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THE HIPPOCRATIC TREATISE *ON ANATOMY*[1]

Anatomy is the basis of medical discourse.
(Hipp. *Loc. Hom.* 2)

INTRODUCTION

On Anatomy (*Anat.*) is the shortest treatise preserved in the Hippocratic Corpus (HC). It describes the internal configuration of the human trunk. The account is for the most part descriptive, function being largely disregarded and speculation completely eschewed. Though systematic it is unsophisticated: two orifices for ingestion are linked by miscellaneous organs, vessels, and viscera to two orifices for evacuation. There is a clear progression in two parallel sections: first, trachea to lung, lung described, location of heart, heart described, kidneys to bladder, bladder described, bladder to genitals, conclusion; and second, oesophagus to belly, location of diaphragm, location of spleen, location and description of belly (close to liver), belly to intestine/colon, colon to rectum and anus, conclusion. The text offers good basic topographical or regional anatomy (the organs studied as they lie in relationship with one another in the different regions of the body). That the work is concerned with human anatomy is certain from the precise description of lung and liver, with features peculiar to human organs; and is corroborated by frequent references to comparative anatomy, with which familiarity is apparently assumed. Such anatomical knowledge, based on extensive observation of animals (probably sacrificial victims as well as laboratory specimens), may have been corroborated by some human dissection, perhaps of the aborted foetus or exposed infant, in conjunction with opportunistic observation of war wounded and accident victims. While the syntax is bald, telegraphic, and asyndetic, the vocabulary is recondite, and poetic. There is erratic omission of the article and recurrent use of compendious comparisons. These features suggest that *Anat.* may be an abridgement of a fuller and more flowery account; this hypothesis is supported by several passages where erroneous or unclear information apparently results from excessive compression or

[1] Appreciative thanks are due to the director and trustees of the Wellcome Trust for the award of a research leave fellowship which released me from arduous teaching duties at the University of St Andrews to pursue work on the Hippocratic treatise *Places in Man* (ed., tr., and comm., forthcoming, Oxford University Press). This paper is a *parergon* of that work. I am most grateful to Professor Vivian Nutton (WIHM and University College London), who first drew *On Anatomy* to my attention and who commented most helpfully on drafts of this paper at successive stages. I am grateful also to Mr James Longrigg (University of Newcastle-upon-Tyne) for advice on the pre-Socratic background, to Sir Kenneth Dover (St Andrews) for comments on the 'style' of the piece, and to Professor Jacques Jouanna (Sorbonne) for invaluable aid in checking and communicating the readings of the ms V. Assistance of a different but equally important kind was afforded by those who answered my countless (doubtless often silly) anatomical questions with great good sense and good humour; especially Dr Donald Coid, whose copy of *Gray's Anatomy* has now become even more thumbed and tattered; Dr Ann Dally, who introduced me to the ways of Wimpole Street; and Dr Susan Whiten, who, with Mr Robin Clark, gave me an unforgettable and highly instructive tour of visual aids in the Department of Anatomy at St Andrews. Without the encouragement and support of all these friends, I should never have completed this paper. In the final stages, it was improved by the comments of the referee (anonymous) and the editors (Stephen Heyworth and Christopher Collard) of *CQ*. For any remaining errors or misapprehensions, I am alone responsible.

imperfect comprehension of a source. The vocabulary is markedly Demokritean and there are strong affinities with *Ep.* 23, the supposititious letter of Demokritos to Hippocrates on 'the nature of man'. As there are similarities also, both in content and in expression, with *Oss.*, a composite work which is related in turn to *Epid.* 2, case histories of patients in Thrace and adjacent regions, and with the similarly located *Epid.* 6, the putative earlier version(s) of *Anat.* may plausibly be attributed to a North Greek strand of scientific and medical endeavour. In this paper a new text is presented, followed by translation, commentary, and discussion incorporating conclusions on origin and date. At the same time, the paper has a wider thrust, concerning the development of ancient anatomical knowledge and scientific terminology. The conclusions have important implications for our understanding of the formation of the HC, both as originally composed and as subsequently constituted.

REFERENCES AND ABBREVIATIONS

V Vatican gr. 276 twelfth century

Anat. is preserved in a further six manuscripts, all recentiores and apparently without independent value. See H. Diels, *Die Handschriften der antiken Ärzte*, Teil I (1905), p. 31 and also B. Alexanderson, *Die hippokratische Schrift Prognostikon* (Göteborg, 1963), pp. 70, 77–8, 110. These are:

Paris 2146 and Paris 2255 = C and E on which Littré relied.
Bologna 3632.
Holkham 282, now in Oxford (by the same hand as Paris 2146).
Munich 71.
Vatican, Palatine 192.

Calvus: Latin translation of Hippocratic writings (1525, preceding Aldine *editio princeps* of Asolanus, 1526).

Cornarius: ed. and Latin trans. (Basle, 1538).

Foesius: ed. and Latin trans. (Frankfurt, 1595; also *Oeconomia*, Frankfurt, 1588).

van der Linden: ed. and Latin trans. (Leiden, 1665).

Triller: *Opuscula Medica* vol. 2, 1st edn (Leiden, 1728); and 2nd edn (Leipzig, 1766): medico-philological commentary on *Anat.*, intended as specimen for complete Hippocratic edition.

Littré: ed. and French trans. (Paris, 1839–61; *Anat.* occupies 8.536–41, published 1853).

Ermerins: ed. and Latin trans. (Utrecht, 1851–64; *Anat.* occupies 3.287–8, published 1864).

BVD: *Black's Veterinary Dictionary* (14th edn, 1982).

GA: *Gray's Anatomy* (30th edn, 1949).

DK: H. Diels and W. Kranz, *Die Fragmente der Vorsokratiker* (10th edn, 1961).

DR: C. Daremberg and E. Ruelle, *Oeuvres de Rufus d'Éphese* (Paris, 1879).

HC: Hippocratic Corpus.

Ibycus, *TLG*: computer search of *TLG* database.

K.: C. G. Kühn, *Claudii Galeni Opera Omnia* (Leipzig, 1821–30).

Abbreviations for ancient authors and works (including Hippocratic treatises) follow Liddell-Scott-Jones.

The following modern works are referred to by author's name and date:

M.-P. Duminil, 'La description des vaisseaux dans les chapitres 11–19 du traité de la Nature des Os', *Hippocratica* (Paris, 1980), 135–48.

L. Edelstein, 'The History of Anatomy in Antiquity', *Ancient Medicine: Selected Papers of Ludwig Edelstein*, edd. O. and E. L. Temkin (Baltimore, 1967; first German publication, 1932), pp. 247–301.

W. A. Greenhill, 'Adversaria Medico-Philologica', *British and Foreign Medico-chirurgical Review* 34–38 (1864–1866).

C. R. S. Harris, *The Heart and the Vascular System in Ancient Greek Medicine* (Oxford, 1973).

J. Irigoin, 'La formation du vocabulaire de l'anatomie en grec: du mycénien aux principaux traités de la collection hippocratique', *Hippocratica* (Paris, 1980), 247–57.

J. Jouanna, *Hippocrate* (Paris, 1992).

G. E. R. Lloyd, 'The Development of Greek Anatomical Terminology', *Science, Folklore and Ideology* (Cambridge, 1983), pp. 149–67.

J. Longrigg, *Greek Rational Medicine* (London, 1993).

I. M. Lonie, *The Hippocratic Treatises On Generation, On the Nature of the Child, Diseases IV: A Commentary* (Berlin and New York, 1981).

J. Mansfeld, *The Pseudo-Hippocratic Tract περὶ ἑβδομάδων* (Assen, 1971).

R. B. Onians, *The Origins of European Thought* (Cambridge, 1952).

F. Skoda, *Médecine ancienne et métaphore* (Paris, 1988).

W. D. Smith, *The Hippocratic Tradition* (Ithaca, NY and London, 1979).

W. D. Smith, *Hippocrates: Pseudepigraphic Writings* (Leiden, 1990).

H. von Staden, *Herophilus. The Art of Medicine in Early Alexandria* (Cambridge, 1989).

O. Temkin, 'Hippocrates as the Physician of Democritus', *Gesnerus* 42 (1985), 455–64.

TEXT

Περὶ ἀνατομῆς[2]

I

1. *Ἀρτηρίη ἐξ ἑκατέρου φαρυγγέθρου τὴν ἔκφυσιν ποιευμένη ἐς ἄκρον πνεύμονος τελευτᾷ, κρίκοις ξυγκειμένη ὁμορυσμοῖς, τῶν περιηγέων ἁπτομένων κατ' ἐπίπεδον ἀλλήλων.*

2. *Αὐτὸς δὲ ὁ πνεύμων ξυνεξαναπληροῖ τὴν χέλυν, τετραμμένος ἐς τὰ ἀριστερά, πέντε ὑπερκορυφώσιας ἔχων, ἃς δὴ καλέουσι λοβοὺς, τεφρίνης χροιῆς τυχών, στίγμασιν ὀρφνώδεσι κεκεντημένος, φύσει ἐὼν τενθρηνιώδης.*

3. *Μέσῳ δ' αὐτέῳ ἡ καρδίη ἐγκαθίδρυται, στρογγυλωτέρη καθεστεῶσα πάντων ζῴων. Ἀπὸ δὲ καρδίης ἐς ἦπαρ βρογχίη πολλὴ καθήκει, καὶ μετὰ βρογχίης φλὲψ μεγάλη καλευμένη, δι' ἧς οὖλον τὸ σκῆνος τρέφεται.*

4. *Τὸ δὲ ἦπαρ ὁμορυσμίην μὲν ἔχει τοῖς ἄλλοις ἅπασιν, αἱμορρωδέστερον δέ ἐστι τῶν ἄλλων, ὑπερκορυφώσιας ἔχον δύο, ἃς καλέουσι πύλας, ἐν δεξίοις τόποις κείμενον. Ἀπὸ δὲ τουτέου σκαλήνη φλὲψ ἐπὶ τὰ κάτω νεφρῶν ἀποτείνουσα.*

5. *Νεφροὶ δὲ ὁμοιορυσμοὶ, τὴν χροιὴν δὲ ἐναλίγκιοι μήλοισιν. Ἀπὸ δὲ τουτέων ὀχετοὶ σκαληνοειδέες ἐς ἄκρην κορυφὴν κύστιος κεῖνται.*

6. *Κύστις δὲ νευρώδης οὖλη καὶ μεγάλη. Ἔκαθεν κύστιος μέσα ὀσχέα πέφυκε.*

7. *Καὶ τὰ μὲν ἔξ ἀνὰ μέσον ἐντὸς φύσις ἐκοσμήθη.*

II

8. *Οἰσοφάγος δὲ ἀπὸ γλώσσης τὴν ἀρχὴν ποιεύμενος ἐς κοιλίην τελευτᾷ, ὃν δὴ καὶ ἐπὶ σηπτικῆς κοιλίης στόμαχον καλέουσι.*

9. *Πρὸς δὲ ἀκάνθης ὄπισθεν ἦπατος φρένες πεφύκασι. Ἐκ δὲ πλευρῆς νόθης, λέγω δὲ ἀριστερῆς, σπλὴν ἀρξάμενος ἐκτέταται ὁμοιόρυσμος ἴχνει ποδός.*

10. *Κοιλίη δὲ ἥπατι παρακειμένη κατ' εὐώνυμον μέρος οὐλομελής ἐστι νευρώδης. Ἀπὸ δὲ κοιλίης πέφυκεν ἕντερον ὁμοιόρυσμον, μακρόν, πηχέων οὐκ ἔλασσον δώδεκα, ἑλικηδὸν ἐν κόλποις ἐνειλούμενον, ὃ καλέουσιν ἔνιοι κόλον, δι' οὗ ἡ παραφορὰ τῆς τροφῆς γίγνεται.*

11. *Ἀπὸ δὲ κόλου πέφυκεν ἀρχὸς λοίσθιος, σάρκα περιπληθέα ἔχων, ἐς ἄκρον δακτυλίου τελευτῶν.*

12. *Τὰ δὲ ἄλλα ἡ φύσις διετάξατο.*

[2] A Budé text by M.-P. Duminil is promised.

APPARATUS CRITICUS

I

1. ὁμορυσμοῖς V: ὁμοιορυσμοῖς van der Linden /ἁπτομένων Ermerins: ἁπτομένη V.

2. ξυνεξαναπληροῖ Ermerins: συνεξαναπληροῖ V/ τετραμμένος ἐς τὰ ἀριστερά V: τετραμμένος εἰς τὰ ἀμφότερα vel ἀμφίστερνα vel τὰ ἄμφω στέρνα Cornarius: τετρημένος ἔς <τε τὰ δεξιὰ καὶ> τὰ ἀριστερά van der Linden: τετραμμένος ἐς <τὰ δεξιὰ καὶ ἐς> τὰ ἀριστερά Ermerins/ὑπερκορυφώσιας Ermerins: ὑποκορυφώσιας V/ὀρφνώδεσι Foesius: ὀρφοναγεσιν V: ἀφρώδεσι van der Linden: ὀφρυόεσι Littré/ τενθρηνιώδης Foesius: ἐὼν τὲ θρηνιώδης V.

3. βρογχίη πολλὴ καθήκει, καὶ μετὰ βρογχίης edd.: μετὰ βρογχίη V: βρυχίη φλὲψ καθήκει, καὶ μετὰ τῆς βρυχίης van der Linden.

4. ὁμορυσμίην V: ὁμοιορυσμίην van der Linden/ἅπασιν V: ἧπασιν Triller/κείμενον Ermerins: κειμένας V/ νεφρῶν recc.: νεφρόν V.

5. μήλοισιν V: μηλείοισιν Triller/ ἐς ἄκρην van der Linden: ἄκρην V.

6. ἔκαθεν κύστιος μέσα ὀσχέα Craik: ἔκαθε κύστιος μεσοχὴ εἶσα V: ἑκάσταθε δὲ κύστιος μετοχὴ εἴσω recc: ἔγκας δὲ κύστιος μετοχὴ εἴσω Triller: ἔκαθεν δὲ κύστιος μετοχὴ εἰς ὃ Littré: ἐκ δὲ τῆς κύστιος μετοχέτευσις ἔξω Ermerins.

7. φύσις *V:* φύσι Ermerins.

II

8. ἐπὶ σηπτικῆς V/ ἐπισημαντικῶς vel ἐπισήμως Cornarius ap. Foesium/ καλέουσιν edd.: καλέουσι V.

9. πεφύκασιν edd.: πεφύκασι V/ ὁμοιόρυσμος edd.: ὁμοιορυσμῷ V.

10. οὐλομελής V: οὐλομένη recc.: οὐλομελίῃ van der Linden/οὐλουμένη Triller/ μακρὸν ap. Foesium: μικρὸν V/ἐν κόλποις V: ἐς κόλπους van der Linden/κόλον V: κῶλον recc. / γίγνεται recc.: γίνεται V.

11. κόλου V: κώλου recc./περιπληθέα V: πολυπληθέα van der Linden/ ἐς ἄκρον V: καὶ ἐς ἄκρον van der Linden.

12. Post διετάξατο lacunae signa Ermerins: fortasse διετάσσετο Craik.

TRANSLATION

I

1. The trachea, taking its origin from each side of the throat, ends at the top of the lung; it is composed of similar rings [to other creatures'], the circular parts touching one another on the surface.

2. The actual lung, inclined towards the left, fills the chest cavity. The lung has five projecting parts, which they call lobes; it has an ashen colour, is punctuated by dark spots, and is in nature like a honey-comb.

3. In the middle of it the heart is situated: it is rounder than [that of] all creatures. From the heart to the liver a large tube goes down, and with the tube the vessel called the great vessel, by means of which the entire frame is nourished.

4. The liver has a similarity to [that of] all other creatures, but is more blood-suffused than [that of] others. It has two projecting parts, which they call gates; it lies in the right part [of the body]. From the liver a slanting vessel extends to the parts below the kidneys.

5. The kidneys are similar [to other creatures'] and in colour are like [those of] sheep. From them slanting ducts reach to the top edge of the bladder.

6. The bladder is all sinewy and large. At a distance from the bladder come, centrally, the genitals.

7. In these six parts [bodily] nature has been arranged internally in the middle.

II

8. The oesophagus, taking its origin from the tongue, ends at the belly; they call it 'mouth' for the putrefying belly.

9. From the backbone, behind the liver, comes the diaphragm. On the false side, I mean the left, the spleen begins, and extends, similar to a footprint.

10. The belly, lying beside the liver, on the left side, is all sinewy. From the belly comes the intestine, which is similar [to other creatures'], long, no less than twelve cubits, in coils entangled in folds. Some call it the colon, and by it the passage of the food occurs.

11. From the colon comes last the rectum, which has fleshy tissue, and which ends at the extremity of the anus.

12. The rest, nature has organized.

COMMENTARY

1. On the trachea see *GA* 1270, 1275: 'The trachea, or windpipe, is a cartilaginous and membranous tube . . . continued downward from the lower part of the larynx. . . . The cartilages . . . vary from sixteen to twenty in number. Each is an imperfect ring which occupies the anterior two-thirds or so of the circumference of the trachea. . . . Two or more of the cartilages often unite, partially or completely'. The author, then, is correct about the rings and about the rings 'touching' one another. Nothing, however, is said about the branching of the windpipe into the right and left extrapulmonary bronchi, which lead separately to right and left lung.

ἀρτηρίη: in Greek medicine, the term ἀρτηρίη (or ἀρτηρίη τραχεῖα, whence trachea; cf. Celsus' '*arteria aspera*') eventually prevailed for the trachea or windpipe. But in the HC the terminology of trachea and bronchial tubes is ambiguous and inconsistent, even within individual treatises and, at times, within individual sections of them (cf. *Int.* 1 on ἀρτηρίη, φλέβια, and σύριγγες all connected with the lung). The term βρόγχος is used not only of the bronchial tubes but generally of the area between throat and lung and, conversely, ἀρτηρίη may be applied to the bronchial tubes; also the two terms may be found together (as *Loc.Hom.* 3.5, 10.1, 14.2, 14.7, where βρόγχος is trachea and ἀρτηρίαι, or by tacit substitution ἀορτεῖς, are bronchial tubes). In the HC, the trachea is rarely simply ἀρτηρίη (but see *Epid.* 7.12 and 25). Most commonly, the term ἀρτηρίαι is, like φλέβες, applied to the important hollow bodily tubes, ducts, or vessels through which fluids (not only blood) were believed to course, and is analogous to the term νεῦρα applied to the solid links in the body, i.e. tendons, sinews, muscles, ligaments, as well as (occasionally) nerves. In some passages ἀρτηρίη is ambiguously used, both of trachea and of vessel (*Epid.* 2.4.1 ~ *Oss.* 5).

In a later distinction, generally agreed to have been formalized by Praxagoras, the arteries were believed to convey πνεῦμα and the veins blood through the body. Thus, in accord with Rufus' explanation (*Anat.* 65, 183 DR) that the φλέβες carry blood and the ἀρτηρίαι blood to some extent but rather πνεῦμα 'air', Pollux (2.5) defines ἀρτηρίαι as paths for air analogous to φλέβες, for blood. The connection between ἀρτηρία as trachea and as artery is probably that both were regarded (rightly in the case of the former) as conveying air. The derivation is uncertain. Possibilities canvassed are from αἴρω 'lift', presumably because the lungs seemed 'suspended' by the trachea, and the heart by the aorta (which, however, itself must be from ἀορτέω 'suspend'); or from ἀραρίσκω 'fit', presumably because the ἀρτηρίη seemed to 'fit' parts of the body together (and for this notion, cf. *Oss.* 1, the intestines ἥρτηται); as did the ἄρθρα, 'joints'.[3]

ἐξ ἑκατέρου φαρυγγέθρου: this term is not used elsewhere in the HC, but is common in late medical writers.[4] It is glossed (s.v. φαρύγαθρον) by Hsch. As a techical locative term, it does not differ in sense from the common term φάρυγξ (cf. Rufus φάρυξ δὲ ἡ φαρύγεθρον *Onom.* 62, 141 DR) or occasional term λάρυγξ, this being the interior of the τράχηλος or αὐχήν (but both of these are used for other narrow parts also, such as the neck of the bladder or of the womb). Pollux differentiates between φάρυγξ, start of oesophagus and λάρυγξ, of trachea (2.4.207).

[3] See Greenhill (1864–6), Irigoin (1980).
[4] Ibycus, *TLG*: Aretaeus, Aetius, Galen, and Oribasius.

Unsurprisingly, the adjective ἑκάτερος, 'each (of two)' is especially common in bodily description (legs, kidneys *Carn.* 5); but the usage here, of each [side of the] throat is unexpected. However, from τράχηλος τὰ μέρεα αὐτοῦ ἑκάτερα ἔνθα καὶ ἔνθα ἀδένας ἔχει, *Gland.* 7 (cf. ἑκατέρωθεν, *Gland.* 4), it seems that the throat was regarded as essentially bipartite, possibly because of its connection, in breathing, with the two nasal passages. (φάρυγγες is occasionally used in the plural, as ἀπὸ κεφαλῆς κατὰ τὰς φάρυγγας, *Mochl.* 39.)

τὴν ἔκφυσιν ποιευμένη: the technical expression ἔκφυσις with reference to trachea has the same significance as the more general term ἀρχή in the parallel description of oesophagus in 8 below, i.e. 'starting-point', 'inception'. Like the related terms ἀπόφυσις, 'excrescence', 'protuberance' (for which ἐπίφυσις is a common manuscript variant) and παράφυσις, it is common in anatomical contexts, especially in *Artic.*, *Fract.* and *Mochl.*; also *Oss.* (e.g. *Artic.* 45, *Fract.* 12, *Mochl.* 1; *Oss. passim*). The terms are typically but not exclusively medical or biological. The circumlocution τὴν ἔκφυσιν ποιευμένη, with abstract noun plus ποιεῖσθαι standing for verb with same root as the noun, recurs in 8 below, τὴν ἀρχὴν ποιεύμενος = verb ἀρχόμενος, as ἀρξάμενος, 9. This is by stylistic preference, the verb being available as alternative: as ἀποπέφυκε, *Loc.Hom.* 3.6 and ἐκπεφύκασιν, *Oss.* 4.

ἐς ἄκρον πνεύμονος: the substantival form 'top point', 'extremity', 'edge' is used again below, ἐς ἄκρον δακτυλίου: this use is uncommon in Attic Greek, but is a regular alternative in the HC, particularly for bodily extremities, as in plural τὰ ἄκρα, *Acut.* 30; and repeatedly in *Artic.* The adjectival form is here used once (ἄκρην κορυφήν, 5).

The singular form πνεύμων is dominant in the HC (and the rare plural is both preceded and followed by the singular, *Gland.* 14). From the expression 'the top of the lung', and the use throughout of the singular, it is evident that the author regarded the lung as a single joined organ, as indeed did Aristotle (*HA* 1.16.495b; *PA* 669b). The original form πλεύμων gave way to πνεύμων presumably because of a supposed connection with πνεῦμα: from the heroic age the lung was known to be vital to life (Hom. *Il.* 4.528 etc.).[5]

τελευτᾷ: this verb, repeated three times in this short piece (1, trachea ending at lung; 8, oesophagus at belly; 11, rectum at anus) is regularly used of the location of bodily parts in the anatomical treatises. For the use of the preposition ἐς, cf. κεῖσθαι ἐς below, 5.

κρίκοις ξυγκειμένη ὁμορυσμοῖς: the sense of κρίκοις is evident, but the expression, forerunner of the modern term 'cricoid' cartilage, is unusual in Greek. Pollux (1.94, on rings for ships' hawsers) regards κρίκος as poetic for κίρκος or κύκλος. Elsewhere in the HC, the noun occurs only in *Mochl.* 41, where it denotes a 'loop' attached to a piece of apparatus (ἄγκυλαι in the excerpted text, *Fract.* 30). The compound verb ἐγκρικόω occurs *Oss.* 18 in the phrase ἐνεκρίκωσεν πρὸς τὴν ἄκανθαν (glossed Erotian E 38 ἐνέδησεν). Celsus' expression *'constat ex circulis quibusdam'* (4.1.3) shares the metaphor. For the compound verb, of bodily composition, see *Fract.* 9

[5] Maladies of the lung and respiratory tract occupy much space in the HC: see especially *Int.* init. and *Loc.Hom.* 14.

(foot and hand composed of many small bones); and see κεῖσθαι below (4, position of liver and 5, position of ureters; also παρακεῖσθαι (10, belly in relation to liver).

The concatenation of terms ὁμορυσμοῖς, ὁμορυσμίην, ὁμοιόρυσμοι, ὁμοιόρυσμον, ὁμοιόρυσμον (connected respectively with rings of trachea, 1; with liver, 4; with kidneys, 5; with spleen, 9; with intestine, 10) is arresting;[6] and we may add ἐναλίγκιοι (connected with the kidneys, 5): throughout, the author is concerned with comparisons, expressed in consistent terminology. In scientific writing, technical terms are liable to be repeated; indeed, variation can be misleading and obscure the sense. Suda (s.v. ῥυσμός) glosses: κατὰ Ἀβδηριτικὴν διάλεκτον σημαίνει τὸ σχῆμα, καὶ ἑτέραις δὲ λέξεσιν οὐχ ἑλληνικαῖς οἱ περὶ τὸν Ἀβδηρίτην Δημόκριτον χρῶνται. Other late commentators (Philoponus, Eustathius), perhaps using the same source, reiterate this information on the Abderite sense of ῥυσμός (σχῆμα, ἔκτασις, θέσις, διάστασις, τύπος), and there is good evidence that ῥυσμός and related words were favoured by Demokritos; see further below. Whatever the authentic Hellenic character of the 'other words' allusively mentioned in the Suda, it seems unduly harsh to imply that the semantic extension of ῥυσμός (Ionic for Attic ῥυθμός) 'form' is not admissible Greek. It seems rather to have been a matter of stylistic preference; cf. E. *El.* 772 (in hendiadys with τρόπος) also *HF* 130, *Supp.* 94. The sense 'shape' is dominant: see Arist. *Metaph.* 985b16, identification with σχῆμα, also Hdt. 5.58, of letters, and *Artic.* 62, of boots; but coexists with more abstract usage, as in *Septim. passim.* Hsch. glosses ῥυσμοδόσθαι· συγκρίνεσθαι, 'compare', precisely in line with the sense of the related words here.

τῶν περιηγέων ἁπτομένων κατ' ἐπίπεδον ἀλλήλων: neither περιηγής 'circular' nor ἐπίπεδος 'level', 'plane' occurs elsewhere in the HC. The former term, which Hsch. glosses as κυκλοτερές, περιφερές, is used by Empedokles (DK 31 B 27.4 = Plu. *Mor.* 926d; cited also Stob.).[7] The term ἐπίπεδος is common in many of the pre-Socratics, including Philolaus, Pythagoras, Anaximander, as well as Demokritos, typically in mathematical contexts (as Demokritos DK 68 B 155 = Plu. *Mor.* 1079e). The vocabulary of this phrase is somewhat alien to the HC, with technical terms of general scientific writing rather than of medicine. Rufus, arguing for the primacy of medical terminology by analogy with learning methods in other skills, cites geometry, where the pupil first learns στιγμὴν καὶ γραμμὴν καὶ ἐπίπεδον, 'point, line, and plane' (*Onom.* 5 = 133–4 DR).

The manuscript reading ἁπτομένη is retained by early editors (glossed ἡμμένη, προσδεδεμένη, i.e. 'attached'). Without ἀλλήλων this would be acceptable Greek; but as the text stands it is impossibly awkward. The nominative singular feminine of the

[6] Following van der Linden, Triller emends the two occurrences of ὁμο- to ὁμοιο-. However, this is unnecessary, as the difference between ὁμο- words (from ὁμός, 'one and the same') and ὁμοιο- words (from ὁμοῖος, 'like', 'resembling') is not always strictly maintained; except that whereas ὁμο- words can mean 'similar', ὁμοιο- words cannot mean 'the same'. Thus ὁμοειδής (close in nuance to ὁμορυσμός here) can mean either 'of like form' or 'uniform'; and coexists with ὁμοιοειδής, which must mean 'of like form'. In our passage, no instance of ὁμορυσμός imperatively demands the sense of sameness rather than similarity; and only one (the case of the spleen) demands the sense of similarity rather than sameness. The Greek is ambiguous, but reference to comparative anatomy ('rings like [those in other animals]') is more probable than to 'a series of rings'; see further below.

[7] Ibycus, *TLG*: 46 occurrences, most Hellenistic or later, but found in Hesiod, Aischylos and Plato.

participle was doubtless scribal error, following *ποιευμένη . . . ξυγκειμένη* and failing to anticipate the change to the genitive absolute construction.

2. On the colour, mottling, and texture of the lung, see *GA* 1285: 'The substance of the lung is of a light, porous, spongy texture . . . in adult life the colour is a dark slaty-grey, mottled in patches.' (The lung is rose-pink in all young creatures; the characteristic black pigmentation, in animals as in humans, is due to breathing an impure atmosphere.) There can be no doubt that the author here describes human anatomical features: five lobes; in fact two (superior and inferior) in the left lung and three (superior, middle and inferior) in the right. The configuration of lobes in the lung is peculiar to different creatures: in the Equidae the lung is not divided into lobes at all; in cattle the lungs are divided into lobes by deep fissures, the left lung having three and the right lung four or five lobes; in the pig the left lung is like that of the ox while the right has an additional apical lobe, itself often in two parts; in the dog each lung has three large lobes, but the right has a small extra lobe and there may be one or more accessory lobes in either lung (*BVD*, s.v. 'lung').

αὐτὸς δὲ ὁ πνεύμων: this initial expression contrasts with the bald resumption of comment, often without even the article, on other organs (liver, bladder, kidneys) picked up from preceding sentences. But cf. *αὐτὴ δὲ* (vessel), *Oss.* 12, bis.

ξυνεξαναπληροῖ τὴν χέλυν: the triple compound is a remarkable formation.[8] Double *συν-* compounds are common enough (32 instances, many occurring several times over, in the HC); and *πληρόω* is a verb commonly made compound (in the HC as *ἀποπληρόω, ἐκπληρόω, ἐπιπληρόω, συμπληρόω*). But the triple compound with *συν-* is unparalleled in the medical treatises of the HC, though note *συνεισκατοικέω Ep.* 23.

χέλυς lit. 'tortoise' is used by extension of things of tortoise shell, commonly the lyre; or of tortoise shape, as 'arched' parts of the body, typically as here the chest and cf. E. *El.* 837 of a bull; cf. also Pollux 2.177 *χελώνιον* explained 'arched part of the back'. See also *χελύνειον* (of the chin), *Ep.* 23. As 'arched' is a somewhat inappropriate descriptive term for the chest (even the chest when a deep breath has been taken), the metaphor may rather relate (i) to similarity with a tortoise shell, protecting vital parts of the body; for the idea, though coupled with anatomical misconceptions, cf. *ὁ θώρηξ καλεόμενος, ἐν ᾧ τὸ ἧπαρ στέγαζεται de Arte* 10; or (ii) to similarity with the lyre, through a realization that the voice comes from, and is somehow amplified by, the chest: cf. the idea that the lung is hollow, with the *σύριγξ* source of the voice, *Morb.* 4.56. The usage of *κίθαρος* 'chest' throughout *Loc.Hom.* (3.6; 10.1, 2; 14.1, 5, 10) shows the same metaphor.

τετραμμένος ἐς τὰ ἀριστερά: the phrase 'inclined (lit. turned) to the left'[9] seems at first sight to give an inaccurate description of the position of the two lungs and to conflict with the author's awareness (evident in what ensues) of the central position of the heart. Ermerins suggests 'turned to <the right and to> the left', on the supposition that a phrase has been lost; Cornarius' tentative emendations (see apparatus) would give a similar sense, 'turned to both sides'. Triller ingeniously

[8] Hence Triller tr. '*coadimplet*', following Cornarius in preference to Foesius' '*implet*'.

[9] *Τρέπεσθαι* is a common verb of orientation in the body, not only of bodily parts; but also of disease, pain, bile, phlegm, etc.

moots τετραμμένος ἐς τ' ἀρυστῆρα, 'adapted to drawing', on the grounds that the purpose of the lungs is inhalation; it is not clear whether he intended τ' to be particle or elided neuter plural article; but neither is possible Greek. (Van der Linden's emendation τετρημένος 'pierced', for τετραμμένος, 'turned', is to be rejected, as it would anticipate τενθρηνιώδης, 'honeycombed', if, as is likely, this is to be read below; and description of the position of the lungs is more appropriate here than description of their appearance.) Littré rejects any emendation, on the grounds that in ancient anatomical texts there is room for 'les erreurs materielles et les fausses opinions'. But there are two other possibilities. (i) The text is sound and the author not in error. As noted above, the author implies there is only one lung; and viewed in this way the lung may be regarded as 'turned to the left': there is a more acute angle on the left side than on the right, due to the position of the heart (see *GA* 1286), so that (*GA* 1290) the right lung is 'shorter'—though 'broader'—than the left. We may then retain the manuscript reading and translate 'inclined towards the left', 'deflected to the left'. (ii) A phrase describing the position of the heart has been misapplied to the lungs, possibly through telescoping of a source. Cf. the description of the human heart, contrasted with that of other creatures, μικρὸν εἰς τὰ εὐώνυμα παρεκκλίνουσα, Arist. *P.A.* 665b–666b.

πέντε ὑπερκορυφώσιας: the term ὑπερκορυφώσις occurs only here applied to the eminences or elevations of the lung (λοβοί) and of the liver (πύλαι); it implies a simple form κορυφώσις, not found either. The word is thus doubly recondite, prefix being added to rare or invented form. κορυφή occurs frequently in the HC as elsewhere with the meaning 'top', as of bladder, 5 below; and especially as crown of head, as *Loc.Hom.* 3; but the only usage of κορυφή similar to this passage, and the affinity is striking, is in the description of vessels in the region of the liver, one said to pass διὰ τῶν κορυφῶν καὶ τοῦ δέρματος 'between the tops [of the lobes] and the skin', *Oss.* 18.

ἃς δὴ καλέουσι λόβους: this is the first of five comments on nomenclature in *Anat.*: here, projections of lung; cf. projections of liver ἃς καλέουσι πύλας, oesophagus ὃν δὴ καὶ ἐπὶ σηπτικῆς κοιλίης στόμαχον καλέουσιν, intestine ὃ καλέουσιν ἔνιοι κόλον, and the vessel μεγάλη καλουμένη. With this information there is clear awareness of possible variation in terminology (ἔνιοι 'some') and perhaps of etymological rationale for terminology (especially if the emendation ἐπισημαντικῶς or ἐπισήμως is adopted, 8). The author is setting out the accepted terminology, which 'they' use, with a slightly didactic tone (δή, δὴ καί).

τεφρίνης χροίης τυχών, στίγμασιν ὀρφνώδεσι κεκεντημένος, φύσει ἐὼν τενθρηνιώδης: the appearance of the lung is described in three successive participial phrases loosely strung together, the first two relating to colour and the third to 'nature', 'character' (here perhaps close to 'texture').

(i) The first description 'ashen' is clear. Although τέφρινος is a hapax, the word τέφρη 'ash' occurs in the gynaecological treatises of the HC.

(ii) The second description is textually uncertain. The word στίγματα 'spots' (glossed Hsch. ποικίλματα) is not used elsewhere in the HC and κεκεντημένος, 'punctuated', lit. 'pricked out', is metaphorical, though readily understood; it is used of the pricking of pain *Morb.* 2.59. The adjective ὀρφοναγέσιν is not credible Greek; palaeographically, the slightest change mooted (by Triller) is to ὀρφναγενέσιν or

ὀρφνογενέσιν supposed to be equivalent to ὀρφνώδεσιν. But Triller himself rejects these fanciful forms in favour of Foesius' ὀρφνώδης. The various conjectures ὀρφνώδεσι (Foesius), ἀφρώδεσι (van der Linden), ὀφρυόεσι (Littré)—all reasonably close to the non-word ὀρφοναγέσιν—mean, respectively, 'dark', 'foamy', and 'protruding'. Of these the first seems anatomically best and alone is paralleled in the HC, *Progn.* 24, of darkness before the eyes.[10]

(iii) In the third phrase, the word division τὲ θρηνιώδης has otiose and misplaced τέ; and the single word τεθρηνιώδης 'like ash' merely replicates 'ashen' just before. Foesius' emendation τενθρηνιώδης 'honey-combed' gives an unusual word, in keeping with the author's elaborate vocabulary. It is attributed to Demokritos, in zoological and embryological writings (DK 68 A 155, citation from Ael. *HN* 12.20, on the formation of horn). Hsch. glosses τενθρηνιῶδες πολὺ καὶ κενὸν κηρίον, καὶ ἀραιόν. The most salient characteristic of the lung is generally thought to be its spongy texture; cf. *Oss.* 13, *V.M.* 22 and many later medical writers, including Celsus 4.1.3, '*spongiosum*'.

3. The author is correct that the heart is 'in the middle of the lung' (i.e. between the lungs), but the allegation that the human heart is peculiarly round cannot be sustained. The heart is in fact neither round, nor heart-shaped; but rather amorphous, or somewhat pouch-shaped (*GA* 697 fig. 678). The reference to the two descending parts (βρογχίη πολλὴ. . . καὶ φλεὲψ μεγάλη) is probably to the prominent vessels, the aorta and vena cava: see *GA* 1415, fig. 1230.

ἐγκαθίδρυται: this compound does not occur elsewhere in the HC, though the simple ἱδρύω is common, often used of a bone 'sitting' in place, *Fract.*, *Artic.*; and there are seventeen other Hippocratic ἐγκατα- compounds.[11] The sense of the verb here is close to that in *Ep.* 23, συνίδρυται of eyes (cf. ἐγκαθήμενοι, of eyes, *Epid.* 2.2.24), ἐνιδρυσμένοι of kidneys and ἐνιδρυσμένη of bladder,[12] and also the notion of the heart as 'ruler', καρδίη βασιλίς. Cf. also the descriptions of the heart ἐνίδρυται . . . ὡς ἐκ παντὸς τοῦ σώματος τὰς ἡνίας ἔχουσα, *Oss.* 18; and περὶ μέσον . . . ἐν γὰρ τοῖς τιμιωτέροις τὸ τιμιώτατον καθίδρυκεν ἡ φύσις, Arist. *P.A.* 665b–666b.[13]

στρογγυλωτέρη . . . πάντων ζώων: the Greek expression is slightly illogical; lit., 'rounder than all creatures'. Hence Ermerins suggests πάντων τῶν ἐν ζώῳ (i.e. 'of all animal organs'). But there is a compendious comparison (cf. 'hair like the graces', sc. the graces' hair); and in 'all creatures', 'other' is readily understood, i.e. 'rounder than that of any other creature'. Similar comparisons are made below, 4 and 5. For this universal anatomy, cf. τοσοῦτον ἐς τὸν ἄνθρωπον ἀποδείξω καὶ τὰ ἄλλα ζῷα, *Carn.* 1. The alleged roundness of the human heart may be based simply on a view that roundness is a 'good' state; cf. Pl. *Ti.* 33 b, c, the κόσμος is spherical because the

[10] As Foesius translated '*notis cavernosis compunctus*', it seems that he finally elected to emend with a word meaning 'cavernous', perhaps ἀντρώδης.

[11] The verb ἐγκαθιδρύω is common in post-classical, especially ecclesiastical, writers (Ibycus, *TLG*: 47 occurrences, headed by 7 in Nicephorus Gregoras); but there are good fifth-century antecedents. Euripides uses it of establishing a cult image, λαβεῖν ἄγαλμ' Ἀθηνῶν τ' ἐγκαθιδρῦσαι χθονί, *I.T.* 978 and employs καθιδρύειν with similar nuance, *I.T.* 1481; cf. also *Ba.* 1339.

[12] So earlier editors; but Smith (1990) corrects to ἐνδρασμένοι and ἐνηδρασμένη.

[13] For the compound verb, there is a parallel in a Demokritean citation, with regard to dream images 'deeply penetrating' the body ἐγκαταβυσσοῦσθαι τὰ εἴδωλα διὰ τῶν πόρων εἰς τὰ σώματα, DK 68 A 77 = Plu. *Mor.* 734f.

sphere is the most perfect of shapes; circular motion is connected with rational activity. Other descriptions of the heart are: *σχῆμα μὲν ὁκοίη πυραμίς*, *Cord.* 1 and *κωνοειδής*, *Ep.* 23; but 'somewhat rounded', Arist. *H.A.* 496.

βρογχίη πολλὴ . . . φλὲψ μεγάλη: two links between heart and liver are indicated. But the terminology is opaque and the brevity and baldness of this text of uncertain date and context renders identification problematical. First, it must be stressed that there is no particular emphasis on the links: the author is simply describing the area between heart and liver. There is no indication that either heart or liver is peculiarly important in bodily function.The two links are: (i) *βρογχίη πολλή* and (ii) *φλὲψ μεγάλη καλευμένη*, by which the whole body is nurtured. *βρογχίη* is any tube (commonly but by no means exclusively the aorta) or system of tubes (commonly the bronchial tubes); and *πολλή* may mean 'many a' or 'big' (cf. Hsch. *πολὺ γὰρ ἀντὶ τοῦ μέγα*). *φλὲψ μεγάλη* commonly refers to the vena cava; but the term could be simply general and descriptive rather than technical and specific. If *ἡ* were to be added, the technical use would be certain, but nothing can be deduced from its omission in this terse work. On *τρέφεται* as a possible aid to identification, see below. Other descriptions (in different authors of different dates) of the aorta are as *ἀρτηρίη μεγάλη*, *μεγίστη*, *ὀρθή*, *παχεῖα*, *πνευματική*, and of the vena cava are as *φλὲψ κοίλη*, *κοιλοτάτη*, *ἠπατῖτις*. But the vena cava is sometimes designated *ἀρτηρίη*, perceived to be different from the other *φλέβες* (by reason of its character, economically described by Triller '*cum ratione tunicae, tum ratione motus et pulsus*') and Galen uses the term *μεγάλη* (with or without the addition *πρὸς πύλας*) for the portal vein, which is, after the vena cava, the body's largest.

The identification which best fits the tenor of the treatise, with its careful attention to location and strict paring down to essentials is as follows: (i) = aorta and (ii) = vena cava, with *πολλή* and *μεγάλη* synonymous, and the difference between the adjectives only a matter of stylistic variatio. This seems the simplest interpretation, consonant both with the Greek text and the salient anatomical 'links' in the thoracic cavity. And cf. the very similar *δύο γάρ εἰσι κοῖλαι φλέβες ἀπὸ τῆς καρδίης· τῇ μὲν οὔνομα ἀρτηρίη· τῇ δὲ κοίλη φλέψ*, *Carn.* 5. Here too the statement that vessels 'come from' the heart may be a matter of simple observation, not necessarily precluding the view that (other) vessels 'come from' the head. Aristotle orders his material similarly (transition from heart to vessels, *P.A.* 667b) but the tenor is very different, as the fundamental importance of the heart is recognized; as also in the sophistic treatise on nutriment, *ῥίζωσις φλεβῶν ἤπαρ, ῥίζωσις ἀρτηριῶν καρδίη· ἐκ τούτων ἀποπλανᾶται ἐς πάντα αἷμα καὶ πνεῦμα καὶ θερμασίη διὰ τούτων φοιτᾷ*, *Alim.* 31.[14]

[14] But several other identifications have been canvassed: 1. (i) = ducts and (ii) = vena cava. The *βρογχίη πολλή* of the mss is taken by LSJ to be an imaginary system of ducts connecting the heart with the liver; similarly Littré translates 'beaucoup de tuyaux'. Harris (1973), pp. 82–3 is impressed by the contrast between *βρογχίη πολλή* and the great vein; and translates 'many a bronchia [= artery?]' finding here 'a double system of blood vessels centred on the heart, with veins and arteries clearly distinguished'. But the trouble with this is that even if *βρογχίη* may represent a plurality, *φλὲψ* (*μεγάλη*) does not; and it is hard to extract a 'system' from a tube; also the vessels are not 'centred on' the heart, but merely leading from it. In short, a distinction between veins and arteries cannot be read into this bald text.

2. (i) = vena cava and (ii) = aorta. Objection: aorta is rarely described as *φλέψ*, though for this designation, cf. *Carn.* 5.2, quoted above.

3. (i) = vena cava and (ii) = portal vein. Triller compares Aristotle's *προσπεφύκασι γὰρ τῷ ἤπατι αὗται δύο φλέβες μέγισται ἡ μὲν καλουμένη πύλη, ἡ δὲ κοίλη* and, while admitting that vena cava is usually that called *μεγάλη*, argues that *πολλή* ('*spatiosam, amplam, maximam*')

δι' ἧς οὖλον τὸ σκῆνος τρέφεται: the word σκῆνος is used four times elsewhere in the treatises of the HC: 1, of premature infants (σκήνεα ἑπτάμηνα—emendation of codd. σκινσα *Septim.* 1); 2 = 3 of a body after death (τὸ τοῦ σώματος σκῆνος *Hebd.* 52 = *Aph.* 8.8, Littré I.402); 4, οἱ πόταμοι ἀνὰ τὸ σῶμα, τοῖσιν ἄρδεται τὸ σκῆνος *Cord.* 7, as well as in the [Demokritean] letter, *Ep.* 18, οὐλομελίην τοῦ σκήνεος. In all these instances, the word is the body either in the abstract or in its non-living state (before birth or after death).

The term is much used by Demokritos: DK 68 A 152 = Ael. *N.H.* 6.60 of the embryo; B 37, B 57, B 187, B 223, B 270, B 288 (all Stobaios citations), of corporeal opposed to mental or spiritual being.[15] The statement that the whole frame is nourished or nurtured by the great vessel opens up further problems. The verb may allude to the common conception of blood passing to different parts of the body and distributing nourishment as needed. For this common idea, cf. [vessels] αἱ τρέφουσι τὰς σάρκας, *Loc.Hom.* 3.6; also the vessel τρόφιμός τε καὶ ἔναιμος which τρέφει τὸν μυελόν, *Oss.* 16. The conception that the vena cava played an important part in this life-giving process might have arisen from the observation that the vena cava collapses on death.

But if the author is here working from an aborted foetus, a particular vessel which linked via umbilical cord to placenta, might seem to 'nourish the frame'.[16] Cf. the notion expressed that nutriment is breath in the lung, food in the belly while ἡ δὲ ἀρχαιοτέρη τροφὴ διὰ τοῦ ἐπιγαστρίου ᾗ ὁ ὀμφαλός, *Alim.* 30.

4. The author describes the situation and character of the liver, also the number of lobes. Cf. *GA* 1400, 'The liver . . . is situated in the upper and right parts of the abdominal cavity . . . owing to its great vascularity, wounds of the liver cause considerable haemorrhage. . . . The liver is divided . . . into a large right and a much smaller left lobe.' Once again, there is no doubt that human anatomy is being discussed. The liver varies greatly in character in different kinds of animal; the horse liver has three lobes; the ox only one distinct lobe; the sheep is similar; the pig has four main lobes and the dog six or seven lobes (*BVD*, s.v. 'liver'). The slanting vessel

may here be a substituted descriptive term.

4. (i) = (ii), both refer to vena cava, with emendation of βρογχίη to βρυχίη (adj., 'deep'). This is the emendation of Caspar Hoffman adopted by van der Linden (see apparatus). Objection: Greek is awkward, and anyway there is no real need to emend.

5. (i) = vena hepatica and (ii) = vena cava inferior. Ermerins (taking his starting point from van der Linden, who however restricted the reference to a single deep vein, the great vein) reads <ἡ> μεγάλη and supposes the reference is to two veins, the vena hepatica and the cava inferior.

Interpretations 3, 4, 5 seem open to the fundamental objection that the location is too low in the body to be right; 2 is terminologically awkward; 1 presses the Greek into excessively advanced anatomical knowledge.

[15] It occurs many times in *Ti. Locr.*, a précis of Pl. *Ti.* preserved in some Platonic mss, apparently (so Taylor ed., 1928) in an attempt to give a superficial Pythagorean colouring to the work. It becomes extremely common in post-classical Greek, for instance in Eusebius (Ibycus, *TLG*).

[16] Triller's interpretation (above n. 14.3) has some such rationale: the umbilical vein by which '*revera infantis corpusculum nutritur*' could readily be associated with the portal vein. However, Triller does not totally exclude the vena cava in this connection; and the latter is rendered likely by the fact that the course of blood from placenta is through umbilical vein to ductus venosus to inferior vena cava; before, at birth, the ductus venosus collapses with the collapse of the umbilical vein; see C. W. F. Burnett, *The Anatomy and Physiology of Obstetrics* (London, 1953), pp. 129–34. It is not impossible that there was some observation of this if the aborted foetus was examined (though observation of the ductus venosus is not recorded until the sixteenth century).

is probably to be identified with the portal vein, which conveys blood to the liver from the intestines (*GA* 854 and 855, fig. 787); it follows the downward course here implied and overlies (is anterior to) the vena cava. Another candidate is the splenic artery, which is 'remarkable for the tortuosity of its course' (*GA* 779), but this goes across the body rather than downwards.

ὁμορυσμίην μὲν ἔχει τοῖς ἄλλοις ἅπασιν, αἱμορρωδέστερον δέ ἐστι τῶν ἄλλων: the second half of the sentence qualifies the first half; the liver is similar (μέν) in general to the livers of all other animals, but different (δέ) in relative 'bloodiness'.[17] Cf. Aristotle τὰ δὲ ἧπατα τῶν τετραπόδων καὶ τῶν ᾠοτόκων καὶ τῶν ἰχθύων ἔνωχρα τῶν πλείστων, *P.A.* 673b29; also Herophilos on the liver οὐχ ὁμοίως . . . οὐχ ὅμοιον . . . ἐν ἅπασιν (von Staden, 1989, 182–3). An alternative interpretation is possible: 'to all other organs of the body'. Aristotle comments that heart and other organs all have αἱματικὴ φύσις and are αἱματικὰ τὴν μορφήν, also that the spleen is αἱματωδής (*P.A.* 647a, 670b); but he regards the heart as even more 'bloody' than the liver, τὸ δὲ ἧπαρ αἱματικώτατον μετὰ τὴν καρδίαν τῶν σπλάγχνων (*P.A.* 637b). In view of the author's stress on comparative anatomy, the former interpretation is preferable. For the bloody character of the liver, cf. ἔναιμον, *V.M.* 22; πολυαίματον, Empedokles DK 31 B 150 = Plu. *Mor.* 683e. The bloody nature of the liver might be perceived without the theory that it was crucial in the distribution of the blood through the body. The associated vein is ἡ αἱμόρρους ἡ παχεία καλεομένη φλέψ as *Oss.* 7 and 12. Of fifteen instances of αἱμόρρους in the HC, four are in *Oss.* 7 and 12. αἱματωδής is more common, with seventy-three occurrences in the HC; but is applied to wounds, not to vessels.

ὑπερκορυφώσιας ἔχον δύο, ἃς καλέουσι πύλας: the projecting parts here called 'gates' are more commonly called 'lobes' (as in the case of the lung), while the term 'gate' is normally applied not (as here) to an eminence, but to a depression or indentation, especially the fissure through which the portal vein enters (see von Staden, 1989, 229). There are several such indentations, the two main ones being the points of entry of the vena cava inferior and the portal vein (*GA* 1405, fig. 1221). The term 'gate' is dismissed by Rufus as appropriate to augury, not to human anatomy (and the distinguishing features of animal livers were well known from minute examination in the course of augury following animal sacrifice; of all the organs it must have been most generally familiar—see e.g. E. *El.* 828sqq.); Rufus also states that the term 'gates' was applied by 'old doctors' to the attachment to the vena cava inferior (*Anat.* 28, 175 DR). It is possible that the odd terminology is the result of drastic summarization: the excrescences have been given the name gates, instead of lobes, while some description of gates is lost. Differentiation is clearly implied *Oss.* 10 = *Epid.* 2.4.1 ἐπὶ πύλας καὶ λοβόν, and cf. Pl. *Ti.* 71c1–2 λοβόν . . . δοχάς . . . πύλας. Hsch. has both terms: πύλας· ἐκτροπάς and λόβιον· τὸ ἄκρον τοῦ ἥπατος.

The number of lobes is variously given. Rufus believed there were four or five. Whereas in *Oss.* 10 a single lobe is envisaged, it is clearly stated in *Oss.* 1 that there are five (ἥπατος πέντε λοβοί) and in *Oss.* 18—as here in *Anat.*—that there are two (in the expressions τὸν δεξιὸν λοβὸν τὸν ἡπατιαῖον and μεταξὺ δύο λοβῶν). The minor

[17] Triller's emendation ἥπασιν 'to all other livers' is made on the grounds that the human liver, though resembling that of some animals, such as cow and sheep, is not like that of all other creatures; but this objection seems to be met by the qualification in the second part of the sentence.

excrescences of the caudate lobe and the quadrate lobe (*GA* 1405, fig. 1221) perhaps confused the issue; but inspection of different species would lead to different conclusions.

ἐν δεξίοις τόποις κείμενον: κείμενον (neut. sg.) is Ermerins' emendation of κειμένας (fem. pl.) and makes the liver lie on the right of the body, rather than the 'gates' on the right of the liver. The general statement is in accord with the rudimentary anatomical description of the text.[18]

σκαλήνη φλεψὶ ἐπὶ τὰ κάτω νεφρῶν ἀποτείνουσα: the adjective, not used elsewhere in the HC, is used by Demokritos (so DK 68 A 37 = Simp. *in cael.* 294.33, and, allegedly based on Aristotle, 132 = Thphr. *C.P.* 67.2); and is extremely common in a wide range of other authors of all dates. Hsch. glosses by σκόλιον, πολύγωνον.[19] The expression τὰ κάτω is compressed, sc. μέρη. The compound verb is used only twice in the HC, here and (in a temporal sense) *Epid.* 4.7, though both τείνειν and ἀποτείνειν are very common.[20]

5. The author describes the kidneys, of which (*GA* 1418) 'The cortical substance is reddish-brown in colour.' The ureters are correctly described as slanting, each being (*GA* 1422) 'a thick-walled, narrow, cylindrical tube which . . . runs downwards and medially' and 'crosses' various parts before (1423) 'finally the ureters run obliquely through the wall of the bladder'. The position of the ureters relative to each other varies from 2.5 cm to about 5 cm, according to whether the bladder is contracted or distended (*GA* 1429); and their position relative to the internal urethral orifice varies correspondingly. The author regards the ureters as reaching the top of the bladder, in accord with his top-to-bottom presentation of anatomy. As their actual position (*GA* 1425, fig. 1243) is rather reaching the 'edge', the translation 'top edge' is appropriate.

νεφροὶ δὲ ὁμοιορυσμοί, τὴν χροιὴν δὲ ἐναλίγκιοι μήλοισιν: as in the case of the liver, it is not immediately clear what is meant by the 'similarity' of the kidneys; ὁμοιορυσμοί, sc. εἰσι = (of the liver) ὁμορυσμίην ἔχει. In view of the apparent stress on comparative anatomy, the most likely explanation is 'like the kidneys of other creatures'; cf. the observation of Aristotle (correct only of the unborn infant *in utero*) that human kidneys are ὅμοιοι . . . τοῖς βοείοις . . . οὐχ ὁμαλεῖς ὥσπερ οἱ τῶν προβάτων καὶ τῶν ἄλλων τῶν τετραπόδων, *P.A.* 671b. But other possibilities are: 'like each other' (as they obviously are) or 'like other organs'; cf. καὶ εἶδος καρδίης οἱ νεφροὶ ἔχουσι· καὶ οὗτοι κοιλώδεες, *Oss.* 4. Comments on shape and colour are

[18] Triller, keeping κειμένας, argues that the phrase does not relate to location at all, either of the organ or of its gates, but to function: in his view δεξιός means not '*dexter*' but '*receptorius, acceptorius*', from root δέχομαι and describes the place which receives '*succum chylosum*' and puts it in the receptacle of the liver. There is some slight support for this ingenious idea from Hsch. s.v. δεξίς· τῶν ἐν τῷ ἥπατι μερῶν παρὰ τοῖς θύταις καλουμένη δόξη; and perhaps from Hsch. attribution to Demokritos of usage of the verb to describe blood vessels δεξαμεναί· ἐν τῷ σώματι φλέβες Δημοκρίτου DK 68 B 135. However, Triller's interpretation is to be rejected for these reasons: δεξιός is so familiar in other senses, τόποι clearly suggests a definite location in the body (cf. title of *Loc.Hom.*); and the writer of this treatise is concerned throughout with description, not with function.

[19] Triller regards this vessel as the descending vena cava (λοξήν Galen *de ven. et art. diss.*); but a vessel other than the 'great' one, argued above to be the vena cava, seems intended.

[20] There is some usage of ἀποτείνειν in Aristotle and Plato and much in later Greek; it is favoured by Joannes Chrysostom, Galen, Eusebius, and Simplicius (Ibycus, *TLG*).

pervasive in such descriptions; cf. Rufus, *σχήματι περιφερεῖς, χροιᾷ φακώδεις*, *Anat.* 51, 181 DR. Here, the ensuing comparison helps to resolve the question. Whereas in the case of the liver the ensuing phrase qualifies the likeness, in the case of the kidneys it amplifies: the kidneys have a similarity to those of other creatures, and further in colour they are like sheep, i.e. (in another compendious or compressed comparison) the kidneys are like [those of] sheep in colour. Cornarius, Foesius, and van der Linden all took *τὴν χροιήν* with *ὁμοιορυσμοί*, i.e. *'renes vero colore inter se similes'* (Foesius tr.) and continued by understanding the ensuing comparison with reference to apples, *'malorum speciem prae se ferunt'* (Foesius tr.). Clearly, their translation is based on the perception that the kidneys are like apples in shape, rather than in colour; but necessitates deletion of *δέ*. The interpretation of the ambiguous *μήλοισιν* as 'sheep' not 'apples' begins with Triller;[21] it greatly aids the sense and it may now be noted that in the HC the sense 'sheep' predominates over the sense 'apple' (15 to 12). The noun sometimes refers to animals generally, as Hsch. notes *μῆλα· κοινῶς μὲν πάντα τὰ τετράποδα, κατ' ἐπικράτειαν δὲ τὰ πρόβατα καὶ αἶγες*. Erotian refers the cognate adjective to sheep, *Σ* 56, *στέατι μηλείῳ ἀντὶ τοῦ προβατείῳ. μῆλα γὰρ τὰ πρόβατα*. Treatment by mutton fat, *Nat. Mul.* 32 etc. and by boiled mutton, *Morb.* 2.69 etc. are described by use of the word. *ἐναλίγκιοι* is epic and exclusively poetic, cf. Parmenides DK 28 B 8. 43 = Simp. *In Ph.* 144.29. It serves as a synonymous alternative to *ὁμοιορυσμοί*, also used in a simile, 9 below. The variatio avoids immediate repetition in a single sentence.

ὀχετοὶ σκαληνοειδέες ἐς ἄκρην κορυφὴν κύστιος κεῖνται: Hsch. and Suda gloss *ὀχετός* as *σολήν*. Elsewhere the ureters are *πόροι* or occasionally *φλέβες*. The preposition, added by van der Linden, is required. In a very similar expression of progress from larynx to bladder, fluid is said to go *ἐς ἄκρην κύστιν*, *Oss.* 1; cf. also Rufus, *πόροι κατὰ κορυφὴν κύστεως συνάπτουσι*.

6. The author completes the downward description with a brief account of the bladder and its outlet.

νευρώδης οὔλη καὶ μεγάλη: cf. *'vesica nervosa'*, Celsus 4.1.11. The adjective *οὖλος* is an epic and Ionic (though not in Herodotos) form for *ὅλος* 'all'.[22]

μέσα ὀσχέα: the emendation suggested is based on V's reading, unknown to Littré and others, who based emendations on the corrupt recc.[23] It gives the required sense, completing the description of the trunk (cf. Rufus, *thorax* extends *ἀπὸ κλειδῶν*

[21] The interpretation is commended by A. von Haller, *Bibliotheca Anatomica* (Zurich, 1774–7), vol. 1, p. 20. Triller's emendation of *μήλοισιν* to *μηλείοισιν* is not necessary; though it would render the animal sense certain rather than probable.

[22] Triller punctuates *κύστις δὲ νευρώδης, οὔλη, καὶ μεγάλη*, tr. *'vesica quae nervosa, constrictiva est et expansiva'*. There is some force in his assertion that *'res . . . ipsa id postulat'*; but the parallels for this extraordinary meaning attributed to *οὔλη* are not altogether convincing: Hsch. glosses s.v. *οὖλος· συνεστραμμένος* and scholiast Ar. *Ran.* 1067 *οὖλον* associated with *εἴλειν, εἰλεῖν*, viz. *'coarctare, complicare, in angustum cogere'*.

[23] Earlier emendations (see apparatus) may be briefly considered: the interpretation of Triller (with reference to the sphincter, tr. 'The constriction of the bladder is deep within') involves a level of detail out of keeping with the rest of the treatise; that of Littré (tr. 'From a distance is the working of the bladder for the purpose for which it exists') involves obscure sense and unidiomatic expression; that of Ermerins (tr. 'From the bladder there is a channel outside') gives good sense, but is very distant from the mss. (Triller emends on the basis of Galen's gloss *ἔγκας·*

μεχρὶ τῶν αἰδοίων): some reference to the final point outside the body is required, by analogy with 11 below. 'Centrally' is in accord with the constant reference to the position of the bodily parts throughout. ὀσχέα is palaeographically close to V; but other candidates, giving similar content, might be ὄρχεις (cf. the course of vessels ἐς τοὺς ὄρχιας καὶ ἐς τὸν ἀρχόν *Oss.* 17, and ἐκ δὲ σώματος κρεμαστοὶ ἐκτὸς οἰκίην νέμονται . . . ὄρχεις, *Ep.* 23) or ἴσχιον, e.g. ὀρχεῖς μέσοι πεφύκασιν or μετὰ ('after that') ἴσχια πέφυκε (cf. ἰσχίῳ στόμα, *Ep.* 23). Or if a reference to the urinary tract is postulated, we might consider ὀχετός, e.g. ἀνέκαθεν ἐκ κύστιος ὀχετὸς πέφυκε. Or the adverb κάτωθεν may be lost (cf. κάτωθεν τοῦ ὀμφάλου, *Aff.* 15). In any case, reference as throughout is primarily, and probably exclusively, to the male body.

7. The author sums up the previous description: the six parts are apparently trachea, lung, heart, liver, kidneys, bladder; and τὰ μὲν ἕξ in 7 seems at first sight to correspond with τὰ δὲ ἄλλα in 12. Seven, not six, was a significant number for Pythagoreans and others. In the numerology of anatomical lists, seven is regular; six is quite anomalous. If not fortuitous, it may result from a deliberately paradoxical count, or, more probably, from counting the kidneys as one, instead of as two. The list of seven vital organs (σπλάγχνα) was typically tongue, heart, lung, liver, spleen, two kidneys; the bladder included here would normally belong rather in a list of organs transporting food and breath. While this kind of listing is particularly common in post-Posidonian literature,[24] there are pre-Socratic antecedents also; and in the HC see especially *Carn.* (where heart, lung, liver, spleen, and kidneys form a group, 5–9, as do trachea, oesophagus, belly, and intestines, leading to bladder and rectum, 3).

ἀνὰ μέσον, ἐντός: the two phrases are in apposition, and ἡ ἐντὸς φύσις is not intended. Similar prepositional expressions are used in *Oss.*: κατὰ μέσον, 10, κατὰ τὸ μέσον, 12, ἐς τὸ ἐντός, 16 and cf. ἐντός, 17.

φύσις ἐκοσμήθη: the concepts κόσμος and φύσις are ubiquitous in philosophical and scientific writing, with subtly changing senses and nuances. One expects the allusive phrases φύσις ἐκοσμήθη, 7 and ἡ φύσις διετάξατο, 12 to be parallel statements, giving parallel conclusions. But there are two differences: the omission of the article in 7, though this may be insignificant in the context of this bald work, where the article is commonly absent; and the change from the passive voice in 7 to the middle in 12. (A small and tempting emendation from διετάξατο, which must be aorist middle, to διετάσσετο, which is ambivalent as imperfect middle or passive, would eliminate the latter problem; the change from aorist passive to imperfect passive would be much less troublesome to consistent sense than the change from passive to middle form.) The sense in 7 seems to be 'the body', 'the bodily organism', concrete, i.e. ἡ ἐντὸς φύσις <*sc.* τοῦ σώματος>; for which cf. ταῦτα δὲ πάσχει διὰ τὴν φύσιν τοῦ σχήματος, *VM* 22 and especially two passages αὗται πηγαὶ φύσιος ἀνθρώπου and ἔστι δὲ ὄργανα τοῖσιν ἡ φύσις ἁρπάζει τὸν ἀέρα, *Cord.* 7 and 8. It approaches the somewhat more abstract sense, 'bodily nature', evinced for example *Hebd.* 5

ἐν βάθει and interprets on the basis of the Suda μετοχή· ὁ περίβολος—i.e. *'ambitus, circulus, orbiculus'*, commenting, *'in ima vesicae parte sive cervice, orbiculus quidam, sive orbicularis est ambiens quidam musculus a natura formata est'*.)

[24] On such lists, and their possible importance as a source for *Hebd.*, see Mansfeld (1971), pp. 197–202.

(human); *Artic.* 13 (human vs. animal); *Nat.Mul.* 1 (female); and is at some great distance (though there is commonly a microcosm ~ macrocosm analogy) from the wide sense of such passages as φύσιν δὲ πάντων θεοὶ διεκόσμησαν, *Vict.* 1. See further on 12 below.

8. The author here starts again (similar descriptions of 'origin' and 'end' of oesophagus as of trachea); and goes on to give a rudimentary description of the digestive process, 8–11. The description is anatomically correct. 'The oesophagus, or gullet, is a muscular canal . . . extending from the pharynx to the stomach. It begins in the neck at the lower border of the cricoid cartilage' (*GA* 1340 and 1341, fig. 1167). The implied physiology is, however, mistaken: the oesophagus is apparently seen as the start of a parallel process of ingestion and excretion: air (and, presumably, some fluid) via trachea ~ food via oesophagus.

οἰσοφάγος: the term occurs also *Loc.Hom.* 3 and 20; but not elsewhere in the HC.[25] Galen's gloss (19.125 K.) probably relates to *Loc.Hom.*, not, as Foesius supposes, to *Anat.* The more usual term for oesophagus is the second given here, στόμαχος, e.g. *Cord.* 2, *Alim.* 25, *Morb.* 4.54. This occurs already in Homer (κατὰ στομάχοιο θέμεθλα 'base of neck', *Il.* 17.47; cf. *Il.* 3.292 and 19.266, throat of sacrificial victims). Rufus cites both terms ᾧ δὲ τὰ σιτία καὶ τὰ ποτὰ εἰς τὴν κοιλίαν κάτεισι, στόμαχος καὶ οἰσοφάγος *Onom.* 157, 155 DR.[26]

ἐς κοιλίην . . . ἐπὶ σηπτικῆς κοιλίης: Erotian K 35 defines κοιλίη as πᾶσα ἡ τοῦ διάφραγμα εὐρυχωρία, καὶ ἡ τοῦ θώρακος δὲ ἐνίοτε. καὶ ἡ γαστὴρ αὐτή. Usage with reference both to upper cavity (chest) and to lower cavity (abdomen), these being separated by the diaphragm, is ubiquitous in the HC. The sense of the preposition ἐπί is unclear; it is either 'towards' (LSJ I.3b and c), or 'in respect of' (LSJ III.4). The idea that digestion involved putrefaction—food being digested by a putrefying process and nutriment then conveyed to the liver for conversion into blood—was commonly associated with Empedokles (τὰς πέψεις τῆς τροφῆς φασι γίνεσθαι . . . Ἐμπεδοκλῆς δὲ σήψεις, DK 31 A 77 = Galen *de def.med.*, 19.372 K.); Galen regarded it as old-fashioned, δηλονότι παλαιά τις ἦν συνήθεια τούτοις τοῖς ἀνδράσιν ἄσηπτα καλεῖν ἅπερ ἡμεῖς ἄπεπτα λέγομεν (DK ibid. = *in Hipp.Aph.* 6.1, 18A.8 K.; cf. also ἡ δὲ πέψις ἔοικεν εἶναι σῆψις ὡς Ἐμπεδοκλῆς μαρτυρεῖ . . . DK 31 B 81 = Plu. *Quaest.Nat.* 912c; cf. DK 31 B 61 = Simplicius; and see Longrigg, 1993, 74). There are further traces of this notion in the expression σιτία ἄσηπτα 'unputrified food' occurring in *Aff.*, *Vict.* 3, *Morb.* 1. Emendations to ἐπισήμως or ἐπισημαντικῶς are therefore unnecessary. The idea of putrefaction was important in early Greek attempts to explain change and development of various kinds, including the formation of the world and animal life (Demokritos, DK 68 B 5 = Diod. 1.7.3; cf. *Carn.* 3, also Pl. *Phd.* 96b). In medicine, the proper healing of wounds and maturation of illnesses depended on the formation and expulsion of pus or similar matter (e.g. *Loc.Hom.*).

[25] The derivation is doubtless (Irigoin, 1980) from οἴσειν + φαγεῖν, i.e. 'transporting what is eaten'.

[26] In the HC, the term στόμαχος is applied also to the mouth of the womb. Only later, as in NT, Soranus, and Galen, did the word take over as 'stomach', a sense firmly fixed in Latin and hence modern European languages.

9. The locations of diaphragm and of spleen are cursorily and somewhat inaccurately indicated. The author does not know, or does not care, about the precise interrelation of these anatomical features, being concerned only with general proximity. 'The diaphragm is a dome-shaped, musculofibrous septum which separates the thoracic from the abdominal cavity, its convex upper surface forming the floor of the former, and its concave upper surface the roof of the latter. . . . The muscular fibres may be grouped according to their origins into three parts—sternal, costal, and vertebral' (*GA* 567). While the diaphragm might be described as 'coming from' the backbone, in the sense that the vertebral part is linked with the lumbar vertebrae by two pillars or crura (*GA* 568), this is scarcely its salient positional feature and it is connected equally with ribs and with sternum. Furthermore, the diaphragm certainly lies above, not behind, the liver. The spleen 'is situated principally in the left hypochondriac region of the abdomen . . . lies between the fundus of the stomach and the diaphragm' and is 'of an oblong flattened form' (*GA* 1476). With correction and amplification of the text we might state that the diaphragm separates the spleen from the left lung and pleura, and from the ninth, tenth, and eleventh ribs.

πρὸς δὲ ἀκάνθης ὄπισθεν ἥπατος φρένες πεφύκασι: the term *ἄκανθα* is properly the backbone or spine, for which the general *ῥάχις* 'back' is commonly used. The former term occurs in *Artic.* and *Mochl.* but rarely elsewhere in the HC (apart from *Oss.*—fin., but not init.—only in *Morb.* 2 and *Mul.* 1). Demokritos uses the word in a riddling sentence, *ἐν γὰρ ξυνῷ ἰχθύι ἄκανθαι οὐκ ἔνεισιν* DK 68 B 151 = Plu. *Sympos.* 643c; cf. also Diog. Apoll. DK 64 B 6 = Simp. *In Ph.* 153.13. The account in *Anat.* seems to be a garbled version of material which is much more clearly presented elsewhere in the HC: *ἦπαρ . . . ἀφωρμήκει σμικρὸν κάτωθεν φρενῶν. φρένες δὲ προσπεφύκασι τῷ ἥπατι ἃς οὐ ῥηίδιον χωρίσαι Epid.* 2.4.1; verbatim also in the account of *Oss.* 10. The liver was generally described as 'below' the diaphragm, as already by Homer, *ἦπαρ ὑπὸ πραπίδων* (*Il.* 11.579; cf. von Staden, 1989, 228). The term *φρένες*, applied to the lung in Homer (Onians, 1952), later denotes the diaphragm, important in the respiratory function, as well of course as the thinking faculty.

ἐκ δὲ πλευρῆς νόθης, λέγω δὲ ἀριστερῆς, σπλὴν ἀρξάμενος τέταται: Aristotle linked the spleen with the liver, and described the location of both with reference to the diaphragm: (liver below the diaphragm on the right, spleen on the left) *H.A.* 496b15 and (spleen a false liver) *P.A.* 669b28. The two are treated as parallel also by Rufus (spleen and liver below lung, liver on right and spleen *ἐναντίως τέτακται τούτῳ*) *Anat.* 28, 175 DR; cf. also the description of the spleen, *ἀπέναντι εὖδει, πρᾶγμα μηδὲν αἰτούμενος*, *Ep.* 23.

This is the only instance where the first person is used in the passage, and it may be contrasted with the third person used in the repeated statements of nomenclature. The most likely explanation is that the author is attempting personal exegesis of his source, 'my interpretation is . . .'. In doing so, he introduces a misunderstanding, possibly through compression or misunderstanding of his source, which probably referred to the false ribs, or to the spleen as a 'false' liver. The word *νόθος*, 'false', lit. 'bastard', is regularly applied to the 'false' ribs, the five ribs not connected with the sternum, so called in contrast with the seven 'true' ribs so connected, defined *νόθαι δὲ πλευραὶ· αἱ μὴ περαίνουσαι πρὸς τὸ στέρνον* Ruf. *Onom.* 94, 145 DR. Confusion can arise

through the ambiguity of πλευρή, 'rib' or 'side'. There is no instance where the meaning 'left' is imperatively demanded for νόθος (and LSJ does not recognize this sense), but the expressions παρὰ τὴν νόθον πλευρήν, with reference to the direction of vessels, *Oss.* 14 and περὶ τὴν νόθον πλευρήν, with reference to the site of pain, *Judic.* 51 are doubtful, as is the description by Pollux of the νῆστις . . . ὑπὸ τὴν νόθην πλευράν, τὴν ἐν ἀριστεροῖς μεχρὶ τῆς λαγόνος παρήκουσαν (2.4.207). The spleen itself is described as 'false' by Aristotle, i.e. useless, by comparison with the concomitant liver (*PA* 669b and cf. πρᾶγμα μηδὲν αἰτούμενος, *Ep.* 23; somewhat similarly, the moon was said to give a 'bastard' light, compared with the sun, Ph. 1.628).

ὁμοιόρυσμος ἴχνει ποδός: Rufus uses the same analogy, with similar terminology κεῖται ὁ σπλὴν κατὰ τὸ εὐώνυμον ὑποχόνδριον, παρεκτεινόμενος ἐπὶ μῆκος ἀνθρωπίνῳ ἴχνει *Anat.* 28, 175 DR. Such similes are common in anatomical contexts: *Oss.*; *Cord.* 1, 5, 10.

10. Belly (stomach) and intestine are described. Although the belly might loosely be said to 'lie beside the liver on the left', more properly it lies inclined to the left below both liver and spleen. 'The stomach is the most dilated part of the digestive tube, and is situated between the end of the oesophagus and the beginning of the small intestine. It lies in the epigastric, umbilical, and left hypochondriac regions of the abdomen, and occupies a recess bounded by the upper abdominal viscera, and completed in front and on the left side by the anterior abdominal wall and the diaphragm' (*GA* 1362–3). The adjective 'sinewy' is apt: 'the wall of the stomach consists of four coats: serous, muscular, areolar and mucous . . . and the muscular coat has three layers of muscular fibres' (*GA* 1367).

κατ' εὐώνυμον μέρος οὐλομελής ἐστι νευρώδης: εὐώνυμος, lit. 'good-omened', is used for 'left' by a common euphemism; cf., in an anatomical context (embryology), *Epid.* 6.4.1 and also Empedokles DK 31 A 83 = Athen.3.78; cf. also Rufus, quoted above. The bladder is similarly νευρώδης οὖλη, 6 above. The sense of 'sinewy' is in both cases probably 'elastic', 'subject to dilatation'. Rufus uses the same adjective of parts of the belly, *Anat.* 10, 178 DR and 42, 179 DR. But the word is appropriate also to appearance, as the empty stomach has prominent folds and wrinkles.[27] The adjective οὐλομελής has evidently the same sense as οὖλον above, 3. But it occurs elsewhere in the HC only *Cord.* 8 (heart as a whole, opposed to its component parts). The sbs. οὐλομελίη or οὐλομελείη occurs *Alim.* 23 (with reference to the whole body, opposed to μέρος 'part' of it) and several times in the phrase περὶ ἀδένων οὐλομελίης 'on glands in general'. This appears in the treatise *Glands* itself in 1 (the first sentence of the work) and in 7 as well as the version of the title given in ms V; and with reference to a work on glands (possibly the surviving *Glands*) in *Artic.* 11 and in Galen 18A.379K. There is an occurrence also in *Ep.* 18, where it is urged by Demokritos that doctors should assess afflictions not only by inspection but by gauging τοὺς ῥυθμούς and should treat τὸ πάθος οὐλομελίην τε τοῦ σκήνεος. It has a 'scientific' flavour in the Pythagorean equation of number τῇ οὐλομελείᾳ τοῦ

[27] Triller's emendation οὐλουμένη, tr. *'cicatricatus'* or *'rugis incisus'* imports a needlessly explicit reference to this aspect.

οὐρανοῦ, 'with the totality of the heavens', DK 58 B 27 = Arist. *Metaph.* 1092b26. Hsch. glosses οὐλομελίῃ· καθόλου 'on the whole'.

ἔντερον ὁμοιόρυσμον: the term ἔντερον is applied to the entire lower digestive tract, i.e. both the small intestine (comprising duodenum, jejunum, ileum) and the large intestine (caecum, appendix, colon terminating in rectum and anal canal); only occasionally is such an expression as τὸ κάτω μέρος τοῦ ἐντέρου used (as, with reference to an enema, *Acut.* 19). Like words for 'belly', 'stomach', with which it is commonly linked (γαστήρ, *Carn.* 3 and 6; νηδύς, *Carn.* 13; κοιλία *Morb.* 4.54), it is extended in usage to cover a large visceral region. Rufus regards the γαστήρ as the 'upper belly' and the κόλον as the 'lower', *Onom.* 169–73, 156–7 DR.

The 'similarity' is left unexplained, but is illumined by two parallel passages (again from *Oss.* and *Epid.*) where human and canine intestines are compared: τὰ κόλα ἔχει κυνὸς μείζω. ἤρτηται δὲ ἐκ τῶν μεσοκώλων. ταῦτα δὲ ἐκ νεύρων ἀπὸ τῆς ῥάχιος ὑπὸ τὴν γαστέρα, *Oss.* 1 (note compendious comparison, as *Anat.* 3, 4, 5); and with slight variation τὰ κόλα ἔχει οἷα κυνός, μείζω δέ, *Epid.* 6.4.6. It seems that, through compression of his source, the author fails to explain the similarity intended, namely to the viscera of the dog. Cf. *BVD*, 'The large intestine [of the dog] has a course somewhat like that of man.'

μακρόν, πηχέων οὐκ ἔλασσον δώδεκα: Foesius' μακρόν for μικρόν is guaranteed by the sense (as all the intestine is included) and the word order (as description, not definition, is here required). The length of the intestine is correctly estimated (twelve cubits being 5–6 metres) and the description is accurate: 'The small intestine is a convoluted tube . . . about 6.5 metres long' with 'a short curved portion' and 'a long greatly coiled part'. 'The large intestine . . . is about 1.5 metres long' (*GA* 1370, 1372, 1380).[28]

ἑλικηδὸν ἐν κόλποις ἐνειλούμενον: ἑλικηδόν is a hapax in the HC (though ἑλικοειδής is found, *Morb.* 4.40, with reference to 'convoluted' vessels), and ἐνειλεῖν too is a hapax (though εἰλεῖν is quite common, used for instance of intestines, *Mul.* 2; of humours, *Morb.* 4; and various other compound forms occur). Hsch. glosses ἑλικηδών· κυκλοειδὴς συστροφή. The expression of *Ep.* 23 is close: εἰλεῖται περὶ κοιλίην ἔντερα. Cf. also καὶ τὰ ἔντερα καὶ τὴν νηδὺν ἐνειλίξατο, *Oss.* 18. Celsus' expression is similar: '*in sinus vehementer implicitum*', 4.1.7. The term 'folds' is used in the HC only here and, of the womb, *Nat.Pue.* (also verb κολπόω of membranes, ibid.). In literary contexts, it is regularly applied to 'folds' of the female body, especially the bosom and the womb.

ὃ καλέουσιν ἔνιοι κόλον: there are similar comments on divergent terminology *Morb. Sacr.* 17 (φρένες a misnomer for diaphragm) and *Carn.* 4 (μυελός a misnomer for spinal marrow). That κόλον, read by V, not κῶλον, is the correct form is guaranteed by an Aristophanic pun on the verb κολάζειν (future middle) παῖ' αὐτὸν ἀνδρικώτατα καὶ γάστριζε καὶ τοῖς ἐντέροις καὶ τοῖς κόλοις ὅπως κολᾷ τὸν ἄνδρα, *Eq.* 455.[29]

[28] Reference to the length of the intestine was a common element in lists of the seven organs transporting food and breath; see Mansfeld (1971), p. 197.

[29] Pollux finds an etymological link, involving digestive suffering, 2.209; for other fanciful etymologies based on an original meaning τροφή 'food' for κόλον, see *Ath. 262a.*

11. Colon, rectum and anus are briefly described.

πέφυκεν ἀρχὸς λοίσθιος: the same verb is found as in 6, 9, 10. The adjective λοίσθιος is exclusively poetic, though λοῖσθος is used also in prose. The term ἀρχός occurs *Oss.* 3, 9, 14, 17; also *Carn.* 4.

σάρκα περιπληθέα ἔχων: lit. 'having abundant flesh'. Van der Linden's emendation πολυπληθέα (commonly adopted) is unnecessary, as περιπληθής is just as common as πολυπληθής and gives comparable sense (Ibycus, *TLG*). His addition of καί would give a smoother connection, but is not necessary in this telegraphic style. For the sense, cf. ἅτε ὑγροῦ ἐόντος τοῦ τε ἀρχοῦ καὶ τῆς σαρκὸς μαλθακῆς, *Fist.* 1.

ἐς ἄκρον δακτυλίου τελευτῶν: for the expression (neuter of adjective, used substantivally, followed by genitive), cf. 1 above. In the HC, the term δακτύλιον is used elsewhere only in *Haem.* Galen glosses κύκλος, τροχίσκος, 19.92 K.

12. A summing up apparently parallel to that of 7 ends the second part of the description. Ermerins' belief that there is a lacuna '*nam non absolvitur sed abrumpitur periodus*' may be correct; but the abruptness does not of itself necessarily indicate this, as the syntax is somewhat fractured throughout.

τὰ δ' ἄλλα ἡ φύσις διετάξατο: the sense of φύσις in 7 above is '[bodily] nature', a concrete and passive entity which is organized by something external to itself, sc. perhaps universal nature; here the sense of ἡ φύσις is '[universal] nature', an abstract and active principle which organizes something, sc. apparently the body. (Cf. Rufus ἐκθησόμεσθα ἣν παρέσχε τοῖς μέρεσιν ἡ φύσις θέσιν τε καὶ ὀνομασίαν *Anat.* 2, 169 DR; and the view that men are ἔργα φύσιος, *Ep.* 11.) Neither sense is difficult; but the switch from one to the other is generally felt to be awkward; however, there is a similar shift in *Ep.* 23, discussed further below. If the two passages are parallel, the 'other parts' of the body (oesophagus, stomach, diaphragm, spleen, intestine, colon) described 8–11 are parallel to the six parts (trachea, lung, heart, liver, kidneys, bladder) enumerated 1–6. But the phrase may refer to further material, passed over (cf. Arist. *Po.* 1449a28). Or τὰ δ' ἄλλα may be adverbial, 'as to other parts' (not specified). Other possibilities are that a reference to 'other creatures' or to 'other works' (cf. *Carn.* fin.) has been lost; or even that φύσις in *Anat.* 7 and 12 is shorthand for '[sc. my treatise on the] nature [of the body]', with oblique reference to some other work where he has explored other matters and reference in the verb to his own embellished style.

DISCUSSION

I. Background

The origins of Greek anatomy lie in the Homeric epics, which display an extensive knowlege of the effects of battle wounds on different bodily parts. Attempts at systematic description begin with the pre-Socratics, still imbued with the attitudes and forms of early verse writing. Analysis of the body into the different components skin, flesh, bones, and viscera linked by hollow channels or vessels conveying fluids (primarily φλέβες conveying blood) and by solid threads (termed νεῦρα and

including cords, sinews, ligaments, nerves, muscles) had a long currency, with little apparent *consensus.*[30] Outline surveys such as *Anat.* must have been composed throughout antiquity, and constantly copied, corrected, imitated, and excerpted.

It is always difficult to assess the extent and nature of influence or interaction in such cases of common content of a factual nature, especially where the very existence of direct contact (rather than the use of common sources) must be in doubt. The brevity of the fragment adds to the problem of the universality of its subject matter. Other writers follow the same descriptive sequence from 'top' downwards, with the trunk regularly treated as an entity. More specifically, discussion of the organs regularly centres on location, size, and colour. Judgement must rest not only on scrutiny of content but on an inevitably somewhat subjective assessment of similarities in approach, arrangement, and expression. The problem of intertextuality within the HC is acute; and even more so when later authors, such as Celsus and Rufus, are considered.

Indirect evidence for the presence of *Anat.* in versions of the HC circulating in antiquity (or, rather, in the putative versions which can be reconstructed from the lists of glosses constructed by grammarians and others) is scanty. The list of Erotian (dating from the time of Nero, *c.* A.D. 50, and referring to many earlier authorities, including Bakcheios, Epikles, and Herakleides) includes no words from *Anat.*, but the brevity of the treatise may account for this. Galen glosses no words from *Anat.* either (unless οἰσοφάγος relates to *Anat.*; but *Loc. Hom.*, from which many other terms are glossed, is a much more likely source). The loss of Galen's comments on Hippocratic anatomy (advertised *De Plac. Hipp. et Plat.* 6.8) is unfortunate, but there is no doubt some truth in his assertion that practical demonstration took the place of written treatises on anatomy.[31]

There is some reason to suppose that Celsus, writing an outline of human anatomy (4.1.1–13) and Rufus of Ephesus, writing an account of anatomical terminology (*Onom.*), knew the work. But the evidence is not unequivocal. Celsus is concerned with '*sedes*' of parts of the body; and especially their relative positions. Thus, such terms as '*incipiunt*', '*fertur*', and '*descendens*' are used, 3. And the description is practical, stressing colour, the ureters being '*albae*', 10; or texture, the lung being '*spongiosus*', 4. Nomenclature features: '*nominant*', 3; '*Graeci vocant*', 10. Celsus (like many others, including the author of *Ep.* 23) includes the head, 2; before describing the parallel '*itinera*' of '*aspera arteria*' to lung and of '*stomachus*' to '*ventriculus*', 3. Lung, heart, and diaphragm are briefly mentioned, 4; then liver, gall-bladder, spleen, kidneys, 5. From this outline of the '*viscerum . . . sedes*', Celsus goes on to the digestive process and the different parts from oesophagus and stomach, 6, to bowels, 7. The course of the ureters from kidneys to bladder is outlined, 10, and the bladder itself described, 11. One salient difference of content between Celsus and the writer of *Anat.* (but a feature in common with *Ep.* 23) is that he pays attention to differences in male and female anatomical layout: differences in bladder, 11, are mentioned before a description of womb and reproductive system, 12–13. Several phrases in Celsus are close enough to phrases in *Anat.* to qualify as translation or at least paraphrase. The most striking parallels in phraseology are these: '*constat ex circulis quibusdam*' (of

[30] Even in the Pneumatic school of medicine, influenced by Posidonius and the Stoics, the seven ἐντὸς μέρη and the seven καθολικὰ μέρη were defined in various ways; see Mansfeld (1971).

[31] On the tradition, see Smith (1979) and von Staden (1989); on terminology see Lloyd (1983) and Skoda (1988).

trachea: note metaphor, toned down by '*quibusdam* ' and correspondence '*circulus*' ~ κρίκος); '*is spongiosus*' (of lung: note the initial pronoun); '*in sinus vehementer implicitum*' (of intestine: note correspondence '*sinus*' ~ κόλπος); '*vesica . . . nervosa*' (of bladder).

Rufus aims at a correct account of anatomical terminology, rather than at the consecutive description seen in Celsus. The closest parallels to *Anat.* in expression are these: lung colour is τεφρὸν καὶ ὑπόλευκον, the spleen resembles a footprint, and the term φαρύγεθρον is used. Pollux provides no independent evidence and was probably utilizing Rufus directly in compiling the medical section of his great lexicon. In the case of Hsch., several glosses suggest familiarity with *Anat.*, or at least with a work or works employing similar diction: περιηγές, τενθρηνιῶδες, and ὀχετός are glossed. There is, then, some reason to suppose that Celsus and Rufus, as well as later lexicographers, knew *Anat.*; but none to confirm that it was then regarded as Hippocratic.

II. Anat. and the HC: content

There is no parallel in the HC for the narrowly anatomical content of *Anat.*, with its exclusion of physiology and pathology. Elsewhere, attempts at anatomy are incorporated in general schemes (*Loc.Hom.*), or are allied with theory (*Carn.*) or address physical function (*Cord.*, *Oss.*) or are embedded in discussion of treatment (*Epid.*, *Artic.*, *Fract.*, *Mochl.*). But how, and indeed whether, the work continued is unknown; and the similar precision of *Oss.* 1 and *Loc.Hom.* 6, which list bones, gives way to more elaborate and leisurely expression. The titles of treatises often give little clue to their actual content: the author of *Carn.*, a work primarily on the viscera, refers to his own earlier work on the vessels, περὶ μὲν οὖν τῶν φλεβῶν εἴρηταί μοι πρότερον, *Carn.* 5; and promises future work on the essential character of the human constitution, based on the number seven, τῆς δὲ φύσιος τὴν ἀνάγκην . . . ἐγὼ φράσω ἐν ἄλλοισιν, *Carn.* fin. The work itself deals in a wide-ranging way with the formation of lungs, liver, spleen, kidneys; also flesh, limbs, nails, teeth, hair, and the senses hearing, smell, sight, and speech. *Mochl.* begins ὀστέων φύσις and *Oss.*, with implied comparative anatomy, ἃ ἡμεῖς αὐτοὶ ἐξ ἀνθρώπου ὀστέων κατεμάθομεν. But overall, the subject of *Oss.* is not bones at all, but vessels.

The nature of many Hippocratic treatises raises fundamental questions of authorship: they may have been the common property of a professional group, pooling ideas and information in an age innocent of concepts of plagiarism and publication, though not immune from professional rivalries. *Oss.* is a composite text, stitched together from heterogeneous and even inconsistent elements and some of its content is identical with passages in *Epid.* 2.[32] The treatise is an amalgam of bits, some of which are replicated elsewhere: *Oss.* 8 = Arist. *H.A.* 3.3, where Aristotle gives his source as Syennesis of Cyprus; *Oss.* 9 = *Nat.Hom.* 11; *Oss.* 4–7 and *Oss.* 10 = *Epid.* 2.4.1. The last part of *Oss.* has been identified with the treatise on vessels mentioned by Galen as an appendage to *Mochl.*, ἐν τῷ περὶ φλεβῶν ὃ προκεῖται τῷ Μοχλικῷ, Galen 19.128 K. However, it is likely that the first person throughout represents the same editorial voice. In *Epid.* also there are repetitions and other elements which make unity of authorship highly unlikely and suggest a process of redaction and compilation: either editorial activity carried out by a single author or case notes from

[32] This was already noted by Littré; see now Duminil (1980) for analysis of structure and content.

different hands, recording impressions of different doctors. *Mochl.* is a summary of *Artic.* and *Fract.*, carefully executed and often keeping the original expression. Another common element is the presence of disagreement (as *Anat.* 10, on terminology) or polemic: ἄλλος δ' αὖ τις τῶν ἰητρῶν, *Fract.* 3; cf. also polemic against Herodikos, *Epid.* 6.3.18. It is in this scheme that *Anat.* has some place. *Anat.* has affinities of content particularly with *Oss.* (and confirms the relationship between *Oss.* and *Epid.* 2); also with *Epid.* 6: see on 3, 4, 5, and especially on 9 (liver and diaphragm), and 10 (intestines).

Anat. comprises a description of the internal configuration of the human trunk. The precision is exemplary. The continuous schematic arrangement is evident in the repeated ἀπό—six times, four with ἐς, one with ἐπί and one alone; or ἐκ—twice, one with ἐς and one alone). It is precise in its stress on start and finish (ἔκφυσις, ἀρχή, τελευτᾶν); on situation, orientation, and extent (κεῖσθαι, τρέπεσθαι, τείνεσθαι); on size, shape, and colour; and particularly on relative position in the body—top, bottom, front, back, right, left, or middle—cf. proximal, distal, anterior, posterior, etc. (ἄκρος, κάτω, ὄπισθεν, δεξιός, ἀριστερός, μέσος, εὐώνυμος). The treatise records organs and viscera, i.e. in Greek terms σπλάγχνα. Flesh, bones, and cords are not mentioned at all, and vessels are mentioned only incidentally, as links. The author is writing a comparative study, expounding human anatomy by reference to the anatomy of mammals in general, with which he takes his readers to be familiar: see on 1, 3, 4, 5, and 10. Simply, he is following the procedure recommended by Aristotle (*H.A.* 1.16.494b21–4): in the absence of dissection, it is necessary to refer to animals similar to man to understand human anatomy. Aristotle examined many different mammals (e.g. hare, deer, mouse, hyena, ass, leopard, weasel, all listed *P.A.* 667a; seal and ox, ibid., 671b) and Herophilos still depended largely on comparative anatomy, despite the availability to him of humans (von Staden, 1989, 182–3). Other Hippocratic authors refer to animals, either in general, as τοσοῦτον ἐς ἄνθρωπον ἀποδείξω καὶ τὰ ἄλλα ζῷα, *Carn.* 1; and ὥσπερ καὶ τοῖσιν ἄλλοισι ζῴοις ἅπασιν, with reference to two halves of the brain, *Morb.Sacr.* 6; or with reference to particular animals: the ox (thighbone), *Artic.* 8; the pig (lung), *Cord.* 2; the dog (intestines), *Epid.* 6.4.6 and *Oss.* 1; cf. also Demokritos' study of dog and pig embryology, DK 68 A 151 = Ael. *N.A.* 12.16 (cf. *Nat.Pue.* 31) and the vignette of Demokritos at home, surrounded by heaps of animal carcasses, which he is laying out and dissecting in order to examine their σπλάγχνα, with a view to assessing the significance of χολή, *Ep.* 17.

It may be supposed that *Anat.* belongs to a period when dissection was not practised on human cadavers, a period when knowledge was gleaned from observation of butchered sacrificial victims (of which the σπλάγχνα were particularly familiar) and from animal dissection; and that knowledge of the interior of the human body would depend on chance supplementary findings from observation of injuries to citizens on the battlefield (cf. *V.C.*) or to slaves in industrial accidents, such as must have occurred in mills and mines. That dissection of human cadavers was not practised in mainland Greece in the fifth and fourth centuries has been cogently argued often enough; but perhaps classical scholars make insufficient allowance for medical curiosity.[33] Examination of aborted foetuses or stillborn infants might have been relatively easy (cf. on 3); and conventions obtaining in such semi-barbarous regions as Thrace may have differed from those of Athens. Certainly many

[33] See Edelstein (1932, tr. 1967; but Edelstein suggests in a cryptic footnote that Demokritos may have been an exception and this notion has a bearing on *Anat.*), Lloyd (1975), Longrigg (1993).

intellectuals, including Herodotos and Demokritos, travelled to Egypt, where they had opportunities to observe the anatomical procedures involved in mummification (cf. Hdt. 2.86). Theoretical modification too might obtrude (cf. view of the heart, 3).

Although *Anat.* is remarkably free from explicit theoretical comment or doctrinal content, some views which are implicit can be extracted. From the pathway postulated trachea–lung–kidneys–bladder, it seems that the writer believes that some fluid enters the body via the trachea. This view is explicitly and forcefully expounded by the author of *Cord.*, and supposedly corroborated by an experiment which involves dissecting a pig, after giving it coloured fluid to drink (*Cord.* 2). The author of *Oss.* init. shares this view: *πότον δὲ διὰ φάρυγγος καὶ στομάχου· λάρυγξ ἐς πλεύμονα καὶ ἀρτηρίην· ἀπὸ δὲ τούτων ἐς ἄκρην κύστιν*, *Oss.* 2; though a somewhat different (or perhaps merely more detailed) route is postulated in the drink–kidneys–bladder sequence which follows, *Oss.* 4; similarly drink, air, and blood all pass through the lung, *Oss.* 13. The expression of *Oss.* 2 is close to that of *Anat.* 5; and the postulated route of fluids is the same. The belief that fluid could enter the body via the trachea seems to be implied in the medical orthodoxy regarding treatments for lung disorders (among the most common of all Hippocratic ailments and ranging from mild infections of the respiratory tract to pneumonia): warm drinks are recommended to render the lung moist and so to dislodge pus, *Morb.* 3.16; drink is required to moisten the lung and encourage expectoration, *Morb.* 1.28; liquid medicine is to be administered to clear pus when the lung dries out, *Aff.* 9; trouble ensues if the lung dries up *ὑπὸ δίψης ἀναγκαίης*, *Loc.Hom.* 26. (And the medical view was generally known: Alcaeus frg. 94; Euripides frg. 983 N.) But the matter was controversial: it is disputed by Aristotle (*P.A.* 664b) and with an emphatic introductory verb *ἐναντιώσομαι* argued that fluids pass not to the lung but to the *κοιλίη*, *Morb.* 4.56.[34] The parallel working of bladder and belly is similarly presented elsewhere, in the HC and in other medical writers: e.g. *κοιλίη* and *κύστις* parallel *Morb.* 4.38 and *Acut.Sp.* 15; *κύστις* and *ἔντερον* parallel *Mul.* 1.34 al.; *ἀρχός* and *κύστις* parallel *Carn.* 3; *δύο μὲν γὰρ αἱ τὸ σιτίον δεχόμεναί τε καὶ ἀφιεῖσαι*, *de Arte* 10; also *περὶ μὲν τῆς τοῦ πνεύματος διοικήσεως ταῦτα . . . περὶ δὲ τῆς τροφῆς ἀναγκαῖον ὑπομιμνήσκειν μετὰ ταῦτα*, Anon.Lond. 24.18–20 and the necessary parts *ᾗ τε δέχονται τὴν τροφὴν καὶ ᾗ τὸ περίττωμα ἀφιᾶσιν*, also *ὅ τε φάρυγξ καὶ ὁ καλούμενος οἰσοφάγος*, Arist. *P.A.* 655b and 664a.

Despite the broad accuracy and precision of the work, it displays only the most rudimentary knowledge of the body's workings.[35] The descriptions of the regions between heart and liver, liver and kidneys are just that, descriptions; and there is no indication whatsoever that the importance of heart and liver is recognized. There is no justification for imputing to the author the perception that the heart has a peculiarly important place as centre of the vascular system; see on 3. Despite detailed reference to the lobes of the lung and of the liver (the latter somewhat confused), there is nothing on the chambers of the heart and no awareness of the heart's complex structure. Similarly, the statement that the liver is *αἱμορρωδέστερον* may, but need not, imply a view of the liver as producer of blood for the rest of the body; and the interpretation of the vessel which 'nurtures' the body is problematical. The reference to the belly as *σηπτική* takes a primitive view of the digestive process, reminiscent of Empedokles; and the adjective applied to the liver, *αἱμορροῦς* 'blood-suffused', has an Empedoklean analogue also.

[34] See Lonie (1981), pp. 361 sqq.

[35] Triller's commentary constantly superimposes his own knowledge on the text.

Sometimes, the writer of *Anat.* seems to be at a loss or mistaken: see on 2, 4, 9. These lapses might result from misunderstanding of a technical source by a writer or excerptor without technical knowledge or from hastily and carelessly executed summary. Compression seems to lead to unclear exposition and even to the elision of essentials: see on 9 and 10, where the parallel versions of *Oss.*, in conjunction with *Epid.* 2 and *Epid.* 6, help to elucidate the sense. The consistent use of the third person may imply that the writer is not himself a medical expert, or is distancing himself from other practitioners; the first person is used only once and introduces an error: see on 9. Treatises evidently written by practitioners tend to use the first-person plural in giving nomenclature for anatomical or diagnostic terms (*V.M.* 19 of yellow bile; *Carn.* 17 of the tunic of the eye, cf. 2); whereas more rhetorical treatises tend to use the third person (*de Arte* 10 of muscle). But there is a wide range from firm to tentative expression and the common use of the passive militates against generalization: veins are described, as *Anat.* 3, in such expressions as αἱμόρρους ἡ παχείη καλεομένη φλέψ, *Oss.* 7 and τὴν κοίλην φλέβα καλεομένην, *Loc.Hom.* 3.5.

There is nothing in the content to suggest any knowledge of the advances made in Alexandria; and nothing to suggest familiarity even with Aristotelian biology. In particular, the ignorance of the structure and function of the heart suggests a date before the research activities of the Lyceum.

III. Anat. and the HC: expression

The vocabulary of *Anat.* has many unusual features, which, like the content, show affinities with *Oss.* A common concentration of anatomical terms in anatomical works has no implications for direct connections, far less for common authorship or shared school of thought. However, the use of different terms for the same parts of the body can be significant; and it is noteable that the author of *Anat.* shares a preference for ἄκανθα with the writer of *Oss.* fin. (ten instances 11–19: 12, 13, 14, 15, 16; five instances 18), as opposed to the writer of *Oss.* init., who like the author of *Mochl.* and *Artic.* uses ῥάχις (nine instances 1–10; three instances 1, 3; two instances 7; two instances 9, 10). In general usage, there are further parallels with *Oss.* and with *Epid.* 2 and 6: see especially on 2, 3, 4, 7, 9, 10. Such coincidences in general medical terms and in non-technical vocabulary become cumulatively significant, especially when these are allied with common ground in doctrinal content. On the basis of this analysis, *Anat.* can be firmly aligned with *Oss.*, and with certain parts of *Epidemics*; also to some extent with *Mochl.* and with *Carn.* Clearly the author sought out a recondite vocabulary; and it is in the nature of this that many words are not commonly found elsewhere. In some instances, the parallel usage is entirely from verse; λοίσθιος 'last' is common but exclusively poetic and ἐναλίγκιος is epic.

The poetic texture is reinforced by the use of simile (see on 9) and figurative language (κεκεντημένος, ἐγκαθίδρυται); these devices are, however, typical of anatomical writing in general. There are runs of dactylic rhythm (τῶν περιηγέων, with synizesis, ἀπτομένων κατ' ἐπ- and -τραμμένος ἐς τὰ ἀριστερά), and some attempt seems to be made to end sentences with spondees, molossi, or still longer sequences of long syllables (ἀλλήλων, τενθρηνιώδης, πάντων ζῴων, ἐκοσμήθη, νευρώδης). These are all features of early prose style, influenced by epic patterns of expression; and in material of this kind the rhythm (like the stress on counting—lobes of lung, gates of liver, six key parts—and on naming—'they call') might originally have served as an *aide-mémoire*. Another feature of the stylistic register belonging to

early prose style is the use of abstract noun plus verb ἔχειν, in preference to a verb of the same root.

While the vocabulary is recondite, the syntax is uncontrived, with compound rather than complex sentences. Such loosely connected writing is typical of early prose. Connection is simple (δέ and καί) after asyndeton in the first sentence. Like *Mochl.*, the terse summary *Oss.* init, and the compressed annotations of *Epid.*, it eschews words which are semantically otiose, such as the definite article and the verb 'to be'. The general, apparently arbitrary, omission of the article in *Anat.* is remarkable: it is usually omitted with such adjectives as ἄκρος, μέσος, πᾶς, and, most obviously, in the case of the bodily parts.[36] This characterizes summaries, but is a common feature also of the aphoristic style affected by Herakleitos; and is seen also in certain Hippocratic texts, such as *Alim.* Similarly the compendious comparisons recurrent in the text characterize both terse and poetic writing styles. *Anat.* is bald, yet still stylistically arresting.

Resemblances with Demokritos are explored in the next section. However, there are certain resemblances too with other pre-Socratics: περιηγής and εὐώνυμος are certainly used by Empedokles; as are ἐναλίγκιος and οὐλομέλης by Parmenides (both in the same fragment, DK 28 B 8, lines 43 and 5 = Simp. *In Ph.* 144.29); and ἐπίπεδον by many writers on scientific subjects. However, these may be chance findings. Caution may be induced by the reflection that two of the more colourful, and apparently recondite, anatomical terms of *Anat.* occur in Euripides: χέλυς (*El.* 837) and ἄκανθα (*El.* 492 and *Tro.* 117). Euripides shows some precision in anatomical knowledge; the first datable use of the term κοίλη φλέψ is in *Ion* 1011. As in the case of content, nothing in language is incompatible with an early date, and the stylistic register is that of early prose.

IV. The Demokritean dimension

An affinity of *Anat.* with the work of Demokritos of Abdera[37] was long ago noted.[38] Strong, and relatively early, traditions linked Demokritos with Hippocrates: Celsus described Hippocrates as 'pupil' of Demokritos (*Proem* 8; there are similar accounts in the later *Vitae* of Soranos, Tzetzes, and Suda). Demokritos was a most prolific writer on a great range of scientific subjects. Many of his works have titles similar to those of Hippocratic treatises: περὶ ἀνθρώπου φύσιος ἢ περὶ σαρκός, περὶ διαιτῆς ἢ διαιτητικά.[39] He was much revered in later antiquity. But there are pressing

[36] Comparison of usage in *Mochl.* shows that in paraphrasing *Artic.*, the author often repeats the base text almost verbatim while omitting such otiose words as the definite article: e.g. *Mochl.* 8 (ἄκρος without article) ~ *Artic.* 18 (ἄκρος with article). But it is omitted in both model and précis, *Mochl.* 12 ~ *Artic.* 22; and in *Fract.* 4 ἄκρην τὴν χεῖρα is followed in the next section by ἐς χεῖρα ἄκρην. Similarly, in the compressed annotations of *Epid.*, ἄκρος is commonly used without the article (6.1, 4.19); cf. also ἐς ἄκρην κύστιν, *Oss.* 1 and μέχρις ἄκρων πλευρέων, *Oss.* 5.

[37] This was a highly prosperous region, with an important trade in grain: evidently it had its own cultural as well as economic vitality; but of this little direct evidence survives. Like Demokritos, the 'sophist' Protagoras came from Abdera. (Demokritos is never described as a sophist, though in many respects his intellectual activity corresponds to that typical in the sophistic movement. For some reason, he did not interest Plato.)

[38] See already Triller (1766), p. 258, who regarded the author as '*aut ipsum Democritum aut alium Abderitum philosophum*'; echoed more sceptically by Ermerins (1864), Prolegomena to *Anat.*, XLII, finding a sophistic attempt '*Democriti personam induere*'.

[39] Cf. also the descriptions of Demokritos searching out ἀληθείην ἀνθρωπίνης φύσεως, *Ep.* 17, as an interpreter of φύσις *and* κόσμος, *Ep.* 20, and as the writer of περὶ φύσιος ἀνθρώπου,

problems of authenticity: many citations are not of Demokritos but of Demokrates, and there were allegedly early forgeries, detected by Kallimachos.[40] The extant fragments indicate that the style of Demokritos was sometimes functional, sometimes elaborate, but certain recurrent distinctive features can be isolated: a liking for compound words and compound verbs, and a tendency to poetic idiom with neologisms.[41] Certain catchwords recurrent in the citations suggest that he was a natural target for imitation, forgery, and pastiche. The key idea of 'similarity', expressed in the root *ῥυσμός*, may be seen as peculiarly Demokritean. In addition to treatises on the subject *περὶ τῶν διαφερόντων ῥυσμῶν* and *περὶ ἀμειψιρρυσμιῶν* ('on different dispositions' and 'on changing dispositions' DK 68 B 8a and 139; cf. also *Ep.* 18 fin.), there are incidental references in many fragments—which cannot all be inventions of forgers or of writers of pastiche—to the terms *ῥυσμοῦν* (DK 68 B 197 = Stob. 3.4.70), *μεταρυσμοῦν* (B 33 = Clem.Strom. 4.151 = Stob. 2.31.65), and *ἐπιρυσμίη* (B 7 = Sext. 7.137). That *ῥυσμός* is pervasive in his physical system may be seen in the argument that colour arises from elements mixed *διαταγῇ τε καὶ ῥυθμῷ καὶ προτροπῇ* DK 68 A 125 = Aet. 1.15.8). Demokritos does seem to have been preoccupied with the idea of form, and especially of sameness in form; cf. *ὁμοιοσχήμων*, DK 68 A 128 = Aet. 4.19.13 and *ὁμοσχημονεῖν* A 135 = Thphr. *de sens.* 50; also *ὁμοφυεῖς* A 61 = Simp. *in cael.* 569, cf. *παντοίας μορφὰς καὶ σχήματα παντοῖα καὶ κατὰ μέγεθος διαφοράς* A 37 = Simp. ibid. 294; and *ὁμοιότης* B 164 = S.E. *M.* 7.116; note too his view that the *μορφή* of man is recognizable *τῷ τε σχήματι καὶ τῷ χρώματι* B 165 = Arist. *PA* 640b.[42] (See also on 2, 3, and 4 for Demokritean usage.)

Supposed relations between Hippocrates and Demokritos are described in the Hippocratic letters.[43] The letters fall into three distinct groups: 10–17, 18–21 and 22–4. *Ep.* 23, the Demokritean letter to Hippocrates *περὶ φύσιος ἀνθρώπου* is particularly relevant to this discussion; but there is much of significance also in 10–17, in 18, and in 20. In *Epp.* 10–17, the main voice is that of Hippocrates, called to Abdera to treat the supposedly mad Demokritos. There are several comments on *πλουσίην τὴν φύσιν*, 'the richness of nature', and the letter ends with the designation of Demokritos as *ἀληθείην ἀνθρωπίνης φύσεως ἐξιχνεύσαντος καὶ νοήσαντος*, 'tracking down and considering the true nature of man'.

Epp. 18–21, which purport to be an exchange between Demokritos and Hippocrates

Ep. 23. There are some seventy titles, according to Diogenes Laertius, DK 68 A 33 = D.L. 9.45–49; but on the sources of D.L. see the sceptical remarks of W. K. C. Guthrie, *History of Greek Philosophy* (Cambridge, 1965), vol. II, p. 388, n. 1.

[40] See RE s.v. Bolos of Mende on later attempts to lend respectability to spurious writings by arrogating the name of Demokritos; cf. especially Plu. *Sympos.* 641b.

[41] Roman critics admired Demokritos' style, finding it poetic. Cicero describes him as '*ornate locutus*' (DK 68 A 34 = Cic. *de orat.* 1.11.49). There is considerable evidence that he affected an arcane vocabulary: Kallimachos compiled a *πίναξ τῶν Δημοκρίτου γλωσσῶν καὶ συνταγμάτων* and Hegesianax wrote a work *περὶ τῆς τοῦ Δημοκρίτου λέξεως*.

[42] Perhaps this preoccupation of Demokritos in some degree anticipates the Aristotelian atempt to distinguish parts of the body as *ὁμοιομέρη* or *ἀνομοιομέρη*, the latter being such as hand, face which do not by division become two of the same thing, *HA* 1.1 init. But we need not look beyond the HC to find similar ideas in circulation; cf. *ὁμοεθνίη Loc.Hom.* 1 (of the organic unity of the body), *ὁμότροπος Vict.* 1.6 and *ὁμόφυλος Nat.Hom.* 3. Rather, the abstract principle of sameness and difference, with respect to shape and colour, is here given pragmatic implementation in study of the colour and shape of the bodily organs.

[43] On the letters, see Smith (1990), edition with translation and commentary, especially pp. 102–5 on *Ep.* 23; see also Littré IX.392; DK 68 C 6; Temkin (1985).

(18 from Demokritos; the others from Hippocrates) seem to have been composed for the express purpose of displaying knowledge of the corpora of these two writers. In *Ep.* 18 the expression *βίβλοι ὑπ' ἐμεῖο γραφεῖσαι* is followed up by clear reference to the titles of works by Demokritos.[44] This letter ends with a positive concatenation of Demokritean vocabulary, in the recommendation that the doctor should consider *ῥυθμούς . . . οὐλομελίην τε τοῦ σκήνεος*. *Ep.* 19 (general statements on madness), *Ep.* 20 (on the place of chance in medicine), and *Ep.* 21 (on the use of hellebore) have elements demonstrably lifted from the HC, with some misunderstandings and additions imported by the excerptor;[45] and doubtless Demokritean elements are similarly present throughout 18.

Epp. 22–4 have a different manuscript tradition from the other letters.[46] The content is somewhat mixed: in *Ep.* 22 Hippocrates writes to his son Thessalos, urging the study of mathematics on the grounds that it is closely allied with medicine; *Ep.* 23 is the Demokritean letter which concerns us here; in 24 Hippocrates writes to King Demetrios, recommending ways to maintain health. *Ep.* 24 is prefaced by the statement *πρότερον μὲν σπουδάζοντες . . . περὶ τῆς ἀνθρωπίνης φύσιος ἐν κεφαλαίῳ θεωρῆσαι τὰ μέρη ταῦτα ξυγγράψαντες . . . ἀπεστείλαμεν*. (It has been supposed that this is a reference to *Ep.* 23. This seems unlikely, as *Ep.* 23, the odd one out in this rather ragged sequence, is Demokritean. It may be rather that *Anat.*, which has strong affinities in content and expression with *Ep.* 23, was known and referred to by the author of *Ep.* 24, who believed the work to be Hippocratic.)

The preamble of *Ep.* 23, leading in to the anatomical discourse, is regarded by Smith as detachable.[47] This preamble justifies the study of medicine by all, on the grounds that bodily malaise affects mental function. The proem is taken to be Demokritean in the second to third centuries A.D.: the words of the letter *σοφίη μὲν γὰρ ψυχὴν ἀναρύεται παθέων, ἰητρικὴ δὲ νούσους σωμάτων ἀφαιρεῖται* are reiterated in *ἰητρικὴ μὲν γὰρ κατὰ Δημόκριτον σώματος νόσους ἀκέεται, σοφίη δὲ ψυχὴν παθῶν ἀφαιρεῖται* DK 68 B 31 = Clem. *Paed.* 1.6, conceivably an independent source drawing not on the letter but on a work of Demokritos, the source also of the letter; the connection with *Ep.* 23 is noted DK ad loc.). There are some striking similarities in phraseology between this letter and *Anat.*: *συνίδρυται* (of the faculty of sight) ~ *ἐγκαθίδρυται* (of the heart), *χελύνειον* (of the chin) ~ *χέλυς* (chest), *εἰλεῖται περὶ κοιλίην ἔντερα* ~ *ἔντερον . . . ἑλικηδὸν ἐν κόλποις ἐνειλούμενον* (similar expressions of intestines), *νευρώδης κύστις* (both of bladder). Similarities in spirit are even more striking. It is particularly remarkable that the nuances of the concepts *κόσμος* and *φύσις* are parallel, and allied with the pervasive concept of order in or aptness to bodily function, and to the craft in design of the living organism. There is even a parallel change in use of *φύσις*. At the beginning of the anatomical description, we find *φύσιος ἀνθρωπίνης ὑπογραφὴ θεωρίην ἔχει τοιήνδε* (same sense as *Anat.* 7); and at the end *ἡ δὲ ἀσώματος ἐν μυχοῖς φύσις ἐξέτευξε παντάμορφα σπλάγχνων γένη* (same sense as *Anat.*12). (In the latter passage, Ermerins reads *σώματος*, linking this genitive with *ἐν μυχοῖς*: this attractive emendation tones down but does not alter the abstract sense of *φύσις*.) There is in *Ep.* 23 much stress on the notion that the organs are fashioned or marshalled by 'nature' to serve [the nature of] the body; *φύσιος ὕπο δεδημιούργηται* (sex organs) and *συνθέσεως δημιουργίῃ συνδεσμεύμενα*

[44] See Smith (1990), p. 93, n. 1

[45] See ibid., p. 95, n. 1 and p. 99, n. 1.

[46] Ibid., p. 42.

[47] The author 'borrowed the anatomy and composed the proem'; cf. 32 'detachable philosophic . . . proem'.

(stomach and intestines), until death ends their service; cf. here ἐκοσμήθη and διετάξατο. In the letter the nouns δημιουργός and δημιουργίη, the verb ἐξέτευξε, and the expressions of the bodily parts εὐκοσμίᾳ χρῶτα κοσμεῦσι (hair), ἠρμοσμένοι ἀλλήλοισι (trachea and oesophagus), συνηρμοσμένον (chin) are more elaborate than, but similar in spirit to, *Anat.* 7 and 12. These ideas accord well with known Demokritean views of man 'governed' by divinity, the two being microcosm and macrocosm, as ἐν τῷ ἀνθρώπῳ μικρῷ κόσμῳ ὄντι κατὰ τὸν Δημόκριτον, and of origins in general as ἐγκοσμούμενον κατὰ λόγον where ῥυσμός, τροπή, διαθιγή play a part (DK 68 B 34 = David *Prol.* 38.14 and A 38 = Simp. *In Ph.* 28.15).

However, with these similarities in phraseology and spirit, there are fundamental divergences. The overall tenor is completely different: the letter is mannered and pompous, whereas *Anat.*, despite its poetic touches, is spare and functional. There are differences too in attitude to bodily function, and in anatomical sophistication. In the letter, the organs are the seat of the emotions (the heart of anger, the liver of desire). The letter is full of theoretical notions, whereas *Anat.* is practical and descriptive. Furthermore, whereas the anatomy of *Anat.* is primitive, and contains no elements which suggest a post-classical date (though, unlike the letter, *Anat.* gives such precise details as the number of lobes in lungs and liver), that of *Ep.* 23 displays insights which seem to follow the work of Herophilos and Erasistratos. These are listed by Smith as: the comment on the uselessness of the spleen; the description of the bladder, woven from vessels; the concept that swallowing is accompanied by a shove; the insight that the brain directs the limbs via the nerves.[48] To these may be added: it is πνεῦμα, not drink, which enters by the trachea; the term lungs, not sg. lung, is used; the heart is not 'round', but 'conical' and in general there is attention to and some understanding of, function.

The two texts, *Ep.* 23 and *Anat.*, are related in a complex fashion. The most plausible hypothesis is that both are derived, directly or indirectly, from the same Demokritean text, but by writers with entirely different purposes. That there are Demokritean elements in *Anat.* is assured. But Demokritean need not mean 'by Demokritos'. Nothing militates against the supposition that this is an excerpt of a genuine work by Demokritos; but it might be a pre-Alexandrian forgery (to be linked with those allegedly detected by Callimachus), or a later pastiche (to be linked with the epistolary tradition). However, the theory of guileless abridgement seems more probable. As the comparative anatomy which features so prominently in *Anat.* belongs not with *Ep.* 23 (though cf. the presentation of Demokritos in *Ep.* 18) but with *Oss.* and *Epid.* 2, it may be supposed that the writer is adapting more than one text. The doctor(s) involved in the writing or compilation of *Epid.* 2, 4 and 6 practised at Abdera, Ainos, and other such northern centres. The common elements in expression between these, *Oss.*, *Anat.*, and the works of Demokritos is some indication of interaction between Hippocratics and Demokriteans in fifth-century Thrace; and between their later imitators. This can only be glimpsed, hardly reconstructed.[49]

V. Conclusion

This extraordinary little piece has found its way into the HC by accident. It is an

[48] Smith (1990), p. 33.

[49] See Jouanna (1992), pp. 48–50 on Hippocrates' connections with North Greece and pp. 36–7 on Hippocrates and Demokritos; also Longrigg (1993), pp. 66–9, 93–7 on Demokritean ideas in the HC.

unoriginal and uncritical summary of earlier anatomical works, incorporating Demokritean material. There is a nexus of related Hippocratic texts, most notably *Oss*. The date of the anonymous redactor is indeterminate, but may be as early as the fourth century. The treatise is a unique testimonial to the nature and extent of ancient anatomical knowlege, and an important document linking the lost Demokritean corpus with certain Hippocratic texts.

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