

85. Aulus Gellius, however, says (*N.A.* XVII 21) that he was older than Socrates. If this is true, his birth would be before 470 B.C.

86. Festugière's note (above, n.34) p. 64 n.74 seems to us to settle the issue in favour of this view.

87. Galen XV, 9ff.

88. Cf. Chapter I.