

GALEN'S PATHOLOGY

Concepts and Contradictions

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PREFACE

This work is a by-product of an attempt, by a modern pathologist, to understand humoral pathology. For help over several years in obtaining literature, I am grateful to Mr Abel Moses of the Natal Institute of Immunology; to Mr Robin Price, Dr Vivian Nutton, and the staff of the Wellcome Institute for the History of Medicine; and to workers in several countries who have sent me reprints.

The entire dissertation (except, of course, for quotations from other authors, which are acknowledged) is my own original work. I thank Professor B.X. de Wet, the supervisor of the project, for many suggestions, and the University of Natal for a generous grant for texts.

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INTRODUCTION: SCOPE OF THE WORK

The primary aim of this work is an unambitious one: to find out what Galen thought about the pathology of internal diseases. Galen's surviving works are voluminous (twenty-two large volumes in the most complete edition, that of Kühn), and most of them are not particularly attractive as literature. As a result, very few people know exactly what he meant, for instance, by a dynamic plethos or an anomalous dyscrasia. It might be thought that anyone wishing to discover such things would have only to consult Kühn's index and read the passages involved. This, however, would be a recipe for disaster. Galen very frequently said different things, and sometimes diametrically opposite things, not only in different works, but sometimes in different parts of the same one. This was sometimes due to forgetfulness, but at others it is a result of his polemical methods. Galen is usually attacking someone when he writes, and what he says depends on who this is, and on how detestable or otherwise his doctrines seem to Galen at the time. Like Dr Johnson, he delivers himself of a vast mass of opinions on a great number of subjects, which are frequently contradictory; but just as the reader comes to the end of Boswell's book with the feeling that he knows Johnson, and can understand something of his thought in spite of the contradictions, so anyone who has read a fair number of Galen's works in their entirety should have some sort of understanding of his mind, and have a good idea what his true opinions were. It has not been possible to read everything that Galen wrote; as a writer far less prone to prolixity observed, the Art is long. The great majority of the works that have much relevance for his general pathology have, however, been examined, and the relevant material transferred to punch cards for subsequent sorting. Every work of Galen that is cited in this dissertation has been read in its entirety. The works are identified by abbreviations in the footnotes, to make it clear to the reader what sources have been used for any particular statement.

The work deals only with the general principles of Galen's general pathology: that is, what would now be called the pathology of internal medicine. His physiology, which has been dealt with

by others, is mentioned only where it seems relevant to his pathological ideas, and his psychology and psychiatry not at all; these are for experts in those fields to deal with. The treatment of his pathology has deliberately been kept as brief as possible, considering principles rather than details. Many of the matters considered could be, and I hope will be, the subjects of more detailed treatment in separate studies in the future.

Once Galen's ideas have been elucidated, a secondary aim of the work has been to put them roughly into the historical perspective of the time. To do this it is necessary to find out what his predecessors said about the subjects in question, and a substantial part of the work is taken up with summaries of their opinions. Particular attention has been paid to the writers of the Hippocratic corpus, to whom Galen so frequently declares his indebtedness; for this purpose the Corpus has also been read in its entirety.

Thirdly, in the course of the study it has become evident that there are certain contradictions, some of them fundamental, in Galen's doctrines; not in what he says, though this is full of contradictions too, but in the structure of his systems. These are considered, and the attempt is made where possible to understand how Galen could have come to hold such views.

In the interests of uniformity, all references to Galen and to the Hippocratic writers are to the editions of Kühn and Littré. Better editions of some of the works exist, and have been read where available. The references to Shakespeare and other modern writers are meant to show the persistence of Galen's ideas in popular thought.

To my knowledge there has been only one previous attempt to consider Galen's pathology. This was R.E. Siegel's Galen's System of Physiology and Medicine, subtitled "An Analysis of his Doctrines and Observations on Bloodflow, Respiration, Humors and Internal Diseases," published in 1968. Siegel was a physician with a great enthusiasm for Galen, but he had two grave drawbacks: he had preconceived ideas of what Galen ought to think, and he frequently did not give chapter and verse for his statements. If his work is mentioned less often than might be expected in this dissertation, it is because pioneers deserve gratitude rather than criticism.

ABBREVIATIONS

AD: (Caelius Aurelianus), Acute Diseases.

K: Claudii Galeni Opera Omnia, editionem curavit C.G. Kühn, 20 vols., reprinted 1964, Olms, Hildesheim. The seventeenth and eighteenth volumes are double, and are referred to as a and b. As this is a facsimile reproduction the pagination is the same as in the original, nineteenth-century edition.

L: Oeuvres complètes d'Hippocrate: traduction nouvelle, avec le text grec en regard... par E. Littré, 10 vols., reprinted 1962, Hakkert, Amsterdam. This is also a facsimile of the nineteenth-century edition.

The works of Galen cited in this study are identified in the footnotes as follows:

Adv. Jul. Adversus ea quae Juliano in Hippocratis aphorismos enunciata sunt, K XVIIIa, 246-299.

Adv. Lycum. Adversus Lycum, K XVIIIa, 196-245.

An in art. An in arteriis sanguis contineatur, K IV, 703-36.

Ars med. Ars medica, K I, 305-412.

De atra bile. De atra bile, K V, 104-148.

De cur. rat. per ven. sect. De curandi ratione per venae sectionem, K XI, 250-316.

De el. ex Hipp. De elementis ex Hippocrate, K I, 413-508.

De fac. nat. De facultatibus naturalibus, K II, 1-214.

De feb. diff. De febrium differentiis, K VII, 273-405.

De inaeq. intemp. De inaequali intemperie, K VII, 733-52.

De lib. prop. De libris propriis, K XIX, 8-48.

De loc. affect. De locis affectis, K VIII, 1-452.

De marcure. De marcure, K VII, 666-704.

De meth. med. De methodo medendi, K X, 1-1021.

De morb. caus. De morborum causis, K VII, 1-41.

De morb. diff. De morborum differentiis, K VI, 836-80.

De opt. const. De optima corporis nostri constitutione, K IV, 737-49.

De plac. H. & P. De placitis Hippocratis et Platonis, K V, 181-805.

- De plen. De plenitudine, K VII, 513-83.
- De san. tuend. De sanitate tuenda, K VI, 1-452.
- De sect. De sectis ad eos qui introducuntur, K I, 64-105.
- De sympt. caus. De symptomatum causis, K VII, 85-272.
- De sympt. diff. De symptomatum differentiis, K VII, 42-84.
- De temp. De temperamentis, K I, 509-694.
- De tremore. De tremore, palpitatione, convulsione et rigore, K VII, 584-642.
- De tum. praet. nat. De tumoribus praeter naturam, K VII, 705-732.
- De usu part. De usu partium corporis humani, K III, 1-933, K IV, 1-366.
- De usu resp. De utilitate respirationis, K IV, 470-511.
- De ven. sect. adv. E. De venae sectione adversus Erasistratum, K XI, 147-86.
- De ven. sect. adv. E. Rom. deg. De venae sectione adversus Erasistrateos Romae degentes, K XI, 187-249.
- In Hipp. de ac. vict. comm. In Hippocratis librum de acutorum victu commentarius, K XV, 418-919.
- In Hipp. aph. comm. In Hippocratis aphorismos commentarius, K XVIIb, 345-887, K XVIIIa, 1-195.
- In Hipp. de nat. hom. comm. Hippocratis de natura hominis liber primus et Galeni in eum commentarius, K XV, 1-173.
- In Hipp. de sal. vict. comm. In Hippocratis vel Polybi opus de salubri victus ratione privatorum commentarius, K XV, 174-223.
- Quod an. mor. Quod animi mores corporis temperamenta sequantur, K IV, 767-822.
- Quod opt. med. Quod optimus medicus sit quoque philosophus, K I, 53-63.

When a book or article is cited for the first time, the reference appears in the usual way in the footnotes. If the same work is cited again, only the author's surname and the page are mentioned, with an abbreviated title if there is more than one work by the same author. Op. cit. and loc. cit. are used only to identify works and loci just referred to. The reader who wants the reference to any particular work should look, not back to its

first mention in the footnotes, but at the list of references at the end of the work, in which all the works cited appear in alphabetical order of authors' names. This is a list of the works examined and cited, not a general bibliography.

CHAPTER I

NATURE

In his great work on therapeutic method, Galen says that conditions in the category of diseases (νοσήματα) παρὰ φύσιν εἰσὶ διαθέσεις καὶ βλάβουσι ἐνέργειαν, are states contrary to nature (παρὰ φύσιν) which also impair function.¹ In another work he defines health as a natural (κατὰ φύσιν) state of all the parts, and the cause of the functions, whereas disease is an abnormal (παρὰ φύσιν) state of a structure, and a cause of impairment of function.² In his work against Julian the Methodist, who had presumed to write a commentary on the Aphorisms of Hippocrates, Galen says that everyone who is healthy is in accordance with nature, κατὰ φύσιν , while the sick are παρὰ φύσιν . He maintains that it is impossible to understand the natural evacuations, the subject of the aphorism in question, without understanding what nature is.³ Thus the concept of nature is basic to Galen's pathology. What does he mean by it? Like all authors, he uses the word φύσις to mean several different things,⁴ just as it does in English. But when he speaks of things being natural (κατὰ φύσιν) or unnatural (παρὰ φύσιν), what does he mean, and how does he picture the Nature he so frequently invokes?

F.M. Cornford has observed that, as the ancients themselves perceived, there were two main traditions in Greek philosophy. He writes:

"The first tradition was called Ionian. Starting from Thales and Anaximander, it was continued in the fifth century by Anaxagoras, Archelaus, Diogenes of Apollonia, and found its most fortunate expression in the Atomism of Democritus, adapted and modified by Epicurus. The trend in this tradition was towards materialism--the belief that reality is to be found in the bodies we can see and handle, and that the soul consists merely of

1. K X, 226-7 (De meth. med.)

2. K VI, 837 (De morb. diff.)

3. K XVIIIa, 267-8 (Adv. Jul.)

4. For some of them, see K XV, 2-5 (In Hipp. de nat. hom. comm.). Galen says that the word also meant many things to Hippocrates (K XV, 570, ibid.) For the history of the word, see K. Deichgräber, 'Die Stellung des griechischen Arztes zur Natur', Die Antike, 15, 116-137, 1939; F. Heinemann, Nomos und Physis, 1965 (these works stop short of Galen), and F. Schiller, 'Stepmother Nature: a medico-historical scan', Clio Medica 13, 201-218, 1978-9, which deals with him, but very inadequately.

bodies of specially fine texture, destined to be dispersed at the moment of death. The existence of gods was not denied; but they were not to interfere with the course of physical events, which is left to the purposeless play of necessity and chance. The other tradition, called Italian, starts from Pythagoras. It throws the emphasis, not on matter, but on form, and sets the interest of an immortal soul above that of a perishable body. It culminates in Platonic idealism, which asserts that soul is ontologically prior to body and the source of all bodily motion. Reality is immaterial, accessible to thought, but not to the senses. The shifting world of appearances can yield no certain knowledge. Although its main structure shows evidence of intelligent design, there is, strictly speaking, no science of nature, because the rational principle of order in the universe has not completely prevailed over that unruly element of chance and necessity, which holds undisputed sway in the Ionian system,"⁵

and again:

"The alternative pattern, preferred by Plato for moral and religious reasons, is the creational. The world is like a thing not born but made, containing evidences of intelligent and intelligible design...Plato held that it was animated by a World-Soul, whose intelligence is responsible for those elements of rational order which we can discern in the structure. Blind necessity and chance are also at work, producing results that no good intelligence could desire, but they are in some degree subordinated to co-operate with benevolent Reason. For this Reason Aristotle substitutes a vaguely personified Nature, who always aims at some end."⁶

Galen has described the differences between the two schools in his work On the Natural Faculties, in the course of a discussion of nutrition, which reflects his own views:

"Nutrition must involve, therefore, a certain assimilation of nutriment to the thing that is nourished; this is quite clear. Some people, however, say that this assimilation does not exist, and is only apparent; they are those who consider that nature is neither craftsmanlike (τεχνυκός) nor providential toward the animal, and that she has no special powers (δυνάμεις)

5. F.M. Cornford, The Unwritten Philosophy and other essays, 1967, pp 119-20.

6. Ibid., p 84.

at all, by which she changes some things, attracts others, and others again eliminates.⁷ Two kinds of sects have arisen in medicine and philosophy among those men who have declared their views on nature...One sect maintains that all substance (οὐσία) subject to generation and decay is continuous (ἠνωμένος) and at the same time subject to change. The other supposes substance to be unchangeable, unalterable, and divided into minute particles, the regions separating them being empty space...According to this second sect, there is no substance or power that is peculiar to nature or mind (ψυχή), but these are brought about by the way in which those primary bodies, which are apathic, come together. According to the first-mentioned sect, however, nature is not posterior to the atoms, but prior by far and older. And so, in their view, she herself constructs the bodies both of plants and of animals, having certain powers (δυνάμεις), the attractive, the assimilative of what is proper, and the excretory power for what is foreign; and she moulds everything in a craftsmanlike manner while it is coming into being, and provides for the finished creature by means of other powers again..."⁸

According to Galen, Hippocrates held this view of nature.⁹ It may be summarised as follows: Substance is continuous (that is, infinitely divisible, not composed of atoms); thus, when finely enough divided, it can interpenetrate everywhere, and there is no occasion to postulate the void or empty space, as the atomists did, to allow for the movement of particles of matter. It undergoes alteration, unlike the supposed atoms, which are not subject to

7. W. Jaeger, *Diokles von Karystos*, 1963, pp 51-53, is of the opinion that the term δύναμις, which is Aristotelian, was introduced into medicine by Diocles, whose teleological outlook was much like that of Galen. The natural faculties are the basis of Galen's physiology; for him the term δύναμις has strong teleological overtones. It is a faculty or power used purposively by Nature. For some further discussion of these faculties, see later in this chapter.

8. K II, 26-7 (De fac. nat.)

9. K II, 29 (*ibid.*) Galen's attribution of any opinion to Hippocrates, however, must be accepted with extreme caution, since Galen's Hippocrates is a fictitious character who has all Galen's opinions. For a convincing exposition of this view, see W.D. Smith, *The Hippocratic Tradition*, 1979.

change, and cannot suffer anything. Galen's Nature is anterior to matter and more noble; she organises it in a craftsmanlike manner, always with a purpose in mind. But the Nature of the atomists, such as Asclepiades, is only a name for matter and its random motion. Hence it knows nothing of purpose; it helps and harms indiscriminately.¹⁰ Galen's Nature, on the other hand, never does harm; she has the good of the organism always in mind. As both he and Aristotle repeatedly say, she does nothing in vain.

The difference between the schools is seen also in their views on causes. For Galen, as for Plato and Aristotle, the important cause is the final cause--the purpose or end for which something was done.¹¹ A man, asked why he was going to market, would be ridiculous, says Galen, to reply that it was because he had two legs which conveyed him there. This is an instrumental cause, but the important cause was the man's intention: to meet his friends, or to buy something.¹² Such final causes--the purpose for which an action is performed--are, of course, the prerogative of intelligent agents. But Democritus and the other atomists refer everything to necessity, not to final causes. Like most scientists, says Aristotle, Democritus does not consider why Nature does anything. It is a meaningless question, if Nature is not intelligent.¹³

Asclepiades also rejects final causes. What is now called the pulmonary artery was believed, by both Asclepiades and Galen, to be a vein; yet it has thick walls like an artery. The modern pulmonary vein was called an artery; yet its walls are thin. Why is this? Asclepiades' explanation (in the old terminology) is that the arteries have grown thin in the lung as a result of their unceasing labour in the movement of the parts, while the corresponding veins engage in only moderate exertion, and hence are in

10. Caelius Aurelianus, AD I, 115.

11. For Aristotle's classification of causes, see Physics 194b-195a.

12. K III, 464 (De usu part.) Galen probably has in mind the Phaedo (98, d-e) where Socrates says that he is sitting in prison, rather than escaping, not because of the position of his muscles, but because he believes it is better to obey the law.

13. De resp. 471b-472a. In the Phaedo (96b-98c), Socrates tells how, in his youth, he studied Anaxagoras, who held that Mind caused everything, in the hope of finding out why it was best for the earth to be as it was. But Anaxagoras disappointed him; he explained these things in physical terms. For Galen's philosophy of causes see P. Moraux, 'Galien comme philosophe: la philosophie de la nature', in V. Nutton (ed.), Galen: problems and prospects, 1981, pp 87-116.

good condition, with thick walls. The veins in every other part of the body (these are veins in modern terminology also) have, he says, no motion at all, and thus waste away like a lazy slave who takes no exercise; those in the lung are the only ones that are kept moving constantly, and their good condition is due to this moderate use of exercise.¹⁴ A child could see the stupidity of this, says Galen. Arteries differ from veins--as Asclepiades would know if he had paid any attention to anatomy, instead of spitting on the dissections of Herophilus--¹⁵ in having more coats in their walls. The veins of the lungs (here May¹⁶ thinks that Galen means veins in the modern sense; hence we should read "arteries" for "veins" in Galen's account) lack the thick tunics of arteries. Does Asclepiades not know this? or, if he does, does he think that when a part wastes it is not the thickness of its tunics, but their number, that becomes less? If this rule applied generally, says Galen, we might expect people in poor health to have fewer parts to their bodies than those who were well; Thersites might have three fingers to the hand, Ajax seven, and Achilles even more, a sight worthy of the wisdom of Asclepiades.¹⁷ Having thus ridiculed Asclepiades by a somewhat doubtful argument, Galen explains that the reason why the arteries in the lungs are like veins, and vice versa,¹⁸ is that it is better so. This is the true first cause, the final cause. The lung, in Galen's system, is an exception to the general rule that pneuma (a constituent of the arterial blood) is contained in arteries, while ordinary blood is in the veins; in this particular organ, the reverse applies. The arrangement in the lung is better because blood, which is thick and sluggish, needs thin-walled vessels to permit its free distribution; whereas pneuma, which is light and mobile, would escape too quickly if the vessels

14. C.R.S. Harris, The Heart and the Vascular System in Ancient Greek Medicine, 1973, p 179, points out that in antiquity anything connected with the right ventricle was called a vein, while vessels emerging from the left ventricle were arteries. It seems strange that a slave who took no exercise should become thin; perhaps he got no food.

15. Herophilus established the difference between arteries and veins (Harris, p 179).

16. Galen on the Usefulness of the Parts of the Body, tr. M.T. May, 1968, p 309.

17. K III, 466-9 (De usu part.)

18. In fact they are like veins because they are veins; the same applies to the arteries.

that retain it were too delicate. Hence the craftsman who made us, having recognised that this was so (ταῦτ' ἄρα προειδὼς ὁ δημιουργὸς ἡμῶν), devised for the vessels of the lung tunics that are opposite in character to the materials they contain, making the arteries, which hold ordinary blood, thin and the veins, which must retain pneuma, thick-walled.¹⁹

To Galen, then, the evidence of design in the universe is not surprising; it is there because an intelligence put the cosmos together with a purpose in mind. How the atomists got over this problem is evident from a passage in Lucretius:

"In no wise then can it be deemed probable, when space yawns illimitable towards all points and seeds in number numberless fly about in manifold ways driven on in ceaseless motion, that this single earth and heaven have been brought into being, that those bodies of matter so many in number do nothing outside them; the more so that this world has been made by nature, just as the seeds of things have chanced spontaneously to clash, after being brought together in manifold wise without purpose, without foresight, without result, and at last have filtered through such seeds as, suddenly thrown together, were fitted to become on each occasion the rudiments of great things, of earth, sea and heaven and the race of living things. Wherefore again and again I say you must admit that there are elsewhere other combinations of matter similar to this, which ether holds in its greedy grasp."²⁰

The universe, this is to say, is infinite and contains innumerable worlds, resulting from the random movements and conjunctions of atoms; in some of them, purely as a result of chance, we shall find the combination of things that we have on this earth. In the same way, as a modern writer has said, a monkey striking aimlessly at the keys of a typewriter should, given an infinity of time, ultimately type out all the books in the British Museum. Galen repeatedly makes fun of such opinions of the materialist school.

19. K III, 446-7 (De usu part.) In Galen's system, the parts of the body other than the lung have veins containing ordinary blood. Veins originate from the liver, and the function of their blood is to nourish the tissues; the flow in the veins is away from the centre, as it also is in the arteries, which, however, contain pneuma or air in addition to blood. For an excellent survey of Galen's physiology see May, p 44 ff. R. Siegel's book, Galen's System of Physiology and Medicine, 1968, is untrustworthy on the circulation because of the author's preconceived ideas.

20. T. Lucreti Cari De Rerum Natura, tr. H.A.J. Munro, 1900: II, 1052-1066.

Some atomists, he says, supposed that the mouth had been formed by heat or pneuma bursting out of the body at that point. Why then, Galen asks, did it not burst out of the top of the head, since pneuma naturally seeks the highest parts? And why, if it came about by chance, is it furnished with teeth and a tongue? Teeth, after all, do not grow in any part of the body where a cavity has been formed; there are none, for instance, in the anus or the vagina. Besides, they are beautifully disposed in the mouth, like a chorus. Was it not clever of the atoms to arrange them thus, and to see that the smallest teeth had a single root, while the larger ones had three or four, and that the molars in the middle were the largest, with smaller ones on either side of them. to leave room for the broad base of the tongue? It seems that the atoms, which, these men say, move at random, are more likely to act rationally than Epicurus and Asclepiades are.²¹ Those who deny Nature's skill, Galen says, lie awake at night trying to think of just one part of the body that is useless, to base their argument on; to confute them Galen has been compelled to write his book, the De Usu Partium, to explain the function of every part of the body.²² There is, even if Asclepiades denies it, an intelligence (νοῦς) that arranges and orders everything, not merely atoms becoming entangled at random.²³ Those people, Galen says, who hold that the body is the product of blind chance, point out similarities in natural objects; a mountain may look like an animal. But in the animal, every part is perfectly adapted for its purpose. Some say that there was no maker of the body, because they do not see him; yet when such people see a fine ship or house, they do not suppose that it never had a maker, merely because he does not happen to be there at the time.²⁴

Galen's view of Nature as a wise, provident and purposeful craftsman is seen in its most developed form in the De Usu Partium. He writes, for example, in the last book of this work, which he calls his "epode":

"I am sure that you will also regard all these things in the same way when you examine carefully and justly the skill displayed in animals, unless, as I have said, you are prevented by some

21. K III, 868-74 (De usu part.)

22. K IV, 351 (ibid.)

23. K III, 469 (ibid.)

24. K V, 783-790 (De plac. H. & P.)

doctrine which you have rashly posited about the elements of the universe. Thus, when anyone looking at the facts with an open mind sees that in such a slime of flesh and juices there is yet an indwelling intelligence and sees too the structure of any animal whatsoever--for they all give evidence of a wise Creator--he will understand the excellence of the intelligence in the heavens. Then a work on the usefulness of the parts, which at first seemed to him a thing of scant importance, will be reckoned truly to be the source of a perfect theology, which is a thing far greater and nobler than all of medicine. Hence such a work is serviceable not only for the physician, but much more so for the philosopher who is eager to gain an understanding of the whole of Nature. And I think that all men of whatever nation or degree who honour the gods should be initiated into this work, which is by no means like the mysteries of Eleusis and Samothrace. For feeble are the proofs that these give of what they strive to teach, but the proofs of Nature are plain to be seen in all animals.

In fact, you must not suppose that such skill as I have been explaining in this book is displayed in man alone; on the contrary, any other animal you may care to dissect will show you as well both the wisdom and the skill of the Creator, and the smaller the animal the greater the wonder it will excite, just as when craftsmen carve something on small objects...Yet not one of these displays more perfect workmanship than the leg of a flea...At all events, if the Creator's skill is such when displayed incidentally, as one might say, in insignificant animals, how great must we consider his wisdom and power when displayed in animals of some importance!

This is one very great advantage which we gain from this work on the usefulness of the parts, not as physicians, but, what is better, as men needing to understand something of the power responsible for usefulness, a power which some philosophers say does not exist at all, let alone its providing for animals." ²⁵
 And, earlier in the same work:

"...the sacred discourse which I am composing as a true hymn of praise to our Creator. And I consider that I am really showing

25. K IV, 360-3 (De usu part., tr. May).

him reverence not when I offer him unnumbered hecatombs of bulls and burn incense of cassia worth ten thousand talents. but when I myself first learn to know his wisdom, power and goodness, and then make them known to others."²⁶

The work on the usefulness of the parts was finished about twenty-five years before Galen's death, and the profoundly religious attitude to Nature that characterises it is not universal in his other works, though he almost always regards her as purposeful and providential. An unusual exception is one passage in Galen's commentary on the Hippocratic work Regimen in Acute Diseases, in which he implies that Nature is irrational. She cannot decide what is best. Men are reasonable beings and usually do what is good for them; but sometimes, when thirsty, they unreasonably consume salty or highly spiced beverages, which do them no good, like children and cattle, which invariably drink whatever comes to hand.²⁷ Nature, according to Galen, is just as bad. When the small veins have been dried out in the heat of summer, they attract to themselves whatever humours happen to be in their vicinity, and if these are acrid or bilious, ardent fever is the result.²⁸ Such contradictions on other subjects abound in Galen's voluminous works; it is fair to say, however, that he very seldom speaks of Nature in this way.

26. K III, 237 (ibid., tr. May). There is no question that Galen's outlook on Nature is basically a religious one; but where others are more dogmatic, he remains an agnostic on certain fundamental questions. Where Plato says (Tim. 41 a-d) that the cause that made the universe commanded his children to fashion the human race, inserting an immortal soul into the part that is generated, Galen remarks that we have no way of knowing whether this is so. Our bodies are works of the highest wisdom and power, but Plato's statements are no more than plausible and reasonable. The question whether any part of the soul is immortal belongs, he says, to speculative philosophy, not to medicine (K V, 791-2, De plac. H. & P.) He says elsewhere that Plato seems to be convinced that the rational soul is immortal; Galen, however, can express no opinion on this subject (K IV, 772-3, Quod An. Mor.) For Galen's attitude to Plato and to speculative philosophy, see P. De Lacy, 'Galen's Platonism', Amer. J. Philol. XCIII, pp27-39, 1972.

27. For such irrational conduct, see also K V, 484 (De plac. H. & P.)

28. K XV, 736 (In Hipp. de ac. vict. comm.)

Even when he is identifying Nature with a god or demiurge, however, Galen never makes her omnipotent. In this she differs from the God of the Pentateuch, with which Galen was familiar.

"For Moses it seems enough to say that God simply willed the arrangement of matter, and it was forthwith arranged in due order; for he believes everything to be possible with God, even if he should wish to make a horse or a bull out of ashes. We, however, do not hold this; we say that certain things are impossible by nature, and that God does not attempt such things at all, but that he chooses the best out of the possibilities of becoming."²⁹

Elsewhere Galen says that Nature, which creates plants and animals, takes some bodily beginning for their genesis, since she cannot create them out of nothing. Starting from this she strives ceaselessly to make them perfect--that is, lacking in none of their proper functions.³⁰ Thus Galen's Nature can operate only on the material available, and she does this through a regular system of causation, since nothing, in Galen's view, happens without a cause. It is necessary to agree in advance that this is so, he says, for if it is not agreed, we cannot seek the cause of any impairment in health.³¹ In a passage preserved in Arabic translation, Galen says:

"They compare those who practise medicine without scientific knowledge to Moses, who framed laws for the tribe of the Jews, since it is his method in his books to write without offering proofs, saying "God commanded; God spake."³²

For Galen, the operations of Nature are not only intelligent, but intelligible; she uses the available materials, and the ordinary chains of cause and effect, just as a purposeful human craftsman does. She does not act arbitrarily. She is divine; Galen quotes with approval the words of Posidonius:

"The cause of suffering (τῶν παθῶν) is the failure to follow in all things the daimon in oneself that is of the same birth

29. K III, 906 (De usu part.)

30. K VII, 677 (De marcore)

31. K X, 50 (De meth. med.); see also K V, 389-90 (De plac. H.&P.)

32. Quoted by R. Walzer, Galen on Jews and Christians, 1949, p 11.

and the same nature as that which governs the whole universe."³³

It is one of the gods:

"Thus, just as we make judgments about human sculptors, so we ought to make them about those who are divine, and marvel at the craftsman (δημιουργός) who made our body, whichever one of the gods he is" (ὅστις ποτέ ἐστὶ θεῶν).³⁴

But it has clear limitations to its power; the problem of evil is thus avoided. Since Nature could not make individuals immortal, says Galen, she invented reproduction.³⁵ The Creator only occasionally makes mistakes.³⁶ When a patient is suffering from a disease, Nature is struggling with the pathological agents, and she is not always victorious. When he has a rigor, the natural faculty or δύναμις is wrestling with the noxious agent, and this continues until it has been completely expelled, if the faculty is strong enough. But if, because of its own weakness or the magnitude of the cause, nature becomes exhausted before ridding the body of the peccant material, the patient dies.³⁷ In berating Erasistratus for his ignorance of nature. Galen says:

"You ought to have first described for me the work of nature, and secondly explained what, on the one hand, she does perfectly and completely, moved by her own laws; and what, on the other hand, she does imperfectly, when impeded by the causative factors of diseases. This is the way to discovery in therapeutics; to be able, through studying the things that she brings well to a conclusion, to aid these patients by adding what is lacking. And when she is not moved at all--for indeed this sometimes happens when she is overcome by the force of the noxious causative agents--I must provide everything myself."³⁸

The whole function of the physician is to co-operate with Nature; to let her alone when she needs no help, but to assist her when she is in difficulties. The general principle is to preserve what is according to nature, and to take away what is not.³⁹ When Nature is overcoming the material (Galen is referring here to nutriment) the person is in health; when it overcomes her, he is diseased.⁴⁰

33. K V, 469-70 (De plac. H.&P.) For Posidonius' views on the soul. see K V, 652-3 (*ibid.*)

34. K V, 789-90 (*ibid.*)

35. K IV, 143 (De usu part.)

36. K IV, 248 (*ibid.*) The reference is to obstetric complications.

37. K VII, 194-6 (De sympt. caus.)

38. K XI, 159 (De ven. sect. adv. E.)

39. K X, 589 (De meth. med.)

40. K I, 364-5 (Ars med.)

Galen suggests in at least one place a reason for the imperfections of earthly nature:

"What part of the universe is more ignoble than the earth? And yet even here there seems to be some intelligence reaching us from the bodies above...It is reasonable to suppose that the intelligence dwelling in them is as much better and more perfect... as their substance is the purer."

Great men like Plato are still made of flesh and the four humours, so how great must be the intelligence in the sun, moon and stars! ⁴¹ This passage suggests that earthly Nature suffers from the corrupt state of affairs in the sublunary sphere, an Aristotelian idea.

How does this Nature operate in bodies? Galen has devoted a special work to the natural faculties or δυνάμεις, the powers through which she exerts her effects. ⁴² Her three principal activities are genesis (γένεσις), growth (αύξησις) and nutrition (θρέψις). ⁴³ Genesis consists first in alteration of the substance from which the new animal originates: namely the menstrual blood. Nature, through her alterative faculty (ἀλλοιωτικὴ δύναμις) can change this blood into all the tissues and organs of the new animal; she is thus cleverer than a human craftsman, like Phidias, who cannot change his wax or gold into ivory. The male semen exercises this alteration on the menstrual blood; it also has an attractive faculty (δ. ἐλκτικὴ) by which it draws the blood to itself, and a diaplasic (δ. διαπλαστικὴ) by which it shapes the organism from the blood. ⁴⁴ This faculty is in the highest degree artistic and craftsmanlike; it does everything for a purpose, so that there is nothing vain or superfluous, or susceptible of any improvement. ⁴⁵

The function of the faculty of growth is to act on what has already come into being through the two aforementioned faculties, and to extend it in every direction. In doing this it does not merely make the parts expand like inflated bladders; the faculty

41. K IV, 358-9 (De usu part.)

42. K II, 1-214. An English translation by A.J. Brock, in the Loeb Classical Library, was for many years the only readily available version in English of any of Galen's works. For an earlier period, see G. Plamböck, *Dynamis im Corpus Hippocraticum*, 1964.

43. K II, 10-11 (De fac. nat.)

44. K II, 82-86 (*ibid.*)

45. K II, 15 (*ibid.*)

of growth, with the assistance of the nutritive faculty, increases the bulk of the parts as they expand, so that they retain their form. ⁴⁶

The nutritive faculty is concerned with the administration of the food and drink taken into the body, converting it into the parts of the animal. To do this it must assimilate the nourishment to the part that is nourished, and this can take place only if there is a certain similarity between them in the first place. Food becomes blood, and for blood to change to flesh is comparatively easy; its conversion to bone, however, involves a much longer process. In the ease and completeness with which they are converted to blood, too, foods vary. Meat, in man, is almost all converted to useful blood--blood, that is, that fulfils its primary purpose, namely to nourish; only a little of the substance of meat is not useful and forms a residue or perittoma which is qualitatively superfluous. Man cannot use grass as a food at all, while a vegetable such as the radish contains very little that his body can use to make blood, and a large quantity of perittoma. Nature has another faculty, the eliminative (δύναμις ἀποκριτική) for the excretion of superfluities. ⁴⁷ She assimilates what is congenial to her, and eliminates what is foreign. The process of assimilation involves several stages. The first is presentation (πρόσθεσις) of the nutriment to the part; the second is attachment (πρόσφυσσις), and the third is assimilation (ὁμοίωσις). ⁴⁸ They can take place because the parts of the body have an attractive faculty by which they actively draw to themselves what is similar. Nature, being craftsmanlike, attracts appropriate things and repels those that are not for the good of the animal, thus eliminating diseases. ⁴⁹

Galen, following Plato, ⁵⁰ makes Nature rule the body from three centres: the brain, the heart and the liver, which distribute their influence through the nerves, arteries and veins respectively. According to Galen the three governing faculties do not (as Aristotle thought) all originate in the heart, but, as Hippocrates and Plato correctly held, from three separate organs, ⁵¹

46. K II, 16-17 (De fac. nat.)

47. K II, 20-22 (ibid.)

48. K II, 24 (ibid.)

49. K II, 46 (ibid.)

50. Tim. 69c-71b.

51. In the Ars Medica (K I, 319), however, a fourth centre appears: the testes, distributing their influence through the spermatic ducts.

the seats of the three souls of Plato. To propagate this doctrine, Galen wrote his work On the Opinions of Hippocrates and Plato.⁵² The nutritive faculty, which is common to plants as well as animals, is distributed in animals by the veins, from their origin, the liver. It is also called the appetitive (ἐπιθυμητικὴ or ψυχική) faculty.⁵³ It has as its function everything concerned with nutrition, the most important being the production of blood; but it is also responsible for the enjoyment of pleasures. Another power is distributed through the arteries from the heart; this is the θυμοειδής or ζωτικὴ , and its function is to provide the tone of the soul,⁵⁴ to be constant and firm in carrying out the commands of reason, and, in anger, to provide the seething of the innate heat, which has its seat in the left ventricle of the heart. It distributes warmth to all parts, and endows the arteries with their pulsatile motion. The faculty (δύναμις λογικὴ) in the brain supplies imagination and memory, knowledge and thought, and confers voluntary motion and sensation on all the parts of the body.⁵⁵ The soul in the brain, in Galen's view, exerts its effects by means of the psychic pneuma⁵⁶ which is generated in the cerebral ventricles and distributed through the nerves; this pneuma, however, is not the soul itself, but its primary instrument. It is not clear to what extent Galen saw the faculties as identical with the varieties of pneuma. He is often said to have postulated three pneumata of this sort, distributed from the three centres through the nerves, arteries and veins respectively. Although his physiology requires that arterial blood must be mixed with pneuma, he in fact usually has very little to say about any variety of pneuma when discussing disease, and it has been doubted whether he believed in a vegetative pneuma, originating in the liver, at all. Galen's pneumatology has been well described by Temkin⁵⁷, and will not be further considered here. It is of relatively little signif-

52. On the Doctrines of Hippocrates and Plato, ed. P. De Lacy, 1981, p. 65 (fragment not in Kühn).

53. K X, 635 (De meth. med.)

54. For the tone of the soul see K V, 403-4 (De plac. H.&P.) The idea comes from the Stoics; the world-soul, which is pneuma, a mixture of fire and air, provides the tone of the universe which holds it in being. See, for example, S. Sambursky, Physics of the Stoics, 1959, p.5; for the qualities of pneuma, the same author's The Physical World of the Greeks, 1963, pp 9-10.

55. K V, 600-02 (De plac. H. & P.)

56. Pneuma, originally air or breath, was the most important factor in the physics of the Stoics and in the pneumatist system of medicine.

57. O. Temkin, 'On Galen's Pneumatology', *Gesnerus* 8, pp 180-9, 1950. See also L.G. Wilson, 'Erasistratus, Galen and the Pneuma', *Bull. Hist. Med.* XXXIII, pp 293-314, 1959. For Aristotle's pneumatology, see W. W. Jaeger, 'Das Pneuma im Lykeion', *Hermes* XLVIII, pp 29-74, 1913.

icance for his general pathology, but will be referred to from time to time in the course of this work.

The natural faculties mentioned in the foregoing by no means constitute an exhaustive list. All the operations of the Nature that governs living things are conducted through them, and Galen would no doubt regard their number as indefinitely large. In most of his works, Nature is simply a purposive force that operates through these faculties. Sometimes, however (notably in the De Usu Partium) he identifies her specifically with a god or with the Platonic Demiurge. Elsewhere he seems to equate Nature with the innate heat. The idea of innate heat will be dealt with in more detail later, but it may be mentioned here that in his work on marasmus Galen directly attributes the essential characteristics of Nature--that is, her faculties--to it. The new generation of physicians, he says, liken the innate heat to a flame which burns the material of the body, but this, according to Galen, is a false comparison. Flames consume their material; the innate heat, on the other hand, is diffused throughout the body, and has faculties by which it attracts nourishment to itself, causes it to adhere, assimilates it, and does, to speak generally, all the things that a flame does not. What flame, says Galen, causes its material to increase instead of consuming it? and what flame assimilates nourishment to that material, instead of assimilating the material to itself? The new physicians, says Galen, also equate nature with the innate heat; but the innate heat that they speak of is like a flame that consumes bodies.⁵⁸ Galen agrees, here, that Nature and the innate heat are one; for Galen, however, this is no ordinary heat. Elsewhere he frequently speaks of Nature without mentioning heat at all.

What are the origins of Galen's idea of Nature? Galen himself would attribute it to Hippocrates, who, he says, was the first who was both a physician and a philosopher,⁵⁹ and said that Nature

58. K VII, 672-6 (De marcore).

59. Cp Celsus, who said (Prooem., 8) that Hippocrates was the first to separate medicine from philosophy, to the great benefit of medicine. Galen would certainly not have agreed. He wrote a special work, That the Best Physician is also a Philosopher (K I, 53-63) to encourage the doctors of his time to become philosophers like Hippocrates. As will be shown, there is not a great deal about Nature--or, for that matter, about any other philosophical concept--in the Hippocratic corpus; but Galen is undeterred by mere facts, and makes Hippocrates out to have been as enthusiastic about Nature as he is himself. He is, Galen says, "continually hymning the praises of Nature's righteousness and the foresight she displays in the creation of animals." (K III, 235, De →

sufficed for everything, and that she had certain faculties--the attractive, the eliminative, and the nutritive.⁶⁰ According to Galen he calls Nature "just" (δικαία),⁶¹ and says, in his book on ulcers, that the physician ought to be the imitator of Nature, and of those things that help spontaneously, such as haemorrhages.⁶² According to Galen, he also said that Nature, being well instructed, does what is necessary without having to be taught, and that our natures are the physicians of our diseases. Galen says that Hippocrates does not declare what is the nature of this Nature that forms and governs us, but calls "Nature" the cause that fashioned us, as all men do.⁶³

The statement that nature suffices in all for all (φύσις ἐξαρκέει πάντα πᾶσιν) appears in the work Nutriment,⁶⁴ which Galen also attributes elsewhere to Hippocrates.⁶⁵ The only possible mention of the natural faculties in the Corpus seems to be in this work too: δυνάμιος δὲ ποικίλαι φύσεις, which Jones⁶⁶ translates "of power varied natures". and Littré "Les natures de la puissance sont diverses.". Littré's explanatory heading reads "La faculté, sans doute la faculté nutritive. a les natures diverses."⁶⁷ This seems to say, not that Nature has several faculties, but that the faculty has several natures; but if φύσις here means species or variety we might translate "There are several varieties of faculty", which might be a reference to the natural faculties. Nutriment, however, is a deliberately obscure work in the manner of Heraclitus; Galen probably regards it as a genuine work of Hippocrates because it happens to express some opinions resembling his own, and he will go to any lengths to try to show that his own views have the sanction of the father of medicine.

(59 continued): usu part.). He makes a similar remark at K II, 38 (De fac. nat.) It has been doubted (for instance by W.A. Heidel, 'Περὶ φύσεως, a study of the conception of nature among the pre-Socratics,' Proc. Amer. Acad. Arts. Sci. XLV, pp 79-133, 1910: see p 93 particularly) whether there was any teleology at all in the Hippocratic and pre-Socratic writings. Such a view was natural in the post-Victorian period of belief in the ability of science to explain everything, when teleological explanations were very much out of favour; it has been contested by Jaeger (Diokles, pp 53-4). Jaeger justly points out, however, that what was only a matter for aphoristic mention in the Corpus becomes in Diocles an all-pervading view of Nature; as, in fact, it was for Galen also.

60. K II, 38 (De fac. nat.)

61. K III, 81 (De usu part.); K II, 38 (De fac. nat.); K V, 791 (De plac. H. & P.)

62. K X, 293 (De meth. med.).

63. K V, 790-1 (De plac. H. & P)

64. L 9, 102.

65. K II, 26 (De fac. nat.)

66. Hippocrates, tr. W.H.S. Jones, 1923, vol. I, p. 347.

67. L 9, 103. See also Schiller, p 202.

Does Hippocrates call Nature "just"? I can find no such passage in the Corpus. May's note reads "e.g. twice in Chapter 1 of Fractures, L3, 412-5."⁶⁸ If this is what Galen is referring to, he is indeed reduced to scraping the barrel. The two phrases are αὕτη γὰρ ἡ δικαιοτάτη φύσις, which means "for this is the most natural position" (for setting a broken limb; Littré renders it "car c'est la manière d'être la plus familière"), and οὕτως ὑπὸ τῆς δικαίης φύσεως ἀναγκασόμενος, which he translates "dans la position que la manière d'être familière lui impose." In both these passages φύσις in fact means "the natural place or position of a bone or joint," one of Liddell-Scott-Jones' definitions.⁶⁹

The idea of a Nature which knows "naturally" what to do certainly appears in the Corpus:

"Nature is the physician of diseases. She finds out for herself the ways, not from intelligence (διάνοια). She is not taught, nor does she learn, but does what is necessary."⁷⁰

"By stitching and cutting, that which is rotten in man is healed by physicians. This too is part of the physician's art: to do away with that which causes pain, and by taking away the cause of this suffering to make him sound. Nature of herself knows how to do these things...In other respects too Nature is the same as the physician's art."⁷¹

The terms κατὰ φύσιν and παρὰ φύσιν are also used in the Hippocratic writings. Speaking of ardent fever, the author of On Critical Days says that the principal sign indicating those who will survive is that the fever is not παρὰ φύσιν, for nothing terrible or fatal results from what is κατὰ φύσιν.⁷² It is not made clear how some ardent fevers can be natural and others not. Elsewhere in the Corpus the idea of a struggle between nature and the disease occurs. If Nature gives time for the disease to take hold, she also gives time to cure it. But if the doctor is slow she may be overcome.⁷³ If the disease and the treatment start together the treatment will win; but since our bodies are dense, diseases lurk

68. May, p. 108.

69. Liddell-Scott-Jones, A Greek Lexicon, 9th ed., 1968, entry φύσις, III.

70. L 5, 314; see also L 9, 113.

71. L 6, 490.

72. L 9, 298. For the use of these terms by Diocles, following Aristotle, see Jaeger, Diokles, p 51. For earlier uses, see Liddell-Scott-Jones, entry φύσις, III.

73. L 6, 20.

unseen in them and thus get a head start on the treatment. The medical art, however, has ways of making Nature talk when she does not show by signs and symptoms what is wrong: urinoscopy, drugs that cause particular humours to be eliminated, and exercise testing.⁷⁴

It seems clear enough that a rudimentary idea of a governing Nature does appear in some of the works in the Hippocratic corpus. It perhaps had its origin in pneumatist ideas of soul among the pre-Socratics, and the manifest imperfections of Nature, in spite of her high origins, might be explained by the Orphic idea of the soul as a fallen god confined in the body,⁷⁵ which it enters by inhalation. Such views appear in a complicated and perhaps deliberately obscure form in the Timaeus, and Fredrich, according to Jaeger, has suggested that Plato's physiological doctrines are based on those of the Sicilian pneumatologist Philistion, who accepted the four elements of Empedocles and the four qualities.⁷⁶ Jaeger suggests that Philistion's idea of breath as an all-pervading life force was taken over by Plato, which assured its subsequent influence.⁷⁷ Plato places the rational soul in the brain rather than the heart, but in other respects, at least according to Jaeger, he is a Sicilian pneumatist in his doctrine.⁷⁸ According to Plato, God made all the elements out of chaos, and then made everything else out of them. The universe is a living organism. He gave his sons the duty of building a mortal body round the immortal soul, which for various good reasons they placed in the head.⁷⁹ The revolutions (περίοδοι) of this soul, however, were distorted in man at his birth, and must be rectified by studying the harmonies and revolutions of the universe, thus making the intellectual part of man like the object of its contemplation, in accordance with its pristine nature.⁸⁰ We have thus in the Timaeus a concept very like the Hebrew one of a divine element that was subsequently corrupted, and like the Christian one that it can be restored, although the method used is very different. Plato's concept is perhaps nearest to the Orphic. Although soul (ψυχή) was de-

74. L 6, 24. Whether or not the author of the Art was a physician, he seems to have been the first clinical pathologist.

75. J. Burnet, Early Greek Philosophy, 1963, pp 81-2. Cf Genesis 2, 7: "And the Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul."

77. Ibid., p 213.

79. Tim. 69, b-e.

76. Jaeger, Diokles, p 211.

78. Ibid., pp 7-8.

80. Ibid., 89e-90d.

scribed after the body of the universe in Timaeus' account, it is in fact anterior to body, and of nobler birth and excellence, so as to rule.⁸¹ It is woven throughout the universe every way from centre to periphery, rather like fire in the body in Plato's account, but is invisible.⁸²

The all-important part played by fire in the physiology of the Timaeus is clear enough, but Plato's account is otherwise distinctly obscure. Aristotle, however, clearly associates the soul with heat. The semen contains the substance that is called hot (τὸ καλούμενον θερμόν), which makes it fertile. This substance is not fire, however, but pneuma, which contains the fifth element.⁸³ Fire does not generate any living things, but the sun's heat does, and so does the innate heat of animals. Soul, according to Aristotle, is connected with some substance different from the elements, and more divine.⁸⁴ It is the origin of nutrition, sensation, thought and movement. Not all living things have all these characteristics.⁸⁵ Soul is the cause and first principle of the living body.⁸⁶ All food requires digestion, and heat results in digestion; hence everything that has a soul, and hence nutrition, has heat.⁸⁷ Aristotle is evidently unwilling to identify the soul more closely than this with heat. The Stoic world-soul is a combination of fire and air.⁸⁸ Clearly the concepts of soul (ψυχή) and nature (φύσις) have much in common.

Although Galen's Nature may have pneumatist origins, he tends to avoid the more metaphysical flights of the speculative philosophers, and pneumatist doctrine--the happy hunting ground of cranks of every sort in antiquity--is relatively unimportant in his medical system. He sometimes identifies his Nature with a god or with the Platonic Δημιουργός, but he refuses to speculate on matters, such as the immortality of the soul, to which Plato gives attention. His Nature is here more like Aristotle's, which is a craftsmanlike

81. Tim. 34c-35a.

82. Ibid., 36e.

83. See p 37.

84. Gen. of An. 736b

85. On the Soul, 413 b.

86. Ibid., 415b.

87. Ibid., 416b. See also On Youth and Old Age, 470a.

88. Cf the dying Cleopatra:

"I am fire and air; my other elements

I give to baser life." (Antony and Cleopatra, V, 2).

The Stoic world-soul, however, differs from Aristotelian and Galenic Nature, which is prior to matter, in being material. For the Stoic doctrine see ref. 54, this chapter.

force immanent in the universe, except that in at least one work, the De Usu Partium, Galen specifically says that he is composing a hymn of praise to God, more acceptable to him than costly sacrifices, which suggests that he sees God as something independent of his creation, and as a possible object of worship. It would scarcely be possible to worship Aristotle's Nature, or even his unmoved mover, with the religious intensity that Galen displays in this work.⁸⁹ His concept of Nature also owes something to the popular Stoicism of his time. For instance, in the Meditations of Galen's patient, the emperor Marcus Aurelius, we read:

"But if there be nothing terrible in each thing being continuously changed into another thing, why should a man look askance at the change and dissolution of all things? For it is in the way of Nature; and in the way of Nature there can be no evil." (κατὰ φύσιν γάρ· οὐδὲν δὲ κακὸν κατὰ φύσιν)⁹⁰

"But art thou discontented with thy share in the whole? Recall the alternative: either Providence or Atoms! and the abundant proofs there are that the Universe is as it were a state." (ὅτι ὁ κόσμος ἴστανεὶ πόλις)⁹¹

"All that is in tune (συναρμόζει) with thee, O Universe, is in tune with me! Nothing that is in due time for thee is too early or too late for me! All that thy seasons bring, O Nature, is fruit for me! All things come from thee, subsist in thee, go back to thee. There is one who says 'Dear city of Cecrops!'; wilt thou not say, 'O dear city of Zeus?'⁹²

89. Aristotle's outlook is just as teleological as Galen's, but less religious. He says, for instance, that the deciduous teeth are shed for the sake of the better (βελτίονος χάριν), since sharp things quickly become blunt, and it is better for an animal to have sharp teeth. He compares such acts of Nature to that of the physician who taps the abdomen of a dropsical patient. The true cause of this action is his desire to improve the patient's health, a final cause, rather than the knife that makes the puncture, a material cause. (Gen. of An. 789a-b). Although Aristotle was not a physician, he seems to be thinking here of the physician as the imitator and assistant of Nature. Both act purposively, to achieve what is better. For the differences between the outlook on Nature of Plato and Aristotle, see F. Solmsen, 'Nature as Craftsman in Greek Thought,' J. Hist. Ideas 24, pp473-496, 1963; especially pp 485-491.

90. The Communings with Himself of Marcus Aurelius..., ed. and tr. C.R. Haines, 1961, II, 17 (Subsequently referred to as Meditations, by book and section). The translations are Haines's.

91. Ibid., IV, 3.

92. Ibid., IV, 23.

"Every thing, be it a horse, be it a vine, has come into being for some end." ⁹³

"Either a medley and a tangled web and a dispersion abroad, or a unity and a plan and a Providence (ἤτοι κυκεῶν καὶ ἀντεμπλοκῆ καὶ σκεδασμὸς ἢ ἔνωσις καὶ τάξις καὶ πρόνοια) If the former, why should I even wish to abide in such a random welter and chaos? But if the latter, I bow in reverence, my feet are on the rock, and I put my trust in the Power that rules." ⁹⁴

These extracts, no doubt, give a fair indication of the outlook of the educated amateur Stoic of the time. Galen's system has many similarities to that of the Stoics. Both postulate a Nature; that of the Stoics was called 'a craftsmanlike Fire walking the way of generation' (πῦρ τεχνικὸν ὁδῶ βαδίζον εἰς γένεσιν).⁹⁵ The systems agree on the heat and the craftsmanship. But the Stoic soul was material,⁹⁶ as was everything in their system; it was pneuma, which, as already mentioned, plays a minor part in Galen's system. The systems agree also on the concept of universal causation, though this was more rigorously applied by the Stoics.⁹⁷ For Galen, nothing happens without a cause; if this were not so, scientific investigation would be impossible.⁹⁸ The Stoic concept of mixture is extremely important for Galen's humoral theory, which will be dealt with in a later chapter.

Galen's explanations of medical events are, as has been shown, commonly teleological; Nature is striving to fulfil some purpose, which is always for the good of the patient, and it is the function of the physician to help her. Such explanations, of course, are very much out of fashion in post-Renaissance science, though they are still common enough in ordinary speech. To try to understand why Galen thought as he did, teleologically, it is necessary to go back to the times in which he lived, and try to assess the two ways of looking at the world in terms of the knowledge and intellectual climate of his day.

93. Meditations, VIII, 19.

94. Ibid., VI, 10.

95. Sambursky, Physics of the Stoics, pp 3-4.

96. Ibid., pp 15-16

97. Sambursky, Physical World of the Greeks, pp 101, 170.

98. See ref. 31, this chapter.

Here, however, a difficulty arises, and one that might not have been expected to trouble a modern scientist. The problem is not with Galen's views, but with those of the materialists. It is very difficult to see how, in times before Darwin, anyone could have seriously contested the argument from design. The almost perfect adaptation of the parts of living things to their functions, about which Galen wrote the De Usu Partium, can nowadays be explained by Darwinian natural selection; but in Galen's time no such mechanism was known, or even conjectured.⁹⁹ He considered them, as Plato did, as things that had been deliberately constructed with a purpose in mind, just as a human craftsman makes an article to serve some particular end. This was a natural way of looking at the world, particularly since, in Plato's view, the rational soul in man was of the same sort as the world-soul; as another tradition puts it, we are created in His image. Hence the creative activities of the divinity are not altogether incomprehensible to men. It was natural for one with a Platonist outlook to postulate powers beyond, and prior to, the world of sense-data. But it was not natural for the materialists to do so; as Galen tells us, they lay awake at night trying to think of some part of an animal that had no function, in order to deny the existence of a purposeful Nature. It would seem that before Darwin such arguments had no chance. And even after him, the problem of the manifest signs of organisation in inorganic matter has still to be solved by those who deny purpose in the universe. Inorganic matter is not chaotic; it has an organised structure right down to the subatomic level. What is more, it evolves, as cosmology shows, though not by the mechanism of reproduction and genetic inheritance upon which natural selection can operate. Design is thus not the sole prerogative of living matter, though it is in the biological sphere that adaptation to function is observed. This is because the functions of the parts of animals are usually obvious; legs are plainly adapted for locomotion, not for digestion or cerebration. But the functions

99. It may be speculated whether the profound effect of Darwin's works on the religious belief of his time was not due at least as much to their apparent destruction of the idea of divinely implanted design in living things as to their doctrine of the descent of man.

of stars and galaxies, if they have any, are not clear.

A useful recent account of teleology, however, denies that, even if a supernatural power had purposively designed things in this way, we could recognise the purposes it had in mind. Woodfield says:

"Suppose that a god existed and that all the things in the world were his creaturae. Suppose that he designed the parts of each organism so that they would fit together harmoniously, each with its own special job. The job assigned to each organ would be its function in the familiar sense. But how could we ever be sure that the organ was doing what the god intended it to do?"¹⁰⁰

The answer to this is surely that the functions of most biological organs are obvious, not only from their structure, but from the uses to which we observe the organism to put them; which, after all, would presumably have been enjoined by the god when he made the animal. Legs not only are well adapted, in terms of their anatomy, for locomotion, but are actually used by animals for that purpose; and what is more, they are adapted in each species precisely for the kind of locomotion in which that species must engage, in occupying its own ecological niche. The legs of the camel are different from those of the flea and the water-beetle. It would reflect little credit on the god's intelligence if we were to suppose that he had really meant legs to serve some quite different good for their possessors, such as olfaction, but that they perversely insisted on using them instead for locomotion; just as no one would suppose that a human craftsman who had made a teapot could have intended it to be used as a hat or a screwdriver. At least in the days before the Origin of Species, the whole creation really did declare the wisdom of God, and Galen, as a pre-Darwinian, was adopting by far the most economical hypothesis in so regarding it. Woodfield, however, would not agree here either.¹⁰¹ He writes:

"The important question is whether there exists something that designed the universe. The claim that there does is unfalsifiable, being a contingent existential claim. Nevertheless, it has not been verified or rendered probable by evidence. Although

100. A. Woodfield, Teleology, 1976, p 28.

101. Galen would have enjoyed himself with Woodfield, had his book been available in the second century.

it might be true that the universe was designed, there is no reason for thinking that it is true."¹⁰²

It is evident from this that today, just as in Galen's time, men with different sorts of minds have taken diametrically opposite views of the nature of the universe.¹⁰³ To those with one kind, it would seem utterly incomprehensible that anyone could have denied the evidence of design in the universe in Galen's time; yet the atomists, who were by no means fools, did exactly that.¹⁰⁴ Even

102. Woodfield, p 219.

103. The difference is clearly to be seen in literature. Some poets, such as Dante, Wordsworth and Manley Hopkins, feel at home in the universe,

"Knowing that Nature never did betray
The heart that loved her; 'tis her privilege
Through all the years of this our life, to lead
From joy to joy..." (Wordsworth, Tintern Abbey, 122-5)

while for others, who feel it no less keenly, the aesthetic experience brings only despair and alienation:

"For nature--heartless, witless nature--
Will neither care nor know..." (A.E. Housman, Last Poems XL)

104. Galen, as we have seen (ref. 25, this chapter) thinks that they held this opinion because they were committed in advance to a particular philosophical viewpoint, and the facts had to be made to fit it: a state of affairs, for that matter, not unknown in materialist circles today. Galen is scarcely entitled to cast the first stone at those whose minds are not open; but on this particular matter he may have been right. There is some evidence that orthodox scientific thought may be coming round to a more idealistic view of the place of mind in the universe than it would have admitted fifty years ago. The findings of quantum physics, in which the observer cannot observe the phenomena at all without altering them, have caused some cosmologists to propound an "anthropic principle", according to which, at least in its more extreme forms, "the observer is as essential to the creation of the universe as the universe is to the creation of the observer." (See G. Gale, 'The Anthropic Principle', Scientific American 245, 6, p 114, 1981.) It is not clear whether the authors of this theory realise how close they are to Berkeleyan idealism:

"Some truths are so near and obvious to the mind, that a man need only open his eyes to see them. Such I take this important one to be, to wit, that all the choir of heaven and furniture of the earth, in a word all those bodies which compose the mighty frame of the world, have not any subsistence without a mind...that consequently so long as they are not actually perceived by me, or do not exist in my mind or that of any other created spirit, they must either have no existence at all, or else subsist in the mind of some eternal spirit." (G. Berkeley, Principles of Human Knowledge, 1710, I, 6.)

From such a point of view the way back to Plato is not very long; Nature may yet become respectable.

today, when there is a mechanism known that will account for biological adaptation, it is still difficult to understand how anyone can say, as Woodfield does, that there is no evidence for supposing that the universe was designed. This is not the place to pursue this argument; it has been necessary to raise the matter, however, to make the point that Galen, in postulating design, was not acting irrationally.

Modern discussions of teleology have dealt at length with the question of the extent to which explanations in terms of ends or goals are applicable, and appropriate, in biology.¹⁰⁵ Purposeful agents like God and Nature are distinctly out of fashion. Woodfield suggests that teleological descriptions which include no reference to a mental state--the kind, that is to say, that it is respectable to mention today--developed, perhaps, from those that are "straight-forward causal explanations in terms of mental antecedents." "Perhaps", he says, "biological function statements started out as artefact-function statements, but dropped the implicit 'God believed/intended that...' at some stage in history."¹⁰⁶ In considering Galen's teleology, however, it is not necessary to go beyond that point at all. His explanations presuppose some kind of purposive agent. The concluding chapter will consider briefly the relevance of such ideas for medical thought today.

105. For a discussion from the viewpoint of an "unreconstructed empirical rationalist" see the essay with the same title in E. Nagel, Teleology Revisited, 1979.

106. Woodfield, p 211.

CHAPTER II

DISEASE

In order to establish a therapeutic method, says Galen, we must first find out what all diseases have in common, by virtue of which they are called diseases. In a passage already quoted, he says that a disease (νόσος or νόσημα) is a diathesis that damages a function¹, or, to be more precise, diseases παρά φύσιν εἰς τὸ διαθέσεις καὶ βλάπτουσιν ἐνέργειαν , diseases are both abnormal diatheses and damage an energeia.² Not all diatheses are abnormal, although normal ones are not a cause of damage to function, nor do all abnormal ones necessarily lead to functional damage. Every diathesis of the body that represents a change from the natural state is either a disease (νόσος), or the cause (αἰτία) of a disease, or a symptom (σύμπτωμα) of a disease.³ A diathesis differs from a pathos or pathema in that the latter involves movement (in the Aristotelian sense of κίνησις⁴, probably best translated alteration); when the alteration ceases, the state that remains is a diathesis. Thus a sense-impression is a pathos, because it produces an alteration in the organ or the body perceiving it. An influence that is not yet taking effect (i.e. producing alteration) is not a pathos but an αἰτία (cause); nor is the diathesis that remains after the effect has passed a pathos. Pathes necessarily involve alteration, but are not necessarily abnormal. Diseases are abnormal by definition.

1. K X, 154 (De meth. med.)

2. K X, 226-7 (ibid.). Galen seems to use the terms νόσος and νόσημα interchangeably. A nosos, he says in another work, is a state contrary to nature, by which an energeia is damaged primarily. A diathesis is any stable state; health, disease and intermediate states (if persistent) are all diatheses. (K VII, 43; De sympt. diff.) Galen's use of the term diathesis is quite different from the more restricted modern one, meaning a state that predisposes to some disease; red-haired people, for example, have been thought to be unduly liable to tuberculosis. A diathesis, for Galen, is any constant state of the body.

3. K VII, 42 (De sympt. diff.)

4. κίνησις is an alteration of what was before, either in location, or in quality, or in quantity. It thus includes change of position, change of state, growth and decay. (Aristotle, On the Soul 406a). Change in quality is called ἀλλοίωσις, change in position πορὰ or κίνησις κατὰ τόπον (Aristotle, Physics 226a, 243a).

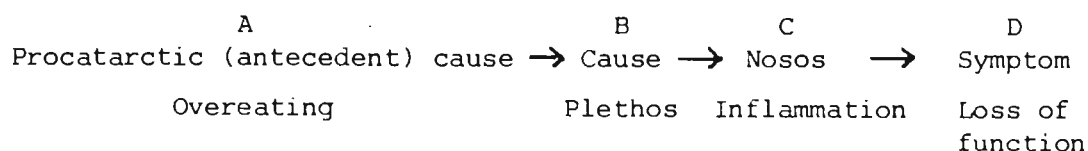
Before considering disease further it remains to define ἐνέργεια . Pathos and energeia both involve kinesis or alteration, but whereas this is passive in the case of a pathos, it is active for energeia. So, says Galen, the separation made by a man who cuts something is an energeia with respect to him, but a pathos with respect to the object that is cut. The energeia comes from the thing that acts; the pathos is its effect as suffered by the object acted on. In his work on the opinions of Hippocrates and Plato Galen offers the definition of energeia as a motion according to nature, which it certainly is, but goes on to say that a pathos is a motion contrary to nature.⁵ This contradicts the definition of pathos just quoted; one must assume that he means here an abnormal or "pathological" pathos, since sense-impressions certainly do not alter the body in an abnormal way. Galen explains elsewhere that this was the sense of the term in his own time; the ancients, including Plato, regarded all the effects of external causes as pathos, but the newer generation call only an unnatural kinesis a pathos.⁶ Energeia is the motion that nature seeks as an end. Thus the normal pulsation of the heart is its energeia; if some external cause results in palpitation, this is a pathos. Thus the same sort of movement can be both an energeia and a pathos.⁷ The energeia of the eye is vision. According to Galen, it makes no difference whether one says ἐνέργεια or ἔργον ; all agree that the function (ἔργον) of the eye is to see.⁸ The most satisfactory English translation of ἐνέργεια would perhaps be "active function", but it is easier to keep the Greek word.

A disease, then, for Galen, is any unnatural condition that impairs any natural function of the body. It is thus impossible to determine how many diseases there are without knowing how many natural functions the body has. To argue over whether the disease is the diathesis or the damage to the energeia itself is, according to Galen, to quibble over words. What is treated is the diathesis of the body that leads to functional impairment.⁹ Galen takes the view that the diathesis is the disease, in which case the damage to the energeia is a symptom; for everything abnormal that happens to the

5. K V, 506-7 (De plac. H. & P.) 6. K X, 87-9 (De meth. med.)
 7. K V, 508-9 (De plac. H. & P.) 8. K X, 43 (De meth. med.)
 9. K X, 63 (ibid.)

patient is a symptom.¹⁰ For example, tremor is something that the part suffers, with alteration and unnatural movement, so it is a pathos; but it is also a symptom, since the movement is abnormal. If there were no movement, but only a subjective sense-impression, say of numbness, it would be a pathos only. Symptoms are unnatural, but they are not diatheses and they do not damage any *energeia*; that is, they are not diseases. But in some ways a *nosos* is a symptom, since it is abnormal, and so, in a way, the antecedent causes of a *nosos* are also symptoms.¹¹

It will be clear from this that Galen's concept of disease is not a simple one. Generally, however, he regards the disease as the diathesis that finally and directly impairs the *energeia*. There may be a whole series of preceding diatheses, which are abnormal in that they impair *energeia*, though they exert this effect only indirectly, via the final *nosos*. They are causes (*αἰτίαι*) of the final *nosos*, not *nosoi* themselves. Galen illustrates this by referring to a trick with pebbles, set up like dominoes so that if the one at the end is touched a chain reaction results and the whole row collapses. All the diatheses preceding the final one are causes of the *nosos*. If some other diatheses follow the *nosos*, like shadows, they are not *nosoi* but symptoms. As an example of causation he mentions a four-link chain:¹²



10. K VII, 50 (De sympt. diff.) A symptom (*σύμπτωμα*) for Galen, pace Liddell-Scott-Jones, is not a symptom in the modern sense; the opposite, in fact. A symptom in twentieth-century medicine (though not always in nineteenth) is something that the patient experiences but that the doctor cannot observe; for instance, a pain. Effects that can be observed by others are signs in modern terminology. A symptom in the modern sense is a pathos for Galen.

11. K VII, 51-3 (De sympt. diff.)

12. K X, 64-7 (De meth. med.) Elsewhere Galen gives other characteristic examples. If a man's nose is flattened by a blow, and his breathing thus obstructed, the narrowness of the passage is the *nosos*, while the flatness is the cause of it. Clearly a *nosos* or *nosema*, for Galen, is a wider concept than the English "disease"; lesion would be a more appropriate translation. Some things are both *nosos* and causes of *nosos*, for instance amputation of the uvula, which impairs the voice and chills the lung, thus becoming a cause of disease there. If you choose to quibble (!) about this, says Galen, and maintain that such a condition is not a *nosema* but a pathos or pathema, you are arguing about words, not facts, a fault to which Galen very frequently refers (K VI, 861-6, De morb. diff.)

Galen, as already mentioned, says that there is disagreement among both ancient and modern authors whether C or D is the nosos; the important point, on which all agree, is that it is C that is treated. It makes no difference, he says, whether C is called nosema or pathos,¹³ or, (if D is regarded as the nosos) a cause of a nosema or pathos.¹⁴ Nosos (or nosema) is a more specific term than pathos, and will usually be employed in what follows.

When all the processes of the body operate blamelessly, the person is in health; but when the patient feels that any of his natural functions (κατὰ φύσιν ἔργα) are functioning poorly, or not at all, he says that there is disease in that part of the body in which he observes the energeia to be impaired, and he consults a physician. Thus there is health when no energeia of any part is faulty; disease when it is damaged.¹⁵

What are the varieties of such damage, and what brings it about? In his work on the differentiation of symptoms, Galen classifies them. Damage to an energeia can result either in disorder of function, or in its deprivation. Examples, where movement is concerned, would be called dyskinesia and akinesia respectively. In the first, the movement, though still present, is impaired; in the second it is abolished. There are two principal categories of energeia, psychical and physical, and he gives examples of disordered function and of abolition of function in both of them. Among the psychical functions, there may be disorders of sense-perception resulting in dulling of sensation, or abnormal sensations may occur; or there may be complete anaesthesia (loss of sensation). The governing faculties--imaginative, rational and recollective--may be affected in various ways. The physician Theophilus, for example, was rational but had auditory and visual hallucinations of flute-players; some lunatics, on the other hand, are not hallucinated. but are irrational. A paralysis of the rational faculty is called anoia. Turning to the physical faculties, the alterative faculty may be totally inhibited, so that no digestion occurs (apepsia); it

13. But there is a difference. If a nosos is a diathesis, it is not a pathos, for a diathesis is a stable state. Galen says elsewhere that a pathos due to a cause that acts only briefly, and then disappears, does not proceed to become a diathesis, because the cause has ceased to act (K VIII. 25; De loc. affect.)

14. K X, 78-81 (De meth. med.)

15. K X, 41 (ibid.)

may be weak but not otherwise abnormal (bradypepsia), or it may be disordered so as to operate in an abnormal manner (dyspepsia), resulting in conditions such as leprosy and elephantiasis.¹⁶

As for the origin of impairment of function, Galen says that Hippocrates originated the doctrine that the genesis of nosemata in the homoiomerous parts is different from that in the organic parts, and it was perfected by Aristotle and Theophrastus. According to this doctrine, the energieas are generated in the homoiomerous parts,¹⁷ and therefore for each organic part there is one proper (ὄργανον) homoiomerous part on which the function of the organ primarily depends. For the eye this is the crystalline humour. All the other parts of the organ develop for the sake of this essential part,¹⁸ and if the part that is the source of the function is diseased, the function will be impaired. There are three basic varieties of diseases:

1. Of the homoiomerous parts: Dyscrasia (i.e. imbalance in the crasis or relative proportions of the humours with their four qualities, Hot, Cold, Wet and Dry).

2. Of the organic parts: Disorders of conformation, number, size or situation.

3. Of both homoiomerous and organic parts: Solution of continuity (e.g. lacerations, fractures, avulsions, ulcers).¹⁹

16. K VII, 53-72 (De sympt. diff.) See also K VII, 200-1 (De sympt. caus.)

17. A homoiomerous part is one that has a homogeneous texture. In the physical world metals and liquids, for example, are homoiomerous, because every part is like every other, and if they are divided up, the parts that result are still the same substance. Gold is a homoiomerous substance. If a gold ring is cut into pieces, the parts are no longer rings, but they are still gold. In the body, Galen's homoiomerous parts are what would now be called tissues, such as bone or liver parenchyma. (His criterion of homogeneity, of course, was a naked-eye one; many of these tissues are not in fact microscopically homogeneous.) The organic parts are built up from homoiomerous materials by imposing form on them, just as a craftsman makes a cup from metal. Several different homoiomerous materials may be used to make one organic part. Thus the arm, an organic part, is made of bone, ligament, flesh, blood, skin, and so on.

18. K X, 118 (De meth. med.)

19. K X, 125-6 (De meth. med.) See also K VII, 26-32 (De caus. morb.), K VI, 845-58 (De morb. diff.) For continuity, see P.H. de Lacy, 'Galen's Concept of Continuity', Gk.Rom. Byz. Stud. 20, pp 355-369, 1979, a study which goes far beyond the surgical importance of continuity.

Thus eucrasia of the homoiomerous parts is not enough to ensure health; there must also be the proper arrangement, size, shape and number of the organic parts.

Galen's doctrine of dyscrasia is basic to his pathology and will be dealt with in detail later. The second category embraces such conditions as congenital deformities, like club foot, which may be correctable in infancy while the parts are still soft; conditions resulting from wrong handling of the newborn, as when nurses bind the chests of female babies in the hope of making their hips larger; faulty reduction of fractures, or interference by the patient before union has taken place; additional or deficient natural structures, such as extra fingers, or (in Galen's opinion) bladder stones and worms; conditions in which the natural form is preserved, but the part is unusually large or small. Some parts may show excessive filling or lack of it, as the face does in elephas and phthisis, respectively, or the whole body may be affected. Nicomachus of Smyrna became so large that he could no longer move his body, but Aesculapius cured him. Cavities in organs may be occluded and obstructed by deformity or by glutinous contents, and such materials may stop up natural outlets; such closing of pores may also result from excessive action of the retentive faculty. Lastly, a natural structure may be in the wrong place.²⁰

The third category embraces chiefly surgical conditions. Solution of continuity in a fleshy part involves a wound or ulcer, or the damage associated with bruising; in a bone, fracture; in a tendon, rupture or avulsion.²¹

For Galen, then, health consists in eucrasia of the homoiomerous parts, coupled with a proper arrangement, size, shape and number of the organs of the body. It involves, that is, both crasis and diaplasis.²² The healthiest bodies--that is, those that have the best

20. K VI, 862-72 (De morb. diff.); K I, 376-9 (Ars med.); K VII, 26-32 (De morb. caus.).

21. K X, 232-3 (De meth. med.)

22. K IV, 737-8 (De opt. const.) Crasis (mixture) is the balance of the humours with their qualities in the part. The idea comes from the Stoics. Their matter was infinitely divisible, so that complete interpenetration of the components was possible in any mixture of suitable materials. For liquids such mixing was called *κράσις*, for other materials *μίξις*. The pneuma of the world-soul, the most subtle kind of matter, could thus interpenetrate everything, and held the cosmos together (Sambursky, Physics of the Stoics, pp 10-16). Since the humours are liquids, the term crasis is rightly applied to their mixtures. Terms such as "dry crasis" or "hot dyscrasia" refer, not to the humours directly, but to the qualities associated with them. Diaplasis (moulding) is the process of forming the organs from homoiomerous materials.

crasis of their tissues and the best diaplasia of their organic parts--are the least liable to disease. Such bodies are least affected by harmful influences, since their temperaments are perfectly balanced and removed from all extremes. Harmful influences may be external to the body, for instance heat, cold, damp or dryness; or they may be physiological or psychological, for instance fatigue or grief; or internal, as a result of perittomata, which are the superfluous residues of nutriment and may be troublesome either by reason of quantity or of quality.²³ Health may be simple or absolute, as when, from birth, the body is eucrasic in its homio-merous parts and its organs are perfectly formed and disposed; or relative, where the body is in the state usual to it, but not the best possible state. The body is simply diseased when from birth it is either dyscrasic in its tissues, or ill-tempered in its organs, or both; temporarily or relatively diseased when the abnormality lasts only for a time, for example in affections of childhood which disappear with adolescence.²⁴ Thus intermediate stages between total health and total disease are possible; such neutral states may be regarded as neither health nor disease.²⁵

Since both the eucrasia of the tissues and the best state of the organs involve symmetria or the state of being well tempered or balanced, disease may also be defined in terms of temperament. What is natural (κατὰ φύσιν) is well tempered (σύμμετρον); what is παρὰ φύσιν is ill-tempered or ἄμετρον. Disease is an ametria of whatever things, in health, are in symmetria.²⁶

If the body were unchanging and apathic, it would remain permanently in health.²⁷ A body that is simple and a unity cannot change. But if it is compound it can, and its best state is then that in which all its components are in their best state. The bodies of animals are not unities, like the atoms of Epicurus or the unjointed (atomic) corpuscles of Asclepiades, which are apathic and not subject to change.²⁸ Compound structures like bodies are subject to genesis and decay, and they are affected by various influences. Some of these cannot be entirely avoided, and their effects are therefore the concern of preventive medicine. Such are food and drink, sleep, and the environment, climatic and otherwise. The

23. K IV, 741-4 (De opt. const.)

25. K I, 313-4 (*ibid.*)

27. K I, 366 (Ars med.)

24. K I, 309-12 (Ars med.)

26. K VI, 838 (De morb. diff.)

28. K VI, 839-40 (De morb. diff.)

ambient air, movement and rest, sleep and waking, food and drink, and psychological states may all be productive either of health or of disease in the body, depending on the circumstances. It is the function of the doctor to adjust them, or the state of the body, wherever possible, so that health is preserved, making any necessary changes before trouble develops. This function of maintaining the best possible constitution of the body is an important part of medicine. Other influences are adventitious, and cannot be foreseen; such are swords and wild beasts. Medicine is not concerned with preventing the effects of such agents in advance, though of course it may treat them when they occur.²⁹ The doctor in antiquity, perhaps because of his lack of specific remedies for disease once it was established, was far more concerned than he is today with the day-to-day maintenance of the patient's health while he was still in possession of it.

Although Galen is committed to the views summarised above, he mentions two major theories of disease of the homoiomerous parts: the one he accepts, as summarised above, and a structural theory, involving disproportion of passages.³⁰ According to this Methodist view, as set forth by Galen, there are only two primary diseases, resulting from breadth and from narrowing of the passages; or, as usually expressed, from relaxation and constriction respectively. The passages in question, Galen says, are not the perceptible lumina of hollow organs, or even similar channels too small to be seen; they are the spaces hypothesised by the leaders of the sect, which are left by the coming together of the primary, apathic elements or atoms. No movement of atoms would be possible, according to this view, in the absence of empty space for the atoms to move in; reality consists of atoms and the void. Since the atoms cannot change or suffer, disease must be an effect of their combination. The atoms must neither move too freely in their passages, nor must they be unduly restricted. While the *symmetria* or even temperament of the passages, with respect to constriction and relaxation, is preserved, the tissues are healthy, but when it is disturbed, they become diseased. Bone, flesh and the other homoiomerous parts must be in a state half way between narrowing and breadth of the passages in order

29. K I, 366-9 (*Ars med.*)

30. K VII, 1-4 (*De caus. morb.*) For the Methodist doctrine, see pp 56-9.

to be healthy. Slight deviations in one direction or the other are not called diseases, since they cause no appreciable damage to function. But if they are considerable, they exceed the limits of health and the part involved is corrupted and diseased.³¹ Compound nosemata, a mixture of constriction and relaxation, occur when some of the passages in the part concerned are constricted, while others are relaxed.³²

Galen is usually particularly contemptuous of Methodism, and does not accept this hypothesis. According to the other one, which Galen favours, the homoiomerous parts are subject to four primary dyscrasic diseases, due to an excess beyond the natural temperament of the primary qualities, the Hot, the Cold, the Damp and the Dry respectively. The parts may be affected in two ways: by an excess in quality only, without any change in quantity, or by a flow to the parts concerned of an abnormal quantity of material having the quality in question in excess. The first variety, if slight, is hard to detect, since there is no swelling; if it is more severe, an excess of heat or dryness may lead to necrosis of the affected part. In the second variety the part is distended, the nature of the swelling depending on the identity of the humour in question. There are also four compound dyscrasias, namely hot/dry, hot/damp, cold/dry and cold/damp,³³ which can affect a part in the same two ways, either qualitatively or by a humour descending on it. A humour can be dry because, although, being liquids, all the humours appear to be damp, they are not all damp in their powers or dynamis; yellow bile, for example, is a hot dry humour, and black bile is cold and dry. And although the dyscrasias are classified in this way, the material that descends on a part, giving rise, say, to an inflammatory swelling, will often be a mixture of humours.³⁴ Galen's humoral pathology will be dealt with in more detail later.

In an attempt to discover some of the origins of Galen's views, and to serve as an introduction to his own humoral pathology, some of the ideas of disease and its origins held by his predecessors must be reviewed, with special reference to the humoral theory. This theory is intimately concerned with Aristotle's four qualities, the

31. K VI, 842-3 (De morb. diff.) 32. K VI, 872-3 (*ibid.*)

33. Not six, because the combinations hot/cold and damp/dry cannot exist.

34. K VI, 843-54, 873-5 (De morb. diff.)

Hot, the Cold, the Damp and the Dry; but since these qualities are in turn associated with the elements Earth, Air, Fire and Water, some preliminary consideration of these is called for, although they are of little direct importance in Galen's system of medicine.

Apparently Empedocles (fl. c 440 BC), the founder of the Italian school of medicine, was the first to identify the four corporeal elements with the four qualities.³⁵ Some idea of substances with opposite properties, however, is much older. Anaximander (born c. 610 BC) regarded the first material cause of everything as the Boundless (ἄπειρον) out of which things having opposite qualities separate. These opposites, which may perhaps call elements (on the other hand they may be qualities) make reparation to one another for injustice; for instance, the warmth of summer would be an injustice to the cold, but the cold has its revenge in winter. According to Aristotle, he said that the Boundless could not be one of the elements, since if one were infinite the others would have ceased to exist; it is therefore a sort of basic substance out of which the elements come into being.³⁶ A much later writer, the author of Regimen I in the Hippocratic corpus, had a simple system of elemental justice and reparation. All animals, he maintained, were composed of the opposite elements fire and water. Each alternately exercised injustice until it became exhausted, and then retired to be the victim of the other's advance; an oscillating cycle of alternating advances of fire and water was thus set up, no doubt based on Heraclitus' ideas.³⁷ Not everyone agreed that there were four elements. The atomists Leucippus and Democritus postulated an infinite number, and Anaxagoras regarded all homoiomerous substances as elements. He held that Earth, Air, Fire and Water were compound bodies, general seed-grounds for homoiomerous substances:³⁸ Plato's elements were not, strictly speaking, Earth, Air, Fire and Water, but the triangles of which these three-dimensional structures were made up. Having this common structure, the corporeal elements were transformable one into another; for instance, two molecules of the tetrahedron or pyramid³⁹ of fire could coalesce to form one octahedron of air. The triangles, of course, are too small to be perceptible.⁴⁰ These are Pythagorean ideas. In constructing the universe, the god who made it used up all the

35. Burnet, p 201.

36. Ibid., p 53.

37. L 6, 472-4.

38. Aristotle, De Gen. et Corr. 314b

39. Cf Shelley (Adonais 447) on the elongated pyramid of Cestius in Rome: "Like flame transformed to marble".

40. Tim. 48e-57c.

earth, air, fire and water that there was; nothing was left over. Hence there is only one universe; it is a living creature, endowed with a soul and reason owing to the providence of the god, who is all good and made it, as far as possible, like himself.⁴¹ The god gave his sons the task of constructing a mortal body round the immortal soul, which they placed in the head; there is also a mortal soul in the lower parts, divided into two by the diaphragm.⁴² Plato blames the elements for diseases of the body. An excess of fire leads to continuous inflammations and fevers; of air, to quotidian fevers; of water, to tertians, because water is more sluggish; and of earth, to quartan fevers, because earth is the most sluggish of all, and is purged in fourfold periods of time.⁴³

The Platonic idea of the construction of the elements from geometrical planes cannot be right, says Aristotle, for planes are composed of points and lines, yet the elements have characteristics, such as mass, which points do not.⁴⁴ Aristotle has given by far the most coherent account of element theory in antiquity. He defines elements as the substances into which other bodies may be analysed, and present in them either potentially or actually, but which cannot themselves be analysed into constituents differing in kind.⁴⁵ This, he says, was the view of Empedocles, against the opinion of Anaxagoras that all homoiomerous substances were elements, and of the atomists that the primary bodies are infinite in number. The number of elements, according to Aristotle, must be limited.⁴⁶ Is there more than one? There must be, for otherwise there would be only one kind of motion.⁴⁷ And the body of an animal cannot consist of only one element such as fire or air, since it has sensation.⁴⁸ A body composed of only one element cannot be sensible, because sensation involves change, and change in such a body is impossible.⁴⁹ Thus the elements can change; they are not eternal, but are subject to generation and decay. They are not generated from some external body; therefore they are generated from one another.⁵⁰ They can change one into another, and therefore each one is potentially latent in each of

41. Tim. 29e-32c.

42. *Ibid.*, 69b-e.

43. *Ibid.*, 86a.

44. But in the same way the atomists believed their atoms to have no sensible characteristics; the qualities of compound bodies were due to the way in which the atoms associated.

46. *Ibid.*, 302a-303b.

45. Aristotle, *On the Heavens*, 302a.

48. Aristotle, *On the Soul*, 435a.

47. *Ibid.*, 304b.

50. *On the Heavens*, 305a.

49. L 6, 34.

the others.⁵¹ Although there is no single one from which the others are derived, there is a fifth, or rather a first or primary element (πρῶτον στοιχεῖον) which fills the whole region of the celestial motions. This is aether; it exists because the spaces between the heavenly bodies must be filled with something,⁵² and these bodies themselves are composed of it. It is not fire, as Anaxagoras thought; this would disturb the proportions of the four other elements. For the same reason it cannot be air. It exists in quantity only in the region above the moon, but varies in purity; it is relatively impure where it borders on the sublunary sphere.⁵³ Its primary motion is eternal and circular, not rectilinear like the movement of the earthly elements; having neither lightness nor weight, it does not move up and down as they do.⁵⁴ The celestial element is the first cause and source of all motion, but the material causes of events in the sublunary sphere are the four elements.⁵⁵ The fifth element is a kind of matter, potentially possessing the four qualities; it has them, however, only by virtue of movement.⁵⁶ On the other hand it has the circular movement of the divine soul-material in Plato, and it is in the nature of the divine, according to Aristotle, to be in eternal motion.⁵⁷

Only the celestial bodies are made of the fifth element; the four earthly elements are produced by the action of the primary qualities (hot, cold, wet and dry). The celestial element is the first cause of the four ordinary elements, which are formed by heat and cold, which operate by reducing or increasing density, the χύσις and πύκνσις, rarefaction and condensation, of the Stoics.⁵⁸ In a sense, therefore, the qualities are prior to the sublunary elements. Of the four causal factors two, the hot and the cold,

51. Aristotle, Met. 339a-b.

52. It had a long life in scientific thought; until the Michelson-Morley experiment of 1881, in fact.

53. Aristotle, of course, accepted the geocentric universe of Eudoxus, with concentric transparent spheres, by far the best account of which is to be found in the Paradiso of Dante. Below the moon there are the four subsidiary spheres of fire, air, water, and earth, from above down; interaction between them produces all the phenomena of meteorology.

54. Aristotle, On the Heavens, 269b-270b. Fire is the lightest element and rises upwards, earth the heaviest and sinks downwards; water and air occupy the intermediate positions.

55. The material cause is the matter from which something is made. Since the celestial element, of which the heavenly bodies consist, is the first cause, we have a basis for astrology; but Galen's medicine is, in fact, remarkably free from it.

56. Aristotle, Met. 339b.

57. Aristotle, On the Heavens, 286a.

58. K II, 8 (De fac. nat.)

are active (ποιητικά), while the wet and the dry are passive (παθητικά).⁵⁹ The effect of heat is generation; the opposite is decay. Generation occurs when the causal quality overcomes the material; decay when the material overcomes the cause. Only Fire is immune to decay; the other three elements all suffer it.⁶⁰

The substances generated by the four qualities could, theoretically, have six combinations of the qualities taken in pairs; but the combinations Hot/Cold and Damp/Dry are, as previously mentioned, contradictory, and hence there are four. Fire is hot and dry; air hot and moist; water cold and moist, and earth cold and dry. The genesis of these elements is cyclical, each changing to the next by alteration of one quality; thus earth can become water by moistening only, but for it to become fire two intermediate steps are necessary.⁶¹

Homoiomeric substances are composed of the elements, and serve in turn as material for all the works of nature. Heat and cold, and the motions that they set up, produce the homoiomeric bodies, which include the tissues of the body; the anhoiomeric structures, or organs, are constructed by nature or some other cause, just as a human craftsman makes a cup from metal.⁶² The homoiomeric substances are made from water and earth, under the influence of heat and cold. Liquids that evaporate are made from water, but milk is a mixture of water and earth. Substances that solidify in the cold come from water, as do those that can be melted by heat, such as metals. Blood and semen have a component of air in addition to water and earth.⁶³

59. According to Aristotle, all other opposites can be derived from these four primary ones: for instance hard and soft from dry and wet respectively, and so on (De Gen. et Corr. 329b-330a). Galen (K II, 7-8, De fac. nat.) says that in some of his works Aristotle regarded hot and cold as the major qualities, but that he considered all four equally in others.

60. Aristotle, Met. 378b-379a.

61. Aristotle, De Gen. et Corr. 330a-331b.

62. Aristotle, Met. 389b-390b. All ordinary substances are made up of all the elements, but in varying proportions. Water (the kind that occurs on earth, not the perfect element) is not completely damp and cold, nor is earth completely dry and cold; if it were, it would be like adamant, and nothing could grow in it. If any one element were destroyed, the whole cosmos would perish; in the same way, if one of the humours in a man should fail, he could not survive (K XV, 92-6; in Hipp. de nat. hom. comm.)

63. Aristotle, Met. 388a-389a.

The opinions of a number of ancient authors on the causation of disease will now be considered in chronological order.

Galen remarks that, just as beauty of body depends on the proportions of its members, so health, in the view of all the ancients, lay in the right relationship of things to one another. All agreed, in fact, that health was a balance or equal temperament, and disease the reverse; it was only in the nature of the factors concerned in this balance that they differed. Asclepiades' factors, says Galen, were solid masses and the spaces between them; Epicurus' were atoms; Anaxagoras postulated the homoiomerics. Lastly there was a major school, starting with Hippocrates and Plato and followed by Aristotle and Theophrastus, Chrysippus and the Stoics, who held that the entities involved were the four qualities, Hot, Cold, Damp and Dry.⁶⁴

The idea of a balance of opposite qualities or materials apparently goes back at least to Alcmaeon of Croton, who was a younger contemporary of Pythagoras. Aristotle says that he may have got his theory of opposites from the Pythagoreans, or vice versa.⁶⁵ Health, in his view, was an isonomy, a free government with equal laws. Disease was due to a monarchia of one quality, an attempt--to use the political analogy--by one individual or group to exercise more power in the community than it should. It seems clear enough from the terms isonomy and monarchia that the metaphor was indeed a political one, which is not surprising in view of the history of Greek city-states. One might compare the medical treatment of purging out the monarchic component to the political practice of ostracism, by which a dangerous individual could be expelled from the community, thus restoring the balance.

Whatever its origin, however, the idea of a healthy balance of opposites, the maintenance of which is the task of medicine, is well represented in the Hippocratic corpus. The author of Breaths, probably a non-medical sophist, offers a naive definition of a disease; it is anything that makes anyone suffer. Thus, he says, hunger is a disease, and is cured by its opposite, feeding. Opposites are cures for their opposites, and medical treatment consists in taking away what is in excess, and in adding what is lacking. All diseases are of this same kind (τρόπος), although their seat (τόπος) varies.⁶⁶ This allopathic attitude (treatment by oppos-

64. K V, 449-50 (De plac. H. & P.)

65. Burnet, p. 193.

66. L 6, 92.

ites) is found in many of the Hippocratic works,⁶⁷ and Galen says that it is also the practice of nature:

"Who does not know that opposites are remedies for their opposites? This is not the doctrine of Hippocrates alone, but is common to all men...These things are done daily under the guidance of Nature; she cures not only hunger with feeding, but repletions with evacuations, cold with heating; and hot conditions with cooling."⁶⁸

The doctrine of humours and qualities is perhaps most clearly set forth in the Corpus in Nature of Man, and this was the system adopted by Galen. It postulates four connate humours, blood, phlegm, yellow bile and black bile. There are, however, a number of works in the Corpus that offer alternative, and sometimes simpler, humoral systems, so that it is tempting to see Nature of Man as the culmination of an evolutionary process, and its acceptance by Galen as an acknowledgment of its perfection. As will be shown later, it is in fact very doubtful whether it is a satisfactory system at all; it is nevertheless convenient to deal with the relevant works in the Corpus in the order in which such an evolution might have occurred, without, however, making any firm commitment in respect either of ancestry or of chronology.⁶⁹

67. See, e.g., Aphorisms, L 4, 476. 68. K XI, 167 (De ven. sect. adv. E.)

69. There are lessons to be learned from the biological sciences here. The new discipline of cladistics, in which evolutionary events and biological patterns are represented by branching diagrams, has shown how important it is to have the right cladogram before pontificating on, for instance, the descent of man and the higher apes. What is an ancestral group in one possible diagram may be the product of independent but parallel evolution from a remoter common ancestor in another. The methods of dating available to the biologist are both more abundant and more rigorous than those at the command of the philologist, yet there is little agreement among biologists on such matters. Hence it is probably quite impossible to date with any certainty the relevant works in the Corpus, or to be sure that one was the ancestor rather than the contemporary of another.

The development of humoral doctrine, and in particular of the notion of black bile, is dealt with by W. Müri, 'Melancholia und schwarze Galle,' *Mus. Helv.* 10, pp 21-38, 1953; R.F. Timken-Zinkann, 'Black bile: a review of recent attempts to trace the origin of the teachings on melancholia to medical observations', *Med. Hist.* 12, pp 288-292, 1968; H. Flashar, Melancholie und Melancholiker in den medizinischen Theorien der Antike. 1966; and E. Schöner, 'Das Viererschema in der antiken Humoralpathologie', *Sudh. Arch., Beihefte: Heft 4*, 1964. There is a statistical-philological study by L. Roy, 'Le concept de χολή, la bile dans le corpus hippocratique', Document 8, *Projet Hippo*, Université Laval (Québec), 1981.

There is a significant remark at the beginning of On Ancient Medicine, a work to which Galen never refers, from which it may be concluded that he did not attribute it to Hippocrates:

"Those who undertake to speak or write on medicine, basing their arguments on an hypothesis, be it hot or cold, moist or dry, or anything else they choose, and restricting the cause of diseases and of death in men to the same thing in all, postulating one or two factors, are manifestly in error",⁷⁰

and again in the thirteenth chapter he says:

"I want to come back to the argument of those who seek to practise the art in the new style, by hypothesis (τὸν καινὸν τρόπον τῆν τέχνην ζητεῦντων ἐξ ὑποθέσεως). If there is some hot or cold or dry or damp quality which injures a person, then the competent practitioner will prescribe hot remedies for the cold, cold for the hot, dry for the damp and damp for the dry."

A man of rather weak constitution, he goes on, who lives on wheat straight from the ear, raw meat, and water, will become ill. What should the remedy be? According to the new system, since the damage can only be due to one of these qualities, the opposite one ought to relieve it. In fact, however, the most appropriate treatment would be to give this patient bread, cooked meat, and wine in place of his previous crude diet; the qualities are quite irrelevant here.⁷¹ The author regards cold and heat as among the least important powers (δυνάμεις) in the whole body.⁷² He accepts, however, the principle of balance; a man, he says, is in the best state of all when everything is digested and in a state of calm, with no individual power making itself evident.⁷³ He envisages, however, an indefinite number of equally important qualities in addition to the four mentioned at the beginning: salt and bitter, sweet and acid, astringent and insipid, and so on.⁷⁴

This author also offers an alternative pathology to this system of multiple powers. This is a structural theory, according to which the shape and conformation of various organs depends on how well they are shaped, and thus on the physical type of the patient: whether

70. L 1, 570.

72. L 1, 606-8.

74. L 1, 606

71. L1, 598-600.

73. L1, 620.

the head is large or small, the chest broad or narrow, and so on. This author's system is not exclusive; it involves not only a balance of an indefinitely large number of opposites, but also the very important effects of suitable and unsuitable foods and drinks, which often have nothing to do with the four classical qualities; the effects of structure mentioned above, and, for good measure, traces of pneumatist pathology as well, in a reference to pain resulting from flatulence dashing against the liver.⁷⁵ Clearly the author of On Ancient Medicine is an eclectic who refuses to be bound by any exclusive theoretical system. His references to the new kind of practice suggest that eclectic schemes such as his own are more ancient than the new-fangled unitary hypotheses involving the four qualities, some of which must now be considered.

The least complicated of these systems are found in the so-called Cnidian⁷⁶ works in the Corpus, the basic tenet of which appears to be that diseases are caused by two humours, phlegm and bile. The author of the work called Affections (περὶ παθῶν) holds that all diseases are caused by these two humours, when one of them experiences an excess of dry, wet, hot or cold, resulting from the environment or from the patient's way of life.⁷⁷ He thus puts forward a two-humour, four-quality theory, in which treatment consists chiefly in either drying or dampening the patient, although the powers of foods and drinks in respect of the other two qualities must also be taken into consideration. A number of diseases are mentioned, all of which are said to result from one or the

75. L 1, 626-36.

76. The difficult question whether a specifically Cnidian school is only, in Smith's phrase, a figment of the scholarly imagination, will not be discussed. For the development by Ilberg of the theory of Littré that there was such a school, see Smith, Hippocratic Tradition, p 39; for modern defences of it, I.M. Lonie, 'The Cnidian Treatises of the Corpus Hippocraticum', Class. Quart. 15, pp 1-30, 1965, and J. Jouanna, Hippocrate: pour une archéologie de l'école de Cnide, 1974. W.D. Smith ('Galen on Coans versus Cnidians', Bull. Hist. Med. 47, pp 569-585, 1973) points out that whatever modern scholars may think they know of the difference between the schools of Cos and of Cnidos, Galen at least was not aware of any. There is no doubt, however, that the works in question do show notable similarities in their ideas of aetiology, and the term "Cnidian" will be used here merely as a convenient label for these works. Lonie (op. cit., p 3) regards Affections, Diseases I, II and III, and Internal Affections as Cnidian.

77. L 6, 208.

other of these two humours being set in motion and fixed in the affected part. There is no distinction of varieties of bile, but in discussing the pathogenesis of gout the author says that it is due to blood in small veins being corrupted by bile or phlegm;⁷⁸ blood thus becomes a secondary cause of disease, but only in so far as it may be corrupted by one of the primarily pathogenic humours. This is so except in one reference, in which all tumours are said to be due to phlegm or to blood.⁷⁹ It seems that this is the first sign of a three-humour system developing out of a two-system.

Diseases I puts forward a similar two-humour system. All diseases are due to bile and phlegm as internal causes, while external causes include such things as fatigue, wounds, heating, cooling, drying or dampening to excess. Bile and phlegm are always present in the body, just as the four humours are in Nature of Man.⁸⁰ Black bile is mentioned as a cause of non-mortal paralyses.⁸¹ and atrabillious madness is referred to,⁸² but there is nothing to suggest that black bile is anything more than a variety of ordinary bile, as is made clear when the qualities of the humours are discussed. Phlegm is the coolest; blood is warmest; bile (no distinction of varieties is made) is a little less hot than blood. Although phlegm is naturally cold, fever can be due to either bile or phlegm becoming heated. Rigor results from either bile or phlegm, or both, becoming mixed with the blood.⁸³ Dryness appears, once again, to play a major part in this pathology. When hot things are heated to excess, or cold things are excessively cooled, the result is equally dry. The blood can be corrupted by bile or phlegm, and venesection in the arm on the affected side is recommended to permit the escape of diseased blood (αὐτοῦ τοῦ αἵματος νεοσηκότητος),⁸⁴ together with these humours. Again there is a suggestion here that blood is developing into a third pathological humour. In discussing the pathogenesis of causus or ardent fever, the author says that the blood, which is by nature the hottest material in the body (ἅτε τῆ φύσει θερμώτατον ἔον ἐν τῷ σώματι) is heated as a result of attracting bile and material from the flesh and the belly, and in

78. L 6. 242.

80. L 6. 142.

82. L 6, 200.

84. L 6, 196.

79. L 6. 244.

81. L 6, 144.

83. L 6. 188.

turn heats the whole body. When the body suffers drying, the patient is hot inside but cold outside: in Galen's terminology, an anomalous dyscrasia. Death in causus is due to desiccation.⁸⁵

Diseases II, which Lonie believes to consist of two separate works, is principally concerned with treatment rather than with aetiology, but puts forward a similar two-humour system. Bile and phlegm, when set in motion particularly from the head, lead to various pathological conditions. Black bile is specially mentioned as a cause of apoplexy when it is set in motion in the head and flows to the neck and thorax, where veins abound. The result is apoplexy and loss of movement, as a result of cooling of the blood. This strongly suggests that black bile, in the opinion of this author, differs from the ordinary variety in being cold, since in Diseases I, as already mentioned, the blood is heated by attracting ordinary bile. If the blood is warmed again and separated from the black bile, the patient recovers.⁸⁶ In another variety of apoplexy, the veins of the head become heated and this causes them to attract phlegm. As a result, because of the coldness of phlegm, the blood is rendered less mobile than before and is cooled, a process that may prove fatal if it continues.⁸⁷ Phlegm, however, though cold, can nevertheless be a cause of inflammation; when it descends from the head and collects in the uvula, which is situated on a large vein, the uvula becomes inflamed and blood is attracted because of the heat.⁸⁸ Thus hot inflammation may result from the accumulation of a cold humour.

The work on Internal Affections, which Lonie⁸⁹ regards as the most coherent statement of Cnidian doctrine, offers a similar system. Pathological effects of blood are mentioned; if the lung attracts blood or salty phlegm, and does not get rid of them, they condense and coagulate, leading to tumours and suppuration.⁹⁰ Diseases of the lung may also result when the large veins in it are filled with blood or with black bile.⁹¹ We have here references to the pathological effects of blood, without any mention of admix-

85. L 6, 198. It is not clear to the modern reader how blood, if it is naturally hotter than any other component of the body, can become heated by absorbing any other humour; but the ancients' views on thermodynamics may have been different from ours.

86. L 7, 14.

87. L 7, 16.

88. L 7, 18. For hot and cold phlegm see Jouanna, pp 93-99.

89. Lonie, 'Cnidian Treatises', p 12.

90. L 7, 174.

91. L 7, 178.

ture of other humours; it is perhaps on the way to becoming a pathogenic humour in its own right. The idea of corruption of the blood by other humours is, however, also to be found here. A rheumatic condition, according to the author, results from phlegm and bile flowing into the great veins that go down the back and end in the feet. These veins are normally full of blood; if something foreign (τὸ ἄλλοῖον) enters them, disease ensues.⁹²

There is a hint in this work that there are more than two kinds of bile. The author says:

"Concerning phlegm I hold the same opinion as concerning bile, that there are many varieties (ἰδέας πολλὰς) of it."⁹³

But black bile is mentioned as a cause of hepatitis, when it descends on the liver, especially in autumn.⁹⁴ Another variety is due to yellow bile.⁹⁵ Black bile may also cause diseases of the spleen in autumn.⁹⁶ There is also a suggestion that phlegm may be hot; when it gets into the abdominal cavity, the blood that collects as a result of the heat (τὸ αἷμα ὑπὸ θερμασίας ἀλισθέν) descends on the ribs,⁹⁷ whereas in the works previously cited phlegm may lead to hot inflammation only because its presence causes blood to be attracted.

The works Generation, Nature of the Child and Diseases IV, which apparently formed a single work in antiquity, espouse a different theory of the humours. This is an explicit four-scheme, as in Nature of Man, and, as in that work, the four humours are innate, and give rise to diseases; but the black bile postulated in Nature of Man is replaced here by water (ὕδωρ or ὕδρωψ), which has its source in the spleen. These humours are present from the time of formation of the embryo.⁹⁸ There is much pneumatist doctrine in this work; the semen in the uterus, for example, uses the cold from the air breathed in by the mother to nourish it, since everything hot is nourished by moderate cold.⁹⁹ All the humours increase as a result of nutriment being taken; thus to eat little is conducive to health. Particular foods and drinks engender each of the humours.¹⁰⁰ The gallbladder receives bile only, but most other parts, and in particular the head, the spleen and the heart, can receive any

92. L 7, 210. For blood as a pathological humour, see Jouanna p 244.

93. L 7, 214.

94. L 7, 236.

95. L 7, 240.

96. L 7, 252; see also Jouanna

p. 249. The idea of the relation of the four humours to the seasons is seen in its most developed form in Nature of Man.

97. L 7, 282.

98. L 7, 542-4.

99. L 7, 486-8.

100. L 7, 556-8.

humour. The head and the spleen are very liable to become diseased as a result, as they have many veins and are capacious reservoirs for humours; the heart, on the other hand, never retains humours since its texture is dense and compact, and any excess is rapidly carried away by the jugular veins. Hence the heart cannot become diseased.¹⁰¹

Fever, in this author's view, results from one part of the body being heated by an excess of humour there. It can be due to any of the humours, but particularly to bile, phlegm and blood, the hottest humours. Fever due to water is usually mild and brief, since water is poor food for fire.¹⁰²

The concourse of humour, having exhausted the nourishment in the part of the body in which it started, goes to another part, till there is no part left unvisited, and the patient expires. Accumulation of humour in a part blocks the veins by which it should be excreted, and therefore persists.¹⁰³

According to this author there are three main causes of disease. The first is humoral, due to a new flux of humour arriving at a part before the humour already there has been excreted; this is an early reference to plethos. The second is climatic; hot weather, for example, can heat a humour which becomes agitated in the body, just as the Scythians make cheese by shaking mare's milk. The third embraces conditions such as trauma and fatigue. Bruising of a part can cause a flux of blood into it. Fatigue leads to stasis and heating of the blood; if this plethos is not eliminated in the stools and urine, fever may follow.¹⁰⁴

The relationship between diseases in the microcosm and affairs in the universe at large is further dealt with in the work on Sevens, but in a fantastic and frequently unintelligible way. The author seems to hold that the body is primarily made up of only one humour, of which all the others are modifications resulting from the action of heat and of cold. When the heat of the soul is stirred up by exertion, food or drink, the result may be fever from attraction of bile or phlegm.¹⁰⁵ There is more than a hint here, as in Diseases IV, that phlegm is hot, as its derivation suggests and as Prodicus of Ceos, Philolaus and Democritus held.¹⁰⁶

101. L 7, 560-2.

102. L 7, 586.

103. L 7, 588.

104. L 7, 582-4.

105. L 8, 639-43.

106. K. Freeman, The Pre-Socratic

Philosophers, 1949, p 372.

The relationship between weather and disease is considered at length in the famous Airs, Waters, Places, but there is little discussion of pathology. The remark is frequently made in the Corpus that sudden or violent changes in climate are productive of disease.¹⁰⁷ This is presumably because they disturb the balance of humours in the patient. The constitution of the patient must also be taken into consideration. Some constitutions are better adapted than others to certain seasons of the year.¹⁰⁸

Most of the writers in the Corpus who espoused a humoral pathology postulated a balance of humours, and hence of qualities. At least one, however, the author of Regimen I, has primary opposites that are elements rather than humours. All animals, he says, are composed of fire and water. Fire moves, water nourishes. The two opposites advance and retreat alternately; water advances until its motion fails, fire until its nourishment is exhausted. Neither can master the other.¹⁰⁹ The most subtle water blended with the most delicate fire gives the best bodily constitution. But the thickest water, mixed with the finest fire, results in a cold moist constitution, and such patients are unhealthy in winter. A mixture of the moistest fire with the densest water leads to a moist, warm constitution; and so on.¹¹⁰ Here we have the qualities springing directly from the elements, rather than from humours.

The same antipathy of dry and moist is seen in the work Places in Man.¹¹¹ The body, according to this author, has a circular arrangement; thus no process in it has either end or beginning. All diseases originate equally from the whole body. Parts that are too dry are the most liable to diseases, while those that are moist are least so. Diseases establish themselves in dry places, but are only intermittently present in damp ones. All the parts of the body communicate in circuits; if the belly does not completely digest

107. L 2, 50; L 2, 296; L 5, 496.

108. L 4, 486.

109. L 6, 472-4.

110. L 6, 506-10.

111. Lonie ('Cnidian Treatises', p. 9) thinks that Places in Man cannot be classified as Cnidian, though influenced by that school, in view of its individual system of aetiology.

the food it floods the body with moisture, which goes first to the head and thence to other parts where it causes disease. The whole body is affected by a lesion in the smallest part.¹¹² The author is a kind of anti-Heraclitean; he regards moisture as good and dryness as bad.¹¹³

The doctrine of humours and qualities is perhaps most clearly set out in the *Corpus in Nature of Man*, the relevant part of which Galen attributes to Hippocrates. The author mentions other thinkers (apparently Pre-Socratics like Thales and Heraclitus) who maintain that the universe consists primarily of one of the elements, earth, air, fire or water; among physicians, he says, some say that man is blood, some bile, and a few, phlegm. This unity is altered by hot and cold to become a diversity of opposites: sweet, bitter, white, black, etc. Most physicians of his time, says the author, hold such opinions. But it cannot be so, for if man were a unity he could not feel pain, and even if he did suffer from disease, there would be only one kind of it and it would thus have only one cure. In fact, however, there are many cures, because there are many constituents of the body, which by heating, cooling, drying and dampening one another contrary to nature, engender diseases which are of many kinds, with many different treatments. There is no time when man is all blood, or any other single humour.¹¹⁴ His body always contains all four of the humours, blood, phlegm, yellow bile and black bile, and it is in health when these humours are duly proportioned one to another, and perfectly mingled. The four humours are quite distinct and different, both in colour and to the sense of touch. Particular drugs purge particular humours preferentially.¹¹⁵ The four humours do, however, increase and decline with the progress of the seasons; phlegm, for instance, is at its height in winter, while blood increases in spring, yellow bile in summer, and black bile in autumn.¹¹⁶ We have here one of

112. L 6, 276-8.

113. Heraclitus, who regarded the One as Fire, naturally distrusted moisture. He finally fell victim, however, to the dampest of diseases, dropsy, which he failed to cure by burying himself in a dunghill (Marcus Aurelius, *Meditations*, III, 3.) The accepted humoral doctrine was rather that moisture, as the principle of life, should be preserved. For the development of this idea in later times, see T.S. Hall, 'Life, Death and the Radical Moisture', *Clio Med.* 6, pp 3-23, 1971.

114. L 6, 32-6.

115. L 6, 38-46.

116. L 6, 46-50.

the early references to the relation between human physiology and the outside environment, particularly climate, which is so important in early medicine. The external environment affects the balance in the body. Pain occurs, according to this author, when there is too much or too little of a particular humour, or when one is isolated without being mixed with the others. When one separates off in this way, the empty place that is left must become diseased, while the place in which it establishes itself must suffer from the excess.¹¹⁷ The most dangerous diseases originate in the strongest parts of the body. If they move from stronger to weaker parts it is hard to get rid of them. But if the movement is in the opposite direction it is easy, since the stronger parts easily consume the material that has flowed into them.¹¹⁸ There is a double origin of diseases: from regimen and from air. Diseases arising from the patient's way of life are the dyscrasias already referred to. But there are also epidemic diseases which affect large numbers of people at the same time, regardless of their way of life. Such diseases are due to air, which is charged with some unhealthy exhalation (νοσηρῆν τὴν ἀπόκοσμον).¹¹⁹

At one stage the Hippocratic author seems to foreshadow Methodism, where he says that the physician must relax what is tense and make tense what is relaxed.¹²⁰ This looks like an interpolation, but it was in Galen's text. It is said, he explains, of causes, not of the bodies affected by them.¹²¹

In commenting on this theory of epidemic disease, Galen agrees with the Hippocratic author, but notes that airborne contagion is not the only cause of such diseases. He mentions epidemics of weakness

117. L 6, 38-40.

118. This is a reference to the movement of perittomata, which is very important in Galen's pathology, and will be dealt with later.

119. L 6, 52-6. The Anonymus Londinensis says that Aristotle (by which, according to his editor, W.H.S.Jones, he means Menon), said that Hippocrates attributed disease to the free passage of pneuma in the body becoming impeded. But, says the writer, what Hippocrates himself said was that diseases were caused by elements... (lacuna)...chilling or heating of bile or phlegm led to disease. Hippocrates' view that all diseases originate either in air or in regimen, says the author, is wrong, because the same cause does not always lead to the same disease, and different causes may do so. (Anon. Lond. VI, 13 - VII, 40.)

120. L 6, 52.

121. K XV, 110-16 (In Hipp. de nat. hom. comm.) Galen must at all costs defend Hippocrates against any imputation of Methodism.

of the legs caused by eating unwholesome pulses, and the effects of drinking polluted water on campaign.¹²²

The same idea of two causes of disease appears in the sophistic work Breaths, whose author maintained that diseases were all the offspring of air.¹²³ When the air is infected with pollutions hostile to man, it causes epidemics. Other diseases are due to regimens, as with the author of Nature of Man, but the mechanism is different. They result, not from dyscrasia, but from the movements of air in the body.

The work called The Art explains that where diseases have their seat in a place that can be examined, one can detect emptiness or filling, colour etc., and thus directly determine the quality (hot, cold, moist or dry) that is in excess. Such diseases, he naively says, should have infallible cures. Most diseases, however, lurk in hidden parts.¹²⁴

It is clear from this brief survey that the rudiments of a humoral pathology are already to be found in the Hippocratic corpus. There is little agreement among the authors, however, as to the details. Galen's system is based on Nature of Man, with four humours--blood, phlegm, yellow bile and black bile--and four qualities. The other works show much variation, both in the number and in the variety of substances involved. Some sort of balance and crisis of opposites, however, was apparently widely accepted in pre-Galenic antiquity.

The opinions of a number of other early authors, of some of whom we otherwise know nothing, have been preserved--it is hard to know how reliably--by the Anonymus Londinensis. He attributes part at least of Nature of Man to Polybus, said to have been Hippocrates'

122. K XV, 118 (In Hipp. de nat. hom. comm.)

123. L 6, 96-100.

124. L 6, 16. Such a simplistic view is still common in popular belief today, and was remarked on in the nineteenth century:

"All mankind, in short, except physicians...conceives all diseases that have a name as distinct entities, and all remedies as distinct antidotes...that each disease has its own remedy, and that the whole practice of medicine really consists in knowing the disease and its antidote, and matching them fairly against each other."

(The Collected Works of Dr P.M. Latham, 1878, II, p 391).

Galen is not free from it. He says that the physician must discover a drug equal to the greatness of the disease. Suppose that there are ten gradations of heat, and seven of dryness; there must presumably be ten remedies of corresponding degrees of coldness, and seven dry ones. The doctor must choose the one that is cold and damp to the exact degree that the disease demands (K I, 383-4; Ars med.). It seems that the idea that every disease has its specific cure, if only the doctor could find it, is a relic of the humoral system.

son-in-law, who held, he says, that the body is not composed of one element, but of a mixture of cold and hot, disturbance of which leads to disease. Diseases also occur if one humour is separated out.¹²⁵ Menecrates surnamed Zeus postulated four substances: blood, bile, phlegm and breath (another alternative to black bile), of which the first pair were hot, the second cold. Disharmony among these substances led to disease. Black bile, though not a primary humour, did exist in the system; it was produced when ordinary bile became stale, and led to local disease in the parts to which it was carried.¹²⁶ Philolaus of Croton, a Pythagorean at the end of the fifth century, held that bodies consisted primarily of heat, and that diseases arose through bile, blood and phlegm. Phlegm, he said, was a hot humour, as its derivation (φλέγειν) suggests. Inflammation resulted from phlegm, which was generated in the body from rain. Bile was a serum of flesh, not derived from the liver.¹²⁷ Hippon of Croton postulated a natural moisture (οὐκεία ὑγρότης) on which perception and life depended. When it dried up, coma and death followed. Excesses of heat and cold affected the moisture, changing its quality or converting it into other substances; thus diseases came about, but he did not specify them.

Thrasymachus of Sardis held that blood was the cause of diseases, each change in the blood leading to a different one. Excess of cold or heat could change blood into phlegm, bile or pus, with pathological consequences. Bile and phlegm could melt, producing serum (ἰχώρ) and sweats, which thickened to form pus.¹²⁸ Petron of Aegina supposed that bodies were composed of cold, linked with moist, and hot, linked with dry. Disproportion of these elements led to disease, as did the residues of nutriment taken in excess. Bile was produced as a result of disease, not vice versa. Petron agreed with Philolaus that bile was useless.¹²⁹

Philistion postulated a body composed of the four elements, each of which was associated with one quality: fire (hot), water (moist), air (cold) and earth (dry).¹³⁰ Diseases came about from

125. Anon. Lond. XIX, 2-17.

126. Ibid., XIX, 48.

127. Ibid., XVIII, 9-49.

128. Ibid., XI, 13-XII, 28.

129. Ibid., XIX, 49 - XX, 14.

130. The classical humoralist scheme attributed two qualities to each element. Stoic doctrine, however, equated one element with one quality (Sambursky, Physics of the Stoics, p 3.)

the elements, where a quality was in excess; from the condition of bodies, where obstruction to the free passage of pneuma led to disease; and from external causes, such as trauma, heat and unsuitable food.¹³¹

Plato was not a physician, but nevertheless expressed some opinions on the causation of disease. It might be due to excess or to deficiency of any of the four elements, or to one of them being in the wrong place. Each element has more than one variety, and disease ensues when an inappropriate variety enters the body. Such unnatural change occurs, for instance, when an element that was formerly cold becomes hot, a change that can only be rectified if some substance is added or subtracted.¹³² There is no mention here of the humours, but they may be generated from blood. Flesh and sinew originate from blood, and can break down into it again, reversing the order of their formation. This corrupts the blood, destroying its nutritive function, and the breakdown products move through the veins in all directions, no longer preserving the order of their natural circuits. The blood thus acquires unnatural colours and flavours, bile, serum (*lymp*) and phlegm. These abnormal humours are all classified as different kinds of bile.¹³³ When the marrow is affected and breaks down, either from deficiency or from excess, the disease is of the most fatal variety, since the substance of the body is flowing in the wrong direction.¹³⁴ It is clear that, at least by Galen's standards, Plato's pathology is unorthodox; it is, however, based on a balance. Health, he says in the Republic, is found when all the parts of the body are in their natural relations of authority or subservience, while disease follows when their relationships are disturbed. The same is true, he says, of the parts of the soul.¹³⁵ A balance between body and soul must also be preserved. If the soul is stronger than the body it agitates it and fills it with psychosomatic troubles, which physicians may mistake for organic disease. If, on the other hand, the body is stronger than the soul, the result is the greatest of all diseases, ignorance (*ἀμαθία*). Hence the soul and the body should each have its appropriate exercises.¹³⁶ Purgative drugs are bad, and should be reserved for the greatest diseases; for in its structure every

131. Anon. Lond. XX, 14-50.

133. Ibid., 82c - 83c.

135. Rep. 444 c-d.

132. Tim. 82 a-b.

134. Ibid., 82e - 84c.

136. Tim. 88 a-d.

disease resembles in some way the nature of the living animal. Like that animal, the disease has its predetermined span of life; interference with drugs may cause many new diseases.¹³⁷

The pseudo-Aristotelian work Problems is a compilation dating, according to the Oxford Classical Dictionary, from as late as the fifth or sixth century; it contains a passage, attributed to Aristotle's pupil and successor Theophrastus,¹³⁸ which discusses the question why all outstanding philosophers, statesmen, poets and artists, such as Empedocles, Plato and Socrates, were melancholic. Wine (particularly red wine) taken in large quantities produces melancholic characteristics, both psychological and physical. This is because wine and the atrabilious temperament are similar; both are full of breath.¹³⁹ Every function of man is under the control of heat, and the melancholic humour (although black bile is naturally cold) is, in nature, a mixture of hot and cold, for nature, says Theophrastus, consists of these two qualities. Black bile has the potentiality of becoming both very hot and very cold. When it is heated, the result is cheerfulness, expressed in song; when it is cold the subject is sluggish and stupid. Excessive heating of black bile makes men mad, clever or amorous;¹⁴⁰ Maracus the Syracusan was an even better poet when he was mad. Those, on the other hand, in whom the heat is more moderate are of melancholic temperament, and superior to the rest of mankind in intellect and artistic ability.¹⁴¹

Opinions on the nature and causation of disease, at or a little before the beginning of the Christian era, are well summarised by Celsus in the introduction to his book on medicine. Diseases, according to the various authorities whom he mentions, have the following hidden causes:

Excess or deficiency of one of the elements, a view held by some philosophers;

137. Tim. 89 b-d.
authority for this.

138. See Müri, p 21, for the

139. The melancholic physical type is hard and lean, with prominent veins; Don Quixote as distinct from Sancho Panza.

140. "The lunatic, the lover and the poet

Are of imagination all compact." (Midsummer Night's Dream, V, 1).

141. Aristotle, Problems 953a - 954b. The dating might be affected by the fact (which the OCD, article Aristotle, does not mention) that Galen seems to mention the work, though not this specific passage, at K IV, 794 (Quod An. Mor.).

Abnormalities in the humours (si in umidis omne vitium est)
(Herophilus);

The pneuma; both Celsus and the Anonymus attribute these opinions to Hippocrates.

Entry of blood into the vessels of the pneuma (arteries), leading to inflammation and fever (Erasistratus);¹⁴²

Impaction of corpuscles in the passages, blocking them (Asclepiades).¹⁴³

142. Erasistratus believed that the arteries, in health, contained no blood, only pneuma. They communicated, however, at or near their ends by fine passages with the veins, which normally were full of blood. If the pneuma in the ends of the arteries were to escape, for instance as the result of a wound, blood would go over from the veins, and the subsequent delivery of pneuma from the left heart would pack it tightly into the ends of the arteries, leading to inflammatory conditions and fever. For further details see the early part of De venae sectione adversus Erasistratum, K XI, 153-4, and of An in arteriis sanguis contineatur, K IV, 703-12. For Erasistratus' opinions, and particularly those of his disciples, see I.M. Lonie, 'Erasistratus, the Erasistrateans and Aristotle', *Bull. Hist. Med.* 38, pp 426-443, 1964.

143. Caelius Aurelianus (AD I, 105-113) gives an excellent summary of the Asclepiadean system. All perceptible substances are composed of imperceptible corpuscles, constantly moving, joining and breaking away. Disease is due to impaction of these particles, as a result of their size, shape, number or velocity, or to distortion of the spaces in which they move. Different diseases arise because of differences in the parts or passages of the body. Not all are due to stoppage; mild diseases may be a result of disturbances in the body fluids or in the pneuma. The humours, however, are not the seats of the immediate causes of disease, but rather of antecedent causes. Plethos is a contributing factor in most diseases. There is no digestion; nutriment is distributed unchanged in the body, except that it is very finely divided. Asclepiades calls this very finely divided substance leptomeres, but Caelius refers to it as spiritus (pneuma). It has neither a hot nor a cold quality, nor indeed any quality, because of its fine state of subdivision. It is converted into all the parts of the body as it traverses the passages. In Asclepiades' system, in fact, we can imagine the food taken in as being rendered down into its constituent corpuscles, or into small aggregates of them; this is, in fact, the only change that an atomist can recognise. The Hippocratic system of coction supposes infinitely divisible material, which is also (unlike the atoms) subject to change, so that what is distributed from the stomach may be as different from the original matter as thoroughly cooked food is from its raw ingredients.

These are the causes considered by practitioners of the rationalist variety, who demand a knowledge of both evident and hidden causes, of the natural functions, and of the internal anatomy of the body. There is, however, little agreement on many of these points between the experts. Where the natural faculties are concerned, Celsus gives the following opinions on one of the most important, namely digestion. Hippocrates held that food was cooked up (concocted) in the stomach by the heat of the body. Asclepiades denied coction, holding that it was distributed unaltered throughout the body, in the crude condition in which it had been swallowed. Pleistonius, a pupil of Praxagoras, believed the process to be one of putrefaction, while Erasistratus maintained that food was ground up in the stomach. Since diseases arise in the internal parts, says Celsus, rationalist physicians held it necessary to study them by dissection, and both Herophilus and Erasistratus dissected living men.¹⁴⁴ The

144. Celsus, Prooem. 9-26. -- Galen says that Erasistratus, Diocles, Praxagoras and Asclepiades are rationalists in the sense that they take the indications for treatment from the disease itself, not from the evident symptoms (K X, 101; De meth. med.) But they are only half dogmatists (the dogmatists accepted the humoral theory of disease, which Galen attributed to Hippocrates), because they apply logical methods only to disease of the organic parts (K X, 184, ibid.) But the indications for treatment are taken, by the followers of Hippocrates, from both the homoiomerous parts and from the organs, since these practitioners understand the nature of both kinds. (This is probably an invention of Galen's, based on indefinite Hippocratic doctrines, and he attributes it to Hippocrates in his usual way.) Of those who understand only one kind, the followers of Herophilus and Erasistratus do not consider the qualities, Hot, Cold, Wet and Dry, either in the body or in the disease; but they do treat logically disease occurring in the organic parts, and resulting from the structure, situation, importance and sensibility of the part. In other words, they deny crisis but accept diaplasia (K X, 309-10, De meth. med.) Erasistratus denied that even an organ was affected by disease unless its structure was affected, for instance by swelling or ulceration (K VIII, 379; De loc. affect.) He attributed these affections of organs to the passing across of blood from the veins into the arteries when the pneuma was emptied out of them; it took place because of the tendency for a vacuum to be refilled (K XI, 153-4; De ven. sect. adv. E.).

empiricist school, on the other hand, relied entirely on experience, holding that nature could never be understood and citing the divergent views of the rationalists as proof of this. "It does not matter what produces the disease, but only what relieves it; nor does it matter how digestion takes place, but what is best digested."¹⁴⁵ Erasistratus, though classified by Celsus in the rationalist camp, denied causation in medicine, since, he said, the same cause did not always produce the same disease in all men, or indeed in the same man at different times in his life.¹⁴⁶ Celsus criticises this opinion. Certain underlying conditions render the body more or less susceptible to disease. Nothing is due to one cause alone, but disease seldom occurs in the absence of one of the causes which Erasistratus rejects.¹⁴⁷ Themison, the founder of Methodism, held that the knowledge of causes was quite useless.¹⁴⁸ Only three things had to be considered: constriction, relaxation, and a mixture of the two. It examined the characteristics that diseases had in common, the so-called communities (κοινότητες).¹⁴⁹ The Methodists considered themselves neither as rationalists, since they did not make conjectures about hidden causes, nor as empiricists, since they held that the Art was more than experience. But, says Celsus,

145. Celsus, Prooem. 27-39.

146. *Ibid.*, 54.

147. *Ibid.*, 58-61.

148. Caelius Aurelianus (AD III, 64-5) quotes Methodist doctrine on tetanus. The cause of the disease, he says, is very different from the disease itself; the task of the doctor is not to describe the cause, but the disease, which, unlike the cause, is obvious, and not the subject of disagreement.

149. The Methodists defined the "communities" as the general characteristics which certain diseases had in common with one another. The classification was exceedingly broad; there were only two basic communities, constriction or obstruction (στεγνωσις) and relaxation or flux (βύσις), together with a third type, a mixture of these two. All that the doctor had to do was to inspect the patient and decide which of these processes was operating; he need pay no attention to hidden causes. Hence the Hippocratic writer who said that life was short and the Art long was in error; the reverse, according to the Methodists, was the truth, and the whole of medicine could be learned in six months or less. (K I, 79-83, De sect.) There is an English translation of the greater part of this short work, On the Sects for Beginners, by A.J. Brock in his Greek Medicine, 1929, pp 131-157; it gives a valuable account of the doctrines of the Methodist, Empiricist and Dogmatist sects in Galen's time.

they do depend on reason; their constriction and relaxation are theoretical concepts.¹⁵⁰ Veterinarians, barbarians ignorant of logic and the keepers of large hospitals must depend on the common characteristics of diseases, but civilised practitioners can do better; according to Celsus, Hippocrates said that one must take both the general and the particular characteristics of disease into consideration. The Methodists are inconsistent because, in fact, they treat different kinds of relaxing diseases quite differently; in spite of their protestations to the contrary, they do consider particular characteristics.¹⁵¹ Celsus mentions a practitioner named Cassius, whose patient suffered from fever and thirst as a result of intoxication. He cured him with cold water, not because he considered whether his body was constricted or relaxed, but because he took into consideration what had happened to cause the condition.¹⁵²

Although the Methodists complained that the rationalists differed among themselves on the causes of disease, whereas they confined their attention to the diseases themselves, about which there was no disagreement, Galen says that, in fact, there was more dissension among the Methodists on the subject of the communities than among those who accepted a humoral pathology on the subject of the qualities. Julian (a Methodist against whom Galen wrote a work) did not believe in nature, because the philosophers disagreed about it. But in that case, says Galen, he ought to be even more sceptical about the tenets of the Methodists, because not one of them agrees with any other about the communities which the Method, which dwells in heaven, brings forth. Admittedly, says Galen, there is disagreement in his own school about the constitutions of our bodies in terms of the qualities and the elements, but not nearly to the extent to which Methodists differ on the communities. Plato, Zeno, Aristotle, Theophrastus, Eudemus, Cleanthes and Chrysippus, together with many stoics, peripatetics and Platonists, agree about the elements; nobody agrees about the communities. None of the ancients accepted them; even Thessalus' non-Methodist disciples reject them.

150. Celsus, Prooem. 62.

151. Ibid., 62-67.

152. Ibid., 69-70.

Thessalus was alone in his opinion until this fellow Julian arrived, says Galen.¹⁵³ The Methodists use grandiloquent language. Julian says that he means by health the symmetric and measured constitution in terms of concretion and liquefaction of the human fabric. In this, he says, Methodists follow Zeno, Aristotle and Plato. But, Galen reminds him, these philosophers attributed health to eucrasia of the Warm, the Cold, the Wet and the Dry; Julian is too ignorant to know this.¹⁵⁴ Julian and his leader Thessalus say that they imitate things that happen to take place to the benefit of the patient, and if these originate in the patient himself they attribute them to nature; if they are external events, to chance. For example, if a patient cuts his forehead in an accident, and his disease is alleviated, they open a vein in the forehead when they encounter similar conditions in the future.¹⁵⁵ Thessalus declares that there shall be only two diseases originating from regimen, namely relaxation and constriction. He does not mention the third Methodist doctrine, a mixture of the two. His theories, according to Galen, are based neither on logic nor on experience; he offers no proofs, but orders people about like a tyrant.¹⁵⁶ His theory agreed with Asclepiades' in regarding health as a symmetria of the passages, but he developed the further concept of metasyncrisis, otherwise known as metaporopoesis, an alteration in the state of the pores or passages. This, says Galen, is nonsense, since bodies do not consist of corpuscles and passages; nor, if they did, could Thessalus' followers explain how a particular drug altered the state of the pores.¹⁵⁷ The followers of Thessalus had abandoned many of

153. K XVIIIa, 268-71 (Adv. Jul.) 154. Ibid., 256-8.

155. Ibid., 249-50.

156. K X, 20-29 (De meth. med.)

Galen's Nature operates by comprehensible cause and effect; the God of the Mosaic account, on the other hand, "moves in a mysterious way His wonders to perform;" He has only to will something and it is forthwith so. It has been suggested that science originated among the Greeks, rather than in oriental countries, because the people of those countries, being ruled by the arbitrary fiats of absolute monarchs, did not expect nature to be consistent. When Galen says that Thessalus issues orders like a tyrant, he is contrasting the Greek, who acts because he has been rationally persuaded, with the Oriental, who does as he is commanded.

157. K X, 268-70 (De meth. med.)

the indications for treatment that he used. They thought only about the evacuation of retained material, without considering in what way it was superfluous, and disagreed among themselves on the concept of disease.¹⁵⁸

Galen's humoral pathology will now be considered in more detail, and an attempt made to relate his views to some of those of the ancients that have come down to us, which have been summarised in this chapter.

158. K X, 124-5 (De meth. med.)

CHAPTER III

GALEN'S HUMORAL PATHOLOGY

Galen's humoral pathology is based on the four qualities. It is to be expected, therefore, that he will attribute their discovery to Hippocrates, and he does. He says that Hippocrates' system of four qualities, which mingle intimately and interact with one another, was later taken up by Aristotle. That it was a new concept at the time when some of the works in the Corpus were written is confirmed by the work On Ancient Medicine, the author of which speaks of the devotees of the new kind of practice (ἐπὶ δὲ τῶν τὸν καλὸν τρόπον τὴν τέχνην ζητούντων), who postulate the opposites Hot, Cold, Wet and Dry,¹ and apparently explain all the phenomena of disease by them. According to him, the old investigators (οἱ παῖτες εὐσόντες) did not do this. They did not consider the qualities, but the strength of each article of diet.² Perhaps Hippocrates was one of the new school; or, to be more exact, perhaps the author of Nature of Man was;³ Galen would like him to have been Hippocrates, since he had opinions so similar to Galen's, but the attribution was not universal in antiquity. Galen says that the opinion that the four qualities govern the bodies of animals, two of them actively and two passively, was held not only by Hippocrates but also by Diocles, Praxagoras, Philistion, Plato, Aristotle, and Theophrastus; all these important people were of this opinion, yet Erasistratus does not even mention it.⁴ Man's body can suffer, says Galen, and therefore it is not a unity.⁵ Its components suffer change under the action of the four qualities, by becoming hotter, colder etc. Only the four qualities can influence bodies near them; the presence, for example of a heavy body does not make a light body heavier,⁶

1. L 1, 598.

2. L 1, 600-02.

3. Galen (Commentary on Nature of Man, K XV, 108) regards only the first eight chapters (up to p 52 in L 6) as by Hippocrates. For the ideas of others on the authorship of this work in antiquity, see Smith, Hippocratic Tradition, pp 219-21.

4. K II, 110-11 (De fac. nat.) For Erasistratus' habit (according to Galen) of ignoring Hippocrates, and Galen's habit of occasionally forgetting himself and declaring that Erasistratus was an excellent fellow, see Smith (ibid.) pp 196-8.

5. K I, 426, 484 (De el. ex Hipp.); K XV, 20-1 (In Hipp. de nat. hom. comm.)

6. In fact it does, but the ancients were unaware of this.

but the Hot, the Cold, the Wet and the Dry do have such effects. These four qualities are primary by nature and the artificers of the elements; this, says Galen, was first pointed out by Hippocrates.⁷

It was commonly believed, according to Galen, that Hippocrates did not mention the elements⁸ at all in Nature of Man. But he did, Galen says, four times. The passage that he quotes, however, does not refer to them directly; the nearest that the Hippocratic author comes to this is when speaking of the qualities, saying that genesis does not come from them alone, but from the bodies themselves, and in particular from those with the utmost amount of each quality. These are by definition elements.⁹ Only the elements are absolutely hot, cold, wet or dry; all other substances show a relative increase of one quality, by virtue of which they are called hot, cold etc.¹⁰ Some have doubted whether the elements exist, because they do not occur unmixed in the body. But the preparation called the tetrapharmacon is made up of four drugs, none of which can be recognised individually in the finished product. Earth in the physical world, for example, always has some admixture of heat and dampness.¹¹ The pure elements, then, are not perceptible in the body by the senses; the simplest substances that can be perceived are the homoiomerous substances that are made up of them.¹² The pure elements do not concern the doctor, although our bodies are composed of them; it is enough for him to know that health is due to a proper mixture of the qualities Hot, Cold, Damp and Dry, and that diseases result from the dyscrasias of these.¹³ Galen says that this was Hippocrates' doctrine.¹⁴

In medicine, then, we are concerned with the four qualities. These are attached to four homoiomerous substances, the four humours,¹⁵ which must now be considered. When Galen is accepting the system of Nature of Man in toto, he says that they are blood, which is hot

7. K I, 485-7 (De el. ex Hipp.)

8. Another work in the Corpus, Fleashes, mentions the elements. Heat (τὸ θερμόν), presumably fire, is, the author says, immortal and has intelligence; it is the same as aether. Earth is cold and dry, air damp and warm; water damp and dense. (L 8, 584-90).

9. K I, 478-9 (De el. ex Hipp.)

10. K I, 538-40 (De temp.)

11. K I, 452-4 (De el. ex Hipp.)

12. K I, 467-8 (*ibid.*)

13. K V, 668 (De plac. H. & P.)

14. K XV, 13-14 (In Hipp. de nat. hom. comm.)

15. Galen wrote a treatise, now lost, on the humours according to Praxagoras, who recognised ten in addition to blood. He says that they were only subdivisions of the four (K II, 140-1, De fac. nat.)

and damp, yellow bile, hot and dry, phlegm, cold and damp, and black bile, which is cold and dry.¹⁶ Although everything that exists is made up of the qualities, the humours are peculiar to man and other animals that have blood.¹⁷ The homoiomerous parts are generated from the humours, which in turn come from food and drink, which come from the elements.¹⁸ The humours are not elements, since they are generated from earth, air, fire and water, and one or the other of these elements predominates in each of them. Thus they differ in their appearance and in their *δυσάμειος*.¹⁹ Animals with blood take their origin from the menstrual blood of the mother, under the informing influence of the semen. Whether the other three humours are involved at this stage is a matter of dispute, but Hippocrates, according to Galen, held that all four took part in the genesis of the embryo, and Galen agrees. The homoiomerous parts of the animal have different qualities; some, such as flesh, are soft and warm, while others, like sinew, are hard and cold. Nature, like a good workman, takes the appropriate humours from the menstrual blood to make each part of the embryo. Blood, therefore, is not a unity; it has, in nature, a varying admixture of other humours.²⁰ In the same way none of the other humours is without some admixture of each of the qualities.²¹

The genesis of humours in the body, according to Galen, was a subject of agreement among Hippocrates, Aristotle, Praxagoras, Phylotimus and others. Nutriment taken into the body, according to these authorities, is altered by the innate heat; when the amount of heat is exactly right, useful blood is generated. If heat is deficient, the result is an excess of phlegm; if it is excessive, of yellow bile. The heat may be affected by several factors; the hot and cold qualities of foods, in the sense of their ability to augment or to diminish heat in the body,²² the period of life (youth is hotter than age), activity, climate and so on.²³ The veins from the

16. K VII, 21 (De morb. caus.); K II, 129-31 (De fac. nat.) This is the classical doctrine of Nature of Man; its contradictions will be considered later in this chapter.

17. K XV, 51 (In Hipp. de nat. hom. comm.)

18. K I, 479-80 (De el. ex Hipp.); K XV, 56 (In Hipp. de nat. hom. comm.)

19. K XV, 66-7 (*ibid.*)

20. K I, 494-7 (De el. ex Hipp.); K XV, 59, 73-4 (In Hipp. de nat. hom. comm.)

21. K XV, 97 (*ibid.*)

22. For solids and liquids that are hot and cold in this sense see Aristotle, Met. 389a-b.

23. K II, 117-8 (De fac. nat.)

stomach to the liver (the first veins in Galen's terminology) not only convey nutriment to the liver, but subject it to certain changes before it arrives there. In the liver, this nutriment is converted to blood. The material in the first veins is like wine when first put into casks, bubbling with innate heat. The heavy part (like the lees of the wine) settles, the light part floats like the flower. This light component goes to the gall bladder, becoming yellow bile; the heavy residue (black bile) is conducted to the spleen.²⁴ This organ ought to be placed directly below the porta hepatis, to receive the deposit; as there was no room there, however, nature housed it on the left side, and connected it to the liver by the splenic vein.²⁵ After the heavy and light residues have been separated from it, the pure red blood rises to the convex part of the liver, from which it goes to the vena cava for distribution to the body, to nourish it. It is mixed with a quantity of watery material to render it more free-flowing; this material does not itself nourish, but distributes nourishment. By the time the blood has gone further along the vena cava and reached the kidneys,²⁶ it has been made more fluid by the warmth of the heart, the seat of the innate heat, and the watery material is therefore no longer necessary and is eliminated by the kidneys.²⁷ The yellower, warmer arterial blood is generated in the left ventricle of the heart (which it reaches through imperceptible pores in the interventricular septum) where it acquires pneuma from the lung and is distributed by the arteries.²⁸

Galen says that blood and the other humours can only be discussed in terms of the innate heat which generates them from nutriment.

24. The humours vary in density and take up their positions just as the elements do. The Hippocratic work Diseases IV lists them in order of increasing density: bile, blood, phlegm and water. Evidently blood is not thicker than water, and this author does not recognise black bile as a primary humour (L 7, 584).

25. The idea of separation of heavy and light components of the blood is modified from Aristotle, for whom, however, the source of the blood was the heart, and the separation, after eating, took place during sleep in the middle compartment of it (On Sleep and Waking, 458a).

26. It must be remembered that there is no circulation; the movement of blood outwards in the veins is a slow one, occasioned by the blood being gradually used up as the periphery in nourishing the tissues. In Galen's system the flow in both arteries and veins is centrifugal. The veins originate in the liver, the arteries in the heart.

27. K III, 269-75 (De usu part.) 28. K V, 572 (De plac. H. & P.)

Erasistratus did not believe in the innate heat, and therefore had to suppose that the humours are taken into the body ready-made in food and drink. According to Galen, however, he said that whether this was in fact so was a question of no practical importance. If it was, Erasistratus ought to have considered which foods contained large quantities of particular humours, such as bile. Honey, by this hypothesis, ought to be such a food, since it is productive of bile in the body. But, says Galen, it cannot contain it, since it is not bitter. When taken into warm bodies--those of men in their prime, and after exertion--it leads to bile; but in old age, which is cold, it generates useful blood.²⁹ Erasistratus said very little about yellow bile, and nothing at all about the black variety.³⁰ Neither did he say anything about the origin of blood.³¹

It is clear that in Galen's physiology blood is the supremely useful humour. The other three have some minor beneficial effects, as already shown for the phlegmatic material in the veins. Even black bile is not completely useless; it thickens the blood, an effect opposite to that of phlegm.³² According to Galen, also, the spleen draws perittomata from the liver and makes them into useful matter, which he does not specify.³³ Galen reproves Erasistratus for alleging that yellow bile is useless; he says it has a function, which he promises to reveal in another work.³⁴ Elsewhere he says that by entering the intestine it washes away phlegmatic residues.³⁵ Galen's attitude to black bile in particular is ambivalent, and will be dealt with later. Apparently, in his opinion, the spleen cleanses the blood of black bile by discharging it through the gut; Hippocrates and Plato, he says, were of this opinion. The spleen wastes in health, presumably from lack of occupation. Black bile is more pernicious and acrid than yellow bile, and when the spleen is disordered the blood becomes thicker and darker.³⁶ The same problem does not arise with phlegm, which is harmless, at least in its sweet and

29. K II, 114-5 (De fac. nat.)

30. K V, 123 (De atra bile).

31. K II, 112 (De fac. nat.). A book could be written about the subjects Galen blames Erasistratus for not mentioning.

32. K II, 138-9 (De fac. nat.)

33. K II, 202 (*ibid.*). Flashar

(p 68) comments that Galen, in common with other writers of late antiquity, makes no reference to the positive psychological characteristics associated with black bile.

34. K II, 139 (De fac. nat.)

35. K III, 353-4 (De usu part.)

36. K II, 130-3 (De fac. nat.) For the swelling of the spleen in fever, with wasting of the body, see the Hippocratic work Places in Man, L 6, 314-6. Erasistratus believed that the spleen had no function at all (K III, 315; De usu part.)

useful part; it also, however, has bitter and salty components.³⁷ Aristotle maintained that phlegm was useful, since the body consumed it in disease, and that when mixed with useful nourishment, it nourished.³⁸ Yellow bile is clearly eliminated by the gall bladder, although the ancient physicians did not mention this organ; it may also appear in the sweat³⁹ and in the urine.⁴⁰ There is no organ to eliminate blood.⁴¹

Various apparently abnormal humours are in fact all derived from the four cardinal ones. Anything that is damp and cold in its dynamis is categorised as a variety of phlegm; if it is dry and hot, as yellow bile.⁴² Normal body fluids are also derived from them. Milk and blood are alternative forms of the same substance; the function of both is to nourish. For this reason the menstrual flow is suspended during lactation.⁴³ Milk, according to Aristotle, is concocted blood; not, as Empedocles supposed, putrefied blood, which in fact is pus.⁴⁴ Semen, according to Aristotle, is also derived from blood.⁴⁵

Galen holds that specific drugs purge particular humours preferentially. Asclepiades disagreed; he maintained that no drug specifically attracted anything, since he denied the natural faculties, one of which is the attractive. In his system, since everything was made up of atoms and passages, nothing could be foreign to the body; quantity, not quality, was the only cause of trouble, and the treatment for an excess of anything was merely to reduce the patient's diet. Galen used specific drugs to remove particular humours. If, he says, a drug purging phlegm is administered to a patient suffering from an excess of bile, it will purge very little bile and do grave harm to the body. A specific cholagogue, however, will benefit him.⁴⁶ A very large dose of a drug purging a specific humour will eliminate that humour first, and then the others in order, ending always with blood, which is the most innate. Complete elimination of any one humour will kill the patient.⁴⁷ Galen attributes the doctrine of drugs purging specific humours to Hippocrates.⁴⁸

37. K II, 139-40 (De fac. nat.) 38. Gen. of An. 725a.
 39. K VIII, 374 (De loc. affect.) 40. K III, 372-3 (De usu part.)
 41. K V, 139-40 (De atra bile). 42. K VII, 22-3 (De morb. caus.)
 43. K XI, 164-5 (De ven. sect. adv. E.)
 44. Gen. of An. 777a. 45. Ibid., 726a.
 46. K I, 497-500 (De el. ex Hipp.) 47. K I, 504-6 (ibid.)
 48. K II, 40 (De fac. nat.)

The humours, according to Galen, exert their pathological effects through the medium of dyscrasia, an imbalance of humours, or of qualities, in the economy of the body. Consequently the concept of dyscrasia--the opposite of being well-tempered or eucrasic--is central to his system of pathology. Everything is well tempered when it is best fitted for its purpose; the well-tempered vine is the one that bears the best and the most abundant grapes, and the well-tempered dog is the best watchdog and hunter and at the same time the most gentle to the household.⁴⁹ Since eucrasia is thus linked with function, different functions will require different crases; man, the lion, the bee and the dog ought not to have the same crasis.⁵⁰ The dog is damper than the ant and the bee, but drier than man; it is hotter than man, but not so hot as the lion. Man is the mean, in terms of crasis, for the whole class of animals; and within the human species the mean is the well-fleshed individual, neither fat nor thin, hot nor cold, etc.;⁵¹ and within the individual the best-tempered part of the body is the skin of the palm of the hand.⁵² Hence temperaments vary among species, among individuals within each species, and among the parts of the individual. They cannot involve the utmost degree of any quality, since this is the prerogative of the pure elements; they are named, therefore, according to the quality that predominates.⁵³

There are, according to Galen, nine⁵⁴ possible crases or mixtures involving the four qualities. The first, which some have not recognised, is the eucrasic state; then there are four simple dyscrasias, in which only one quality, Hot, Cold, Wet or Dry is in excess, and four compound ones, Hot/Damp, Hot/Dry, Cold/Damp, and Cold/Dry. The completely eucrasic state has no quality prevailing; intermediate stages of dyscrasia, with one quality displayed, are represented by the four simple crases; and the extremes of

49. Galen's intensely teleological outlook is evident here. In its conviction that everything was made for the benefit of man it resembles the traditional Hebrew view.

50. K I, 547-8 (De temp.)

51. K I, 536-41 (*ibid.*)

52. K I, 563-4 (*ibid.*)

53. K I, 509-10 (*ibid.*)

54. Not thirteen; see L.J. Rather, 'Two questions on humoral theory', *Med. Hist.* 15, pp 396-8, 1971. When Galen is in the mood for complication, however, he introduces subdivisions; there are, he says, fifteen differences in the crases of individuals with respect to dampness alone, requiring fifteen different drugs; but the unmethodical Methodist Thessalus uses only one for every patient and every part of the body (K X, 209-10, De meth. med.)

dyscrasia, with two qualities in excess, by the four compound ones.⁵⁵ Some have doubted whether the Hot/Damp and Cold/Dry crases can exist, since heat eliminates dampness and vice versa; but they can, for hot water is both hot and damp.⁵⁶ Dyscrasia in bodies may originate from outside or from fluids. Outside influences are, for example, the bites of venomous creatures, heating and cooling drugs, and the temperament of the ambient air; internal causes include accumulation in the body of troublesome humours.⁵⁷

The perfectly eucrasic body is the least liable to disease, since its balance is least readily disturbed. Such bodies have healthy humours. Those in which the crasis is already somewhat disordered are more liable to suffer damage when exposed to the agents of disease, both external and internal.⁵⁸ To preserve the natural crasis of the body, feed like with like; hotter bodies need a hotter diet, drier ones drier, and so on.⁵⁹ But where there is an unhealthy dyscrasia, treat by opposites. A hot and dry dyscrasia is treated with a regimen that is just so much colder and damper than the mean, as the body is warmer and drier. Such pathological changes, however, are not always generalised. The belly can be too cold while the same patient's head is too hot, and each must be considered separately.⁶⁰ And the innate or congenital crasis of a body can be altered by the person's mode of life, making it, for instance, damper by a sedentary lifestyle, drier by a laborious one.⁶¹

The doctor, in order to treat, must therefore be able to recognise the general crasis of his patient, as well as the temperaments of individual parts and organs. The famous Ars Medica deals with such matters at some length, which probably accounts for its popularity until quite recent times.⁶² The general crasis of the body is affected, first of all, by the stage of life. The newly conceived animal is the dampest and hottest, since it is derived from blood and semen, which both have that crasis.⁶³ With advancing age the

55. K I, 557-9 (De temp.)

56. K I, 511-2 (ibid.)

57. K X, 890-1 (De meth. med.)

58. K IV, 741-4 (De opt. const.)

59. Hotter in the sense of generating heat in the body, not the temperature of serving. Wine, for example, is hot; and so for the other qualities also.

60. K I, 373-6 (Ars med.)

61. K I, 604 (De temp.)

62. In spite of this, no published English translation exists.

63. There are difficulties, however, concerning the crasis of blood, which will be considered later in this chapter.

crasis becomes progressively drier and colder.⁶⁴ Thus children are damp and hot; the prime of life is dry and hot; middle age is dry and cold, and old age is damp and cold. This paradox-- it surely ought to be dry and cold--comes from having to fit the facts into a system of four categories, and Galen gets round it by explaining that old age is indeed dry in respect of the solid parts, but damp in respect of the perittomata; old people slobber and their noses run,⁶⁵ although their constitution is fundamentally dry. The well-tempered crasis occurs in adolescence, between childhood and adult life.⁶⁶ It resembles the season of spring, which according to Galen is well-tempered, though some think it is warm and damp.⁶⁷ Sex also affects crasis; women are naturally colder than men.⁶⁸ Bodies of a hot crasis are warm to the touch, hairy, lean, reddish in complexion, and dark-haired, while cold crases are hairless, plump, cold to the touch, and have yellowish skin and hair. Dry crases are lean and hard, damp ones are fleshy and soft, and so on for the compound crases.⁶⁹ The eucrasic body is midway between red and pale; the hair is moderately yellow and curly, and the musculature is neither excessive nor puny. It is neither too hard nor too soft, too hot nor too cold, too hairy nor too naked; in fact, it meets most nearly the canon of human beauty laid down by Polycleitus.⁷⁰ Such a well-tempered body is the standard against which diseased bodies are compared.⁷¹ But harder bodies are less susceptible to external causes of diseases, more susceptible to internal ones; the opposite is true for softer bodies. Hence, depending on the circumstances, a body that is not ideally tempered may be better than a perfectly eucrasic one.⁷² Again, hot damp natures are more liable to putrefactive diseases, but bear thirst and starvation better than dry natures do.⁷³

As examples of Galen's organ-temperament doctrine, we may take the dyscrasias of the brain. Aristotle had remarked that the brain in man was more fluid, and relatively larger, than in any other

64. K I, 577-9 (De temp.)

65. Cf Hamlet, II, 2: "Their eyes purging thick amber and plum-tree gum."

66. K XV, 184-7 (In Hipp. de sal. vict. comm.)

67. K XV, 88 (In Hipp. de nat. hom. comm.)

68. K I, 606 (De temp.)

69. K I, 343-6 (Ars med.)

70. Polycleitus, a sculptor of the fifth century, is said by Pliny (n.h. 34,55) to have written a book on proportion in art.

71. K I, 342 (Ars med.)

72. K IV, 745-6 (De opt. const.)

73. K X, 583-4 (De meth. med.)

animal; it was also the most eucrasic, since man is the most intelligent of all animals.⁷⁴ Of the simple dyscrasias, according to Galen, the hot brain can be recognised by strong curly hair, tending to baldness. The perittomata excreted from the eyes, ears, nose and mouth are scanty and concocted in healthy people of this crasis. They require little sleep, and it is not deep. When the brain is cold, on the other hand, the hair is straight, reddish and slow-growing; there is a tendency to catarrhs and coryzas and to somnolence. A dry brain is marked by a lack of perittomata, by acuteness of the senses, strong curly hair that grows fast, and early baldness. The damp brain can be recognised by straight hair, not becoming bald, dulness of the senses, abundant perittomata, and copious and profound sleep. Of the compound dyscrasias, the hot dry brain is marked by scanty discharges, sharpness of the senses, wakefulness, quick onset of baldness, the hair fast-growing, black and curly; the head hot to the touch and the complexion ruddy. Those with hot damp brains have a good colour, warm skin, prominent veins in the eyes, abundant discharges moderately concocted, hair straight and yellowish, not readily becoming bald, head heavy and stuffy. They are sleepy and comatose, have vivid dreams, gloomy faces, and are insensitive in their perceptions. Hot and damp conditions such as those brought on by the south wind are bad for such people. When the brain is cold and dry the head is cold and pale. The veins in the eyes are not prominent. Such patients are easily harmed by cold conditions, and their heads may be light or full of catarrhs and coryzas. Their hair is atrophic and reddish, and grows feebly. Such people do not go bald early unless the dryness prevails unduly. The cold damp brain is marked by somnolence, dulness of the senses, copious discharges, cold stuffy heads, catarrhs and coryzas; these people do not become bald.⁷⁵ It is interesting to observe that although Galen attributes acuteness of the senses to the crases of the brain,⁷⁶ there are no emotional attributes in his list. These, in his system, are all associated with the crases of the heart,

74. Gen. of An. 744a.

75. K I, 324-9 (Ars med.).

According to Aristotle, however, baldness is due to a deficiency of hot fluid, and is thus common in sexually active men, who excrete their pure natural heat with the semen; the brain, being the coldest part, feels the effect first. (Gen. of An. 783b-784a).

76. If the substance of the brain is subtle, it leads to intelligence; if crass, to stupidity. If it is stable, memory is good. A hot brain leads to changeability of opinions; a cold one to stability. (K I, 322-3; Ars med.).

presumably because he accepts the tripartite division of the soul laid down by Plato. Those with a hot dry crasis of the heart, for example, are daring, angry, swift and brutal, reckless, fierce and implacable; they have a big, hard, rapid pulse, rapid breathing, and a hairy chest. People whose hearts are damp and cold have soft pulses, hairless chests, and are the reverse of spirited, slow to anger, lazy and cowardly.⁷⁷ The heart is unquestionably the principal organ for Galen because it is the seat of the innate heat. An imbalance of humours in the heart, if severe, must, he says, be fatal, because every part of the body must fail if the heart does; this is not true of the brain or liver, or of any other single part.⁷⁸ The liver, for Galen, resembles the brain in not affecting personality.⁷⁹

77. K I, 334-6 (Ars med.)

78. K VIII, 297-9 (De loc. affect.)

79. The origin of the idea, frequent in literature, that it does, is not clear. The liver might, in Galen's system, have been expected to affect desires and appetites, since in Plato (see pp 13-14) it is the seat of the most brutish and unruly soul, the appetitive. Sir Andrew Aguecheek is cowardly because he has no blood in his liver (Twelfth Night, III, 2) and the boy in Macbeth (V,3) is lily-livered. For the crases of the liver see Ars Medica, K I, 337-9. Aristotle placed sense-perception and movement, in animals with blood, in the heart. The writer of the Hippocratic work On the Sacred Disease, which Galen never mentions, agreed however with Galen in locating consciousness in the brain (L 6, 390-2). Galen's experience as surgeon to the gladiators enabled him to say that those wounded in the heart retained their reason, a proof that it could not be seated there (K VIII, 304, De loc. affect.) The source of the nerves, and all sensation and voluntary movement, he says, is in the brain, just as the source of the arteries and of the innate heat is in the heart. Galen says that the Greek term for the brain, encephalon, is misleading; there is no particular reason why it has to be in the head, and in invertebrates it is in the thorax. On one of the few occasions when he mentions the Latin language at all, he admits that its term, cerebrum, is therefore to be preferred; or, if Greek is to be used, it might be called a skindapsos or thingamajig (K III, 629, De usu part.)

Galen's psychology and psychiatry are outside the scope of this work, but it may be remarked that he regarded the mind or soul ($\psi\upsilon\chi\acute{\eta}$) as being affected by the crasis of humours in the body, just as the bodily functions are. In his work on the subject (That the Powers of the Mind follow the Crases of the Body), while refusing to commit himself on the nature of soul, Galen notes that substances that have a heating or cooling effect on the body have corresponding effects on the mind. Wine affects not only the crasis of the body, but also the functions of the soul. Taken in moderation, it dispels sadness. Even those who believe that the soul has its own nature ($\sigma\upsilon\sigma\iota\alpha$), he says, must agree that it serves ($\delta\omicron\upsilon\lambda\epsilon\upsilon\epsilon\iota\upsilon$) the crases of the body. A melancholic state of the humours leads to timidity and depression; wine, in moderation, to the opposite state of mind. (K IV, 775-9; Quod An. Mor.). The developed doctrine of the four temperaments (sanguine, choleric, phlegmatic and melancholic) is entirely post-Galenic, but Galen's observations on the association of bodily habitus with traits of personality foreshadow the modern doctrine of somatotypes and their associated personality traits.

An anomaly in Galen's account of crases is that he seems unable to make up his mind on the proper handling of those having different natural crases in health, a very important part of the work of the ancient physician, who because of his lack of specific curative agents was far more concerned than his modern counterpart with maintaining health in healthy subjects. Hygiene and therapeutics are not the subject of this study, but Galen's attitude points to an anomaly in his concept of what is natural and what is diseased, which is highly relevant to it. We have already seen that he says that the natural crasis of the body, in health, should be preserved by the application of like, rather than unlike, regimen; hotter bodies by nature need hotter diet. He repeats this several times in his work on the preservation of health. To maintain a constitution, use a regimen that is similar to it; to change it, a dissimilar one.⁸⁰ It is natural, Galen says in another work, to yearn after similarities; but in dyscrasia, the patient craves the opposite quality to the one that is in excess.⁸¹ Galen says that none of the empiricists has produced such a theory; this is because it cannot be derived from experience, but requires the use of reason. The difficulties into which reason, thus employed, led him, were considerable.

According to Galen, dry foods are most appropriate for naturally dry natures, moist foods for moist ones. This is because dry nutriment is more rapidly assimilated to dry bodies, and damp nutriment to damp ones.⁸² The author of the Hippocratic work Regimen in Health, though he does not follow the same theoretical scheme as Galen does, takes the opposite view. Young people--here he agrees with Galen--need a soft and moist regimen; but this, he thinks, is because they are dry, whereas in Galen's scheme they are moist. The author of Regimen in Health treats these normal crases by opposites, not by similarities. Old people, he says, need a dry regimen, for they are moist. Those of lean and sinewy habit are dry, and should therefore follow a moister regimen, while those who are naturally soft and fleshy should use a dry one.⁸³ Women, who have soft flesh, should use a dry regimen.⁸⁴ The same rules apply to regimen in the different seasons of the year; in winter, for example, diet should be dry and hot.⁸⁵ It would seem too (unless he is fore-

80. K VI, 395 (De san. tuend.)

82. K VI, 394 (De san. tuend.)

84. L 6, 82.

81. K I, 348-9 (Ars med.)

83. L 6, 74-6.

85. L 6, 74.

shadowing Methodism) that even the author of Nature of Man may have held such views. The physician, he says, must consider constitution, the nature of the disease, the season, and the patient's age. He must relax what is tense and make tense what is relaxed;⁸⁶ that is, his management must be by opposites. There are, however, at least two rather indefinite references in the Corpus to treatment by similarities. One is in Places in Man, where both treatment by opposites and by similarities is mentioned for certain diseases. Some diseases, the author says, are produced by opposites and treatment is therefore by opposites: others by similarities, by which they are also treated. Sometimes one sort of treatment is called for, sometimes the other.⁸⁷ The other reference is in the Sacred Disease. In the famous passage in which the author says that all diseases are equally divine, and all equally human, he remarks that every disease is treatable, and that most are cured by the same things from which they took their origin (ἀκεστά τε τὰ πλεῖστά ἐστι τοῖς αὐτοῖσι τούτοισιν ἀφ' ὧν καὶ γίνεται⁸⁸). Although these passages refer to conditions of disease, not to the crases in health, some such idea may be at the root of Galen's system. He says, in the passage already mentioned, that hotter bodies need hotter diet, colder ones colder, and so on with dry and wet, and the compound crases. Hence to preserve the healthy inborn crasis of the body, feed like with like; but where there is an unhealthy dyscrasia, treat by opposites.⁸⁹

This would be an admirable method if it were true that the natural crasis of the body, on the one hand, and the dyscrasia of disease on the other, were in fact two quite separate and distinct things, and if the natural temperaments with which we are all born were all perfectly eucrasic, and all diseases perfectly dyscrasic. But in fact, as Galen himself repeatedly has to admit, this is not so. The range of normal crases that is compatible with health is wide. The same applies, says Galen, to the tuning of lyres; what satisfies one musician, another may be able to improve. Health is that condition in which we do not suffer pain, and are not impeded in the activities of life. It may not be perfect; the health of Thersites differs from the health of Achilles, but only in degree. Impairment of function contrary to nature is recognised as a dis-

86. L 6, 52.

88. L 6, 394.

87. L 6, 334.

89. K I, 373-6 (Ars med.)

ease only when it has reached a perceptible level.

"Whatever bodies are much more than normally warm, cool, moist or dry, in these the constitution is not perfect; but those in whom there is a deviation from the perfect constitution, but too slight to be perceptible, these we put in the same class as the best, as far as function is concerned."⁹⁰

It is quite clear from these observations, which are deliberately taken from the book in which Galen describes the preservation of health, that the natural crasis is not one thing and disease quite another. Diseases result from perceptible aberrations in crasis, but there is a continuous scale of such variation from perfect eucrasia to total dyscrasia. Galen admits this when classifying the causes of hot, cold, damp and dry diseases in his work on the causes of diseases. Fever, the hot disease, has among its causes external heating; heating foods, such as garlic and onions, and drinks, such as wine; anger, which is a boiling of the heat in the heart, and putrefaction in some part, which generates heat.⁹¹ Cold diseases can be due to chilling, or to foods and drugs of cold potentiality, such as opium and hemlock.⁹² Dry diseases may result from foods with a drying effect, and from dryness of the ambient air; and damp diseases may be provoked by moistening foods, abundance of drink, and an indolent way of life.⁹³ Clearly such influences can readily push the natural crasis of the body in the direction of one of the extremes, leading to diseases. This happens most readily when the natural crasis of the body already shows an inclination in that direction. Thus naturally hot constitutions are the most liable to fever under the influence of such aetiological factors, and least liable to cold diseases.⁹⁴ The cold dry brain is harmed by cold weather.⁹⁵ The perfectly balanced constitution, being the furthest removed from all extremes, is generally the least liable to become diseased under the influence of external factors. Thus it would surely be more logical to keep people healthy by adjusting their natural crases in the direction of eucrasia, rather than by encouraging pathological aberrations by providing, for example, moist constitutions with a moist regimen, and dry ones with dry. Galen appears sometimes to accept this line of reasoning and sometimes

90. K VI, 26 (De san. tuend., tr. R.M. Green).

91. K VII, 4-8 (De morb. caus.)

92. K VII, 10-15 (*ibid.*)

93. K VII, 19-20 (*ibid.*)

94. K VI, 362 (De san. tuend.)

95. See p 69.

not to. Infants, he says, require a completely moist regimen, since they have the moistest constitutions:

"There are those, however, who think that moist natures should always be dried, etc., since they say that by similar remedies each excess is increased, but by opposites restrained; in a word, that opposites are remedies for opposites. But they should remember not only this statement of Hippocrates, in which he says that opposites are cures for opposites, but also that in which he says that all moist treatments are beneficial to the febrile, especially to children and those who are accustomed to be restored by such measures. For he seems to have included in these words three parallel conditions, disease, age and custom. From the disease he takes the indication of opposites, but from age and custom that of similars. For in fever, which is a warm and dry disease, moist treatments are beneficial; but in childhood, which is not a disease but in accordance with nature, that which is most similar is most advantageous. So also in custom, which has produced in the body an acquired and adventitious nature, the application of opposites is most detrimental. And necessarily one must preserve their natural state in bodies according to nature; but in disease one must alter and convert it to the opposite. One is preserved by similars, the other altered by opposites. Therefore we ought not to dry children, because in them moisture is not contrary to nature, as in coughs, colds and catarrhs, but to nourish them according to nature and to moisten them with baths of sweet water...and to provide them with food and drink of as moist a nature as possible. Thus nature herself planned for children, providing them with mother's milk as a moist sustenance."⁹⁶

Galen warns that children should not be moistened and warmed more than normal, however, since slight increases may precipitate them into pathological excesses of heat or moisture. Hence they should not be given wine.⁹⁷ He says again that in people of moist constitution it will do no harm to make the parts drier, though it may be harmful to make them too damp.⁹⁸ And the rule of similarities, which Galen lays down for children, evidently does not apply

96. K VI, 34-5 (De san. tuend., tr. Green).

97. K VI, 54 (ibid.)

98. K VI, 396 (ibid.)

to the aged. Some, says Galen, noticing the damp perittomata of old people, have declared that their constitution is naturally moist. This, however, is not so; they are cold and dry, and should be managed by administering warmth and moisture.⁹⁹ If the rule of similarities were applied, as Galen does in children, their regimen would have to be a cold and dry one. But the competent gerontologist, according to Galen, will use warming and moistening agents in old patients.¹⁰⁰ Elsewhere he tries to have it both ways:

"Therefore for the disabilities that are still within the limits and range of health, if you wish to correct them, treat by opposites...we treat them by contraries until they are restored to the original condition."¹⁰¹

It is not altogether clear, however, what is truly natural. In fact, says Galen, some have maintained that the moist constitution, rather than the well-tempered one, is the best. Moist people live longest (logically enough, since ageing is a loss of moisture as well as heat), and are healthy once the body has come to its strength; presumably they are too damp in the naturally damp time of infancy. Their constitution is worse at the outset, but later becomes the best. Some have maintained that it is in accordance with nature.¹⁰² The modern reader is tempted to ask whether nature is being unnatural here. Perhaps Galen treats old age as he does because it is not a natural condition. It is true that the sophists argued whether it was *κατὰ φύσιν* or *παρὰ φύσιν*.¹⁰³

The truth seems to be that the distinction between minor variations in natural crasis, which have no perceptible effect on function, and the dyscrasias that lead to disease, is a purely qualitative one. There is no point at which we can draw the line between what is *κατὰ φύσιν* and what is *παρὰ φύσιν*. Thus it is quite illogical to have two diametrically opposed methods of management, one for health and the other for disease.

Why, then, if Galen's logical conclusion about the maintenance of health is wrong, did it not lead him into therapeutic disaster?

99. K VI, 353 (De san. tuend.) 100. K VI, 358 (*ibid.*)

101. K VI, 362 (*ibid.*) 102. K VI, 400 (*ibid.*)

103. K K VII, 680-1 (De marcore). Aristotle (Gen. of An., 784b) remarks that one might describe disease as an acquired senility (γήραος επίκτητον) and senility as a natural disease (νόσον φυσικὴν).

The opposite seems to have happened; he was an exceptionally successful practitioner. The answer perhaps is that it made no difference because the whole humoral theory is untrue anyway, and therefore all methods derived by reason from it are equally false, whether or not the reasoning employed in generating them is correct. This was fortunate for Galen, because his reasoning in arriving at his method of preserving health, rather than that of the author of Regimen in Health, seems to have been distinctly faulty. It is not clear why Galen favoured the system he did; he can scarcely have been unaware of its contradictions.

Dyscrasia, in Galen's system, may, as we have seen, be simple or compound; it may also, however, be anomalous or unequal. Galen has left a work devoted entirely to the anomalous dyscrasias. The essence of an anomalous dyscrasia is that there is not a uniformly abnormal crisis in all the affected parts of the body, even if the whole body is involved. We must presumably accept Galen's principle, frequently stated elsewhere, that different parts of the body have different natural crises in health; sinew, for example, is naturally colder and drier than flesh is. Allowing for this, one would suppose that an equal dyscrasia occurred when all the affected parts had their natural crisis proportionately changed to the same degree, and in the same direction. Each one, for instance, might be hotter in the same proportion, with reference to its own natural state of eucrasia. An unequal dyscrasia would then obtain when some parts were more affected while others were less. Galen, it appears, never specifically refers unequal dyscrasia to the varying natural crises of the parts in this way, but takes it for granted. Either the whole body, or only a part of it, may be subject to anomalous dyscrasia. Presumably the whole body is affected when every part of it is dyscrasic, though not all in the same proportion; a part when the rest of the body is eucrasic. The whole body is affected by generalised causes, such as the retention of fuliginous material that would otherwise be transpired, or by excessive exertion, or by anger, which causes the blood to become immoderately heated, or external conditions, or some inflammatory conditions. These examples, which are Galen's own, all involve a hot dyscrasia. Individual parts may be affected by hot or cold humours descending on them, or by a change in crisis with respect to one or more qualities, as a result of heating, chilling, and

so on without any excess of humour being involved.¹⁰⁴ The physician, therefore, can generalise about the crasis of the whole patient from an examination of a part only when the crasis is equal. When it is anomalous no conclusions can be drawn from an individual part, since it may be more or less involved, or not at all, in the dyscrasia so long as this is unequal. Galen gives the example of oysters; from their shells one would take them to be very dry, but their flesh is in fact extremely damp and slimy. (This is not a good example, because no true inequality is involved. The natural crasis of the shell would be dry, while that of the flesh was damp; all that Galen means to say here is that one must not judge the whole from a part.) Again, he says that what is observed may be a relic from a previous episode marked by a particular crasis, and must therefore be treated cautiously in drawing conclusions. A man of sixty who is hairy is not necessarily hot and dry now; he may have been so in the past, and the signs may have persisted.¹⁰⁵ External appearances may be deceptive for another reason. In the colder countries the heat retreats into the interior; thus in Celts the skin is soft, white and hairless, while the concentration of the innate heat at the centre, the heart, makes them brave, passionate and rash. In Ethiopians and Arabs, on the other hand, the innate heat spreads to the periphery and burns the skin black.¹⁰⁶ In much the same way, feverish patients feel hot inside, but cold externally. Some people shiver even without being feverish; this, says Galen, is due to sedentary life-style and overeating generating a cold and phlegmatic humour, and it did not occur in the old days when life was less luxurious. Shivering in association with fever is a sign of an anomalous dyscrasia; some parts are hot while others are cold, as in the Gauls in their natural state. In the fevers which Galen calls agues (ἡπίαιλοι), rigor and fever come on at the same time; in tertian and quartan fevers, the rigor precedes the fever. All these kinds of fever are anomalous dyscrasias.¹⁰⁷

104. K VII, 747-8, 733-4 (De inaeq. intemp.) These causes will be considered further in the chapter on plethos.

105. K I, 638-40 (De temp.) 106. K I, 627-8 (*ibid.*)

107. K VII, 749-51 (De inaeq. intemp.); K VII, 190-1 (De sympt. caus.)

Now pain arises when some part of the body suffers unnatural change, as already shown.¹⁰⁸ Therefore as long as any part of the body is unequally affected by dyscrasia with respect to another, there will be pain in that part; but when all the affected parts are equally involved, there is no longer any change, but a stable state, and this is therefore painless.¹⁰⁹ Hippocrates had said that a unity could not suffer;¹¹⁰ according to Galen he went on to say that pain occurs in those parts whose natures are being changed and corrupted, not in those in which the change and corruption have already been completed. Such parts, says Galen, develop an acquired nature, and no part is injured by its own nature.¹¹¹ This is quibbling, or worse. The parts affected by equal dyscrasia, as Galen would have to admit--and in fact does admit, in the same passage--can be damaged by the excess of the quality, whether this is heat (the source of most of Galen's examples) or some other quality, and the magnitude of the damage is proportional to the dyscrasia. When fever has spread so that all the solid parts are heated to the limit, the crisis is no longer unequal. The patient therefore has no sensation of fever, nor of pain; but he is not free from fever. Although he is unaware of it, he is suffering from hectic fever, the only variety in which the dyscrasia is not anomalous.¹¹² This, and the other varieties of fever, will be considered in the succeeding chapter.

How consistent is Galen's humoral system? It was no doubt the attraction of logically structured systems¹¹³ for Galen's particular sort of mind that made him adopt the system of Nature of Man, with its balance of four humours, rather than, say, the untidier and more positivistic scheme of Ancient Medicine as the basis for his pathology and therapeutics. This was, however, a rash decision, and there is evidence that Galen subsequently regretted it. Although to the casual reader of Nature of Man the basic system may appear consistent and harmless enough, it becomes clear when the attempt is made to erect a developed structure of pathology on it that it is, in fact, full of booby-traps. The fundamental difficulties concern blood, which, it turns out, is incompatible with the other three humours as a member of a four-humour scheme. Galen deals at

108. K XV, 515-6 (In Hipp de vic. acut. comm.); K VII, 739 (De inaeq. intemp.); K VII, 115 (De sympt. caus.)

109. K VII, 752 (De inaeq. intemp.) 110. L 6, 34.

111. K VII, 176 (De sympt. caus.) Perhaps a reference to the aphorism that pain occurs when pus is forming (L 4, 482).

112. K VII, 176 (De sympt. caus.) 113. As a student admirably commented on Nature of Man: "It's so logical!"

length with the genesis of blood and the other humours in his work On the Natural Faculties, from which most of the material for the argument to be put forward is taken. Some quotations may make his difficulties clear:

Erasistratus, who is constantly under attack from Galen for not having done the things he ought to have done,

"does not even refer to the opinions of Hippocrates, Diocles, Praxagoras and Philistion, who held that the parts of the body of all living things are regulated by the hot, the cold, the dry and the moist, of which the first two are active, the second two passive, and that the warm is the most powerful in respect of all the functions, and especially in the origin of the humours."¹¹⁴

On the question of the origin of blood Erasistratus, according to Galen, put forward no opinion at all. But, says Galen, what could anyone say about this who had no use for the concept of innate heat? Or about yellow bile, or black bile, or phlegm?¹¹⁵

"Aristotle says that our bodies are composed of a mixture of hot, cold, wet and dry, and that the warm is the most active (δραστικώτατον) of these, and that those animals that are naturally the warmest have much blood, while the cold ones are bloodless."¹¹⁶

On the question of the genesis of the humours Hippocrates, Aristotle, Praxagoras, Phylotimus and others showed, according to Galen,

"that when nutriment is altered in the veins by the innate heat, blood is produced when it is moderate (ὕπὸ τῆς συμμετρίας τῆς κατ' αὐτήν), but the other humours when it is disproportionate (οὐ δ' ἄλλοι χυμοὶ διὰ τὰς ἀμετρίας)."¹¹⁷

There are two important points here. First, according to Galen, Hippocrates himself was one of the originators of the idea that blood is produced by moderate heat; secondly, a clear distinction is drawn between blood on the one hand and the other three humours on the other. Only when warmth is moderate is blood produced; if there is either too much or too little of it, one of the other humours is generated in place of blood. The other humours, in fact, result from abortions of the process which, when it takes place as it ought to, leads to blood. Blood is a well-born hero among three

114. K II, 111 (De fac. nat.)

115. K II, 112-3 (ibid.)

116. K II, 116 (ibid.)

117. K II, 117 (ibid.)

misbegotten villains.¹¹⁸

"The diseases that are primary and most clearly defined are four, and differ by warmth, coldness, dryness and dampness."¹¹⁹

Galen does not list them here. The hot primary disease is certainly fever.

"But if the unnatural heat (παρὰ φύσιν θερμοσία) impairs the *energeia*, not as an incidental effect, but as the result of its substance (οὐσία) and power (δύναμις), it must be one of the primary diseases.¹²⁰ So, if an ametria of heat (i.e. a dyscrasia) is one of the primary diseases, the normal function (ἐνέργεια) must originate from eucrasia.¹²¹

Galen has now virtually admitted that blood is naturally eucrasic, while the other humours are dyscrasic by nature. Logic, he says later, leads to this conclusion:

"I think it has been sufficiently proved, for those who are able to perceive what follows logically, that even according to Erasistratus himself the cause of the *energeias* is eucrasia of the warm. Since this is so, there is no difficulty in going further and saying that in the case of every function, eucrasia results in the better consequence, and dyscrasia in the worse. If this is so, we must consider that blood is the offspring of moderate heat, yellow bile of excessive (ἄμετρον) heat.¹²²

It is extraordinary to watch Galen walking right into the trap here. Hippocrates, he says, originated the idea that blood is eucrasic; yet Hippocrates was also the author of the four-humour system of Nature of Man, which cannot possibly have a eucrasic humour as one of its members. The essence of that system is that any one of the four humours must be able to produce a dyscrasia if present in excess. The system of two pairs of balanced opposites requires this.

118. It is clear also from other passages that blood occupies a privileged position in Galen's system. It is, he says, the most useful of the humours and the most proper to the body (K I, 603; De temp.) If a large dose of a drug purging a particular humour is administered to a patient, it will eliminate that humour first, then the other two pathological ones, but blood always last of all, since blood is the most proper (ὀκρέτων) to the body (K I, 504-6, De el. ex Hipp.) Sacrifices of blood were frequently offered in antiquity; there must be few, if any, records of offerings of phlegm or bile.

119. K II, 118 (De fac. nat.)

120. Impairment of an *energeia* is Galen's definition of disease; see p 26.

121. K II, 121 (De fac. nat.)

122. K II, 122 (ibid.)

The pathological heat and dryness of yellow bile is exactly compensated for, in health, by the equally pathological dampness and coldness of phlegm. These are by nature dyscrasic humours when considered in isolation. But blood, Galen has now admitted, is not dyscrasic, but perfectly eucrasic in itself.¹²³ Black bile, its opposite, is pathologically cold and dry. How can it be balanced by a humour that is neither excessive nor deficient in any of its qualities? The answer is that it cannot; there is no place for a eucrasic humour in a system of paired opposites, which requires a Heraclitean tension of contrary qualities for its stability. Blood, in fact, ought to be a fifth humour, standing outside the four-system; just as Galen's ninth or well-tempered crisis is additional to, and distinct from, the eight ill-tempered ones.

Galen's terminology makes it clear that this was, in fact, the view he took. Each of the other three humours gives rise to a cacochymia when present in excess; but when blood increases he does not refer to this condition as a cacochymia, but as a plethos.¹²⁴ It is clear (quite apart from etymology) that cacochymia is a dyscrasic state, because if the humours increase equally with one another, thus preserving the original balance, the resulting condition is, again, not a cacochymia, but a plethos.¹²⁵ Plethos is a pathological state, as will be shown in the succeeding chapter; it is, however, not in itself a dyscrasia. The reason for this is that blood is by nature eucrasic.

Galen makes this point implicitly in another place, where he says that parts filled with blood, that is, suffering from a plethos as a preliminary stage of inflammation, are not, at first, unduly warm to the touch. They become so only when the pores become blocked, preventing transpiration.¹²⁶ This heats the blood, which subsequently putrefies. Clearly blood, for him, is not unduly

123. The term "dyscrasic humour" is conveniently used to describe the three pathological humours yellow bile, black bile and phlegm, since each has an excess of two qualities above the norm for a eucrasic mixture. Since crisis implies mixing, pure elements (such as fire, which is hot and dry to the ultimate degree) should not be described as dyscrasic; but Galen has pointed out that all the humours that occur in the body have some admixture of the others (K XV, 96-7; In Hipp. de nat. hom. comm.), so that the term may justifiably be applied to them. Blood, which is ideally eucrasic, can suffer various dyscrasias too, as a result of excessive admixture of one or the other pathological humour. The point of the argument is, however, that blood is normally eucrasic, whereas the other three humours are not.

124. K VII, 574 (De plen.)

125. K X, 891 (De meth. med.)

126. K VII, 712-3 (De tum. praet.nat.)

warm.¹²⁷ He explicitly says it is well tempered in at least one place, his commentary on Nature of Man, in discussing the crisis of the season of spring. Spring, in Nature of Man, is supposed to be warm and damp, like blood. Is it dyscrasic or well-tempered? It has already been shown that if blood is to function as an acceptable opposite for black bile in the four-system, it ought to be pathologically warm and damp when it stands in isolation. But blood is not a pathological humour; the whole nutrition of the body depends on it, and hence it cannot be dyscrasic. There is a contradiction at the root of this problem. As Lloyd has pointed out, certain characteristics had positive connotations, and others negative ones, in Greek thought. These were most marked in the case of left and right; but Aristotle's four qualities were involved as well, and life was associated with the warm and damp, death with the cold and dry.¹²⁸ The characteristics of life are the characteristics of blood; yet to a medical man the combination of warmth and dampness must seem a peculiarly unhealthy one, because these are the conditions that promote the rotting of perittomata.¹²⁹ Hence blood, on which the whole economy of the body depends, cannot be too warm or too damp, in spite of Aristotle's dictum that the warmest animals have the most blood. It must be eucrasic. Blood, Galen says in the commentary in question, is like the season of spring, and both from the evidence of the senses and from considerations of logic, it is well-tempered. Hippocrates, he says, regarded spring as the healthiest and least deadly of all the seasons.¹³⁰ Those philosophers who think that it is warm and damp are mistaken; they say this, Galen significantly observes, because they wish to assign the four crases (i.e. of the four humours) to the four seasons, while neglecting the most important one of all, the eucrasic

127. The idea that blood is not unduly warm by nature is found in at least two pre-Galenic writings: in the late Hippocratic work On the Heart (L 9, 90-92), and in Celsus, IV, 6, 1-2.

128. G.E.R. Lloyd, 'The Hot and the Cold, the Dry and the Wet in Greek philosophy', *J. Hell. Stud.* 84, pp 92-106, 1964. For Galen on this subject see K I, 536-8 (*De temp.*)

129. K XI, 263-4 (*De cur. rat. per ven. sect.*) Hot damp constitutions, according to Galen, are also particularly liable to putrefactive diseases. Even in health such people are foul-smelling, like goats, and they bear thirst and fasting better than the hot and dry; they are thus in less danger if they fall into the hands of the Methodist devotees of the three-day fast (see p 111). (K X, 583-4; *De meth.med.*)

130. K I, 533-4 (*De temp.*) For Hippocrates on spring, see L 4, 488-90; L 5, 74.

state.¹³¹ Yet he makes the same mistake himself in his humoral system by including blood among the four. It is significant that Galen makes the explicit admission that blood is eucrasic in his commentary on Nature of Man, the very Hippocratic work on which he has erected the system that this admission must overthrow. Galen has already granted independent status to the all-important ninth bodily crisis, the eucrasic state; he has had to admit that blood is a eucrasic humour; yet he has never explicitly withdrawn it from his four-scheme. Clearly he would like to do so; this, however, would mean rejecting the entire four-humour scheme of Nature of Man, which he has repeatedly lauded as Hippocratic. There is no alternative four-scheme in the Corpus that could replace it; the only one there is,¹³² the system of Diseases IV, also incorporates blood as one of the four humours.

131. These philosophers are the followers of Athenaeus (first century AD) who held that the eucrasic state was warm and damp, like spring. This, says Galen, is not so, and spring is not warm and damp, but moderate in everything; so much so, that it might equally well be called cold and dry, being colder than summer and drier than winter. The Athenaeans, however, think that it is hotter than winter and damper than summer, so that it is hot, cold, wet and dry all at once, which is absurd. In the same work Galen makes the extraordinary, and significant, suggestion that all the seasons might be well-tempered. If, he says, there is some order in the universe, and everything is arranged for the best, one might expect it to make most of the seasons well tempered; but the followers of Athenaeus wish to show that none of them is. (K I, 524-9; De temp.) Galen is probably being unfair to the Athenaeans here. Schöner (p 82) observes: "Die Mischung "warm und feucht" beispielweise wurde von einigen Pneumatikern nicht als Dyskrasie (= krankhafte Mischung), sondern als normale und optimale Mischung betrachtet, als ein Idealzustand, aus dem heraus keine Krankheit entstehen könne." Some such ideas may be behind Galen's views on the crisis of blood, although he says that it is not warm and damp, but well-tempered, probably because his extensive clinical experience had convinced him of the unhealthiness of this combination of qualities.

132. Strictly speaking, as Schöner (p 41) has pointed out, there is another four-scheme in Affections, the components being bile, phlegm, black bile and water; but such a scheme would be difficult to support by logic. Jung believed that the human mind had an inbuilt tendency to construct schemes of four; the quaternity was one of the archetypes of the collective unconscious. "The quaternity is an archetype of almost universal occurrence...For instance, if you want to describe the horizon as a whole, you name the four quarters of heaven...There are always four elements, four prime qualities, four colours...A quaternity... often has a 3+1 structure, in that one of the terms composing it occupies an exceptional position or has a nature unlike that of the others... This is the "Fourth", which, added to the other three, makes them "One" (from the Glossary, entry "Quaternity", to C.G. Jung's autobiography, Memories, Dreams, Reflections, 1973, p 416). Thus an unsuitable person is frequently pressed into service "to make a fourth" at tennis or bridge. Müri (see note 156, this chapter) suggested that black bile was the unsuitable member of the foursome; it could be argued with equal cogency, however, that blood was in fact the odd man out.

If blood, then, is too good to be true, the other three humours, and particularly black bile, are too bad. As previously mentioned, Galen is hard put to it to think of any significant useful function for yellow bile, black bile or phlegm in the organism, and the reader cannot but sympathise with Erasistratus, who while admitting that Nature was artistic, nevertheless declared that bile was useless. Strangely enough, Galen never seems to make any serious attempt to explain what the main function of these humours presumably is. He might have been expected to say that Nature is so thrifty that she makes use of otherwise worthless superfluties to provide the hot, the cold, the wet and the dry that are necessary to maintain the equal crisis of the body.

Turning from the unsatisfactory hero to the even more unsatisfactory villain of the piece, we must now consider the contradictions in Galen's concept of black bile. As has already been shown, it is implied in Nature of Man that black bile is dry and cold. The author says that blood, like spring, is moist and warm; it is at its lowest ebb in autumn, when black bile is at its height. since autumn is dry and beginning to become cold.¹³³ The same author says that quartan fevers have least of the variety of bile (yellow bile) that causes heat.¹³⁴ When Galen is saying his Nature of Man creed, as mentioned earlier in this chapter, he affirms that blood is moist and warm, and black bile dry and cold.¹³⁵ He seems quite convinced of the existence, and of the qualities, of black bile in his work on the natural faculties:

"I have shown, firstly from the causes by which everything in nature is regulated, I mean the hot and the cold and the dry and the wet, and secondly, from things that can be clearly seen to take place in the body, that a cold and dry humour must exist; and next, that this humour is black bile, and that the internal organ which cleanses it is the spleen."¹³⁶

Elsewhere--even in this same work--he falls into heresy in respect of both these humours; but there are, nevertheless, many passages in other writings in which the orthodox doctrine is upheld. Black bile is colder and thicker than blood, while yellow bile is far

133. L 6, 46-50.

134. L 6, 68.

135. K VII, 21-2 (*De morb. caus.*); K II, 129-31 (*De fac. nat.*)

136. K II, 134 (*ibid.*)

hotter.¹³⁷ Cancerous tumours (καρκίνου) due to black bile are not warm to the touch.¹³⁸ In quartan fevers the rigor is due to a mixture of hot and cold, since black bile is cold, and the fever is due to putrefaction.¹³⁹ Rigor occurs in both quartan and tertian fevers, though they are due to contrary humours¹⁴⁰ (i.e. black bile and yellow bile respectively). Only the melancholic deliria have a cold origin.¹⁴¹ An excess of yellow bile in the body leads to thirst, which is absent in the case of black bile.¹⁴²

Significantly, however, it is in his commentary on Nature of Man, in which, as has just been shown, he had his doubts about blood, that Galen seems to be becoming uncertain about the qualities of black bile as well. In listing the association of the humours with the seasons, he associates black bile with autumn, describing it as dry; he does not, however, say whether it is hot or cold, although he has mentioned both pairs of opposites in speaking of blood and yellow bile in this passage.¹⁴³ In other passages he clearly says or implies that black bile is hot. Dark, lean, hairy people (i.e. those of a hot crasis) have much black bile, and certain articles of diet, including heavy and dark wine--a heating agent par excellence--are productive of black bile in the body.¹⁴⁴ In phlebotomy, thick black blood is seen in bodies that are dry and hot by nature; it also occurs in hot dry regions and climatic conditions.¹⁴⁵ In the same passage, Galen considers why, as the Hippocratic aphorism says, the excretion of black bile is a bad sign.¹⁴⁶ Why is the body harmed by the evacuation of a pernicious humour? It should surely be benefited. The answer seems to be that black bile is a sign that the blood has been overheated. In diseases of a hot and dry dyscrasia, such as causus, the blood is thick and black. In the great plague, which occurs in long hot summers, those who excrete only black material all die; this indicates that the blood has been overheated.¹⁴⁷ The spleen

137. K I, 603 (De temp. nat.)

138. K VII, 720 (De tum. praet.)

140. K VII, 633 (De tremore).

139. K VII, 190 (De sympt. caus.)

142. K VII, 577 (De plen.)

141. K VII, 202 (De sympt. caus.)

143. K XV, 88 (In Hipp. de nat. hom. comm.) In the same passage, however, he also denies that blood is damp and warm; it is eucrasic, he says.

143. K XV, 88 (In Hipp. de nat. hom. comm.)

144. K VIII, 184 (De loc. affect.)

145. This contradicts Galen's observation (K II, 129-31; De fac. nat.) when he is expounding the orthodox doctrine, namely that black bile abounds in cold and dry crases of body, modes of life, and regions.

146. L 4, 510.

147. K V, 114-6 (De atra bile).

(the headquarters of black bile) is blacker in animals of a hot dry crasis, and those with serrated teeth; colder and damper animals, like the domestic pig, have paler spleens.¹⁴⁸

Some sophists, according to Galen, denied that black bile existed, or at any rate that it was of any importance. Julian the Methodist, against whom Galen wrote a complete work, was one of these. But, says Galen, Hippocrates does not mention any stage of life, or season, or any time at all, in which any one of the humours is absent from the body. Galen uses this appeal to the father of medicine to demolish Julian because Julian has had the effrontery to say that those who praised Hippocrates have been made insane by black bile, an opinion with which the modern reader cannot but concur. But Galen says that this witticism applies more appropriately to people like Julian himself, who resembles the ass in Aesop's fable.¹⁴⁹ Other sophistical writers have maintained that black bile is a purely pathological humour, not present in the eucrasic body. They counter the argument that a drug used to purge black bile, when administered to a eucrasic athlete in the peak of condition, will cause this humour to be eliminated, by saying that the drug itself converts blood into black bile in the body. But it is well known, Galen says, that specific drugs attract their proper humours,¹⁵⁰ and Erasistratus has proved that black bile is generated in the body. In his second book on fevers, according to Galen, he says that when the menses are suppressed there may be a flow towards the bladder, with the passage of black urine.¹⁵¹ Sophists, again, argue that there is no organ in the body that receives black bile, as the gall bladder does the yellow variety; hence, they say, black bile is not present in the healthy body. But, by this argument, Galen says, bodies could not contain phlegm either; nor could pigeons, which, he says, have no gall bladders, have yellow bile.¹⁵² But now

148. K V, 127 (De atra bile).

149. K XVIIIa, 290-2 (Adv. Jul.)

150. K V, 144-6 (De atra bile).

151. K V, 138-9 (ibid.).

It is astonishing to see Galen appealing to Erasistratus in support of the existence of black bile, since elsewhere in the same work (K V, 104-5, 123) he accuses him of never mentioning this humour. For that matter, he did not mention it in the passage in question; Galen, who will use almost any argument to prove a point, is merely supposing that he was referring to it.

152. K V, 146-7 (ibid.)

Galen, having, as it would seem, confuted the sophists who hold such ridiculous opinions, suddenly does a volte-face and agrees with them. Genuine black bile, he says, is generated only in abnormal conditions; there is, however, a kind of black humour that occurs in health.¹⁵³ Black bile properly so called may be recognised because it bubbles when poured on the earth; it also has a sharp acid taste. It does not clot, which distinguishes it from black blood. The other variety of black humour, which is found in healthy bodies, does not have these qualities. It is only the excretion of the former, pathological variety that is an unfavourable sign. Galen learned to distinguish the two varieties from his teacher Pelops.¹⁵⁴

As previously mentioned, Galen is beginning to have doubts about the crisis of blood in his work On the Natural Faculties; it is not surprising, therefore, that in it his attitude to its opposite humour, black bile, should also show signs of ambivalence. Although in this work he expounds the classical doctrine of black bile, he also mentions the fermentation test for the pathological humour, which is combusted or overheated black bile. It is more malignant and corrosive than the normal variety, which some call black humour (μέλας χυμός) to distinguish it from pathological black bile (μέλαινα χολή). In discussing the varieties of both kinds of bile, he mentions that pathologically overheated yellow bile develops an appearance like egg yolk (λεκυθώδης), and mentions its similarity to the variety of black bile that has been overheated, and is corrosive, like vinegar, and bubbles when poured on the ground. Both these varieties are unnatural substances. He makes a significant admission here:

"The lecithoid bile often shares the appearance of black bile that has been overheated in this way, when, as it were, it is cooked by fiery heat. And all the other varieties of bile originate, some from a mixture of the varieties mentioned, others as stages, as it were, on the way to the development of these and of their

153. K V, 147-8 (De atra bile).

154. K V, 110-13 (ibid.)

conversion one into another." (τὰ δ' ἄλλα τῶν χολῶν εἶδη
 σύμπαντα τὰ μὲν ἐκ τῆς τῶν εἰρημένων κράσεως γίγνεται, τὰ
 δ' οἶον ὁδοῦ τινές εἰσι τῆς τούτων γενέσεώς τε καὶ εἰς
 ἄλληλα μεταβολῆς.) ¹⁵⁵

It is clear enough from the foregoing that there are notable contradictions in Galen's concept of black bile. He is unable to decide whether it is cold or hot, though agreeing throughout that it is dry, and he is finally compelled to admit that true black bile is not a constituent of the normal body. He cannot argue, however, that the pathological variety is hot and the normal black humour cold, which would reconcile his system with that of Nature of Man, since, as already shown, he says that normal people of hot and dry crasis have thick black blood, and that black bile abounds in normal bodies in hot and dry regions and climatic conditions, although elsewhere he denies this. Clearly his ideas of black bile are thoroughly confused. Why is this?

Opposites come in pairs; hence if in any four-humour system one of the components becomes unsatisfactory and has to be discarded, it must either be replaced with another, or discarded together with its opposite, to leave a two-humour system. Neither of the four-systems in the Hippocratic corpus, however, offers any alternative to blood; the logical thing to do, therefore, when blood, by virtue of its inappropriate eucrasia, becomes unacceptable, is to abandon it together with its opposite humour, black bile, leaving only the phlegm and undifferentiated bile of the early Cnidian works as agents of disease. ¹⁵⁶ This seems to be what the later Galen was trying to do, without going so far as to admit it. He never denies that black bile is dry; in sometimes considering it as hot rather than cold he is aiming to demote it to the status of one of the many varieties of ordinary warm and dry bile, some of which, it is

155. K II, 134-8 (De fac. nat.)

156. Müri (p 27) remarks on the four-system of Nature of Man: "Die schwarze Galle ist wirklich "faute de mieux" aus dem Willen zum System darin aufgenommen worden, weil ohne sie die Vierzahl nicht zu erreichen war. In andern Schriften erscheint nämlich die schwarze Galle nur als eine Unterart der Galle schlechthin, im Gefolge oder als ein Derivat der gelben Galle." The introduction of black bile was unavoidable once blood had been admitted to the scheme, to make up, as Müri says, the total of four humours. When it became clear that it was no longer possible to justify blood as one of the four, black bile had to be relegated to the status of a variety of ordinary bile.

clear, are naturally somewhat hotter and others colder than the mean for yellow bile. The passage from On the Natural Faculties, in which the distinction between the varieties of yellow and of black bile is seen to be blurred, and it is almost implied that one sort can change into the other, is extremely significant here. The medical observations that suggest the existence of a black humour do not have to be denied; only its primacy as one of the four. It would seem likely that Galen started out with a four-humour system firmly based on Nature of Man, but incorporating certain developments and technical terms introduced by the pneumatist school of Athenaeus. His devotion to Hippocrates made him retain this scheme for a long time. All the works in which he mentions or suggests that black bile is cold (Natural Faculties, On Temperaments, Abnormal Swellings, Causes of Symptoms, On Tremor, On Plethos)¹⁵⁷ are dated by Ilberg¹⁵⁸ or Bardong¹⁵⁹, or both, to the period of Galen's second sojourn in Rome, under Marcus Aurelius (169-180 AD). The Commentary on Nature of Man, in which, as already shown, Galen is having doubts about the validity of the Hippocratic system, is later; it is dated by Bardong at about 189.¹⁶⁰ The work On The Affected Parts, which suggests in one place that black bile is hot, is dated in the reign of Septimius Severus, 193 onwards; that is, in the last seven years of Galen's life.¹⁶¹ Unfortunately neither Ilberg nor Bardong, nor Peterson,¹⁶² makes any attempt to date On Black Bile, in which Galen frequently implies that black bile is hot.¹⁶³ Perhaps, from the fact that it is not mentioned in the late work On His Own Books,¹⁶⁴ it may be assumed that it is also a late work.

157. See refs. 136-142.

158. J. Ilberg, 'Ueber die Schriftstellerei des Klaudios Galenos', Rh. Mus. 44, pp 207-239, 1889; 47, pp 489-514, 1892; 51, pp 165-196, 1896; 52, pp 591-623, 1897. The reference here is to 1892, p 513, and 1896, pp 194-5.

159. K. Bardong, 'Beiträge zur Hippokrates- und Galenforschung', Nachdr. Akad. Gött. Phil. Hist. Kl. 7, pp 577-640, 1942; see pp 633-7.

160. Bardong, p 639.

161. Bardong, p. 640; Ilberg,

162. D.W. Peterson, 'Observations on the Chronology of the Galenic Corpus', Bull. Hist. Med. 51, pp 484-495, 1977.

163. It was no doubt this contradiction that caused Siegel (p 25) to deny that On Black Bile was by Galen; elsewhere in the same work, however (p 258) he says that it was. It is not the only work in which ideas that contradict the classical view of black bile are expressed. Such contradictory statements are to be expected, since any four-scheme incorporating blood and black bile is logically unsatisfactory. Siegel, however, believes that Galen "attained a medical system of great consistency", (p 1) and that his black bile was "an integral part of an initially rather logical system" (p 258).

164. K XIX, 8-48.

The passage on the varieties of black and of yellow bile, and their possible interchangeability, from Natural Faculties seems out of place in that work. Peterson remarks on the difficulty of dating more precisely the books that Galen wrote between 169 and 176, since he kept them all to the end of this period and revised them.¹⁶⁵ Both Ilberg and Bardong place On the Natural Faculties early on their lists of writings for this period, so that it might well contain later revisions. It would seem possible that the passage in question is such a later--perhaps considerably later--addition, since elsewhere in the work the classical Nature of Man doctrine, of yellow and black bile as two entirely distinct humours, is maintained. It is fatal for the doctrine of Nature of Man, which is expounded in its pristine purity elsewhere in this work, for yellow bile and black bile to become confused, or for black bile to be hot.

A point against this hypothesis is that, in his late work against Julian the Methodist (dated by Ilberg¹⁶⁶ to the period of Septimius Severus also) Galen writes as if he is fully in agreement with the orthodox Hippocratic doctrine, without, however, specifically mentioning the crisis of either blood or black bile. He says that Hippocrates has shown that all the humours are always simultaneously present in man's body;¹⁶⁷ obviously he has Nature of Man in mind. But the circumstances are unusual. Here is an opponent, and a Methodist at that, who has insulted, not only the divine Hippocrates, but Galen as well, and Galen is not going to let him get away with it by conceding that Hippocrates might have been wrong. Ilberg comments unfavourably on the intemperance of the aged Galen's polemic in this work.¹⁶⁸

The question may well be asked whether a two-humour system, of the sort with which Galen would have been left after blood and black bile had been discarded from the scheme of Nature of Man, is in fact any more consistent than the original four-system. There is no logical objection to a four-system as long as the participants are equal partners, each contributing its own possibility of dyscrasia to make up the eucrasic state of health. But blood was an unsatis-

165. Peterson, p 495n.

166. Ilberg, Rh. Mus. 52, p 616,

1897. The work Against Julian is in K XVIIIa, 246-299.

167. K XVIIIa, 292 (Adv. Jul.)

168. Ilberg, Rh. Mus. 52, p 617,

1897. He says that Galen falls upon his adversary foaming at the mouth.

factory partner from the beginning; it was a vital force in the economy of the whole body, while the other humours were mere perittomata, and it was too eucrasic to associate with such dyscrasic and disreputable companions. It made a dignified withdrawal from the scene, in Galen's mind, somewhere in the 180's. Once it had gone, black bile, its opposite, had to go too. It was not necessary to abolish it; there was medical evidence for the presence of black material in the body. It merely reverted to being one of the many varieties of ordinary bile, par inter pares, as foreshadowed in the passage quoted from On the Natural Faculties.¹⁶⁹ Now there were two pathogenic humours, bile and phlegm. Both were worthless perittomata, so that problems of status were avoided. Bile was hot and dry, phlegm cold and moist, so that all the qualities were represented. It might be argued that, with only two opposed humours, only two dyscrasias, apart from the eucrasic state, could exist in the body; but it has already been shown that many varieties of bile were envisaged, and there is at least one reference in Galen to varieties of phlegm.¹⁷⁰ If some of these varieties were somewhat drier, others somewhat colder, others hotter, and yet others damper than the respective means for the two humours, every dyscrasic state could be produced by appropriate mixtures of them. The association of the humours with the seasons would have to go; but Galen is unenthusiastic about it, in his commentary on Nature of Man, in any case, even going so far as to remark that those who postulate it are in error, and do so only because they wish to associate the four crases tidily with the four seasons.¹⁷¹ The elements play no important part in Galen's system, and would present no difficulty.

Galen's reverence for Hippocrates is such that once he has committed himself to a system which he says is Hippocratic he cannot explicitly renounce it; Hippocrates was always right, and Galen's pride is such that he would never admit that he was not in the same category. The mistake he made was in attributing Nature of Man to Hippocrates in the first place. But Galen's attribution of opinions to Hippocrates is in general so arbitrary that he might

169. See ref. 155.

170. K II, 139-40 (De fac. nat.)

171. See ref. 131.

equally well have committed himself originally to a "Cnidian" two-system; he remarked, in fact, that there was much good material in Diseases and Affections, although overall they were not worthy of the Hippocratic genius.¹⁷² A man who could attribute Nutriments to Hippocrates would have no need to strain at such a gnat.¹⁷³ There is evidence that Galen became dissatisfied with the four-humour system of Nature of Man towards the end of his life. No alternative was wholly satisfactory, since the whole system was basically false; but by removing blood and demoting black bile a great improvement in logical consistency could be achieved. This may have been the idea in Galen's mind in the last ten years of his life. By never eating his words and explicitly renouncing the scheme of Nature of Man, Galen saddled posterity with a humoral system riddled with fundamental contradictions. It might be argued that he did not realise how famous an authority he would be in times to come, but no one who has read much Galen is likely to believe that. The whole question, which is dealt with in this work only in outline, deserves a study of its own; the conclusions drawn here must be regarded as only tentative.

172. K XV, 586 (In Hipp. de vict. acut. comm.)

173. Galen quotes the first sentence of Nutriments as the work of Hippocrates in K II, 26 (De fac. nat.)

CHAPTER IV
HEAT AND FEVER

Galen's ideas of fever cannot be understood without some preliminary consideration of concepts of heat in his system and in those of his predecessors. Although many philosophers in antiquity spoke of the importance of warmth, specific references to the innate heat are not found in the fragments of the pre-Socratics. Diogenes of Apollonia held that the soul of all living things was air, warmer than that outside the body, and that this warmth was not alike in any two living creatures, even of the same species.¹ Empedocles supposed that when the air entered the spaces in the body of the newborn previously filled with fluid, the heat in the child drove it out, resulting in expiration, and its subsequent inflow constituted inspiration; a cycle of air alternately advancing and retreating before the heat of the body was thus set up, as in the Timaeus.² Philolaus of Tarentum, a Pythagorean to whom Burnet attributes some of the concepts in Plato, had a similar system. The body, he said, was composed of the warm, the cold being introduced only after birth, by respiration, just as the fire in the macrocosm draws in the cold dark breath that surrounds the world.³ Galen maintains that the innate heat was known to Hippocrates, who placed it in the heart; this is clear, to Galen at least, from the passage on fever in the Appendix to Regimen in Acute Diseases:⁴ "It increases while it chills the feet, catches fire from the chest, and sends a flame, as it were, to the head."⁵ According to Galen, too, Hippocrates always says that the innate heat is the chief cause of all the works of nature, whereas Plato calls it not heat but fire.⁶ It is not clear where, if anywhere, Hippocrates says this, but it is certainly true that there are several references in the Corpus to heat in the body, and in the late work On the Heart, which Galen never mentions, the innate heat is specifically said to have its seat in the left ventricle, which is made thick to preserve the strength

1. Burnet, p 355.

2. Freeman, p 195.

3. Burnet, pp 278-9.

4. L 2, 420-2.

5. K V, 582 (De plac. H. & P.)

6. K V, 702 (ibid.)

of the heat. The lung, surrounding the heart, modifies the intensity of the heat, since it is cold; respiration has the same effect.⁷ This is the Aristotelian doctrine, and is probably much later than most works in the Corpus. In Nutriments, however, which Galen regards⁸ as truly Hippocratic, we read "Root of veins, liver; root of arteries, heart. From these travel to all parts blood and breath, and heat passes through them",⁹ suggesting a central origin, though not necessarily the heart, for heat. The heat is said to be centred in the heart in the work Fleshes, which Galen apparently never mentioned. The greatest heat, says the author, is in the veins and the heart; hence the heart, the hottest part of the body, contains air, which nourishes it. It moves continually, as does a fire in a house, and attracts air. Cold is nourishment for heat.¹⁰ Heat is immortal, and has intelligence; it is the same as aether.¹¹ This again may be a late work. The book On Sevens tells us that the innate heat both makes the body grow and kills it. Doctors, however, do not understand the action of the innate heat.¹² (They may perhaps be forgiven if Sevens is meant to instruct them.) There is a difference between innate and acquired heat and cold. The innate varieties are derived from the parents at conception; the acquired ones come from food and drink.¹³ The astrological and numerological lore in this work again suggests a late origin. The innate heat is also mentioned in Diseases I, where it is said that diseases due to external causes may be due to air becoming mixed with the innate heat.¹⁴ Use of Liquids suggests a central situation when it says that the skin, being far from the innate heat, is often overcome by heat and cold and is thus in need of one of them.¹⁵ Aphorisms mentions that when the innate heat is great, as in athletes and children, more food is necessary,¹⁶ and Epidemics 6 seems to have a reference to the Aristotelian concept of the innate heat moving in and out in sleep and waking.¹⁷ It seems fair to say that there is little reference to the innate heat in those works in the Corpus that have sometimes been thought "genuine" works of Hippocrates, but that it is mentioned more frequently in the more esoteric, and possibly later, works.

7. L 9, 84.

9. L 9, 110.

11. L 8, 584.

13. L 8, 640.

15. L 6, 124.

17. L 5, 310.

8. See Ch. III, ref. 173.

10. L 8, 592.

12. L 8, 643-4.

14. L 6, 158.

16. L 4, 466.

Diocles, according to Jaeger, made the heart the seat of the innate heat and of the psychic pneuma, though he may not have used the term.¹⁸ This was also the view of Chrysippus, according to Galen. Galen says that Diocles attributed flatulence to an abnormal increase of innate heat, and to the first veins being heated.¹⁹ Aristotle deals with innate heat at some length. All parts of the body contain some, and life consists in the conservation of this heat, death in its destruction. The source of the heat is the heart in all animals that have blood, and if the region of the heart is chilled the whole body is therefore destroyed.²⁰ Some bloodless animals, such as insects, have several sources for their innate heat, since they continue to live when cut in pieces; and even the tortoise, owing to its ill-constructed nature, continues to move its feet after its heart has been removed.²¹ The heart is the first part of the animal that is formed in the embryo, and the last to fail.²² The parts of the embryo are differentiated under the influence of pneuma, but this is not the pneuma of the mother, nor of the embryo, since placental mammals do not breathe until the lungs have been formed. It is innate.²³ The animals that rank highest in the scale of creation have the most heat, since they have more noble souls. Man has the purest and most abundant blood, hence his erect posture (a Platonic idea).²⁴ All animals have souls, and everything that has a soul has heat. The male semen possesses soul and potentially is soul; it contains the substance that is called hot, which makes it fertile. This is not fire but pneuma, which contains the fifth element. This is why fire does not generate animals, but the sun's heat does,²⁵ as does the heat of animals. Soul is connected with some substance different from the elements and more divine than they are.²⁶

Sense perception and movement originate, in animals having blood, in the heart, since the soul, for Aristotle, must be situated where the innate heat is concentrated.²⁷ The innate heat

18. Jaeger, *Diokles*, p. 215. affect.)

21. *On Resp.*, 478b-479a.

23. *Ibid.*, 741b-742a.

25. By spontaneous generation, belief in which persisted into the nineteenth century.

27. *On Sleep & Waking*, 456a.

19. K VIII, 186-7 (*De loc.*

20. *On Youth & Old Age*, 469b.

22. *Gen. of An.*, 741b.

24. *On Resp.*, 477a.

26. *Gen. of An.*, 736b.

is not derived from nourishment taken, but it needs it for its continuance, as otherwise it would quickly exhaust the matter in which it is situated.²⁸ Some philosophers have maintained that heat is nourished by breath rather than nutriment, but this, says Aristotle, is not so.²⁹ The function of respiration is, in fact, to cool the fierce heat which the soul acquires in the heart.³⁰ If the heat is to be preserved, it must be cooled at its source, like a fire that is banked, otherwise it would use up its material too quickly.³¹ Animals that live in air or water cool their innate heat with the help of these elements.³²

Although Aristotle postulates respiration, just as Galen does, to cool the heart, he also believed, at least according to Galen, that the brain had this function.³³ This, says Galen, is an absurd idea. Why, if this is its function, is it so far from the heart? The feet would do it better. In fact the brain, while inside the intact skull, is warmer than the surrounding air, according to Galen.³⁴

The blood, according to Aristotle, is formed, not in the liver as Galen holds, but in the heart. The heart beats because of the expansion, as a result of the heat, of the chyle from the alimentary canal which is constantly entering the heart to be converted into blood.³⁵ The material vaporised from the chyle by the heat must go upwards for a time, and then turn, like the tide in a strait. The hot material rises; when it reaches the upper parts it turns and descends in a dense mass. (The influence of meteorological ideas is plain here.) This turning results in sleep,³⁶ which is due to the innate heat reversing its direction and passing from the periphery to the centre.³⁷ The same thing happens in fear, in which the heat collects in the heart, forsaking the periphery; this may be fatal.³⁸

According to the Anonymus Londinensis, Erasistratus had similar views about the functions of breathing and of nutrition. He said

28. On Length of Life, 466b.

30. On Resp., 478a.

32. Ibid., 470b. It is not clear why nature, which does nothing in vain, did not make the innate heat more moderate from the beginning, so that no cooling would be necessary.

35. On Resp., 479b-480a.

37. On Dreams, 461a. See also L 6, 610; L 5, 310.

38. On Resp., 479b. For Galen on the movement of blood and pneuma in psychological states, see K VIII 191-4, De sympt. caus. For Falstaff's opinions, see King Henry IV part II, IV, iii.

29. On Resp., 473a.

31. On Youth & Old Age, 470a.

33. The Hippocratic work Fleashes poetically describes the brain as the metropolis of cold and glutinosity. (L 8, 588).

34. K III, 620-4 (De usu part.)

36. On Sleep & Waking, 456b.

that the purpose of inspiration was to reduce the heat round the heart so that it did not burn us up.³⁹ He did not believe, however, in the digestive functions of the innate heat; nor did Asclepiades. Erasistratus asked how the gentle heat of the body could achieve such an effect, but Galen replies that the fires of Etna are not necessary.⁴⁰

Galen tells us that Erasistratus, Praxagoras, Phylotimus, Asclepiades and others deny that the innate heat exists; the heat of the body, they say, is acquired from outside. The atomist school attributed it to the movement of bodies in passages. Galen, however, does not postulate corpuscles and passages, nor does he believe, with Asclepiades, that the heat of fever is due to friction. He considers the whole body as breathing and flowing together, and the heat not as something acquired subsequent to conception, but truly innate and from the beginning. It is, he says, the nature and soul of life itself. It is constantly in motion, moving alternately inwards and outwards, and is alternately kindled and extinguished: kindled when it collects centrally, put out when it is dispersed. Complete dispersal if prevented by the cold, of which it has a share.⁴¹ All animals have this heat from the time of their conception, derived from the sperm and menstrual blood. They differ in having more or less of it, but there are none the less limits beyond which life is impossible.⁴² The innate heat, although it is not derived initially from nutriment, is augmented by nourishment that the body can use, just as fuel increases the heat of a fire. All nourishment has this effect, but wine augments the innate heat most quickly.⁴³ Dry wood is nourishment for fire, but it takes time for it to be overcome by the fire before it can heat, and if it is piled on in quantity it puts out the fire rather than augmenting it. Foods that nourish animals take time to heat the body, and even appear to have a cooling effect immediately after they are taken. Even wine heats only if taken in moderation; if in excess, so that it cannot be overcome, it generates cold diseases.⁴⁴ The newer physicians in

39. Anon. Lond. XXII, 51-XXIII, 42. Aretaeus also has several references to the innate heat, e.g. III, 7, 8; IV, 1, 10; IV, 7, 1-2; IV, 12, 7; V, 2, 1.

40. K II, 167-8 (De fac. nat.)

41. K VII, 616-8 (De tremore). 42. K XVIIIa, 199 (Adv. Lycum)

43. K I, 659 (De temp.)

44. K I, 659-61 (ibid.)

Galen's time likened the innate heat to a flame originating from the material from which it was kindled. Young animals and plants, in their view, were so damp that the heat was almost suffocated, and was like a cloudy and sluggish flame. With advancing age, however, it overcame the material and burned pure and ethereal. As the nourishment of the flame failed, it gradually withered, and when it had exhausted the material it went out, and the animal died. This is not so, says Galen. The innate heat does not consume the body; the heat of fever, however, may do so, which seems to be the meaning of Hippocrates' remark that the heat, which produces our bodies, also kills us. The innate heat, far from consuming, moulds and augments the body; it extends through every part of it, and, as mentioned in Chapter I, possesses the natural faculties of attraction, presentation and assimilation; in fact, it is Nature. The new physicians also equate the innate heat with nature, but this is untrue if it is like a flame that corrupts bodies.⁴⁵

Commenting on the remark in Nature of Man that a man is warmest on the first day of his life, coldest on the last,⁴⁶ Galen says that the author should have added that this refers to the innate heat, as Hippocrates did when he said that growing things had the most innate heat. With reference to the author's statement that the body that is growing and increasing rapidly must be hot, Galen remarks that he should say that bodies grow because of the innate heat, not that they are hot as a result of growing. The innate heat is not only well-tempered heat, but also dampness, so that bodies grow in three dimensions as if inflated, since dampness causes objects to swell.⁴⁷ Lycus was another who expressed views on Hippocrates' aphorism that living things had the most innate heat. If, says Galen, Lycus meant by this more substance of heat, he was wrong; for children have smaller bodies than adults. Nor does it refer to heat that differs in quality. Lycus should have said that the heat in growing things was strongest in terms of *energeia*, or in modern terms, functionally more efficient, in performing the proper task of the innate heat, to produce growth. Galen, as already shown, sometimes identifies the innate heat with Nature; in this work he identifies it with the blood. It is derived from the menstrual blood and sperm at conception, and the innate hot body of the

45. K VII, 672-6 (De marcore).

46. L 6, 64.

47. K XV, 154-6 (In Hipp. de nat. hom. comm.)

embryo, the blood, increases with it as it grows. The baby has the most blood; even its bones show it.⁴⁸ Old people have the least.⁴⁹ What is old age, asks Galen elsewhere, but the road to death? If death is the extinction of the innate heat, old age is its enfeeblement. It is the coldest time of life; almost all the blood has been destroyed and the natural faculties are weakened. The body is cold to the touch, and liable to cold diseases such as paralyzes and coryzas.⁵⁰

There has been disagreement, however, as to whether children are hotter than adults. Although Galen says that this refers to the innate heat, which is not the same as the quantity or quality of perceptible heat, he says elsewhere that if children are compared with adults on equal terms--not, for instance, sedentary children with athletic adults--children will be found warmer to the touch than adults are. The heat, he says here, differs also in quality; in children it is more vaporous, abundant and sweet, while in adults it is scanty, dry and less sweet to the touch.⁵¹ Children transpire more than adults do.⁵²

Since the innate heat and the acquired variety are not the same, it is necessary to decide whether bodies are hot with their own innate heat or whether the heat has been acquired. In winter the innate heat is greater, adventitious heat less; the reverse is true in summer. All decomposing things are hot with acquired heat, cold with their own; the same is true of the inhabitants of hot

48. This is a reference to the presence of red (haemopoietic) marrow in the shafts of the long bones of infants, but not in adults.

49. K XVIIIa, 234-9 (Adv. Lycum). "I'll prove this truth with my three drops of blood" (the aged Nestor in Troilus and Cressida I, 3): "Yet who would have thought the old man to have so much blood in him?" (Macbeth V, 1); "Go, lest I let forth your half pint of blood" (Coriolanus V, 2).

50. K I, 580-2 (De temp.)

51. It is not clear how Galen could distinguish varieties of heat by palpation; perhaps the dampness or dryness of the skin was also taken into consideration. There is no doubt, however, that the old physicians, lacking modern artificial aids to diagnosis, were far more skilled in palpation, particularly of the pulse, and (more recently) also in auscultation.

52. K I, 593-5 (De temp.)

southern regions. Since different parts and organs may have different crases, it is necessary to examine the crisis of each part individually, by considering how well it performs its functions.⁵³

In another work (On Tremor) Galen associates the innate heat with the tonos⁵⁴ that pervades the body, and begins to fail as death approaches. He compares the heat to a flame which has a tonos that holds it together, but may be dissipated if the supply of fuel fails, or an excess of fuel smothers it, or it is quenched by water, or by sunlight, which disperses the tonos of the flame by reason of its superior strength. He uses this comparison to illuminate the nature of rigor,⁵⁵ which is a sudden, unnatural, perceptible chill of the innate heat. Such a chill occurs when the innate heat is dissipated, but death is not always accompanied by rigor, since the chill, to produce it, must be sudden and violent. In rigor the heat, having become vaporous, rushes outwards, but is checked by some impediment and thrust back; and since heat cannot remain stationary, it does this repeatedly, setting up a shaking motion.⁵⁶ This is different from the natural motion of the innate heat, which is one of free expansion and contraction. In this work we find the interesting spectacle of Galen expressing Asclepiadean views. In rigor, he says, the body is hotter than normal, for three reasons: from the shutting in of the heat during the period of obstruction to its free passage; from the heat that is now outside having become less; and owing to the increase of the heat from its impacts and violent movements.⁵⁷ The innate pneuma (here he is equating heat with pneuma) is hot by nature; it will be heated still more by violent movement, just as fire can be kindled by rubbing two sticks together, and athletes become hot from exertion. There is a contest between the heat and the pathological cause, just as in other works Galen sees disease as a struggle between nature and the aetiological agent. If the body does not become

53. K I, 628-9 (De temp.)

54. The τόνος of the Stoics is the force that holds the universe together (Liddell-Scott-Jones).

55. The term rigor in medicine usually means a fit of shivering preceding a fever.

56. K VII, 621-4 (De tremore).

57. Again in his work On the Use of Respiration he says that we breathe more deeply and quickly on exertion because heat is increased in things that are strongly moved (K IV, 498-9).

warm after the chilling associated with rigor, the heat has lost the battle.⁵⁸

Galen mentions the opinions of a number of authorities on the functions of respiration. In Asclepiades' view it was concerned with the genesis of the soul itself, while Praxagoras held that some sort of strengthening of the soul took place through its agency. Philistion and Diocles held that it refrigerated the innate heat, and Hippocrates that, in addition to refrigeration, it had the additional function of nourishment. In Erasistratus' opinion, its only function was to keep the arteries full.⁵⁹

According to Galen there are two principal functions of respiration: to refrigerate the innate heat, and to nourish the psychic pneuma. While Galen accepts this second function, which was, in the opinion of Asclepiades, Praxagoras, Phylotimus and others the chief function of respiration,⁶⁰ he adds that the problem is that the substance of the psyche is unknown.⁶¹ Hippocrates, however (at least according to Galen) did say that the psychic pneuma was nourished by respiration. Erasistratus, on the other hand, held that it was nourished from the heart via the arteries. This, says Galen, cannot be so, for if the carotid arteries are ligated the animal suffers no ill effects; therefore the brain does not need pneuma from the arteries.⁶² It is unlikely, in his opinion, that the mere exhalation from the blood is enough to nourish the pneuma, since when the carotids are tied there would be little exhalation. Most of the nourishment of the psychic pneuma, therefore, takes

58. K VII, 623-6 (De tremore); see also K VII, 194-6 (De sympt. caus.)

59. K IV, 471 (De usu resp.) Erasistratus, as already mentioned, believed that the arteries in health contained only pneuma. The Anonymus Londinensis (see ref. 39) says that Erasistratus maintained that respiration cooled the heat round the heart. It seems clear from many references that Erasistratus denied the existence of the innate heat, so that, if he really said this, he must have been referring to heat of adventitious origin.

60. K IV, 483 (De usu resp.)

61. K IV, 471-2. (ibid.)

62. It is curious that Galen, an excellent anatomist, did not realise that the brain is also supplied by the vertebral arteries. As a matter of fact, carotid obstruction in man can lead to cerebral ischaemia.

place through the nostrils.⁶³

Is it the substance, or a particular quality, of the inspired air that the psychic pneuma requires? Not the substance, says Galen, for if we hold our breath we suffocate, although plenty of substance has been taken in.⁶⁴ There must be little transfer of pneuma from the lungs to the arteries, Galen says, because if a bladder is put over the mouth and nose of a child, making an air-tight seal, he will go on breathing in and out of it all day. This shows, says Galen, that the arteries have no need of external qualities.⁶⁵ It is not clear exactly what he means by this. He says elsewhere that respiration is necessary for the heart, which both requires air and has to be cooled because of its burning heat. Inspiration cools it with air, and expiration by ejecting the hot material from the heart. The heart attracts air during diastole and ejects material during systole. The heart is thus the principal respiratory organ; the lung acts as a reservoir for breath so that the movement of the heart is not restricted by the breathing, which would make it impossible to speak or to hold the breath. In making the lung Nature not only provided for this reservoir, but for

63. K IV, 501-4 (De usu resp.) Galen's late views on the pneumata, which never seem to have an important part in his pathology, can be found in the De Methodo Medendi. The psychic pneuma originates in the brain, and is refreshed and nourished both by inspiration and by the blood in the rete mirabile. The existence of the vital pneuma is less certain, but it is reasonable to suppose, he says, that it is contained in the heart and arteries, and nourished by respiration. If natural pneuma exists, this will be found in the liver and veins. The substance (*ουσα*) of the dynamis that govern us is in the pneuma and in the crasis of the solid parts (K X, 837-40). In the Opinions of Hippocrates and Plato, however, Galen describes the origin of the psychic pneuma from the vital (arterial) pneuma, as a result of further elaboration in the rete mirabile, from which it is breathed out into the ventricles of the brain. Soul, however, is not the pneuma in the ventricles, because if the ventricles are opened in the living animal, although loss of movement and sensation result, these return when the wound is closed. Hence soul is seated somewhere in the matter of the brain, and the psychic pneuma is not soul, nor its dwelling-place, but its first instrument in bringing about movement and sensation (K V, 606-8; De plac. H. & P.)

64. K IV, 472-3 (De usu resp.)

65. K IV, 504-5 (ibid.) Clearly Galen never tried this experiment, or if he did, lost interest after a short time. The child would die in a few minutes if the experiment were continued.

the voice too, and a cushion for the heart.⁶⁶ The chief use of respiration is thus to prevent an excess of innate heat, which accumulates when the breath is held and can be fatal. For this purpose both inspiration and expiration are necessary: the first to ventilate and refrigerate, the second to eliminate fuliginous waste products. To nourish the psychic pneuma only inspiration is necessary.⁶⁷

Galen, quite apart from his experiment with the bladder, expresses some doubts elsewhere whether a particular quality is required from the inspired air. In ardent fevers, where heat accumulates in excess in the region of the heart, breathing is augmented, which suggests that its function is indeed to refrigerate. But, he says, if this were so, then in bulimia,⁶⁸ in which these parts of the body are chilled, we would expect breathing to cease; yet it does not. Usually, however, Galen seems quite satisfied that the function of respiration is indeed to refrigerate. He compares the innate heat to the flame of a lamp. A flame, he says, has a double motion: upwards from the origin, and downwards towards it. One cannot be maintained in the absence of the other. The heat of the flame causes the upward movement; the cold of the air the downward. Hence the flame is maintained by a symmetria of heat and cold. When the breath is held the lung is like a closed cupping-glass, which extinguishes a flame over which it is placed; when the animal is breathing it is like a cupping glass with a hole in it. The flame is the innate heat; the fuel, corresponding to the oil in the lamp, is the blood; the heart is the wick.⁶⁹

In his work on the causes of diseases Galen elaborates further on respiration. It takes place not only through the trachea, but through the arteries (in the modern sense) as well. The function of the trachea is to connect the innate heat in the heart with the outside air. At diastole air is drawn into the arteries, both through the trachea into the heart and into the ends of the arteries through the surface of the body; at systole the fuliginous residues are driven out by both these routes. If the trachea is obstructed

66. K III, 412-4 (De usu part.) 67. K IV, 510 (De usu resp.)

68. For bulimia see Xenophon, Anabasis IV, 5, 7. It was cured by giving food, which no doubt restored heat to the heart; wine would probably have been better still.

69. K IV, 482-91 (De usu resp.)

the innate heat is extinguished (presumably by overheating) and death follows. The arteries may be obstructed by a plethos of blood or by occlusion of their mouths; if they can no longer respire, again the patient dies. Partial obstruction is less dangerous; it leads to plethos in those of sedentary habits, and to an increase of heat in those who take exercise. Obstruction to the exhalation of smoky residues leads either to fever or to the extinction of the innate heat.⁷⁰

One of the chief functions of the innate heat is to produce digestion or pepsis. According to Galen, Hippocrates in Regimen in Acute Diseases uses the term pepsis both for the production of blood, which nourishes the body, and for the overcoming by Nature of substances that do not nourish: perittomata such as yellow bile, black bile, and ichor. He thus speaks of concocted and unconcocted residues. Crude bile, for example, is very yellow, biting and malodorous; the concocted humour is more ochreous and less offensive-smelling. In concocted inflammations the blood is converted into pus. This is digestion, although no part of the body is nourished by pus.⁷¹ Although putrefactive changes can occur in the body, rotting in inanimate matter is not pepsis, since the innate heat is not involved.⁷²

Concoction (pepsis) is, according to Aristotle, maturity (τελείωσις) produced by the natural heat of the organism itself, although external heat may help. Thus digestion of food is effected by the innate heat, but baths may assist it. Concoction is what happens to anything when its constituent moisture is mastered. It becomes denser and hotter, as the urine and stools do in health. Ripening (πέπαισις) is a sort of concoction. Boils and phlegm ripen by the moisture in them being concocted by the natural heat. Rawness (ἄμότης) is immaturity or unripeness, and results from a deficiency in the natural heat; thus urine, stools and catarrhal discharges can be raw.⁷³ Such ideas appear in several places in

70. K VII, 15-17 (De caus. morb.) See also K II, 204-7 (De fac. nat.) The idea of respiration through the surface of the body goes back, according to Aristotle (On Resp. 473 a-b) to Empedocles. For further information on this, see Jaeger, Diokles, pp 216-7.

71. According to the Hippocratic work Nutriments, however, pus is nourishment for ulcers (L 9, 118).

72. K XV, 596-7 (In Hipp. de vict. acut. comm.)

73. Aristotle, Met. 379b-380b.

the Hippocratic corpus. The work Regimen III refers the signs in the body and the excreta to the crases of the bowels. If these are cold and moist, watery and undigested food is passed in the stools; this is because the cold inhibits coction, and the moisture makes the bowels loose. Cold dry bowels lead to undigested stools and to wasting. Hot damp bowels draw the flesh of the body to themselves, and the stools are watery and rotten. If they are hot and dry the stools are dry and burnt up; the mouth is dry and the urine and stools are suppressed.⁷⁴ The cold bowel is also mentioned in Affections. A flux of phlegm to the abdomen cools and moistens the nutriment so that it is not digested; the stools are loose and contain unconcocted matter, the condition of lientery.⁷⁵ In Epidemics I the doctor is advised to watch for favourable coctions of the evacuations, since coction indicates crisis and means that recovery is near; crude and unconcocted evacuations, on the other hand, are unfavourable.⁷⁶

Galen defines digestion as an alteration towards the quality that is proper to the thing nourished (ἀλλοίωσις εἰς τὴν οὐκείαν τοῦ τρεφομένου ποιότητα). In the course of this, the nutriment takes on in the stomach a quality appropriate to the animal that is being nourished. It is not surprising that a great change occurs in the stomach, for it contains phlegm, bile, pneuma and innate heat, and is placed among the other viscera, which resemble burning hearths surrounding a cauldron.⁷⁷ Erasistratus, according to Galen, believed that pneuma was propelled into the alimentary canal in some animals, where it assisted in digestion. Galen says that pneuma is not important in human digestion. If it were important in Erasistratus' animals, digestion would be improved when they were suffering from fever, in which pneuma is sent along in greater quantities; but it is not. The abnormal heat impairs digestion rather than augmenting it.⁷⁸

Although the alteration of nutriment in the stomach is great, an even greater one takes place in the liver and first veins, which change the nutriment into the substance (οὐσία) of blood. Slight alteration occurs even in the mouth, through the medium of saliva.⁷⁹

74. L 6, 624.

2-4 (In Hipp. aph. comm.)

77. K II, 163-4 (De fac. nat.)

79. K II, 162-3 (ibid.)

75. L 6, 236. See also K XVIIIa,

76. L 2, 632-6.

78. K II, 120-1 (ibid.)

We turn now to the pathogenesis of fever, starting with the Hippocratic collection. Although fever is very frequently mentioned in these works, there is relatively little discussion of pathology. Nature of Man, the fountainhead of Galen's humoral doctrine, attributes most fevers to bile. Excluding the fevers originating from local lesions, there are four main kinds. The continuous variety is due to the most abundant and the purest bile; it has the shortest duration. Next comes the fever of quotidian periodicity, in which bile is less abundant, followed by the tertian, which has less bile still but lasts longer. The quartan fevers are the most chronic, and are due to black bile, which is the most viscous humour and sticks fast longest in the body; these fevers have least of the bile (the yellow variety) that causes heat. Such fevers occur most frequently in autumn, and in the stage of life that is most under the influence of black bile, namely from 25 to 45 years of age.⁸⁰

Regimen II attributes fever to the melting of the flesh when the body is warmed by exercise; it is eliminated in the sweat and breath, causing pain both in the part evacuated and in the part the flux enters.⁸¹ This idea is found also in Nature of Man.⁸²

Places in Man has perhaps a similar mechanism; an excess of phlegm leads to swelling of the flesh, so that phlegm and bile become immobile and are not evacuated.⁸³

Regimen in Health says that fever is due to the veins through the viscera becoming distended by repletion.⁸⁴ The passage from the Appendix to Regimen in Acute Diseases has previously been quoted; it attributes ardent fever or causus to the small veins being dried out in the heat of summer, and drawing to themselves acrid and bilious humours.⁸⁵

Sevens, one of the few works that specifically mentions the innate heat, says that fever is caused by the heat of the soul being stirred up by labour, food, drink or suchlike; bile or phlegm is then attracted.⁸⁶ The author of Breaths describes two principal causes.

80. L 6, 66-8. It is an interesting reflection on the expectation of life, or the effects of ageing, in antiquity, that a person in his thirties could be considered in the autumn of his days. For a later period, cf Shakespeare, Sonnet II: "When forty winters shall besiege thy brow And dig deep trenches in thy beauty's field."

81. L 6, 582-4.

82. L 6, 40.

83. L 6, 318.

84. L 6, 84.

85. L 2, 394.

86. L 8, 643.

One is epidemic (λουμός) due to miasmata in the air that are inimical to the nature of man; the other, originating from bad regimen, is also due to air. Wind enters the body with the food. If the food, because of its bulk, cannot pass on, the air taken in with it spreads through the body and chills the blood. The ensuing rigor causes the blood to rush in fear to the warmest part of the body, where in due course it warms the air, which now, together with the blood, heats the whole body.⁸⁷ The author of this treatise is committed in advance to explaining all diseases in terms of air; he succeeds here in accounting both for the preliminary chill and rigor and for the subsequent fever, but the whole work shows little contact with reality.

The most extensive account of fever pathology, however, is found in the works Diseases I and IV. Diseases I attributes fever both to bile and to phlegm. When they become heated, they heat the rest of the body; they may be heated by food or drink, or by fatigue, trauma, or excess of heat or of cold. Things seen and heard may also have this effect. Blood is the hottest humour by nature, followed by bile; phlegm is the coldest.⁸⁸ When the blood is heated the whole body shares in the process. This occurs when the blood and the veins absorb bile which has been set in motion. This leads to ardent fever or *causus*. The extremities become cold and dry; the patients are hot inside, cold outside, as in the anomalous dyscrasias of Galen. Death in *causus* is due, according to this author, to the blood drying up and coagulating.⁸⁹ Rigors occur when bile or phlegm, or both, mix with the blood, cooling it initially; this is followed by fever when it heats up.⁹⁰

Diseases IV seems to take a different view of the humours, as already mentioned. The author says that the hottest humours are bile, phlegm and blood (the order may be significant); his fourth humour is water, ὕδρωψ. When one part of the body becomes heated by an excess of humour in it, it heats the others; any of the three humours mentioned above may be responsible. The disease, having exhausted the nourishment in this part, moves to another, and so on.⁹¹ Perittomata in the gut lead to fever if the residues,

87. L 6, 96-100.

88. L 6, 188.

89. L 6, 198-200.

90. L 6, 188-90.

91. L 7, 588-90.

after digestion, are not evacuated promptly. When a second instalment of humour arrives from nourishment subsequently taken, the body, filled with the old and the new humour, is heated, leading to fever. This abnormal heat causes the watery part of the plethos, which is the most inimical to fire, to be eliminated, just as water is preferentially evaporated when a mixture of oil and water is heated. The thicker, bilious part, which is retained, provides nourishment for the fire, so that the fever is further augmented.⁹² This is more likely to happen in summer, when the air that is respired is warmer. Fever results from any of the humours being in excess over the others; this is the condition of plethos. It may be due, not only to excessive accumulation of a humour, but to excessive excretion.⁹³

Celsus says little about the pathogenesis of fever, but mentions several times the interesting idea, now suspected to be correct, that fever may be a beneficial adaptation. It is often, he says, a protection, which seems very strange (*quod maxime mirum videri potest*); it puts an end to pains in the heart if there is no inflammation, and relieves a painful liver; if it begins after spasm and rigor, it relieves them; it relieves disease of the small intestine originating from urinary difficulty, by promoting urination by its heat.⁹⁴ Asclepiades, according to Celsus, used fever as a remedy against itself, giving no fluids for the first few days.⁹⁵ The ancients, he said, gave food when the body was as free from fever as possible, since food is less corrupted when introduced into a body free from fever.⁹⁶ One Petron, said to have been an Alexandrian, treated fevers by augmenting them, keeping the patients as hot as possible; this killed some of them.⁹⁷ Celsus recommends Methodist doctrines in the treatment of fever. It is necessary, he says, to note whether the body is constricted, which chokes it, or relaxed, which wastes it, and to treat accordingly.⁹⁸ Caelius Aurelianus, whose outlook is more consistently Methodist, comments on what he says was Hippocrates' observation that fever supervening on spasm is a good sign, while the reverse is deadly.⁹⁹ Others, he says, disagree, holding that, as Hippocrates himself said, fever burdens the body and aggravates the illness. Natural warmth, in moderation, according to these authors, relaxes congestion, but the

92. L 7, 578-80.

94. Celsus, II, 8, 17.

96. Ibid., III, 4, 16-17.

98. Ibid., III, 6, 13-15.

93. L 7, 566-72.

95. Ibid., III, 4, 2.

97. Ibid., III, 9, 3-4.

99. L 4, 522.

sharp unnatural heat of fever makes inflammation worse.¹⁰⁰ Caelius says that Asclepiades did not attribute all fever to obstruction to the movement of the corpuscles. A less severe form might be due to disturbances of the humours or the pneuma. Caelius, probably quoting Soranus, does not agree with this view.¹⁰¹ Asclepiades, he says, would attribute the mild fever observed in mania to the friction of corpuscles in the smallest passages, which because of their dimensions cannot generate much heat. But if this were so there ought to be high fever in epilepsy, in which the larger passages are affected; yet there is not.¹⁰² Caelius denies the Erasistratean view that all fevers come from inflammation, for some are due to relaxation (solutio). Further, fever is not a necessary sign of a dangerous disease, since there is no fever in cholera.¹⁰³

Galen offers several definitions of fever. In his work on the differentiation of fevers he calls it ἡ παρὰ φύσιν θερμότης, ἣν περὶ καὶ πυρετὸν ὀνομάζομεν "the unnatural heat which we call fever."¹⁰⁴ In his commentary on Regimen in Acute Diseases, referring to the author's remark that "it begins in the chest, and sends up a flame towards the head,"¹⁰⁵ Galen says that the genesis of fever is a turning of the innate heat towards the fiery. Also in the Epidemics, says Galen, Hippocrates calls a severe fever fire, as having no other nature than that of fire.¹⁰⁶ In the great De Methodo Medendi Galen defines fever as a particular disease resulting from dyscrasia, when the heat increases to such a degree of ametria as to distress the patient and cause damage. If these last criteria are not fulfilled, the patient is merely hot, not feverish.¹⁰⁷ All fevers are against nature; in accordance with the general principle, therefore, that what is natural should be preserved, and what is unnatural abolished, all fevers need treatment with a damp and cold regimen.¹⁰⁸

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| 100. Caelius Aurelianus, AD III, 70. | 101. <u>Ibid.</u> , AD I, 108. |
| 102. <u>Ibid.</u> , AD I, 18-20. | 103. <u>Ibid.</u> , AD II, 178. |
| 104. K VII, 277 (De feb. diff.) | 105. See ref. 5. |
| 106. K XV, 456 (In Hipp. de vic. acut. comm.) | |
| 107. K X, 532 (De meth. med.) | 108. K X, 589 (<u>ibid.</u>) |

According to Galen the ancients, and in particular Athenaeus, believed that all fevers resulted from putrefaction of the humours. Praxagoras attributed them all to putrefaction in the hollow vein.¹⁰⁹ Commenting on the Hippocratic aphorism that refers to a fever not caused by bile, Galen says that this shows that not all fevers are due to bile.¹¹⁰ Erasistratus believed that there was no fever without inflammation,¹¹¹ but Galen says that fever may originate from inflammation or in its absence, by putrefaction of humours.¹¹² Galen, however, also postulates a class of non-inflammatory fevers that are not due to rotting of perittomata. These are the ephemeral fevers. The definition of an ephemeral fever is one that is dissolved in twenty-four hours, if the proper treatment is applied.¹¹³ Such fevers follow some recent and evident cause; in the terminology of the new physicians, a procatarctic cause. Other fevers usually do not.¹¹⁴ Such causes are, for example, sunstroke, anger, exertion, and agents such as saline baths which have an astringent effect on the skin, reducing transpiration.¹¹⁵ Not all ephemeral fevers have this element of obstruction of the pores.¹¹⁶ Fever follows such causes only if the heart, the source of the innate heat, is affected. Sunstroke (ἑγκαυστις), other external applications of heat, and heating drugs will produce ephemeral fevers if the heat spreads to the heart.¹¹⁷ Anger, being a seething of the angry faculty, which is located in the heart, directly heats the blood and pneuma in it. In pain and grief the cause is not a boiling in the heart but a movement of heat into it. When someone rests in a state of lassitude after strenuous exertion the heat may be passed on to the heart, resulting in fever.¹¹⁸

Obstruction of the pores of the skin leads to ephemeral fevers, or worse, because normally transpiration through the skin eliminates gassy and fuliginous vapours and also cools the innate heat. The obstruction may occur, not only near the skin surface, but also in the passages leading to it. Obstruction of either may produce

109. K VII, 404 (De diff. feb.)
aph. comm.)
adv. E.Rom. deg.)
intemp.)

114. K VII, 302 (De feb. diff.)
116. K X, 665-7 (De meth. med.)

117. Also foods, where digestion is faulty, particularly if there is constipation at the same time. Cacochymic natures become feverish at once if constipated. (K X, 570-1; De meth. med.)

110. K XVIIIa, 144-5 (In Hipp.

111. K XI, 226 (De ven. sect.

112. K VII, 746-7 (De inaeq.

113. K X, 665-7 (De meth. med.)

115. K VII, 296-7 (ibid.)

117. Also foods, where digestion is faulty, particularly if there is constipation at the same time.

118. K VII, 282-4 (De feb. diff.)

a plethoric state¹¹⁹ which in its turn may result in putrefactive fevers. The danger of obstruction of the pores is particularly great in those who are hot and dry in their crasis. Such people become feverish if they fast for two days, since fasting makes the body bilious, and bile is the hottest humour; anger, grief and lack of sleep are also particularly dangerous for them. The obstruction of the pores leads to the retention of fuliginous vapours which generate fever. Such people should not fast even when in a state of health, for fear of these consequences; if they are not fed when they become feverish, however, they may die by progression to a causus or ardent fever and possibly further, to a hectic fever.¹²⁰ Galen is critical in several places of the simplistic Methodist doctrine of the diatriton or three-day fast. The Methodist system paid no attention to the temperament of the patient, and fasted all patients with fever for three days, with prohibition of bathing. In hot dry natures, according to Galen, this may be fatal; other natures, however, may not be harmed by it, and some are positively benefited.¹²¹ Fevers are not kindled by fasting in those whose natures are cold.¹²² He gives an amusing account of a man of twenty-five, in the hot season, dark, slender, hairy, quick to anger and taking little sleep (a hot dry temperament), who during a day visit to the country bathed in the local astringent waters and was rewarded, as Galen would expect, with a fever from obstruction of the pores. He was attended by two celebrated doctors, an Erasistratean and a Methodist, and in addition, without their knowledge, by Galen. Both of the other doctors ordered him to fast for three days and abstain from baths; but Galen, arriving after they had left, bathed and fed him, and instructed the servants to tell the doctors, when they arrived the next day, that the patient was comfortable and to send them away at once. When they had gone Galen repeated his treatment, and gave him a sleeping draught. The doctors arrived the next day at dawn, but Galen had forestalled them; they ordered the patient to go on fasting, which he undertook to do. "You can imagine" says Galen, "the laughter when they departed." On the third day when the physicians arrived at sunset the patient, unknown to them, had bathed

119. K VII, 286 (De feb. diff.) 120. K X, 679-87 (De meth. med.)
 121. K X, 561-3 (ibid.) 122. K X, 588 (ibid.)

twice and had taken lunch. He pretended to be feverish and wrapped himself in a cloak; including his head, arranging that one of his friends would speak for him, so that the doctors would not know that he had been drinking wine. They asked at what time the paroxysm had attacked, to which the friend replied that the patient had scarcely enjoyed a single hour without one. They touched the man, who was sweating from suppressed laughter and the heat of his wrappings, and said that now that he had sweated he might be fed the next morning. When they had departed he took his third bath of the day and a meal, and the next morning, before the physicians arrived, went back to his usual occupation. They were astonished to find that a man who, as they thought, had fasted three days could be fit for work on the fourth. Doctors who treated patients of such a temperament in their way, in Galen's view, were no better than hangmen. Their patients would be seized with the most biting and acute fevers, readily going on to hectic fever, and perhaps to a parching marasmus or to syncope.¹²³

In the ephemeral fevers due to evident causes, such as the one just mentioned, the diathesis of the body is a simple one; the cause is no longer operating, and the doctor's only task is to treat the fever. In polyhemorous fevers due to putrefaction of humours in the body, however, the effective cause, the putrefactive process, is still active, and neither the diathesis nor the treatment is simple. The physician can treat the fever and pay no attention to the cause, or attack the cause while leaving the fever alone. It is frequently difficult to treat both, because measures that diminish the putrefaction may exacerbate the fever (probably because cold remedies reduce transpiration), and vice versa. Galen says that since remedies for the fever increase the cause, it is not recommended to treat the fever; measures should therefore be directed against the putrefaction, but not with such enthusiasm that by augmenting the fever you put an end to the patient.¹²⁴

Ephemeral fevers are unremitting, i.e. not marked by paroxysms.¹²⁵ Those due to obstruction of the pores may sometimes last longer than a day and a night if the obstruction persists; though not strictly ephemeral, they are of the same kind, and like the strictly ephemeral fevers they have no periodicity. The seething humours are vaporised but nothing escapes, so that the fever is maintained while the

123. K X, 536-42 (De meth. med.) One of many passages in Galen that throw light on medical ethics in antiquity.

124. K X, 661-3 (De meth. med.) 125. K VII, 404-5 (De feb. diff.)

obstruction lasts.¹²⁶ Thus continuous (σὺνοχος) fevers sometimes occur in the absence of any putrefaction, as shown by the absence of any signs of putrefaction in the pulse and urine. But if they last for some time, and transpiration remains inadequate, the cacochymia must inevitably putrefy. If the decline of the fever is prolonged and it does not yield in the same way in which it set in, it is probably becoming putrefactive.¹²⁷

Those continuous fevers that do not follow ephemeral ones generally do not, in contrast to the ephemeral variety, have an evident cause.¹²⁸ One paroxysm may last as long as seven days.¹²⁹ Continuous fevers are most frequent in those of a good habit of body and at a hot time of life.¹³⁰

Continuous fevers can, however, also be due to inflammation in the absence of putrefaction. Putrefaction in the body can occur in the absence of inflammation¹³¹ and contrariwise inflammatory states, which may result in fever, can occur where there is no putrefaction, simply as a result of the hot inflamed part transferring its heat to adjoining parts, and so on until it reaches the heart.¹³² Galen discusses this process (he is referring to putrefactive heat, but the principle is the same) in his third work on venesection. The innate heat in the heart owes its continuance to the blood; whatever change occurs in the heart is communicated to the whole body. Localised regions of heat and cold in individual parts, originating either from an excess of hot or of cold humour, or from dyscrasia in the absence of plethos, do not spread directly to the whole body; they must reach the heart and affect its crisis before fever develops.¹³³ Although Galen does not specifically say so, this is presumably because there is, in his system, no route by which blood can travel towards the heart; the flow in both arteries and veins is away from it. The heat spreads by contiguity from part to part till it reaches the heart; once the substance of the heart becomes hotter, the heat is distributed to all parts by the blood. Galen explains elsewhere that fevers differ according as whether the substance of the heart, or only the humours in it, is heated.¹³⁴ The heating effects of local inflammations depend on the heat of the blood in the affected part and also of

126. K X, 601-5 (De meth. med.)

128. K VII, 304 (De feb. diff.)

130. K X, 778 (De meth. med.)

K X, 752 (De meth. med.)

133. K XI, 263-5 (De cur.rat. per ven. sect.)

134. K VII, 276 (De feb. diff.)

127. K X, 563-5 (ibid.)

129. K VII, 378-9 (ibid.)

131. K VII, 747 (De inaeq. intemp.);

132. K VII, 296-7 (De feb. diff.)

the blood elsewhere. If the heat in the part is moderate, and the rest of the blood well-tempered, it will not readily be heated; but if the blood in the inflamed part seethes, and particularly if the blood in the whole body is hot and bilious in its crisis, the danger of heating of the entire body, by spread to the heart, is greater. The heat spreads first to the blood in the arteries, because it is naturally hotter and more spirituous; then to that in the veins. If the inflamed part is near some viscus that is full of blood, the whole body is more quickly heated. Some substances more readily become hot because of the fineness of their particles. Pneuma is the most readily affected, followed by yellow bile; black bile and phlegm are relatively refractory to such change. Hence the degree of general heating, that is, of fever, depends on the nature of the humours involved; on the degree to which they are impacted and resist elimination; on the degree, if any, of putrefaction that ensues; on the nature of the parts adjacent to the inflammatory focus; and on the general crisis of the blood.¹³⁵

Putrefactive fevers may originate within the body, or as a result of the inhalation of miasmata that spread contagion. Those of endogenous origin will be considered first. In his work on therapeutic method Galen defines putrefaction as the change of the whole substance of the affected body towards decay, as a result of external heat. It is not corrupted by its own natural innate heat; this strengthens and promotes growth rather than destroying. But when transpiration (*διαπνοή*) is impaired, the natural heat is harmed at the same time, and when it has become foreign and unnatural, the humours rot, and the heat invades the fat and the flesh.¹³⁶

Substances not subject to putrefaction, such as stone, become cool again quickly after they have been heated; but material such as dung, once heated by the sun, continues hot because of putrefaction¹³⁷ The choice of excrement as an example is significant, since it is perittomata--the residues of nutriment--that are particularly liable to putrefaction in the body. The presence of such residues in excessive quantity--the condition of plethos--is a major cause of fever.¹³⁸ The varieties of plethos will be considered later, but it

135. K VII, 740-1 (De inaeq. intemp.) 136. K X, 753-5 (De meth. med.)
137. K VII, 297-8 (De feb. diff.) 138. K VII, 279 (ibid.)

may be observed here that an excessive quantity of impacted humour, which cannot be readily transpired, is very liable to putrefy; the danger exists also with the other type, the plethos known as dynamic, in which no humour is in excess but the faculties (δυνάμεις) of the part are weak and cannot deal with the peccant material.¹³⁹

Praxagoras, according to Galen, had believed that all fevers were due to putrefaction of humours in the hollow vein. Not so, says Galen. Apart from the fact that non-putrefactive fevers exist, only the continuous (σῦνοχος) fevers are due to rotting in the great vessels; the periodic fevers result from putrefaction in individual parts that either send on, or receive, or generate, or attract perittomata.¹⁴⁰ Generalised putrefaction in the great vessels usually occurs in full-blooded, well-fleshed bodies; this is because obstruction does not generate fever unless the material to be transpired is abundant and hot, which does not happen in those of a cold habit. So at the cold times of life and in cold crases of the body, whether inborn or acquired, continuous fevers do not occur, nor in those of slender and delicate build.¹⁴¹

Where fever is kindled by putrefaction in the humours, its periodicity or otherwise may further depend on the nature of the humour involved. Yellow bile may give rise either to unremitting fevers, amounting sometimes to ardent fever or causus, or to the tertians. Subjects of such fevers are bilious in their crasis and in the prime of life, the most bilious period; they suffer from them chiefly in summer, when yellow bile is in the ascendant, and in hot and dry climates. Such fevers may follow exertion, mental effort, lack of sleep, heatstroke and scanty hot dry diet, and drugs with a heating and drying effect. The quotidian (ἀμφημερινός) fevers occur in the opposite situation, affecting preferentially those of phlegmatic crasis, in winter, and so on.¹⁴² The heat of putrefying phlegm is like a fire of green wood.¹⁴³ Quartan fevers

139. K VII, 287 (De feb. diff.) Erasistratus had held that the inflammations that engender fevers arise for the most part from plethos (K XI, 220; de ven. sect. adv. E. Rom. deg.) For more on his pathology, see K XI, 153-4 (De ven. sect. adv. E.) It has already been shown that Galen did not take this view; but Athenaeus believed that all fevers resulted from putrefaction (K VII, 295; De feb. diff.)
 140. K VII, 404-5 (De feb. diff.) 141. K X, 606-7 (De meth. med.)
 142. K VII, 333-5 (De feb. diff.) 143. K VII, 342 (ibid.)

are due to black bile, and therefore occur in those of melancholic crasis, and in autumn.¹⁴⁴ Black bile resembles such incombustible materials as rock and bone; if some flame is kindled from it, there is no smoky residue.¹⁴⁵ Intermediate forms of fever, like animal hybrids, occur.¹⁴⁶ A tertian, for instance, that fulfils all the criteria set out above, is called an exact tertian (τριτάτος ἀκριβής , exquisita tertiana); if some of them are lacking, it is referred to simply as a tertian fever.¹⁴⁷ Galen is less certain about the origin of fevers from putrefaction of blood. We may discuss it, he says, if we can learn how blood putrefies. When blood collects in some part beyond the strength of the excretory faculty to disperse it, it is corrupted, especially if it is thick, and contained in small vessels, or impacted from plethos, as in inflammatory conditions. In these, the inhibition of transpiration, and the blood not being mastered by nature, provide a double cause for putrefaction, but Galen does not mention the variety of fever that ensues.¹⁴⁸

Putrefactive fevers may also be set off by external contagion. The idea of airborne contagion is ancient; it perhaps accounts for the use of fumigation with sulphur in Homer.¹⁴⁹ The smells of mud and marshes are mentioned as causes of disease in the Hippocratic work Humours,¹⁵⁰ and epidemic disease, which affects many people at the same time regardless of regimen, is attributed to some unwholesome exhalation (νοσηρὴν τινα ἀπόκρισιν) by the author of Nature of Man, who recommends that the body be kept as thin and weak as possible to avoid the need for deep breathing.¹⁵¹

144. K VII, 335 (De feb. diff.)

145. K VII, 343 (ibid.)

146. K VII, 358 (ibid.)

147. K VII, 371. Plato's ideas

on fever in the Timaeus (86a), says Galen, are mostly wrong. Unlike Galen, he attributes fevers to elements rather than to humours. Continuous fevers, according to Plato, are due to an excess of fire, quotidian to air, tertian to water, and quartan to earth. But, says Galen, quotidian fevers are in fact due to an excess of a phlegm-like humour, which is wet and cold, the characteristics of water rather than of air; and Plato should have attributed tertian fevers to fire, since they are hot and dry, being due to yellow bile (K V, 697-8; De Plac. H. & P.).

148. K VII, 374-5 (De feb. diff.) 149. Od. 22, 492-4. Odysseus fumigates his megaron with sulphur, no doubt because it is full of corpses.

150. L 5, 492.

151. L 6, 54-6. For dietary and other precautions in time of pestilence, see also Celsus I, 10, 1.

The same idea of "miasmata hostile to the nature of man", and others specific for animals, is found in the work Breaths.¹⁵² The Anonymus Londinensis remarks that Hippocrates attributed epidemic disease to air, sporadic disease to regimen, but this, he says, is an unsound argument, since the same cause does not produce the same disease in all those exposed to it, and sometimes different causes result in the same disease.¹⁵³ Erasistratus, according to Celsus, took the same view of causation. But, says Celsus, certain underlying conditions affect the susceptibility of the body to disease, which seldom occurs in the absence of one or the other of them; nothing is due to one cause alone, but this is not to deny causation wholesale, as Erasistratus does.¹⁵⁴ Aristotle, in refuting the Pythagorean doctrine that nourishment through smells was possible, nevertheless conceded that certain smells could be beneficial by reducing the coldness and dampness of the brain.¹⁵⁵ Aretaeus mentioned that rabies could be caught by respiring the effluvia of a mad dog's tongue.¹⁵⁶

Galen remarks that diseases that occur all at one time, if deadly, are called plagues; if less severe, epidemic diseases.¹⁵⁷ In his work on the differentiation of fevers he compares miasmata to seeds that can germinate in a suitable soil. These seeds of pestilence (λοιμοῦ σπέρματα) are abroad in the air, but the greatest part of the genesis of this, or any, disease, is the readiness of the body to fall ill. Suppose that some people have bodies full of perittomata and ready to rot; others well cleansed and free from superfluties. The former group have their pores blocked up, are plethoric, gluttonous, and sexually active, all causes of disorders of digestion leading to pathological humours. When they breathe in putrid air their bodies will begin to rot at once, while the other group will escape infection altogether or become only slightly ill.¹⁵⁸ Pestilential fevers should thus be combated by keeping the body free from perittomata and transpiring freely, and by eliminating the cause--that is, the miasma--wherever possible.¹⁵⁹

152. L 6, 98.

153. Anon. Lond. VI, 13-VII, 40.

154. Celsus, Prooem. 54-61.
155. Aristotle, On Sense & Sensible Objects, 444a-445a.

156. Aretaeus I, 7, 2.

157. K XV, 429 (In Hipp. de ac. vict. comm.)

158. K VII, 291-3 (De feb. diff.) 159. K VII, 295 (ibid.)

This is an interesting anticipation of nineteenth-century bacterial aetiology, put forward with more wisdom than some of the early advocates of that doctrine showed. The infectious agent is not sufficient alone to cause disease; it must have a suitable soil in which to germinate. Warmth, dampness and the provision of suitable nutriments in the medium are usually all necessary for bacterial growth; Galen's seeds germinate best in those of a hot and damp crasis, who are, as already shown, full of perittomata ready to rot. Putrefaction, of course, is in fact due to bacterial action, though it is not a cause of fever in the body. Galen's system is entirely logical. The seeds of pestilence are agents that promote putrefaction in suitable media. These miasmata have unpleasant smells because they are derived from putrefaction. If they enter a body that offers a suitable soil for germination, they lead to putrefactive

160. Those of a hot damp constitution are most liable to putrefactive diseases. Even in health they have foul-swelling sweat, urine, stools and breath, like goats. In liability to fevers they come second to the hot dry individuals; they bear fasting and thirst better than these do, and their risk at the hands of the diatriton-doctors is therefore less (K X, 583-4, De meth. med.). We have seen that in ephemeral fevers in certain types of patients, feeding is essential. Where fevers are due to plethos, obstruction or inflammation, however, or to rotting of humours, food is the greatest evil, and if the patient's strength permits he should be maintained on nothing but melicratum and barley gruel if the doctor is compelled to give anything at all. The choice is between dissolving the patient's strength by starvation, and augmenting the fever by increasing perittomata (K X, 690-1, De meth. med.) Hence, in Galen's view, whether fever patients should be starved depends not only on the fever, but also on the physical type of the patient; a simple rule like the Methodist diatriton is unacceptable. Galen used venesection in fever, more extensively in his youth than later. (See his three works on venesection: De venae sectione adversus Erasistratum, K XI, 147-186; De venae sectione adversus Erasistrateos Romae degentes, K XI, 187-249; and De curandi ratione per venae sectionem, K XI, 250-316. This last is a late work.) In continuous fevers, he says, venesection to loss of consciousness cools the body greatly and extinguishes the fever at once; nothing could be more delightful both to the patient and to the Nature that governs living things. He recounts a case in which, after he had removed an enormous quantity of blood, the bystanders cried out "Man, you have slaughtered the fever", at which, he says, "we all laughed." (K X, 612, De meth. med.)

fevers.¹⁶¹

All fevers, in Galen's system, are by definition dyscrasias. All inflammations and all fevers except hectic fever are unequal or anomalous dyscrasias.¹⁶² Hence they are painful, since, according to Galen, Hippocrates said that pain occurred in those parts whose natures were being changed and corrupted, not in those in which change and corruption had already been completed. Hectic fever occurs when every part has been heated to a proportionately equal degree; it is thus completely painless.¹⁶³ Hectic fever strictly so called shows no onset, accession, peak or decline. Only when the patient is fed do hectic fevers boil up, like quicklime in water; except for such exacerbations, they remain constantly at the same level.¹⁶⁴ According to Galen there are two kinds of hectic fever. The commoner variety occurs when ardent fever (causus) is prolonged to such a degree that the moisture in the body of the heart is consumed. The heart becomes dry and hot, like a lamp that has run out of oil, so that the material of the wick burns, and its continuity is destroyed; even if oil is now added, it will never give a good flame again. This is a marasmic fever; it is not the same thing as the disease of marasmus, which occurs in old age in the absence of fever, leading, through the gradual extinction of the innate heat, to a natural and painless death.¹⁶⁵ Hectic and marasmic fevers dry out the moisture of the fleshy parts, resulting in death or in premature senility, which Galen calls old age from disease (ἐκ νόσου γήρας). The fleshy parts vary from individual to individual in the amount of moisture they contain, and hence in their liability to marasmus. When the meat of various animals is grilled over a fire, some kinds emit abundant moisture which runs down on to the coals; domestic pigs have this sort of

161. In the plague of Athens rotten miasmata arrived from Africa; the season was summer, and the men were quartered in stifling huts, their humours disordered by bad regimen and ready to putrefy. Miasmata may also emanate from unburied corpses, and from stagnant water in summer (K VII, 290; De feb. diff.) The idea that foul smells were in themselves sources of contagion persisted; it accounts for the posies carried by British judges to protect against the plague, and no doubt also partly for the extensive use of scent in the past. See also Chaucer:

"Hold cloos thy mouth, man, by thy fader kin!

The devil of helle sette his foot ther-in!

Thy cursed breeth infecte wol us alle;

Fy, stinking swyn: (Maunciple's Prologue).

162. K VII, 746-7 (De inaeq. intemp.) 163. K VII, 176 (De sympt.caus.)

164. K VII, 699 (De marcore) 165. K VII, 313-5 (De feb.diff.)

soft moist flesh. Wild boars, on the other hand, have very dry flesh. In the hottest fevers, just as in the pork-barbecue, there is perceptible liquefaction of the flesh. If the patient has flesh of the dry variety, deficient in fat, he is liable to marasmic fever. While damp material remains, it is either transpired or excreted in the stool after being liquefied by the heat of the fever; when the moisture is exhausted, the heat dries up the hard flesh.¹⁶⁶ There are two kinds of marasmus. The first is the normal state of old age, and the treatment is moistening and warming, since it is dry but not hot. The kind due to the most ardent fevers, which is called scorching (περιπρυγής) marasmus, needs to be cooled and moistened. The third is called syn-copoid marasmus, and is associated with collapse of the strength; its treatment is a mixture of the treatments for the other two kinds.¹⁶⁷

The other kind of hectic fever occurs when the moisture is not dried up; it is kindled from the damp body of the heart, as the flame of the lamp is from the wick. Galen's account of the origin of this variety of hectic fever is not easy to understand.¹⁶⁸ Hectic fevers of either kind can be recognised by the arteries appearing hotter than the surrounding tissues; this does not occur with other fevers.¹⁶⁹

Galen says he has shown in his book on marasmus that the dryness of the solid parts cannot be completely cured; if this could be done, we would never grow old. Since the progression of hectic fevers to marasmic fever is very dangerous, those who have hectic fevers should be transferred from a hot to a cold dyscrasia, after warning the relatives that this is a desperate measure; it may enable the patient to survive for months, or even years, in a state of pathological cold marasmus resembling old age. The aim is to extinguish the heat; the patient will live as long as the solid parts are able to prevail against the excess of dryness. The treatment is effected with tepid baths and prohibition of exertion. The treatment of patients with hectic fever who are already marasmic should not be undertaken.¹⁷⁰

166. K X, 730-2 (De meth. med.)

168. K VII, 313-5 (De feb. diff.)

170. K X, 720-3 (De meth. med.)

167. K VII, 686-9 (De marcore).

169. K VII, 328 (De feb. diff.)

There are scattered references in the Hippocratic corpus and elsewhere to certain allegedly beneficial effects of fever. For Galen, fever of any kind is a dyscrasia to be rectified; according to Caelius Aurelianus, Hippocrates also may have taken this view. Commenting on Hippocrates' remarks that fever supervening on spasm has beneficial effects, Caelius says that some disagree with this opinion, holding that Hippocrates himself said that fever was a burden to the body and made the disease worse. They say that moderate natural heat is beneficial, but that the sharp heat of fever, which is unnatural and immoderate, makes inflammation worse.¹⁷¹ Occasionally, however, in Galen's opinion, the heat of fever may in fact be beneficial. Commenting on the Hippocratic aphorism that those who suddenly have headache with loss of speech and stertorous breathing die in seven days unless fever comes on, Galen says that the apoplexy is due to gassy pneuma or a plethos of humours, which is dispersed when heated.¹⁷² When considering the aphorism that says that severe pain in the liver is relieved if fever supervenes, Galen says nothing about fever, but remarks that gassy pneuma is one of the causes of the pain,¹⁷³ so that the mechanism may be the same. He applies the same explanation to a similar aphorism about pain in the hypochondrium.¹⁷⁴ Commenting on the aphorism "Those who, after strangury, are attacked by ileus, die in seven days unless fever supervenes and there is an abundant flow of urine",¹⁷⁵ Galen says that this is not so. Ileus is an obstruction of the small intestine due to inflammation, in Galen's opinion; others think it may result from impacted faeces or humours. Fever, in Galen's view, can be of benefit only to conditions due to cooling; neither logic nor experience, he says, supports this aphorism, which is probably spurious.¹⁷⁶

Galen has no satisfactory explanation for the periodicity of certain fevers. He has observed, he says, a periodic process of

171. AD III, 64-70.
comm.)

174. K XVIIIa, 64 (ibid.)

176. K XVIIIa, 68-70 (In Hipp. aph. comm.)

172. K XVIIIa, 87-8 (in Hipp. aph. comm.)

173. K XVIIIa, 160-1 (ibid.)

175. L 4, 574.

heating in putrefying dung,¹⁷⁷ owing to its rotting one part at a time. Substances not subject to putrefaction, such as stone, become cool again when heat is withdrawn, but ordure, once heated by the sun, continues hot because of putrefaction, with a variable periodicity which Galen relates to the periods of fevers.¹⁷⁸ Such a process, however, cannot occur in the living body, since putrefied humours are mixed with unputrefied, and the mass thus cannot rot one part at a time. He then offers a long and somewhat obscure explanation of periodicity, the basis of which seems to be that a flux of humours descending on a part of the body damages its faculties, so that the perittomata are not eliminated, but putrefy on the spot, generating heat until there is no more material to putrefy; the heat then subsides, but recurs when another instalment of perittomata arrives.¹⁷⁹ There is uniformity in the nature and rate of accumulation of the perittomata, and in the weakness of the eliminative faculty in the part; thus the periodicity in a particular episode remains constant. Paroxysms differ in duration from disease to disease and from patient to patient according to the nature of the perittomata, whether viscid or thin; their quantity; their susceptibility to putrefaction; the bodily habitus of the patient (slender bodies have briefer paroxysms); the strength of the faculties (if they are weak, the paroxysms are longer), and the breadth or narrowness of the passages involved. Paroxysms may overlap with no apyrexial intervals, or these intervals may be longer or shorter depending on the circumstances.¹⁸⁰

There is not enough earlier material surviving to determine with certainty the origins of Galen's doctrine of fever, but it is clear from his own works that it is a logical development of his doctrine of dyscrasia, which perhaps owes something to the pneumatist school. All fevers are dyscrasias of the Warm, and all are therefore pathological. Although fever may be secondary to an

177. Galen says that pigeons' droppings can take fire spontaneously, in the same way in which the sun, shining through windows, can set fire to pitch; Archimedes must have used some such mechanism to burn the enemy fleet. The Medean drug, consisting of sulphur and bitumen, readily takes fire spontaneously, and dry and rare substances, such as wool, can be ignited by friction if sulphur is sprinkled on them. He describes a conjuring trick in which an extinguished lamp, brought near a wall or a stone, is lit again if the object has been sprinkled with sulphur (K I, 657-8; *De temp.*)
 178. K VII, 298-9 (*De feb. diff.*) 179. K VII, 379-90 (*ibid.*)
 180. K VII, 391-7 (*ibid.*)

inflammatory process or a focus of putrefaction, fever can exist as a disease--that is, a diathesis that damages an *energeia*--in its own right, and, whatever its origin, is treated, if it is treated at all, as an independent disease. Erasistratus had held that there was no fever without inflammation, by which he understood a process of *paremptosis* of blood from the veins into the arteries. Galen took a different view of inflammation, which he attributed to fluxes of humours descending on the affected part, but none the less did not accept the Erasistratean view. Many of his fevers, particularly the ephemeral ones, resulted from some external or internal cause of heating in the absence both of inflammation and of putrefaction, but often associated with inhibition of transpiration by the skin. Where fever is associated with inflammatory or putrefactive foci, the fever itself is dangerous to the patient, as evidenced by Galen's remark that treating the inflammation may augment the fever, which should not be allowed to reach a level that imperils the patient's life.

The heat of fever, in Galen's view, seems to be independent of, and different from, the innate heat of the body. Confusion arises only because all fevers are due to heating of the heart, which is also the seat of the innate heat. The heat of fever is *παρὰ φύσιν*, and it consumes the body; the innate heat is *κατὰ φύσιν*, and it preserves it and makes it grow. The difference is not simply one of degree, since the abnormal heat of fever is different to the touch, and there are other differences too. Only the innate heat can effect digestion, and it has the natural faculties; yet the abortions of digestion that occur when there is too much or too little heat suggest some confusion or mixture of innate heat with heat from external sources, and the innate heat owes its continuance to the blood, which comes from nutriment taken into the body. Although Galen's idea of the innate heat may not be altogether clear, he does generally distinguish it from the abnormal heat of fever.

PERITTOMA, PLETHOS, INFLAMMATION

The idea that disease can be due to residues of nutriment is an ancient one. The Anonymus Londinensis mentions a certain Ninyas the Egyptian, who attributed acquired disease to nutriment that was not absorbed, but remained in the body, where residues (περλοσώματα) were generated from it by the heat in us.¹ Steuer and Saunders have maintained, it is hard to know how correctly, that this material--decomposing faecal matter retained in the bowel--is the substance referred to as *whdw* in Egyptian medical texts, which was associated with the large intestine and the faeces (ḥś). Medical treatment (šrwḥ) was directed chiefly to preventing the formation of *whdw* by keeping the alimentary tract free from residues; the same word was used for the art of embalming and mummification, the aim of which was to prevent putrefaction of the body after death.² Similar ideas were expressed by many Greeks. Aegimius of Elis believed that diseases occurred as a result of the bulk of the residues or through nutriment.³ Euryphon of Cnidus held that when the belly did not discharge the nutriment, residues rose to the parts near the head, leading to diseases; this could be prevented by keeping the bowels open. Herodicus, another Cnidian, agreed that residues were pathogenic; he attributed their production, however, to a lack of exercise before meals, by which assimilation of the nutriment was inhibited. The residues were of two varieties, both liquid; one was acid and the other bitter.⁴ Predominance of one or the other resulted in disease.

According to the Anonymus, Hippocrates held certain pneumatist views. He attributes to him the view that unsuitable or excessive food is productive of residues, because the heat, being overpowered by the food, is unable to bring about digestion. Similarly, very coarse and indigestible food results in residues, from which gases (φύσαται) rise, leading to disease.⁵ There are several references

1. Anon. Lond. IX, 37-44. 2. R.O. Steuer and J.B. de C.M. Saunders, Ancient Egyptian and Cnidian Medicine, 1959, pp 3-5, 26. Their idea of the Egyptian origin of perittoma-doctrine has been criticised by G. Harig, 'Bemerkungen zum Verhältnis der griechischen zur altorientalischen Medizin', in R. Joly (ed.) Corpus Hippocraticum: actes du colloque hippocratique de Mons, 1977, pp 77-94, and by Jouanna (p 509, n2).

3. Anon. Lond. XIII, 21ff.

4. Apparently the same as (salty) phlegm and bile. These are the two humours of the "Cnidian" works. See Steuer and Saunders, pp 28-9.

5. Anon. Lond. IV, 20 - V, 13.

to residues in the Hippocratic corpus.⁶ When more nourishment is taken in than the constitution can stand, according to one of the Aphorisms, disease is the result.⁷ Another says that bodies that are not clean (καθαρά) are harmed if nourished.⁸ Regimen III describes the condition of surfeit (πλησμονῆς) which is due to too much food and too little exercise. When the belly digests the food, but the flesh (presumably having no need of it because it has not been exercised) rejects it, the nutriment, remaining in the body, putrefies. Its passage in the stool constitutes diarrhoea (διάρροια), the term used when only rotten matter passes; if there is blood, the condition is dysentery (δυσεντερία).⁹ Diseases IV, a work remarkable for its wealth of pathology, attributes fever to the remains of nutriment, which has been digested but not yet evacuated.¹⁰ Numerous other diseases can be due to the generation of pathological humours from foods and drinks. Cheese gives rise to phlegm; other foods to bile and to water (ὕδωψ). Even blood can be a pathological humour. Sanguine foods and drinks produce an excess of blood, which goes to the heart. The heart, however, cannot itself suffer harm from this, since it rapidly transfers the blood to other parts via the jugular veins.¹¹

The Anonymus mentions that, in the view of some of the ancients, fluid nutriment contained both beneficial and deleterious components, which were separated in the body; the bad part was excreted as urine, while the good was retained. He compares this with affairs in the macrocosm. The sun is nourished by the subtle part of the sea, which it draws up by evaporation, leaving the gross and sluggish material behind.¹² Aristotle, in his work on Meteorology,

6. A. Thivel, 'La doctrine des περισσώματα et ses parallèles hippocratiques', Rev. de philol. 39, pp 266-282, 1965, observes (p 268) that the word περισσώματα is never used in the Corpus; he says it is Aristotelian.

8. L 4, 472.

7. L 4, 474.

9. L 6, 614-6.

This terminology is still in use.

10. L 7, 578.

11. L 7, 548-56.

12. Anon. Lond. XXX, 1-40. Thivel

(p. 272) thinks that such speculations were originally oriental, and were taken up by the Pythagoreans, who compared the veins to rivers, and the belly to the sea. This idea also occurs in Regimen IV (Dreams), e.g. L 6, 650, where to dream of a celestial body moving into the sea indicates disease of the bowels.

makes the same comparison. The sweet and fresh part of foods and drinks is drawn off by the innate heat of the body, leaving a bitter and salty perittoma behind. The analogous process, performed by the sun in order to obtain its nourishment, makes the sea salty. The sea is analogous to the residue of all nutriment, and especially of liquid;¹³ it might even be regarded as the earth's urine. Empedocles had described it as the sweat of the earth, but this, says Aristotle, is merely a poetic phrase. The earth could never secrete such a vast volume; and it is presumably still sweating, yet the sea does not increase.¹⁴ The waste products of the body, according to Aristotle, are naturally hot, in the sense of having been generated by heat. Urine, like wine, is hot by nature because, although water is naturally cold, the urine has been produced by the innate heat in the course of digestion, just as wine is made by the heat of fermentation.¹⁵ Not all residues are pathological. Semen, according to Aristotle, is a natural residue (κατὰ φύσιν περὶττωμα). A small amount of semen is derived from a large quantity of nutriment; hence the emission of semen is followed by exhaustion.¹⁶ When the body is increasing in weight there is less semen, because the nutriment has been used up. Fat people are less lustful than thin ones for the same reason; the fat is a residue, though a healthy one.¹⁷ Women, because of their colder natures, cannot concoct the residue to a small volume; hence there is a large volume of menstrual fluid in the female.¹⁸ Gestation and parturition are troublesome to many women, according

13. Aristotle, Met. 355a-b.
Ecclesiastes I, 7.

14. *Ibid.*, 356b; 357a-b. See also

15. *Ibid.*, 389a-b.

16. Aristotle, Gen. of An. 725a-b.

17. *Ibid.*, 725b.

18. *Ibid.*, 766b.

The Hippocratic work Diseases of Women (L 8, 30) maintains that the monthly loss in a healthy woman should be two cotyles (about 500 ml). This is an absurd figure. A modern study of several hundred Swedish women showed the median monthly loss to be 30 ml (L. Hallberg et al., 'Menstrual blood loss and iron deficiency', Acta med. Scand. 180, pp 639-50, 1966.) A sexually active man would probably emit more than 30 ml of semen in the course of a month, which would make it difficult to maintain that the menstrual fluid was the less concocted residue.

to Aristotle, because they have accumulated residues by a sedentary way of life. There should be just the right amount of menstrual fluid to form the fetus, not an excess.¹⁹ The menstrual flow in women, which is the elimination of this residue, tends to occur when the moon is waning, since this is a colder time, and the bodies of women are affected by it. All the residue is not necessarily in the form of blood; if it is not fully concocted it is eliminated as leucorrhoea.²⁰ Both this condition and the menstrual flow, if moderate, are beneficial evacuations of residues that cause disease.²¹ If they are not evacuated, they cause pains and swellings in various parts where they collect, or paralyse as a result of the blood coagulating round the nerves. These complications are commoner in the unmarried.²²

The concept of plethos occurs frequently in the Hippocratic corpus and other early writings. The Anonymus mentions the views of one Aegimius of Elis, who described it as an excess of residues (πλῆθος τῶν περισσωμάτων) which comes about when nutriment is taken in before the digestion of that taken earlier is complete.²³ This idea is elaborated in the Hippocratic work Diseases IV. If the food in the gut is not eliminated at the proper time, the veins become full, leading to disease; this happens more frequently in summer than in winter, since the body is more readily heated when the environment is already hot. Fever results from one of the humours being in excess over the others; any of the four humours in the author's system can have this effect.²⁴

19. Aristotle, *Gen. of An.* 775a-b.

20. τὰ λευκά ; "the whites" in vulgar English parlance.

21. Aristotle, *Gen. of An.* 738a . For the alarming effects that were supposed to follow the retention of these residues, see, for example, K XI, 187-90 (*De ven. sect. adv. E. Rom. dæg.*). For the beneficial effects of menstruation in eliminating residues, see K XI, 165 (*De ven. sect. adv. E.*) Women whose menstrual discharge is regular, says Galen, escape many diseases.

22. L 8, 26-7. For further information on such conditions see also the Hippocratic work Diseases of Virgins, L8, 466-8.

23. Anon. Lond. XIII, 21-2, 44-47.

24. All the humours may also be involved simultaneously. Elsewhere in this work the author explains how these fevers are maintained. The heat resulting from an excess of humours causes the watery part of them, which is the most inimical to fire, to be exhaled; the thick part, which is bilious and the chief nourishment of fire, remains behind. (L 7, 578-80).

Plethora (πληθώρα) is explicitly defined here as a predominance of one humour over the others.²⁵ The same work also puts forward a mechanism for excess of blood, a plethos in Galen's terminology. Certain foods and drinks lead to an excess of blood in the heart, from which it is rapidly transferred to the head and body, leading to redness of the face with swelling of the jugular veins. This is a cause of disturbances in the body. The excess may be eliminated through the nose or bowels; if it is great, disease may be the result.²⁶ The author recognises three causes of disease: the state of plethora just mentioned; climatic extremes; and the effect of external forces, trauma and conditions such as fatigue. In a sense there is only one cause here, plethora; for he explains that an effect of both trauma and unseasonable weather is the heating of the blood, which accumulates in quantity; fatigue has a similar effect,²⁷ which is further dealt with in Regimen II. In those who are not in training, unaccustomed exercise heats the body and the flesh melts. The material thus generated is eliminated in the sweat and in the breath, causing pain not only in the parts that are evacuated but also in the part on which the flux of humours descends, particularly if it is fleshy. The flux undergoes stasis in these parts and becomes warm, resulting in fever.²⁸ In Nature of Man we learn that the most dangerous diseases arise in the strongest parts of the body. If, however, the fluxes move from stronger to weaker parts, it is harder to eliminate them; this is because a strong part more easily consumes the material that has flowed into it.²⁹ The movement of perittomata is mentioned also in the work On the Sacred Disease. If the brain has been inadequately purged of its impurities early in life, by sores on the scalp and otorrhoea, the impurities may cause trouble later by descending on the heart, where they lead to palpitation and dyspnoea; or the chest, with spinal deformities; or the bowels, resulting in diarrhoea; or the chief veins, where the passage of air to the brain is obstructed, with resultant aphasia.³⁰ Places in Man further specifies the

25. L 7, 566-72.

26. L 7, 554-6.

27. L 7, 580-2.

28. L 6, 582-4. Nature of Man

(L 6, 40) also remarks that pain is felt both in places that have been evacuated and in those that are filled to excess, and the author of Ancient Medicine observes that depletion, as well as repletion, is a cause of disease. (L 1, 588).

29. L 6, 56.

30. L 6, 370-2.

movement of fluxions from the head. They can go in seven directions, resulting in disease of the nose, ears, eyes, chest, spinal marrow, vertebrae and flesh, and the pelvic organs.³¹ Diseases IV, on the other hand, offers four routes for the evacuation of the four humours: mouth, nose, anus and urethra. If the humour that is in excess is purged through one of these outlets, disease does not follow. This work likens the parts of the body to a series of vessels communicating by pipes. If the level is altered in one, it is restored from the others. Hence the belly, when full, distributes humours, but when it is empty it draws them from adjacent parts.³² The belly makes its distribution on even days, so that fevers are exacerbated by being provided with nutriment; on odd days it draws from the body, so that fevers come to a crisis or subside. Patients either die or recover on odd days (counting from the onset of the disease). Hence to purge on odd days is dangerous, and may be fatal; the old physicians committed this fault.³³ The fluxes of humours in the body remain in a particular part until they can derive no more nourishment from it; then they move to another, unless there are no parts left to visit, in which case the patient dies.³⁴

Scattered references in the *Corpus* mention a variety of inflammatory conditions that are produced by fluxions descending on individual parts of the body. In Nature of Man, after the description of the veins in the eleventh chapter, the doctor is advised to perform venesection as far as possible from the place where pain is felt and blood collects; thus the accumulation of blood is diverted.³⁵ The following chapter mentions the movement through the veins of material derived from the wasting or melting of the

31. L 6, 294-6. Thivel (p 278) points out that Places in Man is unique in the *Corpus* in postulating the head as the place where the residues collect, and the source, in consequence, of all diseases. He regards this as the primitive doctrine (p 281). The Hippocratic work on Glands also mentions seven routes for the escape of fluxions from the brain, which is, as it were, the chief gland and absorbs surplus moisture from every part of the body. Other glands (the modern lymph nodes) are situated, according to the author, chiefly in the hairy regions, and have the same function of absorbing fluxions (L 8, 556-68. The glands of the chest are the breasts (L 8, 570-2).

32. L 7, 556-8.

34. L 7, 588-90.

33. L 7, 572-6.

35. L 6, 60.

body. If this flux is discharged into the large bowel, it is quickly eliminated in the stool, since there is a way of escape at the lowest point; if it goes to the chest, however, suppuration follows, since the outlet is uppermost. If it goes to the bladder pus may form, and stones in children because of their abundance of natural heat.³⁶ The aetiology of haemorrhoids is mentioned in the work on this subject. Bile or phlegm, fixing themselves in the veins of the rectum, cause the blood in them to become heated; this attracts blood from the veins in the neighbourhood.³⁷ The ill effects of suppression of the menstrual flow, and of bleeding from haemorrhoids, are mentioned in Epidemics³⁸ and Places in Man.³⁹ In Affections a flux of phlegm to the abdomen cools and moistens the nutriment so that it is not properly digested; this is the condition of lientery.⁴⁰ The author of Breaths describes how, in his opinion, air in the veins forces out the thinnest part of the blood, resulting in fluxes of phlegm mixed with acid humours; any part of the body on which they descend becomes the seat of a disease.⁴¹

Celsus, about the beginning of the Christian era, gave his famous description of the four signs of inflammation: rubor et tumor cum calore et dolore. Erasistratus, he says, was wrong in maintaining that there was no fever apart from inflammation.⁴² Celsus also mentions the dangers of suppressing the wonted evacuations by treating haemorrhoids.⁴³ Caelius Aurelianus mentions the opinions of several ancient writers on the causation of inflammatory conditions such as synanche and peripneumonia.⁴⁴

Galen's doctrine of plethos is far more extensive and complicated than anything to be found in earlier writings. It seems likely that at least some of the development leading up to it was his own. He remarks at the beginning of his work on the subject that most doctors are so ignorant of it that their only response to his

36. L 6, 62-4.

38. L 5, 180, 196, 254.

40. L 6, 236.

42. Celsus III, 10, 2-3. L.J. Rather, 'Disturbance of function (functio laesa): the legendary fifth cardinal sign of inflammation...', Bull. N.Y. Acad. Med., 47, pp 303-322, 1971, correctly concludes that Galen did not specifically add this to the signs of inflammation; for Galen, as has been shown in Chapter II, it is a sign of every pathological process.

43. Celsus II, 7, 18.

III, 1-9; II, 140-8.

37. L 6, 436.

39. L 6, 344-6.

41. L 6, 104-6.

44. Caelius Aurelianus, AD

questions is a fish-like stare.⁴⁵ He does not say whether they were any the wiser after reading it.

According to Galen there are two causes of chronic disease: plethos and cacochymia. When what is transpired by the body is less than it taken in, plethoric diseases (πλεθωρικὰ νόσοι) are generated. It is therefore necessary to take care that proportion is observed between the amount of food and drink taken in and the amount of the evacuations.⁴⁶ Hibernating animals, he says, do not transpire because the skin becomes impervious; they therefore require no food.⁴⁷ It is not clear why Galen attaches such importance to transpiration as against evacuation in the urine and stools, but at all events plethos, for him, is due to an excess of nutriment over evacuation. For Galen, plethos always consists in an excess of blood, which may be mixed with other humours; blood, he says, can increase considerably in the body, while the capacity of the other humours to increase is limited.⁴⁸ The increase, however, of a single humour other than blood, such as yellow bile in jaundice, is not plethos but cacochymia;⁴⁹ if all the humours increase together in the same proportion, this is plethos.⁵⁰ Although Galen says that plethos is an excess of humours in the whole body, and thus always a generalised condition,⁵¹ he frequently mentions the movement of perittomata which leads to local swellings and other abnormalities, and he sometimes describes these as localised forms of plethos.⁵²

The chief difficulty in understanding Galen's concept of plethos comes from his classification of it into two varieties, which he calls dynamic plethos (πρὸς δύναμιν) and plethos by filling (πρὸς τὸ ἔγχυσμα).⁵³ He defines dynamic plethos as

45. K VII, 513-4 (De plen.).

46. K VI, 408 (De san. tuend.)

47. K XI, 185 (De ven. sect. adv. E.)

48. K VII, 578 (De plen.) Blood that constitutes a plethos is not useful to the body. The other way in which blood can be non-useful is through having lost its primary function, to nourish (K X, 640-1; De meth. med.)

49. K VII, 574 (De plen.); K X, 891

(De meth. med.)

50. K X, 891 (De meth. med.)

The treatment of the two conditions differs. Plethos is treated with such remedies as venesection and baths; cacochymia with drugs purging particular humours. An exception, however, is an excess of black bile; this is better eliminated by venesection (K XI, 282; De cur. rat. per ven. sect.)

51. K VI, 237-8, 440-1 (De san. tuend.); K VII, 574, 578-9 (De plen.)

52. e.g. K XI, 178 (De ven. sect. adv. E.); K XI, 204, 208, 212 (De ven. sect. adv. E. Rom. deg.); K XVIIIa, 278-9 (Adv. Jul.) Plethos in all the vessels can be evacuated in one operation of venesection; the sort confined to a part cannot be (K XVIIIa, 282; ibid.)

53. K XI, 257-8 (De cur. rat. per ven. sect.)

πρὸς ἰσχύον καὶ δύναμιν τοῦ βασιάζοντος αὐτό , "in relation to the strength and the power (δύναμις) of the body that sustains it", and plethos by filling as πρὸς τὴν ὑποδεχομένην χώραν , "in relation to the capacity of the vessels".⁵⁴ Very briefly, the first kind is due to the weakness of the body, or individual part, relative to the amount of humour; the essential feature is not the excess, but the failure of the body to eliminate it adequately. As Galen says, the faculty (δύναμις) that deals with it (the verb is κατεργάζουαι , subdue) is too weak to master and digest the humours properly, so that they quickly putrefy.⁵⁵ The second variety, plethos by filling, is due to distension of the vessels by the excess, which may rupture them. This variety has the more mechanical basis, and it is not surprising, therefore, that it can occur also in inanimate containers such as wine-jars and skins.⁵⁶ Nevertheless some physicians deny its existence, believing all plethos to be dynamic.⁵⁷ Others recognise only the variety by filling. Chief among these are the materialists, such as Asclepiades. They cannot acknowledge the existence of dynamic plethos, since the dynamis in question is one of the natural faculties, which they reject; as Galen says, it is impossible that plethos should stand in relation to something that does not exist.⁵⁸ In dynamic plethos the excess is a burden on the strength of the body; Galen says that it oppresses the powers (dynameis).⁵⁹ He draws the analogy of physical burdens; a weight that a grown man could easily carry would be an insupportable

54. K VII, 522 (De plen.)

Siegel (p 354) understands dynamic plethos in Galen's terminology as referring to the power of the humour involved, rather than the powers or natural faculties of the body. He does not substantiate this with references. It is true, however, that Galen does mention the dynameis of humours. In commenting on the Hippocratic observation that pain is felt not only in the place where a humour is concentrated, but also in the place left empty by its departure, he says that this is particularly so with humours having strong dynameis. It is not only the quantity of a humour in a particular place, but also its quality; some heat or chill strongly (K XV, 62-3, In Hipp. de nat. hom. comm.)

55. K VII, 287 (De feb. diff.)

56. K VII, 524 (De plen.)

57. K VII, 517, 520-1 (De plen.) It might be argued, Galen suggests, that all plethos in living animals is dynamic, since the variety by filling could be seen as a failure of the containing (συνεχτικὴ) faculty. Galen however does not accept this argument (K VII, 524; De plen.)

58. K VII, 515 (De plen.);

K XVIIIa, 278-9 (Adv. Jul.)

59. K VII, 522 (De plen.)

burden to a child,⁶⁰ and thus, as he remarks at the beginning of his work on plethos, the question of little or much must be seen in relation to the powers, or natural faculties of the body.⁶¹ This concept of the strength of the powers (*δύμη δυνάμεις*)⁶² is thus very important in Galen's system.

Since in dynamic plethos the powers are burdened, it is not surprising that its principal symptom is a sensation of weight and sluggishness of movement; in the variety from filling, on the other hand, the patient feels distended.⁶³ But the precise symptomatology depends both on the particular power that is oppressed and on the nature of the material that is oppressing it, or distending the vessels. Where the sensory faculty (*δύναμις ψυχική* or *αἰσθητική*) is oppressed by dynamic plethos, the characteristic symptoms of weight and difficulty of movement are present. But these sensations do not necessarily indicate plethos in the part in which they are felt; in paralytic conditions, for example, they are present, but the condition is not due to anything wrong with the limb in which they are perceived, but with the delivery of psychic pneuma through the nerves.⁶⁴ The sensations may be felt in the adjacent parts when organs such as the spleen, kidney or lung are affected.⁶⁵ Thus to identify the plethoric part the physician must know anatomy and physiology, and understand the natural faculties.⁶⁶ If it is the vital faculty (*ζωτική δύναμις*) of the arteries that is oppressed, pathological signs appear in the pulse.⁶⁷ The veins have very little sensation, and plethos in them may be symptomless except in those of sensitive perceptions; fortunately, however, although the powers in the arteries are different from those in the veins, the two kinds of vessels communicate, and the situation in the veins can be gauged from the arterial pulse except in conditions where the peccant material in the veins is so thick and viscid that it does not extend to the arteries.⁶⁸

60. K VII, 521 (De plen.)

61. K VII, 514 (*ibid.*)

62. Translated "strength of the powers" since it is clear that no individual power is meant, although the word is in the singular in the Greek.

63. K XI, 276 (De cur. rat. per ven. sect.)

64. K VII, 532-6 (De plen.)

65. K VII, 531 (*ibid.*)

66. K VII, 537 (*ibid.*)

67. K VI, 238 (De san. tuend.)

68. K VII, 573 (De plen.)

An indication of the humour that is in excess can also be obtained from the nature of the pulse; if, for instance, it is phlegm, the pulse has the characteristics of a cold and damp diathesis.⁶⁹

Again, some humours produce specific effects on the body; an excess of yellow bile leads to wakefulness, while black bile makes the patient morose and depressed, and some varieties of phlegm cause somnolence.⁷⁰

The strength or weakness of these governing faculties may be estimated, and the faculty that is suffering oppression identified, by examining the activities proper to them: nervous, nutritive, distributive, and so on, which Galen calls the *energeias*.⁷¹ The magnitude of the plethos, of either variety, is determined from the extent of the signs and symptoms; for example, the sense of weight increases in proportion to the plethos.⁷² The nature of the predominant humour is determined by the colour of the body or part affected; red for blood, pale for yellow bile, whiter for phlegm, and blacker for black bile.⁷³ A plethos of crude humours--that is, of imperfectly concocted blood, results in a leaden complexion, or a white and colourless one; an irregular pulse, heaviness of the whole body, and dulling of consciousness. Such a plethos is particularly deleterious to the faculties, and must be treated with the utmost circumspection to avoid dissolving them altogether.⁷⁴ On the other hand a plethos of overheated blood leads to high fever, and must be heroically evacuated before it destroys some vital part.⁷⁵

Since the essential lesion in dynamic plethos is a weakness of the powers, such plethos can occur when the body is generally weak; this is seen in cachexia and in the rheumatic diseases.⁷⁶ In such conditions the vital organs are oppressed by the excess, even if it is not great, and the blood in them is driven out, to find lodgment in other organs and tissues whose excretory powers are feebler and are thus unable to thrust it back. Such organs and

69. K VII, 579 (De plen.)

70. K VII, 576 (*ibid.*)

71. K XI, 268-9 (De cur. rat. per ven. sect.)

72. K XI, 268 (*ibid.*)

73. K VII, 574 (De plen.)

74. K XI, 279-82 (De cur. rat. per ven. sect.) Galen regards crude or raw humours as a variety of phlegm (K VII, 576; De plen.), logically enough, since the heat necessary for adequate coction has been lacking, and phlegm is by nature cold.

75. K XI, 287 (De cur. rat. per ven. sect.)

76. They are not, of course, rheumatic in the modern sense, but are due to rheums or fluxions descending on the affected part.

tissues are the subcutaneous glands and fat, the lung and spleen which have a porous structure and feeble excretory faculties, and the brain, which, however, is equipped with passages (the ventricles), through which, it was supposed, the excess could escape downwards.⁷⁷ These parts are the most likely to provide a home for wandering perittomata, since they have not the strength to eject them. Galen describes how such residues may be pushed from one part of the body into another, from which, if they are not digested or otherwise dealt with, they may in turn be sent elsewhere until they arrive at some part that is particularly weak in its excretory faculty.⁷⁸ Here they putrefy if the faculty that breaks them down is too weak to do so adequately.⁷⁹ Dynamic plethos can thus lead to localised swellings in such parts,⁸⁰ the nature of the swelling depending on the prevailing humour: where this is black bile it is scirrhus, with phlegm it is flabby, and with bile, erysipelas is produced.⁸¹ Putrefaction of perittomata results in a variety of apostemata or abscesses, which may contain, in addition to pus, material resembling clay, urine, bones, nails, hair, and even living creatures.⁸² A special work of Galen deals with these abnormal swellings.⁸³ Although in it Galen describes the varieties of swellings produced by various abnormal crases of humours, he nowhere mentions plethos specifically.

How, then, do the powers become feeble? Weakness is relative to the task required of them; when, as Galen says, the body to be moved increases while the powers do not keep pace, there must be sluggishness of movement, which is one of the signs of dynamic plethos. If the humours increase without a corresponding augmentation of the powers, there is atony of the *energeia*, that is, of the powers in action. Weakness of the powers can thus result from an increase in flesh, and in humours, with which the powers have not kept pace. In athletes, however, the blood volume and the

77. K XI, 275-6 (De cur. rat. per ven. sect.)

78. K VI, 440-1 (De san. tuend.); K XI, 208 (De ven. sect. adv. E. Rom. deg.); K XI, 274 (De cur. rat. per ven. sect.)

79. K VII, 287 (De feb. diff.) Galen says elsewhere that every superfluous substance that remains in the body must ultimately putrefy (K II, 185; De fac. nat.)

80. K XI, 266 (De cur. rat. per ven. sect.)

81. K XI, 265 (*ibid.*)

82. K VII, 718 (De tum. praet. nat.)

83. The work On Abnormal Swellings is in K VII, 705-32. There is a recent English translation by D.G. Lytton and L.M. Resuhr, *J. Hist. Med.* 33, pp 531-549, 1978.

powers increase together; in increase in the volume of the flesh may also be accompanied by strengthening of the powers, so that neither an increase in the fleshy parts nor distension of the superficial veins is necessarily a sign of pathological plethos.⁸⁴ The arterial pulse is a sound criterion of the strength of the powers; if it is strong and regular, they are in good condition.⁸⁵ Although the strength of the powers declines with age, there are some people in their seventies who are still both full-blooded and strong in their powers.⁸⁶

Galen gives some attention to Erasistratus' theory of plethos. He did not recognise the dynamic variety at all.⁸⁷ He also differed from Galen in his well-known belief that the arteries contained only pneuma, not blood, under normal conditions.⁸⁸ Galen quotes him as saying that when the vessels are full of nutriment that is not being consumed at the periphery, and more is added centrally from the consumption of food, the veins become distended by the excess, and the only place for it to go is across into the arteries, which have anastomoses, normally closed, with the ends of the veins.⁸⁹ Inflammation and fever then ensue. Galen also believes that plethos by filling (ἡ καλουμένη πληθώρα) is an important cause of fever,⁹⁰ though he does not accept Erasistratus' belief that fever is always due to inflammation, that is, to the passage of plethoric blood from the veins into the arteries.⁹¹ Plethos by filling, according to Galen, in addition to rupturing veins forces open their mouths and may cause sudden death by interfering with the transpiration of the body.⁹² Fevers follow this variety of plethos because the obstructions are numerous and the whole body transpires with difficulty.⁹³ Dynamic plethos does not obstruct the mouths of the vessels, so that refrigeration (ἀνάουξις) is not prevented.⁹⁴ Galen lists a variety of inflammatory conditions as arising from plethos, such as synanche, peripneumonia, ophthalmia and arthritis.⁹⁵ Erasistratus calls his own variety of plethos plethora (πληθώρα), a term reserved by Galen for plethos by filling, which indeed is

84. K VII, 562-5 (De plen.)
per ven. sect.)

87. K VII, 538 (De plen.)

89. K VII, 537-8 (De plen.)

91. K XI, 226 (De ven. sect. adv. E. Rom. deg.) Plethos was important in Erasistratus' pathology because he held that the inflammations that led to fever originated chiefly from plethos (K XI, 220; *ibid.*)

92. K XV, 112 (In Hipp. de nat. hom. comm.) 93. K VII, 287 (De feb. diff.)

94. K X, 618 (De meth. med.) 95. K VI, 375 (De san. tuend.)

85. K XI, 292 (De cur. rat.)

86. K XI, 291 (*ibid.*)

88. K XI, 153 (De ven. sect. adv. E.)

90. K VII, 279, 287 (De feb. diff.)

what Erasistratus is describing. Erasistratus says that in this condition there is an increase in the tone of the vessels, and swelling of the limbs, such as occurs after exercise; there is difficulty of movement and a sensation of tension involving the whole body.⁹⁶ Galen points out that Erasistratus, though accepting only plethos by filling, has attributed to it some of the signs and symptoms of dynamic plethos, such as sluggishness of movement; he also, says Galen, mentions an ulcerous sensation, which is not a specific symptom of plethos at all, but of qualitative cacochymia. Galen also disagrees that the increase in the tone of the vessels is necessarily correlated with the increase in blood; they can, he says, sometimes be eutonic in oligoemic conditions. He also comments that it is not true that the excess must go over to the arteries; the alternative is that it might rupture the veins.⁹⁷ Such rupture is one of Galen's recognised complications of plethos by filling; it is clear that it does not occur in the dynamic variety, since Galen asks those who believe only in dynamic plethos how it is that vessels in the lungs can be broken by plethos in the absence of any external trauma.⁹⁸ This account of Erasistratus' pathology contradicts another given by Galen in his work On the Natural Faculties, in which he maintains that Erasistratus believed the veins to be replenished from the centre only as nutriment was used up at the periphery, on the principle of refilling a vacuum. As Galen says, this would make it impossible for plethos to occur, since no more would be brought in than had been taken out.⁹⁹ Whether Erasistratus did indeed hold these contradictory opinions, or whether Galen has misconstrued him, or forgotten the facts in reporting one of them, is not clear. At all events, in Galen's view plethos by filling is marked by rupture of veins, apoplexies and localised swellings.¹⁰⁰ It is commonly brought on by the suppression of a natural evacuation, such as the menstrual flow or bleeding from a haemorrhoid; Galen, like many of the ancients, held such evacuations to be highly beneficial. For example, the

96. K VII, 538-9 (De plen.)

98. K VII, 520-1 (ibid.)

100. K XI, 266 (De cur. rat. per ven. sect.)

97. K VII, 539-43 (ibid.)

99. K II, 74-6 (De fac. nat.)

girl from Chios described in his second work on venesection had suppression of the menses; the Erasistratean physicians refused to bleed her, the plethos was carried to the chest where vessels were ruptured, and she died.¹⁰¹ Galen is sure that she would have recovered had she been venesected.¹⁰² The characteristic symptom of plethos by filling is a feeling of distension, accompanied by swelling of the limbs.¹⁰³ This may be brought on by exertion and is then not abnormal; gymnasts recognise several varieties of it. When it appears in the absence of exercise, however, it is certainly a sign of plethos by filling,¹⁰⁴ though it gives no indication of the identity of the predominant humour.¹⁰⁵

Galen refers further to the opinions of various other physicians and sects on the subject. As already mentioned, Asclepiades and his followers rejected dynamic plethos, since they maintain that the natural faculties do not exist. They believe that excess and deficiency affect only the vessels. Others pay no attention to plethos at all, evacuating only where there is obstruction; none of them, however, explain obstruction in the same way. A third group, the empiricists, hold that it is of no importance whether the powers exist or not, since nothing can be known of them; they rely only on experience, and undertake venesection in the presence of the plethoric syndrome, in which they have observed such treatment to be beneficial.¹⁰⁶ For Menodotus the empiricist at least, this was the only indication for venesection.¹⁰⁷

The plethoric syndrome of the empiricists comprises distension of the veins, redness and heaviness of the whole body, sluggishness of movement, and a feeling of tension in the limbs, together with, according to some, a sensation of irritation, pain or lassitude, a previous history of physical inactivity and of excess in food or drink, and suppression of some wonted evacuation.¹⁰⁸ This is a mixed bag of signs and symptoms of the two varieties of plethos, together with some, such as the ulcerous or irritating sensation, that are, according to Galen, not signs of plethos at all, but

101. K XI, 187-90 (De ven. sect. adv. E. Rom. deg.)

102. K XI, 193-4 (*ibid.*)

103. K VI, 237 (De san. tuend.) 104. K VII, 546-7 (De plen.).
See also K VII, 152-3 (De sympt. caus.)

105. K VII, 561-2 (De plen.) 106. K VII, 515 (De plen.)

107. K XI, 277 (De cur. rat. per ven. sect.); K XV, 765 (In Hipp. de vict. acut. comm.)

108. K VII, 515-6 (De plen.)
For the varieties of lassitude see K VI, 237 (De san. tuend.); K VII, 178 (De sympt. caus.)

of qualitative cacochymia due to biting humours, and of weakness of the powers.¹⁰⁹ He compares the ulcerous sensation to the sensations of a man carrying a few sharp thorns on his back; they prick him, but could scarcely be described as a burden. On the other hand a man carrying a heavy load is heavily burdened, but the pricking sensation is absent; this corresponds to plethos.¹¹⁰ The question whether in dynamic plethos there is always an increase in the quantity of humours is not easy to answer; it is perhaps meaningless, since the essential feature of this kind of plethos is that the powers are unable to deal with the humours, and a quantity that would be normal in one whose powers were strong might be too much for powers that were enfeebled.

Galen gives an indication of his own handling of a patient with plethos at the end of his work on the subject. Suppose an afebrile patient, who has swelling of the veins and redness of the whole body. The first thing to do is to eliminate some heating factor in the patient's way of life. If the signs persist after he has abstained for some time from bathing, exercise and wine, he has an excess of blood. Galen now considers whether he has sensations of weight or of tension, or of sluggishness on movement; whether he has been abnormally wakeful or somnolent; whether his accustomed exercise has been omitted, or his wonted evacuations suppressed. Has he eaten too much, or taken hot baths after meals? Has he shown a tendency to plethoric diseases in the past? What is his physical type? Are the season of the year, and the region in which he lives, of a kind to promote plethos? What are the signs in the pulse?¹¹¹

With respect to treatment, the author of the spurious commentary on the Hippocratic work Humours, no doubt expressing good Galenic doctrine, explains that it may be impossible to deal swiftly with dynamic plethos, since the powers, by definition

109. K VII, 547-8, 554, 561 (De plen.) 110. K VII, 550-1 (ibid.)

111. K VII, 581-2 (De plen.) The modern physician cannot but admire the thoroughness of Galen's history-taking. Plethos is supposed to be commoner in cold and damp climates, and in subjects of stocky build, because transpiration is reduced.

already weak, may be totally dissolved by the evacuation.¹¹²
 The same is true of a plethos of crude humours; if venesection is to be used it may be desirable to spread the bloodlettings over several days, a procedure known as epaphairesis, and to take only a little at a time.¹¹³ Where there is a plethos of overheated blood, however, and the pulse is strong and the patient in the prime of life, Galen sometimes removes six cotyles (about two litres) of blood at one operation; it is necessary, however, to watch the patient's strength, as indicated by the pulse, very carefully during the operation, lest he should die.¹¹⁴ Galen observes that, since diseases are healed by their opposites, the treatment for plethos is evacuation;¹¹⁵ if the patient then improves, the diagnosis was correct.¹¹⁶ Venesection, however, is not always used; there are many possible ways of dispersing plethos,¹¹⁷ and the principal indication for venesection is not plethos, but the severity of the patient's disease, whether present or only foreseen.¹¹⁸ Galen points out that almost all practitioners venesect patients who have been severely bruised, or suffer from ophthalmia, although there is no sign of plethos.¹¹⁹ But where there is general weakness, as in cachexia and the rheumatic diseases, associated with dynamic plethos, the aim of treatment is not so much to eliminate humour as to strengthen the powers, although venesection may be used at the beginning.¹²⁰

Prevention, however, is better than cure; Galen attributes this sentiment to Hippocrates.¹²¹ Those who do not accumulate perittomata, through paying proper attention to diet and mode of life, are not troubled with plethoric diseases even if some of their parts are enfeebled,¹²² while people who are likely to be seized with plethoric conditions should be prophylactically venesected or purged at the beginning of spring.¹²³

Plethos is important in Galen's pathology because it results in inflammatory diseases. Inflammation (φλεγμονή , or in the terminology of the ancients φλόγωσις) originates from a confluxion of blood (ἐπιρροή αἵματος) which is (or becomes) unusually warm, thus heating the part on which it descends. Blood

112. K XVI, 116. The same idea occurs in the genuine work against Julian the Methodist (K XVIIIa, 286). 113. K XI, 286-7 (De cur. rat. per ven. sect.)

114. K XI, 287-9 (ibid.)

115. K XI, 167 (De ven. sect. adv. E.) 116. K VII, 555 (De plen.)

117. K XI, 261 (De cur. rat. per ven. sect.)

118. K XI, 277 (ibid.)

119. K VII, 558 (De plen.)

120. K XI, 276 (De cur. rat. per ven. sect.)

121. K XI, 278 (ibid.)

122. K VI, 440-1 (De san. tuend.)

123. K XI, 271-2 (De cur. rat. per ven. sect.)

flows to the part concerned either because another part, embarrassed by a plethos by virtue of either its quantity or its quality, sends it on, or because the affected part draws blood to itself by means of its attractive faculty. Asclepiades, who denied the existence of the faculties, did not accept this latter explanation. Galen explains the congestion that develops round painful parts by invoking another faculty, the eliminative. Whatever causes the pain is some sort of troublesome matter, which the excretory faculty tries to eject from the affected part. In doing so it also pushes out a quantity of other matter, blood and pneuma, into the overlying parts.¹²⁴ Just as parts vary according to their strength, the noble parts having the strongest faculties by nature, so the stronger parts expel their perittomata into those that are weaker either by nature or as a result of some acquired disability.¹²⁵ The heart, for example, is normally stronger than the liver, which is stronger than the stomach and intestines. But in a particular individual at a particular time the stomach may be stronger than the liver. This depends in part on the state of filling of the parts concerned. When the gut is full the liver is stronger, and draws nutriment from it; when the liver is full and the stomach empty, however, the flow is in the opposite direction. In starvation, when the stomach is in need but the liver has no useful nutriment to give, it sends perittomata to the stomach: bilious, phlegmatic and serous fluids.¹²⁶ There is an element of attraction here too. Just as human faeces are delightful to dogs, so the perittomata from the liver are attracted specifically by particular organs to which they are pleasing; some go to the spleen, some to the gall bladder, others to the kidney.¹²⁷ Commenting on the Hippocratic observation that diseases arising in the strongest parts are the most dangerous,¹²⁸ Galen says that it is necessary to specify which faculties are strongest; the important one here is the excretory faculty. If the part on which the flux descends has a route for excreting it, as, for instance, the stomach and intestines have, it eliminates the excess through

124. K X, 875-9 (De meth. med.)
K VII, 24-6 (De caus. morb.)
127. K II, 177-8 (ibid.)

125. K II, 189-91 (De fac. nat.);
126. K II, 189-90 (De fac. nat.)
128. L 6, 56.

that channel.¹²⁹ If it has not, and its excretory faculty is too feeble to send the excess elsewhere, it becomes the seat of an abnormal swelling. Such parts as are naturally cold will be readily affected by cold fluxions; hot ones by hot. It is better for the peccant fluxes to be sent from noble to ignoble parts (as, in fact, they usually are in the natural course of events) rather than vice versa. If fluxes that have settled in the joints are expelled by treatment from the limbs, and return to some vital part, the patient will die unless they can be revulsed back to the extremities.¹³⁰

In his work on anomalous dyscrasias Galen describes one such process, inflammation in a muscle. The first parts to be filled by the hot fluxion that descends on the part are the larger arteries and veins, then the smaller ones. When these are also full, the surplus rheum escapes through their mouths and walls, filling the adjoining parts with hot humour and distending them. The coats of the vessels are torn, and the parts are compressed by the swelling and heated; this is the condition of inflammation. If the part is overcome by the fluxion it is destroyed. If, on the other hand, it is strong enough to overcome the fluxion, one of two things can happen: either the peccant humour will be transpired, which is the more favourable outcome, or it will be digested, leading to the formation of

129. Dysentery, for example, is for Galen the evacuation of a plethos through the bowel. The perittomata are evacuated through the same veins (discharging them into the gut) through which they were absorbed (taken up from the gut). This is a general law with Galen (K II, 203-4; De fac. nat.) The purgation may not be bloody, but may correspond to some other peccant humour. Thus in cholera the whole body is evacuated via the veins of the alimentary canal (K II, 191-2, De fac. nat.) Diarrhoeas and cholerias, says Galen, cleanse the whole body of perittomata (K X, 513; De meth. med.) Aretaeus (VI, 4, 1) mentions that it is undesirable to check the diarrhoea in cholera, since undigested matters are being eliminated. Diarrhoea was still being treated with castor oil within living memory.

130. K XV, 123-30 (In Hipp. de nat. hom. comm.)

pus and the bursting of the abscess.¹³¹ The heating effects of local inflammations depend both on the heat of the blood in the affected part and on the general crisis of the blood in the body. If the heat in the part is moderate, and the rest of the blood well tempered, the general heating effect will be slight; but if the blood in the part seethes, and the blood in the whole body is bilious, there will be generalised fever. If the inflamed part is near some viscus that is full of blood, the whole body will be quickly heated. The heating effect also depends on the nature of the humour concerned. Some substances, notably pneuma and yellow bile, readily suffer changes in temperature because of the fineness of their particles; black bile and phlegm are less susceptible to it.¹³²

The swelling in inflammatory states is not due to the heat, since things that expand on heating are filled with pneuma, and this is not found in inflammatory swellings, which are full of blood only. The part filled with blood may not be hot from the first, but may only become so as the pores are obstructed, preventing transpiration; the heated blood then putrefies, as hot and moist things commonly

131. K VII, 736-9 (De inaeq. intemp.) When Nature is completely victorious, the most beautiful pus is generated; it is white, thick, homogeneous, smooth, and has only a slight odour. This pus is the result of digestion. Its analogue when the process takes place in the vessels is the urinary sediment (K VII, 299-302; De feb. diff.) Pus for Galen, therefore, is frequently laudable; he does recognise, however, that healing can take place without inflammation or the formation of pus (K X, 378; De meth. med.). This more commonly happens if there has been a copious flow of blood at the time of the injury, as he has seen in gladiatorial combats (K XI, 227; De ven. sect. adv. E. Rom. deg.). This would reduce the danger of plethos. According to the same reasoning, corrosive preparations must not be applied, Galen says, without first evacuating the body of all residues, since otherwise the ointments attract a flow of humours to the affected part and set up inflammation (K X, 260; De meth. med.). Galen describes one of his clinical triumphs over an Erasistratean opponent in his third book on venesection; according to him, he applied this principle with astonishing success (K XI, 299-302; De cur. rat. per ven. sect.) Galen seems uncertain whether Erasistratus believed that healing could occur without inflammation (K X, 378; De meth. med.) In the case mentioned above, however, it was the Erasistratean's refusal to venesect the patient that prevented him from succeeding.

132. K VII, 740-1 (De inaeq. intemp.) This is one of several places in which Galen seems to be expressing atomist views.

do.¹³³ The damage is compounded by the perittomata generated by the affected part itself, which, being unable to escape, are added to those in the fluxion.¹³⁴ The rotting of the perittomata in the part generates heat, which continues as long as there is fuel to feed it; when combustion of the residues is complete the heat subsides, unless a new instalment of perittomata arrives at the part.¹³⁵ Pain, in parts having sensation, is due to a sudden change towards the *παρὰ φύσιν*, which can be of two kinds, either a change of quality (hot, cold, etc.) or a solution of continuity, brought about by stretching or pressure.¹³⁶ Galen's pathology of inflammation thus accounts for the four cardinal signs of Celsus: redness, swelling, heat and pain. The part in which the sensation is felt, however, is not necessarily the primarily affected part.¹³⁷ This is because of Galen's principle of sympathy. For example, the mouth of the belly or cardiac orifice of the stomach is affected sympathetically by disorders in the head, since it is joined to it by one of the most important nerves issuing from the brain. In states such as grief, originating in the brain, a bilious fluxion may sympathetically assail the stomach, particularly if it has become weak.¹³⁸ Similarly the head can suffer in sympathy with the stomach, but it is described as diseased only if the primary lesion is situated in it.¹³⁹

Thus in Galen's system the movement of perittomata from stronger to weaker parts is a major cause of disease. Such conditions are rheumatic¹⁴⁰ in the sense of being due to rheums descending on the part, and are associated with localised plethos of the part involved. The weaker parts (in terms of the eliminative faculty) are the most likely to suffer from rheumatic diseases: the lymph nodes, lung, spleen and brain are particularly liable to them.¹⁴¹ Galen makes it clear in his work on therapeutic method that the strength of the eliminative faculty is associated with the tone of the part;

133. K VII, 708-13 (De tum. praet. nat.)

134. K VII, 397-8 (De feb. diff.)

135. K VII, 389-90 (*ibid.*)

136. K XV, 515-6 (In Hipp. de vict. acut. comm.)

137. K VII, 537 (De plen.)

138. K XVIIIa, 85 (In Hipp. aph. comm.)

139. K VIII, 33 (De loc. affect.)

140. The term "rheumatic" presumably became confined in English to arthritic disease in comparatively recent times, as witness the survival of terms such as "muscular rheumatism". In French coryza is still a rheumatic disease (*s'enrhumer*, to catch cold).

141. K XI, 274-6 (De cur. rat. per ven. sect.)

arteries, veins, nerves and muscles have a naturally strong tone, and are thus presumably able to push out residues effectively, while the tone of the glands, in particular those that are the most porous, is feeble.¹⁴² The skin and subcutaneous tissues are also very liable to collect perittomata. The particular disease that ensues will depend on the nature and qualities of the humour involved; anthrax, carcinos, ulcers, erysipelas, gangrene, phagedaena, vitiligo, atheroma, ganglion and steatoma are some of the offspring of fluxions.¹⁴³ These and other such conditions are dealt with in Galen's book on abnormal swellings.¹⁴⁴

In commenting on the Hippocratic aphorism that erysipelas turning inwards is unfavourable, while it is favourable if it turns outwards, Galen says that this applies to all such conditions.¹⁴⁵ It is better that the fluxions should accumulate in some non-vital part such as the skin than in a noble organ like the brain or the liver. The idea persists in popular medical lore; it is important, in childhood diseases, to "bring out the rash". By the same token, it is dangerous to put an end to beneficial evacuations. Haemorrhoids and varicose ulcers are means used by nature in her constant striving to cleanse the blood, and if an outlet is denied her, the patient may lapse into melancholia.¹⁴⁶ Another danger is to the liver, which bestows its perittomata of faeculent and melancholic blood on haemorrhoids; if these are treated surgically, the liver may become cirrhotic, with extinction of its innate heat which is necessary for the production of blood. When, owing to the deficiency of heat, a watery fluid is generated in place of blood, the patient becomes dropsical. If, on the other hand, the liver thrusts the plethos into the lung, vessels there may be ruptured and the patient becomes phthisical. Hence one pile should always be retained to excrete faeculent cacochymias.¹⁴⁷

142. K X, 880-1 (De meth. med.) 143. K VII, 21-2 (De caus. morb.); K X, 879-80 (De meth. med.) 144. Not all swellings are abnormal; bulging muscles in athletes are normal, whereas the abnormal swellings are marked by impairment of function (K VII, 706; De tum. praet. nat.)

145. K XVIIIa, 36-7 (In Hipp. aph. comm.)

146. K V, 117-8 (De atra bile). 147. KX VIIIa, 22 (In Hipp. aph. comm.)

Since most of the works of the medical authors between Hippocrates and Galen are lost, it is hard to say how much of Galen's doctrine of plethos and inflammation is original. There is no doubt, however, that the foundations of it are to be found in the Hippocratic corpus. Galen's love of systematisation is such that it is safe to assume that much of its development was his own.

CHAPTER VI

CONCLUSION

In conclusion, two characteristic features of Galen's system will be very briefly considered: his predilection for logical, or seemingly logical, explanations, and his teleology.

It has been shown in Chapter III that Galen's humoral system is logically unsound, and that Galen, at least in the later part of his life, seemed to be aware of this. Why then did he adopt it in the first place? It is, he says, Hippocratic, which for Galen is the best of all reasons for choosing it; but it is Hippocratic only because Galen, for some reason, had decided that Nature of Man was good Hippocratic doctrine, a view that was not universal in antiquity. He might equally well have decided to follow the much less rigorous scheme of Ancient Medicine, simply by declaring that this work was from the pen of the father of medicine, while Nature of Man was an inferior production of Polybus, to whom it was in fact commonly attributed by others. Galen attributes, at different times, such a diverse collection of works to Hippocrates that it would present no difficulty to him to declare any work whatever in the Corpus the true doctrine. Yet he never mentions Ancient Medicine; he had decided to abide by the rigorous four-humour system of Nature of Man.

A somewhat similar problem has been considered in a previous study.¹ Galen was an excellent anatomist, and knew perfectly well that the earlier systems--one is in Nature of Man--in which the venous supplies of the two halves of the body were independent, were false; yet he said repeatedly that venesection for certain conditions, if it was to be effective, must be performed on the affected side of the body, and he persisted in this opinion into his old age. It is possible to explain the apparent inconsistency in Galen's views, however, by taking into account the state of physiology, as distinct from anatomy, in his time. When considered in the light of the

1. P. Brain, 'Galen on Venesection', unpublished M.A. dissertation, University of Natal, 1978, pp 28-48.

beliefs concerning the production and distribution of venous blood that prevailed before the discovery of the circulation, Galen's views on venesection are not unreasonable.² Can his four-humour system be justified in the same way?

The difficulty in such an attempt is that, in the matter of venesection, Galen never writes as if there is, in his mind, any contradiction at all between a vascular system that is not divided into independent halves and the practice of letting blood on the affected side of the body. With the four-humour system, however, he seems often to be unhappy about the status, not only of blood, but also of black bile. He never explicitly says that the four-humour system is false, for such an admission would destroy his entire edifice of medicine; his dissatisfaction with it, however, frequently seems obvious. Was, perhaps, his initial acceptance of it a youthful indiscretion, and if so, what was its cause?

Galen has a great admiration for logic. In his work That the Best Physician is also a Philosopher he condemns the physicians of his time, whose only interest is in making money, for their ignorance of philosophy, one branch of which is logical method; this, he says, is necessary to know how many and what sorts of diseases exist.³ This is a revealing remark. The modern investigator tends to look first, not at logical constructions, but at the facts of nature. He will decide the question of how many diseases exist by observation of patients, not by logic, although he may use logical methods to predict, on the basis of his observations, the existence of conditions that have not yet been encountered or noticed. Although Galen used both logic and observation, his priorities were different; he tended first to decide on logical grounds what diseases must exist as a result of various combinations of hypothetical humours and qualities, and only afterwards to look for them in patients. This is a dangerous procedure, because a theory provides the scientist with, as it were, a pair of blinkers which usually prevents him from seeing anything except the thing he is looking for. On the other hand, few if any scientific advances have ever

2. Ibid., pp 45-8.

3. K I, 59 (Quod opt. med.)

been made by pure empiricists. Just as with the atomists and vitalists, there are two types of mind here also. One, of which Plato is the supreme example, has a vision of abstract beauty of the sort that can be partly realised in mathematics, but only very imperfectly in the world of objects in the lower reaches of the Cave. The other believes that the Cave is all the world there is; it has no taste for metaphysics. Galen's admiration for Plato, who is second in his esteem only to Hippocrates,⁴ makes it clear to which of the categories he belongs. He has been educated in mathematics:

"If it depended on me, I would omit demonstrations requiring astronomy, geometry, music or any other logical discipline, lest my books should be held in utter detestation by physicians. For truly on countless occasions throughout my life I have had this experience: people for a time talk pleasantly with me because of my work among the sick, in which they think me very well trained, but when they learn later on that I am also trained in mathematics, they avoid me."⁵

He speaks in several places in this work of the fear and distaste which most people in his time had for mathematics, and of his own devotion to it. To devotees like him, mathematics is beautiful; it offers to the prisoner in the cave an almost religious experience of a perfection and symmetry of abstractions that is not to be found in earthly things. This, perhaps, was Galen's downfall. In medicine he had not to deal with abstractions, but with slimes, fleshs and humours; in constructing a system that would explain them, his passion for logical systems made him go too far in the heavenly direction. Such enthusiasms are common in youth. If it is not examined too closely, the system described in the first part of Nature of Man is extremely attractive for its apparent logical rigour. The world ought to be like that. Plato was wise enough to recognise that it was not, as his parable of the cave shows. Perhaps Galen, at first, was not wise enough; when he later became

4. Plato had no chance of being first, since fiction (the proverb notwithstanding) is stranger than truth.

5. K III, 837 (De usu part., tr. May).

so, it was too late to change his system.

There is an interesting parallel in twentieth-century biology. When it became evident, in the 1950's, that the genetics of the Rh blood groups was not simple, two different systems were proposed. The British one, which was developed by the mathematician R.A. Fisher from results obtained in the laboratory of R.R. Race and his colleagues, postulated a logically rigorous arrangement of three closely linked genes, each with two alleles. The alternative system, put forward by A.S. Wiener in America, required an indefinite number of genes, each of which would be responsible for all the effects postulated by Fisher-Race for the group of three closely linked genes. Fisher's system had an abstract beauty that was totally lacking in Wiener's, and for a time it seemed that it reflected the truth. Several groups that had not been observed were predicted, and some of them were apparently found. Wiener's system, on the other hand, was so open-ended that it was very difficult to falsify it as a result of observation. The Fisher-Race system was much easier to understand and teach, but as time went on it became increasingly difficult to fit the facts to it. Wiener's was a thoroughly untidy system, like the pathology of Ancient Medicine rather than Nature of Man, and he defended it with a polemical enthusiasm that would have done credit to Galen, even if it reflected little on Wiener. The British side was more gentlemanly. The fact seems to be that the abstract beauty of mathematics is often lacking in the world of the natural sciences; as Dante says

Ver' è che come forma non s'accorda
molte fiata alla intenzion dell' arte,
perch' a risponder la materia è sorda. 6

As shown in Chapter I, even the Demiurge is not omnipotent in Galen's system; he has to work within the limitations of his material, which is coarse and unresponsive to the artist. It seems that the youthful Galen was carried away by abstract beauty in systems, and did not take this fact sufficiently into account.⁷

Whatever its origins, however, Galen's system dominated western medicine for many centuries after his death. This was probably

6. Paradiso I, 127-9.

7. For the development of the Rh controversy, see successive editions of R.R. Race and R. Sanger, Blood Groups in Man, 1950, 1954, 1958, 1962, 1968, 1975.

because it was basically much more congenial to a Christian culture than the system of the atomists. In terms of factual truth about the physical world, both systems are equally false; it remains to consider, as Gibbon might have said, whether they are equally useful. Galen's system has metaphysical overtones that the other lacks. Twentieth century medicine comes at the end of a period of several centuries of systems in which the emphasis has been on materialism, as against the Middle Ages when it was on metaphysics. If we were concerned here simply with science there would be no difficulty. Whether or not metaphysical entities exist, it is generally agreed that they are outside the province of science. Medicine, however, is something more than a science. The function of the pathologist, as a scientist, is to find out what is wrong with the patient; that of the physician is something far more difficult: to help him. If the patient needs metaphysics, and the physician cannot supply it, he is a bad physician, however successful he may be in identifying the patient's physical disorders, and even curing them. A recent work by an American physician puts this well. His attitude is the more honest because it is obvious, from reading the whole book, that he does not know what the solution is:

"All the long and continuing training of physicians has been, and (sadly) still is, oriented towards solutions to Priority One problems: the defence against imminent death, the treatment of acute disease, and the protection against imminent danger. But as we have seen, these are no longer the greatest dangers facing us, or those for which we require the most help. Dealing with life is difficult and painful, and that is most often where our physicians fail to help us. They have solutions, but not to our most pressing problems. If one has no solutions to the real problems of this world, it is easier to continue to maintain, no matter how artificially, the primacy of the problems for which one does have solutions."⁸

What are, to use Cassell's term, "the real problems of this world"? It might be argued that they are conditions that need Galen's outlook if they are to be alleviated. If there is one thing that

8. E.J. Cassell, The Healer's Art, 1978, pp 150-1.

characterises Galen's system, it is his sense of purpose in nature, and the need for the physician to co-operate with that purpose in healing the patient. And if there is one thing that characterises post-Renaissance thought in medicine and science, it is its sense of utter purposelessness; we are back among the atomists and their chance assemblies of corpuscles, though we may perhaps have better reasons for holding such views than were available in antiquity. Whether or not the reasons are good, however, it can be maintained that such an attitude is not conducive to health. As Jung observed somewhere, psychological breakdown in middle age is much more common in those whose outlook is not basically a religious one. If a patient with such a problem consults a practitioner who is himself in the act of giving way to despair, he is unlikely to get much help. This is because the relationship between doctor and patient is a two-way one; the doctor's attitude rubs off on the patient, just as the patient's does on the doctor. This is not the place to argue the truth or otherwise of metaphysical systems; the question is simply whether the person who believes himself to be part of a purposeful universe is better off in terms of health, in the broadest sense of the word. If this is so--and it can be argued that it is, although this again is not the place to attempt it--then the patient who has problems of this kind will get far more help from Galen than from Asclepiades. In antiquity, what Cassell calls the real problems of this world were probably much less in evidence than they are today, because of the predominance everywhere of what he calls "Priority One" problems: the problems of merely staying alive. Today almost everyone can be kept alive; and the incidence of suicide is greatest in the countries where this is done most successfully. The temptations to despair are far greater today than ever in the past; a man with the outlook of Galen or Marcus Aurelius will resist them far more successfully than one who has no sense of belonging, whether or not he believes in any sort of personal immortality. And the doctor who believes, with another physician of the past, that

"There is surely a piece of Divinity in us, something that was before the Elements, and owes no homage unto the Sun",⁹

can do more for a patient with such a problem than one who regards him as nothing more than a concatenation of atoms and molecules.

9. Sir Thomas Browne, Religio Medici, 1643.

Galen's facts are almost all wrong, but there is more to truth than facts. It could be argued that in matters of attitude, which is very important in medicine, he still has much to teach the practitioner of today. The best reason for studying his system of pathology, however, is a different one: it is that such studies help to provide the medicine of today with the thing it lacks most, a sense of history. Without it, hubris is inevitable, and there is a medical Nemesis to punish that. Perhaps the decline of the classics has more to do with the decline of the medical profession than many would think.

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