Galen
ON THE NATURAL FACULTIES
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PREFACE

The text used is (with a few unimportant modifications) that of Kühn (Vol. II), as edited by Georg Helmreich; Teubner, Leipzig, 1893. The numbers of the pages of Kühn’s edition are printed at the side of the Greek text, a parallel mark (||) in the line indicating the exact point of division between Kühn’s pages.

Words in the English text which are enclosed in square brackets are supplementary or explanatory; practically all explanations, however, are relegated to the footnotes or introduction. In the footnotes, also, attention is drawn to words which are of particular philological interest from the point of view of modern medicine.

I have made the translation directly from the Greek; where passages of special difficulty occurred, I have been able to compare my own version with Linacre’s Latin translation (1523) and the French rendering of Charles Daremberg (1854–56); in this respect I am also peculiarly fortunate in having had the help of Mr. A. W. Pickard Cambridge of Balliol College, Oxford, who most kindly went through the
proofs and made many valuable suggestions from the point of view of exact scholarship.

My best thanks are due to the Editors for their courtesy and for the kindly interest they have taken in the work. I have also gratefully to acknowledge the receipt of much assistance and encouragement from Sir William Osler, Regius Professor of Medicine at Oxford, and from Dr. J. D. Comrie, first lecturer on the History of Medicine at Edinburgh University. Professor D'Arcy W. Thompson of University College, Dundee, and Sir W. T. Thiselton-Dyer, late director of the Royal Botanic Gardens at Kew, have very kindly helped me to identify several animals and plants mentioned by Galen.

I cannot conclude without expressing a word of gratitude to my former biological teachers, Professors Patrick Geddes and J. Arthur Thomson. The experience reared on the foundation of their teaching has gone far to help me in interpreting the great medical biologist of Greece.

I should be glad to think that the present work might help, however little, to hasten the coming reunion between the "humanities" and modern biological science; their present separation I believe to be against the best interest of both.

A. J. B.

22nd Stationary Hospital, Aldershot.
March, 1916.

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INTRODUCTION

If the work of Hippocrates be taken as representing the foundation upon which the edifice of historical Greek medicine was reared, then the work of Galen, who lived some six hundred years later, may be looked upon as the summit or apex of the same edifice. Galen’s merit is to have crystallised or brought to a focus all the best work of the Greek medical schools which had preceded his own time. It is essentially in the form of Galenism that Greek medicine was transmitted to after ages.

The ancient Greeks referred the origins of medicine to a god Asklepios (called in Latin Aesculapius), thereby testifying to their appreciation of the truly divine function of the healing art. The emblem of Aesculapius, familiar in medical symbolism at the present day, was a staff with a serpent coiled round it, the animal typifying wisdom in general, and more particularly the wisdom of the medicine-man, with his semi-miraculous powers over life and death.

“Be ye therefore wise as serpents and harmless as doves.”
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The temples of Aesculapius were scattered over the ancient Hellenic world. To them the sick and ailing resorted in crowds. The treatment, which was in the hands of an hereditary priesthood, combined the best of the methods carried on at our present-day health-resorts, our hydropathics, sanatoriums, and nursing-homes. Fresh air, water-cures, massage, gymnastics, psychotherapy, and natural methods in general were chiefly relied on.

Hippocrates, the "Father of Medicine" (5th to 4th centuries, B.C.) was associated with the Asclepieum of Cos, an island off the south-west coast of Asia Minor, near Rhodes. He apparently revitalized the work of the health-temples, which had before his time been showing a certain decline in vigour, coupled with a corresponding excessive tendency towards sophistry and priestcraft.

Celsus says: "Hippocrates Cous primus quidem ex omnibus memoria dignis ab studio sapientiae disciplinam hanc separavit." He means that Hippocrates first gave the physician an independent standing, separating him from the cosmological speculator. Hippocrates confined the medical man to medicine. He did with medical thought what Socrates did with thought in general—he "brought it down from heaven to earth." His watchword was "Back to Nature!"

At the same time, while assigning the physician his post, Hippocrates would not let him regard that post as sacrosanct. He set his face against any
tendency to mystery-mongering, to exclusiveness, to sacerdotalism. He was, in fact, opposed to the spirit of trade-unionism in medicine. His concern was rather with the physician’s duties than his “rights.”

At the dawn of recorded medical history Hippocrates stands for the fundamental and primary importance of seeing clearly—that is of clinical observation. And what he observed was that the human organism, when exposed to certain abnormal conditions—certain stresses—tends to behave in a certain way: that in other words, each “disease” tends to run a certain definite course. To him a disease was essentially a process, one and indivisible, and thus his practical problem was essentially one of prognosis—“what will be the natural course of this disease, if left to itself?” Here he found himself to no small extent in opposition with the teaching of the neighbouring medical school of Cnidus, where a more static view-point laid special emphasis upon the minutiae of diagnosis.

Observation taught Hippocrates to place unbounded faith in the recuperative powers of the living organism—in what we sometimes call nowadays the vis medicatrix Naturae. His observation was that even with a very considerable “abnormality” of environmental stress the organism, in the large majority of cases, manages eventually by its own inherent powers to adjust itself to the new conditions. “Merely give Nature a chance,” said the father of medicine in effect, “and most
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diseases will cure themselves.” And accordingly his treatment was mainly directed towards “giving Nature a chance.”

His keen sense of the solidarity (or rather, of the constant interplay) between the organism and its environment (the “conditions” to which it is exposed) is instanced in his book, “Airs, Waters, and Places.” As we recognise, in our popular everyday psychology, that “it takes two to make a quarrel,” so Hippocrates recognised that in pathology, it takes two (organism and environment) to make a disease.

As an outstanding example of his power of clinical observation we may recall the facies Hippocratica, an accurate study of the countenance of a dying man.

His ideals for the profession are embodied in the “Hippocratic oath.”

Anatomy. Impressed by this view of the organism as a unity, the Hippocratic school tended in some degree to overlook the importance of its constituent parts. The balance was re-adjusted later on by the labours of the anatomical school of Alexandria, which, under the aegis of the enlightened Ptolemies, arose in the 3rd century B.C. Two prominent exponents of anatomy belonging to this school were Herophilus and Erasistratus, the latter of whom we shall frequently meet with in the following pages (v. p. 95 et seq.).

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After the death of the Master, the Hippocratic school tended, as so often happens with the best of cultural movements, to show signs itself of diminishing vitality: the letter began to obscure and hamper the spirit. The comparatively small element of theory which existed in the Hippocratic physiology was made the groundwork of a somewhat over-elaborated “system.” Against this tendency on the part of the “Dogmatic” or “Rationalist” school there arose, also at Alexandria, the sect of the Empiricists. “It is not,” they said, “the cause but the cure of diseases that concerns us; not how we digest, but what is digestible.”

Horace said “Graecia capta ferum victorem cepit.” Political domination, the occupation of territory by armies, does not necessarily mean real conquest. Horace’s statement applied to medicine as to other branches of culture.

The introducer of Greek medicine into Rome was Asclepiades (1st century B.C.). A man of forceful personality, and equipped with a fully developed philosophic system of health and disease which commended itself to the Roman savants of the day, he soon attained to the pinnacle of professional success in the Latin capital: he is indeed to all time the type of the fashionable (and somewhat “faddy”) West-end physician. His system was a purely mechanistic one, being based upon
the atomic doctrine of Leucippus and Democritus, which had been completed by Epicurus and recently introduced to the Roman public in Lucretius's great poem "De Rerum Natura." The disbelief of Asclepiades in the self-maintaining powers of the living organism are exposed and refuted at considerable length by Galen in the volume before us.

Out of the teaching of Asclepiades that physiological processes depend upon the particular way in which the ultimate indivisible molecules come together (ἐν τῇ πολί συνόδῳ τῶν πρῶτων ἑκείνων σωμάτων τῶν ἀπαθῶν) there was developed by his pupil, Themison of Laodicea, a system of medicine characterised by the most engaging simplicity both of diagnosis and treatment. This so-called "Methodic" system was intended to strike a balance between the excessive leaning to apriorism shown by the Rationalist (Hippocratic) school and the opposite tendency of the Empiricists. "A pathological theory we must have," said the Methodists in effect, "but let it be simple." They held that the molecular groups constituting the tissues were traversed by minute channels (πόροι, "pores"); all diseases belonged to one or other of two classes; if the channels were constricted the disease was one of stasis (στέγισσας), and if they were dilated the disease was one of flux (ῥύσις). Flux and stasis were indicated respectively by increase and diminution of the natural secretions;
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treatment was of opposites by opposites—of stasis by methods causing dilatation of the channels, and conversely.

Wild as it may seem, this pathological theory of the Methodists contained an element of truth; in various guises it has cropped up once and again at different epochs of medical history; even to-day there are pathologists who tend to describe certain classes of disease in terms of vaso-constriction and vaso-dilatation. The vice of the Methodist teaching was that it looked on a disease too much as something fixed and finite, an independent entity, to be considered entirely apart from its particular setting. The Methodists illustrate for us the tyranny of names. In its defects as in its virtues this school has analogues at the present day; we are all acquainted with the medical man to whom a name (such, let us say, as “tuberculosis,” “gout,” or “intestinal auto-intoxication”) stands for an entity, one and indivisible, to be treated by a definite and unvarying formula.

To such an individual the old German saying “Jedermann hat am Ende ein Bischen Tuberkulose” is simply—incomprehensible.

* * * * * * *

All the medical schools which I have mentioned Galen were still holding their ground in the 2nd century A.D., with more or less popular acceptance, when the great Galen made his entry into the world of Graeco-Roman medicine.
Claudius Galenus was born at Pergamos in Asia Minor in the year 131 A.D. His father was one Nicon, a well-to-do architect of that city. "I had the great good fortune," says Galen,¹ "to have as a father a highly amiable, just, good, and benevolent man. My mother, on the other hand, possessed a very bad temper; she used sometimes to bite her serving-maids, and she was perpetually shouting at my father and quarrelling with him—worse than Xanthippe with Socrates. When, therefore, I compared the excellence of my father's disposition with the disgraceful passions of my mother, I resolved to embrace and love the former qualities, and to avoid and hate the latter."

Nicon called his son Ταληνός, which means quiet, peaceable, and although the physician eventually turned out to be a man of elevated character, it is possible that his somewhat excessive leaning towards controversy (exemplified in the following pages) may have resulted from the fact that he was never quite able to throw off the worst side of the maternal inheritance.

His father, a man well schooled in mathematics and philosophy, saw to it that his son should not lack a liberal education. Pergamos itself was an ancient centre of civilisation, containing, among other culture-institutions, a library only second in importance to that of Alexandria itself; it also contained an Asclepieum.

¹ On the Affections of the Mind, p. 41 (Kühn's ed.).
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Galen's training was essentially eclectic: he studied all the chief philosophical systems of the time—Platonic, Aristotelian, Stoic, and Epicurean—and then, at the age of seventeen, entered on a course of medical studies; these he pursued under the best teachers at his own city, and afterwards, during a period of Wanderjahre, at Smyrna, Alexandria, and other leading medical centres.

Returning to Pergamnos, he received his first professional appointment—that of surgeon to the gladiators. After four years here he was drawn by ambition to Rome, being at that time about thirty-one years of age. At Rome the young Pergamene attained a brilliant reputation both as a practitioner and as a public demonstrator of anatomy; among his patients he finally numbered even the Emperor Marcus Aurelius himself.

Medical practice in Rome at this time was at a low ebb, and Galen took no pains to conceal his contempt for the ignorance, charlatanism, and venality of his fellow-practitioners. Eventually, in spite of his social popularity, he raised up such odium against himself in medical circles, that he was forced to flee the city. This he did hurriedly and secretly in the year 168 A.D., when thirty-six years of age. He betook himself to his old home at Pergamnos, where he settled down once more to a literary life.

His respite was short, however, for within a year he was summoned back to Italy by imperial mandate. Marcus Aurelius was about to undertake an
expedition against the Germans, who at that time were threatening the northern frontiers of the Empire, and he was anxious that his consulting physician should accompany him to the front. “Patriotism” in this sense, however, seems to have had no charms for the Pergamene, and he pleaded vigorously to be excused. Eventually, the Emperor gave him permission to remain at home, entrusting to his care the young prince Commodus.

Thereafter we know little of Galen’s history, beyond the fact that he now entered upon a period of great literary activity. Probably he died about the end of the century.

Galen wrote extensively, not only on anatomy, physiology, and medicine in general, but also on logic; his logical proclivities, as will be shown later, are well exemplified in his medical writings. A considerable number of undoubtedly genuine works of his have come down to us. The full importance of his contributions to medicine does not appear to have been recognized till some time after his death, but eventually, as already pointed out, the terms Galenism and Greek medicine became practically synonymous.

A few words may be devoted to the subsequent history of his writings.

During and after the final break-up of the Roman Empire came times of confusion and of social re-
construction, which left little opportunity for scientific thought and research. The Byzantine Empire, from the 4th century onwards, was the scene of much internal turmoil, in which the militant activities of the now State-established Christian church played a not inconsiderable part. The Byzantine medical scholars were at best compilers, and a typical compiler was Oribasius, body-physician to the Emperor Julian (4th century, a.d.); his excellent Synopsis was written in order to make the huge mass of the Galenic writings available for the ordinary practitioner.

Greek medicine spread, with general Greek culture, throughout Syria, and from thence was carried by the Nestorians, a persecuted heretical sect, into Persia; here it became implanted, and hence eventually spread to the Mohammedan world. Several of the Prophet’s successors (such as the Caliphs Harun-al-Rashid and Abdul-Rahman III) were great patrons of Greek learning, and especially of medicine. The Arabian scholars imbibed Aristotle and Galen with avidity. A partial assimilation, however, was the farthest stage to which they could attain; with the exception of pharmacology, the Arabians made practically no independent additions to medicine. They were essentially systematizers and commentators. “Averrois che il gran comento feo” ¹

¹ “Averrhoës who made the great Commentary” (Dante). It was Averrhoës (Ebn Roshd) who, in the 12th century, introduced Aristotle to the Mohammedan world, and the “Commentary” referred to was on Aristotle.
may stand as the type pur excellence of the Moslem sage.

Avicenna (Ebn Sina), (10th to 11th century) is the foremost name in Arabian medicine: his "Book of the Canon in Medicine," when translated into Latin, even overshadowed the authority of Galen himself for some four centuries. Of this work the medical historian Max Neuburger says: "Avicenna, according to his lights, imparted to contemporary medical science the appearance of almost mathematical accuracy, whilst the art of therapeutics, although empiricism did not wholly lack recognition, was deduced as a logical sequence from theoretical (Galenic and Aristotelian) premises."

Having arrived at such a condition in the hands of the Mohammedans, Galenism was now destined to pass once more to the West. From the 11th century onwards Latin translations of this "Arabian" Medicine (being Greek medicine in oriental trappings) began to make their way into Europe; here they helped to undermine the authority of the one medical school of native growth which the West produced during the Middle Ages—namely the School of Salerno.

Blending with the Scholastic philosophy at the universities of Naples and Montpellier, the teachings of Aristotle and Galen now assumed a position of supreme authority: from their word, in matters
scientific and medical, there was no appeal. In reference to this period the Pergamene was referred to in later times as the "Medical Pope of the Middle Ages."

It was of course the logical side of Galenism which chiefly commended it to the mediaeval Schoolmen, as to the essentially speculative Moslems.

The year 1453, when Constantinople fell into the hands of the Turks, is often taken as marking the commencement of the Renascence. Among the many factors which tended to stimulate and awaken men's minds during these spacious times was the rediscOvery of the Greek classics, which were brought to Europe by, among others, the scholars who fled from Byzantium. The Arabo Scholastic versions of Aristotle and Galen were now confronted by their Greek originals. A passion for Greek learning was aroused. The freshness and truth of these old writings helped to awaken men to a renewed sense of their own dignity and worth, and to brace them in their own struggle for self-expression.

Prominent in this "Humanist" movement was the English physician, Thomas Linacre (c. 1460-1524) who, having gained in Italy an extraordinary zeal for the New Learning, devoted the rest of his life, after returning to England, to the promotion of the litterae humaniores, and especially to making Galen accessible to readers of Latin. Thus the "De Naturalibus Facultatibus" appeared in London in xxi
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1523, and was preceded and followed by several other translations, all marked by minute accuracy and elegant Latinity.

Two new parties now arose in the medical world—the so-called "Greeks" and the more conservative "Arabists."

But the swing of the pendulum did not cease with the creation of the liberal "Greek" party; the dazzling vision of freedom was to drive some to a yet more anarchical position. Paracelsus, who flourished in the first half of the 16th century, may be taken as typifying this extremist tendency. His one cry was, "Let us away with all authority whatsoever, and get back to Nature!" At his first lecture as professor at the medical school of Basle he symbolically burned the works of Galen and of his chief Arabian exponent, Avicenna.

But the final collapse of authority in medicine could not be brought about by mere negativism. It was the constructive work of the Renascence anatomists, particularly those of the Italian school, which finally brought Galenism to the ground.

Vesalius (1514–64), the modern "Father of Anatomy," for dissecting human bodies, was fiercely assailed by the hosts of orthodoxy, including that stout Galenist, his old teacher Jacques Dubois (Jacobus Sylvius). Vesalius held on his way, however, proving, inter alia, that Galen had been wrong xxii
in saying that the interventricular septum of the heart was permeable (cf. present volume, p. 321). Michael Servetus (1509-53) suggested that the blood, in order to get from the right to the left side of the heart, might have to pass through the lungs. For his heterodox opinions he was burned at the stake.

Another 16th-century anatomist, Andrea Cesalpino, is considered by the Italians to have been a discoverer of the circulation of the blood before Harvey; he certainly had a more or less clear idea of the circulation, but, as in the case of the "organic evolutionists before Darwin," he failed to prove his point by conclusive demonstration.

William Harvey, the great Englishman who founded modern experimental physiology and was the first to establish not only the fact of the circulation but also the physical laws governing it, is commonly reckoned the Father of Modern Medicine. He owed his interest in the movements of the blood to Fabricio of Acquapendente, his tutor at Padua, who drew his attention to the valves in the veins, thus suggesting the idea of a circular as opposed to a to-and-fro motion. Harvey's great generalisation, based upon a long series of experiments in vivo, was considered to have given the coup de grâce to the Galenic physiology, and hence threw temporary discredit upon the whole system of medicine associated therewith.

Modern medicine, based upon a painstaking
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research into the details of physiological function, had begun.

While we cannot sufficiently commend the results of the long modern period of research-work to which the labours of the Renascence anatomists from Vesalius to Harvey form a fitting prelude, we yet by no means allow that Galen's general medical outlook was so entirely invalidated as many imagine by the conclusive demonstration of his anatomical errors. It is time for us now to turn to Galen again after three hundred years of virtual neglect: it may be that he will help us to see something fundamentally important for medical practice which is beyond the power even of our microscopes and X-rays to reveal. While the value of his work undoubtedly lies mainly in its enabling us to envisage one of the greatest of the early steps attained by man in medical knowledge, it also has a very definite intrinsic value of its own.

No attempt can be made here to determine how much of Galen's work is, in the true sense of the word, original, and how much is drawn from the labours of his predecessors. In any case, there is no doubt that he was much more than a mere compiler and systematizer of other men's work: he was great enough to be able not merely to collect, to digest, and to assimilate all the best of the work done before his time, but, adding to this the outcome of his own observations, experiments, and reflections, to present
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the whole in an articulated "system" showing that perfect balance of parts which is the essential criterion of a work of art. Constantly, however, in his writings we shall come across traces of the influence of, among others, Plato, Aristotle, and writers of the Stoic school.

Although Galen is an eclectic in the best sense of the term, there is one name to which he pays a very special tribute—that of his illustrious forerunner Hippocrates. Him on quite a number of occasions he actually calls "divine" (cf. p. 293).

"Hippocrates," he says, "was the first known to us of all who have been both physicians and philosophers, in that he was the first to recognise what nature does." Here is struck the keynote of the teaching of both Hippocrates and Galen; this is shown in the volume before us, which deals with "the natural faculties"—that is with the faculties of this same "Nature" or vital principle referred to in the quotation.

If Galen be looked on as a crystallisation of Greek medicine, then this book may be looked on as a crystallisation of Galen. Within its comparatively short compass we meet with instances illustrating perhaps most of the sides of this many-sided writer. The "Natural Faculties" therefore forms an excellent prelude to the study of his larger and more specialised works.
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What, now, is this "Nature" or biological principle upon which Galen, like Hippocrates, bases the whole of his medical teaching, and which, we may add, is constantly overlooked—if indeed ever properly apprehended—by many physiologists of the present day? By using this term Galen meant simply that, when we deal with a living thing, we are dealing primarily with a unity, which, quâ living, is not further divisible; all its parts can only be understood and dealt with as being in relation to this principle of unity. Galen was thus led to criticise with considerable severity many of the medical and surgical specialists of his time, who acted on the assumption (implicit if not explicit) that the whole was merely the sum of its parts, and that if, in an ailing organism, these parts were treated each in and for itself, the health of the whole organism could in this way be eventually restored.

Galen expressed this idea of the unity of the organism by saying that it was governed by a Physis or Nature (ἡ φύσις ἡπερ διοικεῖ τὸ ζωὸν), with whose "faculties" or powers it was the province of φυσιολογία (physiology, Nature-lore) to deal. It was because Hippocrates had a clear sense of this principle that Galen called him master. "Greatest," say the Moslems, "is Allah, and Mohammed is his prophet." "Greatest," said Galen, "is the Physis, and Hippocrates is its prophet." Never did Mohammed more zealously maintain the unity of the Godhead than Hippocrates and Galen the unity of the organism.
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But we shall not have read far before we discover that the term *Physiology*, as used by Galen, stands not merely for what we understand by it nowadays, but also for a large part of *Physics* as well. This is one of the chief sources of confusion in his writings. Having grasped, for example, the uniqueness of the process of *specific selection* (δακη τοι αικειου), by which the tissues nourish themselves, he proceeds to apply this principle in explanation of entirely different classes of phenomena; thus he mixes it up with the physical phenomenon of the attraction of the lodestone for iron, of dry grain for moisture, etc. It is noteworthy, however, in these latter instances, that he does not venture to follow out his comparison to its logical conclusion; he certainly stops short of hinting that the lodestone (like a living organ or tissue) assimilates the metal which it has attracted!

Setting aside, however, these occasional half-hearted attempts to apply his principle of a φυσις in regions where it has no natural standing, we shall find that in the field of biology Galen moves with an assurance bred of first-hand experience.

Against his attempt to "biologize" physics may be set the converse attempt of the mechanical Atomist school. Thus in Asclepiades he found a doughty defender of the view that physiology was "merely" physics. Galen's ire being roused, he is not content with driving the enemy out of the biological camp, but must needs attempt also to
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dislodge him from that of physics, in which he has every right to be.

In defence of the universal validity of his principle, Galen also tends to excessive disparagement of morphological factors; witness his objection to the view of the anatomist Erasistratus that the calibre of vessels played a part in determining the secretion of fluids (p. 123), that digestion was caused by the mechanical action of the stomach walls (p. 243), and dropsy by induration of the liver (p. 171).

While combating the atomic explanation of physical processes, Galen of course realised that there were many of these which could only be explained according to what we should now call "mechanical laws." For example, non-living things could be subjected to φορά (passive motion), they answered to the laws of gravity (ταῖς τῶν ὕλῶν οἰκονόμενα ῥοπαίς, p. 126). Furthermore, Galen did not fail to see that living things also were not entirely exempted from the operation of these laws; they too may be at least partly subject to gravity (loc. cit.); a hollow organ exerts, by virtue of its cavity, an attraction similar to that of dilating bellows, as well as, by virtue of the living tissue of its walls, a specifically "vital" or selective kind of attraction (p. 325).

As a type of characteristically vital action we may take nutrition, in which occurs a phenomenon
which Galen calls **active motion** (δραστική κίνησις) or, more technically, **alteration** (ἀλλοίωσις). This active type of motion cannot be adequately stated in terms of the passive movements (groupings and re-groupings) of its constituent parts according to certain empirical “laws.” Alteration involves **self-movement**, a self-determination of the organism or organic part. Galen does not attempt to explain this fundamental characteristic of alteration any further; he contents himself with referring his opponents to Aristotle’s work on the “Complete Alteration of Substance” (p. 9).

The most important characteristic of the Physis or Nature is its τέχνη—its artistic creativeness. In other words, the living organism is a creative artist. This feature may be observed typically in its primary functions of **growth** and **nutrition**; these are dependent on the characteristic **faculties** or powers, by virtue of which each part draws to itself what is proper or appropriate to it (τὸ οἰκεῖον) and rejects what is foreign (τὸ ἄλλοτρον), thereafter appropriating or assimilating the attracted material; this assimilation is an example of the alteration (or qualitative change) already alluded to; thus the food eaten is “altered” into the various tissues of the body, each of these having been provided by “Nature” with its own specific faculties of attraction and repulsion.

Any of the operations of the living part may be looked on in three ways, either (a) as a διναμίς,
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faculty, potentiality; (b) as an ἔνεργεια, which is this δύναμις in operation; or (c) as an ἔργον, the product or effect of the ἔνεργεια.¹

¹ What appear to me to be certain resemblances between the Galenical and the modern vitalistic views of Henri Bergson may perhaps be alluded to here. Galen's vital principle, ἡ τεχνικὴ φύσις ("creative growth"), presents analogies with l'Evolution créatrice: both manifest their activity in producing qualitative change (ἀλλαξία, change-ment): in both, the creative change cannot be analysed into a series of static states, but is one and continuous. In Galen, however, it comes to an end with the development of the individual, whereas in Bergson it continues indefinitely as the evolution of life. The three aspects of organic life may be tabulated thus:

<table>
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<tr>
<th>δύναμις</th>
<th>ἔνεργεια</th>
<th>ἔργον</th>
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<tr>
<td>Work to be done.</td>
<td>Work being done.</td>
<td>Work done, finished.</td>
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<tr>
<td>Future aspect.</td>
<td>Present aspect.</td>
<td>Past aspect.</td>
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<tr>
<td>A changing which cannot be understood as a sum of static parts; a constant becoming, never stopping — at least till the ἔργον is reached.</td>
<td></td>
<td>A &quot;&quot;thing.&quot;&quot;</td>
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Bergson's "telesological" aspect. Bergson's "philosophical" aspect. Bergson's "outlook of physical science."

Galen recognized "creativeness" (τεχνη) in the development of the individual and its parts (ontogeny) and in the maintenance of these, but he failed to appreciate the creative evolution of species (phylogeny), which is, of course, part of the same process. To the teleologist the possibilities (δυνάμεις) of the Physis are limited, to Bergson they are un-
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Like his master Hippocrates, Galen attached fundamental importance to clinical observation—to the evidence of the senses as the indispensable groundwork of all medical knowledge. He had also, however, a forte for rapid generalisation from observations, and his logical proclivities disposed him limited. Galen and Bergson agree in attaching most practical importance to the middle category—that of Function.

While it must be conceded that Galen, following Aristotle, had never seriously questioned the fixity of species, the following quotation from his work On Habits (chap. ii.) will show that he must have at least had occasional glimmerings of our modern point of view on the matter. Referring to assimilation, he says: "Just as everything we eat or drink becomes altered in quality, so of course also does the altering factor itself become altered. . . . A clear proof of the assimilation of things which are being nourished to that which is nourishing them is the change which occurs in plants and seeds; this often goes so far that what is highly noxious in one soil becomes, when transplanted into another soil, not merely harmless, but actually useful. This has been largely put to the test by those who compose memoirs on farming and on plants, as also by zoological authors who have written on the changes which occur according to the countries in which animals live. Since, therefore, not only is the nourishment altered by the creature nourished, but the latter itself also undergoes some slight alteration, this slight alteration must necessarily become considerable in the course of time, and thus properties resulting from prolonged habit must come to be on a par with natural properties."

Galen fails to see the possibility that the "natural" properties themselves originated in this way, as activities which gradually became habitual—that is to say, that the effects of nurture may become a "second nature," and so eventually nature itself.

The whole passage, however, may be commended to modern biologists—particularly, might one say, to those bacteriologists who have not yet realised how extraordinarily relative is the term "specificity" when applied to the subject-matter of their science.
INTRODUCTION

particularly to deductive reasoning. Examples of an almost Euclidean method of argument may be found in the *Natural Faculties* (e.g. Book III. chap. i.). While this method undoubtedly gave him much help in his search for truth, it also not unfrequently led him astray. This is evidenced by his attempt, already noted, to apply the biological principle of the φύσις in physics. Characteristic examples of attempts to force facts to fit premises will be found in Book II. chap. ix., where our author demonstrates that yellow bile is "virtually" dry, and also, by a process of exclusion, assigns to the spleen the function of clearing away black bile. Strangest of all is his attempt to prove that the same principle of specific attraction by which the ultimate tissues nourish themselves (and the lodestone attracts iron!) accounts for the reception of food into the stomach, of urine into the kidneys, of bile into the gall-bladder, and of semen into the uterus.

These instances are given, however, without prejudice to the system of generalisation and deduction which, in Galen's hands, often proved exceedingly fruitful. He is said to have tried "to unite professional and scientific medicine with a philosophic link." He objected, however, to such extreme attempts at simplification of medical science as that of the Methodists, to whom diseases were isolated entities, without any relationships in time or space (v. p. xv. *supra*).

He based much of his pathological reasoning upon
the "humoral theory" of Hippocrates, according to which certain diseases were caused by one or more of the four humours (blood, phlem, black and yellow bile) being in excess—that is, by various dyscrasias. Our modern conception of "hormone" action shows certain resemblances with this theory.

Besides observation and reasoning, Galen took his stand on experiment; he was one of the first of experimental physiologists, as is illustrated in the present book by his researches into the function of the kidneys (p. 59 et seq.). He also conducted a long series of experiments into the physiology of the spinal cord, to determine what parts controlled movement and what sensibility.

As a practitioner he modelled his work largely on the broad and simple lines laid down by Hippocrates. He had also at his disposal all the acquisitions of biological science dating from the time of Aristotle five hundred years earlier, and reinforced by the discoveries in anatomy made by the Alexandrian school. To these he added a large series of researches of his own.

Galen never confined himself to what one might call the academic or strictly orthodox sources of information; he roamed the world over for answers to his queries. For example, we find him on his journeys between Pergamos and Rome twice visiting the island of Lemnos in order to procure some of the terra sigillata, a kind of earth which had a reputation for healing the bites of serpents and
other wounds. At other times he visited the copper-mines of Cyprus in search for copper, and Palestine for the resin called Balm of Gilead.

By inclination and training Galen was the reverse of a "party-man." In the *Natural Faculties* (p. 55) he speaks of the bane of sectarian partizanship, "harder to heal than any itch." He pours scorn upon the ignorant "Erasistrateans" and "Asclepiadeans," who attempted to hide their own incompetence under the shield of some great man's name (cf. p. 141).

Of the two chief objects of his censure in the *Natural Faculties*, Galen deals perhaps less rigorously with Erasistratus than with Asclepiades. Erasistratus did at least recognize the existence of a vital principle in the organism, albeit, with his eye on the structures which the scalpel displayed he tended frequently to forget it. The researches of the anatomical school of Alexandria had been naturally of the greatest service to surgery, but in medicine they sometimes had a tendency to check progress by diverting attention from the whole to the part.

Another novel conception frequently occurring in Galen's writings is that of the *Pneuma* (*i.e.* the breath, *spiritus*). This word is used in two senses, as meaning (1) the inspired air, which was drawn into the left side of the heart and thence carried all over the body by the arteries; this has not a few analogies with oxygen, particularly as its action in the tissues...
INTRODUCTION

is attended with the appearance of the so-called "innate heat." (2) A vital principle, conceived as being made up of matter in the most subtle imaginable state (i.e. air). This vital principle became resolved into three kinds: (a) πνεῦμα φυσικὸν or spiritus naturalis, carried by the veins, and presiding over the subconscious vegetative life; this "natural spirit" is therefore practically equivalent to the φύσις or "nature" itself. (b) The πνεῦμα ζωτικὸν or spiritus vitalis; here particularly is a source of error, since the air already alluded to as being carried by the arteries tends to be confused with this principle of "individuality" or relative autonomy in the circulatory (including, perhaps, the vasomotor) system. (c) The πνεῦμα ψυχικὸν or spiritus animalis (anima = ψυχή), carried by longitudinal canals in the nerves; this corresponds to the ψυχή.

This view of a "vital principle" as necessarily consisting of matter in a finely divided, fluid, or "etheric" state is not unknown even in our day. Belief in the fundamental importance of the Pneuma formed the basis of the teaching of another vitalist school in ancient Greece, that of the Pneumatists.

It is unnecessary to detail here the various ways in which Galen's physiological views differ from those of the Moderns, as most of these are noticed in footnotes to the text of the present translation. His ignorance of the circulation of the blood does not lessen the force of his general physiological conclu-
sions to the extent that might be anticipated. In his opinion, the great bulk of the blood travelled with a to-and-fro motion in the veins, while a little of it, mixed with inspired air, moved in the same way along the arteries; whereas we now know that all the blood goes outward by the arteries and returns by the veins; in either case blood is carried to the tissues by blood-vessels, and Galen’s ideas of tissue-nutrition were wonderfully sound. The ingenious method by which (in ignorance of the pulmonary circulation) he makes blood pass from the right to the left ventricle, may be read in the present work (p. 321). As will be seen, he was conversant with the “anastomoses” between the ultimate branches of arteries and veins, although he imagined that they were not used under “normal” conditions.

Galen was not only a man of great intellectual gifts, but one also of strong moral fibre. In his short treatise “That the best Physician is also a Philosopher” he outlines his professional ideals. It is necessary for the efficient healer to be versed in the three branches of “philosophy,” viz.: (a) logic, the science of how to think; (b) physics, the science of what is—i.e. of “Nature” in the widest sense; (c) ethics, the science of what to do. The amount of toil which he who wishes to be a physician must undergo—firstly, in mastering the work of his predecessors and afterwards in studying disease at first hand—makes it absolutely necessary that he should
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possess perfect self-control, that he should scorn money and the weak pleasures of the senses, and should live laborious days.

Readers of the following pages will notice that Galen uses what we should call distinctly immoderate language towards those who ventured to differ from the views of his master Hippocrates (which were also his own). The employment of such language was one of the few weaknesses of his age which he did not transcend. Possibly also his mother's choleric temper may have predisposed him to it.

The fact, too, that his vivisection experiments (e.g. pp. 59, 273) were carried out apparently without any kind of anaesthetisation being even thought of is abhorrent to the feelings of to-day, but must be excused also on the ground that callousness towards animals was then customary, men having probably never thought much about the subject.

Galen is a master of language, using a highly polished variety of Attic prose with a precision which can be only very imperfectly reproduced in another tongue. Every word he uses has an exact and definite meaning attached to it. Translation is particularly difficult when a word stands for a physiological conception which is not now held; instances are the words anadosis, prosthesis, and prosphysis, indicating certain steps in the process by which nutriment is conveyed from the alimentary canal to the tissues.
INTRODUCTION

Readers will be surprised to find how many words are used by Galen which they would have thought had been expressly coined to fit modern conceptions; thus our author employs not merely such terms as *physiology*, *phthisis*, *atrophy*, *anastomosis*, but also *haematopoietic*, *anaesthesia*, and even *aseptic*! It is only fair, however, to remark that these terms, particularly the last, were not used by Galen in quite their modern significance.

Summary. To resume, then: What contribution can Galen bring to the art of healing at the present day? It was not, surely, for nothing that the great Pergamene gave laws to the medical world for over a thousand years!

Let us draw attention once more to:

(1) The high ideal which he set before the profession.

(2) His insistence on immediate contact with nature as the primary condition for arriving at an understanding of disease; on the need for due consideration of previous authorities; on the need also for reflection—for employment of the mind's eye (ἡ λογικὴ θεωρία) as an aid to the physical eye.

(3) His essentially broad outlook, which often helped him in the comprehension of a phenomenon through his knowledge of an analogous phenomenon in another γένος of nature.
(4) His keen appreciation of the unity of the organism, and of the inter-dependence of its parts; his realisation that the vital phenomena (physiological and pathological) in a living organism can only be understood when considered in relation to the environment of that organism or part. This is the foundation for the war that Galen waged à outrance on the Methodists, to whom diseases were things without relation to anything. This dispute is, unfortunately, not touched upon in the present volume. What Galen combated was the tendency, familiar enough in our own day, to reduce medicine to the science of finding a label for each patient, and then treating not the patient, but the label. (This tendency, we may remark in parenthesis, is one which is obviously well suited for the standardising purposes of a State medical service, and is therefore one which all who have the weal of the profession at heart must most jealously watch in the difficult days that lie ahead.)

(5) His realisation of the inappropriateness and inadequacy of physical formulae in explaining physiological activities. Galen’s disputes with Asclepiades over τὰ πρῶτα ἐκεῖα σώματα τὰ ἀπαθῆ, over the ἅναρμα στοιχεῖα καὶ ληπώδεις ὁγκοί, is but another aspect of his quarrel with the Methodists regarding their pathological “units,” whose primary characteristic was just this same ἀπαθεία (impassiveness to environment, “unimpressionability”). We have of course
our Physiatric or Iatromechanical school at the present day, to whom such processes as absorption from the alimentary canal, the respiratory interchange of gases, and the action of the renal epithelium are susceptible of a purely physical explanation.¹

(6) His quarrel with the Anatomists, which was in essence the same as that with the Atomists, and which arose from his clear realisation that that primary and indispensable desideratum, a view of the whole, could never be obtained by a mere summation of partial views; hence, also, his sense of the dangers which would beset the medical art if it were allowed to fall into the hands of a mere crowd of competing specialists without any organising head to guide them.

¹ In terms of filtration, diffusion, and osmosis.
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COMMENTARIES AND APPRECIATIONS

SYNOPSIS OF CHAPTERS

BOOK I

CHAPTER I
Distinction between the effects of (a) the organism's psyche or soul (b) its physis or nature. The author proposes to confine himself to a consideration of the latter—the vegetative—aspect of life.

CHAPTER II
Definition of terms. Different kinds of motion. Alteration or qualitative change. Refutation of the Sophists' objection that such change is only apparent, not real. The four fundamental qualities of Hippocrates (later Aristotle). Distinction between faculty, activity (function), and effect (work or product).

CHAPTER III
It is by virtue of the four qualities that each part functions. Some authorities subordinate the dry and the moist principles to the hot and the cold. Aristotle inconsistent here.

CHAPTER IV
We must suppose that there are faculties corresponding in number to the visible effects (or products) with which we are familiar.

CHAPTER V
Genesis, growth, and nutrition. Genesis (embryogeny) subdivided into histogenesis and organogenesis. Growth is a tridimensional expansion of the solid parts formed during genesis. Nutrition.
SYNOPSIS OF CHAPTERS

Chapter VI

The process of genesis (embryogeny) from insemination onwards. Each of the simple, elementary, homogeneous parts (tissues) is produced by a special blend of the four primary alternative faculties (such secondary alternative faculties being osteopoietic, neuropoietic, etc.). A special function and use also corresponds to each of these special tissues. The bringing of these tissues together into organs and the disposal of these organs is performed by another faculty called diaplastic, moulding, or formative.

Chapter VII

We now pass from genesis to growth. Growth essentially a post-natal process; it involves two factors, expansion and nutrition, explained by analogy of a familiar child's game.

Chapter VIII

Nutrition.

Chapter IX

These three primary faculties (genesis, growth, nutrition) have various others subservient to them.

Chapter X

Nutrition not a simple process. (1) Need of subsidiary organs for the various stages of alteration, e.g., of bread into blood, of that into bone, etc. (2) Need also of organs for excreting the non-utilizable portions of the food, e.g., much vegetable matter is superfluous. (3) Need of organs of a third kind, for distributing the pabulum through the body.

Chapter XI

Nutrition analysed into the stages of application (prosthesis), adhesion (prophysis), and assimilation. The stages illustrated by certain pathological conditions. Different shades of meaning of the term nutriment.
SYNOPSIS OF CHAPTERS

CHAPTER XII

The two chief medico-philosophical schools—Atomist and Vitalist. Hippocrates an adherent of the latter school—his doctrine of an original principle or "nature" in every living thing (doctrine of the unity of the organism).

CHAPTER XIII

Failure of Asclepiades to understand the functions of kidneys and ureters. His hypothesis of vaporization of imbibed fluids is here refuted. A demonstration of urinary secretion in the living animal; the forethought and artistic skill of Nature vindicated. Refutation also of Asclepiades's disbelief in the special selective action of purgative drugs.

CHAPTER XIV

While Asclepiades denies in toto the obvious fact of specific attraction, Epicurus grants the fact, although his attempt to explain it by the atomic hypothesis breaks down. Refutation of the Epicurean theory of magnetic attraction. Instances of specific attraction of thorns and animal poisons by medicaments, of moisture by corn, etc.

CHAPTER XV

It now being granted that the urine is secreted by the kidneys, the rationale of this secretion is enquired into. The kidneys are not mechanical filters, but are by virtue of their nature possessed of a specific faculty of attraction.

CHAPTER XVI

Erasistratus, again, by his favourite principle of horror vacui could never explain the secretion of urine by the kidneys. While, however, he acknowledged that the kidneys do secrete urine, he makes no attempt to explain this; he ignores, but does not attempt to refute, the Hippocratic doctrine of specific attraction. "Servile" position taken up by Asclepiades and Erasistratus in regard to this function of urinary secretion.
SYNOPSIS OF CHAPTERS

CHAPTER XVII

Three other attempts (by adherents of the Erasistratean school and by Lycus of Macedonia) to explain how the kidneys come to separate out urine from the blood. All these ignore the obvious principle of attraction.

BOOK II

CHAPTER I

In order to explain dispersal of food from alimentary canal via the veins (anadosis) there is no need to invoke with Erasistratus, the horror vacui, since here again the principle of specific attraction is operative; moreover, blood is also driven forward by the compressing action of the stomach and the contractions of the veins. Possibility, however, of Erasistratus's factor playing a certain minor rôle.

CHAPTER II

The Erasistratean idea that bile becomes separated out from the blood in the liver because, being the thinner fluid, it alone can enter the narrow stomata of the bile-ducts, while the thicker blood can only enter the wider mouths of the hepatic venules.

CHAPTER III

The morphological factors suggested by Erasistratus are quite inadequate to explain biological happenings. Erasistratus inconsistent with his own statements. The inmanence of the physis or nature; her shaping is not merely external like that of a statuary, but involves the entire substance. In genesis (embryogeny) the semen is the active, and the menstrual blood the passive, principle. Attractive, alterative, and formative faculties of the semen. Embryogeny is naturally followed by growth; these two functions distinguished.
SYNOPSIS OF CHAPTERS

CHAPTER IV

Unjustified claim by Erasistrateans that their founder had associations with the Peripatetic (Aristotelian) school. The characteristic physiological tenets of that school (which were all anticipated by Hippocrates) in no way agree with those of Erasistratus, save that both recognize the purposefulness of Nature; in practice, however, Erasistratus assumed numerous exceptions to this principle. Difficulty of understanding why he rejected the biological principle of attraction in favour of anatomical factors.

CHAPTER V

A further difficulty raised by Erasistratus's statement regarding secretion of bile in the liver.

CHAPTER VI

The same holds with nutrition. Even if we grant that veins may obtain their nutrient blood by virtue of the horror vacui (chap. 1), how could this explain the nutrition of nerves? Erasistratus's hypothesis of minute elementary nerves and vessels within the ordinary visible nerves simply throws the difficulty further back. And is Erasistratus's minute "simple" nerve susceptible of further analysis, as the Atomists would assume? If so, this is opposed to the conception of a constructive and artistic Nature which Erasistratus himself shares with Hippocrates and the writer. And if his minute nerve is really elementary and not further divisible, then it cannot, according to his own showing, contain a cavity; therefore the horror vacui does not apply to it. And how could this principle apply to the restoration to its original bulk of a part which had become thin through disease, where more matter must become attached than runs away? A quotation from Erasistratus shows that he did acknowledge an "attraction," although not exactly in the Hippocratic sense.
SYNOPSIS OF CHAPTERS

Chapter VII

In the last resort, the ultimate living elements (Erasistratus's simple vessels) must draw in their food by virtue of an inherent attractive faculty like that which the lodestone exerts on iron. Thus the process of anadosis, from beginning to end, can be explained without assuming a horror vacui.

Chapter VIII

Erasistratus's disregard for the humours. In respect to excessive formation of bile, however, prevention is better than cure; accordingly we must consider its pathology. Does blood pre-exist in the food, or does it come into existence in the body? Erasistratus's purely anatomical explanation of dropsy. He entirely avoids the question of the four qualities (e.g. the importance of innate heat) in the generation of the humours, etc. Yet the problem of blood-production is no less important than that of gastric digestion. Proof that bile does not pre-exist in the food. The four fundamental qualities of Hippocrates and Aristotle. How the humours are formed from food taken into the veins: when heat is in proportionate amount, blood results: when in excess, bile; when deficient, phlegm. Various conditions determining cold or warm temperaments. The four primary diseases result each from excess of one of the four qualities. Erasistratus unwillingly acknowledges this when he ascribes the indigestion occurring in fever to impaired function of the stomach. For what causes this functio laesa? Proof that it is the fever (excess of innate heat).

If, then, heat plays so important a part in abnormal functioning, so must it also in normal (i.e. causes of eucrasia involved in those of dyscrasia, of physiology in those of pathology). A like argument explains the genesis of the humours. Addition of warmth to things already warm makes them bitter; thus honey turns to bile in people who are already warm; where warmth deficient, as in old people, it turns to useful blood. This is a proof that bile does not pre-exist, as such, in the food.
The functions of organs also depend on the way in which the four qualities are mixed—e.g. the contracting function of the stomach. Treatment only possible when we know the causes of errors of function. The Erasistrateans practically Empiricists in this respect. On an appreciation of the meaning of a dyscrasia follows naturally the Hippocratic principle of treating opposites by opposites (e.g. cooling the overheated stomach, warming it when chilled, etc.). Useless in treatment to know merely the function of each organ; we must know the bodily condition which upsets this function. Blood is warm and moist. Yellow bile is warm and (virtually, though not apparently) dry. Phlegm is cold and moist. The fourth possible combination (cold and dry) is represented by black bile. For the clearing out of this humour from the blood, Nature has provided the spleen—an organ which, according to Erasistratus, fulfils no purpose. Proof of the importance of the spleen is the jaundice, toxaemia, etc., occurring when it is diseased. Erasistratus’s failure to mention the views of leading authorities on this organ shows the hopelessness of his position. The Hippocratic view has now been demonstrated deductively and inductively. The classical view as to the generation of the humours. Normal and pathological forms of yellow and black bile. Part played by the innate heat in their production. Other kinds of bile are merely transition-stages between these extreme types. Abnormal forms removed by liver and spleen respectively. Phlegm, however, does not need a special excretory organ, as it can undergo entire metabolism in the body.

Need for studying the works of the Ancients carefully, in order to reach a proper understanding of this subject.
SYNOPSIS OF CHAPTERS

BOOK III

Chapter I

A recapitulation of certain points previously demonstrated. Every part of the animal has an attractive and an alternative (assimilative) faculty; it attracts the nutrient juice which is proper to it. Assimilation is preceded by adhesion (prosphysis) and that again, by application (prosthesis). Application the goal of attraction. It would not, however, be followed by adhesion and assimilation if each part did not also possess a faculty for retaining in position the nutriment which has been applied. A priori necessity for this retentive faculty.

Chapter II

The same faculty to be proved a posteriori. Its corresponding function (i.e. the activation of this faculty or potentiality) well seen in the large hollow organs, notably the uterus and stomach.

Chapter III

Exercise of the retentive faculty particularly well seen in the uterus. Its object is to allow the embryo to attain full development; this being completed, a new faculty—the expulsive—hitherto quiescent, comes into play. Characteristic signs and symptoms of pregnancy. Tight grip of uterus on growing embryo, and accurate closure of os uteri during operation of the retentive faculty. Dilatation of os and expulsive activities of uterus at full term, or when foetus dies. Prolapse from undue exercise of this faculty. Rôle of the midwife. Accessory muscles in parturition.

Chapter IV

Same two faculties seen in stomach. Gurglings or borborygmi show that this organ is weak and is not gripping its contents tightly enough. Undue delay of food in a weak
SYNOPSIS OF CHAPTERS

stomach proved not to be due to narrowness of pylorus: length of stay depends on whether digestion (another instance of the characteristically vital process of alteration) has taken place or not. Erasistratus wrong in attributing digestion merely to the mechanical action of the stomach walls. When digestion completed, then pylorus opens and allows contents to pass downwards, just as os uteri when development of embryo completed.

Chapter V

If attraction and elimination always proceeded pari passu, the content of these hollow organs (including gall-bladder and urinary bladder) would never vary in amount. A retentive faculty, therefore, also logically needed. Its existence demonstrated. Expulsion determined by qualitative and quantitative changes of contents. "Diarrhoea" of stomach. Vomiting.

Chapter VI

Every organic part has an appetite and aversion for the qualities which are appropriate and foreign to it respectively. Attraction necessarily leads to a certain benefit received. This again necessitates retention.

Chapter VII

Interaction between two bodies; the stronger masters the weaker; a deleterious drug masters the forces of the body, whereas food is mastered by them; this mastery is an alteration, and the amount of alteration varies with the different organs; thus a partial alteration is effected in mouth by saliva, but much greater in stomach, where not only gastric juice, but also bile, pneuma, innate heat (i.e. oxidation ?), and other powerful factors are brought to bear on it; need of considerable alteration in stomach
SYNOPSIS OF CHAPTERS

as a transition-stage between food and blood; appearance of faeces in intestine another proof of great alteration effected in stomach. Asclepiades's denial of real qualitative change in stomach rebutted. Erasistratus's denial that digestion in any way resembles a boiling process comes from his taking words too literally.

Chapter VIII

Erasistratus denies that the stomach exerts any pull in the act of swallowing. That he is wrong, however, is proved by the anatomical structure of the stomach—its inner coat with longitudinal fibres obviously acts as a *vis a fronte* (attraction), whilst its outer coat exercises through the contraction of its circular fibres a *vis a tergo* (propulsion); the latter also comes into play in vomiting. The stomach uses the oesophagus as a kind of hand, to draw in its food with. The functions of the two coats proved also by vivisection. Swallowing cannot be attributed merely to the force of gravity.

Chapter IX

These four faculties which subserve nutrition are thus apparent in many different parts of the body.

Chapter X

Need for elaborating the statements of the ancient physicians. Superiority of Ancients to Moderns. This state of affairs can only be rectified by a really efficient education of youth. The chief requisites of such an education.

Chapter XI

For the sake of the few who really wish truth, the argument will be continued. A third kind of fibre—the *oblige*—subserves retention; the way in which this fibre is disposed in different coats.
SYNOPSIS OF CHAPTERS

Chapter XII

The factor which brings the expansive faculty into action is essentially a condition of the organ or its contents which is the reverse of that which determined attraction. Analogy between abortion and normal parturition. Whatever produces discomfort must be expelled. That discomfort also determines expulsion of contents from gall-bladder is not so evident as in the case of stomach, uterus, urinary bladder, etc., but can be logically demonstrated.

Chapter XIII

Expulsion takes place through the same channel as attraction (e.g., in stomach, gall-bladder, uterus). Similarly the delivery (anadosis) of nutriment to the liver from the food-canal via the mesenteric veins may have its direction reversed. Continuous give-and-take between different parts of the body; superior strength of certain parts is natural, of others acquired. When liver contains abundant food and stomach depleted, latter may draw on former; this occurs when animal can get nothing to eat, and so prevents starvation. Similarly, when one part becomes over-distended, it tends to deposit its excess in some weaker part near it; this passes it on to some still weaker part, which cannot get rid of it; hence deposits of various kinds. Further instances of reversal of the normal direction of anadosis from the food canal through the veins. Such reversal of functions would in any case be expected a priori. In the vomiting of intestinal obstruction, matter may be carried backwards all the way from the intestine to the mouth; not surprising, therefore, that, under certain circumstances, food-material might be driven right back from the skin-surface to the alimentary canal (e.g. in excessive chilling of surface); not much needed to determine this reversal of direction. Action of purgative drugs upon terminals of veins; one part draws from another until whole body participates; similarly in intestinal obstruction, each part passes on the irritating substance to its weaker
neighbour. Reversal of direction of flow occurs not merely on occasion but also constantly (as in arteries, lungs, heart, etc.). The various stages of normal nutrition described. Why the stomach sometimes draws back the nutriment it had passed on to portal veins and liver. A similar ebb and flow in relation to the spleen. Comparison of the parts of the body to a lot of animals at a feast. The valves of the heart are a provision of Nature to prevent this otherwise inevitable regurgitation, though even they are not quite efficient.

Chapter XIV

The superficial arteries, when they dilate, draw in air from the atmosphere, and the deeper ones a fine, vaporous blood from the veins and heart. Lighter matters such as air will always be drawn in in preference to heavier; this is why the arteries in the food-canal draw in practically none of the nutrient matter contained in it.

Chapter XV

The two kinds of attraction—the mechanical attraction of dilating bellows and the "physical" (vital) attraction by living tissue of nutrient matter which is specifically allied or appropriate to it. The former kind—that resulting from horror vacui—acts primarily on light matter, whereas vital attraction has no essential concern with such mechanical factors. A hollow organ exercises, by virtue of its cavity, the former kind of attraction, and by virtue of the living tissue of its walls, the second kind. Application of this to question of contents of arteries; anastomoses of arteries and veins. Foramina in interventricular septum of heart, allowing some blood to pass from right to left ventricle. Large size of aorta probably due to fact that it not merely carries the pneuma received from the lungs, but also some of the blood which percolates through septum from right ventricle. Thus arteries carry not merely pneuma, but also some light vaporous blood, which certain parts need more...
than the ordinary thick blood of the veins. The organic parts must have their blood-supply sufficiently near to allow them to absorb it; comparison with an irrigation system in a garden. Details of the process of nutrition in the ultimate specific tissues; some are nourished from the blood directly; in others a series of intermediate stages must precede complete assimilation; for example, marrow is an intermediate stage between blood and bone.

From the generalisations arrived at in the present work we can deduce the explanation of all kinds of particular phenomena; an instance is given, showing the co-operation of various factors previously discussed.
GALEN
ON THE NATURAL FACULTIES
BOOK I
'Επειδὴ τὸ μὲν αἰσθάνεσθαι τε καὶ κινεῖσθαι κατὰ προαιρεσίν ίδια τῶν ξών ἐστὶ, τὸ δ' αὐξάνεσθαι τε καὶ τρέφεσθαι κοινὰ καὶ τοῖς φυτοῖς, εἰδὴ ἄν τὰ μὲν πρῶτα τῆς ψυχῆς, τὰ δὲ δεύτερα τῆς φύσεως ἔργα. εἰ δὲ τις καὶ τοῖς φυτοῖς ψυχῆς μεταδίδωσι καὶ διαδρομένους αὐτὰς ὀνομάζει φυτικὴν μὲν ταύτην, αἰσθητικὴν δὲ τὴν ἐπέραν, λέγει μὲν οὐδ' οὕτως ἄλλα, τῇ λέξει δ' οὐ πάνω τῇ συνηθεὶς κέχρηται. ἀλλ' ἢμεῖς γε μεγίστην λέξεως ἀρετὴν σαφῆνειαν εἶναι πε-2 πεισμένοι καὶ ταύτην εἰδότες. ὑπ' οὐδενὸς οὕτως ὡς ὑπὸ τῶν ἀνυψηλῶν ὀνομάτων διαφθειρομένη, ὡς τοῖς πολλοῖς ἑθοῖς, οὕτως ὀνομάζοντες ὑπὸ μὲν ψυχῆς θ' ἁμα καὶ φύσεως τὰ ζώα διοικεῖσθαι φαμέν, ὑπὸ δὲ φύσεως μόνης τὰ φυτὰ καὶ τὸ γ' αὐξάνεσθαι τε καὶ τρέφεσθαι φύσεως ἔργα φαμέν, οὐ ψυχῆς.

1 That is, “On the Natural Powers,” the powers of the Physis or Nature. By that Galen practically means what we should call the physiological or biological powers, the characteristic faculties of the living organism; his Physis is the subconscious vital principle of the animal or plant.
Since feeling and voluntary motion are peculiar to animals, whilst growth and nutrition are common to plants as well, we may look on the former as effects of the soul and the latter as effects of the nature. And if there be anyone who allows a share in soul to plants as well, and separates the two kinds of soul, naming the kind in question vegetative, and the other sensory, this person is not saying anything else, although his language is somewhat unusual. We, however, for our part, are convinced that the chief merit of language is clearness, and we know that nothing detracts so much from this as do unfamiliar terms; accordingly we employ those terms which the bulk of people are accustomed to use, and we say that animals are governed at once by their soul and by their nature, and plants by their nature alone, and that growth and nutrition are the effects of nature, not of soul.

Like Aristotle, however, he also ascribes quasi-vital properties to inanimate things, cf. Introduction, p. xxvii.

2 Ergon, here rendered an effect, is literally a work or deed; strictly speaking, it is something done, completed, as distinguished from energēia, which is the actual doing, the activity which produces this ergon. cf. p. 13, and Introduction, p. xxx.

3 Gk. psyche, Lat. anima. 4 Gk. physis, Lat. natura.
ΓΑΛΕΝ

II

Καὶ ξητήσομεν κατὰ τῶν λόγων, ύπὸ τίνων γίγνεται δυνάμεων αὐτὰ δὴ ταῦτα καὶ εἰ δὴ τί ἄλλο φύσεως ἔργον ἐστὶν.

"Ἀλλὰ πρῶτερον γε διελέσθαι τε χρῆ καὶ μηνύσαι σαφῶς ἕκαστον τῶν ὀνομάτων, οἷς χρησόμεθα κατὰ τόνδε τῶν λόγων, καὶ ἐφ’ ὦ τι φέρομεν πράγμα. γενήσεται δὲ τούτ’ εὐθὺς ἔργων φυσικῶν διδασκαλία σὺν ταῖς τῶν ὀνομάτων ἐξηγήσεσιν.

"Ὅταν οὖν τι σῶμα κατὰ μηδὲν ἐξαλλάττηται τῶν προϋπαρχόντων, ἡσυχαζεῖν αὐτὸ φαμεν’ εἰ δ’ ἐξίστατο πη, κατ’ ἐκείνο κινεῖσθαι. καὶ τοίνυν ἐπεὶ πολυειδῶς ἐξίσταται, πολυειδῶς καὶ κινηθήσεται. καὶ γὰρ εἶ λευκὸν ὑπάρχον μελαῖνοιτο καὶ εἰ μέλαιν λευκαίνοιτο, κινεῖται κατὰ χρόνων, καὶ εἰ γλυκὸ τέως ὑπάρχον ἁθῖς || αὐστηρὸν ἢ ἐμπαλιν ἐξ αὐστηροῦ γλυκοῦ γένοιτο, καὶ τούτ’ ἄν κινεῖσθαι λέγοιτο κατὰ τῶν χυμῶν, ἢ μφω δὲ ταῦτά τε καὶ τὰ προειρημένα κατὰ τὴν ποιότητα κινεῖσθαι λεχθήσεται καὶ οὐ μόνον γε τὰ κατὰ τὴν χρόνον ἢ τῶν χυμῶν ἐξαλλαττόμενα κινεῖσθαι φαμεν, ἀλλὰ καὶ τὸ θερµότερον ἐκ ψυχροτέρου γενόμενον ἢ ψυχρότερον ἐκ θερµοτέρου κινεῖσθαι καὶ τούτο λέγομεν, ὥσπερ γε καὶ εἰ τὶ εὖρον ἐξ
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II

Thus we shall enquire, in the course of this treatise, from what faculties these effects themselves, as well as any other effects of nature which there may be, take their origin.

First, however, we must distinguish and explain clearly the various terms which we are going to use in this treatise, and to what things we apply them; and this will prove to be not merely an explanation of terms but at the same time a demonstration of the effects of nature.

When, therefore, such and such a body undergoes no change from its existing state, we say that it is at rest; but, if it departs from this in any respect we then say that in this respect it undergoes motion. Accordingly, when it departs in various ways from its pre-existing state, it will be said to undergo various kinds of motion. Thus, if that which is white becomes black, or what is black becomes white, it undergoes motion in respect to colour; or if what was previously sweet now becomes bitter, or, conversely, from being bitter now becomes sweet, it will be said to undergo motion in respect to flavour; to both of these instances, as well as to those previously mentioned, we shall apply the term qualitative motion. And further, it is not only things which are altered in regard to colour and flavour which, we say, undergo motion; when a warm thing becomes cold, and a cold warm, here too we speak of its undergoing motion; similarly also when any-

1 Motion (kinesis) is Aristotle's general term for what we would rather call change. It includes various kinds of change, as well as movement proper. cf. Introduction, p. xxix.
Galen

"In the toto γενός κινῆσεως. Ἐτερον δὲ γενός ἐπὶ τοὺς τὰς χώρας ἀμείβουσι σώματι καὶ τῶν ἐκ τῶν μεταλλάττειν λεγομένοις, ὤνομα δὲ καὶ τοῦτο φορά.

Αὐταὶ μὲν οὖν αἱ δύο κινῆσεις ἀπλαὶ καὶ πρῶται, σύνθετοι δὲ εἰς αὐτῶν αὐξησίας τε καὶ φθίσιας, ἡταν εἰς ἐλαττονός τι μείζον ἡ ἐκ μείζονος ἐλαττον γένηται φυλάττον τὸ οἷκεῖον εἴδος. Ἐτεραὶ δὲ δύο κινήσεις γένεσις καὶ φθορά, γένεσις μὲν ἡ εἰς οὐσίαν ἀγωγῆ, φθορά δὲ ἡ ἐναντία.

Πάσαις δὲ ταῖς κινήσεσι κοινῶν ἐξάλλαξις τοῦ προὐπάρχοντος, ὢσπερ οὖν καὶ ταῖς ἡσυχίαις ἡ φυλακὴ τῶν προὐπαρχόντων. ἄλλα οὖν μὲν ἐξαλλάττεται καὶ πρὸς τὴν ὤψιν καὶ πρὸς τὴν γέωσιν καὶ πρὸς τὴν ἀφίν αἵμα γεγομένα τὰ συτία, συγχωροῦσιν οὖτι δὲ καὶ κατ' ἀλήθειαν, οὐκέτι τοῦτοι ὀμολογοῦσιν οἱ σοφισταὶ. οἱ μὲν γὰρ τινες αὐτῶν ἀπαντά τὰ τοιαῦτα τῶν ἡμετέρων αἰσθήσεως ἀπάτασι τινὰς καὶ παραγωγας νομίζουσιν ἀλλοτ' ἄλλους πασχοῦσών, τῆς ὑποκειμένης οὐσίας μὴ δὲν τοῦτον, ὅς ἐπονομάζεται, δεχομένης: οἱ δὲ τινες εἶναι μὲν ἐν αὐτῇ βούλονται τὰς ποιότητας, ἀμεταβλήτους δὲ καὶ ἀτρέπτους

1 "Conveyance," "transport," "transit"; purely mechanical or passive motion, as distinguished from alteration (qualitative change).

2 "Waxing and waning," the latter literally phthisis, a wasting or "decline," cf. Scotch divining, Dutch verdwijnen.

3 Becoming and perishing: Latin, generatio et corruptio.

4 "Ad substantiam productio seu ad formam processus" (Linacre).
thing moist becomes dry, or dry moist. Now, the common term which we apply to all these cases is alteration.

This is one kind of motion. But there is another kind which occurs in bodies which change their position, or as we say, pass from one place to another; the name of this is transference. ¹

These two kinds of motion, then, are simple and primary, while compounded from them we have growth and decay,² as when a small thing becomes bigger, or a big thing smaller, each retaining at the same time its particular form. And two other kinds of motion are genesis and destruction,³ genesis being a coming into existence,⁴ and destruction being the opposite.

Now, common to all kinds of motion is change from the pre-existing state, while common to all conditions of rest is retention of the pre-existing state. The Sophists, however, while allowing that bread in turning into blood becomes changed as regards sight, taste, and touch, will not agree that this change occurs in reality. Thus some of them hold that all such phenomena are tricks and illusions of our senses; the senses, they say, are affected now in one way, now in another, whereas the underlying substance does not admit of any of these changes to which the names are given. Others (such as Anaxagoras)⁵ will have it that the qualities do exist in it, but that they

⁵ "Preformationist" doctrine of Anaxagoras. To him the apparent alteration in qualities took place when a number of minute pre-existing bodies, all bearing the same quality, came together in sufficient numbers to impress that quality on the senses. The factor which united the minute quality-bearers was Nous. "In the beginning," says Anaxagoras, "all things existed together—then came Nous and brought them into order."
εξ αἰώνος εἰς αἰώνα καὶ τὰς φαινομένας ταύτας ἀλλοιώσεις τῇ διακρίσει τε καὶ συγκρίσει γίγνεσθαι φασιν ὡς Ἀναξαγόρας.

Εἰ δὲ τούτων ἐκτραπομένως ἐξελέγχοιμι, μείζων ἄν μοι τὸ πάρεργον τοῦ ἔργου γένοιτο. εἰ μὲν γὰρ οὐκ ἦσασιν, ὡσα περὶ τῆς καθ' ὅλην τὴν ούσιαν ἀλλοιώσεως Ἀριστοτέλει τε καὶ μετ' αὐτὸν Χρυσίππῳ γέγραπται, παρακαλέσαι χρῆ τοῖς εἰκεῖνων αὐτοὺς ὁμιλῆσαι γράμμασιν εἰ δὲ γιγνώσκοντες ἑπειθ' ἔκοντες τὰ χείρω πρὸ τῶν βελτιώνων ἣ αἱρόνται, μᾶταια δήποτε καὶ τὰ ἡμέτερα νομισοῦσιν. ὅτι δὲ καὶ Ἰπποκράτης ὦτως ἐγιγνωσκεν Ἀριστοτέλους ἐτι πρότερος ὦν, εν ἐτέροις ἦμων ἀποδεδεικτεί. πρῶτος γὰρ οὕτως ἀπάντων ὄν ἵκμεν ἰατρῶν τε καὶ φιλοσόφων ἀποδεικνύειν ἑπεχείρησε τέτταρας εἶναι τὰς πάσας δραστικὰς εἰς ἀλλήλας ποιότητας, ὥσος ὄν γίγνεται τε καὶ φθείρεται πάνθ', ὡσα γένεσιν τε καὶ φθορὰν ἐπιδέχεται. καὶ μέντοι καὶ τὸ κεράννυσθαι δι' ἀλλήλων αὐτὰς ὅλας δὴ ὅλων Ἰπποκράτης ἀπάντων πρῶτος ἐγγυοκαὶ τὰς ἀρχὰς γε τῶν ἀποδεικήσεων, ὅν ὡστερον Ἀριστοτέλης μετεχειρίσατο, παρ' ἑκείνῳ πρῶτῳ γεγραμμένας ἐστὶν εὔρειν.

Εἰ δ' ὅσπερ τὰς ποιότητας οὕτω καὶ τὰς οὐσίας δὴ ὅλων κεραννυσθαι χρῆ νομίζειν, ὥσ ὡστερον ἐπεφήνατο Ζήνων ὁ Κιττιεὺς, οὐχ ἠγοῦμαι δὲν ἔτι περὶ τούτων κατὰ τόνδε τὸν λόγον ἐπεξείναι. μόνην γὰρ εἰς τὰ παρόντα δέομαι γιγνώσκεσθαι

1 "De ea alteratione quae per totam fit substantiam" (Linacre).
2 The systematizer of Stoicism and successor of Zeno.
3 Note characteristic impatience with metaphysics. To Galen, as to Hippocrates and Aristotle, it sufficed to look on
are unchangeable and immutable from eternity to eternity, and that these apparent alterations are brought about by *separation* and *combination*.

Now, if I were to go out of my way to confute these people, my subsidiary task would be greater than my main one. Thus, if they do not know all that has been written, "On Complete Alteration or Substance"¹ by Aristotle, and after him by Chrysippus,² I must beg of them to make themselves familiar with these men's writings. If, however, they know these, and yet willingly prefer the worse views to the better, they will doubtless consider my arguments foolish also. I have shown elsewhere that these opinions were shared by Hippocrates, who lived much earlier than Aristotle. In fact, of all those known to us who have been both physicians and philosophers Hippocrates was the first who took in hand to demonstrate that there are, in all, four mutually interacting *qualities*, and that to the operation of these is due the genesis and destruction of all things that come into and pass out of being. Nay, more; Hippocrates was also the first to recognise that all these qualities undergo an intimate mingling with one another; and at least the beginnings of the proofs to which Aristotle later set his hand are to be found first in the writings of Hippocrates.

As to whether we are to suppose that the *substances* as well as their *qualities* undergo this intimate mingling, as Zeno of Citium afterwards declared, I do not think it necessary to go further into this question in the present treatise;³ for immediate purposes we only the qualitative differences apprehended by the senses as fundamental. Zeno of Citium was the founder of the Stoic school; on the further analysis by this school of the *qualities* into *bodies* cf. p. 144, note 3.
Thus according to Gomperz (Greek Thinkers), the hypothesis of Anaxagoras was that "the bread... already contained the countless forms of matter as such which the human body displays. Their minuteness of size would withdraw them from our perception. For the defect or 'weakness' of the senses is the narrowness of their receptive area.
need to recognize the complete alteration of substance. In this way, nobody will suppose that bread represents a kind of meeting-place for bone, flesh, nerve, and all the other parts, and that each of these subsequently becomes separated in the body and goes to join its own kind; before any separation takes place, the whole of the bread obviously becomes blood; (at any rate, if a man takes no other food for a prolonged period, he will have blood enclosed in his veins all the same). And clearly this disproves the view of those who consider the elements unchangeable, as also, for that matter, does the oil which is entirely used up in the flame of the lamp, or the faggots which, in a somewhat longer time, turn into fire.

I said, however, that I was not going to enter into an argument with these people, and it was only because the example was drawn from the subject-matter of medicine, and because I need it for the present treatise, that I have mentioned it. We shall then, as I said, renounce our controversy with them, since those who wish may get a good grasp of the views of the ancients from our own personal investigations into these matters.

The discussion which follows we shall devote entirely, as we originally proposed, to an enquiry into the number and character of the faculties of Nature, and what is the effect which each naturally renders visible and tangible by the process of nutrition, which combines them.”

Therefore the blood must have come from the bread. The food from the alimentary canal was supposed by Galen to be converted into blood in and by the portal veins. cf. p. 17.

By “elements” is meant all homogeneous, amorphous substances, such as metals, &c., as well as the elementary tissues.
GALEN

ἐκάστη πέφυκεν. ἔργον δὲ δηλούντι καλῶ τὸ 7 γεγονός ἢδη καὶ συμπεπληρωμένον ὑπὸ τῆς ἐνεργείας αὐτῶν, οἶνον τὸ αἷμα, τὴν σάρκα, τὸ νεῦρον ἐνέργειαν δὲ τὴν δραστικὴν ὄνομαξω κίνησιν καὶ τὴν ταύτης αὐτίαν δύναμιν. ἔπει δὲ ἄρα ἐν τῷ τὸ σιτίον αἷμα γίγνεσθαι παθητικῇ μὲν ἥ τοῦ σιτίου, δραστικῇ δὲ ἥ τῆς φλεβὸς γίγνεται κίνησις, ὡσαυτῶς δὲ κἂν τῷ μεταφέρειν τὰ κόλα κινεῖ μὲν ὁ μῦς, κινεῖται δὲ τὰ ὡστὰ, τὴν μὲν τῆς φλεβὸς καὶ τῶν μυῶν κίνησιν ἐνέργειαν εἶναι φημι, τὴν δὲ τῶν σιτίων τε καὶ τῶν ὡστῶν σύμπτωμα τε καὶ πάθημα τα μὲν γὰρ ἀλλαιοῦται, τὰ δὲ φέρεται. τὴν μὲν οὖν ἐνέργειαν ἐγχωρεῖ καλεῖ καὶ ἔργον τῆς φύσεως, οἶνον τὴν πέψιν, τὴν ἀνάδοσιν, τὴν αἰμάτωσιν, οὐ μὴν τὸ γέγονεν ἐξ ἀπαντως ἐνέργειαις· ἢ γὰρ τοι σάρξ ἔργον μὲν ἐστὶ τῆς φύσεως, οὐ μὴν ἐνέργεια γε. δῆλον οὖν, ὥς θάτερον μὲν τῶν ὄνοματων διχῶς λέγεται, θάτερον δὲ οὖ.

III

'Eμοι μὲν οὖν καὶ ἡ φλεβή καὶ τῶν ἀλλῶν ἀπάντων ἐκαστὸν διὰ τὴν ἐκ τῶν τεταρτῶν ποιαν

1 Work or product. Lat. opus. cf. p. 3. note 2
2 Operation, activation, or functioning. Lat. actio. cf. loc. cit.
3 i.e. a concomitant (secondary) or passive affection. Galen is contrasting active and passive "motion." cf. p. 6, note 1.
4 As already indicated, there is no exact English equivalent for the Greek term physis, which is a principle immanent.
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produces. Now, of course, I mean by an effect that which has already come into existence and has been completed by the activity of these faculties—for example, blood, flesh, or nerve. And activity is the name I give to the active change or motion, and the cause of this I call a faculty. Thus, when food turns into blood, the motion of the food is passive, and that of the vein active. Similarly, when the limbs have their position altered, it is the muscle which produces, and the bones which undergo the motion. In these cases I call the motion of the vein and of the muscle an activity, and that of the food and the bones a symptom or affection since the first group undergoes alteration and the second group is merely transported. One might, therefore, also speak of the activity as an effect of Nature—for example, digestion, absorption, blood-production; one could not, however, in every case call the effect an activity; thus flesh is an effect of Nature, but it is, of course, not an activity. It is, therefore, clear that one of these terms is used in two senses, but not the other.

III

It appears to me, then, that the vein, as well as each of the other parts, functions in such and such a way according to the manner in which the four quali-
in the animal itself, whereas our term "Nature" suggests something more transcendent; we are forced often, however, to employ it in default of a better word. cf. p. 2, note 1.

5 In Greek anadosis. This process includes two stages: (1) transmission of food from alimentary canal to liver (rather more than our "absorption"); (2) further transmission from liver to tissues. Anadosis is lit. a yielding-up, a "delivery;" it may sometimes be rendered "dispersal." "Distribution" (diadosis) is a further stage; cf. p. 163, note 4.
κράσιν ὦδὶ πως ἐνεργείν δοκεῖ. εἰςὶ δὲ γε μὴν οὐκ ὄλγου τινεῖς ἄνδρες || οὐδ’ ἀδόξου, φιλόσοφοί τε καὶ ἰατροί, τῷ μὲν θερμῷ καὶ τῷ ψυχρῷ τὸ δράν ἀναφέροντες, ὑποβάλλοντες δ’ αὐτοῖς παθητικά τὸ ξηρὸν τε καὶ τὸ υγρὸν, καὶ πρῶτος ὢ Ἀριστοτέλης τὰς τὸν κατὰ μέρος ἀπάντων αἰτίας εἰς ταύτας ἀνάγειν πειράται τὰς ἀρχὰς, ἥκολούθησε δ’ ὑστερον αὐτῷ καὶ ὁ ἀπὸ τῆς στοάς χορός. καὶ τοῦτοι μὲν, ὥς ἂν καὶ αὐτῶν τῶν στοιχείων τὴν εἰς ἀλληλα μεταβολὴν χύσει τε τίσι καὶ πιλήσειν ἀναφέρουσιν, εὐλογοῦν ἡν ἁρχὰς δραστικάς ποιήσασθαι τὸ θερμὸν καὶ τὸ ψυχρόν, Ἀριστοτέλει δ’ οὐχ οὕτως, ἀλλὰ ταῖς τέτταρις ποιότησιν εἰς τὴν τῶν στοιχείων γένεσιν χρωμένις βέλτιον ἦν καὶ τὰς τῶν κατὰ μέρος αἰτίας ἀπάσας εἰς ταύτας ἀνάγειν. τί δὴποτ’ οὖν ἐν μὲν τοῖς περὶ γενέσεως καὶ φθορᾶς ταῖς τέτταρις χρήται, ἐν δὲ τοῖς μεταφρασμοῖς καὶ τοῖς προβλήμασι καὶ ἀλλοθι πολλαχόθι ταῖς δύο μόναις; εἰ μὲν γὰρ ὃς ἐν τοῖς ξώοις τε καὶ τοῖς φυτοῖς μᾶλλον μὲν δρᾶ τὸ θερμὸν καὶ τὸ ψυχρόν, ἤττον δὲ τὸ ξηρὸν καὶ τὸ υγρὸν ἀποφαίνοιτο τις, ἵσως ἂν ἔχοι καὶ τὸν Ἰπποκράτην σύμψηφον εἰ δ’ ὀσσαῦτος ἐν ἀπασίν, οὐκέτ’ οἷμαι συγχωρήσειν τούτο μὴ ὅτι τὸν Ἐπικράτην ἀλλὰ μηδ’ αὐτὸν τὸν Ἀριστοτέλην μεμνηματαί γε βουλόμενον ὃν ἐν τοῖς περὶ γενέσεως καὶ φθορᾶς οὐχ ἀπλῶς ἀλλὰ μετ’ ἀποδείξεως αὐτοῦ ἣμας ἑδίδαξεν. ἀλλὰ περὶ μὲν τούτων καὶ τοῖς περὶ κράσεων, εἰς ὁσον ἰατρῷ χρήσιμον, ἔπεσκεψάμεθα.
ties are mixed. There are, however, a considerable number of not undistinguished men—philosophers and physicians—who refer action to the Warm and the Cold, and who subordinate to these, as passive, the Dry and the Moist; Aristotle, in fact, was the first who attempted to bring back the causes of the various special activities to these principles, and he was followed later by the Stoic school. These latter, of course, could logically make active principles of the Warm and Cold, since they refer the change of the elements themselves into one another to certain diffusions and condensations. This does not hold of Aristotle, however; seeing that he employed the four qualities to explain the genesis of the elements, he ought properly to have also referred the causes of all the special activities to these. How is it that he uses the four qualities in his book "On Genesis and Destruction," whilst in his "Meteorology," his "Problems," and many other works he uses the two only? Of course, if anyone were to maintain that in the case of animals and plants the Warm and Cold are more active, the Dry and Moist less so, he might perhaps have even Hippocrates on his side; but if he were to say that this happens in all cases, he would, I imagine, lack support, not merely from Hippocrates, but even from Aristotle himself—if, at least, Aristotle chose to remember what he himself taught us in his work "On Genesis and Destruction," not as a matter of simple statement, but with an accompanying demonstration. I have, however, also investigated these questions, in so far as they are of value to a physician, in my work "On Temperaments."

Since heat and cold tend to cause diffusion and condensation respectively.
IV

'Ἡ δ' οὖν δύναμις ἡ ἐν ταῖς φλεψίν ἡ αἵματο-
ποιητική προσαγορευμένη καὶ πᾶσα δ' ἄλλη
dύναμις ἐν τῷ πρός τι νενόηται· πρώτως μὲν
γὰρ τῆς ἐνεργείας αἰτία, ἤδη δὲ καὶ τοῦ ἔργου
κατὰ συμβεβηκός. ἀλλ' εἶπερ ἡ αἰτία πρὸς
τι, τοῦ γὰρ ὑπ' αὐτῆς γενομένου μόνου, τῶν δ' ἄλλων
οὐδενὸς, εὔδηλον, ὅτι καὶ ἡ δύναμις ἐν τῷ
πρός τι. καὶ μέχρι γ' ἂν ἀγνοοῦμεν τὴν οὕσιαν
τῆς ἐνεργούσης αἰτίας, δύναμιν αὐτῆς ὄνομάζωμεν,
eἶναι τινὰ λέγοντες ἐν ταῖς φλεψίν αἵματοποιη-
τικήν, ὡσαύτως δὲ κἂν τῇ κοιλίᾳ πεπτικὴν κἂν τῇ
καρδίᾳ σφυγμικὴν καὶ καθ' ἐκαστόν τῶν ἄλλων
ἰδίαν τινὰ τής κατὰ τὸ μόριον ἐνεργείας. εἶπερ
οὖν μεθόδῳ μέλλοιμεν ἐξευρήσεων, ὅποιαι τε καὶ
ὁποῖαι τινὲς αἱ δυνάμεις εἰσίν, ἀπὸ τῶν ἔργων
αὐτῶν ἄρκτεόν ἐκαστόν γὰρ αὐτῶν ὑπὸ τῶν
ἐνεργείας γίγνεται καὶ τούτων ἐκάστης προηγείται
tῆς αἰτίας.

V

'Ἐργα τούνυν τῆς φύσεως ἐτι μὲν κυουμένου τε
καὶ διαπλαττομένου τοῦ ἔργου τὰ σύμπαντ' ἐστὶ
tοῦ σώματος μόρια, γεννηθέντος δὲ κοινὸν ἐφ'
ἀπασίν ἔργου ἡ εἰς τὸ τέλειον ἐκάστῳ μέγεθος
ἀγωγῆ καὶ μετὰ ταῦθ' ἡ μέχρι τοῦ δυνατοῦ
dιαμονῆ.

'Ενεργείαι δ' ἐπὶ τρισὶ τοῖς εἰρημένοις ἔργοις
tρεῖς ἐξ ἀνάγκης, ἐφ' ἐκάστῳ μία, γένεσις τε καὶ
ON THE NATURAL FACULTIES, I. iv.–v

IV

The so-called blood-making faculty in the veins, then, as well as all the other faculties, fall within the category of relative concepts; primarily because the faculty is the cause of the activity, but also, accidentally, because it is the cause of the effect. But, if the cause is relative to something—for it is the cause of what results from it, and of nothing else—it is obvious that the faculty also falls into the category of the relative; and so long as we are ignorant of the true essence of the cause which is operating, we call it a faculty. Thus we say that there exists in the veins a blood-making faculty, as also a digestive faculty in the stomach, a pulsatile faculty in the heart, and in each of the other parts a special faculty corresponding to the function or activity of that part. If, therefore, we are to investigate methodically the number and kinds of faculties, we must begin with the effects; for each of these effects comes from a certain activity, and each of these again is preceded by a cause.

V

The effects of Nature, then, while the animal is still being formed in the womb, are all the different parts of its body; and after it has been born, an effect in which all parts share is the progress of each to its full size, and thereafter its maintenance of itself as long as possible.

The activities corresponding to the three effects mentioned are necessarily three—one to each—

1 Lit. haematopoietic. cf. p. 11, note 3.  
2 Lit. peptic.  
3 Lit. sphygmic.
Genesis corresponds to the intrauterine life, or what we may call embryogeny. Alteration here means histogenesis or tissue-production; shaping or moulding (in Greek diaplastis) means the ordering of these tissues into organs (organogenesis).
ON THE NATURAL FACULTIES, I. v.—vi

namely, Genesis, Growth, and Nutrition. Genesis, however, is not a simple activity of Nature, but is compounded of *alteration* and of *shaping*.¹ That is to say, in order that bone, nerve, veins, and all other [tissues] may come into existence, the *underlying substance* from which the animal springs must be *altered*; and in order that the substance so altered may acquire its appropriate shape and position, its cavities, outgrowths, attachments, and so forth, it has to undergo a *shaping* or *formative* process.² One would be justified in calling this substance which undergoes alteration the *material* of the animal, just as wood is the material of a ship, and wax of an image.

*Growth* is an increase and expansion in length, breadth, and thickness of the solid parts of the animal (those which have been subjected to the moulding or shaping process). *Nutrition* is an addition to these, without expansion.

VI

Let us speak then, in the first place, of Genesis, which, as we have said, results from *alteration* together with *shaping*.

The seed having been cast into the womb or into the earth (for there is no difference),³ then, after a certain definite period, a great number of parts become constituted in the substance which is being generated; these differ as regards moisture, dryness, coldness and warmth,⁴ and in all the other qualities

² cf. p. 25, note 4.
³ Note inadequate analogy of semen with fertilised seeds of plants (i.e. of gamete with zygote). Strictly speaking, of course, semen corresponds to pollen. cf. p. 130, note 2.
⁴ i.e. the four primary qualities; cf. chap. iii. supra.
Various secondary or derivative differences in the tissues. Note pre-eminence of sense of touch.

De Anima, ii. et seq.

Lit. homoeomorōn = of similar parts throughout, "the same all through." He refers to the elementary tissues, conceived as not being susceptible of further analysis.
ON THE NATURAL FACULTIES, I. vi

which naturally derive therefrom. These derivative qualities, you are acquainted with, if you have given any sort of scientific consideration to the question of genesis and destruction. For, first and foremost after the qualities mentioned come the other so-called tangible distinctions, and after them those which appeal to taste, smell, and sight. Now, tangible distinctions are hardness and softness, viscosity, friability, lightness, heaviness, density, rarity, smoothness, roughness, thickness and thinness; all of these have been duly mentioned by Aristotle. And of course you know those which appeal to taste, smell, and sight. Therefore, if you wish to know which alternative faculties are primary and elementary, they are moisture, dryness, coldness, and warmth, and if you wish to know which ones arise from the combination of these, they will be found to be in each animal of a number corresponding to its sensible elements. The name sensible elements is given to all the homogeneous parts of the body, and these are to be detected not by any system, but by personal observation of dissections.

Now Nature constructs bone, cartilage, nerve, membrane, ligament, vein, and so forth, at the first stage of the animal’s genesis, employing at this task a faculty which is, in general terms, generative and alternative, and, in more detail, warming, chilling, drying, or moistening; or such as spring from the

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1 That is, by the bodily eye, and not by the mind’s eye. The observer is here called an autoptes or “eye-witness.” Our medical term autopsy thus means literally a personal inspection of internal parts, ordinarily hidden.

2 i.e. “alteration” is the earlier of the two stages which constitute embryogeny or “genesis.” cf. p. 13, note 1.
The terms Galen actually uses are: ostopoietic, neuropoietic, chondropoietic.
ON THE NATURAL FACULTIES, I. vi

blending of these, for example, the bone-producing, nerve-producing, and cartilage-producing faculties
(since for the sake of clearness these names must be used as well).

Now the peculiar flesh of the liver is of this kind as well, also that of the spleen, that of the kidneys, that of the lungs, and that of the heart; so also the proper substance of the brain, stomach, gullet, intestines, and uterus is a sensible element, of similar parts all through, simple, and uncompounded. That is to say, if you remove from each of the organs mentioned its arteries, veins, and nerves, the substance remaining in each organ is, from the point of view of the senses, simple and elementary. As regards those organs consisting of two dissimilar coats, of which each is simple, of these organs the coats are the elements—for example, the coats of the stomach, oesophagus, intestines, and arteries; each of these two coats has an alternative faculty peculiar to it, which has engendered it from the menstrual blood of the mother. Thus the special alternative faculties in each animal are of the same number as the elementary parts; and further, the activities must necessarily correspond each to one of the special parts, just as each part has its special use—for example, those ducts which extend from the kidneys into the bladder, and which are called ureters; for these are not arteries, since they do not pulsate nor do they consist of two coats; and they

2 As we should say, parenchyma (a term used by Erasistratus).
3 These were all the elementary tissues that Aristotle, for example, had recognized; other tissues (e.g. flesh or muscle) he believed to be complexes of these.
4 Or tunics.
5 i.e. tissues.
Galen

γὰρ οὔτ' ἀρτηρίαι εἰσίν, ὅτι μήτε σφύζουσι μήτ' ἐκ δυνῶν χιτῶνων συνεστήκασιν, οὔτε φλέβες, ὅτι μήθ' αἴμα περιέχουσι μήτ' ἐοικεν αὐτῶν ὁ χιτῶν κατά τι τῶ τῆς φλεβῶς. ἀλλὰ καὶ νεύρων ἐπὶ πλέον ἀφεστήκασιν ἢ τῶν εἰρημένων.

Τί ποτ' οὖν εἰσίν; ἐρωτᾶ τις, ὥσπερ ἀναγκαῖον διν ἀπαν μόριον ἡ ἀρτηρίαι ἡ φλέβα ἣ νεύρων ὑπάρχειν ἢ ἐκ τούτων πεπλέχθαι καὶ μη τούτ' αὐτό τὸ νῦν λεγόμενον, ὡς ἰδιος ἐκάστῳ τῶν κατὰ μέρος ὅργανον ἔστιν ἢ ὀσύσ. καὶ γὰρ καὶ αἱ κύστεις ἐκάτερα ἢ τε τὸ οὐρὸν ὑποδεχομένη καὶ ἢ τὴν καυτὴν χολήν οὐ μόνον τῶν ἄλλων ἀπαντῶν ἀλλὰ καὶ ἀλληλῶν διαφέρουσι καὶ οἱ εἰς τὸ ἡπαρ ἀποφυώμενοι ἢ πόρου, καθάπερ στόμαχοι τινες ἀπὸ τῆς χοληδόχου κύστεως, οὐδὲν οὔτ' ἀρτηρίαις οὔτε φλεβίν οὔτε νεύρωις ἐοίκασιν. ἀλλὰ περὶ μὲν τούτων ἐπὶ πλέον ἐν ἄλλοις τέ τισι καὶ τοῖς περὶ τῆς Ἰπποκράτους ἀνατομῆς εἴρηται.

Ajax κατὰ μέρος ἁπασαὶ δυνάμεις τῆς φύσεως αἰ ἀλλοιωτικαὶ αὐτὴν μὲν τὴν ὀσύσαν τῶν χιτῶνων τῆς κοιλίας καὶ τῶν ἐντέρων καὶ τῶν υστερῶν ἀπέτελεσαν, ὥσπερ ἐστὶ τὴν δὲ σύνθεσιν αὐτῶν καὶ τὴν τῶν ἐμφυομένων πλοκῆς καὶ τὴν εἰς τὸ ἐντερον ἐκφυσίν καὶ τὴν τῆς ἑνδον κοιλότητος ἱδεὰν καὶ τάλλω ὅσα τοιαῦτα δύναμις τις ἐτέρᾳ διέπλασεν, ἥν διαπλαστικὴν ὄνομαζομεν, ἥν δὴ καὶ τεχνικὴν εἶναι λέγομεν, μᾶλλον δ' ἀρίστην καὶ ἀκραν τέχνην καὶ πάντα τινὸς ἑνεκα ποιῶσαν, ὡς μηδὲν ἀργὸν εἶναι μηδὲ περιττὸν μηδ' ὀλως

1 As, for example, Aristotle had held; cf. p. 23, note 3. Galen added many new tissues to those described by Aristotle.
ON THE NATURAL FACULTIES, 1. vi

are not veins, since they neither contain blood, nor do their coats in any way resemble those of veins; from nerves they differ still more than from the structures mentioned.

"What, then, are they?" someone asks—as though every part must necessarily be either an artery, a vein, a nerve, or a complex of these, and as though the truth were not what I am now stating, namely, that every one of the various organs has its own particular substance. For in fact the two bladders—that which receives the urine, and that which receives the yellow bile—not only differ from all other organs, but also from one another. Further, the ducts which spring out like kinds of conduits from the gall-bladder and which pass into the liver have no resemblance either to arteries, veins or nerves. But these parts have been treated at a greater length in my work "On the Anatomy of Hippocrates," as well as elsewhere.

As for the actual substance of the coats of the stomach, intestine, and uterus, each of these has been rendered what it is by a special alterative faculty of Nature; while the bringing of these together, the combination therewith of the structures which are inserted into them, the outgrowth into the intestine, the shape of the inner cavities, and the like, have all been determined by a faculty which we call the shaping or formative faculty; this faculty we also state to be artistic—nay, the best and highest art—doing everything for some purpose, so that

2 Lit. *synthesis*.
3 By this is meant the *duodenum*, considered as an outgrowth or prolongation of the stomach towards the intestines.
GALEN

οὔτως ἔχων, ὃς δύνασθαι βέλτιον ἑτέρως ἔχειν. ἀλλὰ τούτῳ μὲν ἐν τοῖς περὶ χρείας μορίων ἀποδείξουμεν. ¶

VII

16 Ἐπὶ δὲ τὴν αὐξητικὴν ἢδη μεταβάντες δύναμιν αὐτὸ τοῦθ᾽ ὑπομνήσωμεν πρῶτον, ὡς ὑπάρχει μὲν καὶ αὐτὴ τοῖς κυνουμένοις ὀστέρ καὶ ἡ θρεπτικὴ. ἀλλὰ οἶνον ὑπηρέτιδες τινὲς εἰσὶ τηνικάντα τῶν προερημένων δυνάμεων, οὐκ ἐν αὐταῖς ἔχουσαι τὸ πάν κύρος. ἐπειδὰν δὲ τὸ τέλειον ἀπολάβη μέγεθος τὸ ξύον, ἐν τῷ μετὰ τὴν ἀποκύπτειν χρόνῳ παντὶ μέχρι τῆς ἀκμῆς ἢ μὲν αὐξητικὴ τηνικάντα κρατεῖ βοηθοὶ δ᾽ αὐτῆς καὶ οἶνον ὑπηρέτιδες ἢ τ᾽ ἀλλοιωτικὴ δύναμις ἐστὶ καὶ ἡ θρεπτική. τὰ οὖν τὸ ίδιον ἔστι τῆς αὐξητικῆς δυνάμεως; εἰς πάν μέρος ἐκτείναι τὰ πεφυκότα. καλεῖται δ᾽ οὕτω τὰ στειρὰ μόρια τοῦ σώματος, ἀρτηρίας καὶ φλέβες καὶ νεῦρα καὶ ὀστᾶ καὶ χόνδροι καὶ ύμενες καὶ σύνδεσμοι καὶ οἱ χυτῶν ἀπαντες, οὕς σταϊχεώδεις τε καὶ ὁμοιομερεῖς καὶ ἀπλοὺς ὑλίγων ἐμπροσθὲν ἐκαλοῦμεν. ὅτω δὲ τρόπῳ τὴν εἰς πάν μέρος ἑκτασιν ἵσχουσιν, ἐγὼ φράσω παραδειγμά τι πρότερον εἰπὼν ἕνεκα τοῦ σαφοῦς. ¶

17 Τὰς κύστεις τῶν ὕων λαβόντες οἱ παιδεῖς πληροῦσί τε πνεύματος καὶ τρίβουσιν ἐπὶ τῆς τέφρας πλησίον τοῦ πυρός, ὡς ἀλεαίωσθαι μὲν, βλάπτεσθαι δὲ μηδὲν καὶ πολλῇ γ′ αὐτὴ ἢ

1 Lit. the auxetic or incremental faculty.
there is nothing ineffective or superfluous, or capable of being better disposed. This, however, I shall demonstrate in my work "On the Use of Parts.

VII

Passing now to the faculty of Growth\(^1\) let us first mention that this, too, is present in the foetus \textit{in utero} as is also the nutritive faculty, but that at that stage these two faculties are, as it were, handmaids to those already mentioned,\(^2\) and do not possess in themselves supreme authority. When, however, the animal\(^3\) has attained its complete size, then, during the whole period following its birth and until the acme is reached, the faculty of growth is predominant, while the alterative and nutritive faculties are accessory—in fact, act as its handmaids. What, then, is the property of this faculty of growth? To extend in every direction that which has already come into existence—that is to say, the solid parts of the body, the arteries, veins, nerves, bones, cartilages, membranes, ligaments, and the various \textit{coats} which we have just called elementary, homogeneous, and simple. And I shall state in what way they gain this extension in every direction, first giving an illustration for the sake of clearness.

Children take the bladders of pigs, fill them with air, and then rub them on ashes near the fire, so as to warm, but not to injure them. This is a common

\(^2\) \textit{i.e.} to the alterative and shaping faculties (histogenetic and organogenetic).

\(^3\) If the reading is correct we can only suppose that Galen meant \textit{the embryo}.
παιδία περί τε τὴν Ἰωνίαν καὶ ἐν ἄλλοις ἔθνεσιν οὐκ ὄλγοις ἐστίν. ἐπιλέγουσι δὲ δὴ καὶ τιν’ ἕπτη τρίβοντες ἐν μέτρῳ τε τινὶ καὶ μέλει καὶ ὑμηθμῷ καὶ ἔστι πάντα τὰ βήματα ταῦτα παρακέλευσις τῇ κύστει πρὸς τὴν αὐξήσιν. ἐπειδὰν δ’ ἰκανὸς αὐτοῖς διατετάσθαι δοκῇ, πάλιν ἐμφυσώσθη τε καὶ ἐπιδιατένουσι καὶ ἀὐθίς τρίβουσι καὶ τούτῳ πλεονάκις ποιοῦσιν, ἄχρις ἂν αὐτοῖς ἡ κύστις ἰκανῶς ἔχειν δοκῇ τῆς αὐξήσεως. ἀλλ’ ἐν τούτοις γε τῶν ἐργοις τῶν παῖδων ἐναργῶς, ὅσον εἰς μέγεθος ἐπιδίδωσιν ἡ ἔντος εὐρυχωρία τῆς κύστεως, τοσοῦτον ἀναγκαῖον εἰς λεπτότητα καθαρεύσθαι τὸ σῶμα καὶ εἴ γε τὴν λεπτότητα ταῦτην ἀνατρέφειν οἴοι τ’ ἦσαν οἱ παίδες, ὅμοιος ἂν τῇ φύσει τὴν κύστιν ἐκ μικρᾶς μεγάλην ἀπειράξουσι. οὐκι δὲ τούτ’ αὐτοῖς ενδεί τὸ ἐργον οὐδὲ καθ’ ἕνα τρόπον εἰς μίμησιν ἐνδεχόμενον αὐθήναι μὴ ὅτι τοῖς || παισὶν ἀλλ’ οὐδ’ ἀλλ’ τινί’ μόνης γὰρ τῆς φύσεως ἰδιὸν ἐστίν.

"Ὤστ’ ἢδη σοι δῆλον, ὅσ ἀναγκαία τοῖς αὐξανομένοις ἡ θρέψις. εἰ γὰρ διατείνοιτο μὲν, ἀνατρέφοιτο δὲ μὴ, φαντασίαν ψευδῆ μᾶλλον, οὐκ αὐξήσεως ἀληθῆ τὰ τοιαῦτα σῶματα κτίσεται. καίτοι καί τὸ διατείνεσθαι πάντῃ μόνοις τοῖς ὑπὸ φύσεως αὐξανομένοις ὑπάρχει. τὰ γὰρ ὑφ’ ἦμῶν διατεινόμενα σῶματα κατὰ μίαν τινὰ διάστασιν τοῦτο πάσχοντα μειοῦται ταῖς λοιπαῖς, οὐδ’ ἐστὶν εὔρειν οὐδὲν, ὃ συνεχές ἔτι μένον καὶ ἀδιάσπαστον εἰς τὰς τρεῖς διαστάσεις ἐπεκτείνει δυνάμεθα. μόνης οὖν τῆς φύσεως τὸ πάντῃ διστάναι συνεχές ἕαυτῷ μένον ἔτι καὶ τὴν άρχαίαν ἀπασαν ἰδέαν φυλάττον τὸ σῶμα. "
game in the district of Ionia, and among not a few other nations. As they rub, they sing songs, to a certain measure, time, and rhythm, and all their words are an exhortation to the bladder to increase in size. When it appears to them fairly well distended, they again blow air into it and expand it further; then they rub it again. This they do several times, until the bladder seems to them to have become large enough. Now, clearly, in these doings of the children, the more the interior cavity of the bladder increases in size, the thinner, necessarily, does its substance become. But, if the children were able to bring nourishment to this thin part, then they would make the bladder big in the same way that Nature does. As it is, however, they cannot do what Nature does, for to imitate this is beyond the power not only of children, but of any one soever; it is a property of Nature alone.

It will now, therefore, be clear to you that nutrition is a necessity for growing things. For if such bodies were distended, but not at the same time nourished, they would take on a false appearance of growth, not a true growth. And further, to be distended in all directions belongs only to bodies whose growth is directed by Nature; for those which are distended by us undergo this distension in one direction but grow less in the others; it is impossible to find a body which will remain entire and not be torn through whilst we stretch it in the three dimensions. Thus Nature alone has the power to expand a body in all directions so that it remains unruptured and preserves completely its previous form.
GALEN

Καὶ τοῦτ' ἐστιν ἡ αὐξήσις ἀνευ τῆς ἐπιρρεούσης 
τε καὶ προσπλαττομένης τροφῆς μὴ δυναμένη 
γενέσθαι.

VIII

Καὶ τοίνυν ὁ λόγος ἤκειν ἑοικεν ὁ περὶ τῆς 
θρέψεως, διὸ δὴ λοιπὸς ἐστι καὶ τρίτος ὃν ἐξ 
ἀρχῆς προδείκμεθα. 

19 τὸ γὰρ ἐπιρρέωντος ἐν εἴδει 
τροφῆς παντὶ μορίῳ τοῦ τρεφομένου σώματος 
προσπλαττομένου θρέψις μὲν ἡ ἑνεργεία, θρεπτικὴ 
δὲ δύναμις ἡ αἰτία. ἀλλοίωσις μὲν δὴ κακταύθα 
τὸ γένος τῆς ἑνεργείας, ἀλλ' οὐχ οἴαπερ ἡ ἐν τῇ 
γενέσει. ἔκει μὲν γὰρ οὐκ ὁ πρῶτορ ὑστερον 
ἐγένετο, κατὰ δὲ τῇ θρέψιν τῷ ἡδῆ γεγονότι 
συνεξομολογοῦται τὸ ἐπιρρέου καὶ διὰ τοῦτ' εὐλόγως 
ἔκεινη μὲν τῇ ἀλλοίωσιν γένεσιν, ταὐτὴν δ' 
ἐξομολογοῦσιν ὀνόμασαι.

IX

Ἐπειδὴ δὲ περὶ τῶν τριῶν δυνάμεων τῆς φύσεως 
αὐτάρκης εὑρηται καὶ φαινεῖται μηδεμίας ἄλλης 
προσδείκθαι τὸ ζῶον, ἐχον γε καὶ ὅπως αὐξηθῇ 
καὶ ὅπως τελειωθῇ καὶ ὅπως ἐως πλείστου διαφυ-
λαχθῇ, δόξει μὲν ἄν ὅσῳς ἰκανῶς ἐχειν ὁ λόγος 
οὕτως ἡδῆ καὶ πάσας ἐξηγεῖσθαι τὰς τῆς φύσεως 
δυνάμεις. ἀλλ' εἰ τις πάλιν ἐννοήσειεν, ὅς ὅ-
ON THE NATURAL FACULTIES, I. VII.-IX

Such then is growth, and it cannot occur without the nutriment which flows to the part and is worked up into it.

VIII

We have, then, it seems, arrived at the subject of Nutrition, which is the third and remaining consideration which we proposed at the outset. For, when the matter which flows to each part of the body in the form of nutriment is being worked up into it, this activity is nutrition, and its cause is the nutritive faculty. Of course, the kind of activity here involved is also an alteration, but not an alteration like that occurring at the stage of genesis. For in the latter case something comes into existence which did not exist previously, while in nutrition the inflowing material becomes assimilated to that which has already come into existence. Therefore, the former kind of alteration has with reason been termed genesis, and the latter, assimilation.

IX

Now, since the three faculties of Nature have been exhaustively dealt with, and the animal would appear not to need any others (being possessed of the means for growing, for attaining completion, and for maintaining itself as long a time as possible), this treatise might seem to be already complete, and to constitute an exposition of all the faculties of Nature. If, however, one considers that it has not

1 i.e. not the pre-natal development of tissue already described. cf. chap. vi.
The activation or functioning of this faculty, the faculty in actual operation. cf. p. 3, note 2.
yet touched upon any of the parts of the animal (I mean the stomach, intestines, liver, and the like), and that it has not dealt with the faculties resident in these, it will seem as though merely a kind of introduction had been given to the practical parts of our teaching. For the whole matter is as follows: Genesis, growth, and nutrition are the first, and, so to say, the principal effects of Nature; similarly also the faculties which produce these effects—the first faculties—are three in number, and are the most dominating of all. But as has already been shown, these need the service both of each other, and of yet different faculties. Now, these which the faculties of generation and growth require have been stated. I shall now say what ones the nutritive faculty requires.

X

For I believe that I shall prove that the organs which have to do with the disposal of the nutriment, as also their faculties, exist for the sake of this nutritive faculty. For since the action of this faculty is assimilation, and it is impossible for anything to be assimilated by, and to change into anything else unless they already possess a certain community and affinity in their qualities, therefore, in the first place, any animal cannot naturally derive nourishment from any kind of food, and secondly, even in the case of those from which it can do so, it cannot do this at once. Therefore, by reason of

tēn ἄναγκην πλειόνων ὀργάνων ἀλλοιωτικῶν τῆς τροφῆς ἐκαστον ἡ τῶν ζώων χρήζει. ἦν μὲν γὰρ 
τὸ ειπωθὸν ἐρυθρὸν γένηται καὶ τὸ ἐρυθρὸν ξανθόν, ἀπλῆς καὶ μιᾶς δείται τῆς ἀλλοιωσεως: ἦν δὲ 
τὸ λευκὸν μέλαν καὶ τὸ μέλαν λευκὸν, ἀπασῶν τῶν μεταξῶν. καὶ τοίνυν καὶ τὸ μαλακώτατον ὅπου ἀν 
ἀθρόως σκληρότατον καὶ τὸ σκληρότατον ὅπου ἀν ἀθρόως μαλακώτατον γένοιτο, ὄσπερ οὐδὲ τὸ 
δυσωδέστατον εὐωδέστατον οὐδ’ ἐμπαλιν τὸ εὐωδέστατον δυσωδέστατον ἔξαϊφνης γένοιτ’ ἂν.

Πῶς οὖν εἴς αἷματος ὀστοῦν ἂν ποτε γένοιτο μὴ παχυνθέντος ψε πρότερον ἐπὶ πλείστον αὐτοῦ καὶ 
λευκανθέντος ἢ πῶς εἴς ἄρτον τὸ αἷμα μὴ κατὰ 
βραχὺ μὲν ἀποθεμένον τὴν λευκότητα, κατὰ 
βραχὺ δὲ λαμβάνοντος τὴν ἐρυθρότητα; σάρκα 
μὲν γὰρ εἴς αἷματος γενέσθαι ῥάστον· εἴ γὰρ εἰς 
τοσοῦτον αὐτὸ παχύνειν ὡς σύστασιν 
τίνα σχεῖν καὶ μηκῆτ’ εἶναι ρυτῶν, ἡ πρώτη καὶ 
νεοπαγής οὕτως ἂν εἰη σάρξ; ὂστοῦν δ’ ἢν γένησι 
ταῖς, πολλοῦ μὲν δεῖται χρόνου, πολλῆς δ’ ἐργασιας 
καὶ μεταβολῆς τῷ αἷματι. ὡτὶ δὲ καὶ τῷ ἄρτῳ 
καὶ πολὺ μᾶλλον θρίακειν καὶ τεύτλῳ καὶ τοῖς 
ὀμοίοις παμπόλλης δεῖται τῆς ἀλλοιωσεως εἰς 
αἷματος γένεσιν, οὐδέ τούτ’ ἀδήλων.

“Εν μὲν δὴ τούτ’ αὐτοῦ τοῦ πολλὰ γενέσθαι τὰ 
περὶ τὴν τῆς τροφῆς ἀλλοιωσιν ὀργανα. δεύτερον 
δ’ ἢ τῶν περιττωμάτων φύσις. ὡς γὰρ ὑπὸ 
βοτανῶν οὕτ’ ὀλὼς δυνάμεθα τρέφεσθαι, καίτοι 
τῶν βοσκημάτων τρεφομένων, οὕτως ὑπὸ μαφανί-

1 Lit. "‘necessity’"; more restrictive, however, than our "law of Nature." cf. p. 314, note 1.
2 His point is that no great change, in colours or in anything else, can take place at one step.
ON THE NATURAL FACULTIES, I.

this law, every animal needs several organs for altering the nutriment. For in order that the yellow may become red, and the red yellow, one simple process of alteration is required, but in order that the white may become black, and the black white, all the intermediate stages are needed. So also, a thing which is very soft cannot all at once become very hard, nor vice versa; nor, similarly can anything which has a very bad smell suddenly become quite fragrant, nor again, can the converse happen.

How, then, could blood ever turn into bone, without having first become, as far as possible, thickened and white? And how could bread turn into blood without having gradually parted with its whiteness and gradually acquired redness? Thus it is quite easy for blood to become flesh; for, if Nature thicken it to such an extent that it acquires a certain consistency and ceases to be fluid, it thus becomes original newly-formed flesh; but in order that blood may turn into bone, much time is needed and much elaboration and transformation of the blood. Further, it is quite clear that bread, and, more particularly lettuce, beet, and the like, require a great deal of alteration in order to become blood.

This, then, is one reason why there are so many organs concerned in the alteration of food. A second reason is the nature of the superfluiities. For, as we are unable to draw any nourishment from grass, although this is possible for cattle, similarly we can derive nourishment from radishes, albeit not

3 Not quite our "waste products," since these are considered as being partly synthetic, whereas the Greek perittonmata were simply superfluous substances which could not be used and were thrown aside.
Galen

dos trefometha mén, all' ouch ous ypò ton kredon. touton mén gar olygon dein olon he fusis himon kratei kai metafalsaie kai allloi kai xreiston ex autwn aima synisthsin. en de t' raphanidi to mén oikeion te kai metaelthenai dunamenon, monis kai touto kai sun pollei t' katergasia, pantapason elachiston. olh de olygon dein esti perittomatike kai dieferchetai ta tis pevew sorgan, brakhos ex autheis eis tas flebas analpethentos aimatos kai oude touton telewes xreistov. deuteeras ous autheis edhese diakriseos t' fusiei town en taides flepsi perittomatos. kai xreia kai toutoi odoi te tisv enetron epidei tais ekkriseis auta paragouson, ws m' lymainioto tois xreistov, upodochon te tisv odoi deexamevov, en ais othan eis ikavon plhmos afiketai, tynikant ekkthetai.

Deuteeron he soi kai touto to genos toon en to savmati morion edeurgetai tois perittomatos tis trofhs anakeimeno. allo de triton uper tou paunti feresbai, kathaper tinves odoi pollal dia tou savmatos olos katanemvenai.

Mia mén gar eidosos he dia tou stoma tois aposto tois stitois, ouch en de tis trefomenev allopan pamylo la te kai pamylo dietetota. m' toinov thaimaie to plhdo toon organon, osa trefeswv enekov he fusis edemourgies. ta mën gar alloi-

1 Note "our natures," cf. p. 12, note 4; p. 47, note 1.
2 The term oikeios, here rendered appropriate, is explained on p. 33. cf. also footnote on same page. Linacre often translated it conveniens, and it may usually be rendered proper, peculiar, own special, or own particular in English. Sometimes it is almost equal to akin, cognate, related: cf.
ON THE NATURAL FACULTIES, I. x

to the same extent as from meat; for almost the whole of the latter is mastered by our natures; it is transformed and altered and constituted useful blood; but, in the radish, what is appropriate and capable of being altered (and that only with difficulty, and with much labour) is the very smallest part; almost the whole of it is surplus matter, and passes through the digestive organs, only a very little being taken up into the veins as blood—nor is this itself entirely utilisable blood. Nature, therefore, had need of a second process of separation for the superfluities in the veins. Moreover, these superfluities need, on the one hand, certain fresh routes to conduct them to the outlets, so that they may not spoil the useful substances, and they also need certain reservoirs, as it were, in which they are collected till they reach a sufficient quantity, and are then discharged.

Thus, then, you have discovered bodily parts of a second kind, consecrated in this case to the [removal of the] superfluities of the food. There is, however, also a third kind, for carrying the pabulum in every direction; these are like a number of roads intersecting the whole body.

Thus there is one entrance—that through the mouth—for all the various articles of food. What receives nourishment, however, is not one single part, but a great many parts, and these widely separated; do not be surprised, therefore, at the abundance of organs which Nature has created for the purpose of nutrition. For those of them which have to do with p. 319, note 2. With Galen's ὀικεῖος and ἄλλοτρος we may compare the German terms eigen and fremd used by Aberhalden in connection with his theory of defensive ferment in the blood-serum.
οὖντα προπαρασκευάζει τὴν ἐπιτήδειον ἕκάστῳ μορίῳ τροφῆν, τὰ δὲ διακρίνει τὰ περιττώματα, τὰ δὲ παραπέμπει, τὰ δ’ υποδεχεται, τὰ δ’ ἐκκρίνει, τὰ δ’ ὅδε τῆς πάντη φορᾶς εἰς τῶν χρηστῶν χυμῶν, ὅστ’ εἴπερ βούλει τὰς δυνάμεις τῆς φύσεως ἀπάσας ἐκμαθεῖν, ὑπὲρ ἕκαστου τούτων ἀν εἴη σοι τῶν ὀργάνων ἐπισκεπτέον.

24 Ἄρχη δ’ αὐτῶν τῆς διδασκαλίας, ὡςα 1 τοῦ τέλους ἐγγὺς ἔργα τε τῆς φύσεως ἔστι καὶ μόρια καὶ δυνάμεις αὐτῶν.

XI

Αὐτοῦ δὲ δὴ πάλιν ἀναμνηστέον ἡμῖν τοῦ τέλους, οὕτως ἐνεκα τοσαῦτα τε καὶ τοιαῦτα τῇ φύσει δεδημιούργηται μόρια. τὸ μὲν οὖν ὄνομα τοῦ πράγματος, ὡσπερ καὶ πρότερον εἰρήται, θρέψει: ὃ δὲ κατὰ τούνομα λόγος ὁμοίωσις τοῦ τρέφοντος τῷ τρεφομένῳ. ἢνα δ’ αὕτη γένηται, προηγησασθαι χρῆ πρόσφυσιν, ἢνα δ’ ἐκείνη, πρόσθεσιν. ἐπειδὰν γὰρ ἐκπέσῃ τῶν ἀγγείων ὁ μέλλων θρέψεων ὅτιον τῶν τοῦ ζῶου μορίων χυμῶς, εἰς ἀπαν αὐτὸ διασπεῖρεται πρῶτον, ἐπειτὰ προστίθεται κάπετα προσφύτει καὶ τελέως ὁμοιοῦται.

1 Transit, cf. p. 6, note 1.
2 i.e. of the living organism, cf. p. 2, note 1.
3 i.e. with nutrition.
4 We might perhaps say, more shortly, “assimilation of food to feeder,” or, “of food to fed”; Linacre renders, “nutrimenti cum nutrito assimilatio.”
alteration prepare the nutriment suitable for each part; others separate out the superfluities; some pass these along, others store them up, others excrete them; some, again, are paths for the transit in all directions of the utilisabe juices. So, if you wish to gain a thorough acquaintance with all the faculties of Nature, you will have to consider each one of these organs.

Now in giving an account of these we must begin with those effects of Nature, together with their corresponding parts and faculties, which are closely connected with the purpose to be achieved.

Let us once more, then, recall the actual purpose for which Nature has constructed all these parts. Its name, as previously stated, is nutrition, and the definition corresponding to the name is: an assimilation of that which nourishes to that which receives nourishment. And in order that this may come about, we must assume a preliminary process of adhesion, and for that, again, one of presentation. For whenever the juice which is destined to nourish any of the parts of the animal is emitted from the vessels, it is in the first place dispersed all through this part, next it is presented, and next it adheres, and becomes completely assimilated.

\[5 \text{ Lit. prosphysis, i.e. attachment, implantation.} \]
\[6 \text{ Lit. prosthesis, "apposition." One is almost tempted to retain the terms prosthesis and prosphysis in translation, as they obviously correspond much more closely to Galen's physiological conceptions than any English or semi-English words can.} \]
Δηλοῦσι δ’ αἱ καλοῦμεναι λεύκαι τὴν διαφορὰν ὁμοιώσεως τε καὶ προσφύσεως, ὥσπερ τὸ γένος ἐκεῖνο τῶν ὕδερων, οὐ τινες ὄνομαξουσιν ἀνὰ σάρκα, διορίζει σαφῶς πρόσθεσιν προσφύσεως: οὐ γὰρ ἐνδεία δῆμποι τῆς ἐπιρροέυσης ύγρότητος, ὡς ἐναι τῶν ἀτροφίων τε καὶ φθίσεων, ἦ τοῦ 25 τοιούτου γένεσις ὕδερου || συντελεῖται. φαίνεται γὰρ ἰκανώς ἢ τε σάρξ ὑγρὰ καὶ διάβροχος ἐκαστὸν τε τῶν στερεῶν τοῦ σώματος μορίων ὤσαύτως διακείμενον. ἀλλὰ πρόσθεσις μὲν τις γίγνεται τῆς ἐπιρροέμενης τροφῆς, οὕτως ὑδατω-δεστέρας οὖσης ἐτι καὶ μὴ πᾶν τι κεχυμωμένης μηδὲ τὸ γλίσχρον ἐκεῖνο καὶ κολλώδες, ὃ δὴ τῆς ἐμφύτου θερμασίας οἰκονομία προσθίγνεται, κεκτημένης ἢ πρόσφυσις ἀδύνατός ἐστιν ἐπι-τελεῖσθαί πληθεὶ λεπτῆς ύγρότητος ἀπέπτου διαρρεύσης τε καὶ ῥαδίως ὀλισθαῖσθαι ὑπὸ τῶν στερεῶν τοῦ σώματος μορίων τῆς τροφῆς. ἐν δὲ ταῖς λεύκαις πρόσφυσις μὲν τις γίγνεται τῆς τροφῆς, οὐ μὴν ἐξομοίωσις γε. καὶ δῆλον ἐν τῶ ἔν τῳ ἔν μικρῷ πρόσθεν ρηθέν ὡς ὀρθῶς ἐλέγετο τὸ δεῖν πρόσθεσιν μὲν πρῶτον, ἐφεξῆς δὲ πρόσ-φυσιν, ἐπειτ' ἐξομοίωσιν γενέσθαι τῷ μέλλοντι τρέφεσθαι.

Κυρίως μὲν οὖν τὸ τρέφων ἢ ἐν τροφῇ, τὸ δ’ οἷον μὲν τροφῆ, φῶντες δὲ τρέφον, ὅποιον ἔστι τὸ προσφυόμενον ἢ προστίθεμεν, τροφὴ μὲν οὐ

1 Lit. phthisis. cf. p. 6, note 2. Now means tuberculosis only.
2 More literally, “chymified.” In anasarca the subcutaneous tissue is soft, and pits on pressure. In the “white” disease referred to here (by which is probably meant nodular leprosy) the same tissues are indurated and “brawny.” The
The so-called white [leprosy] shows the difference between assimilation and adhesion, in the same way that the kind of dropsy which some people call anasarca clearly distinguishes presentation from adhesion. For, of course, the genesis of such a dropsy does not come about as do some of the conditions of atrophy and wasting,\(^1\) from an insufficient supply of moisture; the flesh is obviously moist enough,—in fact it is thoroughly saturated,—and each of the solid parts of the body is in a similar condition. While, however, the nutriment conveyed to the part does undergo presentation, it is still too watery, and is not properly transformed into a juice;\(^2\) nor has it acquired that viscous and agglutinative quality which results from the operation of innate heat;\(^3\) therefore, adhesion cannot come about, since, owing to this abundance of thin, crude liquid, the pabulum runs off and easily slips away from the solid parts of the body. In white [leprosy], again, there is adhesion of the nutriment but no real assimilation. From this it is clear that what I have just said is correct, namely, that in that part which is to be nourished there must first occur presentation, next adhesion, and finally assimilation proper.

Strictly speaking, then, nutriment is that which is actually nourishing, while the quasi-nutriment which is not yet nourishing (e.g. matter which is undergoing adhesion or presentation) is not, strictly speaking, nutriment, but is so called only by an equivocation.

\(^1\) The effects of oxidation attributed to the heat which accompanies it? \ cf. p. 141, note 1; p. 234, note 1.
κυρίως, ὁμοιώμως δὲ τροφή: τὸ δ' ἐν ταῖς φλεψίν
26 ἐτι περιεχόμενον || καὶ τούτου μᾶλλον ἐτι τὸ κατὰ
thren γαστέρα τῷ μέλλειν ποτὲ θρέψειν, εἰ καλῶς
κατεργασθεῖη, κέκληται τροφή. κατὰ ταύτα δὲ
cal τῶν ἐδεσμάτων ἐκαστον τροφῆν ὀνομάζομεν
οὔτε τῷ τρέφειν ἱδη τὸ ἑσον οὔτε τῷ τοιούτου
ὑπάρχειν οἶον τὸ τρέφον, ἀλλὰ τῷ δύνασθαι τε
cal μέλλειν τρέφειν, εἰ καλῶς κατεργασθεῖη.
Τούτο γὰρ ἂν καὶ τὸ πρὸς Ἰπποκράτους
λεγόμενον ὡς Ἰροφή δὲ τὸ τρέφον, τροφὴ καὶ τὸ
οἶον τροφῆ καὶ τὸ μέλλον." τὸ μὲν γὰρ ὁμοιώμενον
ἡδη τροφῆν ὀνόμασε, τὸ δ' οἶον μὲν ἐκείνο
προστιθέμενον ἡ προσφυόμενον οἶον τροφῆν' τὸ
d' ἄλλο πᾶν, ὅσον ἐν τῇ γαστρὶ καὶ ταῖς φλεψί
περιέχεται, μέλλον.

XII

Ὁτὶ μὲν οὖν ἀναγκαῖον ὁμοίωσιν τιν' εἶναι τοῦ
τρέφοντος τῷ τρεφομένῳ τῷ θρέψιν, ἀντικρυς
dῆλον. οὐ μὴν ὑπάρχουσάν γε ταύτην τὴν ὁμοίωσιν,
ἀλλὰ φαινομένην μόνον εἶναι φασιν οἱ μῆτε
technikēn oǐmenei tēn phusin eīnai mēte prōnou-
tikēn tōn ἑσον μηθ' ὅλως tīnas oikēias ekhein
dynámeis, aís throumēn tā μὲν ἀλλοιοί, tā δ'
27 ἐλκει, || tā d' ekkrīnei.

Kai autai dūo yegōnasiain aerēseis katā gēnow
en iatrikē tē kai filosofía tōn āpofηναμένωn

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Also, that which is still contained in the veins, and still more, that which is in the stomach, from the fact that it is destined to nourish if properly elaborated, has been called "nutriment." Similarly we call the various kinds of food "nutriment," not because they are already nourishing the animal, nor because they exist in the same state as the material which actually is nourishing it, but because they are able and destined to nourish it if they be properly elaborated.

This was also what Hippocrates said, viz., "Nutriment is what is engaged in nourishing, as also is quasi-nutriment, and what is destined to be nutriment." For to that which is already being assimilated he gave the name of nutriment; to the similar material which is being presented or becoming adherent, the name of quasi-nutriment; and to everything else—that is, contained in the stomach and veins—the name of destined nutriment.

XII

It is quite clear, therefore, that nutrition must necessarily be a process of assimilation of that which is nourishing to that which is being nourished. Some, however, say that this assimilation does not occur in reality, but is merely apparent; these are the people who think that Nature is not artistic, that she does not show forethought for the animal's welfare, and that she has absolutely no native powers whereby she alters some substances, attracts others, and discharges others.

Now, speaking generally, there have arisen the following two sects in medicine and philosophy
Here follows a contrast between the Vitalists and the Epicurean Atomists. cf. p. 153 et seq.

A unity or continuum, an individuum.
among those who have made any definite pronouncement regarding Nature. I speak, of course, of such of them as know what they are talking about, and who realize the logical sequence of their hypotheses, and stand by them; as for those who cannot understand even this, but who simply talk any nonsense that comes to their tongues, and who do not remain definitely attached either to one sect or the other—such people are not even worth mentioning.

What, then, are these sects, and what are the logical consequences of their hypotheses? The one class supposes that all substance which is subject to genesis and destruction is at once continuous and susceptible of alteration. The other school assumes substance to be unchangeable, unalterable, and subdivided into fine particles, which are separated from one another by empty spaces.

All people, therefore, who can appreciate the logical sequence of an hypothesis hold that, according to the second teaching, there does not exist any substance or faculty peculiar either to Nature or to Soul, but that these result from the way in which the primary corpuscles, which are unaffected by change, come together. According to the first-mentioned teaching, on the other hand, Nature is not posterior to the corpuscles, but is a long way prior to them and older than they; and therefore in their view it is Nature which puts together the bodies both of plants and animals; and this she does by virtue of certain faculties which she possesses—these being, on the one hand, attractive and assimilative of what is appropriate, and, on the other, expulsive or

3 Lit. to the physis or the psyche; that is, a denial of the autonomy of physiology and psychology. 4 Lit. somata.
تعليما، καὶ τεχνικῶς ἀπαντα διαπλάττει τε ἑγεννῶσα καὶ προνοείται τῶν ἑγεννωμένων ἐτέραις ἀυθές τις δυνάμεις, στερκτικὴ μὲν τινὶ καὶ προνοητικὴ τῶν ἐγγόνων, κοινωνικὴ δὲ καὶ φιλικὴ τῶν ὀμογενῶν. κατὰ δ’ αὐτὸς ἐτέρους οὔτε τούτων οὔδὲν ὑπάρχει ταῖς φύσεσιν οὔτε ἔννοια τῖς ἐστι τῇ ψυχῇ σύμφυτος ἐξ ἀρχῆς οὐκ ἀκολουθίας οὐ μάχης, οὐ διαιρέσεως οὐ συνθέσεως, οὐ δικαιών οὐκ ἀδίκων, οὐ καλῶν οὐκ αἰσχρῶν, ἀλλ’ ἐξ αἰσθήσεως τε καὶ δί’ αἰσθήσεως ἀπαντά τὰ τοιαύθ’ ἦμων ἐγγίγνοντοι φασὶ καὶ φαντασίαις τισὶ καὶ μιμήμασι οἰκάζεσθα τὰ ξώα.

29 ὂν τοῖς καὶ ἀντίκα ἀπεφήναντο μηδεμίαν εἶναι τῆς ψυχῆς δυναμιν, ἦ λογιζόμεθα, ἀλλ’ ὕπο τῶν αἰσθητῶν ἀγεσθαι παθῶν ἡμᾶς καθάπερ βοσκῆμα πρὸς μηδὲν ἀνανεύσαι μηδ’ ἀντεπεῖν δυναμένους. καθ’ οὕς δηλονότι καὶ ἀνδρεία καὶ φρόνησις καὶ σωφροσύνη καὶ ἐγκράτεια λήρος ἐστὶ μακρός καὶ φιλούμενοι οὔτ’ ἀλλήλους οὔτε τὰ ἔγγονα καὶ τοῖς θεοῖς οὐδὲν ἦμων μέλει. καταφρουσι δὲ καὶ τῶν ὀνειράτων καὶ τῶν οἰωνίων καὶ τῶν συμβόλων καὶ πάσης ἀστρολογίας, ὑπέρ ὅν ἦμεις μὲν ἴδια δ’ ἐτέρων γραμμάτων ἐπὶ πλέον ἐσκεφάλεθα περὶ τῶν Ἀσκληπίαδου τοῦ ἱατροῦ σκοπούμενοι δοχομάτων. ἐνεστὶ δὲ τοῖς βουλομένοις κακεύνοις μὲν ὀμιλήσαι τοῖς λόγοις καὶ νῦν δ’ ἦδη σκοπεῖν, ὡσπερ τινῶν δυοῦν ὄδων ἦμων προκειμένων, ὅποτέραν βέλτιον ἐστὶ τρέπεσθαι. Ἐποκράτησι μὲν γὰρ τὴν προτέραν ῥηθείσαν ἐτράπετο, καθ’ ἣν ἦν ἡμώνται μὲν ἡ οὐσία καὶ ἀλλοιοῦσαι καὶ σύμπτων οἷον ἐστὶ καὶ σύρρουν τὸ
what is foreign. Further, she skilfully moulds everything during the stage of genesis; and she also provides for the creatures after birth, employing here other faculties again, namely, one of affection and forethought for offspring, and one of sociability and friendship for kindred. According to the other school, none of these things exist in the natures \(^1\) [of living things], nor is there in the soul any original innate idea, whether of agreement or difference, of separation or synthesis, of justice or injustice, of the beautiful or ugly; all such things, they say, arise in us from sensation and through sensation, and animals are steered by certain images and memories.

Some of these people have even expressly declared that the soul possesses no reasoning faculty, but that we are led like cattle by the impression of our senses, and are unable to refuse or dissent from anything. In their view, obviously, courage, wisdom, temperance, and self-control are all mere nonsense; we do not love either each other or our offspring, nor do the gods care anything for us. This school also despises dreams, birds, omens, and the whole of astrology, subjects with which we have dealt at greater length in another work,\(^2\) in which we discuss the views of Asclepiades the physician.\(^3\) Those who wish to do so may familiarize themselves with these arguments, and they may also consider at this point which of the two roads lying before us is the better one to take. Hippocrates took the first-mentioned. According to this teaching, substance is one and is subject to alteration; there is a consensus in the move-

\(^1\) For "natures" in the plural, involving the idea of a separate nature immanent in each individual, cf. p. 36, note 1.

\(^2\) A lost work.

\(^3\) For Asclepiades v. p. 40, note 5.
σῶμα καὶ ἡ φύσις ἀπαντᾷ τεχνικῶς καὶ δικαίως πράττει δυνάμεις ἐξούσα, καθ’ ὅσ’ ἡ ἐκαστὸν τῶν μορίων ἐλκεί μὲν || ἔφ’ ἐαυτό τὸν οἰκεῖον ἐαυτῷ χυμόν, ἐλξαν δὲ προσφύει τε παντὶ μέρει τῶν ἐν αὐτῷ καὶ τελέως ἔξομοιον, τὸ δὲ μὴ κρατηθέν ἐν τούτῳ μηδὲ τὴν παντελῆ δυνηθέν ἄλλοισιν τε καὶ ὁμοίωτητα τοῦ τρεφομένου καταδέξασθαι δι’ ἄτερας αὖ τινος ἐκκριτικῆς δυνάμεως ἀποτριβεται.

XIII

Μαθεῖν δ’ ἐνεστὶν ὦν μόνον εξ’ ὅν οἱ τάναντία τιθέμενοι διαφέρονται τοῖς ἑναρχῶς φαινομένοις, εἰς ὁσον ὀρθότητος τε καὶ ἀληθείας ἦκε τὰ Ἰπποκράτους δόγματα, ἀλλὰ καὶ τῶν κατὰ μέρος ἐν τῇ φυσικῇ θεωρίᾳ ξητουμένων τῶν τ’ ἄλλων ἀπαντῶν καὶ τῶν ἐν τοῖς ἑναρχῶς ἑνεργείων. ὁσοι γὰρ οὐδεμίαν οὐδενὶ μορίῳ νομίζομεν ὑπάρχειν ἐλκτικῆς τῆς οἰκείας ποιότητος δυνάμιν, ἀναγκαζόμεθα πολλακις ἑναντία λέγειν τοῖς ἑναρχῶς φαινομένοις, ὦσπερ καὶ ’Ἀσκληπιάδης ὁ ἱατρὸς ἐπὶ τῶν νεφρῶν ἐποίησεν, οὐς οὐ μόνον Ἰπποκράτης ἢ Διοκλής ἢ ’Ερασίστρατος ἢ

2 i.e. “appropriated”; very nearly “assimilated.”

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ments of air and fluid throughout the whole body;\(^1\) Nature acts throughout in an artistic and equitable manner, having certain faculties, by virtue of which each part of the body draws to itself the juice which is proper to it, and, having done so, attaches it to every portion of itself, and completely assimilates it; while such part of the juice as has not been mastered,\(^2\) and is not capable of undergoing complete alteration and being assimilated to the part which is being nourished, is got rid of by yet another (an expulsive) faculty.

XIII

Now the extent of exactitude and truth in the doctrines of Hippocrates may be gauged, not merely from the way in which his opponents are at variance with obvious facts, but also from the various subjects of natural research themselves—the functions of animals, and the rest. For those people who do not believe that there exists in any part of the animal a faculty for attracting its own special quality\(^3\) are compelled repeatedly to deny obvious facts.\(^4\) For instance, Asclepiades, the physician,\(^5\) did this in the case of the kidneys. That these are organs for secreting [separating out] the urine, was the belief not only of Hippocrates, Diocles,

\(^1\) "Attractricem convenientis qualitatis vim" (Linacre).
\(^2\) Cf. p. 36, note 2.
\(^3\) "obvious phenomena."
\(^4\) Asclepiades of Bithynia, who flourished in the first half of the first century B.C., was an adherent of the atomistic philosophy of Democritus, and is the typical representative of the Mechanistic school in Graeco-Roman medicine; he disbelieved in any principle of individuality ("nature") in the organism, and his methods of treatment, in accordance with his pathology, were mechano-therapeutical. cf. p. 61, note 3.
Πραξιγόρας ἢ τις ἄλλος ἰατρὸς ἀριστος ὀργανα διακριτικά τῶν οὐρών πεπιστεύκασιν ὑπάρχειν, ἀλλὰ καὶ οἱ μαγείρους σχεδὸν ἀπαντεῖσιν, ὀσημέραι θεώμενοι τὴν τε θέσιν αὐτῶν καὶ τὸν ἄρ' ἐκατέρου πόρον εἰς τὴν κύστιν ἐμβάλλοντα, τὸν οὐρητήρα καλούμενον, ἐξ αὐτῆς τῆς κατασκευῆς ἀναλογιζόμενοι τὴν τε χρείαν αὐτῶν καὶ τὴν δύναμιν. καὶ πρὸ γε τῶν μαγείρων ἀπαντεῖ ἀνθρωποὶ καὶ δυσουροῦσες τολλάκις καὶ παντάπασιν ἰσχυροῦσες, ὅταν ἠλασώσα μὲν τὰ κατὰ τὰς ψόας, ψαμμώδῃ δὲ ἐξουρώσω, νεφριτικοὺς ὀνομάζοντο σφᾶς αὐτοὺς.

'Ασκληπιάδην δ' οἶμαι μηδὲ λίθον οὐρηθέντα ποτὲ θεάσασθαι πρὸς τῶν οὕτω πασχόντων μηδ' ὡς προηγήσατο κατὰ τὴν μεταξὺ τῶν νεφρῶν καὶ τῆς κύστεως χώραν ὀδύνη τῆς ὄξεια διερχομένου τοῦ λίθου τὸν οὐρητήρα μηδ' ὡς οὐρηθέντος αὐτοῦ τὰ τε τῆς ὀδύνης καὶ τὰ τῆς ἰσχυρίας ἐπαύσατο παραχρῆμα. πῶς οὖν εἰς τὴν κύστιν τῷ λόγῳ παράγει τὸ υδρόν, ἄξιον ἄκουσαι καὶ θαυμάσαι τάνδρος τὴν σοφίαν, ὅς καταλήψων οὕτως εὐρέας ὁδοὺς ἑναρχῶ ἐπιφανείᾳ ἀφανείς καὶ στενὰς καὶ παντάπασιν ἀναστήτους. "ὑπέθετο. Βούλεται γὰρ εἰς ὄμοις ἀναλούμενον τὸ πικρόμενον υγρὸν εἰς τὴν κύστιν διαδίδοσθαι κατείδ. ἐξ ἐκείνων ἀυθίς ἀλλ' ἵππος συνιότων οὕτως ἀπολαμβάνειν αὐτὸ τὴν ἄρχαλαν ἱδέαν καὶ γνωσθαι πάλιν υγρόν ἐξ ὄμοιον ἄτεχνος ώς περὶ ὀπογγάς τινος ἢ ἐρίου τῆς κύστεως διανοοῦμενος, ἄλλ' οὐ σῶματος ἀκριβῶς πυκνοῦ καὶ στεγανοῦ δύο χιτώνας ἰσχυροτάτους κεκτημένου,
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Erasistratus, Praxagoras,¹ and all other physicians of eminence, but practically every butcher is aware of this, from the fact that he daily observes both the position of the kidneys and the duct (termed the ureter) which runs from each kidney into the bladder, and from this arrangement he infers their characteristic use and faculty. But, even leaving the butchers aside, all people who suffer either from frequent dysuria or from retention of urine call themselves "nephrites,"² when they feel pain in the loins and pass sandy matter in their water.

I do not suppose that Asclepiades ever saw a stone which had been passed by one of these sufferers, or observed that this was preceded by a sharp pain in the region between kidneys and bladder as the stone traversed the ureter, or that, when the stone was passed, both the pain and the retention at once ceased. It is worth while, then, learning how his theory accounts for the presence of urine in the bladder, and one is forced to marvel at the ingenuity of a man who puts aside these broad, clearly visible routes,³ and postulates others which are narrow, invisible—indeed, entirely imperceptible. His view, in fact, is that the fluid which we drink passes into the bladder by being resolved into vapours, and that, when these have been again condensed, it thus regains its previous form, and turns from vapour into fluid. He simply looks upon the bladder as a sponge or a piece of wool, and not as the perfectly compact and impervious body that it is, with two very

¹ Diocles of Carystus was the chief representative of the Dogmatic or Hippocratic school in the first half of the fourth century B.C. Praxagoras was his disciple, and followed him in the leadership of the school. For Erasistratus, cf. p. 95 et seq.
² Sufferers from kidney-trouble.
³ The ureters.
ΔIKEION

δι' ὀν εἴπερ διέρχεσθαι φήσομεν τοὺς ἀτμοὺς, τι
δήποτ' οὐχὶ διὰ τοῦ περιτοναίου καὶ τῶν φρενῶν
dιελθόντες ἐνέπλησαν ὑδατος τὸ τ' ἐπιγάστριον
アップ καὶ τὸν θώρακα; ἀλλὰ παχύτερος, φησίν,
ἔστι δηλαδὴ καὶ στεγανώτερος ὁ περιτόναιος
χιτῶν τῆς κύστεως καὶ διὰ τοῦτ' ἐκεῖνος μὲν
ἀποστέγει τοὺς ἀτμοὺς, ἢ δὲ κύστις παραδέχεται.
ἀλλ' εἴπερ ἀνατετμήκει ποτέ, τάχ' ἂν ἦπιστατο
τὸν μὲν ἐξωθεὶν χιτῶνα τῆς κύστεως ἀπὸ τοῦ
περιτοναίου πεφυκότα τὴν αὐτὴν ἐκείνῳ φύσιν
ἐχειν, τὸν δ' ἐνδοθεὶν τὸν αὐτῆς τῆς κύστεως ὕδιον
πλέον ἢ διπλάσιον ἐκεῖνο τὸ πάχος ὑπάρχειν.

33 Ἀλλ' ἴσως οὕτε τὸ || πάχος οὐθ' ἢ λεπτότης
τῶν χιτῶνων, ἀλλ' ἡ θέσις τῆς κύστεως αἰτία τοῦ
φέρεσθαι τοὺς ἀτμοὺς εἰς αὐτήν. καὶ μην εἰ καὶ
diὰ τάλλα πάντα πιθανὸν ἢν αὐτοὺς ἐνταῦθαί
cυναθροίζεσθαι, τὸ γε τῆς θέσεως μόνης αὐταρκες
κωλύσαι. κάτω μὲν γὰρ ἡ κύστις κεῖται, τοῖς δ' ἀτμοῖς σύμφυτος ἢ πρὸς τὸ μετέωρον φορά, ὡστε
πολὺ πρότερον ἢν ἐπλησαν ἄπαντα τὰ κατὰ τὸν
θώρακα τε καὶ τὸν πνεύμονα, πρὶν ἐπὶ τὴν κύστιν
ἀφικέσθαι.

Καὶ τοῖ τῇ θέσεως κύστεως καὶ περιτοναίου καὶ
θώρακος μημονεύων; διεκπεσούντες γὰρ δήποτ'
toὺς τε τῆς κοιλίας καὶ τῶν ἐντέρων χιτῶνας οἱ
ἀτμοί κατὰ τὴν μεταξὺ χώραιν αὐτῶν τε τοῦτων
καὶ τοῦ περιτοναίου συναθροίζονται καὶ υγρὸν
ἐνταῦθαι γενήσονται, ὡσπερ καὶ τοῖς ύδερικοῖς ἐν
toῦτῳ τῷ χωρίῳ τὸ πλεῖστον ἀθροίζεται τοῦ

1 Unless otherwise stated, “peritoneum” stands for parietal peritoneum alone.
strong coats. For if we say that the vapours pass through these coats, why should they not pass through the peritoneum and the diaphragm, thus filling the whole abdominal cavity and thorax with water? "But," says he, "of course the peritoneal coat is more impervious than the bladder, and this is why it keeps out the vapours, while the bladder admits them." Yet if he had ever practised anatomy, he might have known that the outer coat of the bladder springs from the peritoneum and is essentially the same as it, and that the inner coat, which is peculiar to the bladder, is more than twice as thick as the former.

Perhaps, however, it is not the thickness or thinness of the coats, but the situation of the bladder, which is the reason for the vapours being carried into it? On the contrary, even if it were probable for every other reason that the vapours accumulate there, yet the situation of the bladder would be enough in itself to prevent this. For the bladder is situated below, whereas vapours have a natural tendency to rise upwards; thus they would fill all the region of the thorax and lungs long before they came to the bladder.

But why do I mention the situation of the bladder, peritoneum, and thorax? For surely, when the vapours have passed through the coats of the stomach and intestines, it is in the space between these and the peritoneum that they will collect and become liquefied (just as in dropsical subjects it is in this region that most of the water gathers). Otherwise the vapours must necessarily pass straight forward.

2 In the peritoneal cavity.
3 Contrast, however, anasarca, p. 41.
ΓALEN

υδατος, ἡ πάντως αὐτοῦς χρῆ φέρεσθαι πρόσω
diὰ πάντων τῶν ὁπώσον ὁμιλοῦντων καὶ μηδὲ-
ποθ' ἱστασθαι. ἄλλ' εἰ καὶ τοῦτο τις ὑπόθετο,
dιεκπεσόντες ἂν ὠὕτως οὐ τὸ περιτόναιον μόνον
アルバム καὶ τὸ ἐπιγάστριον, εἰς τὸ περίχον σκε-
dασθείειν ἢ πάντως ἂν ύπ' τῷ δέρματι || συν-
αθροισθείειν.

Ἀλλὰ καὶ πρὸς ταύτη ἀντιλέγειν οἱ νῦν
Ἄσκληπιάδειον πειρώνται, καίτοι πρὸς ἀπάντων
ἀεὶ τῶν παρατυχανόντων αὐτοῖς, ὅταν περὶ
tούτων ἐρίζωσι, καταγελᾶμενοι. οὕτως ἄρα
δυσαπότρυπτόν τι κακών ἔστιν ἡ περὶ τὰς αἱρέσεις
φιλοτιμία καὶ δυσέκνυπτον ἐν τοῖς μάλιστα καὶ
ψώρας ἀπάσης δυσιατότερον.

Τῶν γοῦν καθ' ἡμᾶς τις σοφιστῶν τὰ τ' ἄλλα
καὶ περὶ τοὺς ἐριστικοὺς λόγους ἰκανῶς συγκε-
κροτημένοι καὶ δεινῶς εἰπεῖν, εἴπερ τις ἄλλος,
ἀφικόμενος ἐμοί ποθ' ύπέρ τούτων εἰς λόγους,
tοσούτων ἀπέδει τοῦ δυσωπείσθαι πρὸς τινος
tῶν εἰρημένων, ὅστε καὶ θαυμάζειν ἐφασκεν
ἐμοὶ τὰ σαφῶς φαινόμενα λόγοις ληπόδεσιν
ἀνατρέπειν ἐπιχειροῦντος. ἑναργῶς γὰρ ὁσιμέραι
θεωρεῖσθαι τὰς κύστεις ἀπάσας, εἰ τις αὐτὰς
ἐμπλήσειν ύδατος ἢ ἄερος, εἶτα δῆσας τὸν
τρύχηλον πιέζοι πανταχοθεν, οὔδαμοθεν μεθεῖ-
σας οὔδεν, ἀλλ' ἀκριβῶς ἄπαν ἐντὸς ἐαυτῶν
στεγοῦσας. καίτοι γ' εἴπερ ἡσών τινες ἐκ τῶν
νεφρῶν εἰς αὐτὰς ἤκοντες αἰσθητοὶ καὶ μεγάλοι
πόρου, πάντως ἂν, ἐφ' ἐκεῖνων, ὦσπερ εἰς ἑι̣

35 τὸ || ύγρὸν εἰς αὐτὰς, οὕτω καὶ θλιβόντων
ἐξεκρίνετο. ταύτα καὶ τὰ τοιαύτ' εἰπ' ἐξαίφνης
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through everything which in any way comes in contact with them, and will never come to a standstill. But, if this be assumed, then they will traverse not merely the peritoneum but also the epigastrium, and will become dispersed into the surrounding air; otherwise they will certainly collect under the skin.

Even these considerations, however, our present-day Asclepiadeans attempt to answer, despite the fact that they always get soundly laughed at by all who happen to be present at their disputations on these subjects—so difficult an evil to get rid of is this sectarian partizanship, so excessively resistant to all cleansing processes, harder to heal than any itch!

Thus, one of our Sophists who is a thoroughly hardened disputer and as skilful a master of language as there ever was, once got into a discussion with me on this subject; so far from being put out of countenance by any of the above-mentioned considerations, he even expressed his surprise that I should try to overturn obvious facts by ridiculous arguments! "For," said he, "one may clearly observe any day in the case of any bladder, that, if one fills it with water or air and then ties up its neck and squeezes it all round, it does not let anything out at any point, but accurately retains all its contents. And surely," said he, "if there were any large and perceptible channels coming into it from the kidneys the liquid would run out through these when the bladder was squeezed, in the same way that it entered?" 1

1 Regurgitation, however, is prevented by the fact that the ureter runs for nearly one inch obliquely through the bladder wall before opening into its cavity, and thus an efficient valve is produced.
ἀπταίστω καὶ σαφεῖ τῷ στόματι τελευτῶν ἀναπηδήσας ἂπνη ἐκαταλιπὼν ἡμᾶς ὡς οὐδὲ πιθανῆς τινος ἀντιλογίας εὐπορήσαι δυναμένους.

Οὕτως οὐ μόνον ύψεσ οὐδὲν ἔσασιν οἱ ταῖς αἱρέσεσι δουλεύοντες, ἀλλ' οὐδὲ μαθεῖν υπομένουσι. δέον γὰρ ἀκούσαι τὴν αὐτίαν, δι' ἥν εἰσίναι μὲν δύναται διὰ τῶν ὑφητήρων εἰς τὴν κύστιν τὸ υγρόν, ἐξείναι δ' αὐθείς ὑπίσω τὴν αὐτὴν ὀδὸν οὐκέθ' οἶον τι, καὶ θαυμάσαι τὴν τέχνην τῆς φύσεως, οὕτε μαθεῖν ἐθέλουσι καὶ λοιδοροῦνται προσέτι μάθην ὑπ' αὐτῆς ἀλλα τε πολλὰ καὶ τοὺς νεφροὺς γεγονέναι φάσκοντες. εἰσὶ δ' οἱ καὶ δειχθήναι παρόντων αὐτῶν τοὺς ἀπὸ τὸ νεφρὸν εἰς τὴν κύστιν ἐμφυομένους ὑφητήρας υπομείναντες ἐπόλμησαν εἰπειν οἱ μὲν, ὅτι μάθην καὶ οὕτοι γεγόνασιν, οἱ δ', ὅτι σπερματικοὶ τινὲς εἴσι πόροι καὶ διὰ τοῦτο κατὰ τὸν τράχηλον αὐτῆς, οὐκ εἰς τὸ κύτος ἐμφύουνται. δείξαντες οὖν ἡμεῖς αὐτοῖς τοὺς ὡς ἀληθῶς σπερματικοὺς πόρους κατωτέρω τῶν ὑφητήρων ἔμβαλλοντας εἰς τὸν τράχηλον, ὕπ' ὑγοῦν, εἰ καὶ μὴ πρότερον, ψήθηκεν ἄπαξειν τε τῶν ψευδῶν υπειλημμένων ἐπὶ τε ταὐτίας μεταστήσεις αὐτίκα. οὐ δὲ καὶ πρὸς τοὺς ἀντιλέγειν ἐτῶλμων οὐδὲν εἶναι θαυμαστὸν εἰπόντες, ἐν ἑκείνοις μὲν ὡς ἄν στεγανωτέρους οὐσίων ἐπὶ πλέον υπομένειν τὸ σπέρμα, κατὰ δὲ τοὺς ἀπὸ τῶν νεφρῶν ὡς ἄν ἱκανῶς ἀνευρυσμένους ἐκρεῖν διὰ ταχέων. ἡμεῖς

1 On the τέχνη (artistic or creative skill) shown by the living organism (φύσις) v. pp. 25, 45, 47; Introduction, p. xxix.
2 Direct denial of Aristotle's dictum that "Nature does nothing in vain." We are reminded of the view of certain
similar remarks in precise and clear tones, he concluded by jumping up and departing—leaving me as though I were quite incapable of finding any plausible answer!

The fact is that those who are enslaved to their sects are not merely devoid of all sound knowledge, but they will not even stop to learn! Instead of listening, as they ought, to the reason why liquid can enter the bladder through the ureters, but is unable to go back again the same way, —instead of admiring Nature's artistic skill 1—they refuse to learn; they even go so far as to scoff, and maintain that the kidneys, as well as many other things, have been made by Nature for no purpose! 2

And some of them who had allowed themselves to be shown the ureters coming from the kidneys and becoming implanted in the bladder, even had the audacity to say that these also existed for no purpose; and others said that they were spermatic ducts, and that this was why they were inserted into the neck of the bladder and not into its cavity. When, therefore, we had demonstrated to them the real spermatic ducts 3 entering the neck of the bladder lower down than the ureters, we supposed that, if we had not done so before, we would now at least draw them away from their false assumptions, and convert them forthwith to the opposite view. But even this they presumed to dispute, and said that it was not to be wondered at that the semen should remain longer in these latter ducts, these being more constricted, and that it should flow quickly down the ducts which came from the kidneys, seeing that these were modern laboratory physicians and surgeons that the colon is a "useless" organ. cf. Erasistratus, p. 143.

The vasa deferentia.
οὖν ἡμαγκάσθημεν αὐτοῖς τοῦ λοιποῦ δεικνύειν εἰσρέαν τῇ κύστει διὰ τῶν οὐρητήρων τὸ οὖρον ἐναργῶς ἐπὶ ζωτος ἐτι τοῦ ζῶου, μόνης ἄν οὕτω ποτὲ τὴν φλυαρίαν αὐτῶν ἐπισχῆσει ἐλπίζουτε.

Ὁ δὲ τρόπος τῆς δείξεως ἐστὶ τοιοῦτος. διελεῖν χρῆ τὸ πρὸ τῶν οὐρητήρων περιτόναιον, εἴτε βρόχος αὐτοὺς ἐκλαβεῖν κάπετι, ἐπιδήσαντας ἐὰςαι τὸ ζῶου οὐ γὰρ ἄν οὐρήσειν ἐτι. μετὰ δὲ πάντα λύειν μὲν τοὺς ἐξωθεῖν δεσμοὺς, δεικνύναι δὲ κενὴ μὲν τὴν κύστιν, μεστοὺς δὲ ἰκανῶς καὶ διατεταμένους τοὺς οὐρητήρας καὶ κινδυνεύοντας βαγῆναι κάπετα τοὺς βρόχους αὐτῶν ἀφελόντας ἐναργῶς ὃραν ήδη πληρομένην οὖρον τὴν κύστιν.

37 Ἐπὶ δὲ τούτῳ ἐν διακεφαλεῖν χρῆ τῷ αἰδοίῳ κάπετα θλίβειν πανταχόθεν τὴν κύστιν. οὐδὲ γὰρ ἄν οὐδὲν ἐτι διὰ τῶν οὐρητήρων ἐπανέλθου πρὸς τοὺς νεφροὺς. καὶ τούτῳ δὴλον γίγνεται τὸ μὴ μόνον ἐπὶ τεθνεώτος ἀλλὰ καὶ περιόντος ἐτι τοῦ ζῶου καλύσθαι μεταλαμβάνειν αὐθίς ἐκ τῆς κύστεως τοὺς οὐρητήρας τὸ οὖρον. ἐπὶ τούτοις ὀφθείσιν ἐπιτρέπειν ἡδὴ τὸ ζῶου οὐρεῖν λύνοντας αὐτοῦ τὸν ἐπὶ τῷ αἰδοίῳ βρόχον, εἰτ' αὐθίς ἐπιβαλεῖν μὲν θατέρῳ τῶν οὐρητήρων, ἔασαι δὲ τὸν ἐτερον εἰς τὴν κύστιν συνεῖν καὶ τίνα διάλυσιν τρόχουν ἐπιδεικνύειν ἡδή, πῶς ὁ μὲν ἐτερος αὐτῶν ὁ δεδεμένος μεστός καὶ διατεταμένος κατὰ τὰ πρὸς τῶν νεφρῶν μέρη φαίνεται, ὁ δ' ἐτερος ὁ λευκύμνος αὐτοῦ μὲν χαλάρος ἐστι, πεπλήρωσε δ' οὖρον τὴν κύστιν. εἰτ' αὐθίς διατεμεῖν πρῶτον μὲν τὸν πλήρη καὶ δείξαι, πῶς ἐξαικονίζεται τὸ
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well dilated. We were, therefore, further compelled to show them in a still living animal, the urine plainly running out through the ureters into the bladder; even thus we hardly hoped to check their nonsensical talk.

Now the method of demonstration is as follows. One has to divide the peritoneum in front of the ureters, then secure these with ligatures, and next, having bandaged up the animal, let him go (for he will not continue to urinate). After this one loosens the external bandages and shows the bladder empty and the ureters quite full and distended—in fact almost on the point of rupturing; on removing the ligature from them, one then plainly sees the bladder becoming filled with urine.

When this has been made quite clear, then, before the animal urinates, one has to tie a ligature round his penis and then to squeeze the bladder all over; still nothing goes back through the ureters to the kidneys. Here, then, it becomes obvious that not only in a dead animal, but in one which is still living, the ureters are prevented from receiving back the urine from the bladder. These observations having been made, one now loosens the ligature from the animal’s penis and allows him to urinate, then again ligatures one of the ureters and leaves the other to discharge into the bladder. Allowing, then, some time to elapse, one now demonstrates that the ureter which was ligatured is obviously full and distended on the side next to the kidneys, while the other one—that from which the ligature had been taken—is itself flaccid, but has filled the bladder with urine. Then, again, one must divide the full ureter, and demonstrate how
oùron ἐξ αὐτοῦ, καθάπερ ἐν ταῖς φλεβοτομίαις τὸ αἷμα, μετὰ ταῦτα δὲ καὶ τὸν ἑτέρον αὐθις διατεμεῖν κἀπεὶ ἐπιδήσαι τὸ ξῦνον ἐξωθεῖν, ἀμ-φοτέρων διηγημένων, || εἴθ’ ὅταν ἰκανῶς ἔχειν δοκῇ, λύσαι τὸν δεσμὸν. εὑρεθήσεται γὰρ ἢ μεί κύστις κενή, πλῆρες δ’ οὐρον τὸ μεταξ’ τῶν ἑντέρων τε καὶ τοῦ περιτοναίου χωρίον ἀπαν, ὡς ἄν εἰ καὶ υδερικὸν ἦν τὸ ξῦνον. ταῦτ’ οὖν εἰ τις αὐτὸς καθ’ ἑαυτὸν βουληθεὶς βασανίζειν ἐπὶ ξῦνον, μεγάλως μοι δοκεῖ καταγνώσθαι τῆς Ἀσκληπιώδους προπετείας. εἰ δὲ δὴ καὶ τῇ αὑτίαν μάθοι, δι’ ἥν οὐδὲν ἐκ τῆς κύστεως εἰς τοὺς οὐρητήρας ἀντεκρεῖ, πεισθῆναι ἄν μοι δοκεῖ καὶ διὰ τούτῳ τὴν εἰς τὰ ζῶα πρόνοιαν τε καὶ τέχνην τῆς φύσεως.

Ἰπποκράτης μὲν οὖν ὁμὶλεὶ ἀτρόντων τε καὶ φιλοσόφων πρῶτος ἀπάντων, ὡς ἂν καὶ πρῶτος ἑπιγνοὺς τὰ τῆς φύσεως ἔργα, θαυμάζει τε καὶ διὰ παντὸς αὐτὴν ὑμνεῖ δικαίως οὐσιώδως καὶ μόνην ἐξαρκεῖν εἰς ἀπαντα τοῖς ζῴωις φησίν, αὐτὴν ἐξ αὐτῆς ἀδιδάκτως πράττονσαν ἀπαντα τὰ δεόντα: τοιαύτην δ’ οὖσαν αὐτὴν εὐθέως καὶ δυνάμεις ὑπέλαβεν ἔχειν ἐλκτικὴν μὲν τῶν οἰκείων, ἀποκριτικὴν δὲ τῶν ἀλλοτρίων καὶ τρέφειν τε καὶ ἀγὰς αὐτῆν τὰ ζῶα καὶ κρίνειν τὰ νοσήματα· καὶ διὰ τούτ’ ἐν τοῖς σώμασιν ἤμων σύμπνοιαν τε μίαν εἶναι φησὶ καὶ σύρροιαν καὶ πάντα συμπαθεία: κατὰ δὲ τὸν Ἀσκληπιώδην

2 cf. p. 36, note 2.
the urine spurts out of it, like blood in the operation of venesection; and after this one cuts through the other also, and both being thus divided, one bandages up the animal externally. Then when enough time seems to have elapsed, one takes off the bandages; the bladder will now be found empty, and the whole region between the intestines and the peritoneum full of urine, as if the animal were suffering from dropsy. Now, if anyone will but test this for himself on an animal, I think he will strongly condemn the rashness of Asclepiades, and if he also learns the reason why nothing regurgitates from the bladder into the ureters, I think he will be persuaded by this also of the forethought and art shown by Nature in relation to animals.¹

Now Hippocrates, who was the first known to us of all those who have been both physicians and philosophers inasmuch as he was the first to recognize what Nature effects, expresses his admiration of her, and is constantly singing her praises and calling her "just." Alone, he says, she suffices for the animal in every respect, performing of her own accord and without any teaching all that is required. Being such, she has, as he supposes, certain faculties, one attractive of what is appropriate,² and another eliminative of what is foreign, and she nourishes the animal, makes it grow, and expels its diseases by crisis.³ Therefore he says that there is in our bodies a concordance in the movements of air and fluid, and that everything is in sympathy. According to Asclepiades, however, nothing is

³ The morbid material passed successively through the stages of "crudity," "coction" (pepsis), and "elimination" (crisis). For "critical days" cf. p. 74, note 1.
This was the process by which nutriment was taken up from the alimentary canal; “absorption,” “dispersal;” cf. 62
naturally in sympathy with anything else, all substance being divided and broken up into inharmonious elements and absurd "molecules." Necessarily, then, besides making countless other statements in opposition to plain fact, he was ignorant of Nature's faculties, both that attracting what is appropriate, and that expelling what is foreign. Thus he invented some wretched nonsense to explain blood-production and anadosis, and, being utterly unable to find anything to say regarding the clearing-out of superfluities, he did not hesitate to join issue with obvious facts, and, in this matter of urinary secretion, to deprive both the kidneys and the ureters of their activity, by assuming that there were certain invisible channels opening into the bladder. It was, of course, a grand and impressive thing to do, to mistrust the obvious, and to pin one's faith in things which could not be seen!

Also, in the matter of the yellow bile, he makes an even grander and more spirited venture; for he says this is actually generated in the bile-ducts, not merely separated out.

How comes it, then, that in cases of jaundice two things happen at the same time—that the dejections contain absolutely no bile, and that the whole body becomes full of it? He is forced here again to talk nonsense, just as he did in regard to the urine. He also talks no less nonsense about the black bile and the spleen, not understanding what was said by Hippocrates; and he attempts in stupid—I might say insane—language, to contradict what he knows nothing about.

p. 13, note 5. The subject is dealt with more fully in chap. xvi.

1 Lit. catharsis.
Τί δὴ τὸ κέρδος ἐκ τῶν τοιούτων δογμάτων εἰς τὰς θεραπείας ἐκτίςατο; μήτε νεφριτικῶν τι νόσημα δύνασθαι θεραπεύσαι μήτ' ἱκτερίκων μήτε μελαγχολικῶν, ἀλλὰ καὶ περὶ τοῦ πᾶσιν ἀνθρώπων οὐχ Ἰπποκράτει μονὸν ὀμολογουμένου τοῦ καθαίρειν τῶν φαρμάκων ἐνα μὲν τὴν ἕκασθην χολήν, ἐνα δὲ τὴν μέλαιαν, ἀλλὰ δὲ τινα φλέγμα καὶ τινα τὸ λεπτὸν καὶ ύδατῶδες περίπτωμα, μηδὲ περὶ τούτων συνχωρεῖν, ἀλλ' ὑπ' αὐτῶν τῶν φαρμάκων γίγνεσθαι λέγειν τοιούτων ἕκαστον τῶν κενομένων, ὅσπερ ὑπὸ τῶν χολῆς ὑδάτων πόρων τῆς χολῆς καὶ μηδὲν διαφέρειν κατὰ τὸν θαυμαστόν Ἀσκληπιάδην ἢ ύδραγωγον διδόναι τοῖς υδρευόσιν ἢ χολαγωγον φάρμακον. Ἀπάντα γὰρ ὀμοιώς κενοῦν καὶ συντήκειν τὸ σῶμα καὶ τὸ σύντηγμα τοιώνδε τι φαίνεσθαι ποιεῖν, μὴ πρότερον υπάρχον τοιούτων.

'Αρ' οὖν οὐ μαίνεσθαι νομιστέον αὐτῶν ἢ παντάπασιν ἀπειρον εἶναι τῶν ἔργων τῆς τέχνης; τὸς γὰρ οὖκ οίδεν, ὡς, εἰ μὲν φλέγματος ἁγωγὸν δοθείη φάρμακον τοῖς ἵκτερίσιν, οὐκ ἂν οὐδὲ τετταράς κυάθους καθαρθεῖν οὐτω δ' οὐδ' εἰ τῶν ύδραγωγῶν τιν χολαγωγῷ δέ φαρμάκῳ πλεῖστον μὲν ἐκκενοῦται χολῆς, αὐτίκα δὲ καθαρὸς τοῖς οὕτω καθαρθεῖσιν ὁ χρῶς γίγνεται. τολλοῦν γοῦν ἡμεῖς μετὰ τὸ θεραπεύσαι τὴν ἐν τῷ ἑπτα εἰδεῖσιν ἀπαξ καθήτατες ἀπηλλάξαμεν τοῦ παθήματος. οὐ μην οὖδ' εἰ φλέγματος ἀγωγῷ καθαίροις φαρμάκῳ, πλίον ἂν τι δια-πράξαι.
ON THE NATURAL FACULTIES, I. xiii

And what profit did he derive from these opinions from the point of view of treatment? He neither was able to cure a kidney ailment, nor jaundice, nor a disease of black bile, nor would he agree with the view held not merely by Hippocrates but by all men regarding drugs—that some of them purge away yellow bile, and others black, some again phlegm, and others the thin and watery superfluity; he held that all the substances evacuated were produced by the drugs themselves, just as yellow bile is produced by the biliary passages! It matters nothing, according to this extraordinary man, whether we give a hydragogue or a cholagogue in a case of dropsy, for these all equally purge and dissolve the body, and produce a solution having such and such an appearance, which did not exist as such before.

Must we not, therefore, suppose he was either mad, or entirely unacquainted with practical medicine? For who does not know that if a drug for attracting phlegm be given in a case of jaundice it will not even evacuate four \textit{cyathi} of phlegm? Similarly also if one of the hydragogues be given. A cholagogue, on the other hand, clears away a great quantity of bile, and the skin of patients so treated at once becomes clear. I myself have, in many cases, after treating the liver condition, then removed the disease by means of a single purgation; whereas, if one had employed a drug for removing phlegm one would have done no good.

drugs were given; they are the products of dissolved tissue. Asclepiades did not believe that diseases were due to a \textit{materia praeconis}, but to disturbances in the movements of the molecules (\(\gamma\kappa\alpha\iota\)) which constitute the body; thus, in opposition to the humoralists such as Galen, he had no use for drugs. \textit{cf.} p. 49, note 5.  

4 About \(\frac{3}{4}\) oz., or one-third of a pint.
ГАЛЕН

Καὶ ταῦτ’ οὖχ Ἰπποκράτης μὲν οὕτως οἶδε γεγονόμενα, τοῖς δ’ ἀπὸ τῆς ἐμπειρίας μόνης ὑμωμένους ἐτέρως ἐγνωσται, ἀλλὰ κάκεει· οἷς ὁσαύτως καὶ πᾶσιν ιατροῖς, οἷς μέλει τῶν ἑργῶν τῆς τέχνης, οὕτω δοκεῖ πλὴν Ἀσκληπιάδου. προδοσίαιν γὰρ εἶναι νενόμικε τῶν στοιχείων δὲν ὑπέθετο τῇν ἀληθῆ περὶ τῶν τοιούτων ὀμολογιάν. εἰ γὰρ ὅλως εὐρεθεὶ τι φάρμακον ἐλεκτικὸν τοῦτο τῶν χυμοῦ μόνου, κίνδυνος κρατεῖν δηλαδὴ τῷ λόγῳ τὸ ἐν ἐκάστῳ τῶν σωμάτων εἶναι τῶν δύναμιν ἐπισταστικῆν τῆς οἰκείας ποιότητος. διὰ τούτο κινήκον μὲν καὶ κόκκον τοῦ κινίδιον καὶ ἱπποφαῖς οὖχ ἐλκεῖν ἕκ τοῦ σώματος ἀλλὰ ποιεῖν τὸ φλέγμα φησίν· ἀνθὸς δὲ χαλκοῦ καὶ λεπίδα καὶ αὐτῶν τῶν κεκαυμένων χαλκῶν καὶ χαμαίδρων καὶ χαμαίλεοντα εἰς ύδωρ ἀναλύει τὸ σῶμα καὶ τοὺς υδρεικοὺς ὑπὸ τούτων οὐ καθαιρομένους ὀνειραθητέον ἀλλὰ κενομένους συναιξόντων δηλαδὴ τὸ πάθος. εἰ γὰρ οὐ κενοὶ τὸ περιεχόμενον ἐν τοῖς σώμασιν ὑδατῶδες ύγρὸν ἀλλ’ αὐτὸ γεννᾶ, τῷ νοσήματι προστιμωρεῖται. καὶ μὲν γε καὶ ή σκαμμωνία πρὸς τῷ μή κενοῖν ἐκ τοῦ σώματος τῶν ἰκτερικῶν τὴν χολήν ἐτι καὶ τὸ χρηστὸν αἰμα χολήν ἐγγεγειομένη || καὶ συντηκοσσα τὸ σῶμα καὶ τηλικαύτα κακὰ δρόσα καὶ τὸ πάθος ἐπαύξουσα κατὰ γε τῶν Ἀσκληπιάδου λόγου.

1 The Empiricists. cf. Introduction, p. xiii.
2 His ὑγκοι or molecules.
3 He does not say “organized” or “living” body; inanimate things were also thought to possess “natures”; cf. p. 2, note 1.
Nor is Hippocrates the only one who knows this to be so, whilst those who take experience alone as their starting-point know otherwise; they, as well as all physicians who are engaged in the practice of medicine, are of this opinion. Asclepiades, however, is an exception; he would hold it a betrayal of his assumed "elements" to confess the truth about such matters. For if a single drug were to be discovered which attracted such and such a humour only, there would obviously be danger of the opinion gaining ground that there is in every body a faculty which attracts its own particular quality. He therefore says that safflower, the Cnidian berry, and Hippophaes do not draw phlegm from the body, but actually make it. Moreover, he holds that the flower and scales of bronze, and burnt bronze itself, and germander, and wild mastich dissolve the body into water, and that dropsical patients derive benefit from these substances, not because they are purged by them, but because they are rid of substances which actually help to increase the disease; for, if the medicine does not evacuate the dropsical fluid contained in the body, but generates it, it aggravates the condition further. Moreover, scammony, according to the Asclepiadecan argument, not only fails to evacuate the bile from the bodies of jaundiced subjects, but actually turns the useful blood into bile, and dissolves the body; in fact it does all manner of evil and increases the disease.

And yet this drug may be clearly seen to do good to numbers of people! "Yes," says he, "they derive

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4 Carthamus tinctorius.  
5 Daphne Gnidium.  
6 Euphorbia acanthothamnos.  
7 Teuerium chamaedrys.  
8 Atractylis gummifera.  
9 On use of χειρός cf. p. 98, note 1.
λόγῳ τῆς κενώσεως. καὶ μὴν εἰ φλέγματος ἀγωγὸν αὐτοῖς δοῦσι φάρμακον, οὐκ ὀνήσονται. καὶ τοῦ οὕτως ἐναργεῖς ἔστιν, ὡστε καὶ οἱ ὀπὸ μόνης τῆς ἐμπειρίας ὀρμώμενοι γνωστοκοινοῖς αὐτῷ. καίτοι τούτοις γε τοῖς ἀνδράσιν αὐτῷ δὴ τούτ᾽ ἔστι φιλοσόφων, τὸ μηδενὶ λόγῳ πιστεύειν ἄλλα μόνοις τοῖς ἐναργῶς φαινομένοις. ἐκεῖνοι μὲν οὖν σωφρονοῦσιν. Ἀσκληπιίδης δὲ παραπαίει ταῖς αἰσθήσεις ἡμᾶς ὑπιστεῖν κελεύων, ἕνθα τὸ φαινόμενον ἀνατρέπει σαφῶς αὐτοῦ τὰς ὑποθέσεις. καίτοι μακρῶς γὰρ ἢν ἀμεινόν οὐχ ὀμόσε χωρεῖν τοῖς φαινομένοις ἄλλοι ἐκεῖνοι ἀναθέσθαι τὸ πάν.

Αρ' οὖν ταῦτα μόνον ἐναργῶς μάχεται τοῖς Ἀσκληπιίδου δόγμασιν ἢ καὶ τὸ θέρους μὲν πλείονα κενοῦσθαι τῷ ἐκατῆν χολήν ὑπὸ τῶν αὐτῶν φαρμάκων, χειμώνος δὲ τὸ φλέγμα, καὶ νεανίσκως μὲν πλείονα τῇ χολήν, πρεσβύτη δὲ τὸ φλέγμα, φαίνεται μὲν γὰρ ἐκαστὸν ἐξκεῖν τῇ ὁδίᾳ, οὐκ αὐτὸ γεννᾶν τῇ ὁικῇ ὁδίᾳ. εἰ γὰρ ἔθελήσαις νεαισκῷ τινὶ τῶν ἰσχιῶν καὶ θερμῶν ὁρὰ θέρους μὴτ' ἄργῳς βεβιωκότι μὴτ' ἐν πλημμυρῇ φλέγματος ἀγωγὸν δοῦναι φάρμακον, ὀλιγιστὸν μὲν καὶ μετὰ βίας πολλῆς ἐκκενώσεις τοῦ χυμοῦ, βλάψεις δ' ἐσχάτως τῶν ἀνθρωπῶν ἐμπαλινίν δ' εἰ χολαγωγῆν δοής, καὶ πάμπολυ κενώσεις καὶ βλάψεις οὐδέν.

Ἀρ' ὑπιστοίμεν ἐτί τῷ μὴ οὖχ ἐκαστὸν τῶν φαρμάκων ἐπάγεσθαι τὸν οἰκεῖον ἐαυτῶ χυμόν;

1 Empiricist physicians.
benefit certainly, but merely in proportion to the evacuation." . . . But if you give these cases a drug which draws off phlegm they will not be benefited. This is so obvious that even those who make experience alone their starting-point \(^1\) are aware of it; and these people make it a cardinal point of their teaching to trust to no arguments, but only to what can be clearly seen. In this, then, they show good sense; whereas Asclepiades goes far astray in bidding us distrust our senses where obvious facts plainly overturn his hypotheses. Much better would it have been for him not to assail obvious facts, but rather to devote himself entirely to these.

Is it, then, these facts only which are plainly irreconcilable with the views of Asclepiades? Is not also the fact that in summer yellow bile is evacuated in greater quantity by the same drugs, and in winter phlegm, and that in a young man more bile is evacuated, and in an old man more phlegm? Obviously each drug attracts something which already exists, and does not generate something previously non-existent. Thus if you give in the summer season a drug which attracts phlegm to a young man of a lean and warm habit, who has lived neither idly nor too luxuriously, you will with great difficulty evacuate a very small quantity of this humour, and you will do the man the utmost harm. On the other hand, if you give him a cholagogue, you will produce an abundant evacuation and not injure him at all.

Do we still, then, disbelieve that each drug attracts that humour which is proper to it? \(^2\) Possibly the

\(^2\) Note that drugs also have "natures"; cf. p. 66, note 3, and pp. 83-84.
ίσως φήσουσιν οί ἀπ’ Ἀσκληπιάδου, μᾶλλον δ’ οὐκ ἴσως, ἀλλὰ πάντως ἀπιστεῖν ἔροῦσιν, ἵνα μὴ προδώσῃ τὰ φίλτατα.

XIV

Πάλιν οὖν καὶ ἡμεῖς ἐφ’ ἐτέραν μεταβδώμεν ἀδόλεσχίαν: οὐ γὰρ ἐπιτρέπουσιν οἱ σοφισταὶ τῶν ἄξιων τι ξητημάτων προχειρίζεσθαι καίτοι παμπόλλων ὑπαρχόντων, ἀλλὰ κατατρίβειν ἀναγκάζουσι τὸν χρόνον εἰς τὴν τῶν σοφισμάτων, ὧν προβάλλουσι, λύσιν.

Τὸς οὖν ἡ ἀδόλεσχία; ἡ ἐνδοξος αὐτῇ καὶ πολυθρόλητος λίθος ἦ τὸν σίδηρον || ἐπιστομένη. τάχα γὰρ ἄν αὐτῇ ποτὲ τὴν ψυχὴν αὐτῶν ἐπιστάσασαι πιστεύειν εἰναι τινάς ἐν ἑκάστῳ τῶν σωμάτων ἐλκτικὰς τῶν οἰκείων ποιοτήτων δυνάμεις.

'Επίκουρος μὲν οὖν καίτοι παραπλησίως Ἀσκληπιάδη στοιχείως πρὸς τὴν φυσιολογίαν χρώμανος ὦ μως ὁμολογεῖ, πρὸς μὲν τῆς ἡρακλείας λίθου τὸν σίδηρον ἐλκέσθαι, πρὸς δὲ τῶν ἠλέκτρων τὰ κυρίβια καὶ πειράται γε καὶ τὴν αἰτίαν ἀποδιδόναι τοῦ φανομένου. τὰς γὰρ ἀπορρεοῦσας ἀτόμους ἀπὸ τῆς λίθου ταῖς ἀπορρεοῦσαι ἀπὸ τοῦ σιδήρου τοῖς σχῆμασιν οἰκείαις εἰναὶ φησιν, ὡστε περιπλέκεσθαι ῥαδίως. προσκρουοῦσας οὖν αὐτὰς τοῖς συγκρίμασιν ἐκατέρως τῆς τοῦ λίθου καὶ τοῦ σιδήρου κάπετι εἰς τὸ μέσον ἀποταλ-λομένας οὕτως ἀλλήλαις τε περιπλέκεσθαι καὶ

1 Pun here. 2 Lit. physiology, i.e. nature-lore, almost our "Natural Philosophy"; cf. Introduction, p. xxvi.
adherents of Asclepiades will assent to this—or rather, they will—not possibly, but certainly—declare that they disbelieve it, lest they should betray their darling prejudices.

XIV

Let us pass on, then, again to another piece of nonsense; for the sophists do not allow one to engage in enquiries that are of any worth, albeit there are many such; they compel one to spend one's time in dissipating the fallacious arguments which they bring forward.

What, then, is this piece of nonsense? It has to do with the famous and far-renowned stone which draws iron [the lodestone]. It might be thought that this would draw their minds to a belief that there are in all bodies certain faculties by which they attract their own proper qualities.

Now Epicurus, despite the fact that he employs in his Physics elements similar to those of Asclepiades, yet allows that iron is attracted by the lodestone, and chaff by amber. He even tries to give the cause of the phenomenon. His view is that the atoms which flow from the stone are related in shape to those flowing from the iron, and so they become easily interlocked with one another; thus it is that, after colliding with each of the two compact masses (the stone and the iron) they then rebound into the middle and so become entangled with each other,

3 The ultimate particle of Epicurus was the ἀτομος or atom (lit. "non-divisible"), of Asclepiades, the ἕγκος or molecule. Asclepiades took his atomic theory from Epicurus, and he again from Democritus; cf. p. 49, note 5.

4 Lit. Herculean stone.
Galen

συνεπισπάσθαι τὸν σίδηρον. τὸ μὲν ὁμοῦ τῶν ὑποθέσεων εἰς τὴν αἰτιολογίαν ἀπίθανον ἀντικρυς δήλου, ὡμοι ό σ' οὖν ὁμολογεῖ τὴν ὀλκήν, καὶ οὕτω γε καὶ κατὰ τὰ σώματα τῶν ξώνων φησὶ γίγνεσθαι τὰς τ' ἀνάδοσεις καὶ τὰς διακρίσεις τῶν περιτ- 
τωμάτων καὶ τὰς τῶν καθαιρόντων φαρμάκων ἐνεργείας.

'Ασκληπιάδης δὴ τὸ τῇς εἰρημένης αἰτίας ἀπίθανον || ύπιδόμενος καὶ μηδεμίαν ἀλλήν ἐφ' οίς ὑπέθετο στοιχείους ἐξευρίσκων πιθανὴν ἐπὶ τὸ μηδ' ὀλος ἐλκεσθαι λέγειν ὑπὸ μηδείνος μηδεν ἀναισχυντήσας ἐτράπετο, δέον, εἰ μὴ οἳ Εὐπρε- 
κουρος εἴπεν ἥρεσκετο μὴ τ' ἄλλα βελτίω λέγειν εἰχεν, ἀποστήμα τῶν ὑποθέσεων καὶ τὴν τε ψύσιν εἰπεῖν τεχνικὴν καὶ τὴν οὐσίαν τῶν ὄντων ἐνου- 
μένην τε πρὸς έαυτήν ἄει καὶ ἀλλοιομένην ὑπὸ τῶν έαυτῆς μορίων εἰς ἀλληλα δρόμων τε καὶ 
πασχόντων. εἰ γὰρ ταῦτ' ὑπέθετο, χαλεπὸν οὖν ἢν τὴν τεχνικὴν ἐκείνην ψύσιν ὁμολογήσαι δύνα- 
μεις ἐχειν ἐπιστατικὴν μὲν τῶν οἰκείων, ἀπο- 
κριτικὴν δὲ τῶν ἀλλοτρίων. οὐ γὰρ δι' ἄλλο τι 
γ' ἢν αὐτῇ τὸ τεχνικὴ τ' εἶναι καὶ τοῦ ξών 
διασωστικὴ καὶ τῶν νοσημάτων κριτικὴ παρὰ τὸ 
προσίεσθαι μὲν καὶ φυλάττειν τὸ οἰκείον, ἀπο- 
κρίνειν δὲ τὸ ἀλλότριον.

'Αλλ' Ἀσκληπιάδης κανταύθα τὸ μὲν ἀκόλου- 
θου ταῖς ἁρχαὶς αἰς ὑπέθετο συνείδειν, οὐ μὲν τὴν 
γε πρὸς τὸ φαινόμενον ἐναργῶς ὑδέσθη μάχην, 
47 ἀλλ' ὀμόσε || χωρεῖ καὶ περὶ τοῦτον πᾶσιν οὐκ 
ιατροῖς μόνον ἄλλη ἣδη καὶ τοῖς ἄλλοις ἀνθρώποις

1 Lit. aetiology. 2 Anadosis; cf. p. 62, note 1.
and draw the iron after them. So far, then, as his hypotheses regarding causation\(^1\) go, he is perfectly unconvincing; nevertheless, he does grant that there is an attraction. Further, he says that it is on similar principles that there occur in the bodies of animals the dispersal of nutriment\(^2\) and the discharge of waste matters, as also the actions of cathartic drugs.

Asclepiades, however, who viewed with suspicion the incredible character of the cause mentioned, and who saw no other credible cause on the basis of his supposed elements, shamelessly had recourse to the statement that nothing is in any way attracted by anything else. Now, if he was dissatisfied with what Epicurus said, and had nothing better to say himself, he ought to have refrained from making hypotheses, and should have said that Nature is a constructive artist and that the substance of things is always tending towards unity and also towards alteration because its own parts act upon and are acted upon by one another.\(^3\) For, if he had assumed this, it would not have been difficult to allow that this constructive nature has powers which attract appropriate and expel alien matter. For in no other way could she be constructive, preservative of the animal, and eliminative of its diseases,\(^4\) unless it be allowed that she conserves what is appropriate and discharges what is foreign.

But in this matter, too, Asclepiades realized the logical sequence of the principles he had assumed; he showed no scruples, however, in opposing plain fact; he joins issue in this matter also, not merely with all physicians, but with everyone else, and

\(^{\text{3 cf. p. 45.}}\) \(^{\text{4 The vis conservatrix et medicatrix Naturae.}}\)
The crisis or resolution in fevers was observed to take place with a certain regularity; hence arose the doctrine of “critical days.”
maintains that there is no such thing as a crisis, or critical day, and that Nature does absolutely nothing for the preservation of the animal. For his constant aim is to follow out logical consequences and to upset obvious fact, in this respect being opposed to Epicurus; for the latter always stated the observed fact, although he gives an ineffective explanation of it. For, that these small corpuscles belonging to the lodestone rebound, and become entangled with other similar particles of the iron, and that then, by means of this entanglement (which cannot be seen anywhere) such a heavy substance as iron is attracted—I fail to understand how anybody could believe this. Even if we admit this, the same principle will not explain the fact that, when the iron has another piece brought in contact with it, this becomes attached to it.

For what are we to say? That, forsooth, some of the particles that flow from the lodestone collide with the iron and then rebound back, and that it is by these that the iron becomes suspended? that others penetrate into it, and rapidly pass through it by way of its empty channels? that these then collide with the second piece of iron and are not able to penetrate it although they penetrated the first piece? and that they then course back to the first piece, and produce entanglements like the former ones?

The hypothesis here becomes clearly refuted by its absurdity. As a matter of fact, I have seen five writing-stylets of iron attached to one another in a line, only the first one being in contact with the

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2 These were hypothetical spaces or channels between the atoms; cf. Introduction, p. xiv.
δ’ εἰς τάλλα τῆς δυνάμεως διαδοθείσης: καὶ οὐκ ἔστιν εἰπεῖν, ὅσ, εἰ μὲν τῷ κάτω τοῦ γραφείου πέρατι προσάγοις ἔτερον, ἔχεται τε καὶ συνάπτεται καὶ κρέμασθαι τὸ προσενεχθὲν: εἰ δ’ ἄλλω τινὶ μέρει τῶν πλαγίων προσθεῖσι, οὗ συνάπτεται.

πάντη γὰρ ὁμοίως ἡ τῆς λίθου διαδίδοται δύναμις, εἰ μόνον ἰγαμοῦ κατὰ τι τοῦ πρῶτου γραφείου, καὶ μέντοι κάκ τούτο πάλιν εἰς τὸ δεύτερον ὠλον ἡ δύναμις ἅμα νοῆματι διαρρέει καὶ ἐκείνου πάλιν εἰς τὸ τρίτον ὠλον. εἰ δὴ νοῆσαι σμικράν τινα λίθον ἤρακλείαν ἐν οίκῳ τινὶ κρεμαμένην, εἰτ’ ἐν κύκλῳ ψαύοντα πάμπολλα σιδήρα πάλιν ἐτερα κακείων ἀλλα καὶ τούτ’ ἀρχί πλεῖονος, ἀπαντά || δήποτε τίμπλασθαι δεὶ τὰ σιδήρα τῶν ἀπορρεόντων τῆς λίθου σωμάτων. καὶ κινδυνεύει διαφορηθῆναι τὸ σμικρὸν ἐκείνο λιθίδιον εἰς τὰς ἀπορροας διαλυθὲν. καὶτοι, καὶ εἰ μηδεν παρακεῖται αὐτῷ σιδήριον, εἰς τὸν ἀέρα σχεδανυται, μάλιστ’ εἰ καὶ θερμὸς ὑπάρχοι.

Ναι, φησὶ, σμικρὰ γὰρ αὐτὰ χρῆ πάνω νοεῖν, ὡστε τῶν ἐμφερομένων τῷ ἄερι θηγμάτων τοῦ ὄρος ἡ τῶν σμικροτάτων ἐκείνων ἐναι μυριστῶν εἶναι μέρος. εἰτ’ ἐξ οὐτω σμικρῶν τολμάτε λέγειν κρεμάνυσθαι βάρη τηλικαῦτα σιδήρου; εἰ γὰρ ἐκαστὸν αὐτῶν μυριστῶν ἐστὶ μέρος τῶν ἐν τῷ ἄερι φερομένων θηγμάτων, τηλίκον χρῆ νοῆσαι τὸ πέρας αὐτῶν τὸ ἀγκιστροεῖδες, ὃ περιπλέκεται πρὸς ἀλληλα; πάντως γὰρ δήποτε τοῦτο σμικροτάτων ἐστιν ὀλον τοῦ θηγματος.

1 He means the specific drawing power or faculty of the lodestone. 2 cf. our modern "radium-emanations."
lodgestone, and the power\(^1\) being transmitted through it to the others. Moreover, it cannot be said that if you bring a second stylet into contact with the lower end of the first, it becomes held, attached, and suspended, whereas, if you apply it to any other part of the side it does not become attached. For the power of the lodestone is distributed in all directions; it merely needs to be in contact with the first stylet at any point; from this stylet again the power flows, as quick as a thought, all through the second, and from that again to the third. Now, if you imagine a small lodestone hanging in a house, and in contact with it all round a large number of pieces of iron, from them again others, from these others, and so on,—all these pieces of iron must surely become filled with the corpuscles which emanate from the stone; therefore, this first little stone is likely to become dissipated by disintegrating into these emanations.\(^2\) Further, even if there be no iron in contact with it, it still disperses into the air, particularly if this be also warm.

"Yes," says Epicurus, "but these corpuscles must be looked on as exceedingly small, so that some of them are a ten-thousandth part of the size of the very smallest particles carried in the air." Then do you venture to say that so great a weight of iron can be suspended by such small bodies? If each of them is a ten-thousandth part as large as the dust particles which are borne in the atmosphere, how big must we suppose the hook-like extremities by which they interlock with each other\(^3\) to be? For of course this is quite the smallest portion of the whole particle.

\(^3\) cf. Ehrlich's hypothesis of "receptors" in explanation of the "affinities" of animal cells.
Εἴτε μικρὸν μικρῷ, κινούμενον κινούμενῳ περιπλακέων οὐκ εὑθὺς ἀποπάλλεται. καὶ γὰρ δὴ καὶ ἀλλ’ ἄττα πάντως αὐτοῖς, τὰ μὲν ἀνώθεν, τὰ δὲ κάτωθεν, καὶ τὰ μὲν ἐμπροσθεν, τὰ δ’ ὀπίσωθεν, τὰ δ’ ἐκ τῶν δεξιῶν, τὰ δ’ ἐκ τῶν ἀριστερῶν || ἐκρηγμύμενα σεῖε τε καὶ βράττει καὶ μένειν οὐκ εἳ. καὶ μέντοι καὶ πολλαὶ χρὴ νοεῖν ἐξ ἀνάγκης ἕκαστον ἐκεῖνον τῶν σμικρῶν σωμάτων ἔχειν ἀγκιστρώδη πέρατα. δ’ ἐνὸς μὲν γὰρ ἀλλήλοις συνάπτεται, δ’ ἐτέρου δ’ ἐνὸς τοῦ μὲν ὑπερκειμένου τῇ λίθῳ, τοῦ δ’ ὑποκειμένου τῷ σιδηρῷ. εἰ γὰρ ἄνω μὲν ἐξαφθεῖν τῆς λίθου, κάτω δὲ τῷ σιδηρῷ μὴ συμπλακεῖν, πλέον οὐδέν. ὡστε τοῦ μὲν ὑπερκειμένου τὸ ἄνω μέρος ἐκκρέμασθαι χρῆ τῆς λίθου, τοῦ δ’ ὑποκειμένου τῷ κάτω πέρατι συνῆφθαι τὸν σίδηρον. ἐπεὶ δὲ κάκων πλαγίων ἀλλήλοις περιπλέκεται, πάντως ποιεῖ κανταῦθα ἔχει τὰ ἀγκιστρα. καὶ μέμνησό μοι πρὸ πάντων, ὅπως ὁντα σμικρὰ τὰς τοιαύτας καὶ τοσαύτας ἀποφύσεις ἔχει. καὶ τούτων μᾶλλον ἔτι, πῶς, ἣν τὸ δεύτερον σιδηρίου συναφθῇ τῷ πρῶτῳ καὶ τῷ δεύτερῳ τὸ τρίτον κακεῖνῳ τὸ τέταρτον, ἀμα μὲν διεξέρχεσθαι χρῆ τούς πόρους ταύτη τὰ σμικρὰ καὶ λῃστῇ ψήγματα, ἀμα δ’ ἀποπάλλεσθαι τοῦ μετ’ αὐτὸ || τεταγμένου, καίτοι κατὰ πᾶν ὁμοῖον τὴν φύσιν ὑπάρχοντος.

Οὐδὲ γὰρ ἡ τοιαύτη πάλιν ὑπόθεσις ἀτόλμος, ἀλλ’ εἰ χρῆ τάληθες εἰπεῖν, μακρῷ τῶν ἐμπροσθεν ἀναισχυντοτέρα, πέντε σιδηρίων ὁμοῖων ἀλλή-
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Then, again, when a small body becomes entangled with another small body, or when a body in motion becomes entangled with another also in motion, they do not rebound at once. For, further, there will of course be others which break in upon them from above, from below, from front and rear, from right and left, and which shake and agitate them and never let them rest. Moreover, we must perforce suppose that each of these small bodies has a large number of these hook-like extremities. For by one it attaches itself to its neighbours, by another—the topmost one—to the lodestone, and by the bottom one to the iron. For if it were attached to the stone above and not interlocked with the iron below, this would be of no use. Thus, the upper part of the superior extremity must hang from the lodestone, and the iron must be attached to the lower end of the inferior extremity; and, since they interlock with each other by their sides as well, they must, of course, have hooks there too. Keep in mind also, above everything, what small bodies these are which possess all these different kinds of outgrowths. Still more, remember how, in order that the second piece of iron may become attached to the first, the third to the second, and to that the fourth, these absurd little particles must both penetrate the passages in the first piece of iron and at the same time rebound from the piece coming next in the series, although this second piece is naturally in every way similar to the first.

Such an hypothesis, once again, is certainly not lacking in audacity; in fact, to tell the truth, it is far more shameless than the previous ones; according

1 i.e. from the point of view of the theory.
λοις ἐφεξῆς τεταγμένων διὰ τοῦ πρῶτου διαδύ-
μενα βαδίως τῆς λίθου τὰ μόρια κατὰ τὸ δεύτερον
ἀποπάλλεσθαι καὶ μὴ διὰ τούτου κατὰ τὸν αὐτὸν
πρῶτον ἐτοίμως διεξέρχεσθαι. καὶ μὴν ἐκατέρως
ἀτοπον. εἰ μὲν γὰρ ἀποπάλλεται, πῶς εἰς τὸ
πρῶτον ὁκέως διεξέρχεται; εἰ δ᾽ οὐκ ἀποπάλλεται,
pῶς κρεμάνυται τὸ δεύτερον ἐκ τοῦ πρῶτου; τὴν
γὰρ ἀπόταλασιν αὐτὸς ὑπέθετο δημιουργὸν τῆς
όλης.

'Ἀλλ', ὅπερ ἔφην, εἰς ἀδολεσχίαν ἀναγκαῖον
ἐμπίπτειν, ἐπειδὰν τις τοιούτως ἀνδράσι διαλέγη-
tαι. σύντομον οὖν τινα καὶ κεφαλαίωδη λόγον
ἐπὶ τῶν ἀπαλλάττεσθαι βουλομαι. τοῖς Ἀσκλη-
πιάδου γράμμασιν εἰ τις ἑπιμελῶς ὁμιλήσειε, τὴν
τε πρὸς τὰς ἀρχὰς ἀκολουθίαν τῶν τοιούτων
dογμάτων ἀκριβῶς ἄν ἐκμάθῃ καὶ τὴν πρὸς τὰ
φαινόμενα μάχην. ὁ μὲν οὖν Ἐπίκουρος τὰ
52 φαινόμενα φυλάττειν βουλόμενος ἀσχημονεῖ || φι-
λοτιμούμενος ἐπιδεικνύειν αὐτὰ ταῖς ἀρχαῖς ὁμο-
λογούντα· ὁ δὲ Ἀσκληπιάδης τὸ μὲν ἀκολουθοῦν
tαῖς ἀρχαῖς φυλάττει, τοῦ φαινομένου δὲ οὐδὲν
αὐτῷ μέλει. ἵστως οὖν βουλεῖται τὴν ἀτοπίαν
ἐξελέγχειν τῶν ὑποθέσεων, εἰ μὲν πρὸς Ἀσκλη-
pιάδην ὁ λόγος αὐτῷ γίγνετο, τῆς πρὸς τὸ
φαινόμενον ὑπομιμητάκετο μάχης· εἰ δὲ πρὸς
Ἐπίκουρον, τῆς πρὸς τὰς ἀρχὰς διαφωνίας. αἱ
dὲ ἄλλαι σχεδὸν αἰρέσεις αἱ τῶν ὀμοίων ἀρχῶν
ἐχόμεναι τελέσεις ἀπέσβησαν, αὐταί δὲ ἐτι μόναι
dιαρκοῦσιν οὐκ ἅγεννώς. καίτοι τὰ μὲν Ἀσ-
κληπιάδου Μηνόδοτος ὁ ἐμπειρικὸς ἀφύκτως
ἐξελέγχει, τὴν τε πρὸς τὰ φαινόμενα μάχην ὑπο-
μιμήςκων αὐτὸν καὶ τὴν πρὸς ἄλληλα· τὰ δ᾽ 80
to it, when five similar pieces of iron are arranged in a line, the particles of the lodestone which easily traverse the first piece of iron rebound from the second, and do not pass readily through it in the same way. Indeed, it is nonsense, whichever alternative is adopted. For, if they do rebound, how then do they pass through into the third piece? And if they do not rebound, how does the second piece become suspended to the first? For Epicurus himself looked on the rebound as the active agent in attraction.

But, as I have said, one is driven to talk nonsense whenever one gets into discussion with such men. Having, therefore, given a concise and summary statement of the matter, I wish to be done with it. For if one diligently familiarizes oneself with the writings of Asclepiades, one will see clearly their logical dependence on his first principles, but also their disagreement with observed facts. Thus, Epicurus, in his desire to adhere to the facts, cuts an awkward figure by aspiring to show that these agree with his principles, whereas Asclepiades safeguards the sequence of principles, but pays no attention to the obvious fact. Whoever, therefore, wishes to expose the absurdity of their hypotheses, must, if the argument be in answer to Asclepiades, keep in mind his disagreement with observed fact; or if in answer to Epicurus, his discordance with his principles. Almost all the other sects depending on similar principles are now entirely extinct, while these alone maintain a respectable existence still. Yet the tenets of Asclepiades have been unanswerably confuted by Menodotus the Empiricist, who draws his attention to their opposition to phenomena and to each other;
'Επικούρου πάλιν ὁ Ἀσκληπιάδης ἔχόμενος ἂν τῆς ἀκολουθίας, ὡς ἐκεῖνος οὐ πάνω τι φαίνεται φροντίζων.

Ἀλλ' οἱ νῦν ἀνθρωποί, πρὶν καὶ ταύτας ἐκμαθεῖν τὰς αἰρέσεις καὶ τὰς ἄλλας τὰς βελτίων κατείχατα χρόνω πολλῷ κρίναί τε καὶ βασανίσαι τὸ καθ' ἐκάστην αὐτῶν ἀληθές τε καὶ ψεύδος, οἱ μὲν ἱατροὶ ἔαυτοὺς, οἱ δὲ φιλόσοφοι ὀνομάζουσι μηδὲν εἰδότες. || οὐδὲν οὖν θαυμαστὸν ἐπίσης τοῖς ἀληθεύει τὰ ψευδή τετιμῆσθαι. ὅτῳ γάρ ἐκάστος πρῶτῳ περιτύχῃ διδασκάλῳ, τοιοῦτος ἐγένετο, μὴ περιμείνας μηδὲν ἔτι παρ' ἀλλού μαθεῖν. ἔνιοι δ' αὐτῶν, εἰ καὶ πλείοσιν ἐντύχοιεν, ἀλλ' οὕτω γ' έἰσίν ἀσύνετοί τε καὶ βραδεῖς τὴν διάνοιαν, ὡστε καὶ γεγορακότες οὔτω συνιάζων ἀκολουθίαν λόγου. πάλαι δὲ τοὺς τοιούτους ἐπὶ τὰς βαναύσους ἀπέλυνον τέχνας. ἀλλὰ ταύτα μὲν ἡς ὁ τι τελευτήσει θεὸς οἶδεν.

'Ἡμεῖς δ' ἐπειδῆ, καίτοι φεύγουσι ἀντιλέγειν τοῖς ἐν αὐταῖς ταῖς ἀρχαῖς εὐθὺς ἐσφαλμένους, ὡμοιότατης ἡ γνακάσθημεν ὑπ' αὐτῆς τῶν πραγμάτων τῆς ἀκολουθίας εἰπεῖν τινα καὶ διαλεχθῆναι πρὸς αὐτούς, ἔτι καὶ τούτο προσθήσομεν τοῖς εἰρημένοις, ὡς οὐ μόνον τὰ καθαίροντα φάρμακα πέφυκεν ἐπιστάσθαι τὰς οἰκείας ποιότητας ἀλλὰ καὶ τὰ τοὺς σκόλοπας ἀνάγοντα καὶ τὰς τῶν βελῶν ἀκίδας εἰς πολύ βάθος σαρκός ἐμπεπαρμένας ἐνίοτε. καὶ μέντοι καὶ ὅσα τοὺς ἱοὺς τῶν θηρίων ἢ τοὺς ἐμπεφαρμαγμένους τοὺς βέλεσιν ἀνέλκει, καὶ ταύτα τὴν αὐτὴν ταῖς ἥρακλείαις λίθοις ἐπιδείκνυται δύναμιν. ἐγὼν οὖν οἴδα ποτὲ καταπεπαρμένου ἐν ποδὶ νεανίσκου σκόλοπα τοῖς 54
and, again, those of Epicurus have been confuted by Asclepiades, who adhered always to logical sequence, about which Epicurus evidently cares little.

Now people of the present day do not begin by getting a clear comprehension of these sects, as well as of the better ones, thereafter devoting a long time to judging and testing the true and false in each of them; despite their ignorance, they style themselves, some "physicians" and others "philosophers." No wonder, then, that they honour the false equally with the true. For everyone becomes like the first teacher that he comes across, without waiting to learn anything from anybody else. And there are some of them, who, even if they meet with more than one teacher, are yet so unintelligent and slow-witted that even by the time they have reached old age they are still incapable of understanding the steps of an argument. . . . In the old days such people used to be set to menial tasks. . . . What will be the end of it God knows!

Now, we usually refrain from arguing with people whose principles are wrong from the outset. Still, having been compelled by the natural course of events to enter into some kind of a discussion with them, we must add this further to what was said—that it is not only cathartic drugs which naturally attract their special qualities,¹ but also those which remove thorns and the points of arrows such as sometimes become deeply embedded in the flesh. Those drugs also which draw out animal poisons or poisons applied to arrows all show the same faculty as does the lodestone. Thus, I myself have seen a thorn which was embedded in a young man's foot fail to

¹ cf. p. 69, note 2.
That is to say, the two properties should go together in all cases—which they do not.

**Trygon pastinaca.**
come out when we exerted forcible traction with our fingers, and yet come away painlessly and rapidly on the application of a medicament. Yet even to this some people will object, asserting that when the inflammation is dispersed from the part the thorn comes away of itself, without being pulled out by anything. But these people seem, in the first place, to be unaware that there are certain drugs for drawing out inflammation and different ones for drawing out embedded substances; and surely if it was on the cessation of an inflammation that the abnormal matters were expelled, then all drugs which disperse inflammations ought, ipso facto, to possess the power of extracting these substances as well.¹

And secondly, these people seem to be unaware of a still more surprising fact, namely, that not merely do certain medicaments draw out thorns and others poisons, but that of the latter there are some which attract the poison of the viper, others that of the sting-ray,² and others that of some other animal; we can, in fact, plainly observe these poisons deposited on the medicaments. Here, then, we must praise Epicurus for the respect he shows towards obvious facts, but find fault with his views as to causation. For how can it be otherwise than extremely foolish to suppose that a thorn which we failed to remove by digital traction could be drawn out by these minute particles?

Have we now, therefore, convinced ourselves that everything which exists³ possesses a faculty by which it attracts its proper quality, and that some things do this more, and some less?

Or shall we also furnish our argument with the

¹ cf. p. 66, note 3.
χειρισόμεθα τῷ λόγῳ; φανήσονται γὰρ οἷμα καὶ τῶν γεωργῶν αὐτῶν ἀμαθέστεροι περὶ τὴν φύσιν οἱ μηδὲν ὠλος ὑπὸ μηδενὸς ἐλκεσθαί συγχωροῦντες· ὥσ ἔγγογε πρότον μὲν ἀκούσας τὸ γιγνόμενον ἑθαύμασα καὶ αὐτὸς ἤβουλήθην αὐτόπτης αὐτοῦ καταστήμα. μετὰ ταῦτα δὲ, ὡς καὶ τὰ τῆς πείρας ὤμολόγη, τὴν αἰτίαν σκοπούμενος ἐν παμπόλλῳ χρόνῳ κατὰ πάσας τὰς αἱρέσεις οὐδεμίαν ἄλλην εὐρεῖν οἶδο τῇ ὂν ὁὐδ’ ἄχρι τοῦ πιθανοῦ προϊόνταν ἀλλὰ καταγελάστου τε καὶ σαφῶς ἐξελεγχομένας τὰς ἄλλας ἀπάσας πλὴν τῆς τὴν ὀλκήν πρεσβευούσης.

"Εστι δὲ τὸ γιγνόμενον τοιόῦτο. κατακομίζοντες οἱ παρ’ ἡμῖν γεωργοὶ τοὺς ἕκ τῶν ἁγρῶν πυρὸς εἰς τὴν πόλιν εἰς ἀμάξας τισίν, ὅταν ὑφελέσθαι βουληθῶσιν, ὡστε μὴ φοραθῆναι, κεράμω ἄττα πληρόσαντες ὑδατος μέσοις αὐτοῖς ἐνιστάσιν. ἐλκοντες οὖν ἐκεῖνοι διὰ τοῦ κεραμίου τὸ ύγρον εἰς αὐτοὺς ὄγκον μὲν καὶ βάρος προσκτόνται, κατάδηλοι δ’ οὐ πάντι γίγνονται τοῖς ὀρῶσιν, εἰ μὴ τις προπεπυμένος ήδη περιεργοτερον ἐπισκοποῖτο. καὶ τοῖς ή’ εὶ βουληθεῖς ἐν ἡλίῳ καταθεῖν πάνυ θερμῷ ταῦτον ἁγγεῖον, ἐλάχιστον παντελῶς εὐρήσεις τὸ δαπανώμενον ἐπ’ ἐκάστης ἡμέρας. οὕτως ἄρα καὶ τῆς ἡλιακῆς θερμασίας τῆς σφοδρᾶς ἐσχυροτέραν ὰν πυρὸ δύναμιν ἔχουσιν ἔλκειν εἰς οὕτως τὴν πλησίαζουσαν ὑγρότητα. άνιρος οὖν ἑνταῦθα μακρὸς ἡ πρὸς τὸ λεπτομερές φορὰ τοῦ περιέχοντος ἡμᾶς ἀέρος καὶ μάλιστ’ ὅταν ἱκανῶς ἡ θερμός,
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illustration afforded by corn?¹ For those who refuse to admit that anything is attracted by anything else, will, I imagine, be here proved more ignorant regarding Nature than the very peasants. When, for my own part, I first learned of what happens, I was surprised, and felt anxious to see it with my own eyes. Afterwards, when experience also had confirmed its truth, I sought long among the various sects for an explanation, and, with the exception of that which gave the first place to attraction, I could find none which even approached plausibility, all the others being ridiculous and obviously quite untenable.

What happens, then, is the following. When our peasants are bringing corn from the country into the city in wagons, and wish to filch some away without being detected, they fill earthen jars with water and stand them among the corn; the corn then draws the moisture into itself through the jar and acquires additional bulk and weight, but the fact is never detected by the onlookers unless someone who knew about the trick before makes a more careful inspection. Yet, if you care to set down the same vessel in the very hot sun, you will find the daily loss to be very little indeed. Thus corn has a greater power than extreme solar heat of drawing to itself the moisture in its neighbourhood.² Thus the theory that the water is carried towards the rarefied part of the air surrounding us³ (particularly when that is distinctly warm) is utter nonsense; for although it is

¹ Specific attraction of the "proper" quality; cf. p. 85, note 3.
² Theory of evaporation insufficient to account for it. cf. p. 104, note 1.
ΓΑΛΕΝ

πολύ μὲν ὑπάρχοντος ἢ κατὰ τοὺς πυροῦς λεπτο-μερεστέρου, δεχομένου δ' οὐδὲ τὸ δέκατον μέρος τῆς εἰς ἐκείνους μεταλαμβανόμενης ύγρότητος.

XV

'Επει δ' ἰκανῶς ἡδολεσχήσαμεν ὑνὰ ἐκόντες, ἀλλ', ὡς ἡ παροιμία φησί', μαυρομένως ἀναγκασθέντες συμμανήναι, πάλιν ἐπὶ τὴν τῶν οὐρων ἐπανέλθωμεν διάκρισιν, ἐν ἣ τῶν μὲν Ἀσκληπιάδου λήρων ἐπιλαθῶμεθα, μετὰ δὲ τῶν πεπεισμένων διηθεῖσθαι τὰ οὐρα διὰ τῶν νεφρῶν, τίς ὁ τρόπος τῆς ἐνεργείας ἐστίν, ἐπισκεψόμεθα πάντως γὰρ ἐξ αὐτῶν ἐπὶ τοὺς νεφροὺς φέρεται τὰ οὐρα τοῦτο βέλτιον εἶναι νομίζοντα, καθάπερ ἡμεῖς, ὅπωτεν εἰς τὴν ἀγορὰν ἀπόλομεν· ἦ, εἰ τοῦτ άδύνατον, ἔτερον τι χρὴ τῆς φορᾶς αὐτῶν ἐξευρεῖν αὐτίον. τί δὴ τοῦτ’ ἐστίν; εἰ γὰρ μὴ τοῖς νεφροῖς δώσομεν τίνα δύναμιν ἐλκτικὴν τῆς τοιαύτης ποιότητος, ως Ἰπποκράτης ἐνόμιζεν, οὔδὲν ἔτερον ἐξευρήσομεν. ὅτι μὲν γὰρ ἦτοι τούτους ἔλκειν αὐτὸ προσήκεν ἢ τὰς φλέβας πέμπειν, εἴπερ γε μὴ ἐξ ἐαυτοῦ φέρεται, παντὶ ποι σήλαν. ἀλλ' εἰ μὲν αἱ φλέβες περιστελλόμεναι προωθοῦεν, οὐκ ἐκείνο μόνον, ἀλλὰ σὺν αὐτῷ καὶ τὸ πᾶν αἷμα τὸ περιεχόμενον ἐν εἰσαὐταῖς εἰς τοὺς νεφροὺς ἐκθλίψομεν εἰ δὲ τοῦτ άδύνατον, ως δείξομεν, λείπεται τούς νεφροὺς ἔλκειν.

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much more rarefied there than it is amongst the corn, yet it does not take up a tenth part of the moisture which the corn does.

XV

Since, then, we have talked sufficient nonsense—not willingly, but because we were forced, as the proverb says, "to behave madly among madmen"—let us return again to the subject of urinary secretion. Here let us forget the absurdities of Asclepiades, and, in company with those who are persuaded that the urine does pass through the kidneys, let us consider what is the character of this function. For, most assuredly, either the urine is conveyed by its own motion to the kidneys, considering this the better course (as do we when we go off to market!¹), or, if this be impossible, then some other reason for its conveyance must be found. What, then, is this? If we are not going to grant the kidneys a faculty for attracting this particular quality,² as Hippocrates held, we shall discover no other reason. For, surely everyone sees that either the kidneys must attract the urine, or the veins must propel it—if, that is, it does not move of itself. But if the veins did exert a propulsive action when they contract, they would squeeze out into the kidneys not merely the urine, but along with it the whole of the blood which they contain.³ And if this is impossible, as we shall show, the remaining explanation is that the kidneys do exert traction.

¹ Playful suggestion of free-will in the urine.
² Specific attraction. cf. p. 87, note 2.
³ i.e. there would be no selective action.
Πώς οὖν ἄδύνατον τούτο; τῶν νεφρῶν ἡ θέσις ἀντιβαίνει. οὐ γὰρ δὴ οὖτος ὑπόκεινται τῇ κοιλῆ φλεβῇ || καθάπερ τοὺς ἐξ ἐγκεφάλου περιπτώμασιν ὑπὲρ τῆς ῥινῆς καὶ κατὰ τὴν ῥυμοῦν ὅμοιοι πόροι, ἀλλ' ἐκατέρωθεν αὐτὴ παράκεινται. καὶ μήν, εὔπερ ὤμοιος τοὺς ῥήματα όσον ἄν ἡ λεπτότερον καὶ τελέως ὅρρωδες, τούτῳ μὲν ἐτοίμως διαπέμπουσι, τὸ δὲ παχύτερον ἀποστέγουσιν, ἀπαν ἐπ' αὐτοὺς ἱέναι χρῆ τὸ αἷμα τὸ περιεχόμενον ἐν τῇ κοιλῇ φλεβῇ, καθάπερ εἰς τοὺς τρυγητοὺς ὁ πᾶς οἶνος ἐμβάλλεται. καὶ μὲν γε καὶ τὸ τοῦ γάλακτος τοῦ τυρουμένου παραδείγμα σαφῶς ἃν, ὁ βούλομαι λέγειν, ἐνδείξαιτο. καὶ γὰρ καὶ τούτῳ πάν ἐμβληθὲν εἰς τοὺς ταλάρους οὐ πᾶν διηθεῖται, ἀλλ' ὅσον μὲν ἄν ἡ λεπτότερον τῆς εὐρύτητος τῶν πλοκάμων, εἰς τὸ κάταντες φέρεται καὶ τούτῳ μὲν ὄρρος ἔποιομάζεται τὸ λοιπὸν δὲ τὸ παχὺ τὸ μέλλον ἐσεσθαι τυρός, ὡς ἄν οὐ παραδεχομένου αὐτὸ τῶν ἐν τοῖς ταλάροις πόρων, οὐ διεκπέπτει κάτω. καὶ τοίνυν, εὔπερ οὕτω μέλλει διηθεῖσθαι τῶν νεφρῶν ὁ τοῦ αἵματος ὄρρος, ἀπαν ἐπ' αὐτοὺς ἥκειν χρῆ τὸ αἷμα καὶ μὴ τὸ μὲν ναί, τὸ δ' οὐ.||

59 Πώς οὖν ἔχει τὸ φαινόμενον ἐκ τῆς ἀνατομῆς: Ὁ τὸ μὲν ἐτερον μέρος τῆς κοιλῆς ἀνω πρὸς τὴν καρδίαν ἀναφέρεται, τὸ λοιπὸν δ' ἐπιβαίνει τῇ ράχει καθ' ὀλίγῃ αὐτῆς ἐκτεινόμενον ἀχρὶ τῶν σκελῶν, ὡστε τὸ μὲν ἐτερον οὔτ' ἐγγὺς ἀφικνεῖται

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1 Nasal mucus was supposed to be the non-utilizable part of the nutriment conveyed to the brain. *cf.* p. 214, note 3.
And how is propulsion by the veins impossible? The situation of the kidneys is against it. They do not occupy a position beneath the hollow vein [vena cava] as does the sieve-like [ethmoid] passage in the nose and palate in relation to the surplus matter from the brain;\(^1\) they are situated on both sides of it. Besides, if the kidneys are like sieves, and readily let the thinner serous [whey-like] portion through, and keep out the thicker portion, then the whole of the blood contained in the vena cava must go to them, just as the whole of the wine is thrown into the filters. Further, the example of milk being made into cheese will show clearly what I mean. For this, too, although it is all thrown into the wicker strainers, does not all percolate through; such part of it as is too fine in proportion to the width of the meshes passes downwards, and this is called whey [serum]; the remaining thick portion which is destined to become cheese cannot get down, since the pores of the strainers will not admit it. Thus it is that, if the blood-serum has similarly to percolate through the kidneys, the whole of the blood must come to them, and not merely one part of it.

What, then, is the appearance as found on dissection?

One division of the vena cava is carried upwards\(^2\) to the heart, and the other mounts upon the spine and extends along its whole length as far as the legs; thus one division does not even come near the

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\(^1\) He means from its origin in the liver (i.e. in the three hepatic veins). His idea was that the upper division took nutriment to heart, lungs, head, etc., and the lower division to lower part of body. On the relation of right auricle to vena cava and right ventricle, \textit{cf.} p. 321, notes 4 and 5.
tòn veφrôn, to λoιτoν dè pλησιώζει μέν, oú μή eis aútoûs ye kαταφύται. éxhîn δ', eîster émellên ós dè hèbôv aútoûn kαθαρθήσεσθαι to aîma, pán émîpitpein eîs aútoûs kàpêita kàtò mèn fêresbâi to lepßton, ἵσχεσθαι δ' ἀνò to paxû. ἦνν δ' οûx oûtôs èxei: πλάγιoι γâr èκατέρωθεν tîs koiîhs fihèôs oî veφrôi kewntai. οûkouv ós hèbôv dënthouî, pêmpónouîs mèn èkeînhs, aûtôl δ' oûdêmîan éisôferômenoi ðûnamîn, âll' èlkouîi ðèlînovô: toûto gâr èti leîptetai.

Πòs oûn élkoûsîn; eî méû, òs 'Eptíkouvôs oîêtai tâs òlîkâs àpàsas gîgnesbâi kata tâs tîn aûtômów àpòpàlûsies te kai pèrîplokâs, àmeînou ÷ûn òûtôs èîpèîn aûtôûs mèd' èlkekîn ðôlôs. pòlû gâr ãn òûtô ñê tîn èpì tîs ðrakleîas ìsthôn miðraph pròsâbên èîpî|]mèûnôs ð' lògos èxètaξòmenos èûrèbehîn yêloîôteros; âll' òs 'Ippokrátîs ÷bouîlêto. leçbìsîtetai dè safèstèron èpî prôîkonûtî tò lògô. ÷ûnì gâr òû tòûto pêrókeîta dìdáskêîn, âll' òs oût' âllî òû ðì dînàtvû èîpèîn aûtiûn èînai tîs tîn ðùròw díakrísèwos pêlù tîs ðîlêîhs tîn veφrôn oûth' òûtô gîgnesbâi tîn ðîlêîh, òs oî miðdêmîan oîkêîan dîdôntes tì fûsêi ðûnamîn oûntaî gîgnesbâi.

Toûto gâr òmôløgînèvntos, òs èstîn ðôlôs tîs èn toîs ùpò fûsêwos dìoikoumêvnoi ðûnamîs Ñèlêttikî, ÷êpòðîs ðòmìkoût' ãn ð' pêrî ànàdôsèwos tòrofîs âllî tì lègêîn èpîcheîrôn.

1 We arrive at our belief by excluding other possibilities.
2 i.e. the mechanistic physicists. cf. pp. 45-47.
3 cf. p. 85, note 3.
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kidneys, while the other approaches them but is certainly not inserted into them. Now, if the blood were destined to be purified by them as if they were sieves, the whole of it would have to fall into them, the thin part being thereafter conveyed downwards, and the thick part retained above. But, as a matter of fact, this is not so. For the kidneys lie on either side of the vena cava. They therefore do not act like sieves, filtering fluid sent to them by the vena cava, and themselves contributing no force. They obviously exert traction; for this is the only remaining alternative.

How, then, do they exert this traction? If, as Epicurus thinks, all attraction takes place by virtue of the 

rebounds and entanglements of atoms, it would be certainly better to maintain that the kidneys have no attractive action at all; for his theory, when examined, would be found as it stands to be much more ridiculous even than the theory of the lodestone, mentioned a little while ago. Attraction occurs in the way that Hippocrates laid down; this will be stated more clearly as the discussion proceeds; for the present our task is not to demonstrate this, but to point out that no other cause of the secretion of urine can be given except that of attraction by the kidneys, and that this attraction does not take place in the way imagined by people who do not allow Nature a faculty of her own.3

For if it be granted that there is any attractive faculty at all in those things which are governed by Nature, a person who attempted to say anything else about the absorption of nutriment would be considered a fool.

1 The subject of anadosis is taken up in the next chapter. cf. also p. 62, note 1.
'Ερασίστρατος δ’ οὖκ οἶδ’ ὅπως ἐτέραις μὲν τισὶν δόξαις εὑθεσὶν ἀντεῖπε διὰ μακρῶν, ὑπερέβη δὲ τελέως τὴν 'Ιπποκράτους, οὐδ’ ἄχρι τοῦ μυημονεύσαι μόνον αὐτῆς, ως ἐν τοῖς περὶ καταπόσεως ἐποίησεν, ἀξιῶσας. ἐν ἐκεῖνοις μὲν γὰρ ἄχρι τοσοῦτον φαίνεται μυημονεύων, ως τούνομ’ εἰπεῖν τῆς ὀλκῆς μόνον ὅδε πως γράφων.

"Ολκή μὲν οὖν τῆς κοιλίας οὐδεμία φαίνεται εἶναι": περὶ δὲ τῆς ἦν ἀναδόσεως τῶν λόγων ποιούμενος οὖδ’ ἄχρι συλλαβῆς μιᾶς ἐμνημόνευσε τῆς 'Ιπποκρατείου δόξης. καίτοι γ’ ἐπήρκεσεν ἃν ἡμῖν, εἰ καὶ τούτ’ ἐγραφεὶ μόνον, ὡς 'Ιπποκράτης εἰπὼν "Σάρκες ὀλκοὶ καὶ ἐκ κοιλίης καὶ ἐξώθεν" ψεύδεται· οὔτε γὰρ ἐκ τῆς κοιλίας οὔτ’ ἐξώθεθεν ἐλκειν δύνανται. εἰ δὲ καὶ ὅτι μῆτρας αὐτιώμενος ἄρρωστον αὐχένα κακῶς εἶπεν "Οὐ γὰρ δύναται αὐτές ὁ στόμαχος εἰρύσαι τὴν γονήν," ἢ εἰ καὶ τι τοιοῦτον ἄλλο γράφειν ὁ 'Ερασίστρατος ἦξιώσε, τὸτ’ ἃν καὶ ἡμεῖς πρὸς αὐτὸν ἀπολογούμενοι εἴπομεν·

"Ω γενναίε, μὴ ῥητορικῶς ἥμων κατάτρεχε χωρίς ἀποδείξεως, ἄλλ’ εἰπὲ τίνα κατηγορίαν τοῦ δόγματος, ἵν’ ἡ πεισθῶμεν σοι ὡς καλῶς ἐξέλεγχοντι τὸν παλαίον λόγον ἡ μεταπείσωμεν

1 On Erasistratus v. Introd. p. xii. His view that the stomach exerts no holke, or attraction, is dealt with more fully in Book III., chap. viii.
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XVI

Now, while Erasistratus for some reason replied at great length to certain other foolish doctrines, he entirely passed over the view held by Hippocrates, not even thinking it worth while to mention it, as he did in his work "On Deglutition"; in that work, as may be seen, he did go so far as at least to make mention of the word attraction, writing somewhat as follows:

"Now, the stomach does not appear to exercise any attraction." But when he is dealing with ana-dosis he does not mention the Hippocratic view even to the extent of a single syllable. Yet we should have been satisfied if he had even merely written this: "Hippocrates lies in saying 'The flesh attracts both from the stomach and from without,' for it cannot attract either from the stomach or from without." Or if he had thought it worth while to state that Hippocrates was wrong in criticizing the weakness of the neck of the uterus, "seeing that the orifice of the uterus has no power of attracting semen," or if he [Erasistratus] had thought proper to write any other similar opinion, then we in our turn would have defended ourselves in the following terms:

"My good sir, do not run us down in this rhetorical fashion without some proof; state some definite objection to our view, in order that either you may convince us by a brilliant refutation of the ancient doctrine, or that, on the other hand, we may convert you from your ignorance." Yet why do I

\[i.e.\] the tissues.  \[cf.\] p. 291.
ώς ἀγνοοῦντα. καίτοι τί λέγω ῥητορικῶς; μὴ γάρ, ἐπειδὴ τινὲς τῶν ῥητόρων, ἃ μᾶλλον ἁδυνατοῦσι διαλύεσθαι, ταῦτα διαγελάσαντες οὐδὲ ἐπιχειροῦσιν ἀντιλέγειν, ἢδη ποιν ποτὸ καὶ ἥμεις ἤγομεθ' εἶναι τό ῥητορικῶς· τό γάρ διὰ λόγου πιθανοῦ ἐστὶ τό || ῥητορικῶς, τὸ δ' ἄνευ λόγου βαρμολοχικόν, οὐ ῥητορικόν. οὐκοιν οὔτε ῥητο-

62 ῥικῶς οὔτε διαλεκτικῶς ἀντείπειν ὁ Ἐρασίστρατος ἐν τῷ περὶ τῆς καταπόσεως λόγῳ. τί γάρ φησιν; "Ολκῆ μὲν ὡς τῆς κοιλίας οὐδεμιὰ φαίνεται εἶναι." πάλιν οὖν αὐτῷ παρ' ἡμῶν ἀντιμαρτυρῶν ὁ αὐτὸς λόγος ἀντιπαραβαλλέσθω· περιστολὴ μὲν οὖν τοῦ στομάχου οὐδεμιὰ φαίνεται εἶναι. καὶ πῶς οὐ φαίνεται; τάχ' ἀν ἴσως εἴποι τις τῶν ἀπ' αὐτοῦ· τό γὰρ ἀεὶ τῶν ἄνωθεν αὐτοῦ μερῶν συστελλομένων διαστέλλεσθαι τὰ κάτω πῶς οὖκ ἐστὶ τῆς περιστολῆς ἐνδεικτικῶν; αὖθις οὖν ἥμεις, καὶ πῶς οὐ φαίνεται, φησομεν, ἡ τῆς κοιλίας ὅλκη; τὸ γὰρ ἀεὶ τῶν κάτωθεν μερῶν τοῦ στομάχου διαστελλομένων συστέλλεσθαι τὰ ἀνω πῶς οὖκ ἐστὶ τῆς ὅλκης ἐνδεικτικῶν; εἰ δὲ σωφρονήσειν ποτε καὶ γνοιτ τὸ φαινόμενον τούτο μηδὲν μᾶλλον τῆς ἐτέρας τῶν δοξῶν ὑπάρχειν ἐνδεικτικῶν ἀλλ' ἀμφότερον εἶναι κοινὸν, οὕτως ἂν ἢδη δείξαμεν αὐτῷ τὴν ὀρθὴν ὁδὸν τῆς τοῦ ἀληθοῦς εὑρέσεως.

'Αλλ' περὶ μὲν τῆς κοιλίας αὖθις. ἢ δὲ τῆς

63 τροφῆς ἀνάδοσις οὐδὲν δεῖται || τῆς πρὸς τὸ κενοῦ-

μενον ἀκολουθίας ἀπαξ γε τῆς ἐλεκτικῆς δυνάμεως

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say "rhetorical"? For we too are not to suppose that when certain rhetoricians pour ridicule upon that which they are quite incapable of refuting, without any attempt at argument, their words are really thereby constituted rhetoric. For rhetoric proceeds by persuasive reasoning; words without reasoning are buffoonery rather than rhetoric. Therefore, the reply of Erasistratus in his treatise "On Deglutition" was neither rhetoric nor logic. For what is it that he says? "Now, the stomach does not appear to exercise any traction." Let us testify against him in return, and set our argument beside his in the same form. *Now, there appears to be no peristalsis*¹ of the gullet. "And how does this appear?" one of his adherents may perchance ask. "For is it not indicative of peristalsis that always when the upper parts of the gullet contract the lower parts dilate?" Again, then, we say, "And in what way does the attraction of the stomach not appear? For is it not indicative of attraction that always when the lower parts of the gullet dilate the upper parts contract?" Now, if he would but be sensible and recognize that this phenomenon is not more indicative of the one than of the other view, but that it applies equally to both,² we should then show him without further delay the proper way to the discovery of truth.

We will, however, speak about the stomach again. And the dispersal of nutriment [anadosis] need not make us have recourse to the theory regarding the

¹ *Peristalsis* may be used here to translate Gk. *peristolē*, meaning the contraction and dilation of muscle-fibres *circularly* round a lumen. cf. p. 263, note 2.

² For a demonstration that this phenomenon is a conclusive proof neither of *peristolē* nor of real vital *attraction*, but is found even in dead bodies v. p. 267.
This was Erasistratus's favourite principle, known in Latin as the "horror vacui" and in English as "Nature's abhorrence of a vacuum," although these terms are not an exact translation of the Greek. τὸ κενοῦμενον probably means
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to become refilled} when
granted the attractive faculty of
Now, although Erasistratus knew that

natural tendency

of a vacuum

once we have
the kidneys.
this

most

faculty

certainly

existed,

he

neither

nor denied it, nor did he make any
statement as to his views on the secretion of urine.
Why did he give notice at the very begiiming of
his "General Principles" that he was going to speak
about natural activities firstly what they are, how
they take place, and in what situations and then,
in the case of urinary secretion, declared that this
took place through the kidneys, but left out its
method of occurrence ? It must, then, have been for
no purpose that he told us how digestion occurs, or
spends time upon the secretion of biliary superfluities ; 2 for in these cases also it Avould have been
sufficient to have named the parts through which the
function takes place, and to have omitted the method.
On the contrary, in these cases he Avas able to tell us
not merely through what organs, but also in Avhat
way it occurs as he also did, I think, in the case of
anadosis; for he was not satisfied vith sapng that
this took place through the veins, but he also considered fully the method, Avhich he held to be from
the tendency of a vacuum to become refilled.
Concerning the secretion of urine, however, he writes
that this occurs through the kidneys, but does not
add in what way it occurs. I do not think he could
say that this Avas from the tendency of matter to fill
a vacuum,^ for, if this Avere so, nobody would have
ever died of retention of m"ine, since no more can

mentioned

it

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vacuum, not the matter evacuated, although Galen elsewhere uses Ktvoce in the latter inoii-classical) sense, e.g. pp. 67,
215.
Akoloiilliia is a folloicingxip, a sequence, almost a cott,* v. p. 123.
• /. Book II., chap. i.
eequeiice.

the

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Galen

ρυῆμα ποτε παρὰ τὸ κενοῦμενον. ἄλλης γὰρ αἰτίας μηδεμίας προστεθείσης, ἄλλα μόνης τῆς πρὸς τὸ κενοῦμενον ἀκολουθίας ποδηγούσης τὸ συνεχὲς, οὐκ ἐγχωρεῖ πλέον ἐπιρρυῆμα ποτε τοῦ κενοῦμενον. ἄλλ' οὖδ' ἄλλην τινὰ προσθείναι πιθανὴν αἰτίαν εἶχεν, ὡς ἐπὶ τῆς ἀναδάσεως τῆς ἐκθλιψίω τῆς γαστρός. ἄλλ' αὕτη γ' ἐπὶ τοῦ κατὰ τὴν κοίλην αἴματος ἀπολογεῖ τελέως, οὐ τῷ μήκει μόνον τῆς ἀποστάσεως ἐκλυθεῖσα, ἄλλα καὶ τῷ τὴν καρδίαν ὑπερκειμένην ἐξαρπάζειν αὐτῆς σφοδρῶς καθ' ἐκάστην διαστολὴν οὖκ ὀλίγον αἷμα.

Μόνη δ' τις ἔτι καὶ πάντων ἔρημος ἀπελεύπητο τῶν σοφισμάτων ἐν τοῖς κάτω τῆς κοίλης ἡ πρὸς τὸ κενοῦμενον ἀκολουθία, διά τε τοὺς ἐπὶ ταῖς ἰσχυρίαις ἀποθυνόσκοτας ἀπολογολεκύνων πιθανότητα καὶ διὰ τὴν τῶν νεφρῶν θέσιν οὐδὲν ἠττον. εἰ μὲν γὰρ ἂπαν ἐπ' αὐτούς ἐφέρετο τὸ αἷμα, δεόντως αὖ τις ἂπαν ἐφασκεν αὐτῷ καθαίρεσθαι. νυνὶ δὲ, οὐ γὰρ ὅλον ἄλλα τοσοῦτον αὐτοῦ μέρος, ὅσον αἱ μέχρι νεφρῶν δέχονται φλέβες, ἐπ' αὐτοὺς ἐρχεται, μόνον ἑκεῖνο καθαρθήσεται. καὶ τὸ μὲν ὀρρῶδες αὐτοῦ καὶ λεπτὸν οἷον δ' ἥθμων τινῶν τῶν νεφρῶν διαδύσεται; τὸ δ' αἴματῶδες τε καὶ παχὺ κατὰ τὰς φλέβας ὑπομένου ἐμποδῶν στήσεται τῷ κατόπτῳ ἐπιρρέουτι. παλινδρομεῖν οὖν αὐτὸ πρότερον ἐπὶ τὴν κοίλην ἀναγκαῖον καὶ κενὰς οὕτως ἐργάζεσθαι τὰς ἐπὶ τοὺς νεφροὺς ιούσας φλέβας, αἱ δεύτερον οὐκέτι

1 Vital factor necessary over and above the mechanical.
3 pp. 91, 93.

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flow into a vacuum than has run out. For, if no other factor comes into operation save only this tendency by which a vacuum becomes refilled, no more could ever flow in than had been evacuated. Nor could he suggest any other plausible cause, such, for example, as the expression of nutriment by the stomach which occurs in the process of anadosis; this had been entirely disproved in the case of blood in the vena cava; it is excluded, not merely owing to the long distance, but also from the fact that the overlying heart, at each diastole, robs the vena cava by violence of a considerable quantity of blood.

In relation to the lower part of the vena cava there would still remain, solitary and abandoned, the specious theory concerning the filling of a vacuum. This, however, is deprived of plausibility by the fact that people die of retention of urine, and also, no less, by the situation of the kidneys. For, if the whole of the blood were carried to the kidneys, one might properly maintain that it all undergoes purification there. But, as a matter of fact, the whole of it does not go to them, but only so much as can be contained in the veins going to the kidneys; this portion only, therefore, will be purified. Further, the thin serous part of this will pass through the kidneys as if through a sieve, while the thick sanguineous portion remaining in the veins will obstruct the blood flowing in from behind; this will first, therefore, have to run back to the vena cava, and so to empty the veins going to the kidneys; these veins will no longer be able to

4 i.e. the part below the liver; cf. p. 91, note 2.
5 Renal veins.
Гален

παρακομιούσιν ἐπ’ αὐτοὺς ἀκάθαρτον ἄμα. κατ’ εἰληφότος γὰρ αὐτὰς τοῦ προτέρου πάροδος οὐδεμία λέγεται. τὸς οὖν ἡμῶν ἡ δύναμις ἀπάξει πάλιν ὅποιῳ τῶν νεφρῶν τὸ καθαρὸν ἄμα; τὸς δὲ τοῦτο μὲν διαδεξαμένη κελεύσει πάλιν πρὸς τὸ κάτω μέρος ἵνα τῆς κοίλης, ἐτέρῳ δ’ ἀνωθεν ἐπιφερομένω προστάξει, πρὶν || ἐπὶ τοὺς νεφροὺς ἀπελθεῖν, μὴ φέρεσθαι κάτω;

Ταῦτ’ οὖν ἀπαντά συνιδῶν ὁ Ἐρασίστρατος ἀποροιῶν μεστὰ καὶ μιάν μόνην δόξαν εὔπορον εὐρῶν ἐν ἀπασὶ τὴν τῆς ὀλκής, οὕτ’ ἀπορεῖσθαι βουλόμενος οὔτε τὴν Ἰπποκράτους ἑθέλων λέγειν ἄμεινον ὑπέλαβε σιωπητέον εἶναι περὶ τοῦ τρόπου τῆς διακρίσεως.

'Αλλ’ εἰ κύκεινος ἐσίγχησεν, ἥμεις οὐ σιωπήσομεν. ἴσμεν γὰρ, ὡς οὐκ ἐνδέχεται παρελθόντα τὴν Ἰπποκράτειον δόξαν, εἰθ’ ἐτερὸν τι περὶ νεφρῶν ἑνεργείας εἴποντα μὴ οὐ καταγέλαστον εἶναι παντάπωσι. διὰ τοῦτ’ Ἐρασίστρατος μὲν ἐσιώτησεν, Ἀσκληπιάδης δ’ ἐφεύσατο παραπλησίως οἰκέτας λάλοις μὲν τὰ πρόσθεν τοῦ βίου καὶ πολλὰ πολλάκις ἐγκλήματα διαλυσαμένους ύπὸ περιττῆς πανουργίας, ἐπ’ αὐτοφώρῳ δὲ ποτε κατειλημμένους, εἰτ’ οὐδὲν ἐξευρίσκουσι σόφισμα κάπετ’ ἐνταῦθα τοῦ μὲν αἰδημονεστέρου σιωπώντος, οἶδον ἀποπληξία τοι καὶ κατειλημμένου, τοῦ δ’ ἀναίσχυντερού κρύπτοντος μὲν ἔθ’ ύπὸ μάλης τὸ ξητούμενον, ἐξομμυρμένον δὲ καὶ μηδ’ ἐωρακέναι πῶς τοις φάσκοντος. οὕτω γὰρ τοι καὶ ὁ Ἀσκλη-πιάδης || ἐπιλειπόντων αὐτοῦ τῶν τῆς πανουργίας σοφισμάτων καὶ μήτε τῆς πρὸς τὸ λεπτομερές

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conduct a second quantity of unpurified blood to the kidneys—occupied as they are by the blood which had preceded, there is no passage left. What power have we, then, which will draw back the purified blood from the kidneys? And what power, in the next place, will bid this blood retire to the lower part of the vena cava, and will enjoin on another quantity coming from above not to proceed downwards before turning off into the kidneys?

Now Erasistratus realized that all these ideas were open to many objections, and he could only find one idea which held good in all respects—namely, that of attraction. Since, therefore, he did not wish either to get into difficulties or to mention the view of Hippocrates, he deemed it better to say nothing at all as to the manner in which secretion occurs.

But even if he kept silence, I am not going to do so. For I know that if one passes over the Hippocratic view and makes some other pronouncement about the function of the kidneys, one cannot fail to make oneself utterly ridiculous. It was for this reason that Erasistratus kept silence and Asclepiades lied; they are like slaves who have had plenty to say in the early part of their career, and have managed by excessive rascality to escape many and frequent accusations, but who, later, when caught in the act of thieving, cannot find any excuse; the more modest one then keeps silence, as though thunderstruck, whilst the more shameless continues to hide the missing article beneath his arm and denies on oath that he has ever seen it. For it was in this way also that Asclepiades, when all subtle excuses had failed him and there was no longer any room for nonsense about "conveyance towards the
GALEN

φοράς ἔχοντις ἐτὶ χώραν ἐνταυθοῖ ληρεῖσθαι μὴθ' ὡς ὑπὸ τῶν νεφρῶν γεννᾶται τούτι τὸ περίττωμα, καθάπερ ὑπὸ τῶν ἐν ἡπατὶ πόρων ἡ χολή, δυνατῶν δὲ εἰπόντα μὴ οὐ μέγιστον ὅφλεῖν γέλωτα, ἐξομυνταὶ τε καὶ ψεύτεται φανερῶς, οὐ διηκεῖν λέγον ἐπὶ τοὺς νεφροὺς τὸ ὅρον ἄλλα ἀτμοειδῶς εὐθὺς ἐκ τῶν κατὰ τὴν κοῖλην μερῶν εἰς τὴν κύστιν ἀθροίζεσθαι.

Οὔτοι μὲν οὖν τοῖς ἐπὶ αὐτοφώρῳ κατειλημένοις οἰκέταις ὀμοίως ἐκπλαγεῖτες ὁ μὲν ἔσιώτησεν, ὁ δὲ ἀναίσχυντως ψεύτεται.

XVII

Τῶν δὲ νεωτέρων ὁσοὶ τοῖς τούτων ὄνομασιν ἐαυτοὺς ἐσέμυναν Ἑρασιστρατείους τε καὶ 'Ασκληπιαδείους ἐπονομάσαντες, ὀμοίως τοὺς ὑπὸ τοῦ βελτίστου Μενάνδρου κατὰ τὰς κωμῳδίας εἰςαγορέμενοι οἰκέταις. Δάσις τε τισι καὶ Γέταις, οὐδὲν ἤγομμένοις σφίσι πεπράχθαι γενναίον, εἰ μὴ τρίς ἔξαπατήσειν τὸν δεσπότην, οὕτω καὶ αὐτοὶ κατὰ πολλὴν χολὴν ἀναίσχυντα σοφίσματα συνέθεσαν, οἱ μὲν, ἵνα μηδ' ὅλως ἐξελεγχθεὶν ποτ' ἢ 68 Ἀσκληπιιάδης ψευδόμενος, οἱ δ', ἵνα κακῶς εἰπώσιν, ὁ καλῶς ἐσιώτησεν Ἑρασιστράτος.

Ἀλλὰ τῶν μὲν Ἀσκληπιαδείοις ἄλλης, οἱ δ' Ἑρασιστράτειοι λέγειν ἐπιχειροῦντες, ὅπως οἱ νεφροὶ διηθοῦσι τὸ ὅρον, ἀπαντα ὅρωστι τε καὶ

1 cf. p. 87, note 3.
2 κοῖλην: the usual reading is κοιλίαν, which would make

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rarefied part [of the air],"¹ and when it was impossible without incurring the greatest derision to say that this superfluity [i.e. the urine] is generated by the kidneys as is bile by the canals in the liver—he, then, I say, clearly lied when he swore that the urine does not reach the kidneys, and maintained that it passes, in the form of vapour, straight from the region of the vena cava,² to collect in the bladder.

Like slaves, then, caught in the act of stealing, these two are quite bewildered, and while the one says nothing, the other indulges in shameless lying.

XVII

Now such of the younger men as have dignified themselves with the names of these two authorities by taking the appellations "Erasistrateans" or "Asclepiadeans" are like the Davi and Getae—the slaves introduced by the excellent Menander into his comedies. As these slaves held that they had done nothing fine unless they had cheated their master three times, so also the men I am discussing have taken their time over the construction of impudent sophisms, the one party striving to prevent the lies of Asclepiades from ever being refuted, and the other saying stupidly what Erasistratus had the sense to keep silence about.

But enough about the Asclepiadeans. The Erasistrateans, in attempting to say how the kidneys let the urine through, will do anything or suffer anything it "from the region of the alimentary canal." ² cf. p. 118, note 1.

¹ F _105_
πᾶσχουσι καὶ παντοίοι γάγγυνται πιθανῶν ἐξεύρειν τι ξητοῦντες αὐτίων ὀλκής μὴ δεόμενον.

Οἱ μὲν δὴ πλησίον Ἐρασιστράτου τοῖς χρόνοις γενόμενοι τὰ μὲν ἄνω τῶν νεφρῶν μόρια καθαρῶν αἵμα λαμβάνειν φασί, τῷ δὲ βάρος ἐχειν τὸ ὑδατώδες περίττωμα βρίθειν τε καὶ ὑπορρεῖν κάτω διηθούμενον δὲ ἐνταῦθα κατὰ τοὺς νεφροὺς αὐτοὺς χρηστὸν οὗτῳ γενόμενον ἀπασί τοῖς κάτω τῶν νεφρῶν εἰπτέμπεσθαι τὸ αἷμα.

Καὶ μέχρι γέ τινος εὐδοκίμησεν ὢδε ἡ δόξα καὶ ἠκμασε καὶ ἀληθῆς ἐνομίσθη· χρόνῳ δὲ ύστερον καὶ αὐτοῖς τοῖς Ἐρασιστρατείοις ὑποπτος ἐφάνη καὶ τελευτώτες ἀπέστησαν αὐτῆς. αἰτεῖσθαι γὰρ ἐδόκοι δύο ταῦτα μήτε συγχωρούμενα πρὸς τινός ἀλλ' οὖν ἀποδειχθήμαται δυνάμενα, πρῶτον μὲν τὸ βάρος τῆς ὀρρώδους ὑγρότητος ἐν τῇ κούλῃ ἢ φλεβί γενόμενον, ὡσπερ οὐκ ἐξ ἀρχῆς ὑπάρχουν, ὅποτε ἐκ τῆς κούλης εἰς ἤπαρ ἀνεφέρετο. τῇ δὴ οὖν οὐκ εὐθὺς ἐν ἐκεῖνοι τοῖς χωρίοις ὑπέρρει κάτω; πῶς δ' ἂν τῷ δόξειν εὐλόγως εἰρήθαι συντελεῖν εἰς τὴν ἀνάδοσιν ἡ ὑδατώδης ὑγρότης, εἴπερ οὖτως ἐστὶ βαρεία;

Δεύτερον δ' ἀτοπον, ὅτι κἂν κάτω συγχωρηθῇ φέρεσθαι πᾶσα καὶ μὴ κατ' ἀλλο χωρίον ἡ τῆς κούλης φλέβα, τίνα τρόπον εἰς τοὺς νεφροὺς εἰπτεῖσθαι, χαλεπῶν, μᾶλλον δ' ὑδάνατον εἰπτεῖν, μῆτ' ἐν τοῖς κάτω μέρεσι κειμένων αὐτῶν τῆς φλεβὸς ἀλλ' ἐκ τῶν πλαγίων μῆτ' ἐμφυομένης εἰς αὐτοὺς τῆς κούλης ἀλλ' ἀποφυσίν τίνα μόνον

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or try any shift in order to find some plausible explanation which does not demand the principle of attraction.

Now those near the times of Erasistratus maintain that the parts above the kidneys receive pure blood, whilst the watery residue, being heavy, tends to run downwards; that this, after percolating through the kidneys themselves, is thus rendered serviceable, and is sent, as blood, to all the parts below the kidneys.

For a certain period at least this view also found favour and flourished, and was held to be true; after a time, however, it became suspect to the Erasistrateans themselves, and at last they abandoned it. For apparently the following two points were assumed, neither of which is conceded by anyone, nor is even capable of being proved. The first is the heaviness of the serous fluid, which was said to be produced in the vena cava, and which did not exist, apparently, at the beginning, when this fluid was being carried up from the stomach to the liver. Why, then, did it not at once run downwards when it was in these situations? And if the watery fluid is so heavy, what plausibility can anyone find in the statement that it assists in the process of anadosis?

In the second place there is this absurdity, that even if it be agreed that all the watery fluid does fall downwards, and only when it is in the vena cava,\(^1\) still it is difficult, or, rather, impossible, to say through what means it is going to fall into the kidneys, seeing that these are not situated below, but on either side of the vena cava, and that the vena cava is not inserted into them, but merely sends a branch.\(^2\)

\(^1\) Not at an earlier stage, when it is still on its way from the alimentary canal to the liver. \(^2\) i.e. a renal vein.
eis ἐκάτερον περιπούσης, ὡσπερ καὶ εἰς τάλλα πάντα μόρια.

Τὸς οὖν ἡ διαδεξαμένη ταύτην δόξα κατα-
γνωσθείσαν; ἐμοὶ μὲν ἡλιθιωτέρα μακρὸν φαίνεται τῆς προτέρας. ἦκμασε δ' οὖν καὶ αὐτὴ ποτὲ.

φασὶ γὰρ, εἰ κατὰ τῆς γῆς ἐκχυθεὶς μεμυγμένου ἔλαιον ἔδατι, διάφορον ἐκάτερον ὄδὸν βαδίεσθαι καὶ ῥυήσεθαι τὸ μὲν τῇδε, τὸ δὲ τῇδε. θαυμαστὸν οὖν οὐδὲν εἶναι φασίν, εἰ τὸ μὲν ὑδατῶδες υγρὸν εἰς τοὺς νε||φροὺς ρεῖ, τὸ δ' αἷμα διὰ τῆς κοίλης φέρεται κάτω. κατέγυρσται οὖν ἦδη καὶ ἦδε

η δόξα. διὰ τὶ γὰρ ἀπὸ τῆς κοίλης μυρίων ἐκπεφυκιῶν φλεβῶν αἷμα μὲν εἰς τὰς ἄλλας ἀπάσας, ἢ δ' ὀρρώδης υγρότης εἰς τὰς ἐπὶ τοὺς νεφροὺς φερομένας ἐκτρέπεται; τούτω̄ αὐτὸ τὸ ἦκτούμενον οὖς εἰρήκασιν, ἀλλὰ τὸ γεγυμώμενον εἰπόντες μόνον οἴονται τὴν αἰτίαν ἀποδεδωκέναι.

Πάλιν οὖν, τὸ τρίτον τὸ σωτήρι, τῆς χειρίστην ἀπασῶν δόξαν ἐξευρημένην νῦν ὐπὸ Δύκου τοῦ Μακεδόνος, εὐδοκιμοῦσαν δὲ διὰ τὸ καινὸν ἦδη λέγωμεν. ἀπεθύματο γὰρ ἡ οἱ Δύκοις οὕτως, ὡσπερ εὲ αὐτὸν τινὸς χρησμὸν ἀποφθέγμων, περίπτωμα τῆς τῶν νεφρῶν θρέψεως εἶναι τὸ οὐρον. ὅτι μὲν οὖν αὐτὸ τὸ πιστομένον ἀπαν οὕρου γίγνεται, πλὴν εἰ τι μετὰ τῶν διαχωρι-

μάτων ὑπῆλθεν ἡ εἰς ἱδρώτας ἀπεχώρησεν ἡ εἰς τὴν ἄδηλον διαπνοῆ, ἐναρχῶς ἐνδείκνυται τὸ πλῆθος τῶν καθ' ἐκάστην ἦμέραν οὐρουμένων. ἐν χειμώνι δὲ μάλιστα μαθεῖν ἐστιν ἐπὶ τῶν ἀργούντων μὲν, κωθωνιζομένων δὲ, καὶ μάλιστ' 71 εἰ λεπτὸς ὁ οἶνος εἰς καὶ πόριμος. οὐροῦσι || γὰρ

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into each of them, as it also does into all the other parts.

What doctrine, then, took the place of this one when it was condemned? One which to me seems far more foolish than the first, although it also flourished at one time. For they say, that if oil be mixed with water and poured upon the ground, each will take a different route, the one flowing this way and the other that, and that, therefore, it is not surprising that the watery fluid runs into the kidneys, while the blood falls downwards along the vena cava. Now this doctrine also stands already condemned. For why, of the countless veins which spring from the vena cava, should blood flow into all the others, and the serous fluid be diverted to those going to the kidneys? They have not answered the question which was asked; they merely state what happens and imagine they have thereby assigned the reason.

Once again, then (the third cup to the Saviour!), let us now speak of the worst doctrine of all, lately invented by Lycus of Macedonia, but which is popular owing to its novelty. This Lycus, then, maintains, as though uttering an oracle from the inner sanctuary, that urine is residual matter from the nutrition of the kidneys! Now, the amount of urine passed every day shows clearly that it is the whole of the fluid drunk which becomes urine, except for that which comes away with the dejections or passes off as sweat or insensible perspiration. This is most easily recognized in winter in those who are doing no work but are carousing, especially if the wine be thin and diffusible;

1 In a toast, the third cup was drunk to Zeus Sôtèr (the Saviour).
2 An anatomist of the Alexandrian school.
3 cf. nasal mucus, p. 90, note 1.
οὗτοι διὰ ταχέων ὀλίγου δείκ, ὀσονπερ καὶ πίνουσιν. οτὶ δὲ καὶ ὁ Ἐρασίστρατος οὕτως ἐγίγνωσκεν, οἱ τὸ πρῶτον ἀνεγιγνώκοτες ἀυτοῦ σύγγραμμα τῶν καθόλου λόγων ἔπιστανται. ὡσθ᾽ ὁ Λύκος οὐτ᾽ ἀληθῆ φαίνεται λέγων οὐτ᾽ Ἐρασίστρατεια, δήλον δ᾽ ὡς οὖν Ἀσκληπιάδεια, πολὺ δὲ μᾶλλον οὖν Ἰπποκράτεια. λευκῷ τοῖνυν κατὰ τὴν παροιμίαν ἐοικε κόρακι μήτ᾽ αὐτοῖς τοῖς κόραξιν ἀναμιχθῆναι δυναμένω διὰ τὴν χρόαν μήτε ταῖς περιστεραῖς διὰ τὸ μέγεθος, ἀλλ᾽ οὕτι ποιοῦτον γ᾽ ἐνεκα παροπτέος· ἵσως γὰρ τι λέγει θαυμαστόν, ὃ μηδεῖς τῶν ἐμπροσθεν ἔγγον.

Τὸ μὲν οὖν ἀπαντᾶ τὰ τρεφόμενα μόρια ποιεῖν τι περίττωμα συγχρωμοῦμεν, τὸ δὲ τοὺς νεφροὺς μόνους, οὕτω σμικρὰ σῶματα, χάος ὅλους τέταρτας ἤ καὶ πλείους ἵσχειν ἔνωτε περιττῶματος οὔθ᾽ ὀμολογοῦμενον οὕτε λόγον ἔχουν· τὸ γὰρ ἐκάστου τῶν μειζόνων σπλάγχνων περίττωμα πλεῖον ἀναγκαῖον ὑπάρχειν. οἷον αὐτίκα τὸ τοῦ πνεύμονος, εἴπερ ἀνάλογον τῷ μεγεθεὶ τοῦ 72 σπλάγχνου γῆγοςτο, πολλαπλάσιον ἐσται δῆπον τοῦ κατὰ τοὺς νεφροὺς, ὡσθ᾽ ὅλοις μὲν ὁ θώραξ ἐμπλησθῆσεται, πυγηθῆσαι δ᾽ αὐτίκα τὸ ἔδον. ἀλλ᾽ εἰ ἵσων φῆσαι τις γίγνεσθαι τὸ καθ᾽ ἐκάστον τῶν ἄλλων μορίων περιττῶμα, διὰ πολὺν κυστεων ἐκκρίνεται; εἰ γὰρ οἱ νεφροὶ τοῖς κωθωνιζομένοις τρεῖς ἢ τέταρτας ἐνιότερον χάος ποιοῦσι περιττῶματος, ἐκάστου τῶν ἄλλων σπλάγχνων πολλῷ πλείους ἔσονται καὶ πίθου τινὸς οὕτως μεγίστον ἔδεισε τοῦ δεξιομένου τὰ πάντων περιτ-

1 "Sur l’Ensemble des Choses" (Daremberg).
ON THE NATURAL FACULTIES, I. xvii

these people rapidly pass almost the same quantity as they drink. And that even Erasistratus was aware of this is known to those who have read the first book of his "General Principles." ¹ Thus Lycus is speaking neither good Erasistratism, nor good Asclepiadism, far less good Hippocratism. He is, therefore, as the saying is, like a white crow, which cannot mix with the genuine crows owing to its colour, nor with the pigeons owing to its size. For all this, however, he is not to be disregarded; he may, perhaps, be stating some wonderful truth, unknown to any of his predecessors.

Now it is agreed that all parts which are undergoing nutrition produce a certain amount of residue, but it is neither agreed nor is it likely, that the kidneys alone, small bodies as they are, could hold four whole congii,² and sometimes even more, of residual matter. For this surplus must necessarily be greater in quantity in each of the larger viscera; thus, for example, that of the lung, if it corresponds in amount to the size of the viscus, will obviously be many times more than that in the kidneys, and thus the whole of the thorax will become filled, and the animal will be at once suffocated. But if it be said that the residual matter is equal in amount in each of the other parts, where are the bladders, one may ask, through which it is excreted? For, if the kidneys produce in drinkers three and sometimes four congii of superfluous matter, that of each of the other viscera will be much more, and thus an enormous barrel will be needed to contain the waste products of them all.

² About twelve quarts. This is about five times as much as the average daily excretion, and could only be passed if a very large amount of wine were drunk.
ΓΑΛΕΝ

τόματα. καὶ τοῖς πολλάκις, ὃσον ἐπιέ τις, ὀλγου
deῖν οὐρήσειν ἀπαν, ὡς ἄν ἑπὶ τοὺς νεφροὺς φερο-
mένου τοῦ πόματος ἀπαντος.

'Εσικέν οὖν ὁ τὸ τρίτον ἐξαιπατῶν οὕτως οὐδὲν ἀνύειν ἀλλ' εὑρήσεις γεγονέναι κατάφωρος καὶ μένειν ἐτι τὸ ἐξ ἀρχῆς ἀπορον Ἐρασίστράτῳ τε καὶ τοῖς ἄλλοις ἀπασὶ πλὴν Ἡπποκράτους. διατρίβω δ' ἐκὼν ἐν τῷ τόπῳ σαφῶς εἰδώς, ὅτι μηδὲν εἰπεῖν ἔχει μηδὲς ἄλλος περὶ τῆς τῶν νεφρῶν ἐνεργείας, ἀλλ' ἀναγκαῖον ἢ τῶν μαγείρων ἀμαθεστέρους φαίνεσθαι μηδ' ὅτι διηθεῖται δι' αὐτῶν τὸ ὄνρον ὁμολογοῦντας ἢ || τούτο συγχωρήσαντας μηδὲν ἐτ' ἔχειν εἰπεῖν ἐτερον αὖτιον τῆς διακρίσεως πλὴν τῆς ὀλκῆς.

'Αλλ' εἰ μὴ τῶν οὕρων ἡ φορὰ τῇ πρὸς τὸ κενούμενον ἀκολουθία γίγνεται, δήλον, ὡς οὔδ' ἡ τοῦ αἵματος οὔδ' ἡ τῆς χολῆς ἡ εἰπερ ἐκεῖνων καὶ τούτου· πάντα γὰρ ὁσαύτως ἀναγκαῖον ἐπιτε-
λείσθαι καὶ κατ' αὐτῶν τὸν Ἐρασίστρατον.

Εἰρήσεται δ' ἑπὶ πλέον ύπὲρ αὐτῶν ἐν τῷ μετὰ ταῦτα γράμματι.
Yet one often urinates practically the same quantity as one has drunk, which would show that the whole of what one drinks goes to the kidneys.

Thus the author of this third piece of trickery would appear to have achieved nothing, but to have been at once detected, and there still remains the original difficulty which was insoluble by Erasistratus and by all others except Hippocrates. I dwell purposely on this topic, knowing well that nobody else has anything to say about the function of the kidneys, but that either we must prove more foolish than the very butchers if we do not agree that the urine passes through the kidneys; or, if one acknowledges this, that then one cannot possibly give any other reason for the secretion than the principle of attraction.

Now, if the movement of urine does not depend on the tendency of a vacuum to become refilled, it is clear that neither does that of the blood nor that of the bile; or if that of these latter does so, then so also does that of the former. For they must all be accomplished in one and the same way, even according to Erasistratus himself. This matter, however, will be discussed more fully in the book following this.

BOOK II
"Ότι μὲν οὖν ἀναγκαῖον ἐστιν οὐκ Ἕρασιστράτῳ μόνον ἀλλὰ καὶ τοῖς ἄλλοις ἄπασιν, ὅσοι μέλλουσιν περὶ διακρίσεως οὐρών ἐρεῖν τι χρηστόν, ὀμολογήσαι δύναμιν τιν’ ὑπάρχειν τοῖς νεφροῖς ἔλκουσαν εἰς ἑαυτοὺς ποιότητα τοιαύτην, οἷα ἐν τοῖς οὐρωῖς ἑστὶ, διὰ τοῦ πρόσθεν ἐπιδεικτὰς γράμματος, ἀναμιμησόκοντος ἀμ’ αὐτὸ καὶ τοῦ θ’ ἡμῶν, ὥς οὖν ἄλλως μὲν εἰς τὴν κύστιν φέρεται τὰ οὖρα διὰ τῶν νεφρῶν, ἄλλως δ’ εἰς ἀπαντά τοῦ ζωοῦ τὰ μόρια τὸ αἷμα, κατ’ ἄλλον δὲ τινα πρόπον ἡ ξανθή χολὴ διακρίνεται. δειχθείσης γὰρ ἐναργῶς ἐφ’ ἐνός ὁ πεποιθοῦν ὁργάνου τῆς ἑλκτικῆς τε καὶ ἑπισταστικῆς ὀνομαζομένης δυνάμεως οὐδὲν ἐτι χαλεπὸν ἐπὶ τὰ λοιπὰ μεταφέρειν αὐτὴν· οὐ γὰρ δὴ τοῖς μὲν νεφροῖς ἡ φύσις ἐδωκέ τινα τοιαύτην δύναμιν, οὐχὶ δὲ γε καὶ τοῖς τὸ χολῶδες ύγρὸν ἔλκουσιν ἀγγείους οὐδὲ τούτοις μὲν, οὐκέτι δὲ καὶ τῶν ἄλλων μορίων ἐκάστῶς. καὶ μὴν εἰ τούτ’ ἄληθες ἐστι, θαυμάζειν χρῆ τοῦ Ἕρασιστράτου ψευδείς οὕτω λόγοις ὑπὲρ ἀνα-

1 cf. p. 89. 2 This term is nowadays limited to the drawing action of a blister. cf. p. 223.
In the previous book we demonstrated that not only Erasistratus, but also all others who would say anything to the purpose about urinary secretion, must acknowledge that the kidneys possess some faculty which attracts to them this particular quality existing in the urine. Besides this we drew attention to the fact that the urine is not carried through the kidneys into the bladder by one method, the blood into parts of the animal by another, and the yellow bile separated out on yet another principle. For when once there has been demonstrated in any one organ, the drawing, or so-called epispastic faculty, there is then no difficulty in transferring it to the rest. Certainly Nature did not give a power such as this to the kidneys without giving it also to the vessels which abstract the biliary fluid, nor did she give it to the latter without also giving it to each of the other parts. And, assuredly, if this is true, we must marvel that Erasistratus should make statements concerning the delivery of nutriment from the food-canal which are

3 The radicles of the hepatic ducts in the liver were supposed to be the active agents in extracting bile from the blood. cf. pp. 145-149. 4 Anadosis; cf. p. 13, note 5.
The term κοιλία is used both specifically for the stomach proper and also (as probably here) in a somewhat wider sense for the stomach region, including the adjacent part of the small intestine; this was the part of the alimentary canal.
so false as to be detected even by Asclepiades. Now, Erasistratus considers it absolutely certain that, if anything flows from the veins, one of two things must happen: either a completely empty space will result, or the contiguous quantum of fluid will run in and take the place of that which has been evacuated. Asclepiades, however, holds that not one of two, but one of three things must be said to result in the emptied vessels: either there will be an entirely empty space, or the contiguous portion will flow in, or the vessel will contract. For whereas, in the case of reeds and tubes it is true to say that, if these be submerged in water, and are emptied of the air which they contain in their lumens, then either a completely empty space will be left, or the contiguous portion will move onwards; in the case of veins this no longer holds, since their coats can collapse and so fall in upon the interior cavity. It may be seen, then, how false this hypothesis—by Zeus, I cannot call it a demonstration!—of Erasistratus is.

And, from another point of view, even if it were true, it is superfluous, if the stomach has the power of compressing the veins, as he himself supposed, and the veins again of contracting upon their contents and propelling them forwards. For, apart from other considerations, no *plethora* would ever take place in the body, if delivery of nutriment resulted merely from the tendency of a vacuum to become refilled. Now, if the compression of the stomach becomes weaker the further it goes, and cannot reach to an from which nutriment was believed to be absorbed by the mesenteric veins; cf. p. 309, note 2.

2 cf. p. 100, note 2; p. 167, note 2.

3 A characteristic "lesion" in Erasistratus's pathology.
μέχρι παντός ἀδυνατός ἐστιν ἐξικνείσθαι καὶ διὰ τούτ’ ἀλλὰς τινὸς δεῖ μηχανής εἰς τὴν πάντη φορὰν τοῦ αἱματος, ἀναγκαῖα μὲν ἢ πρὸς τὸ κενούμενον ἀκολουθία προσεξεύρηται· πλῆθος δ’ ἐν οὐδείῳ τῶν μεθ’ ἦπαρ ἐσται || μορίων, ἢ, εἰπερ ἁρα, περὶ τὴν καρδίαν τε καὶ τὸν πνεύμονα. μόνη γὰρ αὐτὴ τῶν μεθ’ ἦπαρ εἰς τὴν δεξιὰν αὐτῆς κοιλίαν ἔλκει τὴν τροφὴν, εἰτα διὰ τῆς φλεβὸς τῆς ἀρτηριώδους ἐκπέμπει τῷ πνεύμονι· τῶν γὰρ ἄλλων οὐδὲν οὐδ’ αὐτὸς ὁ Ἐρασίστρατος ἐκ καρδίας βούλεται τρέφεσθαι διὰ τὴν τῶν ύμένων ἐπίφυσιν. εἰ δὲ γ’, ὡς πλῆθος γένηται, φυλάξομεν ἄχρι παντὸς τὴν βρώμην τῆς κατὰ τὴν κοιλίαν ἐνθλύσεως, οὐδὲν ἢτι δεόμεθα τῆς πρὸς τὸ κενούμενον ἀκολουθίας, μάλιστ’ εἰ καὶ τὴν τῶν φλεβῶν συνυποθοίμεθα περιστολὴν, ὡς αὐτ’ καὶ τοῦτ’ αὐτῷ πάλιν ἀρέσκει τῷ Ἐρασίστράτῳ.

II

Ἀναμνηστέον οὖν αὕθις αὐτόν, κἀν μὴ βούληται, τῶν νεφρῶν καὶ λεκτέων, ὡς ἐλεγχὸς οὔτοι φανερώτατος ἀπάντων τῶν ἀποχωροῦντων τῆς ὁλκῆς οὔδεὶς γὰρ οὐδὲν οὔτ’ εἶπε πιθανόν, ἀλλ’ οὐδ’ ἐξευρέθην εἰχε κατ’ οὑδένα τρόπον, ὡς

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1 A certain subordinate place allowed to the horror vacui.
2 i.e. the parts to which the veins convey blood after it leaves the liver—second stage of anadosis; cf. p. 91, note 2; p. 13, note 5.
ON THE NATURAL FACULTIES, II. 1.—II

indefinite distance, and if, therefore, there is need of some other mechanism to explain why the blood is conveyed in all directions, then the principle of the refilling of a vacuum may be looked on as a necessary addition;¹ there will not, however, be a plethora in any of the parts coming after the liver,² or, if there be, it will be in the region of the heart and lungs; for the heart alone of the parts which come after the liver draws the nutriment into its right ventricle, thereafter sending it through the arterioid vein ³ to the lungs (for Erasistratus himself will have it that, owing to the membranous excrescences,⁴ no other parts save the lungs receive nourishment from the heart). If, however, in order to explain how plethora comes about, we suppose the force of compression by the stomach to persist indefinitely, we have no further need of the principle of the refilling of a vacuum, especially if we assume contraction of the veins in addition—as is, again, agreeable to Erasistratus himself.

II

Let me draw his attention, then, once again, even if he does not wish it, to the kidneys, and let me state that these confute in the very clearest manner such people as object to the principle of attraction. Nobody has ever said anything plausible, nor, as we previously showed, has anyone been able to discover,

¹ What we now call the pulmonary artery. Galen believed that the right ventricle existed for the purpose of sending nutrient blood to the lungs.
² Lit. owing to the ongrowth (epiphysis) of membranes; he means the tricuspid valve; cf. p. 314, note 2; p. 321, note 4.
ἐμπροσθεν ἑδείκνυμεν, ἔτερον αὐτίον ὦρων διακρίσεως, ἀλλ’ ἀναγκαῖον ὁ μαίνεσθαι δοκεῖν, εἰ
78 φήσαιμεν ἀτμοεὶ||Δώς εἰς τὴν κύστιν ἴναι τὸ ὦρον ἢ ἀσχημονεῖν τῆς πρὸς τὸ κενοῦμενον ἀκολουθίας
μυημονεύοντας, ληρώδους μὲν οὐσίας κατ’ τοῦ ἀἵματος, ἀδυνάτον δὲ καὶ Ἰλιθίου παντάπασιν
ἐπὶ τῶν ὦρων.

'Εν μὲν δὴ τούτῳ σφάλμα τῶν ἀποστάντων τῆς ὀλεθρίας: ἔτερον δὲ τὸ περὶ τῆς κατὰ τὴν ξανθὴν
χολῆν διακρίσεως. οὐδὲ γὰρ οὔδ’ ἐκεῖ παραρρέοντος τοῦ ἀἵματος Ἴτα στόματα τῶν χοληδόχων ἀγγείων ἀκριβῶς διακριθήσεται τὸ χολόδες
περίττωμα. καὶ μὴ διακρινέσθω, φασίν, ἀλλὰ συναναφερέσθω τῷ ἀἵματι πάντη τὸν σώματος.
ἀλλ’, δὲ σοφότατοι, προνοητικὴν τοῦ ξίφου καὶ τεχνικὴν αὐτὸς ὁ Ἐρασίστρατος ὑπέθετο τὴν
φυσιν. ἀλλὰ καὶ τὸ χολόδες ὑγρὸν ἄχρηστον εἶναι παντάπασι τοῖς ξίφοις ἐφασκεν. οὐ συμβαίνει δ’ ἀλλήλοις ἀμφοτερά. τοῦς γὰρ ἄν ἐτὶ προνοεῖσθαι τοῦ ξίφου δόξειεν ἐπιτρέπουσα
συναναφέρεσθαι τῷ ἀἵματι μοχθηρὸν οὕτω χυμὸν;

'Αλλὰ ταῦτα μὲν σμικρά: τὸ δὲ μέγιστον καὶ σαφέστατον πάλιν ἐνταῦθ’ ἀμάρτημα καὶ δὴ
φρύσω. εἴπερ γὰρ δ’ οὐδὲν ἀλλ’ ἢ ὅτι παχύτερον
79 μὲν ἐστὶ τὸ ἀἷμα, λεπτότερα δ’ ἢ || ξανθὴν χολὴ
cαὶ τὰ μὲν τῶν φλεβῶν εὐρύτερα στόματα, τὰ
by any means, any other cause for the secretion of urine; we necessarily appear mad if we maintain that the urine passes into the kidneys in the form of vapour, and we certainly cut a poor figure when we talk about the tendency of a vacuum to become refilled;¹ this idea is foolish in the case of blood, and impossible, nay, perfectly nonsensical, in the case of the urine.²

This, then, is one blunder made by those who dissociate themselves from the principle of attraction. Another is that which they make about the secretion of yellow bile. For in this case, too, it is not a fact that when the blood runs past the mouths [stomata] of the bile-ducts there will be a thorough separation out [secretion] of biliary waste-matter. “Well,” say they, “let us suppose that it is not secreted but carried with the blood all over the body.” But, you sapient folk, Erasistratus himself supposed that Nature took thought for the animals’ future, and was workmanlike in her method; and at the same time he maintained that the biliary fluid was useless in every way for the animals. Now these two things are incompatible. For how could Nature be still looked on as exercising forethought for the animal when she allowed a noxious humour such as this to be carried off and distributed with the blood? . . .

This, however, is a small matter. I shall again point out here the greatest and most obvious error. For if the yellow bile adjusts itself to the narrower vessels and stomata, and the blood to the wider ones, for no other reason than that blood is thicker and bile thinner, and that the stomata of the veins are

¹ Horror vacui. ² But Erasistratus had never upheld this in the case of urinary secretion. cf. p. 99.
This was the characteristically “anatomical” explanation of bile-secretion made by Erasistratus. cf. p. 170, note 2.
wider and those of the bile-ducts narrower,\(^1\) then it is clear that this watery and serous superfluity,\(^2\) too, will run out into the bile-ducts quicker than does the bile, exactly in proportion as it is thinner than the bile! How is it, then, that it does not run out? “Because,” it may be said, “urine is thicker than bile!” This was what one of our Erasistrateans ventured to say, herein clearly disregarding the evidence of his senses, although he had trusted these in the case of the bile and blood. For, if it be that we are to look on bile as thinner than blood because it runs more, then, since the serous residue\(^2\) passes through fine linen or lint or a sieve more easily even than does bile, by these tokens bile must also be thicker than the watery fluid. For here, again, there is no argument which will demonstrate that bile is thinner than the serous superfluities.

But when a man shamelessly goes on using circumlocutions, and never acknowledges when he has had a fall, he is like the amateur wrestlers, who, when they have been overthrown by the experts and are lying on their backs on the ground, so far from recognizing their fall, actually seize their victorious adversaries by the necks and prevent them from getting away, thus supposing themselves to be the winners!

Why, then, says Galen, does not urine, rather than bile, enter the bile-ducts? \(^2\) Urine, or, more exactly, blood-serum.
III

Ἀὔρως οὖν μακρὸς ἀπασα πόρων ὑπόθεσις ἐς φυσικὴν ἐνέργειαν. εἰ μὴ γὰρ δύναμις τις σύμφυτος ἐκάστῳ τῶν ὄργανων ὑπὸ τῆς φύσεως εὐθὺς ἐξ ἀρχῆς δοθεὶς, διαρκεῖν οὐ δυνήσεται τὰ ξύα, μὴ ὁτι τοσοῦτον ἄριθμον ἔτοι ἀλλ' οὐδ' ἡμερῶν ὀλιγόστων ἀνεπιτρόπευτα γὰρ ἔσαντες αὐτὰ καὶ τέχνης καὶ προνοίας ἐρήμα μόναις ταῖς τῶν ὑλῶν οἰακεῖστομαι ῥοπαῖς, οὐδαμοὶ δυνάμεως οὐδεμιᾶς τῆς μὲν ἐλκούσης τὸ προσήκον ἑαυτῇ, τῆς δ' ἀπωθούσης τὸ ἀλλότριον, τῆς δ' ἀλλοιούσης τε καὶ προσφυόρους τὸ θρέψον, οὐκ οἶδ' ὅπως οὐκ ἄν εἴημεν καταγέλαστοι περὶ τε τῶν φυσικῶν ἐνέργειῶν διαλεγόμενοι καὶ πολὺ μᾶλλον ἐτὶ περὶ τῶν ψυχικῶν καὶ || συμπάσης γε τῆς ξώης.

Ὅτι γὰρ ξὴν οὐδὲ διαμένειν οὐδὲν τῶν ξών οὔτ' εἰς ἐλάχιστον χρόνον ἔσται δυνατόν, εἰ τοσοῦτα κεκτημένον εἰς ἑαυτῷ μόρια καὶ οὕτω διαφέροντα μήτ' ἐλκτικῆ τῶν οἰκείων χρήσεται δυνάμει μήτ' ἀποκριτικῆ τῶν ἀλλοτρίων μήτ' ἀλλοιωτικῆ τῶν θρεψοντων. καὶ μήν εἰ ταῦτα ἔχομεν, οὐδὲν ἐτί πόρων μικρὸν ἢ μεγάλων ἢς ὑποθέσεως ἀνασυνείκτον λαμβανομένων εἰς οὕρον καὶ χωλῆς διάκρισιν δεόμεθα καὶ τινὸς ἐπικαίρου θέσεως, ἐν ὦ μόνῳ σωφρονεῖν ἐσθείκαν ὁ Ἐρασίστρατος ἀπαντά καλῶς τεθῆναι τε καὶ διαπλασ-

1 Or ducts, canals, conduits, i.e. morphological factors.
3 “Only”; cf. Introd., p. xxviii.
4 Note how Galen, although he has not yet clearly differ-
Thus, every hypothesis of channels\(^1\) as an explanation of natural functioning is perfect nonsense. For, if there were not an inborn faculty given by Nature to each one of the organs at the very beginning, then animals could not continue to live even for a few days, far less for the number of years which they actually do. For let us suppose they were under no guardianship, lacking in creative ingenuity\(^2\) and forethought; let us suppose they were steered only by material forces,\(^3\) and not by any special faculties (the one attracting what is proper to it, another rejecting what is foreign, and yet another causing alteration and adhesion of the matter destined to nourish it); if we suppose this, I am sure it would be ridiculous for us to discuss natural, or, still more, psychical, activities—or, in fact, life as a whole.\(^4\)

For there is not a single animal which could live or endure for the shortest time if, possessing within itself so many different parts, it did not employ faculties which were attractive of what is appropriate, eliminative of what is foreign, and alterative of what is destined for nutrition. On the other hand, if we have these faculties, we no longer need channels, little or big, resting on an unproven hypothesis, for explaining the secretion of urine and bile, and the conception of some favourable situation (in which point alone Erasistratus shows some common sense, since he does regard all the parts of the body as entiatted physiological from physical processes (both are "natural") yet separates them definitely from the psychical. cf. p. 2, footnote. A psychical function or activity is, in Latin, actio animalis (from anima = psyche).
θήναι τὰ μόρια τοῦ σώματος ὑπὸ τῆς φύσεως οἰόμενος.

Ἀλλὰ εἰ παρακολουθήσειν ἑαυτῷ φύσιν όνομάζουσι τεχνικὴν, εὐθὺς μὲν ἐὰν ἀρχὴς ἦπαινα καλῶς διαπλάσασάν τε καὶ διαθέεσαν τοῦ ξύλου τὰ μόρια, μετὰ δὲ τὴν τοιαύτην ἐνέργειαν, ὡς οὐδὲν ἔλειπεν, ἐτὶ προαγαγοῦσαν εἰς φῶς αὐτὸ σέ τις δυνάμεσιν, ὅπερ ἀνευ ξύλον οὐκ ἦδυνατο, καὶ μετα ταῦτα κατὰ βραχὺ προσαυξήσασαν ἀχρι τοῦ πρέποντος μεγέθους, οὐκ οίδα πῶς ὑπομένει πόρων σμικρότητι τῇ μεγέθεσι τῆς τισιν ἄλλαις οὕτως θηρώδεσιν υποθέσεσι φυσικὰς ἐνεργείας ἐπιτρέπειν. ἦ γὰρ διαπλάστουσα τὰ μόρια φύσις ἐκείνη καὶ κατὰ βραχὺ προσαυξήσουσα πάντως δήμου δὲ ὅλων αὐτῶν ἐκτέταται καὶ γὰρ ὅλα δὲ ὅλων οὐκ ἔξωθεν μόνον αὐτὰ διαπλάττει καὶ τρέφει καὶ προσαύξει. Πραξιτέλης μὲν ἔτερ ἦ Φείδιας ἦ τις ἄλλος ἀγαλματοποιῶς ἔξωθεν μόνον ἐκόσμον τῶν ὕλων, καθὰ καὶ φαύνειν αὐτῶν ἠδύνατο, τὸ βάθος δ᾽ ἀκόσμητον καὶ ἄργον καὶ ἄτεχνον καὶ ἀπρονότον ἀπέλιπτον, ὥς ἂν μὴ δυνάμενοι κατελθεῖν εἰς αὐτὸ καὶ καταδύναι καὶ θυγεῖν ἀπάντων τῆς ἔλης τῶν μερῶν. ἡ φύσις δ᾽ οὕτως, ἀλλὰ τὸ μὲν ὅστιν μέρος ἀπαν ὅστοιν ἀποτελεῖ, τὸ δὲ σαρκὸς σάρκα, τὸ δὲ πιμελῆς πιμελὴν καὶ τῶν ἄλλων ἐκαστον οὐδὲν γὰρ ἐστὶν ἄφαντον αὐτῇ μέρος οὐδ᾽ ἀνεξέργαστον οὐδ᾽ ἀκόσμητον. ἀλλὰ τῶν μὲν κηρῶν ο Φείδιας οὐκ ἦδυνατο ποιεῖν ἐλέφαντα καὶ χρυσον, ἀλλ᾽ οὐδὲ τῶν χρυσῆν κηρῶν ἐκαστον γὰρ αὐτῶν μένον, οἶνον ἡν ἔξαρχης, ἔξωθεν μόνον ἡμφιεσμένον εἴδος τι
having been well and truly placed and shaped by Nature).

But let us suppose he remained true to his own statement that Nature is "artistic"—this Nature which, at the beginning, well and truly shaped and disposed all the parts of the animal,1 and, after carrying out this function (for she left nothing undone), brought it forward to the light of day, endowed with certain faculties necessary for its very existence, and, thereafter, gradually increased it until it reached its due size. If he argued consistently on this principle, I fail to see how he can continue to refer natural functions to the smallness or largeness of canals, or to any other similarly absurd hypothesis. For this Nature which shapes and gradually adds to the parts is most certainly extended throughout their whole substance. Yes indeed, she shapes and nourishes and increases them through and through, not on the outside only. For Praxiteles and Phidias and all the other statuaries used merely to decorate their material on the outside, in so far as they were able to touch it; but its inner parts they left unembellished, unwrought, unaffected by art or forethought, since they were unable to penetrate therein and to reach and handle all portions of the material. It is not so, however, with Nature. Every part of a bone she makes bone, every part of the flesh she makes flesh, and so with fat and all the rest; there is no part which she has not touched, elaborated, and embellished. Phidias, on the other hand, could not turn wax into ivory and gold, nor yet gold into wax: for each of these remains as it was at the commencement, and becomes a perfect statue

1 The stage of organogenesis or diaplasia; cf. p. 25, note 4.
The spermatozoon now becomes an "organism" proper.

1 Galen attributed to the sperma or semen what we should
simply by being clothed externally in a form and artificial shape. But Nature does not preserve the original character of any kind of matter; if she did so, then all parts of the animal would be blood—that blood, namely, which flows to the semen from the impregnated female and which is, so to speak, like the statuary's wax, a single uniform matter, subjected to the artificer. From this blood there arises no part of the animal which is as red and moist [as blood is], for bone, artery, vein, nerve, cartilage, fat, gland, membrane, and marrow are not blood, though they arise from it.

I would then ask Erasistratus himself to inform me what the altering, coagulating, and shaping agent is. He would doubtless say, "Either Nature or the semen," meaning the same thing in both cases, but explaining it by different devices. For that which was previously semen, when it begins to procreate and to shape the animal, becomes, so to say, a special nature. For in the same way that Phidias possessed the faculties of his art even before touching his material, and then activated these in connection with this material (for every faculty remains inoperative in the absence of its proper material), so it is with the semen: its faculties it possessed from the beginning, while its activities it does not receive from its material, but it manifests them in connection therewith.

And, of course, if it were to be overwhelmed with a great quantity of blood, it would perish, while if it were to be entirely deprived of blood to the fertilized ovum: to him the maternal contribution is purely passive—mere food for the sperm. The epoch-making Ovum Theory was not developed till the seventeenth century cf. p. 19, note 3.
The attraction described not merely as qualitative but also as quantitative.

1 i.e. we should be talking psychology, not biology; cf. stomach, p. 307, note 3.

2 Attraction now described not merely as qualitative but also as quantitative. cf. p. 85, note 3.
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it would remain inoperative and would not turn into a nature. Therefore, in order that it may not perish, but may become a nature in place of semen, there must be an afflux to it of a little blood—or, rather, one should not say a little, but a quantity commensurate with that of the semen. What is it then that measures the quantity of this afflux? What prevents more from coming? What ensures against a deficiency? What is this third overseer of animal generation that we are to look for, which will furnish the semen with a due amount of blood? What would Erasistratus have said if he had been alive, and had been asked this question? Obviously, the semen itself. This, in fact, is the artificer analogous with Phidias, whilst the blood corresponds to the statuary’s wax.

Now, it is not for the wax to discover for itself how much of it is required; that is the business of Phidias. Accordingly the artificer will draw to itself as much blood as it needs. Here, however, we must pay attention and take care not unwittingly to credit the semen with reason and intelligence; if we were to do this, we would be making neither semen nor a nature, but an actual living animal.\(^1\) And if we retain these two principles—that of proportionate attraction\(^2\) and that of the non-participation of intelligence—we shall ascribe to the semen a faculty for attracting blood similar to that possessed by the lodestone for iron.\(^3\) Here, then, again, in the case of the semen, as in so many previous instances, we have been compelled to acknowledge some kind of attractive faculty.

\(^3\) He still tends either to biologize physics, or to physicize biology—whichever way we prefer to look at it. cf. Book I., chap. xiv.
Aristotelian and Stoic duality of an active and a passive principle.

Note that early embryonic development is described as a process of nutrition. cf. p. 130, note 2.

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And what is the semen? Clearly the active principle of the animal, the material principle being the menstrual blood. Next, seeing that the active principle employs this faculty primarily, therefore, in order that any one of the things fashioned by it may come into existence, it [the principle] must necessarily be possessed of its own faculty. How, then, was Erasistratus unaware of it, if the primary function of the semen be to draw to itself a due proportion of blood? Now, this fluid would be in due proportion if it were so thin and vaporous, that, as soon as it was drawn like dew into every part of the semen, it would everywhere cease to display its own particular character; for so the semen will easily dominate and quickly assimilate it—in fact, will use it as food. It will then, I imagine, draw to itself a second and a third quantum, and thus by feeding it acquires for itself considerable bulk and quantity. In fact, the alternative faculty has now been discovered as well, although about this also Erasistratus has not written a word. And, thirdly the shaping faculty will become evident, by virtue of which the semen firstly surrounds itself with a thin membrane like a kind of superficial condensation; this is what was described by Hippocrates in the sixth-day birth, which, according to his statement, fell from the singing-girl and resembled the pellicle of an egg. And following this all the other stages will occur, such as are described by him in his work "On the Child's Nature."

But if each of the parts formed were to remain as small as when it first came into existence, of what use would that be? They have, then, to grow.

* On the alternative and shaping faculties cf. p. 18, note 1.
αὐξηθύσεται; πάντη διατεινόμενα θ’ ἁμα καὶ τρεφόμενα. καὶ μοι τῶν ἐμπροσθεν εἰρημένων ἐπὶ τῆς κύστεως, ἢν οἱ παῖδες ἐμφυσόντες ἐτριβήσω ἀναμνησθεὶς μαθήσῃ μᾶλλον || κακὸς τῶν νῦν ῥηθησομένων.

'Εννόησον γὰρ δὴ τὴν καρδιάν οὕτω μὲν μικρὰν εἶναι κατ’ ἀρχάς, ὡς κέγχρου μηδὲν διαφέρειν ἢ, εἰ βούλει, καῦμον, καὶ ζήτησον, ὅπως ἂν ἄλλως αὔτη γένοιτο μεγάλη χωρὶς τοῦ πάντη διατεινομένην τρέφεσθαι δι’ ὅλης εαυτῆς, ὡς ὅλῃς πρόσθεν ἐδείκνυτο τὸ σπέρμα τρεφόμενον. ἀλλ’ οὐδὲ τούτ’ Ἐρασίστρατος οἰδὲν ὅ τὴν τέχνην τῆς φύσεως ὁμών, ἀλλ’ οὕτως αὐξάνεσθαι τὰ ζῷα νομίζει καθάπερ τινὰ κρησέραν ἢ σειρὰν ἢ σάκκον ἢ τάλαρον, δόν ἐκάστῳ κατὰ τὸ πέρας ἐπιπλεκομένων ὁμοίων ἐτέρων τοῖς ἐξ ἀρχῆς αὐτὰ συντιθείσιν ἢ πρόσθεσις γίνεται.

'Αλλὰ τούτῳ γ’ οὐκ αὐξήσις ἐστιν ἀλλὰ γένεσις, ὁ σοφῶτατε γίγνεται γὰρ ὁ θύλακος ἐτι καὶ ὁ σάκκος καὶ θοιμάτιον καὶ ἡ οἰκία καὶ τὸ πλοῦν καὶ τῶν ἄλλων ἐκαστῶν, ὃταν μηδέπω τὸ προσήκον εἴδος, οὐ χάριν ὑπὸ τοῦ τεχνίτου δημουργεῖται, συμπεπληρωμένον ἢ. πότ’ οὖν αὐξάνεται; ὅταν ἢ ἡ τέλειος ὁν ὃ τάλαρος, ὧς ἔχειν πυθμένα τε τινὰ καὶ στόμα καὶ οἶνον γαστέρα καὶ τὰ τούτων μεταξύ, μείζων ἀπασι τούτως γένεται.
Now, how will they grow? By becoming extended in all directions and at the same time receiving nourishment. And if you will recall what I previously said about the bladder which the children blew up and rubbed,¹ you will also understand my meaning better as expressed in what I am now about to say.

Imagine the heart to be, at the beginning, so small as to differ in no respect from a millet-seed, or, if you will, a bean; and consider how otherwise it is to become large than by being extended in all directions and acquiring nourishment throughout its whole substance, in the way that, as I showed a short while ago, the semen is nourished. But even this was unknown to Erasistratus—the man who sings the artistic skill of Nature! He imagines that animals grow like webs, ropes, sacks, or baskets, each of which has, woven on to its end or margin, other material similar to that of which it was originally composed.

But this, most sapient sir, is not growth, but genesis! For a bag, sack, garment, house, ship, or the like is said to be still coming into existence [undergoing genesis] so long as the appropriate form for the sake of which it is being constructed by the artificer is still incomplete. Then, when does it grow? Only when the basket, being complete, with a bottom, a mouth, and a belly, as it were, as well as the intermediate parts, now becomes larger in all these respects. “And how can this happen?” someone will ask. Only by our basket suddenly becoming an animal or a plant; for growth belongs to living things alone. Possibly you imagine that a house grows when it is being built, or a basket when being

¹ pp. 27–29.
σθαί καὶ τὸν τάλαρον πλεκόμενου καὶ θοιμάτιον ὑφαινόμενον. ἄλλ' οὐχ ὃδ' ἔχει· τοῦ μὲν γὰρ ἦδη συμπεπληρωμένου κατὰ τὸ εἶδος ἡ αὐξήσις, τοῦ δὲ ἐτι γεγονόμενον ἢ εἰς τὸ εἶδος ὁδὸς οὐκ αὐξήσις ἀλλὰ γένεσις ὀνομάζεται. αὐξάνεται μὲν γὰρ τὸ ὄν, γίγνεται δὲ τὸ οὐκ ὄν.

IV

Καὶ ταῦτ' Ἐρασίστρατος οὐκ οἶδεν, ὅπερ ὀλὸς ἀληθεύονσιν ὁ ὁπ' αὐτοῦ φάσκοντες ὀμιληκέναι τοῖς ἐκ τοῦ περιπάτου φιλοσόφων αὐτοῦ. ἀρχὴ μὲν οὖν τοῦ τῆς φύσιν ὑμνεῖν ὡς τεχνικὴν καὶ γὰρ γνωρίζω τὰ τοῦ περιπάτου δόγματα, τῶν δὲ ἄλλων οὐδὲν οὐδ' ἑγγὺς. εἰ γὰρ τὸις ὀμιλήσεις τοῖς Ἄριστοτέλειοι καὶ Θεοφράστου γράμμασι, τῆς Ἰπποκράτους δὲ αὐτὰ δοξεῖε φυσιολογίας ὑπομνήματα συγκεῖσθαι, 89 τὸ θερμὸν καὶ τὸ ψυχρὸν || καὶ τὸ ἔρημον καὶ τὸ ψυχρὸν εἰς ἄλληλα δρόμονα καὶ πάσχοντα καὶ τοῦτων αὐτῶν δραστικῶτατον μὲν τὸ θερμὸν, δευτερον δὲ τῇ δυνάμει τὸ ψυχρὸν Ἰπποκράτους ταῦτα σύμμπαντα πρῶτον, δευτέρου δὲ Ἄριστοτέλεοι εἰπόντος. τρέφεσθαι δὲ δι' ὅλων αὐτῶν τὰ τρεφόμενα καὶ κεράνυσθαι δι' ὅλων τὰ κεραυνύμενα καὶ ἀλλοιοῦσθαι δι' ὅλων τὰ ἀλλοιούμενα, καὶ ταῦτ' Ἰπποκράτειοι θ' ἀμα καὶ Ἄριστοτέλειοι καὶ τὴν πέψιν ἑλλοιωσίν τιν'

plaited, or a garment when being woven? It is not so, however. Growth belongs to that which has already been completed in respect to its form, whereas the process by which that which is still becoming attains its form is termed not growth but genesis. That which is, grows, while that which is not, becomes.

IV

This also was unknown to Erasistratus, whom nothing escaped, if his followers speak in any way truly in maintaining that he was familiar with the Peripatetic philosophers. Now, in so far as he acclaims Nature as being an artist in construction, even I recognize the Peripatetic teachings, but in other respects he does not come near them. For if anyone will make himself acquainted with the writings of Aristotle and Theophrastus, these will appear to him to consist of commentaries on the Nature-lore [physiology] of Hippocrates—according to which the principles of heat, cold, dryness and moisture act upon and are acted upon by one another, the hot principle being the most active, and the cold coming next to it in power; all this was stated in the first place by Hippocrates and secondly by Aristotle. Further, it is at once the Hippocratic and the Aristotelian teaching that the parts which are being nourished receive that nourishment throughout their whole substance, and that, similarly, processes of mingling and alteration involve the entire substance. Moreover, that digestion is a species of

3 For definitions of alteration and mingling (crasis, "temperament") cf. Book I., chaps. ii. and iii.
GALEN

υπάρχειν καὶ μεταβολὴν τοῦ τρέφοντος εἰς τὴν
οἰκεῖαν τοῦ τρεφομένου ποιότητα, τὴν δὲ ἐξαι-
μάτωσιν ἀλλοίωσιν εἶναι καὶ τὴν θρέψιν ὁςαύτως
καὶ τὴν αὔξησιν ἐκ τῆς πάντη διατάσεως καὶ
θρέψεως γίγνεσθαι, τὴν δὲ ἀλλοίωσιν ὑπὸ τοῦ
θερμοῦ μάλιστα συντελεῖσθαι καὶ διὰ τοῦτο καὶ
τὴν πέψιν καὶ τὴν θρέψιν καὶ τὴν τῶν χυμῶν
ἀπάντων γένεσιν, ἢδη δὲ καὶ τοῖς περιττώμασι
τὰς ποιότητας ὑπὸ τῆς ἐμφύτου θερμασίας ἐγγί-
γενθαι, ταῦτα σύμπαντα καὶ πρὸς τούτοις ἑτέρα
ποιλλὰ τὰ τε τῶν προειρημένων δυνάμεως καὶ
τὰ || τῶν νοσημάτων τῆς γενέσεως καὶ τὰ τῶν
ιαμάτων τῆς εὐρέσεως Ἰπποκράτης μὲν πρῶτος
ἀπάντων ὅν ἵσμεν ὁρθῶς εἰπεῖν, Ἄριστοτέλης δὲ
deύτερος ὁρθῶς ἐξηγήσατο. καὶ μὴν εἰ ταῦτα
σύμπαντα τοῖς ἐκ τοῦ περιπάτου δοκεῖ, καθάπερ
οὐν δοκεῖ, μηδὲν δ' αὐτῶν ἀρέσκει τῷ Ἐρασιστρά-
τῳ, τί ποτε βούλεται τοῖς Ἐρασιστρατείοις ἦ
προς τοὺς φιλοσόφους ἐκείνους τοῦ τῆς αἰρέσεως
ἀυτῶν ἡγεμόνος ὁμιλία; θαυμάζουσι μὲν γὰρ
ἀυτῶν ὡς θεοῦ καὶ πάντ' ἀληθεύειν νομίζουσιν.
εἰ δ' οὕτως ἔχει ταῦτα, πάμπολο δὴν τῆς
ἀληθείας ἐσφάλθαι χρῆ νομίζειν τοὺς ἐκ τοῦ
περιπάτου φιλοσόφους, οῖς μηδὲν δὲν Ἐρασι-
στράτος ὑπελάμβανεν ἀρέσκει. καὶ μὴν ὡσπερ
τιν' εὐγένειαν αὐτῷ τῆς φυσιολογίας τὴν πρὸς
τοὺς ἀνδρας ἐκείνους συνουσίαν ἐκπορίζουσι.

Πάλιν οὖν ἀναστρέψωμεν τὸν λόγον ἐτέρως ἢ
ὡς ὀλίγως πρόσθεν ἐτύχομεν εἰπόντες. εἰπέρ γὰρ
οἱ ἐκ τοῦ περιπάτου καλῶς ἐφυσιολογησαν,
οὗδὲν ἂν εἴη ληρωδέστερον Ἐρασιστράτου καὶ
dιδώμι τοῖς Ἐρασιστρατείοις αὐτοῖς τὴν αἰρέσειν.
ON THE NATURAL FACULTIES, II. iv

alteration—a transmutation of the nutriment into the proper quality of the thing receiving it; that blood-production also is an alteration, and nutrition as well; that growth results from extension in all directions, combined with nutrition; that alteration is effected mainly by the warm principle, and that therefore digestion, nutrition, and the generation of the various humours, as well as the qualities of the surplus substances, result from the *innate heat*;¹ all these and many other points besides in regard to the aforesaid faculties, the origin of diseases, and the discovery of remedies, were correctly stated first by Hippocrates of all writers whom we know, and were in the second place correctly expounded by Aristotle. Now, if all these views meet with the approval of the Peripatetics, as they undoubtedly do, and if none of them satisfy Erasistratus, what can the Erasistrateans possibly mean by claiming that their leader was associated with these philosophers? The fact is, they revere him as a god, and think that everything he says is true. If this be so, then we must suppose the Peripatetics to have strayed very far from truth, since they approve of none of the ideas of Erasistratus. And, indeed, the disciples of the latter produce his connection with the Peripatetics in order to furnish his *Nature-lore* with a respectable pedigree.

Now, let us reverse our argument and put it in a different way from that which we have just employed. For if the Peripatetics were correct in their teaching about Nature, there could be nothing more absurd than the contentions of Erasistratus. And, I will leave it to the Erasistrateans themselves to decide:

¹ i.e. are associated with oxidation? cf. p. 41, note 3.
91 ἣ γὰρ τοῦ πρῶτον λόγον ἡ τούτων ἡ προσήκουσάν.
λέγει δ’ ὁ μὲν πρῶτος οὐδέν ὀρθῶς ἐγνωκέναι
περὶ φύσεως τοὺς περιπατητικοὺς, ὥ δὲ δεύτερος
Ἐρασίστρατος. ἐμὸν μὲν οὖν ὑπομυνήσαι τῶν
dογμάτων τῆς μάχης, ἐκείνων δ’ ἡ αἴρεσις.

Ἄλλ’ οὖν ἀποσταίειν τοῦ θαυμάζειν ‘Ἐρασί-
στρατόν: οὐκόν σιωπάτωσαν περὶ τῶν ἐκ τοῦ
περιπάτου φιλοσοφῶν. παμπόλλων γὰρ οὖν
δογμάτων φυσικῶν περὶ τε γένεσιν καὶ θεορά-
tῶν ξῶν καὶ υγίειαν καὶ νόσους καὶ τὰς θερα-
πείαις αὐτῶν ἐν μόνον εὐρεθήσεται ταύτῶν ‘Ἐρασί-
στράτῳ κακείνοις τοῖς ἀνδράσι, τὸ τίμως ἕνεκα
πάντα ποιεῖν τὴν φύσιν καὶ μάτην μηδέν.

’Αλλὰ καὶ αὐτὸ τοῦτο μέχρι λόγου κοινῶν,
ἐργὸν δὲ μυριάκις ‘Ἐρασίστρατος αὐτὸ διαφθείρει
μάτην μὲν γὰρ ὁ σπλήν ἐγένετο, μάτην δὲ τὸ
ἐπίπλοον, μάτην δ’ αἰ εἰς τόσον νεφροὺς ἀρτηρίας
καταφυόμεναι, σχεδὸν ἀπάσων τῶν ἀπὸ τῆς
μεγάλης ἀρτηρίας ἀποβλαστανοῦσιν οὕσαι
μέγισται, μάτην δ’ ἀλλὰ μυρία κατά γε τὸν
’Ερασιστράτειον λόγον: ἀπερ εἰ μὲν οὖδ’ ὀλῶς
γνωσκει, βραχεῖ μαγεῖρον σοφώτερός ἐστιν ἐν
ταῖς ἀνατομαῖς, εἰ δ’ εἰδῶς οὐ λέγει τὴν χρείαν

92 αὐτῶν, οἴεται || δηλούντι παραπλησίως τῷ σπλήνι
μάτην αὐτὰ γεγονόταί. καίτοι εἰ ταῦτ’ ἐπεξ-
έρχομαι τῆς περὶ χρείας μορίων πραγματείας
οὔτα μελλοῦσης ἦμιν ἵδια περαινεσθαί;

1 “Useless” organs; cf. p. 56, note 2. For fallacy of
Erasistratus’s view on the spleen v. p. 205.

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they must either advance the one proposition or the other. According to the former one the Peripatetics had no accurate acquaintance with Nature, and according to the second, Erasistratus. It is my task, then, to point out the opposition between the two doctrines, and theirs to make the choice.

But they certainly will not abandon their reverence for Erasistratus. Very well, then; let them stop talking about the Peripatetic philosophers. For among the numerous physiological teachings regarding the genesis and destruction of animals, their health, their diseases, and the methods of treating these, there will be found one only which is common to Erasistratus and the Peripatetics—namely, the view that Nature does everything for some purpose, and nothing in vain.

But even as regards this doctrine their agreement is only verbal; in practice Erasistratus makes havoc of it a thousand times over. For, according to him, the spleen was made for no purpose, as also the omentum; similarly, too, the arteries which are inserted into kidneys 1—although these are practically the largest of all those that spring from the great artery [aorta]! And to judge by the Erasistratean argument, there must be countless other useless structures; for, if he knows nothing at all about these structures, he has little more anatomical knowledge than a butcher, while, if he is acquainted with them and yet does not state their use, he clearly imagines that they were made for no purpose, like the spleen. Why, however, should I discuss these structures fully, belonging as they do to the treatise "On the Use of Parts," which I am personally about to complete?

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Galen

Πάλιν οὖν ἀναλάβωμεν τὸν αὐτὸν λόγον εἰπόντες τὸ βραχὺ πρὸς τοὺς Ἐρασιστρατείους ἐτὶ τῶν ἐφεξῆς ἐχώμεθα. δοκοῦσι γὰρ μοι μηδὲν ἀνεγνωκέναι τῶν Ἀριστοτέλους οὕτωι συγγραμμάτων, ἀλλ’ ἄλλων ἀκούοντες, ὡς δεινὸς ἢν περὶ φύσιν ὁ ἀνθρωπος καὶ ὡς οἱ ἀπὸ τῆς στοὰς κατ’ ἵχνη τῆς ἐκείνου φυσιολογίας βαδίζουσιν, εἰθ’ εὑρόντες ἐν τὶ τῶν περιφερεμένων δογμάτων κοινῶν αὐτῷ πρὸς Ἐρασιστρατον ἀναπλάσαι τινὰ συνούσιαν αὐτὸν πρὸς ἐκείνους τοὺς ἀνδρας. ἀλλ’ οτι μὲν τῆς Ἀριστοτέλους φυσιολογίας οὐδὲν Ἐρασιστράτῳ μέτεστιν, ὁ κατάλογος τῶν προειρημένων ἐνδείκνυται δογμάτων, ὁ πρῶτον μὲν Ἰπποκράτους ἢν, δευτέρου δ’ Ἀριστοτέλους, τρίτων δὲ τῶν Στωϊκῶν, ἐνὸς μόνον μετατιθεμένου τοῦ τᾶς ποιότητας εἶναι σώματα.

Τάχα δ’ ἄν τῆς λογικῆς ἐνέκα θεωρίας ὁμιληκέναι φαίειν τὸν Ἐρασιστρατον τοῖς ἐκ τοῦ περιπάτου φιλοσόφοις, οὐκ εἰδότες, ὡς ἐκείνοι μὲν ψευδεῖς καὶ ἀπεράντους οὐκ ἐγραψαν λόγους, τὰ δ’ Ἐρασιστράτεια βιβλία παρμπόλλους ἔχει τοὺς ποιοτύτους.

Τάχ’ ἄν οὖν ἦδη τις θαυμάζοι καὶ διαποροίη, τί παθῶν ο’ Ἐρασιστράτος εἰς τοσούτων τῶν Ἰπποκράτους δογμάτων ἀπετράπετο καὶ διὰ τὶ τῶν ἐν ἡπατὶ πόρων τῶν χοληδόχων, ἀλλ’ γὰρ ἦδη νεφρῶν, ἀφελόμενος τῆς ἐλεκτικῆς δύναμιν ἐπίκαιρον αἰτιᾶται θέσιν καὶ στομάτων

1 The Stoics. 2 The Peripatetics (Aristotelians). 3 Aristotle regarded the qualitative differences apprehended by our senses (the cold, the warm, the moist, and the dry) as fundamental, while the Stoics held the four corporeal elements
Let us, then, sum up again this same argument, and, having said a few words more in answer to the Erasistrateans, proceed to our next topic. The fact is, these people seem to me to have read none of Aristotle's writings, but to have heard from others how great an authority he was on "Nature," and that those of the Porch follow in the steps of his Nature-lore; apparently they then discovered a single one of the current ideas which is common to Aristotle and Erasistratus, and made up some story of a connection between Erasistratus and these people. That Erasistratus, however, has no share in the Nature-lore of Aristotle is shown by an enumeration of the aforesaid doctrines, which emanated first from Hippocrates, secondly from Aristotle, thirdly from the Stoics (with a single modification, namely, that for them the qualities are bodies).

Perhaps, however, they will maintain that it was in the matter of logic that Erasistratus associated himself with the Peripatetic philosophers? Here they show ignorance of the fact that these philosophers never brought forward false or inconclusive arguments, while the Erasistratean books are full of them.

So perhaps somebody may already be asking, in some surprise, what possessed Erasistratus that he turned so completely from the doctrines of Hippocrates, and why it is that he takes away the attractive faculty from the biliary passages in the liver—for we have sufficiently discussed the kidneys—alleging [as the cause of bile-secretion] a favourable situation, the narrowness of vessels, and a (earth, air, fire, and water) to be still more fundamental. cf. p. 8, note 3.  

Lit. bile-receiving (choledochous).
στενότητα καὶ χώραν τινὰ κοινὴν, εἰς ἣν παρ-ἀγουσι μὲν αἱ ἀπὸ τῶν πυλῶν τὸ ἀκάθαρτον ἀίμα, μεταλαμβάνουσι δὲ πρῶτοι μὲν οἱ πόροι τῆς χολῆς, δεύτεροι δ’ αἱ ἀπὸ τῆς κοιλῆς φλέβος τὸ καθαρὸν ἀίμα. πρὸς γὰρ τῷ μηδὲν ἀν ἐλα-βηναι τῇ ὀλκήν εἰπὼν ἄλλων μυρίων ἐμελλείν ἀμφισβητομένων ἀπαλλάξεσθαι λόγων.

V

'Ὡς νῦν γε πόλεμος οὐ σμικρός ἐστι τοῖς Ἐρασιστρατείοις οὐ πρὸς τοὺς ἄλλους μόνον ἄλλα καὶ πρὸς ἄλληλους, οὐκ ἔχουσιν, ὅπως ἐξηγήσωνται τὴν ἐκ τοῦ πρῶτον τῶν καθόλου λόγων λέξιν, ἐν ἣ φήσαι. "Εἰς τὸ ἀνε-στομωμένων ἔτερον δύο ἀγγελίων τῶν τ’ ἐπὶ τὴν χοληθροχον τεινόντων καὶ τῶν ἐπὶ τὴν κοιλὴν φλέβαι συμβαίνει τῆς ἀναφερομένης ἐκ τῆς κοιλίας τροφῆς τὰ ἐναρμόζοντα ἑκατέρως τῶν στομάτων εἰς ἐκάτερα τῶν ἀγγελίων μετα-λαμβάνεσθαι καὶ ταῦτα μὲν ἐπὶ τὴν χοληθροχον φέρεσθαι, τὰ δ’ ἐπὶ τὴν κοιλὴν φλέβαι περαιού-σθαι." τὸ γὰρ "εἰς τὸ αὐτὸ ἀνεστομωμένων," ὁ κατ’ ἀρχὰς τὴς λέξεως γέγραπται, τί ποτε χρῆ νοῆσαι, χαλέπδον εἰπεῖν. ἤτοι γὰρ οὕτως εἰς ταῦτα, ὡστε τῷ τῆς ἐν τοῖς σιμιοῖς φλεβὸς πέρατι συνάπτειν δύο ἐτερα πέρατα, τὸ τ’ ἐν τοῖς

1 Jecoris portae, the transverse fissure, by which the portal vein enters the liver.

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common space into which the veins from the gateway [of the liver] conduct the unpurified blood, and from which, in the first place, the [biliary] passages take over the bile, and secondly, the [branches] of the vena cava take over the purified blood. For it would not only have done him no harm to have mentioned the idea of attraction, but he would thereby have been able to get rid of countless other disputed questions.

At the actual moment, however, the Erasistrateans are engaged in a considerable battle, not only with others but also amongst themselves, and so they cannot explain the passage from the first book of the "General Principles," in which Erasistratus says, "Since there are two kinds of vessels opening at the same place, the one kind extending to the gall-bladder and the other to the vena cava, the result is that, of the nutriment carried up from the alimentary canal, that part which fits both kinds of stomata is received into both kinds of vessels, some being carried into the gall-bladder, and the rest passing over into the vena cava." For it is difficult to say what we are to understand by the words "opening at the same place" which are written at the beginning of this passage. Either they mean there is a junction between the termination of the vein which is on the concave surface of the liver and two other vascular terminations (that of the vessel on the convex surface of the liver).
κυρτοὶς καὶ τὸ τοῦ χοληδόχου πόρου, ἢ, εἰ μὴ
οὕτω, χώραν τινὰ κοινὴν ἐπινοῆσαι χρῆ τῶν
τριῶν ἀγγείων οἶον δεξαμενήν τινα, πληρομενήν
μὲν ὑπὸ τῆς κάτω φλεβῶς, ἐκκενουμένην δὲ εἰς τέ
τοὺς χοληδόχους πόρους καὶ τὰς τῆς κοίλης
ἀποσχίδας· καθ’ ἐκατέραν δὲ τῶν ἐξηγήσεων
ἀτοπα πολλὰ, περὶ ὅν εἰ πάντων λέγοιμι, λάθοιμ’
ἀν ἐμαυτὸν ἐξηγήσεις Ἐρασιστράτου γράφων,
οὐχ, ὡσπερ ἄρχεις προοδεοῦν, περαινοῦν. κοινὸν
δ’ ἀμφοτέραις ταῖς ἐξηγήσεσιν ἀτοπον τὸ μῆ||
95 καθαίρεσθαι πᾶν τὸ αἷμα. χρῆ γὰρ ὅσ εἰς
ἡμῶν τινὰ τὸ χοληδόχου ἀγγεῖον ἐμπίπτειν
αὐτό, οὐ παρέρχεσθαι καὶ παραρρέειν ὡκεῖς εἰς
tὸ μείζον στόμα τῇ ρύμῃ τῆς ἀνάδοσεως φερό-
μενον.

Ἀρ’ οὖν ἐν τούτοις μόνον ἀπορίας ἀφύκτοις ὁ
Ἐρασιστράτου λόγος ἐνέχεται μῇ βουληθέντος
χρήσασθαι ταῖς ἐλκτικαῖς δυνάμεσιν εἰς μηδέν, ἡ
σφοδρότατα μὲν ἐν τούτοις καὶ σαφῶς οὕτως, ὡς
ἀν μὴ δὲ παίδα λαθεῖν;

VI

Εἰ δ’ ἐπισκοποῖτό τις ἐπιμελῶς, οὐδ’ ὁ περὶ
θρέψεως αὐτοῦ λόγος, ὄν ἐν τῷ δευτέρῳ τῶν
καθόλου λόγων διεξέρχεται, τὰς αὐτὰς ἀπορίας
ἐκφεύγει. τῇ γὰρ πρὸς τὸ κενοῦμενον ἀκολούθια
συγχωρηθέντος ἐνὸς λήμματος, ὡς πρὸσθεν
ἐδεικνυμεν, ἐπέραινε τι περὶ φλεβῶν μόνων καὶ
tοῦ κατ’ αὐτὰς αἵματος. ἐκρέντος γὰρ τινος

1 The portal vein. 2 cf. p. 120, note 1.
and that of the bile-duct), or, if not, then we must suppose that there is, as it were, a common space for all three vessels, which becomes filled from the lower vein,¹ and empties itself both into the bile-duct and into the branches of the vena cava. Now, there are many difficulties in both of these explanations, but if I were to state them all, I should find myself inadvertently writing an exposition of the teaching of Erasistratus, instead of carrying out my original undertaking. There is, however, one difficulty common to both these explanations, namely, that the whole of the blood does not become purified. For it ought to fall into the bile-duct as into a kind of sieve, instead of going (running, in fact, rapidly) past it, into the larger stoma, by virtue of the impulse of *anadosis*.

Are these, then, the only inevitable difficulties in which the argument of Erasistratus becomes involved through his disinclination to make any use of the attractive faculty, or is it that the difficulty is greatest here, and also so obvious that even a child could not avoid seeing it?

VI

And if one looks carefully into the matter one will find that even Erasistratus's reasoning on the subject of *nutrition*, which he takes up in the second book of his "General Principles," fails to escape this same difficulty. For, having conceded one premise to the principle that matter tends to fill a vacuum, as we previously showed, he was only able to draw a conclusion in the case of the veins and their contained blood.² That is to say, when
κατὰ τὰ στόματ᾽ αὐτῶν καὶ διαφορομένου καὶ μὴν ἀθρόως τόπου κενοῦ δυναμένου γενέσθαι μὴτε τῶν φλεβῶν συμπεσεῖν, τούτῳ γὰρ ἦν τὸ παραλειπόμενον, ἀναγκαίον ἦν ἐπεσθαί τὸ συνεχὲς ἀναπληρῶν τού κενού μένου τῇ βάσιν. αἱ μὲν δὴ φλέβες ἦμιν οὕτω θρέψονται τοῦ περιεχομένου καὶ αὐτὰς αἵματος ἀπολαύονται· τὰ δὲ νεῦρα πῶς; οὐ γὰρ δὴ κἂν τούτοις ἐστὶν αἶμα. προ- χειρον μὲν γὰρ ἦν εἰπεῖν, ἐλκοῦντα παρὰ τῶν φλεβῶν· ἄλλῃ οὖ βούλεται. τὶ ποτ′ οὐν καν- ταύθα ἐπιτεχνάται; φλέβας ἔχειν εἰν ἐαυτῷ καὶ ἀρτηρίας τὸ νεῦρον ὡσπερ τινὰ σειρὰν ἐκ τριῶν ἰμάτων διαφέροντων τῇ φύσι πεπλεγ- μένην. ὡθήσῃ γὰρ ἐκ ταύτης τῆς υποθέσεως ἐκφεύγεσθαι τῷ λόγῳ τῆς ὅλκην· οὐ γὰρ ἄν ἐτί δείσεσθαι τὸ νεῦρον εἴν ἐαυτῷ περείχον αἵματος ἀγγείον ἐπίρρυτον τινὸς ἐξωθεὶ ἐκ τῆς παρα- κεμένης φλεβὸς τῆς ἀληθινῆς αἵματος ἑτέρου, ἄλλῃ ἰκανον αὐτῷ πρὸς τὴν θρέψιν ἐσεθαι τὸ κατεφευσμένον ἀγγείον ἐκεῖνο τῷ λόγῳ θεω- ρητόν.

Ἀλλὰ κανταύθα πάλιν αὐτῶν ὀμοία τις ἀπορία διεδέξατο. τούτῳ γὰρ τὸ σμικρὸν ἀγγείον ἐαυτὸ μὲν θρέψει, τὸ παρακεμένον μέντοι νεῦρον ἐκείνο τὸ ἀπλοῦν ἡ τῇ ἀρτηρίαν οὐχ οἷον τ᾽ ἐσται τρέφειν ἀνευ τοῦ σύμφυτον την ὑπάρχειν αὐτοῖς ὅλκην τῆς τροφῆς. || τῇ μὲν γὰρ πρὸς τὸ κενοῦ- μενον ἀκολουθία πῶς ἄν ἔτι δύνατο τῆν τροφῆν ἐπισπάσθαι τῷ ἀπλοῦν νεῦρον, ὡσπερ αἱ φλέβες

1 cf. p. 272, note 1.
2 i.e. one might assume an attraction.
blood is running away through the stomata of the veins, and is being dispersed, then, since an absolutely empty space cannot result, and the veins cannot collapse (for this was what he overlooked), it was therefore shown to be necessary that the adjoining quantum of fluid should flow in and fill the place of the fluid evacuated. It is in this way that we may suppose the veins to be nourished; they get the benefit of the blood which they contain. But how about the nerves? For they do not also contain blood. One might obviously say that they draw their supply from the veins. But Erasistratus will not have it so. What further contrivance, then, does he suppose? He says that a nerve has within itself veins and arteries, like a rope woven by Nature out of three different strands. By means of this hypothesis he imagined that his theory would escape from the idea of attraction. For if the nerve contain within itself a blood-vessel it will no longer need the adventitious flow of other blood from the real vein lying adjacent; this fictitious vessel, perceptible only in theory, will suffice it for nourishment.

But this, again, is succeeded by another similar difficulty. For this small vessel will nourish itself, but it will not be able to nourish this adjacent simple nerve or artery, unless these possess some innate proclivity for attracting nutriment. For how could the nerve, being simple, attract its nourishment, as do the composite veins, by virtue of the tendency

3 i.e. visible to the mind's eye as distinguished from the bodily eye. cf. p. 21, note 4. Theoretum without qualification means merely visible, not theoretic. cf. p. 205, note 1.
According to the Pneumatist school, certain of whose ideas were accepted by Erasistratus, the air, breath pneuma, or spirit was brought by inspiration into the left side of the heart, where it was converted into natural, vital, and psychic pneuma; the latter then went to the brain, whence it was distributed through the nervous system; practically
of a vacuum to become refilled? For, although according to Erasistratus, it contains within itself a cavity of sorts, this is not occupied with blood, but with *psychic pneuma,* and we are required to imagine the nutriment introduced, not into this cavity, but into the vessel containing it, whether it needs merely to be nourished, or to grow as well. How, then, are we to imagine it introduced? For this simple vessel [*i.e. nerve*] is so small—as are also the other two—that if you prick it at any part with the finest needle you will tear the whole three of them at once. Thus there could never be in it a perceptible space entirely empty. And an emptied space which merely existed in theory could not compel the adjacent fluid to come and fill it.

At this point, again, I should like Erasistratus himself to answer regarding this small elementary nerve, whether it is actually one and definitely continuous, or whether it consists of many small bodies, such as those assumed by Epicurus, Leucippus, and Democritus. For I see that the Erasistrateans are at variance on this subject. Some of them consider it one and continuous, for otherwise, as they say, he would not have called it *simple*; and some venture to resolve it into yet other elementary bodies. But if it be one and continuous, then what is evacuated from it in the so-called *insensible transpiration* of the

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this teaching involved the idea of a *psyche,* or conscious vital principle. "Psychic pneuma" is in Latin *spiritus animalis* (*anima = psyche*); cf. p. 126, note 4. Introduction, p. xxxiv.

2 Observe that Erasistratus's "simple nerve" may be almost looked on as an anticipation of the *cell.* The question Galen now asks is whether this vessel is a "unit mass of living matter," or merely an agglomeration of *atoms* subject to mechanical law. *cf.* Galen's "fibres," p. 329.
οὐδεμίαν ἐν ἑαυτῷ καταλείπει χώραν κενῆν. οὔτω γὰρ οὐχ ἐν ἄλλᾳ πολλὰ γενησεται, διειργο-
μένα δὴν πο ταῖς κεναῖς χώραις. εἰ δὲ εκ πολλῶν
σύγκειται, τῇ κηπαίᾳ κατὰ τὴν παροιμίαν πρὸς
'Ασκληπιάδην ἀπεχωρήσαμεν ἄναρμα τινα στοι-
χεία τιθέμενοι. πάλιν οὖν ἄτεχνος ἡμῖν ἡ φύσις
λεγέσθω· τοῖς γὰρ τοιούτοις στοιχείοις ἐξ ἀνάγ-
κης τοῦθ' ἐπεται.

Διὸ δὴ μοι καὶ δοκοῦσιν ἀμαθῶς πάνυ τὴν εἰς
tὰ τοιαῦτα στοιχεῖα τῶν ἀπλῶν ἀγγείων εἰσάγειν
dιάλυσιν ἐνιοῦ τῶν Ἐρασίστρατείων. ἐμοὶ γοῦν
οὐδὲν διαφέρει. καθ' ἐκατέρως γὰρ ἄτοπος ὁ
tῆς θρέψεως ἔσται λόγος, ἐκεῖνος τοῖς ἀπλοῖς
ἀγγείοις τοῖς σμικροῖς τοῖς συντιθεῖσι τὰ μεγάλα
τε καὶ αἰσθητὰ νεύρα κατὰ μὲν τοὺς συνεχὴ
φυλάττοντας αὐτὰ μὴ δυναμένης γενέσθαι τῆς
πρὸς τὸ κενούμενον ἀκολουθίας, ὅτι μηδὲν ἐν τῷ
συνεχεῖ γίγνεται κενὸν, καὶ ἀπορρέῃ τῇ συνερ-
χεται γὰρ πρὸς ἄλληλα τὰ καταλειπόμενα μόρια,
καθάπερ ἐπὶ τοῦ ὑδάτος ὄραται, καὶ πάλιν ἐν
γίγνεται πάντα τὴν χώραν τοῦ διαφορηθέντος
αὐτὰ καταλαμβάνοντα· κατὰ δὲ τοὺς ἔτερους,
ὅτι τῶν στοιχείων ἐκείνων οὐδὲν δεῖται τῆς πρὸς
τὸ κενούμενον ἀκολουθίας. ἐπὶ γὰρ τῶν αἰσθητῶν
μόνων, οὐκ ἐπὶ τῶν λόγων θεωρητῶν ἔχει δύναμιν,
όσ αὐτὸς ὁ Ἐρασίστρατος ὁμολογεῖ διαρρήξην,
οὐ περὶ τοῦ τοιούτου κενοῦ φάσκων ἐκάστοτε
ποιεῖσθαι τὸν λόγον, ὁ κατὰ βραχὺ παρέσπαρται
tοῖς σώμασιν, ἀλλὰ περὶ τοῦ σαφοῦς καὶ αἰσθητοῦ
καὶ ἀθρόου καὶ μεγάλου καὶ ἑναρχοῦς καὶ ὅπως
ἀν ἄλλως ὀνομᾶζειν ἑθέλησ. Ἐρασίστρατος μὲν
γὰρ αὐτὸς αἰσθητὸν ἀθρόως οὐ φησι δύνασθαι

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physicians will leave no empty space in it; otherwise it would not be one body but many, separated by empty spaces. But if it consists of many bodies, then we have "escaped by the back door," as the saying is, to Asclepiades, seeing that we have postulated certain inharmonious elements. Once again, then, we must call Nature "inartistic"; for this necessarily follows the assumption of such elements.

For this reason some of the Erasistrateans seem to me to have done very foolishly in reducing the simple vessels to elements such as these. Yet it makes no difference to me, since the theory of both parties regarding nutrition will be shown to be absurd. For in these minute simple vessels constituting the large perceptible nerves, it is impossible, according to the theory of those who would keep the former continuous, that any "refilling of a vacuum" should take place, since no vacuum can occur in a continuum even if anything does run away; for the parts left come together (as is seen in the case of water) and again become one, taking up the whole space of that which previously separated them. Nor will any "refilling" occur if we accept the argument of the other Erasistrateans, since none of their elements need it. For this principle only holds of things which are perceptible, and not of those which exist merely in theory; this Erasistratus expressly acknowledges, for he states that it is not a vacuum such as this, interspersed in small portions among the corpuscles, that his various treatises deal with, but a vacuum which is clear, perceptible, complete in itself, large in size, evident, or however else one cares to term it (for, what Erasistratus himself says is, that "there cannot be a
γενέσθαι κενῶν· ἐγὼ δ' ἐκ περιουσίας εὐπορῆσας ὄνομάτων ταύτων δῆλον ἐν γε τῷ ὑπὸ προκειμένω λόγῳ δυναμένων καὶ τάλλα προσέθηκα.

100 Καλλιον οὖν μοι δοκεῖ καὶ ἢμᾶς τι συνεισενέγκασθαι τοῖς Ἑρασιστρατείοις, ἐπειδὴ κατὰ τοῦτο γεγόναμεν, καὶ συμβουλεύσας τοὺς τὸ πρῶτον ἐκεῖνο καὶ ἅπλούν ὑπ' Ἑρασιστράτων καλούμενον ἀγγείον εἰς ἔτερ' ἅττα σώματα στοιχεῖωδῆ διαλύουσιν ἀποστήναι τῆς ὑπολήψεως, ὡς πρὸς τῷ μηδὲν ἔχειν πλέον ἔτι καὶ διαφερομένοις Ἑρασιστράτῳ. ὅτι μὲν ὁμοῦ οὐδὲν ἔχει πλέον, ἐπιδεδείκται σαφῶς· οὐδὲ γὰρ ἡδυνῆθη διαφυγεῖν τὴν περὶ τῆς θρέψεως ἀπορίαν ἡ ὑπόθεσις· ὅτι δ' οὐδ' Ἑρασιστράτῳ σύμφωνον ἐστιν, ὃ ἐκεῖνος ἅπλοῦν καὶ πρῶτον ὀνομάζει, συνθέτοι ἀποφαίνουσα, καὶ τὴν τῆς φύσεως τέχνην ἀναιροῦσα, πρόδηλον καὶ τοῦτ' εἶναι μοι δοκεῖ. εἰ μὴ γὰρ καν τοῖς ἅπλοῖς τούτοις ἐνωσίν τινα τῆς οὐσίας ἀπολείψειν, ἀλλ' εἰς ἄναρμα καὶ ἀμέριστα καταβησόμεθα στοιχεῖα, παντάπασιν ἀναιρίσομεν τῆς φύσεως τὴν τέχνην, ὅσπερ καὶ πάντες οἱ ἐκ ταύτης ὁρμώμενοι τῆς ὑποθέσεως ἰατροὶ καὶ φιλόσοφοι. δευτέρα γὰρ τῶν τοῦ ξύλου μορίων κατὰ τὴν τοιαύτην ὑπόθεσιν ἡ φύσις, οὗ πρῶτη

101 γίγνεται. διαπλάττετει δὲ καὶ δημιουργεῖν οὐ τού δευτέρου γεγονότος, ἀλλὰ τοῦ προϋπάρχουτος ἐστιν· ὥστ' ἀναγκαῖον ἐστιν εὐθὺς ἐκ σπερμάτων ὑποθέσθαι τὰς δυνάμεις τῆς φύσεως, αἰς δια-

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1 cf. Book I., chap xii.
2 i.e. in biology we must begin with living substance—with something which is specifically alive—here with the "unit mass of living matter." cf. p. 73, note 3.

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perceptible space which is entirely empty"; while I, for my part, being abundantly equipped with terms which are equally elucidatory, at least in relation to the present topic of discussion, have added them as well).

Thus it seems to me better that we also should help the Erasistrateans with some contribution, since we are on the subject, and should advise those who reduce the vessel called primary and simple by Erasistratus into other elementary bodies to give up their opinion; for not only do they gain nothing by it, but they are also at variance with Erasistratus in this matter. That they gain nothing by it has been clearly demonstrated; for this hypothesis could not escape the difficulty regarding nutrition. And it also seems perfectly evident to me that this hypothesis is not in consonance with the view of Erasistratus, when it declares that what he calls simple and primary is composite, and when it destroys the principle of Nature's artistic skill. For, if we do not grant a certain unity of substance to these simple structures as well, and if we arrive eventually at inharmonious and indivisible elements, we shall most assuredly deprive Nature of her artistic skill, as do all the physicians and philosophers who start from this hypothesis. For, according to such a hypothesis, Nature does not precede, but is secondary to the parts of the animal. Now, it is not the province of what comes secondarily, but of what pre-exists, to shape and to construct. Thus we must necessarily suppose that the faculties of Nature, by which she

3 "Ad elementa quae nec coalescere possunt nec in partes dividit" (Linacre). On the two contrasted schools cf. p. 45.
4 cf. loc. cit.
πλάττει τε καὶ αὐξάνει καὶ τρέφει τὸ ζῷον. ἀλλ' ἐκείνων τῶν σωμάτων τῶν ἀνάρμων καὶ ἀμερῶν οὐδὲν ἐν ἑαυτῷ διαπλαστικὴν ἔχει δύναμιν ἢ αὐξητικὴν ἢ θρεπτικὴν ἢ ὄλως τεχνικὴν ἀπαθεῖς γὰρ καὶ ἀμετάβλητον ὑπόκειται. τῶν δ' εἰρημένων οὐδὲν ἄνευ μεταβολῆς καὶ ἀλλοιώσεως καὶ τῆς δ' ὁλον κράσεως γίγνεται, καθάπερ καὶ διὰ τῶν ἐμπροσθὲν ἐνεδειξάμεθα. καὶ διὰ ταύτην τὴν ἀνάγκην οὐκ ἔχοντες, ὅπως τὰ ἀκόλουθα τοῖς στοιχείοις, οἷς ὑπέθετο, φυλάττοιεν, οἱ ἀπὸ τῶν τοιούτων αἱρέσεων ἀπαντεῖς ἀτεχνὸν ἡμαρακάσθησαν ἀποφημάθαι τὴν φύσιν. καίτοι ταῦτά ἦν οὐ παρ' ἡμῶν ἔχρην μανθάνειν τοὺς Ἐρασιστράτειους, ἀλλὰ παρ' αὐτῶν τῶν φιλοσόφων, οἷς μάλιστα δοκεῖ πρῶτον ἐπισκοπεῖσθαι τὰ στοιχεῖα τῶν ὑλῶν ἀπάντων.

Οὕκον οὖν Ἐρασιστράτον ἄν τις ὁρθῶς ἄχρι τοσαύτης ἀμαθίας νομίζοι προήκειν, ὡς μηδενὶ ταύτην γνωρίσαι δυνηθηναι τὴν ἀκολουθιαν, ἀλλ' ἄμα μὲν ὑποθέσας τεχνικὴν τὴν φύσιν, ἄμα δ' εἰς ἀπαθή καὶ ἀναρμα καὶ ἀμεταβλήτα στοιχεία καταθραύασαι τὴν οὐσίαν. καὶ μὴν εἰ δώσει τιν' ἐν τοῖς στοιχείοις ἀλλοϊσθοί σε καὶ μεταβολὴν καὶ ἑνώσιν καὶ συνέχειαν, ἐν ἀσύνθετον αὐτῶ τὸ ἀπλοῦν ἁγγεῖον ἔκειν, καθάπερ καὶ αὐτὸς ὄνομάζει, γενησται. ἀλλ' ἡ μὲν ἀπλὴ φλέψ ἐξ αὐτῆς τραφήσεται, τὸ νεῦρον δὲ καὶ ἡ ἀρτηρία παρὰ τῆς φλεβός.

2 "At corporum quae nec una committi nec dividi possunt nullum in se formaricem, auctricem, nutricem, aut
shapes the animal, and makes it grow and receive nourishment, are present from the seed onwards; whereas none of these inharmonious and non-partite corpuscles contains within itself any formative, incremental, nutritive, or, in a word, any artistic power; it is, by hypothesis, unimpressionable and untransformable, whereas, as we have previously shown, none of the processes mentioned takes place without transformation, alteration, and complete intermixture. And, owing to this necessity, those who belong to these sects are unable to follow out the consequences of their supposed elements, and they are all therefore forced to declare Nature devoid of art. It is not from us, however, that the Erasistrateans should have learnt this, but from those very philosophers who lay most stress on a preliminary investigation into the elements of all existing things.

Now, one can hardly be right in supposing that Erasistratus could reach such a pitch of foolishness as to be incapable of recognizing the logical consequences of this theory, and that, while assuming Nature to be artistically creative, he would at the same time break up substance into insensible, inharmonious, and untransformable elements. If, however, he will grant that there occurs in the elements a process of alteration and transformation, and that there exists in them unity and continuity, then that simple vessel of his (as he himself names it) will turn out to be single and uncompounded. And the simple vein will receive nourishment from itself, and the nerve and artery from the vein. How, and in what

in summa artificem facultatem habet; quippe quod im-patibile esse immutibileque praesumitur” (Linacre).

3 Book I., chaps. v.—xl.
πῶς καὶ τίνα τρόπον; ἐν τούτῳ γὰρ δὴ καὶ πρόσθεν γενόμενοι τῷ λόγῳ τῆς τῶν Ἐρασίστρατείων διαφωνίας ἐμπιστεύσαμεν, ἔπεδείξαμεν δὲ καὶ καθ' ἐκατέρως μὲν ἀπορον εἶναι τὴν τῶν ἀπλῶν ἐκείνων ἀγγείων θρέψιν, ἀλλὰ καὶ κρῖναι τὴν μάχην αὐτῶν οὐκ ὁκυνήσαμεν καὶ τιμήσαι τὸν Ἐρασίστρατον εἰς τὴν βελτίωνα μεταστήσαντες αἴρεσιν.

Ἄθις οὖν ἐπὶ τὴν ἐν ἀπλοῦν ἡμώμενον ἑαυτῷ πάντη τὸ στοιχείον ἐκεῖνο νεύροιν ὑποτιθεμένην αἴρεσιν ὁ λόγος μεταβάς ἐπισκοπεῖσθω, πῶς τραφύσηται τὸ γὰρ εὑρέθην ἐνταῦθα κοινὸν ἢ ἢ δὴ καὶ τῆς Ἰπποκράτους αἱρέσεως γένοιτο.

Κάλλιον δ' ἂν μοι δοκῶ τὸ ζητούμενον ἐπὶ τῶν νευσηκότων καὶ σφόδρα καταλελεπτυσμένων βασανισθῆναι. πάντα γὰρ τούτοις ἐναργῶς φαίνεται τὰ μόρια τοῦ σώματος ἀτροφα καὶ λεπτὰ καὶ πολλῆς προσθήκης τε καὶ ἀναθρέψεως δεόμενα. καὶ τοίνυν καὶ τὸ νεύρον τοῦτο τὸ αἰσθητόν, ἐφ' οὔπερ ἐξ ἀρχῆς ἐποιησάμην τὸν λόγον, ἰσχυόν μὲν ἰκανῶς γέγονε, δεῖται δὲ θρέψεως. ἔχει δ' ἐν ἑαυτῷ μέρη πάμπολλα μὲν ἐκεῖνα τὰ πρῶτα καὶ ἀόρατα νεῦρα τά σμικρὰ καὶ τινὰς ἀρτηρίας ἀπλὰς ὀλίγας καὶ φλέβας ὀμοίως ἄπαντι οὖν αὐτοῦ τὰ νεῦρα τὰ στοιχεῖώδη καταλελεπτυνται δηλοῦντι καὶ αὐτά, ἢ, εἰ μηδ' ἐκεῖνα, οὔδὲ τὸ ὅλον. καὶ τοίνυν καὶ θρέψεως οὐ τὸ μὲν ὅλον δεῖται νευρον, ἐκαστον δ' ἐκείνων οὐ δεῖται. καὶ μην εἰ δεῖται μὲν ἀναθρέψεως, οὔδέν δ' ἡ πρὸς τὸ κενούμενον ἀκολούθια
way? For, when we were at this point before, we drew attention to the disagreement among the Erasistrateans, and we showed that the nutrition of these simple vessels was impracticable according to the teachings of both parties, although we did not hesitate to adjudicate in their quarrel and to do Erasistratus the honour of placing him in the better sect.  

Let our argument, then, be transferred again to the doctrine which assumes this *elementary nerve* to be a single, simple, and entirely unified structure, and let us consider how it is to be nourished; for what is discovered here will at once be found to be common also to the school of Hippocrates.  

It seems to me that our enquiry can be most rigorously pursued in subjects who are suffering from illness and have become very emaciated, since in these people all parts of the body are obviously atrophied and thin, and in need of additional substance and feeding-up; for the same reason the ordinary *perceptible nerve*, regarding which we originally began this discussion, has become thin, and requires nourishment. Now, this contains within itself various parts, namely, a great many of these primary, invisible, minute nerves, a few simple arteries, and similarly also veins. Thus, all its elementary nerves have themselves also obviously become emaciated; for, if they had not, neither would the nerve as a whole; and of course, in such a case, the whole nerve cannot require nourishment without each of these requiring it too. Now, if on the one hand they stand in need of feeding-up, and if on the

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2 On account of his idea of a simple tissue not susceptible of further analysis.  

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βοηθεῖν αὐτοῖς δύναται διὰ τὰς ἐμπροσθεν εἰρημένας ἀπορίας καὶ διὰ τὴν ὑπόγυον ἵσχυο-
tητα, καθάπερ δείξω, ξητητέων ἦμων ἐστιν ἐτέραν αἰτίαν θρέψεως.

Πῶς οὖν ἡ πρὸς τὸ κενοῦμενον ἀκολουθία τρέφειν ἀδύνατὸς ἐστὶ τῶν οὕτω διακεῖμενον;

104 ὅτι τοσοῦτον ἀκολουθεῖν || ἀναγκάζει τῶν συν-
εχῶν, ὡςον ἀπορρεῖ. τούτο δὲ ἐπὶ μὲν τῶν ἐνεκτούντων ἱκανόν ἐστιν εἰς τὴν θρέψιν, ἵσα
γὰρ ἐπὶ αὐτῶν εἶναι χρὴ τοῖς ἀπορρέουσι τὰ προστιθέμενα: ἐπὶ δὲ τῶν ἑσχάτως ἴσχυῶν καὶ
πολλῆς ἀναθρέψεως δεομένων εἰ μὴ πολλαπλά-
σιον εἰς τὸ προστιθέμενον τοῦ κενοῦμενον, τὴν
ἐξ ἀρχῆς ἔξιν ἀναλαβεῖν οὐκ ἂν ποτὲ δύναντο.
δὴ λοιπὸν ὡς ἐλκεῖν αὐτὰ δεῖσαι τοσοῦτῳ
πλεῖον, ὡς καὶ δεῖται πλείονος. Ἐρασίστρατος
dὲ κανταῦθα πρότερον ποιήσας τὸ δεύτερον οὐκ
οἴδ᾿ ὡπὸς οὐκ αἰσθάνεται. διότι γὰρ, φησὶ,
pολλῇ πρόσθεσις εἰς ἀναθρέψιν γίνεται τοῖς
νενοσηκόσι, διὰ τούτῳ καὶ ἡ πρὸς ταύτην ἀκολο-
θία πολλῇ. πῶς δὲ ἂν πολλῇ πρόσθεσις ἐνοίκῳ
μὴ προηγομένης ἀναδόσεως δαψιλῷς; εἴ δὲ
τὴν διὰ τῶν φλεβῶν φορὰν τῆς τροφῆς ἀνάδοσιν
καλεῖ, τὴν δὲ εἰς ἐκαστον τῶν ἀπλῶν καὶ ἀφράτων
ἐκείνων νεύρων καὶ ἀρτηρίων μετάληψιν οὐκ
ἀνάδοσιν ἀλλὰ διάδοσιν, ὡς τῶν ὀνομάζειν

105 ἤξιώσαν, εἶτα || τὴν διὰ τῶν φλεβῶν μόνη τῇ

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1 The horror vacui.
other the principle of the refilling of a vacuum\(^1\) can give them no help—both by reason of the difficulties previously mentioned and the actual thinness, as I shall show—we must then seek another cause for nutrition.

How is it, then, that the tendency of a vacuum to become refilled is unable to afford nourishment to one in such a condition? Because its rule is that only so much of the contiguous matter should succeed as has flowed away. Now this is sufficient for nourishment in the case of those who are in good condition, for, in them, what is presented\(^2\) must be equal to what has flowed away. But in the case of those who are very emaciated and who need a great restoration of nutrition, unless what was presented were many times greater than what has been emptied out, they would never be able to regain their original habit. It is clear, therefore, that these parts will have to exert a greater amount of attraction, in so far as their requirements are greater.

And I fail to understand how Erasistratus does not perceive that here again he is putting the cart before the horse. Because, in the case of the sick, there must be a large amount of presentation\(^2\) in order to feed them up, he argues that the factor of "refilling"\(^1\) must play an equally large part. And how could much presentation take place if it were not preceded by an abundant delivery\(^3\) of nutriment? And if he calls the conveyance of food through the veins delivery, and its assumption by each of these simple and visible nerves and arteries not delivery but distribution\(^4\), as some people have thought fit to name it, and then ascribes conveyance

\(^{1}\text{Anadosis, "absorption"; cf. p.13, note 5.}\)\(^{2}\text{Lit. diadosis.}\)
πρὸς τὸ κενούμενον ἀκολούθια φησὶ γίγνεσθαι, τὴν εἰς τὰ λόγω θεωρητὰ μετάληψιν ἡμῖν ἐξηγησάσθω. ὅτι μὲν γὰρ οὐκέτι ἐπὶ τούτων ἡ πρὸς τὸ κενούμενον ἀκολούθια λέγεσθαι δύναται καὶ μάλιστ' ἐπὶ τῶν ἐσχάτως ἱσχρῶν, ἀποδέδεικται. τί δὲ φησιν ἐπ' αὐτῶν ἐν τῷ δευτέρῳ τῶν καθόλου λόγων ὁ 'Ερασίστρατος, ἡξιον ἐπακοῦσαι τῆς λέξεως: "Τοίς δ' ἐσχάτοις τε καὶ ἀπλοῖς, λεπτοῖς τε καὶ στενοῖς ὀυσίων, ἐκ τῶν παρακειμένων ἥγειεών ἡ πρόσθεσις συμβαίνει εἰς τὰ κενόματα τῶν ἀπενεχθέντων κατὰ τὰ πλάγια τῶν ἥγειεών ἐλκομένης τῆς τροφῆς καὶ καταχωριζομένης." ἐκ ταύτης τῆς λέξεως πρῶτον μὲν τὸ κατὰ τὰ πλάγια προσέρχει τε καὶ ἀποδέχομαι κατὰ μὲν γὰρ αὐτὸ τὸ στόμα τὸ ἀπλοῦν νεόροιν οὐκ ἂν δύνατο δεχόμενον τὴν τροφὴν οὕτως εἰς ὅλον ἐαυτὸ διανέμειν· ἀνάκειται γὰρ ἐκείνο τῷ ψυχικῷ πνεύματι κατὰ δὲ τὸ πλάγιον ἐκ τῆς παρακειμένης φλεβὸς τῆς ἀπλῆς ἐγχώρει λαβείν αὐτό. δεύτερον δ' ἀποδέχομαι τῶν ἐκ τῆς 'Ερασίστρατος λέξεως ὀνομάτων τὸ γεγραμμένον ἐφεξῆς τῷ κατὰ τὰ πλάγια. || τί γὰρ φησι; "Κατὰ τὰ πλάγια τῶν ἥγειεών ἐλκομένης τῆς τροφῆς." ὅτι μὲν οὖν ἐλκεται, καὶ ἡμεῖς ὀμολογούμεν, ὅτι δ' οὐ τῇ πρὸς τὸ κενούμενον ἀκολούθια, δεδεικται πρόσθεν.

VII

'Εξεύρωμεν οὖν κοινῆ, πῶς ἐλκεται. πῶς δ' ἄλλως ἢ ὁς ὁ σίδηρος ύπο τῆς ἡρακλείας λίθου

1 i.e. let him explain the diadosis.
through the veins to the principle of vacuum-refilling alone, let him explain to us the assumption of food by the hypothetical elements. For it has been shown that at least in relation to these there is no question of the refilling of a vacuum being in operation, and especially where the parts are very attenuated. It is worth while listening to what Erasistratus says about these cases in the second book of his "General Principles": "In the ultimate simple [vessels], which are thin and narrow, presentation takes place from the adjacent vessels, the nutriment being attracted through the sides of the vessels and deposited in the empty spaces left by the matter which has been carried away." Now, in this statement firstly I admit and accept the words "through the sides." For, if the simple nerve were actually to take in the food through its mouth, it could not distribute it through its whole substance; for the mouth is dedicated to the psychic pneuma. It can, however, take it in through its sides from the adjacent simple vein. Secondly, I also accept in Erasistratus's statement the expression which precedes "through the sides." What does this say? "The nutriment being attracted through the sides of the vessels." Now I, too, agree that it is attracted, but it has been previously shown that this is not through the tendency of evacuated matter to be replaced.

VII

Let us, then, consider together how it is attracted. How else than in the way that iron is attracted by

2 "Spiritus animalis"; cf. p. 152, note 1. The nutriment was for the walls of the vessels, not for their cavities. cf. p. 319, note 3.
δύναμιν ἐξούσις ἐλκτικῆς τοιαύτης ποιότητος; ἀλλ' εἰ τὴν μὲν ἀρχὴν τῆς ἀναδόσεως ἢ τῆς κοιλίας ἐνθλήψει παρέχεται, τὴν δὲ μετὰ ταῦτα φοράν ἀπασαν αἳ τε φλέβες περιστελλόμεναι καὶ προωθοῦσαί καὶ τῶν τρεφομένων ἑκαστὸν ἐπιστῶμενον εἰς ἑαυτό, τῆς πρὸς τὸ κενούμενον ἀκολουθίας ἀποστάντες, ὡς οὐ πρεποῦσης ἀνδρὶ τεχνικήν ὑποθεμένοι τὴν φύσιν, οὕτως ἄν ἦδη καὶ τὴν ἀντιλογιὰν εἰςμεν πεθευγότες τὴν Ἀσκληπιάδου μὴ δυνάμενοι γε λύειν αὐτὴν. τὸ γὰρ εἰς τὴν ἀποδειξιν παραλαμβανόμενον λήμμα τὸ διεξενιμένον οὐκ ἐκ δυοῖν ἀλλ' ἐκ τριῶν ἐστι κατὰ γε τὴν ἀλήθειαν διεξενιμένοι. εἰ μὲν οὖν 107 ὡς ἐκ δυοῖν αὐτῷ χρη||σάμεθα, ψεύδος ἐσται τι τῶν εἰς τὴν ἀποδειξιν παραληπτομένων εἰ δ' ὡς ἐκ τριῶν, ἀπέραντος δ' λόγος γενηστεται.

VIII

Καὶ ταῦτ' οὐκ ἔχρην ἀγνοεῖν τὸν Ἑρασίστρατον, εἶπερ κἂν ὅπως ποτὲ τοῖς ἐκ τοῦ περιπάτου δυνατοῖς, ὡσπερ οὖν οὐδὲ τὰ περὶ τῆς γενέσεως τῶν χιμών, ὑπὲρ δὲ οὖν οὐδὲν ἔχων εἰπεῖν οὐδὲ μέχρι τοῦ μετρίου πιθανοῦ οὔτει παρακρούει σκηπτόμενος, ὡς οὐδὲ χρήσιμος ὅλος ἐστὶν ἢ τῶν τοιούτων ἐπίσκεψις. εἰτ', ὅ πρὸς θεῶν, ὅπως μὲν τὰ σιτία κατὰ τὴν γαστέρα πέστεται χρήσιμον ἐπιστασθαι, πῶς δ' ἐν ταῖς φλεψιν ἢ
ON THE NATURAL FACULTIES, II. vii.-viii

the lodestone, the latter having a faculty attractive of this particular quality [existing in iron]? 1 But if the beginning of anadosis depends on the squeezing action of the stomach, 2 and the whole movement thereafter on the peristalsis and propulsive action of the veins, as well as on the traction exerted by each of the parts which are undergoing nourishment, then we can abandon the principle of replacement of evacuated matter, as not being suitable for a man who assumes Nature to be a skilled artist; thus we shall also have avoided the contradiction of Asclepiades 3 though we cannot refute it: for the disjunctive argument used for the purposes of demonstration is, in reality, disjunctive not of two but of three alternatives; now, if we treat the disjunction as a disjunction of two alternatives, one of the two propositions assumed in constructing our proof must be false; and if as a disjunctive of three alternatives, no conclusion will be arrived at.

VIII

Now Erasistratus ought not to have been ignorant of this if he had ever had anything to do with the Peripatetics—even in a dream. Nor, similarly, should he have been unacquainted with the genesis of the humours, about which, not having even anything moderately plausible to say, he thinks to deceive us by the excuse that the consideration of such matters is not the least useful. Then, in Heaven's name, is it useful to know how food is digested in the stomach, but unnecessary to know how bile comes into existence

1 Specific attraction; cf. Book I., chap. xiv.
2 cf. p. 100, note 2.
3 In Book II., chap. i.
χολή γίγνεται, περιττόν; καὶ τῆς κενώσεως ἂρα φροντίστευτον αὐτῆς μόνης, ἀμελητέον δὲ τῆς γενέσεως; ὥσπερ οὖν ἁμείνον ὑπάρχον μακρὸ τὸ καλύειν εὐθὺς ἐξ ἀρχῆς γεννᾶσθαι πλείονα τοῦ πράγματ' ἔχειν ἐκκενοῦντας. θαυμαστὸν δὲ καὶ τὸ διαπορεῖν, εἴτ' ἐν τῷ σώματι τήν γένεσιν αὐτῆς ὑποθετέον εἴτ' εὐθὺς ἐξωθεὶν ἐν τοῖς σιτίοις περιέχεσθαι φατέον. εἶ γὰρ ὅτι τοῦτο καλὸς ἡπόρηται, τι οὐχὶ καὶ περὶ τοῦ αἷματος ἐπισκε-108 ψόμεθα, πότερον ἐν τῷ σώματι ἡ λαμβάνει τήν γένεσιν ἢ τοῖς σιτίοις παρέσπαρται, καθάπερ οἱ τάς ὁμοιομερείας ὑποτιθέμενοι φασι; καὶ μὴν πολλῷ γ' ἢν χρησιμότερον ζητεῖσθαι, ποιὰ τῶν σιτίων ὁμολογεῖ τῇ τῆς αἷματόσωσις ἐνεργεια καὶ ποιὰ διαφέρεται, τοῦ ζητεῖν, τίνα μὲν τῇ τῆς γαστρός ἐνεργεία νικᾶται ῥάδιως, τίνα δ' ἀντι-βαίνει καὶ μάχεται. τούτων μὲν γὰρ ἡ ἐκλεξίς εἰς πέψιν μόνην, ἐκείνων δ' εἰς αἷματος χρηστοῦ διαφέρει γένεσιν. οὐδὲ γὰρ ἴσον ἔστιν ἢ μὴ καλὸς ἐν τῇ γαστρὶ χυλοθήκην τῇ τροφῇ ἢ μὴ χρηστῶν αἷμα γεννηθήκαν. πῶς δ' οὐκ αἰδεῖται τάς μὲν τῆς πέψεως ἀποτυχίας διαιροῦμενος, ως πολλαί τ' εἰσὶ καὶ κατὰ πολλάς γίγνονται προφάσεις, ὑπὲρ δὲ τῶν τῆς αἷματόσωσις σφαλ-μάτων οὖν ἀχρί ρήματος εὑνός οὖν ἀχρὶ συλλαβῆς μᾶς φθεγξάμενος; καὶ μὴν εὐρίσκεται γε καὶ παχὺ καὶ λεπτὸν ἐν ταῖς φλεψίν αἱμα καὶ τοῖς μὲν ἐρυθρότερον, τοῖς δὲ ξανθότερον, τοῖς δὲ μελάντερον, τοῖς δὲ φλεγματωδέστερον. εἰ δ' οἵτι

1 Prevention better than cure.
2 e.g. Anaxagoras; cf. p. 7, note 5; p. 20, note 3.
3 Lit. haematosia.

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in the veins? Are we to pay attention merely to the evacuation of this humour, and not to its genesis? As though it were not far better to prevent its excessive development from the beginning than to give ourselves all the trouble of expelling it! And it is a strange thing to be entirely unaware as to whether its genesis is to be looked on as taking place in the body, or whether it comes from without and is contained in the food. For, if it was right to raise this problem, why should we not make investigations concerning the blood as well—whether it takes its origin in the body, or is distributed through the food as is maintained by those who postulate homœomerias? Assuredly it would be much more useful to investigate what kinds of food are suited, and what kinds unsuited, to the process of blood-production rather than to enquire into what articles of diet are easily mastered by the activity of the stomach, and what resist and contend with it. For the choice of the latter bears reference merely to digestion, while that of the former is of importance in regard to the generation of useful blood. For it is not equally important whether the aliment be imperfectly chylified in the stomach or whether it fail to be turned into useful blood. Why is Erasistratus not ashamed to distinguish all the various kinds of digestive failure and all the occasions which give rise to them, whilst in reference to the errors of blood-production he does not utter a single word—nay, not a syllable? Now, there is certainly to be found in the veins both thick and thin blood; in some people it is redder, in others yellower, in some blacker, in others more of the nature of phlegm. And one who realizes that it
Erasistratus held the spleen to be useless, cf. p. 143.

Induration: Gk. skirros, Lat. scirrhus. The condition is now commonly known by Laënnec’s term cirrhosis, from Gk. kírros, meaning yellow or tawny. Here again we have an example of Erasistratus’s bias towards anatomical or structural rather than functional explanations of disease. cf. p. 124, note 1.
may smell offensively not in one way only, but in a
great many different respects (which cannot be put
into words, although perfectly appreciable to the
senses), would, I imagine, condemn in no measured
terms the carelessness of Erasistratus in omitting
a consideration so essential to the practice of our
art.

Thus it is clear what errors in regard to the
subject of dropsies logically follow this carelessness.
For, does it not show the most extreme carelessness
to suppose that the blood is prevented from going
forward into the liver owing to the narrowness of the
passages, and that dropsy can never occur in any
other way? For, to imagine that dropsy is never
caused by the spleen\(^1\) or any other part, but always by
induration of the liver,\(^2\) is the standpoint of a man
whose intelligence is perfectly torpid and who is
quite out of touch with things that happen every
day. For, not merely once or twice, but frequently,
we have observed dropsy produced by chronic
haemorrhoids which have been suppressed,\(^3\) or
which, through immoderate bleeding, have given
the patient a severe chill; similarly, in women, the
complete disappearance of the monthly discharge,\(^4\)
or an undue evacuation such as is caused by
violent bleeding from the womb, often provoke
dropsy; and in some of them the so-called female
flux ends in this disorder. I leave out of account

\(^3\) On the risks which were supposed to attend the checking
of habitual bleeding from piles cf. Celsus (\textit{De Re Med. VI.}
\textit{xviii. 9}), “\textit{Atque in quibusdam parum tuto supprimitur, qui
sanguinis profluvio imbeciliores non fiunt; habent enim
purgationem hanc, non morbum.” (\textit{i.e. the habit was to be
looked on as a periodical cleansing, not as a disease.})

\(^4\) Lit. \textit{catharsis}.\)
Apparently some form of anaemia.
the dropsy which begins in the flanks or in any other susceptible part; this clearly confutes Erasistratus's assumption, although not so obviously as does that kind of dropsy which is brought about by an excessive chilling of the whole constitution; this, which is the primary reason for the occurrence of dropsy, results from a failure of blood-production,\(^1\) very much like the diarrhoea which follows imperfect digestion of food; certainly in this kind of dropsy neither the liver nor any other viscus becomes indurated.

The learned Erasistratus, however, overlooks—nay, despises—what neither Hippocrates, Diocles, Praxagoras, nor Philistion\(^2\) despised, nor indeed any of the best philosophers, whether Plato, Aristotle, or Theophrastus; he passes by whole functions as though it were but a trifling and casual department of medicine which he was neglecting, without deigning to argue whether or not these authorities are right in saying that the bodily parts of all animals are governed by the Warm, the Cold, the Dry and the Moist, the one pair being active and the other passive, and that among these the Warm has most power in connection with all functions, but especially with the genesis of the humours.\(^3\) Now, one cannot be blamed for not agreeing with all these great men, nor for imagining that one knows more than they; but not to consider such distinguished teaching worthy either of contradiction or even mention shows an extraordinary arrogance.

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\(^1\) For Diocles and Praxagoras see p. 51, note 1.

\(^2\) Philistion of Locri, a contemporary of Plato, was one of the chief representatives of the Sicilian school of medicine.

\(^3\) cf. Book I., chap. iii.
GALEN

Kaὶ μὴν σμικρότατος ἐστὶ τὴν γνώμην καὶ ταπεινῶς ἐσχάτως ἐν ἀπάσαις ταῖς ἀντιλογίαις ἐν μὲν τοῖς περὶ τῆς πέψεως λόγοις τοῖς σήμεσθαι τὰ συτία νομίζουσι φιλοτίμως ἀντιλεγών, ἐν δὲ τοῖς περὶ τῆς ἀναδόσεως τοῖς διὰ τὴν παράθεσιν τῶν ἀρτηρίων ἀναδίδοσθαι τὸ διὰ τῶν φλεβῶν αἷμα νομίζουσι, ἐν δὲ τοῖς περὶ τῆς ἀναπνοῆς τοῖς περιωθεῖσθαι τὸν ἄερα φάσκουσιν. οὐκ ὁκιησε δ’ οὐδὲ τοῖς ἀτμοειδῶς εἰς τὴν κύστιν ἴναι τὰ οὐρα νομίζουσιν ἀντεπείν οὐδὲ τοῖς εἰς τὸ 112 τὸν πνεύμωνα φέρεσθαι τὸ προτὸν. οὕτως ἐν ἀπασὶ τὰς χειριστάς ἐπιλεγόμενος δόξας ἀγάλλεται διατρίβων ἐπὶ πλέον ἐν ταῖς ἀντιλογίαις· ἐπὶ δὲ τῆς τοῦ αἷματος γενέσεως οὐδὲν ἀτμοτέρας οὖσης τῆς ἐν τῇ γαστρί χυλώσεως τῶν σιτίων οὔτ’ ἀντεπεῖν τινὶ τῶν πρεσβυτέρων ἱέρωσεν οὔτ’ αὐτὸς εἰσηγήσασθαι τινὶ ἐτέραν γνώμην ἐτόλμησεν, ὁ περὶ πασῶν τῶν φυσικῶν ἐνεργειῶν ἐν ἀρχῇ τῶν καθόλου λόγων ύποσχόμενος ἐρεῖν, ὅπως τε γίγνονται καὶ δι’ ὄντινων τοῦ ζῴου μορίων. ἢ τῆς μὲν πέπτειν τὰ συτία πεφυκνίας δυνάμεως ἀρρωστοῦσης ἀπεπτύσσει τὸ ζῷον, τῆς δ’ αἷματουσῆς τὰ πεθέντα οὕδεν ἔσται πάθημα τὸ παράπαν, ἀλλ’ ἀδαμαντίνῃ τις ἢμῖν αὐτῇ μόνῃ καὶ ἀπαθής ἐστὶν; ἢ ἀλλ’ τι τῆς ἀρρωστίας αὐτῆς ἐκγονον υπάρξει

1 Gk. pepsis; otherwise rendered coction.
2 cf. p. 13, note 5.
3 e.g. Asclepiades.
4 Lit. chylosis; cf. p. 238, note 2.
5 That is to say, the haematopoietic function deserves
ON THE NATURAL FACULTIES, II. viii

Now, Erasistratus is thoroughly small-minded and petty to the last degree in all his disputations—when, for instance, in his treatise "On Digestion," he argues jealously with those who consider that this is a process of putrefaction of the food; and, in his work "On Anadosis," with those who think that the anadosis of blood through the veins results from the contiguity of the arteries; also, in his work "On Respiration," with those who maintain that the air is forced along by contraction. Nay, he did not even hesitate to contradict those who maintain that the urine passes into the bladder in a vaporous state, as also those who say that imbibed fluids are carried into the lung. Thus he delights to choose always the most valueless doctrines, and to spend his time more and more in contradicting these; whereas on the subject of the origin of blood (which is in no way less important than the chylification of food in the stomach) he did not deign to dispute with any of the ancients, nor did he himself venture to bring forward any other opinion, despite the fact that at the beginning of his treatise on "General Principles" he undertook to say how all the various natural functions take place, and through what parts of the animal! Now, is it possible that, when the faculty which naturally digests food is weak, the animal's digestion fails, whereas the faculty which turns the digested food into blood cannot suffer any kind of impairment? Are we to suppose this latter faculty alone to be as tough as steel and unaffected by circumstances? Or is it that weakness of this faculty will result in some-

consideration as much as the digestive processes which precede it
Galen

καὶ ὁὐχ ὑδερός; δῆλος οὖν ἐναργῶς ἐστὶν ὁ Ἑρασίστρατος ἐξ ὧν ἐν μὲν τοῖς ἄλλοις οὐδὲ ταῖς φαινοτάταις δόξαις ἀντιλέγειν ὁκνησεν, ἐνταυθοὶ δ' οὔτ' ἀντιπεῖν τοῖς πρόσθεν οὔτ' αὐτῶς εἰπεῖν τι καίνον ἑτόλυμησε, τὸ σφάλμα τῆς ἑαυτοῦ γνωρίζων αἱρέσεως.

Τί γὰρ ἄν καὶ λέγειν ἐσχεν ὑπὲρ αἷματος ἐνθρωπος εἰς μηδὲν τῷ συμφύτῳ θερμῷ χρῶμενος; τι δὲ περὶ ξαυθῆς χολῆς ἡ μελαίνης ἡ φλέγματος; ὦτι η Ἄλα δυνατὸν ἑστὶν ἀναμεμενεμένην τοῖς σίτιοις εὐθὺς ἐξωθὲν παραγίγγεσθαι τὴν χολὴν. λέγει γοῦν ὥδε πως αὐτοῖς ὑνόμαισιν ἕνεκεν κατεργασία τῆς τροφῆς γενναίατε τοιαύτη ἕγρασσα ἡ μεμψιμενή τοῖς ἐξωθέν προσφερομένοις παραγίγγεσθαι, οὐδὲν χρήσιμον πρὸς ἰατρικὴν ἑπεσκέφθαι." καὶ μὴν, ὃ γενναίοτατε, καὶ κενοῦσθαι χρήναι φάσκεις ἐκ τοῦ ἕνω τὸν χυμὸν τοῦτον καὶ μεγάλως λυπεῖν, εἰ μὴ κενώθειν. πῶς οὖν οὐδὲν ἐξ αὐτοῦ χρηστοῦ ὑπολαμβάνων γίγνεσθαι τολμᾶς ἄχρηστον λέγειν εἰς ἰατρικὴν εἶναι τὴν περὶ τῆς γενέσεως αὐτοῦ σκέψιν;

Τοποκείσθω γὰρ ἐν μὲν τοῖς σίτιοις περιέχεσθαι, μὴ διακρίνεσθαι δὲ ἀκριβῶς ἐν ἡπατικά ταῦτα γὰρ ἀμφότερα νομίζεις εἶναι δυνατά. καὶ μὴν οὐ σμίκρον ἐνταῦθα τὸ διαφέρον ἡ ἐλαχιστὴν ἡ παμπόλλην χολὴν ἐν ἑαυτοῖς περιέχοντα προσάρασθαι σιτία. τὰ μὲν γὰρ ἀκίνδυνα, τὰ δὲ παμπόλλην περιέχοντα τῷ μὴ δύνασθαι πᾶσαν

1 i.e. Erasistratus could obviously say nothing about any of the humours or their origins, since he had not postulated
thing else than dropsy? The fact, therefore, that Erasistratus, in regard to other matters, did not hesitate to attack even the most trivial views, whilst in this case he neither dared to contradict his predecessors nor to advance any new view of his own, proves plainly that he recognized the fallacy of his own way of thinking.¹

For what could a man possibly say about blood who had no use for innate heat? What could he say about yellow or black bile, or phlegm? Well, of course, he might say that the bile could come directly from without, mingled with the food! Thus Erasistratus practically says so in the following words: "It is of no value in practical medicine to find out whether a fluid of this kind² arises from the elaboration of food in the stomach-region, or whether it reaches the body because it is mixed with the food taken in from outside." But, my very good Sir, you most certainly maintain also that this humour has to be evacuated from the animal, and that it causes great pain if it be not evacuated. How, then, if you suppose that no good comes from the bile, do you venture to say that an investigation into its origin is of no value in medicine?

Well, let us suppose that it is contained in the food, and not specifically secreted in the liver (for you hold these two things possible). In this case, it will certainly make a considerable difference whether the ingested food contains a minimum or a maximum of bile; for the one kind is harmless, whereas that containing a large quantity of bile, owing to the fact that it cannot be properly purified ³ the four qualities (particularly the Warm—that is, innate heat). ¹ i.e. bile. ² i.e. deprived of its bile.
114 αὐτῆν ἐν ἴππατι καθαρθήναι καλῶς αἴτια καταστήσεται τῶν τ' ἄλλων παθῶν, ὅπερ αὐτὸς ὁ Ἑρασίστρατος ἐπὶ πλήθει χολῆς γίγνεσθαι φησι, καὶ τῶν ἴκτέρων οὐχ ἴκιστα. πῶς οὖν οὐκ ἀναγκαίοτατον λατρέῳ γεγυμόσκειν, πρῶτον μὲν, ώς ἐν τοῖς σιτίοις αὐτοῖς ἔξωθεν ἡ χολή περιέχεται, δεύτερον δ', ός τὸ μὲν τεῦτλον, εἰ τύχωι, παμπόλλην, ὁ δ' ἄρτος ἐλαχίστην καὶ τὸ μὲν ἐλαιὸν πλείστην, ὁ δ' οἶνος ὁλιγίστην ἐκαστὸν τε τῶν ἄλλων ἀνίσον τῷ πλήθει περιέχει τὴν χολῆν; πῶς γὰρ οὖκ ἂν εἰπὴ γελοιότατος, διὰ ἂν ἔκων αἴρηται τὰ πλείουν χολῆν ἐν ἑαυτοῖς περιέχοντα πρὸ τῶν ἑναντίων;

Τί δ' εἰ μὴ περιέχεται μὲν ἐν τοῖς σιτίοις ἡ χολή, γίγνεται δ' ἐν τοῖς τῶν ζῴων σώμασιν; ἡ οὖχι καὶ κατὰ τοῦτο χρήσιμον ἐπίστασθαι, τίνι μὲν καταστάσει σῶματος ἐπεται πλείων αὐτῆς ἡ γένεσις, τίνι δ' ἐλάττων; ἀλλοιῶν γὰρ δήπου καὶ μεταβάλλειν οἷοί τ' ἐσμὲν καὶ τρέπειν ἐπὶ τὸ βέλτιον ἀεὶ τὰς μοχθηρᾶς καταστάσεις τοῦ σώματος. ἀλλ' εἰ μὴ γεγυμόσκοιμεν, καθότι μοχθηρὰ καὶ ὑπ' τῆς δεοῦσας ἐξίσταται, πῶς ἂν αὐτὰς ἐπανάγειν οἷοί τ' εἴημεν ἐπὶ τὸ || κρείττον;

Οὐκοιν ἄχρηστον ἐστὶν εἰς τὰς ἱάσεις, ὡς Ἑρασίστρατος φησιν, ἐπίστασθαι τάληθες αὐτὸ περὶ γενέσεως χολῆς. οὐ μὴν οὖδ' ἀδύνατον οὐδ' ἀσαφὲς ἔξευρειν, ὅτι μὴ τῷ πλείστῃν ἐν ἑαυτῷ περιέχειν τὸ μέλι τὴν ἕανθην χολῆν ἀλλ' ἐν τῷ σώματι μεταβαλλόμενον εἰς αὐτὴν ἀλλοιώτατα τε καὶ τρέπεται. πικρὸν τε γὰρ ἂν ἦν γενομένοις, εἰ χολῆν ἔξωθεν εὐθὺς ἐν ἑαυτῷ περιέχειν ἀπασί τ' ἂν ὁσιώτως τοῖς ἀνθρώποις ἰσον αὐτῆς ἐγένεια

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in the liver, will result in the various affections—particularly jaundice—which Erasistratus himself states to occur where there is much bile. Surely, then, it is most essential for the physician to know in the first place, that the bile is contained in the food itself from outside, and, secondly, that for example, beet contains a great deal of bile, and bread very little, while olive oil contains most, and wine least of all, and all the other articles of diet different quantities. Would it not be absurd for any one to choose voluntarily those articles which contain more bile, rather than those containing less?

What, however, if the bile is not contained in the food, but comes into existence in the animal's body? Will it not also be useful to know what state of the body is followed by a greater, and what by a smaller occurrence of bile?\(^1\) For obviously it is in our power to alter and transmute morbid states of the body—in fact, to give them a turn for the better. But if we did not know in what respect they were morbid or in what way they diverged from the normal, how should we be able to ameliorate them?

Therefore it is not useless in treatment, as Erasistratus says, to know the actual truth about the genesis of bile. Certainly it is not impossible, or even difficult to discover that the reason why honey produces yellow bile is not that it contains a large quantity of this within itself, but because it [the honey] undergoes change, becoming altered and transmuted into bile. For it would be bitter to the taste if it contained bile from the outset, and it would produce an equal quantity of bile

\(^1\) Here it is rather the living organism we consider than the particular food that is put into it.
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to plήθος, ἀλλ' οὐχ ὡδ' ἔχει τάληθες. ἐν μὲν γὰρ τοῖς ἀκμάζουσι καὶ μᾶλιστ' ἐὰν φύσει θερμότεροι καὶ βίον εἶν βιοῦντες ταλαιπωροῦν, ἀπαν εἰς ξανθὴν χολὴν μεταβάλλει τὸ μέλιν τοῖς γέρουσι δ' ἰκανῶς ἐστιν ἐπιτήδειον, ὅσ' ἂν οὐκ εἰς χολὴν ἀλλ' εἰς αἷμα τὴν ἀλλοίωσιν ἐν ἑκείνοις λαμβάνον. Ἐρασίστρατος δὲ πρὸς τῷ μηδὲν τοῦτων γυγνώσκειν οὐδὲ περὶ τὴν διαίρεσιν τοῦ λόγου σωφρονεῖ, πότερον ἐν τοῖς συτίοις ἡ χολὴ περιέχεται εὐθὺς εἷς ἄρχης ἡ κατὰ τὴν ἐν τῇ κοιλίᾳ κατεργασίαν ἐγένετο, μηδὲν εἶναι χρήσι-116 μοι ἐν τῇ ἱατρικῇ ἐπεσκέφθαι λέγων. ἔχρην ἦ γὰρ δήποτε προσθείναι τι καὶ περὶ τῆς ἐν ἑπατί καὶ φλεσὶ γενέσεως αὐτῆς, ἐν τοῖς δὲ τοῖς ὀργάνοις γεννᾶσθαι τὴν χολὴν ἀμα τῷ αἴματι τῶν παλαιῶν ἱατρῶν τε καὶ φιλοσόφων ἀποφημαμένων. ἀλλὰ τοῖς εὐθύς εἷς ἄρχης σφαλείσι καὶ διαμαρτάνουσι τῆς ὁρθῆς ὀδοῦ τοιαύτα τε ληρεῖν ἀναγκαίον ἐστί καὶ προσέτε τῶν χρησιμωτάτων εἰς τὴν τέχνην παραλιπεῖν τὴν ζήτησιν.

Ἡδέως δ' ἂν ἐνταῦθα τοῦ λόγου γεγονός ἡρόμην τοὺς ὁμιλήσαι φάσκοντας αὐτὸν ἐπὶ πλείστου τοῖς ἐκ τοῦ περιπάτου φιλοσοφοὺς, εἰ γυγνώσκουσιν, ὅσα περὶ τοῦ κεκράσθαι τὰ σώμαθ ἡμῶν ἐκ θερμοῦ καὶ ψυχροῦ καὶ ξηροῦ καὶ υγροῦ πρὸς Ἀριστοτέλους εἰρηταὶ τε καὶ ὑποδεδεικται, καὶ ὡς τὸ θερμὸν ἐν αὐτοῖς ἐστι τὸ δραστικῶτατον καὶ ὡς τῶν ξύων ὅσα μὲν θερμότερα φύσει, ταῦτα πάντως ἐναίμε, τὰ δ' ἐπὶ πλεύν ψυχρότερα πάντως ἀναίμα καὶ διὰ τοῦτο τοῦ χειμῶνος ἀργά
in every person who took it. The facts, however, are not so.\textsuperscript{1} For in those who are in the prime of life, especially if they are warm by nature and are leading a life of toil; the honey changes entirely into yellow bile. Old people, however, it suits well enough, inasmuch as the alteration which it undergoes is not into bile, but into blood. Erasistratus, however, in addition to knowing nothing about this, shows no intelligence even in the division of his argument; he says that it is of no practical importance to investigate whether the bile is contained in the food from the beginning or comes into existence as a result of gastric digestion. He ought surely to have added something about its genesis in liver and veins, seeing that the old physicians and philosophers declare that it along with the blood is generated in these organs. But it is inevitable that people who, from the very outset, go astray, and wander from the right road, should talk such nonsense, and should, over and above this, neglect to search for the factors of most practical importance in medicine.

Having come to this point in the argument, I should like to ask those who declare that Erasistratus was very familiar with the Peripatetics, whether they know what Aristotle stated and demonstrated with regard to our bodies being compounded out of the Warm, the Cold, the Dry and the Moist, and how he says that among these the Warm is the most active, and that those animals which are by nature warmest have abundance of blood, whilst those that are colder are entirely lacking in blood, and consequently in winter lie idle and motionless, lurking

\textsuperscript{1} Supreme importance of the "soil." \textit{cf.} Introduction, pp. xii. and xxxi.
καὶ ἀκίνητα κεῖται φωλεύοντα δίκην νεκρῶν. εἴρηται δὲ καὶ περὶ τῆς χρονᾶς τοῦ αἵματος οὐκ Ἄριστοτέλει μόνου, ἀλλὰ καὶ Πλάτωνι. καὶ 117 ἡμεῖς νῦν, ὅπερ ἤδη καὶ πρόσθεν εἰπον, || οὐ τὰ καλῶς ἀποδειγμένα τοῖς παλαιοῖς λέγειν προύθεμα, μήτε τῇ γυώμῃ μήτε τῇ λέξει τοὺς ἄνδρας ἐκείνους ὑπερβαλέσθαι δυνάμενοι τὰ θ' ἦτοι χωρίς ἀποδείξεως ώς ἐναργῆ πρὸς αὐτῶν εἰρημένα διὰ τὸ μηδ' ὑπονοήσαι μοχθηροὺς οὕτως ἔσεσθαι τινας σοφιστάς, οἱ καταφρονήσουσι τῆς ἐν αὐτοῖς ἀληθείας, ἥ καὶ παραλειμμένα τελέως ὑπ' ἐκείνων ἀξιόμενον εὐρίσκειν τε καὶ ἀποδεικνύμαι.

Περὶ δὲ τῆς τῶν χυμῶν γενέσεως οὐκ οίδ', εἰ ἔχει τις ἔτερον προσθείναι σοφότερον ὡς Ἡπποκράτης εἶπε καὶ Ἄριστοτέλης καὶ Πραξιγόρας καὶ Φιλότιμος καὶ ἄλλοι πολλοὶ τῶν παλαιῶν. ἀποδεικται γὰρ ἐκείνους τοὺς ἄνδρας ἀλλοιουμένης τῆς τροφῆς ἐν ταῖς φλεβῖν ὑπὸ τῆς ἐμφύτου θερμασίας αἴμα μὲν ὑπὸ τῆς συμμετρίας τῆς κατ' αὐτήν, οἱ δ' ἄλλοι χυμοὶ διὰ τᾶς ἀμετρίας γιγνόμενοι καὶ τούτῳ τὸ λόγῳ πάνθ' ὁμολογεῖ ταῖς φαινόμενα. καὶ γὰρ τῶν ἐδεσμάτων ὥσα μὲν ἐστὶ θερμότερα φύσει, χωλωδέστερα, τὰ δὲ ψυχρότερα φλεγματικότερα. καὶ τῶν ἥλικων ὁσαύτως χο- 118 λωδέστε||ραι μὲν αἱ θερμότεραι φύσει, φλεγματωδέστεραι δ' αἱ ψυχρότεραι καὶ τῶν ἐπιτηδευμάτων δὲ καὶ τῶν χωρῶν καὶ τῶν ὀρῶν καὶ πολὺ δὴ πρότερον ἐτὶ τῶν φύσεων αὐτῶν αἱ μὲν ψυχρότεραι φλεγματωδέστεραι, χωλωδέστεραι δ' αἱ

1 Aristotle, Hist. Animal., iii. xix.; Plato, Timaeus, 80 ε.
in holes like corpses. Further, the question of the colour of the blood has been dealt with not only by Aristotle but also by Plato. Now I, for my part, as I have already said, did not set before myself the task of stating what has been so well demonstrated by the Ancients, since I cannot surpass these men either in my views or in my method of giving them expression. Doctrines, however, which they either stated without demonstration, as being self-evident (since they never suspected that there could be sophists so degraded as to contemn the truth in these matters), or else which they actually omitted to mention at all—these I propose to discover and prove.

Now in reference to the genesis of the humours, I do not know that any one could add anything wiser than what has been said by Hippocrates, Aristotle, Praxagoras, Philotimus and many other among the Ancients. These men demonstrated that when the nutriment becomes altered in the veins by the innate heat, blood is produced when it is in moderation, and the other humours when it is not in proper proportion. And all the observed facts agree with this argument. Thus, those articles of food, which are by nature warmer are more productive of bile, while those which are colder produce more phlegm. Similarly of the periods of life, those which are naturally warmer tend more to bile, and the colder more to phlegm. Of occupations also, localities and seasons, and, above all, of natures themselves, the colder are more phlegmatic, and the warmer more

2 Philotimus succeeded Diocles and Praxagoras, who were successive leaders of the Hippocratic school. cf. p. 51, note 1.
3 Lit. phomena.
4 i.e. living organisms; cf. p. 47, note 1.
Erasistratus rejected the idea of innate heat; he held that the heat of the body was introduced from outside.
bilious. Also cold diseases result from phlegm, and warmer ones from yellow bile. There is not a single thing to be found which does not bear witness to the truth of this account. How could it be otherwise? For, seeing that every part functions in its own special way because of the manner in which the four qualities are compounded, it is absolutely necessary that the function [activity] should be either completely destroyed, or, at least hampered, by any damage to the qualities, and that thus the animal should fall ill, either as a whole, or in certain of its parts.

Also the diseases which are primary and most generic are four in number, and differ from each other in warmth, cold, dryness and moisture. Now, Erasistratus himself confesses this, albeit unintentionally; for when he says that the digestion of food becomes worse in fever, not because the innate heat has ceased to be in due proportion, as people previously supposed, but because the stomach, with its activity impaired, cannot contract and triturate as before—then, I say, one may justly ask him what it is that has impaired the activity of the stomach.

Thus, for example, when a bubo develops following an accidental wound gastric digestion does not become impaired until after the patient has become fevered; neither the bubo nor the sore of itself impedes in any way or damages the activity of the stomach. But if fever occurs, the digestion at once deteriorates, and we are also right in saying that the activity of the stomach at once becomes impaired. We must add, however, by what

2 As a *bubo* is a swelling in the groin, we must suppose that the wound referred to would be in the leg or lower abdomen.
χρή τοῦ λόγου. τὸ μὲν γὰρ ἐλκος οἷς οἶον τῷ ἂν αὐτῆν βλάπτειν, ὥσπερ οὖν ὁ βουβων. ἦ γὰρ ἀν ἔβλαψε καὶ πρὸ τοῦ πυρετοῦ. εἰ δὲ μὴ ταύτα, δὴ λοῦ, ὡς ἦ τῆς θερμασίας πλεονέξια. δύο γὰρ ταύτα προσεγένετο τῷ βουβῶν, ἦ τῆς κατὰ τὰς ἀρτηρίας τε καὶ τὴν καρδίαν κινήσεως ἀλλοιωσίς καὶ ἦ τῆς κατὰ φύσιν θερμασίας πλεονέξια. ἀλλ' ἦ μὲν τῆς κινήσεως ἀλλοιωσίς οὐ μόνον οὐδὲν

120 βλάψει τῆς ἐνέργειας τῆς γαῖστρος, ἀλλὰ καὶ προσωφελήσει κατ’ ἐκείνα τῶν ξών, ἐν οἷς εἰς τὴν πέψιν ὑπέθετο πλειστὸν δύνασθαι τὸ διὰ τῶν ἀρτηριῶν εἰς τὴν κοιλίαν ἐμπίπτον πνεῦμα. διὰ λοιπὴν οὖν ἔτι καὶ μόνην τὴν ἁμετρον θερμασίαν ἦ βλάβη τῆς ἐνεργείας τῇ γαστρί. τὸ μὲν γὰρ πνεῦμα σφοδρότερον τε καὶ συνεχέστερον καὶ πλέον ἐμπίπτει νῦν ἢ πρότερον. ὡστε ταύτῃ μὲν μᾶλλον πέψει τὰ διὰ τὸ πνεῦμα καλὸς πέττοντα ξῶα, διὰ λοιπὴν δ’ ἔτι τὴν παρὰ φύσιν θερμασίαν ἀπεπτῆσει. τὸ γὰρ καὶ τὸ πνεῦματι φάναι τιν’ ὑπάρχειν ἰδιοτητα, καθ’ ἦν πέττει, κἂπειτα ταύτῃ πυρεττόντων διαφθείρεσθαι καθ’ ἑτερον τρόπον ἐστὶν ὁμολογῆσαι τὸ ἄτοπον.

1 i.e. fever as a cause of disease.
2 As we should say, “circulatory” changes.
3 This is the “vital spirit” or pneuma which, according to Erasistratus and the Pneumatist school, was elaborated in the left ventricle, and thereafter carried by the arteries all over the body, there to subserve circulatory processes. It
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it has been impaired. For the wound was not capable of impairing it, nor yet the bubo, for, if they had been, then they would have caused this damage before the fever as well. If it was not these that caused it, then it was the excess of heat (for these two symptoms occurred besides the bubo—an alteration in the arterial and cardiac movements and an excessive development of natural heat). Now the alteration of these movements will not merely not impair the function of the stomach in any way: it will actually prove an additional help among those animals in which, according to Erasistratus, the *pneuma*, which is propelled through the arteries and into the alimentary canal, is of great service in digestion; there is only left, then, the disproportionate heat to account for the damage to the gastric activity. For the pneuma is driven in more vigorously and continuously, and in greater quantity now than before; thus in this case, the animal whose digestion is promoted by pneuma will digest more, whereas the remaining factor—abnormal heat—will give them indigestion. For to say, on the one hand, that the pneuma has a certain property by virtue of which it promotes digestion, and then to say that this property disappears in cases of fever, is simply to admit the absurdity. For when they are again asked what it is that has altered the pneuma, they will only be able to reply, “the abnormal heat,” and particularly if it be the pneuma in the food canal which is in

has some analogy with oxygen, but this is also the case with the “natural spirit” or pneuma, whose seat was the liver and which was distributed by the veins through the body; it presided over the more vegetative processes. cf. p. 152, note 1; Introduction, p. xxxiv.
καλίαν: οὐδὲ γὰρ πλησιάζει κατ’ οὐδὲν τούτο τῷ βουβών.

Καὶ τί τῶν ζώων ἐκεῖνων, ἐν οἷς ἢ τοῦ πνεύματος ἰδιότης μέγα δύναται, μνημονεύω, παρὰν ἐπ’ ἀνθρώποις, ἐν οἷς ἢ οὐδὲν ἢ παντάπασιν ἀμωδρόν τι καὶ μικρόν ὦφελεῖ, ποιεῖσθαι τὸν λόγον; ἀλλ’ ὅτι μὲν ἐν τοῖς πυρετοῖς οὔτοι κακῶς πέπτουσιν, ὄμως γε καὶ αὐτός καὶ τὴν γ’ αἰτίαν προστιθείς βεβλάφθαι φησὶ τῆς γαστρὸς τῆς ἐνέργειαν. οὐ μὴν ἀλλὰν γε τίνα πρόφασιν τῆς βλάβης εἰπεῖν ἔχει πλὴν τῆς παρὰ φύσιν θερμασίας. ἀλλ’ εἰ βλάπτει τὴν ἐνέργειαν ἡ παρὰ φύσιν θερμασία μὴ κατὰ τί συμβεβηκός, ἀλλὰ διὰ τὴν αὐτὴς οὐσίαν τε καὶ δύναμιν, ἐκ τῶν πρῶτων ἂν εἰ θεσμάτων καὶ μὴν οὐκ ἐνδέχεται τῶν πρῶτων μὲν εἶναι θεσμάτων τὴν ἀμετρίαν τῆς θερμασίας, τὴν δ’ ἐνέργειαν ὑπὸ τῆς εὐκρασίας μὴ γίγνεσθαι. οὐδὲ γὰρ δι’ ἀλλο τι δυνατὸν γίγνεσθαι τὴν δυσκρασίαν αἰτίαν τῶν πρῶτων θεσμάτων ἀλλ’ ἢ διὰ τὴν εὐκρασίαν διαφθειρομένην. τὸ γὰρ ὑπὸ ταύτης γίγνεσθαι τὰς ἐνέργειας ἀνάγκη καὶ τὰς πρῶτας αὐτῶν βλάβας διαφθειρομένης γίγνεσθαι.

"Οτι μὲν οὖν καὶ κατ’ αὐτὸν τὸν Ἑρασίστρατον ἡ εὐκρασία τοῦ θερμοῦ τῶν ἐνεργείων αἰτία, τοῖς θεωρεῖν τὸ ἄκολουθον δυναμένοις ἰκανῶς ἀποδειχθαί νομίζω. τούτου δ’ ὑπάρχοντος ἠμῶν οὐδὲν ἄτι χαλεπὸν || ἐφ’ ἐκάστης ἐνεργείας.

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1 Even leaving the pneuma out of account, Galen claims that he can still prove his thesis.

2 In other words: if dyscrasia is a first principle in pathology, then eucrasia must be a first principle in physiology.
question (since this does not come in any way near the bubo).

Yet why do I mention those animals in which the property of the pneuma plays an important part, when it is possible to base one's argument upon human beings, in whom it is either of no importance at all, or acts quite faintly and feebly? But Erasistratus himself agrees that human beings digest badly in fevers, adding as the cause that the activity of the stomach has been impaired. He cannot, however, advance any other cause of this impairment than abnormal heat. But if it is not by accident that the abnormal heat impairs this activity, but by virtue of its own essence and power, then this abnormal heat must belong to the primary diseases. But, indeed, if disproportion of heat belongs to the primary diseases, it cannot but be that a proportionate blending [eucrasia] of the qualities produces the normal activity. For a disproportionate blend [dyserasia] can only become a cause of the primary diseases through derangement of the eucrasia. That is to say, it is because the [normal] activities arise from the eucrasia that the primary impairments of these activities necessarily arise from its derangement.

I think, then, it has been proved to the satisfaction of those people who are capable of seeing logical consequences, that, even according to Erasistratus's own argument, the cause of the normal functions is eucrasia of the Warm. Now, this being so, there is nothing further to prevent us from saying

3 The above is a good instance of Galen's "logical" method as applied to medical questions; an appeal to those who are capable of following "logical sequence." cf. p. 209, note 1.
τῇ μὲν εὐκρασίᾳ τὸ βέλτιον ἔπεσθαι λέγειν, τῇ
dὲ δυσκρασίᾳ τὰ χείρῳ. καὶ τοῖνυν εἰτέπερ ταῦτά
οὕτως ἔχει, τὸ μὲν αἷμα τῆς συμμέτρου θερ-
μασίας, τὴν δὲ ξανθὴν χολήν τῆς ἀμέτρου νομι-
ματέου ὑπάρχειν ἐγγυον. οὕτω γὰρ καὶ ἡμῖν
ἐν τῇ ταῖς θερμαῖς ἡλικίαις καὶ τοῖς θερμοῖς
χωρίοις καὶ ταῖς ὀραίοις τοῦ ἔτους ταῖς θερμαῖς
καὶ ταῖς θερμαῖς καταστάσεσιν, ὡσαύτως δὲ καὶ
tαῖς θερμαῖς κράσεσι τῶν ἀνθρώπων καὶ τοῖς
ἐπιτηδεύμασι τε καὶ τοῖς διαίτημασι καὶ τοῖς
νοσήμασι τοῖς θερμοῖς εὐλόγως ἡ ξανθὴ χολὴ
πλείστη φαίνεται γιγνομένη.
Τὸ δ' ἀπορεῖν, εἰτ' ἐν τοῖς σώμασι τῶν ἀνθρώ-
pων ὁ χυμὸς οὕτως ἔχει τὴν γένεσιν εἰτ' ἐν τοῖς
σιτίοις περιέχεται, μηδὲ ὅτι τοῖς υγιαίνουσιν
ἀμέμπτως, ὅταν ἄσιτήσωσι παρὰ τὸ ἑδος ὑπὸ
tινος περιστάσεως πραγμάτων ἀναγκασθέντες,
pικρόν μὲν τὸ στόμα γίγνεται, χολώδη δὲ τὰ
οὖρα, δάκνεται δ' ἡ γαστήρ, ἑωρακότος ἐστὶν
ἀλλ' ὡσπερ ἐξαιρήθης νῦν εἰς τὸν κόσμον ἐλη-
lυθότος καὶ μῆπο τὰ κατ' αὐτὸν φανόμενα
gιγνόσκοντος. ἐπεὶ τίς οὐκ οἶδεν, ὡς ἔκαστον
τῶν ἐψομένων ἐπὶ πλέον ἀλυκότερον μὲν τὸ
123 πρῶτον, ὕστερον || δὲ πικρότερον γίγνεται; καὶ
εἰ τὸ μέλι βουληθείσης αὐτὸ τὸ πάντων ἄλκυτα-
tον ἐπὶ πλείστον ἐγείρει, ἀποδείξεις καὶ τοῦτο
πικρότατον. δ' γὰρ τοῖς ἀλλοίς, ὅσα μὴ φύσει
θερμά, παρὰ τῆς ἐφύσεως ἐγγίγνεται, τοῦτ' ἐκ
φύσεως ὑπάρχει τῷ μέλιτι. διὰ τοῦτ' οὖν ἐψῴ-
μενον οὐ γίγνεται ἄλκυτερον. ὥσον γὰρ ἔχον
ἐναι θερμοτήτος εἰς γένεσιν ἄλκυτητος, ἀκριβῶς
αὐτῷ τοῦτο πᾶν οἴκοθεν ὑπάρχει. ὃ τοῖνυν
190
that, in the case of each function, eucrasia is followed by the more, and dyscrasia by the less favourable alternative. And, therefore, if this be the case, we must suppose blood to be the outcome of proportionate, and yellow bile of disproportionate heat. So we naturally find yellow bile appearing in greatest quantity in ourselves at the warm periods of life, in warm countries, at warm seasons of the year, and when we are in a warm condition; similarly in people of warm temperaments, and in connection with warm occupations, modes of life, or diseases.

And to be in doubt as to whether this humour has its genesis in the human body or is contained in the food is what you would expect from one who has—I will not say failed to see that, when those who are perfectly healthy have, under the compulsion of circumstances, to fast contrary to custom, their mouths become bitter and their urine bile-coloured, while they suffer from gnawing pains in the stomach—but has, as it were, just made a sudden entrance into the world, and is not yet familiar with the phenomena which occur there. Who, in fact, does not know that anything which is overcooked grows at first salt and afterwards bitter? And if you will boil honey itself, far the sweetest of all things, you can demonstrate that even this becomes quite bitter. For what may occur as a result of boiling in the case of other articles which are not warm by nature, exists naturally in honey; for this reason it does not become sweeter on being boiled, since exactly the same quantity of heat as is needed for the production of sweetness exists from beforehand in the honey. Therefore the external heat,
Εξώθεν τοῖς ἐλλιπῶς θερμοῖς ἢν ὀψέλιμον, τούτ’ ἐκείνῳ βλάβη τε καὶ ἄμετρία γίγνεται καὶ διὰ τούτο θάττων τῶν ἄλλων ἐφόμενον ἀποδείκνυται πικρών. δι’ αὕτω δὲ τούτῳ καὶ τοῖς θερμοῖς φύσει καὶ τοῖς ἀκμάζουσιν εἰς χολήν ἐτόίμως μεταβάλλεται. θερμὸς γὰρ θερμὸν πλησιάζον εἰς ἄμετρίαν κράσεως ἐτοίμως εξίσταται καὶ φθάνει χολή γιγνόμενον, οὐχ αἷμα. δεῖται τοῖς πυχραῖς μὲν κράσεως ἀνθρώπου, ψυχραῖς δὲ ἡλικίας, ἵνα εἰς αἵματος ἀγγεῖα φύσιν. οὕκοιν ἀπὸ τρόπου συνεβούλευσεν Ἰπποκράτησι τοῖς φύσει πικροχόλοις μὴ προσφέρειν τὸ μέλι, ὡς ἤν θερμοτέρας διὶ δηλονοτι κράσεως ὑπάρχουσιν. οὕτω δὲ καὶ τοῖς νοσήμασι τοῖς πικροχόλοις πολέμιον εἶναι τὸ μέλι καὶ τῇ τῶν γερότων ἡλικία φίλιον οὐχ Ἰπποκράτης μόνον ἀλλὰ καὶ πάντες ἱατροὶ λέγονται, οἱ μὲν ἐκ τῆς φύσεως αὐτοῦ τὴν δύναμιν ἐνδεξαμένης εὑρόντες, οἱ δὲ ἐκ τῆς πείρας μόνης. οὐδὲ γὰρ οὐδὲ τοῖς ἀπὸ τῆς ἐμπειρίας ἱατροὶς ἔτερον τι παρὰ ταῦτα τετήρηται γιγνόμενον, ἀλλὰ χρηστῶν μὲν γέροντε, νέω δὲ οὐχ χρηστῶν, καὶ τῷ μὲν φύσει πικροχόλω βλαβερόν, ὀψέλιμον δὲ τῷ φλεγματώδει· καὶ τῶν νοσημάτων ὁσαύτως τοῖς μὲν πικροχόλοις ἐχθρόν, τοῖς δὲ φλεγματώδει φίλιον· ἐνὶ δὲ λόγῳ τοῖς μὲν θερμοῖς σώμασιν ἡ διὰ φύσιν ἡ διὰ νόσου ἡ δὲ ἡλικίαν ἡ δὲ ὄραν ἡ διὰ χώραν ἡ δὲ ἐπιτήδευσμα χολῆς γεννητικῶν, αἵματος δὲ τοῖς ἑναυτίοις.

Καὶ μὴν οὐκ ἐνδέχεται ταύτων ἐδεσμα τοῖς μὲν χολήν γεννῶ, τοῖς δὲ αἷμα μὴ οὐκ ἐν τῷ σώματι.
which would be useful for insufficiently warm substances, becomes in the honey a source of damage, in fact an excess; and it is for this reason that honey, when boiled, can be demonstrated to become bitter sooner than the others. For the same reason it is easily transmuted into bile in those people who are naturally warm, or in their prime, since warm when associated with warm becomes readily changed into a disproportionate combination and turns into bile sooner than into blood. Thus we need a cold temperament and a cold period of life if we would have honey brought to the nature of blood. Therefore Hippocrates not improperly advised those who were naturally bilious not to take honey, since they were obviously of too warm a temperament. So also, not only Hippocrates, but all physicians say that honey is bad in bilious diseases but good in old age; some of them having discovered this through the indications afforded by its nature, and others simply through experiment, for the Empiricist physicians too have made precisely the same observation, namely, that honey is good for an old man and not for a young one, that it is harmful for those who are naturally bilious, and serviceable for those who are phlegmatic. In a word, in bodies which are warm either through nature, disease, time of life, season of the year, locality, or occupation, honey is productive of bile, whereas in opposite circumstances it produces blood.

But surely it is impossible that the same article of diet can produce in certain persons bile and in others blood, if it be not that the genesis of these humours is

1 The aim of dietetics always being the production of moderate heat—i.e. blood.
2 Note contrasted methods of Rationalists and Empiricists.
Galen

dês geôsewos autôw enpeteleuméntis. eî gar dê
oukothên yge kai par' eautou tov êdesmâton
ékaston èxhov kai ouk èn tois tov xôov sómassi
125 metaâbaluménon ègènva tîn xolihv, èn âpaspin
an ómôwos autôn tois sómassin ègènva kai to
mén pikrôu èxw geuvoménoi hîn an oumai xolhis
pointhikon, eî dè ti glukû kai xrhstôn, ouk an
oude to braxútaton èx autôn xolhês ègenvató. kai
mên ou to méli mónon, allâ kai tov állov èkaston
tôn glukêwov tois prroieirmhênoi sómassi tois di'
ótipon tov èirrmhînov thermai oúsin eîs xolhê
ètopímos èxístatai.

Kaîtoî tânt' ouk ouî èpws èxhvenìchthn eîpteîn
ou prroëluménoi allî 'îp' autês toû lógou tîs
ákoloûthias anagkasthês. èîrntai d' èpti pleî-
ston ýpèr autôn 'Aristotêle te kai Praxagôra
tîn 'Ippokratous kai Plátowos gnowhmìn órthôs
èxhghaménois.

IX

Mê toînun ouâ apodeîxeis ùp' hêmôn eîrhnsthâ
vovmîzhn tâ touaûtâ màllon hî perî tîs tîn
állov xynwoskóntov anaiosththias ènideîxeis, ou
mêde tâ prôs âpántov ómoloskômena kai kath'
èkásth hêmérav fauvômêna xynwoskouvhn tás
126 d' apodeîxeis autôn tâs kat' èpisthmhn èx
èkeînou xrh lambsâneîn tîn arxhôn, wîn hîdî
kai prôsthèn || eîpomêne, ou to drân kai páschê
eîs álhlhla tois sómassin èpârchei kata tê
thermôn kai xynrhôn kai xhpôn kai xgrôn. kai

\[1\] Lit. anaesthesia. Linacre renders it indocilitas.
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accomplished in the body. For if all articles of food contained bile from the beginning and of themselves, and did not produce it by undergoing change in the animal body, then they would produce it similarly in all bodies; the food which was bitter to the taste would, I take it, be productive of bile, while that which tasted good and sweet would not generate even the smallest quantity of bile. Moreover, not only honey but all other sweet substances are readily converted into bile in the aforesaid bodies which are warm for any of the reasons mentioned.

Well, I have somehow or other been led into this discussion,—not in accordance with my plan, but compelled by the course of the argument. This subject has been treated at great length by Aristotle and Praxagoras, who have correctly expounded the view of Hippocrates and Plato.

IX

For this reason the things that we have said are not to be looked upon as proofs but rather as indications of the dulness of those who think differently, and who do not even recognise what is agreed on by everyone and is a matter of daily observation. As for the scientific proofs of all this, they are to be drawn from these principles of which I have already spoken—namely, that bodies act upon and are acted upon by each other in virtue of the Warm, Cold, Moist and Dry. And if one is

2 p. 15.
Galen

eīte phlébas eίθ' ἡπαρ eίτ' ἀρτηρίας eίτε καρδίαν eίτε κοιλίαν eίτ' ἀλλο τι μόριον ἑνεργείων τις φήσειεν ἡπτινοῦν ἑνεργείαν, ἀφύκτως ἀνάγκαις ἀναγκασθήσεται διὰ τὴν ἐκ τῶν τεττάρων πολιαν κράσιν ὁμολογήσαι τὴν ἑνεργείαν ὑπάρχειν αὐτῷ. ὅ-
speaking of any activity, whether it be exercised by vein, liver, arteries, heart, alimentary canal, or any part, one will be inevitably compelled to acknowledge that this activity depends upon the way in which the four qualities are blended. Thus I should like to ask the Erasistrateans why it is that the stomach contracts upon the food, and why the veins generate blood. There is no use in recognizing the mere fact of contraction, without also knowing the cause; if we know this, we shall also be able to rectify the failures of function. "This is no concern of ours," they say; "we do not occupy ourselves with such causes as these; they are outside the sphere of the practitioner, and belong to that of the scientific investigator." Are you, then, going to oppose those who maintain that the cause of the function of every organ is a natural eucrasia, that the dyserasia is itself known as a disease, and that it is certainly by this that the activity becomes impaired? Or, on the other hand, will you be convinced by the proofs which the ancient writers furnished? Or will you take a midway course between these two, neither perforce accepting these arguments as true nor contradicting them as false, but suddenly becoming sceptics—Pyrrhonists, in fact? But if you do this you will have to shelter yourselves behind the Empiricist teaching. For how are you going to be successful in treatment, if you do not understand the real essence of each disease? Why, then, did you not call yourselves Empiricists from the beginning? Why do you confuse us by announcing that you are

3 That is, a blending of the four principles in their natural proportion; Lat. temperiea. Dyscrasia = intemperies, "dis-temper."
σικᾶς ἐνεργείας ἐπαγγελλόμενοι ξητεῖν ἱάσεως ἐνεκεν; εἰ γὰρ ἄδυνατος ἡ γαστήρ ἐστι τινὶ περιστέλλεσθαι καὶ τρίβει, πῶς αὐτὴν εἰς τὸ κατὰ φύσιν ἐπανάξομεν ἀγνοοῦτες τὴν αἰτίαν τῆς ἄδυναμίας; ἐγὼ μὲν φημὶ τὴν μὲν ὑπερτεθερμασμένην ἐμψυκτέων ἡμῖν εἶναι, τὴν δὲ ἐψυχομένην θερμαντέον· οὕτω δὲ καὶ τὴν ἐξηρασμένην ὑγραντέον, τὴν δὲ ἐγχερασμένην ξηραντέον. ἄλλα 128 καὶ || κατὰ συζυγίαν, εἰ θερμοτέρα τοῦ κατὰ φύσιν ἀμα καὶ ξηροτέρα τῶν γεγενημένων, κεφάλαιον εἶναι τῆς ἱάσεως ἐμψυχεῖν θ’ ἀμα καὶ ὑγραίνειν· εἰ δ’ αὖ ψυχροτέρα τε καὶ ξηροτέρα, θερμαίνειν τε καὶ ξηραίνειν κατὶ τῶν ἀλλῶν ὡσαύτως· οἱ δ’ ἀπ’ Ἐρασίστρατον τὸ ποτε καὶ πράξουσιν οὐδ’ ὅλως ξητεῖν τῶν ἐνεργειῶν τὰς αἰτίας ὁμολογοῦντες; ὁ γὰρ τοῦ καρπὸς τῆς περὶ τῶν ἐνεργειῶν ἡττήσεως οὐτὸς ἔστι, τὸ τὰς αἰτίας τῶν δυσκρασίων εἰδότα εἰς τὸ κατὰ φύσιν ἐπανάγειν αὐτάς, ὡς αὐτὸ γε μόνον τὸ γηρώνει τὴν ἐκάστοτε τῶν ὀργάνων ἐνεργειαν ἥττησ ἐστὶν οὕτως χρηστὸν εἰς τὰς ἱάσεις.

'Ἐρασίστρατος δὲ μοι δοκεῖ καὶ αὐτὸ τοῦτ’ ἄγνοειν, ὡς, ἥτις ἄν ἐν τῷ σώματι διάθεσις βλαττή τὴν ἐνεργείαν μὴ κατὰ τι συμβεβηκός ἄλλα πρῶτως τε καὶ καθ’ ἐαυτὴν, αὐτὴ τὸ νόσημα ἐστὶν αὐτό. πῶς οὖν ἐτι διαγνωστικός τε καὶ ἱατικὸς ἐσται τῶν νοσημάτων ἄγνοοιν ὅλως αὐτὰ τίνα τ’ ἐστὶ καὶ πόσα καὶ ποῖα; κατὰ μὲν δὴ τὴν γαστήρα τὸ γε τοσοῦτον 'Ἐρασίστρατος ἥξιωσε 198
investigating natural activities with a view to treatment? If the stomach is, in a particular case, unable to exercise its peristaltic and grinding functions, how are we going to bring it back to the normal if we do not know the cause of its disability? What I say is that we must cool the over-heated stomach and warm the chilled one; so also we must moisten the one which has become dried up, and conversely; so, too, in combinations of these conditions; if the stomach becomes at the same time warmer and drier than normally, the first principle of treatment is at once to chill and moisten it; and if it become colder and moister, it must be warmed and dried; so also in other cases. But how on earth are the followers of Erasistratus going to act, confessing as they do that they make no sort of investigation into the cause of disease? For the fruit of the enquiry into activities is that by knowing the causes of the dyscrasias one may bring them back to the normal, since it is of no use for the purposes of treatment merely to know what the activity of each organ is.

Now, it seems to me that Erasistratus is unaware of this fact also, that the actual disease is that condition of the body which, not accidentally, but primarily and of itself, impairs the normal function. How, then, is he going to diagnose or cure diseases if he is entirely ignorant of what they are, and of what kind and number? As regards the stomach, certainly, Erasistratus held that one should at least

1 This is the orthodox Hippocratic treatment, that of opposites by opposites. Contrast the homoeopathic principle which is the basis of our modern methods of immunisation (similia similibus carentur, Hahnemann).
129 ζητείσθαι τὸ πῶς πέττεται τὰ σιτία: ἢ τὸ δ’ ἢτις πρώτῃ τε καὶ ἄρχηγὸς αὐτία τούτον, πῶς οὖκ ἐπεσκέψατο; κατὰ δὲ τὰς φλέβας καὶ τὸ αἷμα καὶ αὐτὸ τὸ πῶς παρέλιπεν.

'Αλλ' οὖθ' Ἡποκράτης οὖτ' ἄλλος τις ὧν ὀλίγῳ πρόσθεν ἐμνημόνευσα φιλοσόφων ἡ ἰατρῶν ἄξιον φέτ' εἶναι παραλιπεῖν ἀλλὰ τὴν κατὰ φύσιν ἐν ἐκάστῳ ἀρχηγῷ θερμασίαν εὐκρατῶν τε καὶ μετρίως ὕγρᾶν οὖσαν αἴματος εἶναι φασὶ γεννητικὴν καὶ δι' αὐτὸ γε τοῦτο καὶ τὸ αἷμα θερμὸν καὶ ὕγρον εἶναι φαιτὶ δυνάμει χυμῶν, ὥσπερ τὴν ἕαυθὴν χολήν θερμὴν καὶ ἔηραν εἶναι, εἰ καὶ ὅτι μάλισθ' ὕγρα φαίνεται. διαφέρειν γὰρ αὐτῶς δοκεῖ τὸ κατὰ φαντασίαν ὕγρον τοῦ κατὰ δύναμιν. ἡ τίς οὖχ οἴδεν, ὡς ἅλμη μὲν καὶ θάλαττα ταριχεύει τὰ κρέα καὶ ἄσηπτα διαφιλάττει, τὸ δ' ἄλλο πῶς ὑδωρ τὸ πότιμον ἐτοίμως διαφεύρει τε καὶ σήπει; τίς δ' οὖχ οἴδεν, ὡς ἕαυθῆς χολῆς ἐν τῇ γαστρὶ περιεχομένης πολλῆς ἀπαύστω δίψει συνεχόμεθα καὶ ὡς ἐμέσατες αὐτὴν εὐθὺς ἄδυναν γεννητικὴ μᾶλλον ἤ εἰ

130 πάμπολυ ποτὸν προσηράμεθα; ἢ θερμὸς οὖν εὐλόγως ὁ χυμὸς οὖτος εἰρηται καὶ ἔηρος κατὰ δύναμιν, ὥσπερ γε καὶ τὸ φλέγμα ψυχρόν καὶ ὕγρόν. ἐναργεῖς γὰρ καὶ περὶ τοῦτον πίστεις Ἡποκράτεις τε καὶ τοῖς ἄλλοις εἰρηται παλαιοῖς.

Πρόδικος δ' ἐν τῷ περὶ φύσεως ἀνθρώπου γράμματι τὸ συγκεκαυμένον καὶ οἷον ὑπερωπτημένον ἐν τοῖς χυμοῖς ὄνομάζων φλέγμα παρὰ τὸ πεφλέχθαι τῇ λέξει μὲν ἐτέρως χρήται, φυλάττει.
investigate how it digests the food. But why was not investigation also made as to the primary originative cause of this? And, as regards the veins and the blood, he omitted even to ask the question "how?"

Yet neither Hippocrates nor any of the other physicians or philosophers whom I mentioned a short while ago thought it right to omit this; they say that when the heat which exists naturally in every animal is well blended and moderately moist it generates blood; for this reason they also say that the blood is a virtually warm and moist humour, and similarly also that yellow bile is warm and dry, even though for the most part it appears moist. (For in them the apparently dry would seem to differ from the virtually dry.) Who does not know that brine and sea-water preserve meat and keep it uncorrupted, whilst all other water—the drinkable kind—readily spoils and rots it? And who does not know that when yellow bile is contained in large quantity in the stomach, we are troubled with an unquenchable thirst, and that when we vomit this up, we at once become much freer from thirst than if we had drunk very large quantities of fluid? Therefore this humour has been very properly termed warm, and also virtually dry. And, similarly, phlegm has been called cold and moist; for about this also clear proofs have been given by Hippocrates and the other Ancients.

Prodicus\(^2\) also, when in his book "On the Nature of Man" he gives the name "phlegm" (from the verb \(\pi\epsilon\phi\lambda\epsilon\chi\theta\alpha\iota\)) to that element in the humours which has been burned or, as it were, over-roasted, while using

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1 Lit. a\(\acute{e}\)ptic.
2 Prodicus of Ceos, a Sophist, contemporary of Socrates.
μέντοι τὸ πράγμα κατὰ ταύτὸ τοῖς ἄλλοις. τὴν δὲ ἐν τοῖς ὁνόμασι τάνδρος τούτου καινοτομίαν ἰκανῶς εὐδείκνυται καὶ Πλάτων. ἀλλὰ τοῦτο γε τὸ πρὸς ἀπάντων ἀνθρώπων ὁνομαζόμενον φλέγμα τὸ λευκὸν τὴν χρόαν, ὁ βλέψαν ὁνομάζει Πρόδικος, ὁ ψυχρὸς καὶ υγρὸς χυμὸς ἑστὶν οὔτος καὶ πλείστος τοῖς τε γέρονσι καὶ τοῖς ὄπωσδήποτε ψυγείσιν ἀθροίζεται καὶ οὐδεὶς οὐδὲ μακρόμενος ἀν ἄλλο τῇ ἡ ψυχρὸν καὶ υγρὸν εἶσθε ἀν αὐτῶν.

Ἀρ' οὖν θερμὸς μὲν τῖς ἑστὶ καὶ υγρὸς χυμὸς καὶ θερμὸς καὶ ξηρὸς ἑτέρος καὶ υγρὸς καὶ ψυχρὸς ἄλλος, οὐδεὶς δὲ ἑστὶ ψυχρὸς καὶ ξηρὸς τὴν δύναμιν, ἀλλ' ἡ τετάρτη συζυγία τῶν κράτων σεων || ἐν ἀπασί τοῖς ἄλλοις ὑπάρχουσα μόνοις τοῖς χυμοῖς οὐχ ὑπάρχει; καὶ μὴν ἡ γε μέλαινα χολὴ τοιοῦτος ἑστὶ χυμός, ὅπ τι σωφρονοῦντες ιατροὶ καὶ φιλόσοφοι πλεονεκτεῖν ἐφασαν τῶν μὲν ὄρων τοῦ ἑτέρου ἔν φιλοτέχνῳ ἑλευστα, τῶν δὲ ἡλικίων ἐν ταῖς μετὰ τὴν ἀκρῆν. οὔτω δὲ καὶ διαιτήματα καὶ χωρία καὶ καταστάσεις καὶ νόσους τινὰς ψυχρὰς καὶ ξηρὰς εἶναι φασίν οὐ γὰρ δὴ χωλὴν ἐν ταύτῃ μόνῃ τῇ συζυγίᾳ τὴν ψυγείαν εἶναι νομίζοντοι ἀλλ' ὀσπερ τὰς ἄλλας τρεῖς οὕτω καὶ τίνδε διὰ πάντων ἐκτετάσθαι.

Ἡξίμην οὖν κἀκεφαλὴ ἐρωτήσαη δύνασθαι τοὺς Ἐρασίστρατον, εἰ μηδὲν ὀργανὸν ἡ τεχνικὴ φύσις ἐδημούργησε καθαρτικὸν τοῦ ποιοῦτον χυμοῦ, ἀλλὰ τῶν μὲν οὕρων ἀρά τῆς διακρίσεως ἑστὶν ὀργανὰ δύο καὶ τῆς ἦξανθῆς χολῆς ἑτέρον οὐ
a different terminology, still keeps to the fact just as the others do; this man's innovations in nomenclature have also been amply done justice to by Plato.\(^1\) Thus, the white-coloured substance which everyone else calls *phlegm*, and which Prodicus calls *blenna [mucus],*\(^2\) is the well-known cold, moist humour which collects mostly in old people and in those who have been chilled\(^3\) in some way, and not even a lunatic could say that this was anything else than cold and moist.

If, then, there is a warm and moist humour, and another which is warm and dry, and yet another which is moist and cold, is there none which is virtually *cold and dry?* Is the fourth combination of temperaments, which exists in all other things, non-existent in the humours alone? No; the *black bile* is such a humour. This, according to intelligent physicians and philosophers, tends to be in excess, as regards seasons, mainly in the fall of the year, and, as regards ages, mainly after the prime of life. And, similarly, also they say that there are cold and dry modes of life, regions, constitutions, and diseases. Nature, they suppose, is not defective in this single combination; like the three other combinations, it extends everywhere.

At this point, also, I would gladly have been able to ask Erasistratus whether his "artistic" Nature has not constructed any organ for *clearing away* a humour such as this. For whilst there are two organs for the excretion of urine, and another of considerable size for that of yellow bile, does the

2 cf. the term *blennorrhoea*, which is still used.
3 cf. the Scotch term "colded" for "affected with a cold"; Germ. *erkältet.*
σμικρόν, ὃ δὲ τούτων κακοθέστερος χυμὸς ἀλάται διὰ παντὸς ἐν ταῖς φλεψίν ἀναμεμεγμένος τῷ αἵματι. καίτοι "Δυσεντερίη," φησί που Ἰπποκράτης, "ὅη ἀπὸ χολῆς μελαίνης ἀρέξη-132 ται, θανάσιμον," οὐ μήν ἢ γ' ἀπὸ τῆς ξανθῆς χολῆς ἀρχομένη πάντως ὀλέθριος, ἀλλ' οἱ πλείους ἐξ αὐτῆς διασφόρονται. τοσούτῳ κακοθέστερα τε καὶ δριμυτέρα τὴν δύναμιν ἢ μέλαινα χολή τῆς ξανθῆς ἐστιν. ἃρ' οὖν οὗτε τῶν ἄλλων ἀνέγιον τί τῶν τοῦ Ἰπποκράτους γραμμάτων ὁ Ἑρασίστρατος οὔδὲν οὔτε τὸ περὶ φύσεως ἀνθρώ-που βιβλίον, ἵν' οὔτως ἀργῶς παρέλθου τὴν περὶ τῶν χυμῶν ἐπίσκεψιν, ἡ γνωστεία μέν, ἐκὼν δὲ παραλείπει καλλίστην τῆς τέχνης θεωρίαν; ἐχρήν οὖν αὐτὸν μηδὲ περὶ τοῦ σπλήνδος εἰρή-κέναι τι μηδ' ἄσχημον ὑπὸ τῆς τεχνικῆς φύ-σεως ὀργάνων τηλικοῦτον μάτην ἡγούμενον κατε-σκευάσθαι. καὶ μήν οὐχ Ἰπποκράτης μόνον ἢ Πλάτων, οὔδέν τι χείρος Ἑρασίστρατὸς περὶ φύσιν ἄνδρες, ἐν τὶ τῶν καθαιρόντων τὸ αἷμα καὶ τοῦτ' εἶναι φασὶ τὸ σπλάγχνον, ἄλλα καὶ μυρίοι σὺν αὐτοῖς ἄλλοι τῶν παλαιῶν ἰατρῶν τε καὶ φιλοσόφων, ἵνα ἀπάντων προσποιησάμενος ὑπερφρονεῖν ὁ γενναῖος Ἑρασίστρατος οὔτ' ἀν-τείπειν οὖθ' ὑλὸς τῆς δόξης αὐτῶν ἐμυνόμενος. καὶ μὴν ὅσοις γε τὸ σῶμα βάλλει, τούτοις ὃ σπλήν φθίνει, φησίν Ἰπποκράτης, καὶ οἱ ἀπὸ 133 τῆς ἐμπειρίας ὀρμώμενοι πάντες ὁμολογοῦσιν ἰατροῖ. καὶ ὅσοι γ' αὖ μέγας καὶ ὑπούλος 204
humor which is more pernicious than these wander about persistently in the veins mingled with the blood? Yet Hippocrates says, "Dysentery is a fatal condition if it proceeds from black bile"; while that proceeding from yellow bile is by no means deadly, and most people recover from it; this proves how much more pernicious and acrid in its potentialities is black than yellow bile. Has Erasistratus, then, not read the book, "On the Nature of Man," any more than any of the rest of Hippocrates's writings, that he so carelessly passes over the consideration of the humours? Or, does he know it, and yet voluntarily neglect one of the finest studies in medicine? Thus he ought not to have said anything about the spleen, nor have stultified himself by holding that an artistic Nature would have prepared so large an organ for no purpose. As a matter of fact, not only Hippocrates and Plato—who are no less authorities on Nature than is Erasistratus—say that this viscus also is one of those which cleanse the blood, but there are thousands of the ancient physicians and philosophers as well who are in agreement with them. Now, all of these the high and mighty Erasistratus affected to despise, and he neither contradicted them nor even so much as mentioned their opinion. Hippocrates, indeed, says that the spleen wastes in those people in whom the body is in good condition, and all those physicians also who base themselves on experience agree with this. Again, in those cases in which the spleen is large and is increasing from

1 The word theoria used here is not the same as our theory. It is rather a "contemplation," the process by which a theory is arrived at. cf. p. 226, note 2.

2 Erasistratus on the uselessness of the spleen. cf. p. 143.

αὐξάνεται, τούτως καταφθείρει τε καὶ κακόχυμα τὰ σῶματα τίθησιν, ὡς καὶ τοῦτο πάλιν ὅγχα Ἰπποκράτης μόνον ἄλλα καὶ Πλάτων ἄλλοι τε πολλοὶ καὶ οἱ ἀπὸ τῆς ἐμπειρίας ὁμολογοῦσιν ἰατροὶ. καὶ οἱ ἀπὸ σπληνὸς δὲ κακοτραγοῦντος ἀκτετοὶ μελάντεροι καὶ τῶν ἐλκῶν αἱ οὐλαὶ μέλαιναι. καθόλου γάρ, όταν ἐνδεέστερον ἢ προσήκειν εἰς ἑαυτῶν ἐλκη τῶν μελαγχολικῶν χυμῶν, ἀκάθαρτον μὲν τὸ αἷμα, κακόχρουν δὲ τὸ πάν γίγνεται σῶμα. πότε δ' ἐνδεέστερον ἐλκεί; ἢ δὴλον ὅτι κακῶς διακέλμενος; ὥσπερ ὅν τοῖς νεφροῖς ἐνεργείας οὖν ἐλκεῖν τὰ σῶμα κακῶς ἐλκεῖν υπάρχει κακοπραγούσι, οὕτω καὶ τῷ σπληνῷ ποιότητος μελαγχολικῆς ἐλκτεκὴν ἐν ἑαυτῷ δύναμιν ἔχοντι σύμφωνον ἀρρωστήσαντι ποτε ταύτην ἀναγκαῖον ἐλκεῖν κακῶς κἂν τῶδε παχύτερον ἴδῃ καὶ μελάντερον γίγνεσθαι τὸ αἷμα.

Ταῦτ' ὅτι ἀπαντά πρὸς τε τὰς διαγνώσεις τῶν νοσημάτων καὶ τὰς ἱάσεις μεγίστην παρεχόμενα χρείαν ἢ ύπερεπτήδησε τελῶς ὁ Ἑρασίστρατος καὶ καταφρονεῖν προσεποίησατο τηλεκούσην ἀνδρῶν ὁ μηδὲ τῶν τυχόντων καταφρονῶν ἄλλ', ἀεὶ φιλοτιμῶν ἀντιλέγον ταῖς ἑλθεῖστάταις δόξαις. ὥς καὶ δὴλον, ὡς οὐδὲν ἔχων οὔτ' ἀντιπεπείν τοῖς προσβυτέροις ὑπὲρ ὧν ἀπεφήματο περὶ σπληνὸς ἐνεργείας τε καὶ χρείας οὗτ' αὐτῶς εὔευρίσκον τι κανονὶ εἰς τὸ μηδὲν ἄλος εἰπεῖν ἀφίκετο. ἀλλ' ἡμεῖς γε πρῶτον μὲν ἐκ τῶν αἰτίων, οἷς ἀπαντὰ διοικεῖται τὰ κατὰ τὰς

1 Enlargement and suppuration (?) of spleen associated with toxaemia or “cacochoemy.” 2 Lit. “melancholic.”

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internal suppuration, it destroys the body and fills it with evil humours;¹ this again is agreed on, not only by Hippocrates, but also by Plato and many others, including the Empiric physicians. And the jaundice which occurs when the spleen is out of order is darker in colour, and the cicatrices of ulcers are dark. For, generally speaking, when the spleen is drawing the atrabilary² humour into itself to a less degree than is proper, the blood is unpurified, and the whole body takes on a bad colour. And when does it draw this in to a less degree than proper? Obviously, when it [the spleen] is in a bad condition. Thus, just as the kidneys, whose function it is to attract the urine, do this badly when they are out of order, so also the spleen, which has in itself a native power of attracting an atrabilary quality,³ if it ever happens to be weak, must necessarily exercise this attraction badly, with the result that the blood becomes thicker and darker.

Now all these points, affording as they do the greatest help in the diagnosis and in the cure of disease were entirely passed over by Erasistratus, and he pretended to despise these great men—he who does not despise ordinary people, but always jealously attacks the most absurd doctrines. Hence, it was clearly because he had nothing to say against the statements made by the ancients regarding the function and utility of the spleen, and also because he could discover nothing new himself, that he ended by saying nothing at all. I, however, for my part, have demonstrated, firstly from the causes by which everything throughout nature is governed (by

³ i.e. the combination of sensible qualities which we call black bile. cf. p. 8, note 3.
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φύσεις, τού θερμοῦ λέγω καὶ ψυχροῦ καὶ ἄιροῦ καὶ ψυχροῦ, δεύτερον δ' ἐξ αὐτῶν τῶν ἐναργῶς φαινομένων κατὰ τὸ σώμα ψυχροῦ καὶ ἄιροῦ εἶναι τινα χρήμαν χυμὸν ἀπεδείξαμεν. ἐξής δ', ὅτι καὶ μελαγχολικὸς οὕτως ὑπάρχει καὶ τὸ καθαίρειν αὐτὸν σπλάγχνον ὁ σπλήν ἐστιν, διὰ βραχέως ὡς ἐν μάλιστα τῶν τοῖς παλαιοῖς ἀποδεδειγμένων ἀναμνήσαντες ἐπὶ τὸ λείπον ἐτὶ τοῖς παρούσι λόγοις ἀφιξόμεθα.

Τῇ δ' ἀν εἰή λείπον ἀλλο γ' ἢ ἐξηγήσασθαι 135 σαφῶς, οἴον τι βούλονται τε || καὶ ἀποδεικνύουσι περὶ τὴν τῶν χυμῶν γένεσιν οἱ παλαιοὶ συμβαίνειν. ἐναργέστερον δ' ἂν γνωσθείη διὰ παραδείγματος. οἴουν δὴ μοι νόει γλεύκινος οὐ πρὸ πολλοῦ τῶν σταφυλῶν ἐκτεθλημένον ξένοντά τε καὶ ἁλλοιούμενον ὑπὸ τῆς ἐν αὐτῷ θερμασίας ἐπειτα κατὰ τὴν αὐτοῦ μεταβολὴν δύο γενόμενα περιττῶματα τὸ μὲν κουφότερον τε καὶ ἁερωδέστερον, τὸ δὲ βαρύτερον τε καὶ γεωδέστερον, ἢν τὸ μὲν ἀνθεός, οἶμαι, τὸ δὲ τρύγα καλοῦσι. τούτων τῷ μὲν ἐτέρῳ τὴν ξανθὴν χολὴν, τῷ δ' ἐτέρῳ τὴν μέλαιναν εἰκάζων οὐκ ἂν ἀμάρτωσι, οὐ τὴν αὐτὴν ἔχοντων ἑδέαν τῶν χυμῶν τούτων ἐν τῷ κατὰ φύσιν διοικεῖσθαι τὸ ξύρον, οἶαν καὶ παρὰ φύσιν ἔχοντος ἐπιφαινοῦται πολλάκις. ἢ μὲν γὰρ ξανθὴ λεκιθώδης γίγνεται· καὶ γὰρ ὄνομαζον σὺν οὕτως αὐτῆς, ὅτι ταῖς τῶν ὦν λεκίθων ὀμοιόταται κατὰ τε χρόαν καὶ πάχος. ἢ δ' αὖ μέλαινα κακοηθέστερα μὲν πολὺ καὶ

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the causes I mean the Warm, Cold, Dry and Moist) and secondly, from obvious bodily phenomena, that there must needs be a cold and dry humour. And having in the next place drawn attention to the fact that this humour is black bile [atrabiliary] and that the viscus which clears it away is the spleen — having pointed this out by help of as few as possible of the proofs given by ancient writers, I shall now proceed to what remains of the subject in hand.

What else, then, remains but to explain clearly what it is that happens in the generation of the humours, according to the belief and demonstration of the Ancients? This will be more clearly understood from a comparison. Imagine, then, some new wine which has been not long ago pressed from the grape, and which is fermenting and undergoing alteration through the agency of its contained heat. Imagine next two residual substances produced during this process of alteration, the one tending to be light and air-like and the other to be heavy and more of the nature of earth; of these the one, as I understand, they call the flower and the other the lees. Now you may correctly compare yellow bile to the first of these, and black bile to the latter, although these humours have not the same appearance when the animal is in normal health as that which they often show when it is not so; for then the yellow bile becomes vitelline, being so termed because it becomes like the yolk of an egg, both in colour and density; and again, even the black bile itself becomes much more malignant than when in

1 Thus Galen has demonstrated the functions of the spleen both deductively and inductively. For another example of the combined method cf. Book III., chaps. i. and ii.; cf. also Introd. p. xxxii. 2 i.e. its innate heat. 3 Lit. lecithoid.
Note that there can be “normal” black bile.

The term food here means the food as introduced into the stomach; the term nutriment (trophé) means the same
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its normal condition, but no particular name has been given to [such a condition of] the humour, except that some people have called it corrosive or acetose, because it also becomes sharp like vinegar and corrodes the animal's body—as also the earth, if it be poured out upon it—and it produces a kind of fermentation and seething, accompanied by bubbles—an abnormal putrefaction having become added to the natural condition of the black humour. It seems to me also that most of the ancient physicians give the name black humour and not black bile to the normal portion of this humour, which is discharged from the bowel and which also frequently rises to the top [of the stomach-contents]; and they call black bile that part which, through a kind of combustion and putrefaction, has had its quality changed to acid. There is no need, however, to dispute about names, but we must realise the facts, which are as follow:

In the genesis of blood, everything in the nutriment which belongs naturally to the thick and earth-like part of the food, and which does not take on well the alteration produced by the innate heat—all this the spleen draws into itself. On the other hand, that part of the nutriment which is roasted, so to speak, or burnt (this will be the warmest and sweetest part of it, like honey and fat), becomes yellow bile, and is cleared away through the so-called biliary vessels; now, this is thin, moist, and fluid, not like what it is when, having been roasted to an excessive degree, it becomes yellow, fiery, and thick, like the yolk of food in the digested condition, as it is conveyed to the tissues. cf. pp. 41-43. Note idea of imperfectly oxidized material being absorbed by the spleen. cf. p. 214, note 1.

* Lit. choledochous, bile-receiving.
GALEN

ωδόν ὄμοιον λεκίθους. τοῦτο μὲν γὰρ ἢδη παρὰ φύσιν θάτερον δὲ τὸ πρῶτον εἰρημένον κατὰ φύσιν ἐστὶν ὁσπερ γε καὶ τοῦ μέλανος χυμοῦ τὸ μὲν μῆτω τῆν οἶον ζέσιν τε καὶ ζύμωσιν τῆς γῆς ἐργαζόμενον κατὰ φύσιν ἐστὶν, τὸ δὲ εἶς τοιαύτην μεθιστάμενον ἰδέαν τε καὶ δύναμιν ἡδῆ παρὰ φύσιν θερμοῦ προσειλήφθος δριμύτητα καὶ οἶον τέφρα τις ἡδῆ γεγονός. ὅδε πως καὶ ἡ κεκαυμένη τρύξ τῆς ἀκαύστου διήνεγκε. θερμόν γάρ τι χρήμα αὐτὴ γ' ἱκανός ἐστιν, ὥστε καίειν τε καὶ τήκειν καὶ διαφέρειν τὴν σάρκα. τῇ δ' ἐτέρα τῇ μῆτω κεκαυμένη τοὺς ἱατροὺς ἐστὶν εὑρεῖν χρωμένους εἰς ὁσαπερ καὶ τῇ γῇ τῇ καλομένη κεραμίτιδι καὶ τοῖς ἄλλοις, ὅσα ἔξηραίνειν θ' ἀμα καὶ ψύχειν πέφυκεν.

Εἰς τὴν τῆς οὕτω συγκαυθείσης μελαίνης χολῆς ἰδέαν καὶ ἡ λεκιθόδης ἐκείνη μεθισταται πολλάκις, ὅταν καὶ αὐτὴ ποθ' οἶον ὀπτηθείσα 138 τύχῃ πυρώδει θερμασία. τὰ δ' ἄλλα || τῶν χολῶν εἴδη σύμπαντα τά μὲν ἐκ τῆς τῶν εἰρημένων κράσεως γίγνεται, τὰ δ' οἶον ὄοι τινὲς εἰσὶ τῆς τούτων γενέσεως τε καὶ εἰς ἄλληλα μεταβολῆς. διαφέρουσι δὲ τῷ τάς μὲν ἀκράτους εἶναι καὶ μόνας, τὰ δ' οἶον ὄρροις τισιν ἐξυγρασμένας. ἀλλ' οἱ μὲν ὅρροι τῶν χυμῶν ἀπαντεις περιττώματα καὶ καθαρὸν αὐτῶν εἶναι δεῖται τοῦ ζῶου τὸ σώμα. τῶν δ' εἰρημένων χυμῶν ἐστὶ τις ἥρεια τῇ φύσει καὶ τοῦ παχέος καὶ τοῦ λεπτοῦ καὶ καθαίρεται πρὸς τε τοῦ σπληνὸς καὶ τῆς ἐπὶ τῷ ἥπαινοι κύστεως τὸ αἷμα καὶ ἀποτίθεται τοσοῦτον τε καὶ τοιοῦτον ἐκατέρου μέρος, ὅσον καὶ οἶον, εἴπεο εἰς 212
eggs; for this latter is already abnormal, while the previously mentioned state is natural. Similarly with the black humour: that which does not yet produce, as I say, this seething and fermentation on the ground, is natural, while that which has taken over this character and faculty is unnatural; it has assumed an acridity owing to the combustion caused by abnormal heat, and has practically become transformed into ashes. In somewhat the same way burned lees differ from unburned. The former is a warm substance, able to burn, dissolve, and destroy the flesh. The other kind, which has not yet undergone combustion, one may find the physicians employing for the same purposes that one uses the so-called potter's earth and other substances which have naturally a combined drying and chilling action.

Now the vitelline bile also may take on the appearance of this combusted black bile, if ever it chance to be roasted, so to say, by fiery heat. And all the other forms of bile are produced, some from a blending of those mentioned, others being, as it were, transition-stages in the genesis of these or in their conversion into one another. And they differ in that those first mentioned are unmixed and unique, while the latter forms are diluted with various kinds of serum. And all the serums in the humours are waste substances, and the animal body needs to be purified from them. There is, however, a natural use for the humours first mentioned, both thick and thin; the blood is purified both by the spleen and by the bladder beside the liver, and a part of each of the two humours is put away, of such quantity and

1 Thus over-roasting—shall we say excessive oxidation?—produces the abnormal forms of both black and yellow bile.
Galen

ὁλον ἤνέχθη τοῦ ζώου τὸ σῶμα, βλάβην ἀν τιν ἐιργάσατο. τὸ γὰρ ἵκανὸς παχὺ καὶ γεώδες καὶ τελέως διαπεφυγός τὴν ἐν τῷ ἦπατι μεταβολὴν ὁ σπλήν εἰς ἑαυτὸν ἐλκει· τὸ δ’ ἄλλο τὸ μετρίως παχὺ σὺν τῷ κατειργάσθαι πάντη φέρεται. δεῖται γὰρ ἐν πολλοῖς τοῦ ζώου μορίοις παχύτητός τινος 139 τὸ αἶμα καθάπερ οἴμαι καὶ τῶν ἐμφερομένων ἰνῶν. καὶ εἰρήσεται μὲν καὶ Πλάτωνι περὶ τῆς χρείας αὐτῶν, εἰρήσεται δὲ καὶ ἡμῖν ἐν ἑκείνους τοὺς γράμμασιν, ἐν οἷς ἂν τὰς χρείας τῶν μορίων διερχόμεθα· δεῖται δ’ ο睾 ἡκιστα καὶ τοῦ ξανθοῦ χυμοῦ τοῦ μῆτω πυρώδους ἐσχάτως γεγενημένου τὸ αἶμα καὶ τὸς αὐτὸ καὶ ἡ παρὰ τούτῳ χρεία, δ’ ἑκείνων εἰρήσεται.

Φλέγματας δ’ οὕδεν ἐποίησεν ἡ φύσις ὄργανον καθαρτικὸν, ὅτι ψυχρὸν καὶ ύγρὸν ἐστὶ καὶ οἶνον ἡμίπεπτός τις τροφῆ. δείται τοῖς οὐ κενοῦσθαι τὸ τοιοῦτον ἀλλ’ ἐν τῷ σώματι μένον ἀλλοιοῦσθαι. τὸ δ’ ἐξ ἐγκεφάλου καταρρέων περίττωμα τάχα μὲν ἂν οὐδ’ ἐλέγμα τις ὀρθῶς ἀλλὰ βλέπουσαν τε καὶ κόρυζαν, ὡσπερ οὖν καὶ ὄνομάζεται, καλοῖς. εἴ δὲ μῆ, ἀλλ’ ὅτι γε τῆς τοῦτον κενώσεως ὀρθῶς ἡ φύσις προνοῦσατο, καὶ τοῦτ’ ἐν τοῖς περὶ χρείας μορίων εἰρήσεται, καὶ γὰρ οὖν καὶ τὸ κατά τε τῆν γαστέρα καὶ τὰ ἐντερα συνιστάμενον φλέγμα ὅπως ἀν ἐκκενωθῇ καὶ αὐτὸ τάχιστα τε καὶ κάλλιστα, τὸ παρεσκευασμένον τῇ φύσει μηχάνημα δ’ ἑκείνων εἰρήσεται καὶ αὐτὸ τῶν

1 cf. p. 277, note 2.
2 Timaeus, 82 c–d.
3 cf. p. 90, note 1. The term “catarrh” refers to this “running down,” which was supposed to take place through

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quality that, if it were carried all over the body, it would do a certain amount of harm. For that which is decidedly thick and earthy in nature, and has entirely escaped alteration in the liver, is drawn by the spleen into itself; the other part which is only moderately thick, after being elaborated [in the liver], is carried all over the body. For the blood in many parts of the body has need of a certain amount of thickening, as also, I take it, of the fibres which it contains. And the use of these has been discussed by Plato, and it will also be discussed by me in such of my treatises as may deal with the use of parts. And the blood also needs, not least, the yellow humour, which has as yet not reached the extreme stage of combustion; in the treatises mentioned it will be pointed out what purpose is subserved by this.

Now Nature has made no organ for clearing away phlegm, this being cold and moist, and, as it were, half-digested nutriment; such a substance, therefore, does not need to be evacuated, but remains in the body and undergoes alteration there. And perhaps one cannot properly give the name of phlegm to the surplus-substance which runs down from the brain, but one should call it mucus [blenna] or coryza—as, in fact, it is actually termed; in any case it will be pointed out, in the treatise "On the Use of Parts," how Nature has provided for the evacuation of this substance. Further, the device provided by Nature which ensures that the phlegm which forms in the stomach and intestines may be evacuated in the most rapid and effective way possible—this also will be described in that com-

the pores of the cribriform plate of the ethmoid into the nose.
140 ὑπομνημάτων. ὅσον οὖν ἐμφέρεται ταῖς φλεψί φλέγμα χρήσιμον ὑπάρχον τοῖς ζώοις, οὐδεμιᾶς δεῖται κενώσεως. προσέχειν δὲ χρῆ κἂνταῦθα τὸν νοῦν καὶ γνῶσκειν, ὁσπέρ τῶν χολῶν ἐκατέρας τὸ μὲν τὶ χρήσιμον ἐστὶ καὶ κατὰ φύσιν τοῖς ζῴοις, τὸ δ’ ἀχρηστόν τε καὶ παρὰ φύσιν, οὕτω καὶ τοῦ φλέγματος, ὅσον μὲν ἂν ἡ γλυκύ, χρηστὸν εἶναι τοῦτο τῷ ζῷῳ καὶ κατὰ φύσιν, ὅσον δ’ ὦξι καὶ ἀλμυρόν ἐγένετο, τὸ μὲν ὦξι τελέως ἡπεπτήσθαι, τὸ δ’ ἀλμυρὸν διάσεσθήθαι. τελείαν δ’ ἀπεφίλων φλέγματος ἀκούειν χρῆ τὴν τῆς δευτέρας πέψεως δηλονότι τῆς ἐν φλεψίν· οὐ γὰρ δὴ τῆς γε πρῶτης τῆς κατὰ τὴν κοιλίαν· ᾨ οὖν ἂν ἐγεγένητο τὴν ἀρχὴν χυμός, εἰ καὶ ταύτην διεπεφεύγει.

Ταῦτ’ ἀρκεῖν μοι δοκεῖ περὶ γενέσεως τε καὶ διαφθορᾶς χυμῶν ὑπομνημάτι εἶναι τῶν Ἰπποκράτει τε καὶ Πλάτωνι καὶ Ἀριστοτέλει καὶ Πραξιγόρα καὶ Διοκλεῖ καὶ πολλοῖς ἄλλοις τῶν παλαιῶν εἰρημένων· οὐ γὰρ ἐδικαίωσα πάντα μεταφέρειν εἰς τόνδε τὸν λόγον τὰ τελέως ἐκεῖνος γεγραμμένα. τοσοῦτον δὲ μόνον ὑπὲρ ἐκάστου 141 εἴπον, ὅσον ἐξορμήσει τε τοὺς ἐντυγχάνοντας, εἰ μὴ παυτάπασιν εἰεν σκειοί, τοῖς τῶν παλαιῶν ὁμιλήσαι γράμματα καὶ τὴν εἰς τὸ βάρον αὐτοῖς συνεῖναι βοήθειαν παρέξει. γέγραπται δὲ ποι καὶ δ’ ἐτέρου λόγου περὶ τῶν κατὰ Πραξιγόραν τὸν Νικάρχου χυμῶν. εἰ γὰρ καὶ ὅτι μάλιστα
mentary. As to that portion of the phlegm which is carried in the veins, seeing that this is of service to the animal it requires no evacuation. Here too, then, we must pay attention and recognise that, just as in the case of each of the two kinds of bile, there is one part which is useful to the animal and in accordance with its nature, while the other part is useless and contrary to nature, so also is it with the phlegm; such of it as is sweet is useful to the animal and according to nature, while, as to such of it as has become bitter or salt, that part which is bitter is completely undigested, while that part which is salt has undergone putrefaction. And the term "complete indigestion" refers of course to the second digestion—that which takes place in the veins; it is not a failure of the first digestion—that in the alimentary canal—for it would not have become a humour at the outset if it had escaped this digestion also.

It seems to me that I have made enough reference to what has been said regarding the genesis and destruction of humours by Hippocrates, Plato, Aristotle, Praxagoras, and Diocles, and many others among the Ancients; I did not deem it right to transport the whole of their final pronouncements into this treatise. I have said only so much regarding each of the humours as will stir up the reader, unless he be absolutely inept, to make himself familiar with the writings of the Ancients, and will help him to gain more easy access to them. In another treatise ¹ I have written on the humours according to Praxagoras, son of Nicarchus; although this authority makes as many as ten humours, not

¹ Now lost.
δέκα ποιεὶ χωρίς τοῦ αἵματος, ἐνδέκατος γὰρ ἂν εἰη χυμὸς αὐτὸ τὸ αἷμα, τῆς Ἰπποκράτους οὐκ ἀποχωρεῖ διδασκαλίας. ἀλλ’ εἰς εἰδὴ τινὰ καὶ διαφορὰς τέμνει τοὺς ὑπ’ ἐκείνου πρώτου πάντων ἁμα ταῖς οἰκείαις ἀποδεῖξειν εἰρημένους χυμοὺς.

Ἐπαινεῖν μὲν οὖν χρὴ τοὺς τ’ ἐξηγησαμένους τὰ καλῶς εἰρημένα καὶ τοὺς εἰ τι παραλέιπονται προστιθέντας: οὐ γὰρ οἷόν τε τὸν αὐτὸν ἀρξασθαί τε καὶ τελείωσαι μέμφεσθαι δὲ τοὺς οὔτως ἀταλαπάρους, ὥς μηδὲν ὑπομένειν μαθεῖν τῶν ὀρθῶς εἰρημένων, καὶ τοὺς εἰς τοσοῦτον φιλοτιμούν, ὥστε ἐπιθυμία νεωτέρον δογμάτων ἀεὶ πανουργεῖν τι καὶ σοφίζεσθαι, τὰ μὲν ἐκόντας παραλιπόντας, ὥσπερ Ἑρασίστρατος ἐπὶ τῶν 142 χυμῶν ἐποίησε, τὰ δὲ παρῴργως ἀντιλέγοντας, ὥσπερ αὐτὸς θ’ οὔτος καὶ ἄλλοι πολλοὶ τῶν νεωτέρων.

Ἀλλ’ οὕτως μὲν ὁ λόγος ἐνταυθοὶ τελευτάτω, τὸ δ’ ὑπόλοιπον ἀπαν ἐν τῷ τρίτῳ προσθήσῳ.
including the blood (the blood itself being an eleventh), this is not a departure from the teaching of Hippocrates; for Praxagoras divides into species and varieties the humours which Hippocrates first mentioned, with the demonstration proper to each.

Those, then, are to be praised who explain the points which have been duly mentioned, as also those who add what has been left out; for it is not possible for the same man to make both a beginning and an end. Those, on the other hand, deserve censure who are so impatient that they will not wait to learn any of the things which have been duly mentioned, as do also those who are so ambitious that, in their lust after novel doctrines, they are always attempting some fraudulent sophistry, either purposely neglecting certain subjects, as Erasistratus does in the case of the humours, or unscrupulously attacking other people, as does this same writer, as well as many of the more recent authorities.

But let this discussion come to an end here, and I shall add in the third book all that remains.
BOOK III
143 Ὅτι μὲν οὖν ἡ θρέψις ἀλλοιουμένου τε καὶ ὁμοιουμένου γίγνεται τοῦ τρέφοντος τῷ τρεφόμενῳ καὶ ώς ἐν ἐκάστῳ τῶν τοῦ ζῶου μορίων ἄγετός τίς δύναμις, ἢν ἀπὸ τῆς ἐνεργείας ἀλλοιωτικῆς μὲν κατὰ γένος, ὁμοιωτικῆς δὲ καὶ θρεπτικῆς κατ' εἴδος ὄνομάξομεν, ἐν τῷ προσθεν δεδήλωται λόγῳ. τῇ δὲ εὐπορίαν τῆς ὑλῆς, ἢν τροφὴν ἐαυτῷ ποιεῖται τὸ τρεφόμενον, εξ ἐσέρας τινὸς ἦχειν ἐδείκνυτο δυνάμεως ἐπιστάσθαι πεφυκώς τὸν οἰκεῖον χυμόν, εἶναι δ' οἰκεῖον ἐκάστῳ τῶν μορίων χυμῶν, ὅσ' ἂν σὲ ἐπιτιθέσθωσιν εἰς τήν ἐξωμοίωσιν ἤ, καὶ τὴν ἐλκοσαν αὐτῶν δύναμιν ἀπὸ τῆς ἐνεργείας ἐλκτικῆς τε τινα καὶ ἐπισταστικῆς ὄνομάξησθαι. δεδείκται δὲ καὶ, ώς πρὸ μὲν τῆς ὑμιώσεως ἡ πρόσφυσις ἐστὶν, ἐκείνης δ' ἐμπροσθεν ἡ πρόσθεσις γίγνεται, τέλος, ὡς ἂν εἰποί τις, οὐσα τῆς κατὰ τὴν ἐπισταστικῆς δύναμιν ἐνεργείας. αὐτὸ μὲν γὰρ τὸ παράγεσθαι τὴν τροφὴν ἐκ τῶν φλεβῶν εἰς ἐκαστὸν τῶν μορίων τῆς ἐλκτικῆς ἐνεργούσης γίγνεται δυνά-

1 "Of food to feeder," i.e. of the environment to the organism. cf. p. 39, chap. xi.
BOOK III

It has been made clear in the preceding discussion that nutrition occurs by an *alteration* or *assimilation* of that which nourishes to that which receives nourishment,¹ and that there exists in every part of the animal a faculty which in view of its activity we call, in general terms, *alterative*, or, more specifically, *assimilative* and *nutritive*. It was also shown that a sufficient supply of the matter which the part being nourished makes into nutriment for itself is ensured by virtue of another faculty which naturally attracts its *proper juice* [humour] that that juice is proper to each part which is adapted for assimilation, and that the faculty which attracts the juice is called, by reason of its activity, *attractive* or *epispastic*.² It has also been shown that assimilation is preceded by *adhesion*, and this, again, by *presentation*,³ the latter stage being, as one might say, the end or goal of the activity corresponding to the attractive faculty. For the actual bringing up of nutriment from the veins into each of the parts takes place through the activation of the attractive faculty,⁴ whilst to

³ For these terms (*prosthesis* and *prophysis* in Greek) cf. p. 39, notes 5 and 6.
⁴ Lit. “through the energizing (or functioning) of the attractive faculty”; the faculty (*δύναμις*) *in operation* is an activity (*ἐργασία*). cf. p. 3, note 2.
μεως, τὸ δὴ ἡδὴ παρῆχθαι τε καὶ προστίθεσθαι τῷ μορίῳ τὸ τέλος ἐστὶν αὐτό, δι’ ὅ καὶ τῆς τοιαύτης ἐνέργειας ἐδεήθημεν· ὅνα γὰρ προστεθῇ, διὰ τούθεν ἐλκεται. χρόνου δ’ ἐντεῦθεν ἡδὴ πλείονος εἰς τὴν θρέψιν τοῦ ζῴου δεῖ· ἐλθθήναι μὲν γὰρ καὶ διὰ ταχέων τι δύναται, προσφύναι δὲ καὶ ἀλλοιωθῆναι καὶ τελέως ὁμοιωθῆναι τῷ τρεφομένῳ καὶ μέρος αὐτοῦ γειέσθαι παραχρῆμα μὲν οὐχ οἶνον τε, χρόνῳ δ’ ἂν πλείον συμβαίνοι καλῶς. ἀλλ’ εἰ μὴ μένοι κατὰ τὸ μέρος ὁ προστεθείσιν οὕτος χυμὸς, εἰς ἐτερον δὲ τι μεθίσταινο καὶ παραρρέοι διὰ παντὸς ἁμείβοι τε καὶ ὑπαλ.-

145 λάττων τὰ χωρία, κατ’ οὕτεν αὐτῶν || οὕτε πρόσφυσις οὕτ’ ἐξομοίωσις ἐσται. δεῖ δὲ κανταῦθα τινος τῇ φύσει δυνάμεως ἐτέρας εἰς πολυχρόνιον μονήν τοῦ προστεθέντος τῷ μορίῳ χυμοῦ καὶ ταύτης οὐκ ἔξωθεν ποθὲν ἐπιρρεόσθησις ἀλλ’ ἐν αὐτῷ τῷ θρεψμένῳ κατοικοσμήσεις, ἦν ἀπὸ τῆς ἐνέργειας πάλιν οἱ πρὸ ἡμῶν ἡναγκάσθησαν δυν—

μάσαι καθεκτικήν.

Ὁ μὲν δὴ λόγος ἡδὴ σαφῶς ἐνεδείξατο τὴν ἀνάγκην τῆς γενέσεως τῆς τοιαύτης δυνάμεως καὶ ὡστὶς ἀκολουθίας σύνεσιν ἔχει, πέπεισται βεβαιών ἐξ δὲν εἰπομεν, ὡς ὑποκειμένου τε καὶ προαιρετικού τοῦ τεχνικῆς εἶναι τὴν φύσιν καὶ τοῦ ζῴου κηδεμοικῆν ἀναγκαῖον ὑπάρχειν αὐτῇ καὶ τὴν τοιαύτην δύναμιν.
have been finally brought up and presented to the part is the actual end for which we desired such an activity; it is attracted in order that it may be presented. After this, considerable time is needed for the nutrition of the animal; whilst a thing may be even rapidly attracted, on the other hand to become adherent, altered, and entirely assimilated to the part which is being nourished and to become a part of it, cannot take place suddenly, but requires a considerable amount of time. But if the nutritive juice, so presented, does not remain in the part, but withdraws to another one, and keeps flowing away, and constantly changing and shifting its position, neither adhesion nor complete assimilation will take place in any of them. Here too, then, the [animal’s] nature has need of some other faculty for ensuring a prolonged stay of the presented juice at the part, and this not a faculty which comes in from somewhere outside but one which is resident in the part which is to be nourished. This faculty, again, in view of its activity our predecessors were obliged to call retentive.

Thus our argument has clearly shown the necessity for the genesis of such a faculty, and whoever has an appreciation of logical sequence must be firmly persuaded from what we have said that, if it be laid down and proved by previous demonstration that Nature is artistic and solicitous for the animal’s welfare, it necessarily follows that she must also possess a faculty of this kind.

1 This chapter is an excellent example of Galen’s method of reasoning a priori. The complementary inductive method, however, is employed in the next chapter. cf. p. 209, note 1.
II

'Αλλ' ἡμεῖς οὖν τούτων μόνῳ τῷ γένει τῆς ἀποδείξεως εἰδισμένοι χρησθαί, προστιθέντες δ' αὐτῷ καὶ τὰς ἐκ τῶν ἐναργῶς φαινομένων ἀναγκαζούσας τε καὶ βιαζομένας πίστεις ἐπὶ τὰς τοιαύτας καὶ νῦν ἀφιξόμεθα καὶ δείξομεν ἐπὶ μὲν τινῶν μορίων τοῦ σώματος οὕτως ἐναργῆ τὴν καθεκτικὴν δύναμιν, ὡς αὐταῖς ταῖς αἰσθήσεις διαγγελθήσθαι τῇ ἑνέργειαν αὐτῆς, ἐπὶ δὲ τινῶν ἦττον μὲν ἐναργῶς ταῖς αἰσθήσεις, λόγῳ δὲ κανταῦθα φωρᾶθηναι δυναμένην.

'Αρξόμεθ' οὖν τῆς διδασκαλίας ἀπ' αὐτοῦ τοῦ τέως πρώτου μεθόδου τινὶ προχειρίσασθαι μόρῑ αὔτα τοῦ σώματος, ἐφ' ὃν ἀκριβῶς ἐστὶ βασανίσαι τε καὶ ξητὶσαι τὴν καθεκτικὴν δύναμιν ὁποία ποτ' ἔστιν.

Ἀρ' οὖν ἁμένου ᾗ τις ἐτέρωθεν ἢ ἄπο τῶν μεγίστων τε καὶ κοιλοτάτων ὀργάνων ύπάρξασθαι τῆς ξητήσεως; ἐμοὶ μὲν οὖν οὐκ ἂν δοκεῖ βελτιων. ἐναργεῖς γοῦν εἰκὸς ἐπὶ τούτων φανῆναι τὰς ἑνεργείας διὰ τὸ μέγεθος· ὡς τὰ γε σμικρὰ τάχ' ἂν, εἰ καὶ σφοδρὰν ἔχει τὴν τοιαύτην δύναμιν, ἀλλ' οὖν αἰσθήσεις γ' ἐτοιμὴν διαγγελθήσθαι τὴν ἑνεργείαν αὐτῆς.

'Αλλ' ἔστιν ἐν τοῖς μάλιστα κοιλοτάτα καὶ μεγίστα τῶν τοῦ ζύμου μορίων ἢ τε γαστήρ καὶ <αἱ> μὴτραὶ τε καὶ ύστεραι καλουμέναι. τῷ οὖν κωλύει ταῦτα πρώτα προχειρισαμένους ἐπίσκεψασθαι τὰς ἑνεργείας αὐτῶν, ὅσαι μὲν καὶ πρὸ τῆς ἀνατομῆς

1 The deductive.
2 The logos is the argument or "theory" arrived at by the
ON THE NATURAL FACULTIES, III. II

II

Since, however, it is not our habit to employ this kind of demonstration alone, but to add thereto cogent and compelling proofs drawn from obvious facts, we will also proceed to the latter kind in the present instance: we will demonstrate that in certain parts of the body the retentive faculty is so obvious that its operation can be actually recognised by the senses, whilst in other parts it is less obvious to the senses, but is capable even here of being detected by the argument.¹

Let us begin our exposition, then, by first dealing systematically for a while with certain definite parts of the body, in reference to which we may accurately test and enquire what sort of thing the retentive faculty is.

Now, could one begin the enquiry in any better way than with the largest and hollowest organs? Personally I do not think one could. It is to be expected that in these, owing to their size, the activities will show quite clearly, whereas with respect to the small organs, even if they possess a strong faculty of this kind, its activation will not at once be recognisable to sense.

Now those parts of the animal which are especially hollow and large are the stomach and the organ which is called the womb or uterus.² What prevents us, then, from taking up these first and considering their activities, conducting the enquiry on our own process of λογική θεωρία or "theorizing"; cf. p. 151, note 3; p. 205, note 1.

¹ The Greek words for the uterus (mētrae and hysterae) probably owe their plural form to the belief that the organ was bicornuate in the human, as it is in some of the lower species.
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δήλα, τὴν ἐξέτασιν ἐφ' ἡμῶν αὐτῶν ποιομένους, ὅσων ὁ ἀμυδρότεραι, τὰ παραπλήσια διαίρονται 147 ἀνθρώπῳ ζώα, ὥστε ὃς ὁμιλήσῃ τὸ γε καθόλου περὶ τῆς ξιτομένης δυνάμεως καὶ τῶν ἀνομοίων ἐνδείξεις ἀλλ' ὡς ἢ ἁμα τῷ κοινῷ καὶ τὸ ἱδίον ἐφ' ἡμῶν αὐτῶν ἐγγωκότες εἰς τε τᾶς διαγνώσεις τῶν νοσημάτων καὶ τὰς ἱάσεις εὐ-πορώτεροι γιανμέθα.

Περὶ μὲν οὖν ἀμφιτέρων τῶν ὁργάνων ἀμα λέγειν ἀδύνατον, ἐν μέρει δ' ὑπὲρ ἐκατέρου ποιησόμεθα τὸν λόγον ἀπὸ τοῦ σαφήστερον ἐνδείξασθαι δυναμένον τὴν καθεκτικὴν δύναμιν ἀρξάμενοι. κατέχει μὲν γὰρ καὶ ἡ γαστὴρ τὰ σιτία, μέχρι περὶ ἀν ἐκπέψῃ, κατέχουσι δὲ καὶ αἱ μύται τὸ ἐμβρυον, ἐστ' ἂν τελειώσωσιν ἀλλὰ πολλαπλάσιος ἦστιν ὅ τῆς τῶν ἐμβρύων τελειώ- σεως χρόνος τῆς τῶν σιτίων πέψεως.

III

Εἰκὸς οὖν καὶ τὴν δύναμιν ἐναργέστερον ἐν ταῖς μῆτραις φωράσεων ἡμᾶς τὴν καθεκτικὴν, ὅσω καὶ πολυχρωνιστέραι τῆς γαστρὸς τὴν ἐνέργειαν κέκτηται. μησὶ γὰρ ἐννέα που ταῖς πλείσταις τῶν γυναικῶν ἐν αὐταῖς τελειοῦται τὰ κυήματα, μεμυκθαίς μὲν ἀπαντὶ τῷ αὐχένι, περιεχούσις δὲ πανταχόθεν αὐτὰ συν τῷ χορίῳ.|| 148 καὶ πέρας ὑπὲρ τῆς τοῦ στόματος μύσεως καὶ τῆς τοῦ κυομένου κατὰ τὰς μήτρας μονῆς ἡ χρεία τῆς ἐνεργείας ἦστιν ὧν γὰρ ὡς ἔτυχεν οὐδ' ἀλόγως ἰκανὰς περιστελλέσθαι καὶ κατέχειν τὸ
persons in regard to those activities which are obvious without dissection, and, in the case of those which are more obscure, dissecting animals which are near to man;¹ not that even animals unlike him will not show, in a general way, the faculty in question, but because in this manner we may find out at once what is common to all and what is peculiar to ourselves, and so may become more resourceful in the diagnosis and treatment of disease.

Now it is impossible to speak of both organs at once, so we shall deal with each in turn, beginning with the one which is capable of demonstrating the retentive faculty most plainly. For the stomach retains the food until it has quite digested it, and the uterus retains the embryo until it brings it to completion, but the time taken for the completion of the embryo is many times more than that for the digestion of food.

III

We may expect, then, to detect the retentive faculty in the uterus more clearly in proportion to the longer duration of its activity as compared with that of the stomach. For, as we know, it takes nine months in most women for the foetus to attain maturity in the womb, this organ having its neck quite closed, and entirely surrounding the embryo together with the chorion. Further, it is the utility of the function which determines the closure of the os and the stay of the foetus in the uterus. For it is not casually nor without reason that Nature has made

¹ Note this expression. For Galen's views on the origin of species, cf. Introduction, p. xxxi., footnote.


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ἐμβρυον ἡ φύσις ἀπείραστα τὰς υστέρας, ἀλλ' ἢν εἰς τὸ πρέπον αφίκηται μέγεθος τὸ κυούμενον.

όταν οὖν, οὐ χάριν εὐνύγαυν τῇ καθεκτικῇ δυνάμει, συμπεπληρωμένον ἢ, ταύτην μὲν ἀνέπαυσάν τε καὶ εἰς ἠρεμίαν ἔπανήγαγον, ἀντ' αὐτῆς δ' ἐτέρα χρώναι τῇ τέως ἡσυχαζούση, τῇ προστικῇ. ἢν δ' ἄρα καὶ τῆς ἐκείνης ἡσυχίας ὅρος ἡ χρεία καὶ τῆς γ' ἐνεργείας ὡσαύτως ἡ χρεία: καλοῦσθαι μὲν γὰρ αὐτῆς ἐνεργεῖ, μὴ καλοῦσθαι δ' ἡσυχάζει.

Καὶ χρῆ πάλιν κανταῦθα καταμαθεῖν τῆς φύσεως τῆν τέχνην, ὡς οὖ μόνον ἐνεργειών χρησίμων δυνάμεις ἐνέθηκεν ἐκάστῳ τῶν ὄργανων, ἀλλὰ καὶ τοῦ τῶν ἡσυχίων τε καὶ κινήσεων καιροῦ προονόσατο. καλῶς μὲν γὰρ ἀπάντων γεγομένων τῶν κατὰ τὴν κύψην ἡ ἀποκριτικὴ δύναμις ἡσυχάζει τελέως ὡσπέρ ὅσιον ὅσια, κακοπραγίας δὲ τινος γεγομένης ἡ περὶ τὸ χορίον ἢ περὶ τινα τῶν ἄλλων ἢ μὲν ἢ περὶ τὸ κυούμενον αὐτὸ καὶ τῆς τελειώσεως αὐτοῦ παντάπασιν ἀπογρωσθείσης οὐκέτι ἀναμένουσι τὸν εἰνεάμηνον αἰ μὴ τραίρε γρόνον, ἀλλ' ἢ μὲν καθεκτικὴ δύναμις αὐτίκα δὴ πέπαιναι καὶ παραχωρεῖ κινεῖσθαι τῇ πρότερον ἀργοῦρη, πράττει δ' ἤδη τι καὶ πραγματεύεται χρηστὸν ἡ ἀποκριτικὴ τε καὶ προστικὴ· καὶ γὰρ οὖν καὶ ταύτην οὕτως ἐκάλεσαν ἀπὸ τῶν ἐνεργεῖων αὐτῆς τὰ ὀνόματα θέμενοι καθάπερ καὶ ταῖς ἄλλαις.

Καὶ πῶς ὁ λόγος έοικεν ὑπὲρ ἀμφοτέρων ἀποδείξεων ἀμα: καὶ γὰρ τοι καὶ διαδεχομένας αὐτὰς ἄλληλας καὶ παραχωροῦσαν ἀεὶ τὴν ἐτέραν τῇ λοιπῇ, καθότι ἢν ἡ χρεία κελεύῃ, καὶ

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the uterus capable of contracting upon, and of retaining the embryo, but in order that the latter may arrive at a proper size. When, therefore, the object for which the uterus brought its retentive faculty into play has been fulfilled, it then stops this faculty and brings it back to a state of rest, and employs instead of it another faculty hitherto quiescent—the propulsive faculty. In this case again the quiescent and active states are both determined by utility; when this calls, there is activity; when it does not, there is rest.

Here, then, once more, we must observe well the Art [artistic tendency] of Nature—how she has not merely placed in each organ the capabilities of useful activities, but has also fore-ordained the times both of rest and movement. For when everything connected with the pregnancy proceeds properly, the eliminative faculty remains quiescent as though it did not exist, but if anything goes wrong in connection either with the chorion or any of the other membranes or with the foetus itself, and its completion is entirely despaired of, then the uterus no longer awaits the nine-months period, but the retentive faculty forthwith ceases and allows the heretofore inoperative faculty to come into action. Now it is that something is done—in fact, useful work effected—by the eliminative or propulsive faculty (for so it, too, has been called, receiving, like the rest, its names from the corresponding activities).

Further, our theory can, I think, demonstrate both together; for seeing that they succeed each other, and that the one keeps giving place to the other according as utility demands, it seems not unreason-
τὴν διδασκαλίαν κοινὴν οὐκ ἀπεικόσ ἐστὶ δέχεσθαι. τῆς μὲν οὖν καθεκτικῆς δυνάμεως ἔργον περιστείλα τὰς μῆτρας τῷ κυνουμένῳ πανταχόθεν, ὡστε εὐλόγως ἀποτομέναις μὲν ταῖς μαίεντρίαις τὸ στόμα μεμυκὸς αὐτῶν φαίνεται, ταῖς κυνούσαις δ' αὐτάις κατὰ τὰς πρῶτας ἡμέρας καὶ μᾶλιστα κατ' αὐτὴν ἐκείνην, ἐν ἵπτερ ἂν ἢ τῆς γονής σύλληψις γένηται, κυνουμένων τε καὶ συν-150 τρεχοῦσῶν εἰς ἐαυτὰς τῶν ύστερῶν αἰσθησιν γίνεται καὶ ἢν ἀμφο ταῦτα συμβῆ, μῦσαι μὲν τὸ στόμα χρώσ φλεγμονῆς ἢ τινος ἄλλου παθήματος, αἰσθητικὸς δὲ τῆς κατὰ τὰς μῆτρας κυνήσεως ἀκολουθῆσαι, πρὸς αὐτὰς ἡδὴ τὸ σπέρμα τὸ παρὰ τάνδρος εἰληφέναι τε καὶ κατέχειν αἱ γυναικεῖς νομίζουσι.

Ταῦτα δ' οὖν ἡμεῖς νῦν ἀναπλάττομεν ἡμῖν αὐτοῖς, ἀλλ' ἐκ μακρᾶς πείρας δοκιμασθέντα πάσι γέγραπται σχεδὸν τι τοῖς περὶ τούτων πραγμάτευσαμένης. Ἡρόφιλος μὲν γε καὶ ὡς οὐδὲ πυρῆνα μήλης ἢν δέχοιτο τῶν μητρῶν τὸ στόμα, πρὶν ἀποκυνν ἄρτι γυναῖκα, καὶ ὡς οὐδὲ τούλαχιστον ἐτὶ διέστηκεν, ἢν ὑπάρξῃ κύρια, καὶ ὡς ἐτὶ πλέον ἀναστομοῦντα κατὰ τὰς τῶν ἐπιμηνίων φοράς, οὐκ ἀκυνήσε γράφειν: συνομολογοῦσι δ' αὐτῷ καὶ οἱ ἄλλοι πάντες οἱ περὶ τούτων πραγματευσάμενοι καὶ πρῶτος ἡ ἄπαντων ἱματρών τε καὶ φιλοσόφων Ἰπποκράτης ἀπεφήματα μύειν τὸ στόμα τῶν ύστερῶν ἐν τε ταῖς κυνήσει καὶ ταῖς φλεγμοναῖς, ἀλλ' ἐν μὲν ταῖς κυνήσεις οὐκ ἔξεστάμενοι τῆς φύσεως, ἐν δὲ ταῖς φλεγμοναῖς σκληρῶν γηγρόμενον.
able to accept a common demonstration also for both. Thus it is the work of the retentive faculty to make the uterus contract upon the foetus at every point, so that, naturally enough, when the midwives palpate it, the os is found to be closed, whilst the pregnant women themselves, during the first days—and particularly on that on which conception takes place—experience a sensation as if the uterus were moving and contracting upon itself. Now, if both of these things occur—if the os closes apart from inflammation or any other disease, and if this is accompanied by a feeling of movement in the uterus—then the women believe that they have received the semen which comes from the male, and that they are retaining it.

Now we are not inventing this for ourselves: one may say the statement is based on prolonged experience of those who occupy themselves with such matters. Thus Herophilus does not hesitate to state in his writings that up to the time of labour the os uteri will not admit so much as the tip of a probe, that it no longer opens to the slightest degree if pregnancy has begun—that, in fact, it dilates more widely at the times of the menstrual flow. With him are in agreement all the others who have applied themselves to this subject; and particularly Hippocrates, who was the first of all physicians and philosophers to declare that the os uteri closes during pregnancy and inflammation, albeit in pregnancy it does not depart from its own nature, whilst in inflammation it becomes hard.

1 Herophilus of Chalcedon (circa 300 B.C.) was, like Erasistratus, a representative of the anatomical school of Alexandria. His book on Midwifery was known for centuries. cf. Introduction, p. xii.
Γάλεν

Ἐπὶ δὲ γε τῆς ἐναντίας τῆς ἐκκριτικῆς ἀνοίγωνται μὲν τὸ στόμα, προέρχεται δὲ ὁ πυθμὴν ||

151 ἄπασι όσον οἶον τῷ ἐγγυτάτῳ τοῦ στόματος ἀπωθούμενος ἔξω τὸ ἐμβρυον, ἀμα δ' αὐτῷ καὶ τὰ συνεχῆ μέρη τὰ οἶον πλευρά τοῦ παντὸς ἀργάνου συνεπιλαμβανόμενα τοῦ ἔργου θλίβει τε καὶ προσθεὶ πάν ἔξω τὸ ἐμβρυον. καὶ πολλαῖς τῶν γυναικῶν ὀδίνες βίαιοι τὰς μήτρας ὀλας ἐκπεσεῖν ἠνάγκασαν ἀμέτρως χρησιμέναις τῇ τοιαύτῃ δυνάμει, παραπλησίου των γυναικόμενου τῷ πολλάκις ἐν πάλαις τισὶ καὶ φιλονεικίας συμβαίνοντι, ὅταν ἀνατρέψαι τε καὶ καταβαλεῖν ἐτέρους σπεύδοντες αὐτοῖς συγκαταπέσωμεν. οὖτω γὰρ καὶ αἱ μήτραι τὸ ἐμβρυον ὀδοῦσαι συνεξέπεσον ἐνίστε καὶ μάλισθ', ὅταν οἱ πρὸς τὴν ῥάχιν αὐτῶν σύνδεσμοι χαλαροὶ φύσει τυγχάνωσιν ὅντες.

"Εστι δὲ καὶ τούτο θαυμαστόν τι τῆς φύσεως σοφισμα, τὸ ξόντος μὲν τοῦ κυήματος ἄκριβὸς πάνυ μεμυκέαν τὸ στόμα τῶν μητρῶν, ἀποθανόντος δὲ παραχρήμα διανοίγεσθαι τοσοῦτον, ὅσον εἰς τὴν ἔξοδον αὐτοῦ διαφέρει. καὶ μέν τοι καὶ αἱ μαίαι τὰς τικτούσας οὐκ εὐθὺς ἀνιστάσιν οὐδ' ἐπὶ τὸν δίφρον καθίζουσιν, ἀλλ' ἀπτοῦται 152 πρότερον ἀνουγομένου τοῦ στόματος || κατὰ βραχὺ καὶ πρώτον μὲν, ὡστε τὸν μικρὸν δάκτυλον καθιέναι, διεστηκέναι φασίν, ἐπειτ' ἤδη καὶ μείζον καὶ κατὰ βραχὺ δὴ πυθμανομένοις ἠμῖν ἀποκρίνονται τὸ μέγεθος τῆς διαστάσεως ἐπανξανόμενον. ὅταν δ' ἰκανὸν ἦ πρὸς τὴν τοῦ κυνομένου δίοδον, ἀνιστάσιν αὐτὰς καὶ καθίζουσιν
In the case of the opposite (the eliminative) faculty, the os opens, whilst the whole fundus approaches as near as possible to the os, expelling the embryo as it does so; and along with the fundus the contiguous parts—which form as it were a girdle round the whole organ—co-operate in the work; they squeeze upon the embryo and propel it bodily outwards. And, in many women who exercise such a faculty immoderately, violent pains cause forcible prolapse of the whole womb; here almost the same thing happens as frequently occurs in wrestling-bouts and struggles, when in our eagerness to overturn and throw others we are ourselves upset along with them; for similarly when the uterus is forcing the embryo forward it sometimes becomes entirely prolapsed, and particularly when the ligaments connecting it with the spine happen to be naturally lax.¹

A wonderful device of Nature’s also is this—that, when the foetus is alive, the os uteri is closed with perfect accuracy, but if it dies, the os at once opens up to the extent which is necessary for the foetus to make its exit. The midwife, however, does not make the parturient woman get up at once and sit down on the [obstetric] chair, but she begins by palpating the os as it gradually dilates, and the first thing she says is that it has dilated “enough to admit the little finger,” then that “it is bigger now,” and as we make enquiries from time to time, she answers that the size of the dilatation is increasing. And when it is sufficient to allow of the transit of the foetus,² she then makes the patient get up from her bed and

¹ Relaxation of utero-sacral ligaments as an important predisposing cause of prolapsus uteri.
² That is, at the end of the first stage of labour.
καὶ προθυμεῖσθαι κελεύουσιν ἀπώσασθαι τὸ παιδίον. ἦστι δ’ ἦδη τούτο τὸ ἔργον, ὅ παρ’ ἑαυτῶν αἱ κύουσαι προστιθέασιν, οὐκέτι τῶν ὑστερῶν, ἀλλὰ τῶν κατ’ ἐπιγάστριον μυὼν, οὐ πρὸς τὴν ἀποτάτησιν τε καὶ τὴν οὐρήσιν ἡμῖν συνεργοῦσιν.

IV

Οὔτω μὲν ἐπὶ τῶν μητρῶν ἐναργῶς αἱ δύο φαίνονται δυνάμεις, ἐπὶ δὲ τῆς γαστρὸς ὀδε. πρῶτον μὲν τοῖς κλύδωσιν, οὐ δὴ καὶ πεπίστευνται τοῖς ἱατρῶις ὄρρωστοι κοιλίας εἶναι συμπτώματα καὶ κατὰ λόγον πεπίστευνται· ἐνίοτε μὲν γὰρ ἐλάχιστα προσενεγμένων οὐ γίγνονται περιστελλομένης ἀκριβῶς αὐτοῖς τῆς γαστρὸς καὶ σφυγγούσης πανταχόθεν, ἐνίοτε δὲ μεστῇ μὲν ἡ 153 γαστήρ ἐστιν, οἱ κλύδωνες δ’ ὡς ἐπὶ κενῆς ἐξακούονται. κατὰ φύσιν μὲν γὰρ ἔχουσα καὶ χρωμένη καλῶς τῇ περισταλτικῇ δυνάμει, κἂν ὄλγον ἢ τὸ περιεχόμενον, ἀπαν αὐτὸ περιλαμβάνουσα χώραν οὐδεμίαν ἀπολείπει κενήν, ἄρρωστοσια δε, καθότι ἐν ἅδυνασθη περιλαβεῖν ἀκριβῶς, ἐνταῦθ’ εὑρυχωριάν τιν’ ἐργαζομένη συγχωρεῖ τοῖς περιεχομένοις ύγροῖς κατὰ τὰς τῶν σχημάτων μεταλλαγάς ἀλλοτ’ ἀλλαχόσε μεταρρέουσι κλύδωνας ἀποτελεῖν.

Εὐλόγως οὖν, ὅτι μηδὲ πέψουσιν ἰκανῶς, οἱ ἐν τῶι τῷ συμπτώματι γενόμενοι προσδοκῶσιν· οὐ γὰρ ἐνδεχεται πέψαι καλῶς ἄρρωστον γαστέρα. τοῖς τοιούτοις δε καὶ μέχρι πλεῖονος ἐν αὐτῇ
ON THE NATURAL FACULTIES, III. iii.-iv

sit on the chair, and bids her make every effort to expel the child. Now, this additional work which the patient does of herself is no longer the work of the uterus but of the epigastric muscles, which also help us in defaecation and micturition.

IV

Thus the two faculties are clearly to be seen in the case of the uterus; in the case of the stomach they appear as follows:—Firstly in the condition of gurgling, which physicians are persuaded, and with reason, to be a symptom of weakness of the stomach; for sometimes when the very smallest quantity of food has been ingested this does not occur, owing to the fact that the stomach is contracting accurately upon the food and constricting it at every point; sometimes when the stomach is full the gurglings yet make themselves heard as though it were empty. For if it be in a natural condition, employing its contractile faculty in the ordinary way, then, even if its contents be very small, it grasps the whole of them and does not leave any empty space. When it is weak, however, being unable to lay hold of its contents accurately, it produces a certain amount of vacant space, and allows the liquid contents to flow about in different directions in accordance with its changes of shape, and so to produce gurglings.

Thus those who are troubled with this symptom expect, with good reason, that they will also be unable to digest adequately; proper digestion cannot take place in a weak stomach. In such people also, the mass of food may be plainly seen to remain
GALEN

fiavetai paramevou to 7baros, on 7ai Kai Bradu-
terou pettonysi. Kai mou thavmaseiv an tis ep-
auton touton malista to poluchronon tis en to
ystrophidiatriobiou ou touton sitiou monon alla kai
tou pomaou ou gar, oter an omheii tis, on to
this yastrophos stoma to kata stevnon ikanous
uptarcho oudev paristei prin akribosis leiothynai,
touti autiou 6ntos esti. Pollla yvov pollarwos
154 opor6y ostata megistata katapanvou || pammollon
kai tis daktulioi xynov en to stoma vi
labtou awkou katepie kai allos tis nomisma kai
allou alla to skleron kai dyskatergastov,
all6 omes apantei ou touto radhov apetapthev,
a katepiein, ouved6s autois akolouthisantos semy-
potomatos. Ei de ge tis stevotis tov 6r6u tis
yastrophos autia touto menein eti pleon 7i tois
atrittopoi sittos, oudev an toutou touto diekow-
rysein. Alla kai to touto poma autois en tis
yastroph parameiven eti pleiston ikanon appagev
thun upoviai touto 6r6u tis stevotitos 6lou
yvar, etiper 7i en to kekuludhais to 6patou
uptenai, tis te rophiemai an ouw kai to 6 gala kai
o tis pttisimhis xulos autika diexei pasiw.
all6 onych 6de exei tois mene gar asthonewen eti
pleistos emplei tausta kai klydwnas ergnazetai
paramevonta kai thlebei kai barinei tis yastera,
tois 6i sxuroi ou monon toutou oudev sylvaiwnei,
allla kai polv pl6thos artopai kai kredow upo-
chorei tachews.

1 The pylorus.

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an abnormally long time in the stomach, as would be natural if their digestion were slow. Indeed, the chief way in which these people will surprise one is in the length of time that not food alone but even fluids will remain in their stomachs. Now, the actual cause of this is not, as one would imagine, that the lower outlet of the stomach, being fairly narrow, will allow nothing to pass before being reduced to a fine state of division. There are a great many people who frequently swallow large quantities of big fruit-stones; one person, who was holding a gold ring in his mouth, inadvertently swallowed it; another swallowed a coin, and various people have swallowed various hard and indigestible objects; yet all these people easily passed by the bowel what they had swallowed, without there being any subsequent symptoms. Now surely if narrowness of the gastric outlet were the cause of untriturated food remaining for an abnormally long time, none of these articles I have mentioned would ever have escaped. Furthermore, the fact that it is liquids which remain longest in these people’s stomachs is sufficient to put the idea of narrowness of the outlet out of court. For, supposing a rapid descent were dependent upon emulsification, then soups, milk, and barley-emulsion would at once pass along in every case. But as a matter of fact this is not so. For in people who are extremely asthenic it is just these fluids which remain undigested, which accumulate and produce gurglings, and which oppress and overload the stomach, whereas in strong persons not merely do none of these things happen, but even a large quantity of bread or meat passes rapidly down.

Lit. barley-“chyle,” i.e. barley-water.
Οὐ μόνον δὲ ἐκ τοῦ περιτετάσθαι τὴν γαστέρα 155 καὶ βαρύνεσθαι || καὶ μεταρρεῖν ἅλλοτ' εἰς ἅλλα μέρη μετὰ κλύδωνος τὸ παραμένειν ἐπὶ πλέον ἐν αὐτῇ πάντως τοῖς οὕτως ἔχουσι τεκμηριάτ' ἀν τις ἅλλα καὶ τῶν ἐμέτων ἐνιοῦ γάρ οὐ μετὰ τρεῖς ὀρας ἢ τέτταρας ἅλλα νυκτῶν ἦδη μέσων παμπόλλου μεταξύ χρόνου διελθόντος ἐπὶ ταῖς προσφοραῖς ἀνήμεσαν ἀκριβῶς ἀπαντα τὰ ἐδηδεσμένα.

Καὶ μὲν δὴ καὶ ξὺν οὖσιν ἐμπλήσας ὑγρᾶς τροφῆς, ὁσπερ ἡμεῖς πολλάκις ἐπὶ συν ἐπειράθημεν ἐξ ἀλεύρων μέθ' ὕδατος οἰον κυκεώνα τινα δόντες αὐτοῖς, ἔπειτα μετὰ τρεῖς που καὶ τέτταρας ὀρας ἀνατεμόντες, εἰ οὗτω καὶ σὺ πράξειας, εὐρήσεις ἔτι κατὰ τὴν γαστέρα τὰ ἐδηδεσμένα πέρας γάρ αὐτοῖς ἐστὶ τῆς ἐνταῦθα μονῆς οὐχ ἢ χύλωσις, ἢ καὶ ἑκτὸς ἐτί οὖτων μηχανῆσασθαί δυνατὸν ἐστιν, ἀλλ' ἢ πέψις, ἐτερον τι τῆς χυλώσεως οὕσα, καθάπερ αἰμάτωσις τε καὶ θρέψις, ὡς γὰρ κάκεινα δέδεικται ποιοτήτων μεταβολή γιγνόμενα, τὸν αὐτὸν τρόπον καὶ ἡ ἐν τῇ γαστρὶ πέψις τῶν συτίων εἰς τὴν οἰκείαν ἐστὶ τῷ τρέφο-156 μένῳ ποιότητα || μεταβολή καὶ ὅταν γε πεφθηκέν τελέως, ἀνοίγνυται μὲν τηνικάθα τὸ κάτω στόμα, διεκόπτετε δ' αὐτοῦ τὰ σιτία ῥαδίως, εἰ καὶ πληθὺς τι μεθ' ἕαυτῶν ἔχοντα τύχοι λίθων ἡ ὀστῶν ἡ γυγάρτων ἡ τινος ἅλλου χυλωθήναι μὴ δυναμένου. καὶ σος ἑοῦτ' ἐνεστῶν ἐπὶ ξὺν 240
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And it is not only because the stomach is distended and loaded and because the fluid runs from one part of it to another accompanied by gurglings—it is not only for these reasons that one would judge that there was an unduly long continuance of the food in it, in those people who are so disposed, but also from the vomiting. Thus, there are some who vomit up every particle of what they have eaten, not after three or four hours, but actually in the middle of the night, a lengthy period having elapsed since their meal.

Suppose you fill any animal whatsoever with liquid food—an experiment I have often carried out in pigs, to whom I give a sort of mess of wheaten flour and water, thereafter cutting them open after three or four hours; if you will do this yourself, you will find the food still in the stomach. For it is not chylification which determines the length of its stay here—since this can also be effected outside the stomach; the determining factor is digestion which is a different thing from chylification, as are blood-production and nutrition. For, just as it has been shown that these two processes depend upon a change of qualities, similarly also the digestion of food in the stomach involves a transmutation of it into the quality proper to that which is receiving nourishment. Then, when it is completely digested, the lower outlet opens and the food is quickly ejected through it, even if there should be amongst it abundance of stones, bones, grape-pips, or other things which cannot be reduced to chyle. And you may observe this

1 i.e. not the mere mechanical breaking down of food, but a distinctively vital action of "alteration."
Galen

θεάσασθαι στοχασαμενῳ τὸν καιρὸν τῆς κάτω διξέοδου. καὶ μὲν γε καὶ εἰ σφαλείς ποτὲ τοῦ καίρου καὶ μηδὲν μήπω κάτω παρέρχοιτο πεπτομένων ἔτι κατὰ τὴν γαστέρα τῶν σιτίων, οὐδὲ οὔτως ἀκαρπος ἢ ἀνατομὴ σοι γενήσεται: θεάσῃ γὰρ ἐτ' αὐτῶν, ὅπερ οἷγμ ρόσθεν ἐλέγομεν, ἀκριβῶς μὲν μεμυκότα τὸν πυλωρόν, ἀπασάν δὲ τὴν γαστέρα περιεσταλμένην τοῖς σιτίοις τρόπον ὀμοιότατον, οἴκοντερ καὶ αἱ μήτραι τοῖς κυνομένοις. οὐ γὰρ ἐστιν οὐδέποτε κεφήν εὑρείν χώραν οὔτε κατὰ τὰς υστέρας οὔτε κατὰ τὴν κοιλίαν οὔτε κατὰ τὰς κύστεις ἀμφότερας οὔτε κατὰ τὴν χοληδόχον ὄνομαξομένην οὔτε τὴν ἐτέραν: ἀλλ' εἴτ' οἷγμ εἰτ' τὸ περιεχόμενον ἐν αὐταῖς εἴτε πολὺ, μεσταὶ καὶ πλήρεις αὐτῶν αἱ κοιλίαι φαίνονται περιστελλομένων ἀεὶ τῶν χυτῶν τοῖς περιεχόμενοις, ὅταν γε κατὰ φύσιν ἔχῃ τὸ ξύον. ||

157 Ἐρασίστρατος δ' οὐκ οἴδ' ὅτως τὴν περιστολήν τῆς γαστρὸς ἀπάντων αἰτίαν ἀποφαίνει καὶ τῆς λειώσεως τῶν σιτίων καὶ τῆς τῶν περιττομάτων ὑποχωρήσεως καὶ τῆς τῶν κεχυλωμένων ἀναδόσεως.

Ἐγὼ μὲν γὰρ μυριάκις εἵπ' ζῶντος εἵτ' τοῦ ζῴου διελὼν τὸ περιτόναιον εὗρον ἀεὶ τὰ μὲν ἐντερα πάντα περιστελλόμενα τοῖς ἐνυπάρχοντες, τὴν κοιλίαν δ' οὐχ ἀπλῶς, ἀλλ' εἵπ' μὲν ταῖς ἐδώδαις ἀνωθέν τε καὶ κάτωθεν αὐτὰ καὶ πανταχόθεν ἀκρι-

1 Choledochous. 2 More exactly peri-tolé; cf. p. 97, note 1. 3 Neuburger says of Erasistratus that "dissection had taught him to think in terms of anatomy." It was chiefly
ON THE NATURAL FACULTIES, III. iv

yourself in an animal, if you will try to hit upon the time at which the descent of food from the stomach takes place. But even if you should fail to discover the time, and nothing was yet passing down, and the food was still undergoing digestion in the stomach, still even then you would find dissection not without its uses. You will observe, as we have just said, that the pylorus is accurately closed, and that the whole stomach is in a state of contraction upon the food very much as the womb contracts upon the foetus. For it is never possible to find a vacant space in the uterus, the stomach, or in either of the two bladders—that is, either in that called bile-receiving or in the other; whether their contents be abundant or scanty, their cavities are seen to be replete and full, owing to the fact that their coats contract constantly upon the contents—so long, at least, as the animal is in a natural condition.

Now Erasistratus for some reason declares that it is the contractions of the stomach which are the cause of everything—that is to say, of the softening of the food, the removal of waste matter, and the absorption of the food when chylified [emulsified].

Now I have personally, on countless occasions, divided the peritoneum of a still living animal and have always found all the intestines contracting peristaltically upon their contents. The condition of the stomach, however, is found less simple; as regards the substances freshly swallowed, it had grasped these accurately both above and below, in fact at every point, and was as devoid of movement the gross movements or structure of organs with which he concerned himself. Where an organ had no obvious function, he dubbed it "useless"; e.g. the spleen (cf. p. 143).

i.e. contracting and dilating; no longitudinal movements involved; cf. p. 263, note 2.
Galen

βῶς περιεληφθάναι ἰκώντον, ὡς δοκεῖν ἡνδόσθαι καὶ περιπεθυκέναι τοῖς συτίοις· ἐν δὲ τούτῳ καὶ τὸν πυλωρὸν εύρισκον ἢ ἄλλο μεμυκότα καὶ κεκλεισμένον ἀκριβῶς ὀσπερ τὸ τῶν ύστερῶν στόμα ταῖς ἐγκύμοσιν.

Ἐπὶ μέντοι ταῖς πέψεσι συμμπεπληρωμέναις ἀνέφκτο μὲν ὁ πυλωρός, ἡ γαστήρ δὲ περισταλτικῶς ἐκινεῖτο παραπλησίως τοῖς ἐντέροις.

V

'Ἀπαντάν ὁν ἀλλήλοις ὀμολογεί ταῦτα καὶ τῇ γαστρὶ καὶ ταῖς ύστεραις καὶ ταῖς κύστεσιν εἰναὶ τινας ἐμφύτους δυνάμεις καθεκτικὰς μὲν τῶν 158 οἰκείων ποιοτήτων, ἢ ἀποκριτικὰς δὲ τῶν ἄλλων νομισμάτων. ὅτι μὲν γὰρ ἔλκει τὴν χολήν εἰς ἐαυτὴν ἢ ἐπὶ τῷ ἕπατε κύστεις, ἐμπροσθεν δέδεσκεν, ὅτι δὲ καὶ ἀποκρίνεται καθ' ἐκάστην ἡμέραν εἰς τὴν γαστέρα, καὶ τούτῳ ἐναργῶς φαίνεται. καὶ μὴν εἰ διεδέχετο τὴν ἐλκτικὴν δύναμιν ἢ ἐκκριτικὴν καὶ μὴ μέση τις ἁμορφών ἢ καθεκτικήν, διὰ παντὸς ἐχρῆ ἀνατεμνομένων τῶν ξύων ἵνα πλήθος χολῆς εὐρίσκεσθαι κατὰ τὴν κύστιν· οὐ μὴν εὐρίσκεται γε. ποτὲ μὲν γὰρ πληροστάτη, ποτὲ δὲ κενοτάτη, ποτὲ δὲ τὰς ἐν τῷ μεταξύ διαφορὰς ἐχοῦσα θεωρεῖται, καθάπερ καὶ ἡ ἐτέρα κύστις ἢ τὸ ὀσρον ὑποδεχομένη. ταύτης μὲν γε καὶ πρὸ τῆς ἀνατομῆς αἰσθανόμεθα, πρὶν ἀνιαθῆναι τῷ πλήθει βαρυθείσαι ἢ τῇ δριμύτητι ὑπεδείσαιν,


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as though it had grown round and become united with the food. At the same time I found the pylorus persistently closed and accurately shut, like the os uteri on the foetus.

In the cases, however, where digestion had been completed the pylorus had opened, and the stomach was undergoing peristaltic movements, similar to those of the intestines.

V

Thus all these facts agree that the stomach, uterus, and bladders possess certain inborn faculties which are retentive of their own proper qualities and eliminative of those that are foreign. For it has been already shown that the bladder by the liver draws bile into itself, while it is also quite obvious that it eliminates this daily into the stomach. Now, of course, if the eliminative were to succeed the attractive faculty and there were not a retentive faculty between the two, there would be found, on every occasion that animals were dissected, an equal quantity of bile in the gall-bladder. This however, we do not find. For the bladder is sometimes observed to be very full, sometimes quite empty, while at other times you find in it various intermediate degrees of fulness, just as is the case with the other bladder—that which receives the urine; for even without resorting to anatomy we may observe that the urinary bladder continues to collect urine up to the time that it becomes uncomfortable through the increasing quantity of urine or the irritation caused by its acidity—the presumption
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... άθροιζούσης ἐτι τὸ οὖρον, ὡς οὐσίς τινὸς κάνταίθα δυνάμεως καθεκτικῆς.

Οὕτω δὲ καὶ ἡ γαστήρ ὑπὸ δριμύτητος πολλάκις δηχθείσα πρωιαίτερον τοῦ δέοντος ἀπεπτον ἐτι τὴν τροφὴν ἀποτρίβεται. αὖθις δ' ἂν ποτε τῷ πλήθει βαρυνθείσα ἢ καὶ κατ' ἀμφο ἑνελθόντα κακῶς διατεθείσα διαρροίαις ἐάλω. καὶ μὲν γε καὶ οἱ ἐμετοι, τῷ πλήθει βαρυνθείσης ||

159 αὐτῆς ἢ τὴν ποιώτητα τῶν ἐν αὐτῇ συτίων τε καὶ περιττωμάτων μὴ φερούσης, ἀνάλογον τι ταῖς διαρροίαις πάθημα τῆς ἀνώ γαστρὸς ἑστιν. ὅταν μὲν γὰρ ἐν τοῖς κάτω μέρεσιν αὐτῆς ἢ τοιαύτη γένηται διάθεσις, ἐρωμένων τῶν κατὰ τὸν στόμαχον, εἰς διαρροίας ἐτελεύτησεν, ὅταν δ' ἐν τοῖς κατὰ τὸ στόμα, τῶν ἄλλων εὑρωστοῦντων, εἰς ἐμέτους.

VI

"Ἐνεστὶ δὲ καὶ τοῦτο πολλάκις ἐναργὴς ἰδεῖν ἐπὶ τῶν ἀποσίτων. ἀναγκαζόμενοι γὰρ ἐσθίειν οὔτε καταπίνειν εὐσθενοῦσιν οὔτ', εἰ καὶ βιάσαιτο, κατέχουσιν, ἀλλ' εὐθὺς ἀνεμοῦσι. καὶ οἱ ἄλλως δὲ τῶν ἐδεσμάτων πρὸς ὅτιον δυσχεραίνοντες βιασθέντες εὕροντες προσάρασθαι ταχέως ἔξεμονθιν, ἢ εἰ κατάσχοιει βιασάμενοι, ναυτιώδεις τ' εἰςί καὶ τῆς γαστρὸς ὑπτίας αἰσθάνονται καὶ σπευδόσης ἀποθέσθαι τὸ λυποῦν.

Οὕτως εὖ ἀπάντων τῶν φαινομένων, ὁπερ εξ ἀρχῆς ἔρρεθη, μαρτυρεῖται τὸ δεῖν ὑπάρχειν τοῖς τοῦ ζώου μορίος σχεδὸν ἄπασιν ἐφεσιν μὲν τινα

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thus being that here, too, there is a retentive faculty.

Similarly, too, the stomach, when, as often happens, it is irritated by acidity, gets rid of the food, although still undigested, earlier than proper; or again, when oppressed by the quantity of its contents, or disordered from the co-existence of both conditions, it is seized with diarrhoea. Vomiting also is an affection of the upper [part of the] stomach analogous to diarrhoea, and it occurs when the stomach is overloaded or is unable to stand the quality of the food or surplus substances which it contains. Thus, when such a condition develops in the lower parts of the stomach, while the parts about the inlet are normal, it ends in diarrhoea, whereas if this condition is in the upper stomach, the lower parts being normal, it ends in vomiting.

VI

This may often be clearly observed in those who are disinclined for food; when obliged to eat, they have not the strength to swallow, and, even if they force themselves to do so, they cannot retain the food, but at once vomit it up. And those especially who have a dislike to some particular kind of food, sometimes take it under compulsion, and then promptly bring it up; or, if they force themselves to keep it down, they are nauseated and feel their stomach turned up, and endeavouring to relieve itself of its discomfort.

Thus, as was said at the beginning, all the observed facts testify that there must exist in almost all parts of the animal a certain inclination towards, or, so to
καὶ οἶκια τῆς οἰκείας ποιότητος, ἀποστροφὴν 160 δὲ τινὰ || καὶ οἶκον μίσος τι τῆς ἀλλοστρίας. ἀλλ' ἐφιέμενα μὲν ἐλκεὶν εὐλογοῦν, ἀποστρεφόμενα δὲ ἐκκρίνειν.

Κἂν τούτων πάλιν ἢ θ' ἐλκτική δύναμις ἀποδείκνυται καθ' ἄπαν ὑπάρχουσα καὶ ἡ προ-ωστική.

'Ἀλλ' εἴπερ ἐφεσίς τέ τις ἐστὶ καὶ έλξεις, εὕη ἂν τις καὶ ἀπολαύσις· οὐδὲν γὰρ τῶν ὄντων ἐλκεὶ τι δι' αὐτὸ τὸ ἐλκεῖν, ἀλλ' ἵν' ἀπολαύσῃ τοῦ διὰ τῆς ὀλκῆς εὐπορηθέντος. καὶ μὴν ἀπολαύσων οὐ δύναται μὴ κατασχόν. κἂν τούτῳ πάλιν ἢ καθεκτικὴ δύναμις ἀποδείκνυται τὴν γένεσιν ἀναγκαίαν ἔχουσα· σαφῶς γὰρ ἐφίεται μὲν τῶν οἰκείων ποιοτήτων ἢ γαστήρ, ἀποστρέφεται δὲ τὰς ἀλλοστρίας.

'Ἀλλ' εἴπερ ἐφίεται τε καὶ ἐλκεῖν καὶ ἀπολαύει κατέχουσα καὶ περιστελλομένη, εὕη ἂν τι καὶ πέρας αὐτὴ τῆς ἀπολαύσεως κατὶ τῷ δ' οἷος ἦδη τῆς ἐκκριτικῆς δυνάμεως ἐνεργοῦσης.

VII

'Ἀλλ' εἰ καὶ κατέχει καὶ ἀπολαύει, κατα-χρηται πρὸς ὁ πέφυκε. πέφυκε δὲ τοῦ προσ-161 ὑκοντος ἐαυτῆ || κατὰ ποιότητα καὶ οἰκείου

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1 Note use of psychological terms in biology. cf. also p. 133, note 3.
2 "In everything." cf. p. 66, note 3.
ON THE NATURAL FACULTIES, III. vi.-vii

speak, an appetite for their own special quality, and an aversion to, or, as it were, a hatred of the foreign quality. And it is natural that when they feel an inclination they should attract, and that when they feel aversion they should expel.

From these facts, then, again, both the attractive and the propulsive faculties have been demonstrated to exist in everything.

But if there be an inclination or attraction, there will also be some benefit derived; for no existing thing attracts anything else for the mere sake of attracting, but in order to benefit by what is acquired by the attraction. And of course it cannot benefit by it if it cannot retain it. Herein, then, again, the retentive faculty is shown to have its necessary origin: for the stomach obviously inclines towards its own proper qualities and turns away from those that are foreign to it.

But if it aims at and attracts its food and benefits by it while retaining and contracting upon it, we may also expect that there will be some *termination* to the benefit received, and that thereafter will come the time for the exercise of the eliminative faculty.

VII

But if the stomach both retains and benefits by its food, then it employs it for the end for which it [the stomach] naturally exists. And it exists to partake of that which is of a quality befitting and proper to

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3. Galen confuses the nutrition of organs with that of the ultimate living elements or cells; the stomach does not, of course, feed itself in the way a cell does. *cf. Introduction, p. xxxii.*
Galen

metəlaμβάνειν: ὡς θ' ἐλκεὶ τῶν σιτίων ὅσον χρηστότατον ἀτμωδῶς τε καὶ κατὰ βραχύ καὶ τούτο τοῖς ἐαυτῆς χιτῶσιν ἐναποτίθεται τε καὶ προστίθησιν. ὅταν δ' ἰκανῶς ἐμπλησθῇ, καθά- περ ἄχθος τι τὴν λοιπὴν ἀποτίθεται τροφὴν ἐσχηκών τι χρηστῶν ἡδὴ καὶ αὐτὴν ἐκ τῆς πρὸς τὴν γαστέρα κοινωνίας. οὐδὲ γὰρ ἐνδέχεται δύο σῶματα δράν καὶ πάσχειν ἐπιτήδειον συνελθόντα μὴ οὗ τοῖς πάσχειν θ' ἀμα καὶ δράν ἡ θάτερον μὲν δράν, θάτερον δὲ πάσχειν. ἐὰν μὲν γὰρ ἱσάζῃ ταῖς δυνάμεσιν, εξ ἵσον δράσει τε καὶ πείσεται, ἄν δ' ὑπερέχῃ πολὺ καὶ κρατή θάτερον, ἐνεργήσει περὶ τὸ πάσχον ὄστε δράσει μέγα μὲν τι καὶ αἰσθητὸν, αὐτό δ' ήτοι σμικρὸν τι καὶ οὐκ αἰσθητὸν ἡ παντάπασιν οὐδὲν πείσεται. ἀλλ' ἐν τούτῳ δὴ καὶ μάλιστα διήνεγκε φαρμάκου δηλητηρίου τροφῆ, τὸ μὲν γὰρ κρατεῖ τῆς ἐν τῷ σῶματι δυνάμεως, ἡ δὲ κρατεῖται.

Οὐκον ἐνδέχεται τροφὴν μὲν εἰναὶ τι τῷ ὕπω προσήκουσαν, οὔ μὲν καὶ κρατεῖσθαι γ' ὰμοίως 162 πρὸς τῶν || ἐν τῷ ὕπῳ ποιοτήτων· τὸ κρατεῖσθαι δ' ἦν ἀλλοιούσθαι. ἀλλ' ἐπεὶ τὰ μὲν ἰσχυρότερα ταῖς δυνάμεσιν ἀστι μόρια, τὰ δ' ἀσθενεστέρα, κρατήσει μὲν πάντα τῆς οἰκείας τῷ ὕπῳ τροφῆς, οὔχ ὀμοίως δὲ πάντα· κρατήσει δ' ἄρα καὶ ἡ γαστὴ καὶ ἀλλοιώσει μὲν τὴν τροφῆν, οὔ μὲν ὀμοίως ἦπατι καὶ φλέψτι καὶ ἀρτηρίαις καὶ καρδία.

Πόσον οὖν ἐστιν, ὁ ἀλλοιωθεὶς, καὶ δὴ θεασώμεθα· πλέον μὲν ἡ κατὰ τὸ στόμα, μεῖον δ' ἡ κατὰ τὸ

1 cf. Asclepiades's theory regarding the urine, p. 51.
2 The process of application or prosthesis. cf. p. 223, note 3.
it. Thus it attracts all the most useful parts or the food in a vaporous\(^1\) and finely divided condition, storing this up in its own coats, and applying\(^2\) it to them. And when it is sufficiently full it puts away from it, as one might something troublesome, the rest of the food, this having itself meanwhile obtained some profit from its association with the stomach. For it is impossible for two bodies which are adapted for acting and being acted upon to come together without either both acting or being acted upon, or else one acting and the other being acted upon. For if their forces are equal they will act and be acted upon equally, and if the one be much superior in strength, it will exert its activity upon its passive neighbour; thus, while producing a great and appreciable effect, it will itself be acted upon either little or not at all. But it is herein also that the main difference lies between nourishing food and a deleterious drug; the latter masters the forces of the body, whereas the former is mastered by them.\(^3\)

There cannot, then, be food which is suited for the animal which is not also correspondingly subdued by the qualities existing in the animal. And to be subdued means to undergo alteration.\(^4\) Now, some parts are stronger in power and others weaker, therefore, while all will subdue the nutriment which is proper to the animal, they will not all do so equally. Thus the stomach will subdue and alter its food, but not to the same extent as will the liver, veins, arteries, and heart.

We must therefore observe to what extent it does alter it. The alteration is more than that which

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\(^1\) Mutual influence of organism and environment.

\(^2\) Qualitative change. cf. Book I., chap. ii.
ἡπάρ τε καὶ τὰς φλέβας. αὐτὴ μὲν γὰρ ἡ ἀλλοίωσις εἰς αἵματος οὐσίαν ἅγει τὴν τροφὴν, ἡ δὲ εὐ τὸ στόματι μεθύστησι μὲν αὐτῆς ἐναργῶς εἰς ἔτερον εἴδος, οὐ μὴν εἰς τέλος γε μετακοσμεῖ. μάθοις δὲ ἂν ἐπὶ τῶν ἐγκαταλειφθέντων ταῖς διαστάσεσι τῶν οδόντων σιτίων καὶ καταμεινάντων δὲ ὅλης νυκτὸς· οὔτε γὰρ ἄρτος ἀκριβῶς ὁ ἄρτος οὔτε κρέας ἐστὶ τὸ κρέας, ἀλλὰ ὅξη τοιοῦτον, ὕποντε καὶ τοῦ κρέατος, δια- λέλυται δὲ καὶ διατήτηκε καὶ τὰς ἐν τῷ κρέατος σαρκῶς ἀπομέμακται ποιότητας. ἐνεστὶ δὲ σοι 163 θείασασθαι τὸ μέγεθος τῆς ἐν τῷ στόματι || τῶν σιτίων ἀλλοιώσεως, εἰ πυροῦς μασησάμενος ἐπιθείς ἀπέπτωσις δοθῆσιν· ὅξη τὸ στέφανος τάχιστα μεταβάλλοντας τε καὶ συμπέπτοντας, οὕτω τοιοῦτον, ὅταν ὑδατι φυραθῶσιν, ἑργάσα- σθαι δυναμένους. καὶ μὴ θαυμάσῃς· τὸ γὰρ τὸν φλέγμα τουτὶ τὸ κατὰ τὸ στόμα καὶ λειχήνων ἐστὶν ἄκος καὶ σκορπίους ἀναίρει παραχρήμα καὶ πολλὰ τῶν ἱοβόλων θηρίων τὰ μὲν εὐθέως ἀποκτείνει, τὰ δὲ ὑστερον· ἀπαντα γούν βλάπτει μεγάλως. ἀλλὰ τὰ μεμασημένα σιτία πρῶτον μὲν τοῦτο τῷ φλέγματι βέβρεκται τε καὶ πεφυραται, δεύτερον δὲ καὶ τῷ χρωτὶ τοῦ στόματος ἀπαντα πεπλησίακεν, ὡστε πλείονα μεταβολὴν εἰλήφη τῶν ἐν ταῖς κεναῖς χώραις τῶν οδόντων ἐσφημωμένων.

'Αλλ' ὅσουν τὰ μεμασημένα τοῦτον ἐπὶ πλέον ἠλλοϊσταὶ, τοσοῦτον ἑκείνων τὰ καταποθέντα.
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occurs in the mouth, but less than that in the liver and veins. For the latter alteration changes the nutriment into the substance of blood, whereas that in the mouth obviously changes it into a new form, but certainly does not completely transmute it. This you may discover in the food which is left in the intervals between the teeth, and which remains there all night; the bread is not exactly bread, nor the meat meat, for they have a smell similar to that of the animal’s mouth, and have been disintegrated and dissolved, and have had the qualities of the animal’s flesh impressed upon them. And you may observe the extent of the alteration which occurs to food in the mouth if you will chew some corn and then apply it to an unripe [undigested] boil: you will see it rapidly transmuting—in fact entirely digesting—the boil, though it cannot do anything of the kind if you mix it with water. And do not let this surprise you; this phlegm [saliva] in the mouth is also a cure for lichens\textsuperscript{1}; it even rapidly destroys scorpions; while, as regards the animals which emit venom, some it kills at once, and others after an interval; to all of them in any case it does great damage. Now, the masticated food is all, firstly, soaked in and mixed up with this phlegm; and secondly, it is brought into contact with the actual skin of the mouth; thus it undergoes more change than the food which is wedged into the vacant spaces between the teeth.

But just as masticated food is more altered than the latter kind, so is food which has been swallowed more altered than that which has been merely

\textsuperscript{1} Apparently skin-diseases in which a superficial crust (resembling the lichen on a tree-trunk) forms—\textit{e.g.} psoriasis.
μὴ γὰρ οὖδὲ παραβλητὸν ἦ τὸ τῆς ύπερβολῆς, εἰ τὸ κατὰ τὴν κοιλίαν ἐνυόησαίμεν φλέγμα καὶ χολή καὶ πνεῦμα καὶ θερμασίαν καὶ οὐλὴν τὴν οὐσίαν τῆς γαστρός. εἰ δὲ καὶ συνεποιήσαις

164 αὐτῇ τὰ παρακείμενα || σπλάγχνα καθάπερ τινὶ λέβητι μεγάλῳ πυρὸς ἐστίας πολλάς, εἰκ δεξιῶν μὲν τὸ ἥπαρ, εἰς ἀριστερῶν δὲ τὸν σπλήνα, τὴν καρδίαν δ’ ἐκ τῶν ἄνω, σὺν αὐτῇ δὲ καὶ τὰς φρένας αἰωρομένας τε καὶ διὰ παντὸς κινομένας, ἐφ’ ἀπασὶ δὲ τούτων σκέπων τὸ ἐπίπλου, ἐξαισιότητι καὶ πειθήσῃ τὴν ἀλλοίωσιν γίγνεσθαι τῶν εἰς τὴν γαστέρα καταποθέντων σιτίων.

Πῶς δ’ ἂν ἡδύνατο ῥάδιως αἰματούσθαι μὴ προπαρασκευασθέντα τῇ τοιαύτῃ μεταβολῇ; δεδεικται γὰρ οὖν καὶ πρόσθεν, ὡς οὐδὲν εἰς τὴν ἐναντίαν ἀθρόως μεθίσταται ποιότητα. πῶς οὖν ὁ ἄρτος αἷμα γίγνεται, πῶς δὲ τὸ τεῦτλῳ ἢ ὁ κύαμος ἢ τι τῶν ἄλλων, εἰ μὴ πρότερον τιν’ ἐτέραν ἀλλοίωσιν ἐδέξατο; πῶς δ’ ἡ κοπρός ἐν τοῖς λεπτοῖς ἐντέρως ἀθρόως γενιθήσεται; τὰ γὰρ ἐν τούτωι σφοδρότερον εἰς ἀλλοίωσιν ἐς τῶν κατὰ τὴν γαστέρα; πότερα τῶν χυτῶν τὸ πλῆθος ἢ τῶν γειτνιώτων σπλάγχνων ἢ περίθεσις ἢ τῆς μονῆς ὁ χρόνος ἢ σύμφυτος τοῖς ἐν τοῖς ὀργάνοις θερμασία; καὶ μὴ κατ’ οὐδὲν τούτων πλεονεκτεῖ τὰ ἐντερὰ τῆς γαστρός. τί ποτ’ οὖν ἐν μὲν τῇ

165 γαστρὶ νυκτὸς || ὅλης πολλάκις μείναντα τὸν ἄρτον ἐτὶ φυλάττεσθαι βούλονται τὰς ἀρχαῖας διασοφύζουσα ποιότητας, ἐπειδὰν δ’ ἀπαξ ἐμπέσῃ

1 Note especially pneumonia and innate heat, which practically stand for oxygen and the heat generated in oxidation. cf. p. 41, note 3.

2 Book 1., chap. x.

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masticated. Indeed, there is no comparison between these two processes; we have only to consider what the stomach contains—phlegm, bile, pneuma, [innate] heat,¹ and, indeed the whole substance of the stomach. And if one considers along with this the adjacent viscera, like a lot of burning hearths around a great cauldron—to the right the liver, to the left the spleen, the heart above, and along with it the diaphragm (suspended and in a state of constant movement), and the omentum sheltering them all—you may believe what an extraordinary alteration it is which occurs in the food taken into the stomach.

How could it easily become blood if it were not previously prepared by means of a change of this kind? It has already been shown² that nothing is altered all at once from one quality to its opposite. How then could bread, beef, beans, or any other food turn into blood if they had not previously undergone some other alteration? And how could the faeces be generated right away in the small intestine?³ For what is there in this organ more potent in producing alteration than the factors in the stomach? Is it the number of the coats, or the way it is surrounded by neighbouring viscera, or the time that the food remains in it, or some kind of innate heat which it contains? Most assuredly the intestines have the advantage of the stomach in none of these respects. For what possible reason, then, will objectors have it that bread may often remain a whole night in the stomach and still preserve its original qualities, whereas when once it is projected into the

¹ That is to say, faeces are obviously altered food. This alteration cannot have taken place entirely in the small intestine; therefore alteration of food must take place in the stomach.

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toīς ἐντέρους, εὑθὺς γύνεσθαι κόπρον; εἰ μὲν γὰρ ὁ τοσοῦτος χρόνος ἀδύνατος ἄλλοιον, οὐδ' ὁ βραχὺς ἰκανός· εἰ δ' οὗτος αὐτάρκης, πῶς οὖ πολὺ μᾶλλον ὁ μακρός; ἀρ' οὖν ἄλλοιοται μὲν ἡ τροφὴ κατὰ τὴν κοιλίαν, ἄλλην δὲ τῶν ἀλλοίωςιν καὶ οὐχ οἶον ἐκ τῆς φύσεως ἵσχει τοῦ μεταβάλλοντος ὁργάνου; ἢ ταύτην μὲν, οὐ μὴν τὴν ἡ οἰκείαν τῷ τοῦ ζύφου σῶματι; μακρῷ τούτῳ ἀδυνατώτερον ἐστὶ. καὶ μὴν οὐκ ἄλλο γ' ἢν ἡ πέψις ἡ ἄλλοιώσις εἰς τὴν οἰκείαν τετραφομένου ποιότητα. εἰπερ οὖν ἡ πέψις τοῦτῳ ἐστι καὶ ἡ τροφὴ κατὰ τὴν γαστέρα δέδεικται δεχομένη ποιότητα τῷ μέλλοντι πρὸς αὐτὴς θρέψεσθαι ζῷῳ προσήκουσαν, ἰκανῶς ἀποδέδεικται τὸ πέπτεσθαι κατὰ τὴν γαστέρα τὴν τροφήν.

Καὶ γελοῖος μὲν 'Ἀσκληπιάδης οὐτ' ἐν ταῖς ἑρυγαῖς λέγων ἐμφαίνεσθαι ποτὲ τὴν ποιότητα τῶν πεφθέντων σιτίων οὐτ' ἐν τοῖς ἐμέτοις οὐτ' ἐν ταῖς ἀνατομαῖς· αὐτὸ γὰρ δὴ τὸ τοῦ σῶματος ἔξοδείν αὐτὰ τῆς κοιλίας ἐστὶ τὸ πεπέφθαι. ὁ δ' οὕτως ἐστὶν εὐθῆς, ὅστ', ἐπειδὴ τῶν παλαιῶν ἀκούει λεγόντων ἐπὶ τὸ χρηστὸν ἐν τῇ γαστρὶ μεταβάλλειν τὰ σιτιά, δοκιμάζει λείπειν οὐ τὸ κατὰ δύναμιν ἄλλα τὸ κατὰ γεύσιν χρηστὸν, ὡσπερ ἢ τοῦ μήλου μηλωδεστέρου· χρὴ γὰρ οὕτως αὐτῷ διαλέγεσθαι· γυμνομένου κατὰ τὴν κοιλίαν ἢ τοῦ μέλιτος μελιτωδεστέρου.

1 cf. p. 39.
2 Asclepiades held that there was no such thing as real
intestines, it straightway becomes ordure? For, if such a long period of time is incapable of altering it, neither will the short period be sufficient, or, if the latter is enough, surely the longer time will be much more so! Well, then, can it be that, while the nutriment does undergo an alteration in the stomach, this is a different kind of alteration and one which is not dependent on the nature of the organ which alters it? Or if it be an alteration of this latter kind, yet one perhaps which is not proper to the body of the animal? This is still more impossible. Digestion was shown to be nothing else than an alteration to the quality proper to that which is receiving nourishment. Since, then, this is what digestion means and since the nutriment has been shown to take on in the stomach a quality appropriate to the animal which is about to be nourished by it, it has been demonstrated adequately that nutriment does undergo digestion in the stomach.

And Asclepiades is absurd when he states that the quality of the digested food never shows itself either in eructations or in the vomited matter, or on dissection. For of course the mere fact that the food smells of the body shows that it has undergone gastric digestion. But this man is so foolish that, when he hears the Ancients saying that the food is converted in the stomach into something “good,” he thinks it proper to look out not for what is good in its possible effects, but for what is good to the taste. this is like saying that apples (for so one has to argue with him) become more apple-like [in flavour] in the stomach, or honey more honey-like!

qualitative change; the food was merely broken up into its constituent molecules, and absorbed unaltered. cf. p. 49, note 5.
Πολύ δ’ ευθέστερος ἦτε καὶ γελοιότερος ὁ Ἐρασίστρατος ἡ μὴ νοῦν, ὅπως εἰρηταὶ πρὸς τῶν παλαιῶν ἡ πέψις ἐψήσει παραπλήσιος ὑπάρχειν, ἢ ἐκών σοφιζόμενος ἐαυτόν. ἐψήσει μὲν οὖν, φησίν, οὕτως ἐλαφρῶς ἔχουσαν θερμασίαν οὐκ εἰκὸς ἦναι παραπλήσιαν τὴν πέψιν, ὡσπερ ἡ τὴν Αἴτνην δέον ὑποθέτειν τῇ γαστρὶ ἢ ἄλλος αὐτὸς ἀλλοιώσαι τὰ σιτία μὴ δυναμένης ἢ δυναμένης μὲν ἀλλοιοῦν, οὗ κατὰ τὴν ἐμφυτόν δὲ θερμασίαν, ἕγραν οὐσάν δηλονότι καὶ διὰ τοῦτο ἐξειν οὐκ ὀπτὰν εἰρημένην.

'Εχρήν δ’ αὐτὸν, εἰπερ περὶ πραγμάτων ἀντι-
λέγειν ἐβούλετο, πειρατῆσαι δεῖξαι μάλιστα μὲν 167 καὶ || πρῶτον, ὡς οὖν μεταβάλλει τὴν ἀρχήν οὖν ἀλλοιούται κατὰ ποιότητα πρὸς τῆς γαστρὸς τὰ σιτία, δεύτερον δ’, εἰπερ μὴ οἷς τ’ ἢν τοῦτο πιστῶσασθαι, τὸ τὴν ἀλλοίωσιν αὐτῶν ἄχρηστον εἶναι τῷ ξώφῳ εἰ δὲ μηδὲ τοῦτ’ εἰχε διαβάλλειν, εξελέγξαι τὴν περὶ τὰς δραστικὰς ἀρχὰς ὑπό-
ληψιν καὶ δείξαι τὰς ἐνέργειας ἐν τοῖς μορίοις οὖ διὰ τὴν ἐκ θερμοῦ καὶ ψυχροῦ καὶ ξηροῦ καὶ ὑγροῦ ποιῶν κράσιν ὑπάρχειν ἄλλα δι’ ἄλλο τε εἰ δὲ μηδὲ τοῦτ’ ἐτόλμα διαβάλλειν, ἄλλ’ ότι γε μὴ τὸ θερμὸν ἐστίν ἐν τοῖς ὑπὸ φύσεως διοικο-
μένοις τὸ τῶν ἄλλων δραστικότατον. ἢ εἰ μὴ τοῦτο μὴ τῶν ἄλλων τι τῶν ἐμπροσθεν εἰχεν ἀποδεικνύναι, μὴ ληρεῖν δινόματι προσπαλαίοντα  

1 i.e. denial of forethought in the Physis.
Erasistratus, however, is still more foolish and absurd, either through not perceiving in what sense the Ancients said that digestion is similar to the process of boiling, or because he purposely confused himself with sophistries. It is, he says, inconceivable that digestion, involving as it does such trifling warmth, should be related to the boiling process. This is as if we were to suppose that it was necessary to put the fires of Etna under the stomach before it could manage to alter the food; or else that, while it was capable of altering the food, it did not do this by virtue of its innate heat, which of course was moist, so that the word boil was used instead of bake.

What he ought to have done, if it was facts that he wished to dispute about, was to have tried to show, first and foremost, that the food is not transmuted or altered in quality by the stomach at all, and secondly, if he could not be confident of this, he ought to have tried to show that this alteration was not of any advantage to the animal. If, again, he were unable even to make this misrepresentation, he ought to have attempted to confute the postulate concerning the active principles—to show, in fact, that the functions taking place in the various parts do not depend on the way in which the Warm, Cold, Dry, and Moist are mixed, but on some other factor. And if he had not the audacity to misrepresent facts even so far as this, still he should have tried at least to show that the Warm is not the most active of all the principles which play a part in things governed by Nature. But if he was unable to demonstrate this any more than any of the previous propositions, then he ought not to have made himself ridiculous by quarrelling uselessly.
μάτην, οὖσπερ οὔ συφῶς Ἄριστοτέλους ἐν τ'] ἀλλοις πολλοῖς καὶ τῷ τετάρτῳ τῶν μετεωρολογικῶν ὁπως ἢ πέψις ἐψήσει παραπλήσιον εἶναι λέγεται, καὶ ὅτι μὴ πρῶτος μηδὲ κυρίως ὀνομαζόντων, εἰρηκότος.

'Ἀλλ', ὡς ἡδη λέλεκται πολλάκις, ἀρχῇ τούτων ἀπάντων ἐστὶ μία ὧδε περὶ θερμοῦ καὶ ψυχροῦ καὶ ξηροῦ καὶ ύγροῦ διασκέψασθαι, καθάπερ Ἄριστοτέλης ἐποίησεν ἐν τῷ δευτέρῳ περὶ γενέσεως καὶ ἔσθα φθορᾶς, ἀπὸ δεῖξας ἀπάσας τὰς κατὰ τὰ σώματα μεταβολὰς καὶ ἀλλοιώσεις ὑπὸ τούτων γίγνεσθαι. ἀλλ' Ἐρασίστρατος οὔτε τούτοις οὔτ' ἄλλως τινὶ τῶν προειρημένων ἀντειπῶν ἐπὶ τούνομα μόνον ἐτράπετο τῆς ἐψήσεως.

VIII

'Επὶ μὲν οὖν τῆς πέψεως, εἰ καὶ τῶλλα πάντα παρέλιπε, τὸ γοῦν ὅτι διαφέρει τῆς ἐκτὸς ἐψήσεως ἢ ἐν τοῖς ζῷοις πέψις, ἐπειράθη δεικνύει, περὶ δὲ τῆς καταπόσεως οὔθ' ἀχρὶ τοσοῦτον. τί γάρ φησιν;

"'Ολκή μὲν οὖν τῆς κοιλίας οὐδεμία φαίνεται εἶναι."

Καὶ μὴν δύο χιτώνας ἢ γαστήρ ἔχει πάντως ἐνεκά τοῦ γεγονότας καὶ διήκουσιν οὕτῳ μέχρι τοῦ στόματος, ὃ μὲν ἐνδού, οἷος ἐστὶ κατὰ τὴν γαστέρα, τοιοῦτος διαμένων, ὃ δ' ἐτερος ἐπὶ τὸ
ON THE NATURAL FACULTIES, III. vii.—viii.

with a mere name—as though Aristotle had not clearly stated in the fourth book of his "Meteorology," as well as in many other passages, in what way digestion can be said to be allied to boiling, and also that the latter expression is not used in its primitive or strict sense.

But, as has been frequently said already,¹ the one starting-point of all this is a thoroughgoing enquiry into the question of the Warm, Cold, Dry and Moist; this Aristotle carried out in the second of his books "On Genesis and Destruction," where he shows that all the transmutations and alterations throughout the body take place as a result of these principles. Erasistratus, however, advanced nothing against these or anything else that has been said above, but occupied himself merely with the word "boiling."

VIII

Thus, as regards digestion, even though he neglected everything else, he did at least attempt to prove his point—namely, that digestion in animals differs from boiling carried on outside; in regard to the question of deglutition, however, he did not go even so far as this. What are his words?

"The stomach does not appear to exercise any traction."²

Now the fact is that the stomach possesses two coats, which certainly exist for some purpose; they extend as far as the mouth, the internal one remaining throughout similar to what it is in the stomach, and the other one tending to become of a more fleshy

¹ v. p. 9, et passim. ² cf. p. 97.
It appears to me, from comparison between this and other passages in Galen's writings (notably *Use of Parts*, iv., 8), that he means by the "two coats" simply the mucous and the muscular coats. In this case the "straight" or "longitudinal" fibres of the inner coat would be the *rugae*; the "circular" fibres of the inner intestinal coat would be the *valvulae conniventes*.
nature in the gullet. Now simple observation will testify that these coats have their fibres inserted in contrary directions. And, although Erasistratus did not attempt to say for what reason they are like this, I am going to do so.

The inner coat has its fibres straight, since it exists for the purpose of traction. The outer coat has its fibres transverse, for the purpose of peristalsis. In fact, the movements of each of the mobile organs of the body depend on the setting of the fibres. Now please test this assertion first in the muscles themselves; in these the fibres are most distinct, and their movements visible owing to their vigour. And after the muscles, pass to the physical organs, and you will see that they all move in correspondence with their fibres. This is why the fibres throughout the intestines are circular in both coats—they only contract peristaltically, they do not exercise traction. The stomach, again, has some of its fibres longitudinal for the purpose of traction and the others transverse for the purpose of peristalsis. For just as the movements in the muscles take place when each of the fibres becomes tightened and drawn towards its origin, such also is what happens in the stomach; when the transverse fibres tighten, the breadth of

2 The term here rendered peristalsis is peristolé in Greek; it is applied only to the intermittent movements of muscles placed circularly round a lumen or cavity, and comprehends systolé or contraction and diastolé or dilatation. In its modern significance, peristalsis, however, also includes the movements of longitudinal fibres. cf. p. 97, note 1.

3 i.e. those containing non-striped or "involuntary" muscle fibres; organs governed by the "natural" pneuma; cf. p. 186, note 3.

4 By this term is meant only what we should call the "voluntary" muscles.
Γαλέν

γυνεῖαι τὸ ἐυρος τῆς περιεχομένης ὑπ` αὐτῶν κοιλότητος, τῶν δ` εὐθείων ἐλκομένων τε καὶ εἰς ἐαυτᾶς συναγομένων οὐκ ἐνδέχεται μή εὐρω διὰ συναι-170ρεῖσθαι τὸ μήκος. ἀλλὰ μὴν ἐναργῶς γε φαίνεται καταπινόντων συναιρούμενον καὶ τοσοῦτον ὁ λάρυγξ ἀνατρέχων, ὅσον ὁ στόμαχος καταπά-
ται, καὶ ὅταν γε συμπληρωθείη τῆς ἐν τῷ καταπίνειν ἐνεργείας ἀφεθῇ τῆς τάσεως ὁ στόμα-
χος, ἐναργῶς πάλιν φαίνεται καταφερόμενος ὁ λάρυγξ· ὁ γὰρ ἐνδον χιτῶν τῆς γαστροῦ ὁ τὰς εὐθείας ἴνας ἔχων ὁ καὶ τῶν στόμαχον ὑπαλείφων καὶ τὸ στόμα τοῖς ἐντὸς μέρεσιν ἐπεκτείνεται τοῦ λάρυγγος, ὡστ` οὐκ ἐνδέχεται κατασπῶμενον αὐτῶν ὑπὸ τῆς κοιλίας μὴ οὔ συνεπισπᾶσθαι καὶ τὸν λάρυγγα.

"Ὅτι δ` αἰι περιφερεῖς ἰνες, αἰς περιστελλέται τά τ` ἀλλα μόρια καὶ ἡ γαστήρ, οὐ συναιροῦσι τὸ μήκος, ἀλλὰ συστέλλουσι καὶ στενοῦσι τὴν εὐρύτητα, καὶ παρ` αὐτοῦ λαβεῖν ἐστίν ὁμολογού-
μενον Ἐρασίστράτος περιστελλέσθαι γάρ φησι τοῖς συνίοις τήν γαστέρα κατὰ τὸν τῆς πέφεως ἀπαντά χρόνον. ἄλλ` εἰ περιστελλέται μὲν, οὐδεν δὲ του μήκους ἀφαιρείται τῆς κοιλίας, οὐκ ἐστὶ τῆς περισταλτικῆς κινήσεως ἵδιον τὸ κατα-
σπᾶν κάτω τὸν στόμαχον. ὅπερ γὰρ αὐτὸς ὁ Ἐρασίστρατος εἴπε, τοῦτο μόνον αὐτὸ συμ-
171βήσεται τὸ τῶν ἄνω συστελλομένων διαστέλ-

λεσθαι τὰ κάτω. τοῦτο δ` ὅτι, κἂν εἰς νεκροῦ τὸν στόμαχον ὑδατος ἐγχέχεις, φαίνεται ἑγερόμενον, οὐδείς ἄγνοει. ταῖς γὰρ τῶν ὑλῶν διὰ στενοῦ

1 cf. p. 97.
the cavity contained by them becomes less; and when the longitudinal fibres contract and draw in upon themselves, the length must necessarily be curtailed. This curtailment of length, indeed, is well seen in the act of swallowing: the larynx is seen to rise upwards to exactly the same degree that the gullet is drawn downwards; while, after the process of swallowing has been completed and the gullet is released from tension, the larynx can be clearly seen to sink down again. This is because the inner coat of the stomach, which has the longitudinal fibres and which also lines the gullet and the mouth, extends to the interior of the larynx, and it is thus impossible for it to be drawn down by the stomach without the larynx being involved in the traction.

Further, it will be found acknowledged in Erasistratus's own writings that the circular fibres (by which the stomach as well as other parts performs its contractions) do not curtail its length, but contract and lessen its breadth. For he says that the stomach contracts peristaltically round the food during the whole period of digestion. But if it contracts, without in any way being diminished in length, this is because downward traction of the gullet is not a property of the movement of circular peristalsis. For what alone happens, as Erasistratus himself said, is that when the upper parts contract the lower ones dilate.1 And everyone knows that this can be plainly seen happening even in a dead man, if water be poured down his throat; this symptom2 results from the passage of matter through a narrow

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1 For "symptom." cf p. 13, and p. 12, note 3. "Transitum namque materiae per angustum corpus id accidens consequitur" (Linacre). Less a "result" or "consequence" than an "accompaniment."
σώματος ὀδοιπορίαις ἀκόλουθόν ἔστι τὸ σύμ-
πτωμα: θαυμαστὸν γάρ, εἰ διερχομένου τινὸς
αὐτὸν ὄγκου μὴ διαστάλησται. οὐκοιν τὸ μὲν
τῶν ἀνω συστελλομένων διαστέλλεσθαι τὰ κάτω
κοινὸν ἐστὶ καὶ τοῖς νεκροῖς σώμασι, δι᾽ ἐν
ὁπωσοῦν τι διεξέρχεται, καὶ τοῖς ἔσοιν, εἰτὲ
περιστελλοῦτο τοῖς διερχομένοις εἰθ’ ἐλκοῖτο.
Τὸ δὲ τῆς τοῦ μῆκος συναρέσεως ἵδιον τῶν
tὰς εὐθείας Ἰνας ἔχοντων ὄργανον, ἢν ἔπισπά-
σωντα τι. ἀλλὰ μὴν ἐδείχθη κατασπώμενος ὁ
στόμαχος, οὗ γὰρ ἄν ἐίλκε τὸν Λάρυγγα νήλου
όν, ὡς ἡ γαστὴρ ἐλκεὶ τὰ σιτία διὰ τοῦ
στομάχου.
Καὶ ἡ κατὰ τὸν ἔμετον δὲ τῶν ἐμομένων ἄχρε
τοῦ στόματος φορὰ πάντως μὲν που καὶ αὐτὴ τὰ
μὲν ὑπὸ τῶν ἀναφερομένων διατεινόμενα μέρη
τοῦ στομάχου διεστώτα κέκτηται, τῶν πρόσω δ’
ὁ τι ἄν ἐκάστοτ’ ἐπιλαμβάνεται, τοῖτ’ ἄρχομενον
διαστέλλεται, τὸ δ’ ὅπισθεν καταλείπει δηλοῦντι
συστελλόμενον, ὡσθ’ ὀμοίαν εἶναι πάντη τὴν
dιάθεσιν τοῦ στομάχου κατὰ γε τοῦτο τῇ τῶν
καταπινόντων ἀλλὰ τῆς ὀλκῆς μὴ παροῦσης τὸ
μῆκος ὀλον ἴσον ἐν τοῖς τοιούτοις συμπτώμασι
διαφυλάττεται.
Διὰ τούτῳ δὲ καὶ καταπίνειν ὅραν ἔστιν ἢ ἔμειν,
ὅτι καταπίνει μὲν ἀμφότερο τῆς γαστρὸς τῶν
χυτῶν ἐνεργοῦντων, τοῦ μὲν ἐντὸς ἐλκοῦτος, τοῦ
δ’ ἐκτὸς περιστελλομένου τε καὶ συνεπωθοῦντος,
ἔμειται δὲ θατέρου μόνον τοῦ ἐξωθεὶν ἐνεργοῦντος,
channel; it would be extraordinary if the channel did not dilate when a mass was passing through it.\(^1\)

Obviously then the dilatation of the lower parts along with the contraction of the upper is common both to dead bodies, when anything whatsoever is passing through them, and to living ones, whether they contract peristaltically round their contents or attract them.\(^2\)

Curtailment of length, on the other hand, is peculiar to organs which possess longitudinal fibres for the purpose of attraction. But the gullet was shown to be pulled down; for otherwise it would not have drawn upon the larynx. It is therefore clear that the stomach attracts food by the gullet.

Further, in vomiting, the mere passive conveyance of rejected matter up to the mouth will certainly itself suffice to keep open those parts of the oesophagus which are distended by the returned food; as it occupies each part in front \([\text{above}]\), it first dilates this, and of course leaves the part behind \([\text{below}]\) contracted. Thus, in this respect at least, the condition of the gullet is precisely similar to what it is in the act of swallowing.\(^3\) But there being no traction, the whole length remains equal in such cases.

And for this reason it is easier to swallow than to vomit, for deglutition results from both coats of the stomach being brought into action, the inner one exerting a pull and the outer one helping by peristalsis and propulsion, whereas emesis occurs from the outer coat alone functioning, without there

\(^2\) i.e. this phenomenon is a proof neither of peristolé nor of attraction. \(\text{cf. p. 97, note 2.}\)

\(^3\) Contraction and dilatation of course being reversed.
Galen

outhern ἐλκοντός εἰς τὸ στόμα. οὐ γὰρ δὴ ὁσπερ ἡ τῆς γαστρός ὀρέξις προηγεῖτο τοῦ καταπίνειν τὰ σιτία, τὸν αὐτὸν τρόπον καὶ τοῖς ἐμέτοις ἐπιθυμεῖ τι τῶν κατὰ τὸ στόμα μορίων τοῦ γυγνομένου παθήματος, ἀλλ’ ἀμφό τῆς γαστρός αὐτῆς εἰσιν ἐναντίας διαθέσεις, ὀρεγομένης μὲν καὶ προσιεμένης τὰ χρῆσιμά τε καὶ οἰκεία, δυσχερανυσίς δὲ καὶ ἀποτριβομένης τὰ ἀλλότρια. Διὸ καὶ τὸ καταπίνειν αὐτὸ τοῖς μὲν ἰκανῶς ὀρεγομένοις τῶν οἰκείων ἐδεσμάτων τῇ γαστρὶ τάχιστα γίνεται, σαφῶς ἐλκούσης αὐτὰ καὶ καταστώσης πρὶν ἡ μασηθῆναι, τοῖς δ’ ἦτοι φάρμακόν τι κατ’ 173 ἀνάγκην πίνουσιν ἡ σιτίων ἐν χώρᾳ φαρμάκου προσφερομένους ἀνιαρὰ καὶ μόγης ἡ κατάποσις αὐτῶν ἐπιτελεῖται.

Δήλος οὖν ἔστιν ἐκ τῶν εἰρημένων ὁ μὲν ἐνδον χυτῶν τῆς γαστροῦ ὁ τὰς εὐθείας ἔχων ἢνας τῆς ἐκ τοῦ στόματος εἰς αὐτὴν ὀλκῆς ἐνέκα γεγονὼς καὶ διὰ τοῦτ’ ἐν ταῖς καταπόσεσι μόνας ἐνεργῶν, ὁ δ’ ἐξωθεὶν ὁ τὰς ἐγκαρσίας ἔχων ἐνέκα μὲν τοῦ περιστελλεσθαῖ τοῖς ἐνυπάρχουσι καὶ πρωσθεὶν αὐτὰ τοιοῦτος ἀποτελεσθεῖς, ἐνεργῶν δ’ οὐδὲν ἦττον ἐν τοῖς ἐμέτοις ἡ ταῖς καταπόσεσι. ἐναργέστατα δὲ μαρτυρεῖ τῷ λεγομένῳ καὶ τὸ κατὰ τὰς χάννας τε καὶ τοὺς συνόδοντας γεγυμνομένοις εὐρίσκεται γὰρ ἐνίοτε τούτων ἡ γαστὴρ ἐν τῷ στόματι καθάπερ καὶ ὁ Ἀριστοτέλης ἐν ταῖς περὶ

1 The channa is a kind of sea-perch; "a species of Serranus, either S. scriba or S. cabrilla" (D'Arcy W. Thompson). cf. Aristotle's Nat. Hist. (D'Arcy Thompson's edition, Oxford, 1910), IV., xi., 538 a, 20. The synodont "is not to be identified with certainty, but is supposed to be Dentex vul-
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being any kind of pull towards the mouth. For, although the swallowing of food is ordinarily preceded by a feeling of desire on the part of the stomach, there is in the case of vomiting no corresponding desire from the mouth-parts for the experience; the two are opposite dispositions of the stomach itself; it yearns after and tends towards what is advantageous and proper to it, it loathes and rids itself of what is foreign. Thus the actual process of swallowing occurs very quickly in those who have a good appetite for such foods as are proper to the stomach; this organ obviously draws them in and down before they are masticated; whereas in the case of those who are forced to take a medicinal draught or who take food as medicine, the swallowing of these articles is accomplished with distress and difficulty.

From what has been said, then, it is clear that the inner coat of the stomach (that containing longitudinal fibres) exists for the purpose of exerting a pull from mouth to stomach, and that it is only in deglutition that it is active, whereas the external coat, which contains transverse fibres, has been so constituted in order that it may contract upon its contents and propel them forward; this coat furthermore, functions in vomiting no less than in swallowing. The truth of my statement is also borne out by what happens in the case of the *channae* and *synodonts*¹; the stomachs of these animals are sometimes found in their mouths, as also Aristotle writes in his *History garis,* that is, an edible Mediterranean perch. "It is not the stomach," adds Prof. Thompson, "but the air-bladder that gets everted and hangs out of the mouth in fishes, especially when they are hauled in from a considerable depth." cf. *H. A.*, VIII., ii., 591 b, 5.

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.gzpyn evgraxeiv istorjairas kai proosthēsi ge tīn aitiaian upo laimargias autous touto symbaínêi pháskwn.

"Exei gar òde; kata tás sfodroteras ðrēgeis ānaw prostrēchei pāsai tois gzpyn os gastrē, os te tīn pāthous aîsthēsin énarghē schôntes exèrpein autois fasi tīn koilian, énion de māsw-
174 mēnov ēti kai mēpô || kalos en to stómata tā sistia katergasamēnov exarpâzēi faneiros ākōntwn. ef' òn ovn gzpyn fūsee laimárghon úparchōntws h t' euvruchwria tou stōmatos ēste daui̇lis h te tīs gastrōs thésis eγγh, òs ἐπὶ svuððontos te kai čánynvs, oúdevn thauamastón, ōtain īkanūs pevnásanta diwkh tī tôn mikrotēron gzpyn, eit' ἕδη plēsion h tou svulablēin, ãnatrechein èpēgoushēs tīs èpithumias eis to stōma tīn gastrēra. gevēsthai ð' állyws ēmîxanov touto mē oux òsper diá cheiros tou sthomachou tīs gastrōs èpistwomēnēs eis éautēn tā sistia. kathá-
per gar kai ἕmeis upo prōthumias eniote tī cheiri sunepekteîoumen ólous ἕmās autous ènēka tou thēttōn èpithrâxasathy tou prokeiμēnου σῶμatos, ou̇n kai h gastrη ovn cheiri tī sthomacho sunepekteînetai. kai diá tou̇t' ef' òn gzpyn āma tā tēria taunti sunepesten, èfēsioi te sfodrā tīs trofēs h te stōmaches mikrōs h t' euvruchwria tou stōmatos daui̇lis, èpî tou̇n oλîgη ropē tīs èpstkâsēwes eis to stōma tīn koilian olhun ãnâ-
férei.

'Hekei mēn ón ovn ἵσωs ãndri fυσικω̄ par' autēs
175 mōnhs tīs katastekhēs tōn oργān̄wov tīn ènđei̇xi̇n
tīs ènergei̇as laimβānēi̇n. ou̇ gar di̇ mātēn γ'
of Animals; he also adds the cause of this: he says that it is owing to their voracity.

The facts are as follows. In all animals, when the appetite is very intense, the stomach rises up, so that some people who have a clear perception of this condition say that their stomach “creeps out” of them; in others, who are still masticating their food and have not yet worked it up properly in the mouth, the stomach obviously snatches away the food from them against their will. In those animals, therefore, which are naturally voracious, in whom the mouth cavity is of generous proportions, and the stomach situated close to it (as in the case of the synodont and channa), it is in no way surprising that, when they are sufficiently hungry and are pursuing one of the smaller animals, and are just on the point of catching it, the stomach should, under the impulse of desire, spring into the mouth. And this cannot possibly take place in any other way than by the stomach drawing the food to itself by means of the gullet, as though by a hand. In fact, just as we ourselves, in our eagerness to grasp more quickly something lying before us, sometimes stretch out our whole bodies along with our hands, so also the stomach stretches itself forward along with the gullet, which is, as it were, its hand. And thus, in these animals in whom those three factors co-exist—an excessive propensity for food, a small gullet, and ample mouth proportions—in these, any slight tendency to movement forwards brings the whole stomach into the mouth.

Now the constitution of the organs might itself suffice to give a naturalist an indication of their functions. For Nature would never have purpose-
Under the term "neura," tendons were often included as well as nerves. Similarly in modern Dutch the word *zenuw* ("sinew") means both a tendon and a nerve; *zenuwachtig* = "nervous."
lessly constructed the oesophagus of two coats with contrary dispositions; they must also have each been meant to have a different action. The Erasistratean school, however, are capable of anything rather than of recognizing the effects of Nature. Come, therefore, let us demonstrate to them by animal dissection as well that each of the two coats does exercise the activity which I have stated. Take an animal, then; lay bare the structures surrounding the gullet, without severing any of the nerves, arteries, or veins which are there situated; next divide with vertical incisions, from the lower jaw to the thorax, the outer coat of the oesophagus (that containing transverse fibres); then give the animal food and you will see that it still swallows although the peristaltic function has been abolished. If, again, in another animal, you cut through both coats with transverse incisions, you will observe that this animal also swallows although the inner coat is no longer functioning. From this it is clear that the animal can also swallow by either of the two coats, although not so well as by both. For the following also, in addition to other points, may be distinctly observed in the dissection which I have described—that during deglutition the gullet becomes slightly filled with air which is swallowed along with the food, and that, when the outer coat is contracting, this air is easily forced with the food into the stomach, but that, when there only exists an inner coat, the air impedes the conveyance of

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2 Rather than the alternative reading, τὸν ἐσωθεν χιτῶνα. Galen apparently supposes that the outer coat will not be damaged, as the cuts will pass between its fibres. These cuts would be, presumably, short ones, at various levels, no single one of them involving the whole circumference of the gullet.
σιτίων διατείνον τ' αὐτὸν καὶ τῆν ἐνέργειαν ἐμποδίζουν.

'Αλλ' οὔτε τούτων οὔδεν 'Ἐρασίστρατος εἶπεν οὔθ' ὡς ἡ σκολιὰ θεσίς τοῦ στομάχου διαβάλλει σαφῶς τὸ δόγμα τῶν νομιζόντων ὑπὸ τῆς ἀνωθεν βολῆς μόνης ποδηγούμενα μέχρι τῆς γαστρὸς ἱέναι τὰ καταπινόμενα. μόνον δ' ὅτι πολλὰ τῶν μακροπραξίων ζῷων ἐπικεκυφότα καταπίνει, καλῶς εἶπεν. ο' δὴ λόγον, ὅτι τὸ φαινόμενον οὐ τὸ πῶς καταπίνομεν ἀποδείκνυσιν, ἀλλὰ τὸ πῶς οὐ καταπίνομεν· ὅτι γὰρ μὴ διὰ μόνης τῆς ἀνωθεν βολῆς, ἐκ τούτου δὴ λογοῦ οὐ μὴν εἰδ' ἐλκουσίης τῆς κοιλίας εἴτε παράγοντος αὐτὰ τοῦ στομάχου, 177 δήλον ἦδη πω. ἀλλ' ἠμέδις γε || πάντας τοὺς λογισμοὺς εἰσώντες τοὺς τ' ἐκ τῆς κατασκευῆς τῶν ὀργάνων ὀρμωμένους καὶ τοὺς ἀπὸ τῶν ἄλλων συμπτωμάτων τῶν τε πρὸ τοῦ γυμνωθῆναι τῶν στόμαχον καὶ γυμνωθέντος, ὡς ὀλίγῳ πρόσθεν ἐλέγομεν, ἰκανῶς ἐνεδειξάμεθα τοῦ μὲν ἐλκεν ἐνεκα τὸν ἐντὸς χιτῶνα, τοῦ δ' ἀπώθειν τὸν ἐκτὸς γεγονέναι.

Προφθέμεθα μὲν οὖν ἀποδείξας τὴν καθεκτικὴν δύναμιν ἐν ἑκάστῳ τῶν ὀργάνων οὕσαν, ὅσπερ ἐν τῷ πρόσθεν λόγῳ τὴν ἐλκτικὴν τε καὶ προσέτι τὴν ἀλλοιωτικὴν. ὑπὸ δὲ τῆς ἀκολουθίας τοῦ λόγου ταῖς τέταρται ἀπεδείξαμεν ύπαρχούσας τῇ γαστρί, τὴν ἐλκτικὴν μὲν ἐν τῷ καταπίνειν, τὴν καθεκτικὴν δ' ἐν τῷ πέπτειν, τὴν ἀπωστικὴν δ' ἐν τοῖς ἐμέτοις καὶ ταῖς τῶν πεπεμένων σιτίων εἰς τὸ λεπτὸν ἐνετερον ύποχωρίσεσιν, αὐτὴν δὲ τὴν πέψιν ἀλλοιώσων υπάρχειν.
food, by distending this coat and hindering its action.

But Erasistratus said nothing about this, nor did he point out that the oblique situation of the gullet clearly confutes the teaching of those who hold that it is simply by virtue of the impulse from above that food which is swallowed reaches the stomach. The only correct thing he said was that many of the long-necked animals bend down to swallow. Hence, clearly, the observed fact does not show how we swallow but how we do not swallow. For from this observation it is clear that swallowing is not due merely to the impulse from above; it is yet, however, not clear whether it results from the food being attracted by the stomach, or conducted by the gullet. For our part, however, having enumerated all the different considerations—those based on the constitution of the organs, as well as those based on the other symptoms which, as just mentioned, occur both before and after the gullet has been exposed—we have thus sufficiently proved that the inner coat exists for the purpose of attraction and the outer for the purpose of propulsion.

Now the original task we set before ourselves was to demonstrate that the retentive faculty exists in every one of the organs, just as in the previous book we proved the existence of the attractive, and, over and above this, the alterative faculty. Thus, in the natural course of our argument, we have demonstrated these four faculties existing in the stomach—the attractive faculty in connection with swallowing, the retentive with digestion, the expulsive with vomiting and with the descent of digested food into the small intestine—and digestion itself we have shown to be a process of alteration.
IX

Ούκουν ἔτ' ἀπορήσομεν οὐδὲ περὶ τοῦ σπληνός, 
εἰ ἐλκεῖ μὲν τὸ οἰκεῖον, ἀποκρίνει δὲ τὸ ἄλλοτριον, 
ἄλλοιον δὲ καὶ κατέχειν, ὅσον ἂν ἐπισπάσηται, 
pέφυκεν, οὐδὲ περὶ ἡπτατος ἡ φλεβὸς ἡ ἀρτηρίας 
178 ἡ καρδίας ἡ τῶν || ἄλλων τινός· ἀναγκαίαι γὰρ 
ἐδείχθησαν αἱ τέτταρες αὐταὶ δυνάμεις ἀπαντῆ 
μορίῳ τὸ μέλλοντι θρέψεσθαι καὶ διὰ τούτ' αὐτᾶς 
ὑπηρέτιδας εἶναι θρέψεως ἐφαμεν· ὡς γὰρ τὸ τῶν 
ἀνθρώπων ἀποπάτημα τοῖς κυσίν ἡδιστον, οὐτω 
καὶ τὰ τοῦ ἡπτατος περιττόματα τὸ μὲν τῷ 
σπληνῷ, τὸ δὲ τῇ χοληδόχῳ κύστει, τὸ δὲ τοῖς 
νεφροῖς οἰκεῖον.

X

Καὶ λέγειν ἐτὶ περὶ τῆς τούτων γενέσεως οὐκ 
ἀν ἔθελομι μεθ' Ἰπποκράτην καὶ Πλάτωνα καὶ 
Ἀριστοτέλην καὶ Διοκλέα καὶ Πραξιγόραν καὶ 
Φιλότιμον. οὐδὲ γάρ οὐδὲ περὶ τῶν δυνάμεων 
eἴπων ἃν, εἰ τις τῶν ἐμπροσθεν ἀκριβῶς ἐξειργά- 
σατο τὸν ὑπὲρ αὐτῶν λόγον.

'Επεὶ δ' οἱ μὲν παλαιοὶ καλῶς ὑπὲρ αὐτῶν 
ἀποφημάμενοι παρέλιπον ἀγωνίσασθαι τῷ λόγῳ, 
μὴ' ὑπονοίασαν ἐσεθαί τινας εἰς τοσοῦτον 
ἀνασχῦντος σοφιστάς, ὡς αντιλέγειν ἐπιχειρή- 
sαι τοῖς ἐναργέσιν, οἱ νεώτεροι δὲ τὸ μὲν τι

1 cf. p. 205.
ON THE NATURAL FACULTIES, III. ix.–x

IX

Concerning the spleen, also, we shall therefore have no further doubts \(^1\) as to whether it attracts what is proper to it, rejects what is foreign, and has a natural power of altering and retaining all that it attracts; nor shall we be in any doubt as to the liver, veins, arteries, heart, or any other organ. For these four faculties have been shown to be necessary for every part which is to be nourished; this is why we have called these faculties the handmaids of nutrition. For just as human faeces are most pleasing to dogs, so the residual matters from the liver are, some of them, proper to the spleen;\(^2\) others to the gall-bladder, and others to the kidneys.

X

I should not have cared to say anything further as to the origin of these [surplus substances] after Hippocrates, Plato, Aristotle, Diocles, Praxagoras, and Philotimus, nor indeed should I even have said anything about the faculties, if any of our predecessors had worked out this subject thoroughly.

While, however, the statements which the Ancients made on these points were correct, they yet omitted to defend their arguments with logical proofs; of course they never suspected that there could be sophists so shameless as to try to contradict obvious facts. More recent physicians, again, have been

\(^{2}\) Thus Galen elsewhere calls the spleen a mere emunctory (ἐκμαγεῖον) of the liver. cf. p. 214, note 1.
Galen

νικηθέντες ὑπὸ τῶν σοφισμάτων ἔπεισθησαν αυτοίς, τὸ δὲ τι καὶ ἀντιλέγειν ἐπιχειρήσαντες ἀποδείξει μοι πολὺ τῆς τῶν παλαιῶν ἔδοξαν δυνα-μεως, || διὰ τοῦθ', ὡς ἂν ἐκείνων αὐτῶν, εἴπερ ἔτ' ἦν τις, ἀγωνίσασθαι μοι δοκεῖ πρὸς τοὺς ἀνατρέ-ποντας τῆς τέχνης τὰ κάλλιστα, καὶ αὐτὸς σῶτος ἐπειρᾶθην συνθεῖναι τοὺς λόγους.

"Οτι δ' ἢ οὐδὲν ἢ παντάπασι ἀνύσω τι σμικρόν, οὐκ ἄγνωστο πάμπολλα γὰρ εὐρίσκω τελέως μὲν ἀποδεδειγμένα τοῖς παλαιοῖς, οὔτε δὲ συνετὰ τοῖς πολλοῖς τῶν νῦν δὲ ἀμαθίαν ἀλλ' οὐδ' ἐπιχειρούμενα γιγνώσκεσθαι διὰ βραθμίαν, οὔτ', εἰ καὶ γνωσθείη τινὶ, δικαίως ἐξεταζόμενα.

Χρῆ γὰρ τὸν μέλλοντα γνώσεσθαι τι τῶν πολλῶν ἂμεινον εὖθὺς μὲν καὶ τῇ φύσει καὶ τῇ πρώτῃ διδασκαλίᾳ πολὺ τῶν ἄλλων διενεχείν· ἐπειδὰν δὲ γένηται μειράκιον, ἀληθεῖας τινὰ σχεῖν ἐρωτικὴν μανίαν, ὥσπερ ἐνθουσιῶντα καὶ μήθ' ἡμέρας μήτε νυκτὸς διαλείπειν σπεύδουτά τε καὶ συντε-ταμένον ἐκμαθεῖν, ὡς τοῖς ἐνδοξοτάτοις εὑρῆται τῶν παλαιῶν· ἐπειδὰν δ' ἐκμάθη, κρίνειν αὐτὰ καὶ βασανίζειν χρόνῳ παμπόλλῳ καὶ σκοπεῖν, πόσα μὲν ὁμολογεῖ τοῖς ἑναργῶς φαινομένοις, 180 πόσα δὲ διαφέρεται, || καὶ οὕτω τὰ μὲν αἴρεῖσθαι, τὰ δ' ἀποστρέφεσθαι. τῷ μὲν δὴ τοιοῦτω πάνυ σφόδρα χρησίμους ἤλπικα τοὺς ἡμετέρους ἐσε-
ON THE NATURAL FACULTIES, III. x

partly conquered by the sophistries of these fellows and have given credence to them; whilst others who attempted to argue with them appear to me to lack to a great extent the power of the Ancients. For this reason I have attempted to put together my arguments in the way in which it seems to me the Ancients, had any of them been still alive, would have done, in opposition to those who would overturn the finest doctrines of our art.

I am not, however, unaware that I shall achieve either nothing at all or else very little. For I find that a great many things which have been conclusively demonstrated by the Ancients are unintelligible to the bulk of the Moderns owing to their ignorance—nay, that, by reason of their laziness, they will not even make an attempt to comprehend them; and even if any of them have understood them, they have not given them impartial examination.

The fact is that he whose purpose is to know anything better than the multitude do must far surpass all others both as regards his nature and his early training. And when he reaches early adolescence he must become possessed with an ardent love for truth, like one inspired; neither day nor night may he cease to urge and strain himself in order to learn thoroughly all that has been said by the most illustrious of the Ancients. And when he has learnt this, then for a prolonged period he must test and prove it, observing what part of it is in agreement, and what in disagreement with obvious fact; thus he will choose this and turn away from that. To such an one my hope has been that my treatise would prove of the very greatest assistance. . . .
σθαι λόγους· εἰεν δὲ ἄν ὀλίγοι παντάπασιν οὕτως δὲ ἄλλοις οὕτω γενήσεται τὸ γράμμα περιττόν, ὡς εἰ καὶ μὐθον οὕνω τις λέγοι.

XI

Συμπεραντέον οὖν ἡμῖν τὸν λόγον ἑνεκά τῶν τῆς ἀληθείας ἐφιεμένων ὅσα λείτει κατ' αὐτὸν ἐτι προσθείσιν. ὡς γὰρ ἡ γαστήρ ἐλκει μὲν ἐναργησί καὶ καταστάθη τὰ σιτία τοῖς σφόδρα πεινώδεσι, πρὶν ἁκριβῶς ἐν τῷ στόματι λειωθῆναι, δυσχεράνει δὲ καὶ ἀπωθείται τοῖς ἀποσίτοις τε καὶ πρὸς ἀνάγκην ἐσθίουσιν, οὕτω καὶ τῶν ἄλλων ὀργάνων ἐκαστον ἀμφότερα ἔχει τὰς δυνάμεις, τὴν τοῦ σικειῶν ἐλκτικὴν καὶ τὴν τῶν ἀλλοτρίων ἀποκριτικὴν. καὶ διὰ τοῦτο, κἂν ἐξ ἔνος ἡ χιτώνος ὀργάνον τι συνεστώς, ὁσπερ καὶ αἱ κυστεῖς ἀμφότεραι καὶ αἱ μῆτραι καὶ αἱ φλέβες, ἀμφότερα τῶν ἱνῶν ἔχει τὰ γένη, τῶν εὐθείων τε καὶ τῶν ἐγκαρσίων.

181 Καὶ μὲν γε καὶ τρίτον τοι πλην οὐδὲν ἔστιν τῶν λοξῶν, ἐλαττὸν πολὺ τῷ πλήθει τῶν προειρημένων δύο γενῶν. εὑρίσκεται δ' ἐν μὲν τοῖς ἐκ δυνῆς ὑποτέλειον ὑποτελέσσων ὀργάνως ἐν θατέρῳ μόνῳ ταῖς εὐθείαις ἰσιον ἁναμεμμενένων, ἐν δὲ τοῖς ἐξ ἔνος ἃμα τοῖς ἄλλοις δύο γένεσι. συνεπιλαμβάνοντε δ' αὐτὰ μέγιστον τῇ τῇς καθεκτικῆς ὁνομασθείσης δυνάμεως ἐνεργείας. δεῖται γὰρ ἐν τούτῳ τῷ χρόνῳ πανταχόθεν ἐσφίγγεται καὶ περιτετάςθαι τοῖς εἰναι χόρον τοῦ μόριον, ἢ

1 cf. p. 269.
ON THE NATURAL FACULTIES, III. x.-xi

Still, such people may be expected to be quite few in number, while, as for the others, this book will be as superfluous to them as a tale told to an ass.

XI

For the sake, then, of those who are aiming at truth, we must complete this treatise by adding what is still wanting in it. Now, in people who are very hungry, the stomach obviously attracts or draws down the food before it has been thoroughly softened in the mouth, whilst in those who have no appetite or who are being forced to eat, the stomach is displeased and rejects the food. And in a similar way each of the other organs possesses both faculties—that of attracting what is proper to it, and that of rejecting what is foreign. Thus, even if there be any organ which consists of only one coat (such as the two bladders, the uterus, and the veins), it yet possesses both kinds of fibres, the longitudinal and the transverse.

But further, there are fibres of a third kind—the oblique—which are much fewer in number than the two kinds already spoken of. In the organs consisting of two coats this kind of fibre is found in the one coat only, mixed with the longitudinal fibres; but in the organs composed of one coat it is found along with the other two kinds. Now, these are of the greatest help to the action of the faculty which we have named retentive. For during this period the part needs to be tightly contracted and stretched over its contents at every point—the

2 The urinary bladders of pigs (such as Galen dissected) are thin, and appear to have only one coat.
Galen

μὲν γαστήρ ἐν τῷ τῇς πέψεως, αἰ μήτραι δ' ἐν τῷ τῆς κυψευσι χρόνῳ παντί.

Ταῦτ' ἀρα καὶ ὁ τῆς φλεβῶς χιτῶν εἰς ὁ ἐκ πολυειδῶν ἵνων ἐγένετο καὶ τῶν τῆς ἁρτηρίας ὁ μὲν ἐξωθεὶν ἐκ τῶν στρογγύλων, ὁ δ' ἐσωθεὶν ἐκ μὲν τῶν εὐθειῶν πλείστων, ὅλην δὲ τινων σὺν αὐταῖς καὶ τῶν λοξῶν, ὡστε τὰς μὲν φλέβας ταῖς μήτραις καὶ ταῖς κύστεσιν ἔσκεναι κατὰ γε τὴν τῶν ἵνων σύνθεσιν, εἰ καὶ τῷ πάχει λειπόνται, τὰς δ' ἁρτηρίας τῇ γαστρί. μόνα δὲ πάντων ὀργάνων ἐκ δυοὶν θ' ἀμα καὶ ἀμφοτέρων ἐγκαρσίας ἔχωντων τὰς ἑκατόν ἐγένετο τὰ ἑνέπαι. τὸ δ' ὦτι

182 βέλτιον ἦν || τὸν τ' ἀλλων ἐκάστω τοιοῦτῳ τῇν φύσιν ὑπάρχειν, οἶόντερ καὶ νῦν ἑστῖ, τοῖς τ' ἐντέροις ἐκ δυοὶν ὀμοῖων χιτῶνῳν συγκεῖσθαι, τῆς περὶ χρείας μορίων πραγματείας ἑστίν. οὐκούν νῦν χρὴ ποθεῖν ἀκούειν περὶ τῶν τοιούτων, ὡσπερ οὐδὲ διὰ τί περὶ τοῦ πλήθους τῶν χιτῶνῳν ἐκάστου τῶν ὀργάνων διαπεφώνηται τοῖς ἀνατομικοὶς ἀνδράσιν. ὡτέρ μὲν γὰρ τούτων αὐτόρκως ἐν τοῖς περὶ τῆς ἀνατομικῆς διαφωνίας εἰρηταὶ περὶ δὲ τοῦ διότι τοιοῦτον ἐκάστου ἐγένετο τῶν ὀργάνων, ἐν τοῖς περὶ χρείας μορίων εἰρήσεται.

XII

Νυνὶ δ' οὐδέτερον τοὺτον πρόκειται λέγειν, ἀλλὰ τὰς φυσικὰς δυνάμεις μόνας ἀποδεικνύειν ἐν ἐκάστῳ τῶν ὀργάνων τέτταρας ὑπαρχούσας. ἕτερ τούτ' οὖν πάλιν ἐπανελθόντες ἀναμνησσώμεν τε

1 cf. p. 243
2 My suggestion is that Galen refers to (1) the mucous
stomach during the whole period of digestion,\textsuperscript{1} and
the uterus during that of gestation.

Thus too, the coat of a vein, being single, consists
of various kinds of fibres; whilst the outer coat of
an artery consists of circular fibres, and its inner
coat mostly of longitudinal fibres, but with a few
oblique ones also amongst them. Veins thus re-
semble the uterus or the bladder as regards the
arrangement of their fibres, even though they are
deficient in thickness; similarly arteries resemble
the stomach. Alone of all organs the intestines
consist of two coats of which both have their fibres
transverse.\textsuperscript{2} Now the proof that it was for the best
that all the organs should be naturally such as they
are (that, for instance, the intestines should be com-
posed of two coats) belongs to the subject of the use
of parts\textsuperscript{3}; thus we must not now desire to hear about
matters of this kind nor why the anatomists are at
variance regarding the number of coats in each
organ. For these questions have been sufficiently
discussed in the treatise “On Disagreement in
Anatomy.” And the problem as to why each organ
has such and such a character will be discussed in
the treatise “On the Use of Parts.”

\textbf{XII}

It is not, however, our business to discuss either
of these questions here, but to consider duly the
natural faculties, which, to the number of four, exist
in each organ. Returning then, to this point, let us
coat, with its \textit{valvulae conniventes}, and (2) the \textit{muscular} coat,
of which the chief layer is made up of circular fibres. \textit{cf.}
p. 262, note 1. \textsuperscript{4} Or \textit{utility}. 283
τῶν ἐμπροσθεν εἰρημένων ἐπιθωμέν τε κεφαλὴν ἕδη τῷ λόγῳ παντὶ τὸ λείπον ἔτι προσθέντες. ἐπειδὴ γὰρ ἐκαστὸν τῶν ἐν τῷ νόμῳ μορίων ἐλκεῖν εἰς ἑαυτὸ τῶν οἰκεῖων χυμῶν ἀποδεδείκται καὶ πρότη σχέδου αὐτὴ τῶν φυσικῶν ἐστὶν δυνάμεων, εἴδω οἱ ἐκείνοι γνωστεῖν, ὡς οὐ πρότερον ἀποτρίβεται τὴν ἐλχθεῖσαν <τροφὴν> ἦτοι σύμπασαν ἢ καὶ τι περίττωμα αὐτῆς, πρὶν ἂν εἰς ἑαυτίαν μεταπέσῃ διάθεσιν ἢ αὐτὸ τὸ ὄργανον ἢ καὶ τῶν περιεχομένων ἐν αὐτῷ τὰ πλείστα. ἢ μὲν οὖν γαστήρ, ἐπειδὰν μὲν ἰκανῶς ἐμπλησθῆ τῶν συτίων καὶ τὸ χρηστότατον αὐτῶν εἰς τοὺς ἑαυτῆς χυτῶν ἐναπόθηται βδάλλουσα, τηνικαῦτ᾽ ἦδη τὸ λοιπὸν ἀποτρίβεται καθάπερ ἅχος ἀλλότριον· αἱ κύστεις δ', ἐπειδὰν ἐκαστὸν τῶν ἐλχθέντων ἢ τῷ πληθεὶ διατείνον ἢ τῇ ποιότητι δάκνου ἀνιαρῶν γένηται.

Τὸ δ' αὐτῶ τρόπῳ καὶ αἱ μὴ τραυματισθήσεται τὸν γαρ, ἐπειδὴ δὲ τῶν εἰρημένων γίγνεται μὲν καὶ βιαῖως ἐστὶν ὁτὲ καὶ ἀμβλωκοσκοῦσι τηνικαῦτα, γίγνεται δ' ὡς τὰ πολλά καὶ προσηκόντως, ὅπερ οὖν ἀμβλωσκείν ἀλλ' ἀποκυίσκειν τε καὶ τίκτειν ὀνομάζεται. τοὺς μὲν οὖν ἀμβλωθριδίοις φαρμάκοις ἦ τισὶν ἄλλοις παθήμασι διαφθείρουσι τὸ ἐμβρυον ἢ τίνας τῶν ὑμένων αὐτοῦ ῥηγχύνουσιν αἱ ἀμβλώσεις ἐπονται, οὔτω δὲ κατειδαν ἀναθώσι τοῦ αἱ μὴ τραυματισθῆναι τῇ διατάξει, ταῖς δὲ τῶν ἐμβρύων αὐτῶν κινήσεις ταῖς σφοδρόταταις οἵ τόκοι, καθάπερ καὶ τοῦθ᾽ Ἡποκράτει καλῶς εἰρηταί. κοινὸν δ'
recall what has already been said, and set a crown to the whole subject by adding what is still wanting. For when every part of the animal has been shown to draw into itself the juice which is proper to it (this being practically the first of the natural faculties), the next point to realise is that the part does not get rid either of this attracted nutriment as a whole, or even of any superfluous portion of it, until either the organ itself, or the major part of its contents also have their condition reversed. Thus, when the stomach is sufficiently filled with the food and has absorbed and stored away the most useful part of it in its own coats, it then rejects the rest like an alien burden. The same happens to the bladders, when the matter attracted into them begins to give trouble either because it distends them through its quantity or irritates them by its quality.

And this also happens in the case of the uterus; for it is either because it can no longer bear to be stretched that it strives to relieve itself of its annoyance, or else because it is irritated by the quality of the fluids poured out into it. Now both of these conditions sometimes occur with actual violence, and then miscarriage takes place. But for the most part they happen in a normal way, this being then called not miscarriage but delivery or parturition. Now abortifacient drugs or certain other conditions which destroy the embryo or rupture certain of its membranes are followed by abortion, and similarly also when the uterus is in pain from being in a bad state of tension; and, as has been well said by Hippocrates, excessive movement on the part of the embryo itself brings on labour. Now
ἀπασῶν τῶν διαθέσεων ἢ ἀνία καὶ ταύτης αὐτῶν τριττῶν ἢ ὅγκος περιττὸς ἢ τῷ βάρος ἢ δῆξις. ὅγκος μὲν, ἐπειδὰν μηκέτι φέρωσι διατεινόμεναι, βάρος δ', ἐπειδὰν ὑπὲρ τὴν ῥόμην αὐτῶν ἢ τὸ περιεχόμενον, δῆξις δ', ἐπειδὰν ἦτοι τὰ πρότερον ἐν τοῖς ύμέσιν ύγρὰ στεγόμενα ραγέντων αὐτῶν εἰς αὐτὰς ἐκχυθῇ τὰς μῆτρας ἢ καὶ σύμπαν ἀποφθαρέν τὸ κῦμα σηπόμενον τε καὶ διαλυόμενον εἰς μοχθηροὺς ἰχώρας οὕτως ἐρεθίζη τε καὶ δάκυν τοῖς χυτῶν τῶν ύστερῶν.

'Ἀνάλογον οὖν ἐν ἀπασὶ τοῖς ὀργάνοις ἐκαστα τῶν τ' ἔργων αὐτῶν τῶν φυσικῶν καὶ μέντοι τῶν παθημάτων τε καὶ νοσημάτων φαίνεται γνυνόμενα, τὰ μὲν ἐναργῶς καὶ σαφῶς οὕτως, ὡς ἀποδείξεως δεῖσθαι μηδέν, τὰ δ' ἢττον μὲν ἐναρ-185γώς, οὐ μὴν ἀγνωστά γε παντάπασι τοῖς || ἐθέλουσι προσέχειν τὸν νοῦν.

'Επὶ μὲν οὖν τῆς γαστρῶς αἱ τε δῆξεις ἐναργεῖς, διότι πλείστης αἰσθήσεως μετέχει, τὰ τ' ἄλλα παθήματα τὰ τε ναυτίαν ἐμποιοῦντα καὶ οἱ καλούμενοι καρδιωγμοί σαφῶς ενδείκνυται τὴν ἀποκριτικὴν τε καὶ ἀπωστικὴν τῶν ἀλλοτρίων δύναμιν, οὕτω δὲ καὶ τῶν ύστερῶν τε καὶ τῆς κύστεως τῆς τὸ ύγρόν υποδεχόμενης· ἐναργῶς γὰρ οὖν καὶ αὐτὴ φαίνεται μέχρι τοσοῦτον τὸ ύγρὸν υποδεχομένη τε καὶ ἀθροίζουσα, ἄχρις ἢττοι πρὸς τοῦ πλήθους αὐτῶν διατεινομένη μηκέτι φέρῃ τὴν ἀνίαν ἢ πρὸς τῆς ποιότητος δακυμένης χρονίζου γὰρ ἐκαστὸν τῶν περιττωμάτων ἐν τῷ σώματι σήτεται δηλονότι, τὸ μὲν ἠλάττον, τὸ δὲ πλείον χρόνῳ, καὶ οὕτω δακυνόδες τε καὶ δριμὺ καὶ ἀνιαρὸν τοῖς περιέχουσι γίγνεται. οὐ μὴν

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pain is common to all these conditions, and of this there are three possible causes—either excessive bulk, or weight, or irritation; bulk when the uterus can no longer support the stretching, weight when the contents surpass its strength, and irritation when the fluids which had previously been pent up in the membranes, flow out, on the rupture of these, into the uterus itself, or else when the whole foetus perishes, putrefies, and is resolved into pernicious ichors, and so irritates and bites the coat of the uterus.

In all organs, then, both their natural effects and their disorders and maladies plainly take place on analogous lines,¹ some so clearly and manifestly as to need no demonstration, and others less plainly, although not entirely unrecognizable to those who are willing to pay attention.

Thus, to take the case of the stomach: the irritation is evident here because this organ possesses most sensibility, and among its other affections those producing nausea and the so-called heartburn clearly demonstrate the eliminative faculty which expels foreign matter. So also in the case of the uterus and the urinary bladder; this latter also may be plainly observed to receive and accumulate fluid until it is so stretched by the amount of this as to be incapable of enduring the pain; or it may be the quality of the urine which irritates it; for every superfluous substance which lingers in the body must obviously putrefy, some in a shorter, and some in a longer time, and thus it becomes pungent, acrid, and burdensome to the organ which contains it. This

¹ Relationship between physiology and pathology again emphasized. cf. p. 188, note 2.
έπὶ γε τῆς ἐπὶ τῷ ἦπατι κύστεως ὁμοίως ἔχει· ὃ δῆλον, ὅτι νεῦρον ἦκιστα μετέχει. χρῆ δὲ κάνταῦθα τὸν γε φυσικὸν ἀνδρα τὸ ἀνάλογον ἐξευρήσκειν. εἰ γὰρ ἐλκεῖν τε τῶν σικείου ἀπε- δείχθη χυμόν, ὡς φαίνεσθαι πολλάκις μεστὴν,

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186 ἀποκρίθειν τε τῶν αὐτῶν τοῦτον οὐκ εἰς μακράν, ἀναγκαῖον ἐστὶν αὐτὴν ἢ διὰ τὸ πλῆθος βαρυνο- μένην ἢ τῆς ποιότητος μεταβαλλοῦσης ἐπὶ τὸ δακυδόδες τε καὶ δριμῶ τῆς ἀποκρίσεως ἐφίεσθαι. οὐ γὰρ δὴ τὰ μὲν σιτία τὴν ἀρχαίαν ὑπαλλάττει ποιότητα ταχέως οὔτως, ὡστε, ἐπειδὰν ἐμπέσῃ τοῖς λεπτοῖς ἐντέροις, εὐθὺς εἶναι κόπρον, ἡ χολή δὲ οὐ πολὺ μᾶλλον ἢ τὸ οὖρον, ἐπειδὰν ἀπαξ ἐκπέσῃ τῶν φλεβῶν, ἐξαλλάττει τὴν ποιότητα, τάχιστα μεταβαλλοῦντα καὶ σπόμενα. καὶ μὴν εἰπερ ἐπὶ τε τῶν κατὰ τὰς υστέρας καὶ τὴν κοιλίαν καὶ τὰ ἐντέρα καὶ προσέτι τὴν τὸ οὖρον ὑποδεχομένην κύστιν ἐναργῶς φαίνεται διάτασις τῆς ὠ ὁδέξις ἢ ἄχθος ἐπεγείρον ἐκαστὸν τῶν ὀργάνων εἰς ἀπόκρισιν, οὔδεν χαλεπὸν κατὰ τῆς χοληδόχου κύστεως ταύτῳ τούτῳ ἐννοεῖν ἐπὶ τε τῶν ἄλλων ἀπάντων ὀργάνων, ἐξ ὧν δηλοῦντο καὶ αἱ ἀρτηρίαι καὶ αἱ φλέβες εἰσίν.

XIII

Οὐ μὴν οὖδὲ τὸ διὰ τοῦ αὐτοῦ πόρου τὴν θ' ὀλκὴν γίγνεσθαι καὶ τὴν ἀπόκρισιν ἐν διαφέ-

187 ροιοι οὐδὲν ἐτι χαλεπὸν ἐξευρεῖν, εἰ γε καὶ τῆς γαστρον ὁ στόμαχος οὐ μόνον ἐδέσματα

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ON THE NATURAL FACULTIES, III. xii.-xiii.

does not apply, however, in the case of the bladder alongside the liver, whence it is clear that it possesses fewer nerves than do the other organs. Here too, however, at least the physiologist\(^1\) must discover an analogy. For since it was shown that the gall-bladder attracts its own special juice, so as to be often found full, and that it discharges it soon after, this desire to discharge must be either due to the fact that it is burdened by the quantity or that the bile has changed in quality to pungent and acrid. For while food does not change its original quality so fast that it is already ordure as soon as it falls into the small intestine, on the other hand the bile even more readily than the urine becomes altered in quality as soon as ever it leaves the veins, and rapidly undergoes change and putrefaction. Now, if there be clear evidence in relation to the uterus, stomach, and intestines, as well as to the urinary bladder, that there is either some distention, irritation, or burden inciting each of these organs to elimination, there is no difficulty in imagining this in the case of the gall-bladder also, as well as in the other organs,—to which obviously the arteries and veins also belong.

XIII

Nor is there any further difficulty in ascertaining that it is through the same channel that both attraction and discharge take place at different times. For obviously the inlet to the stomach does not merely

\(^1\) Or physicist—the investigator of the Physis or Nature. cf. p. 196, note 2. Note here the use of analogical reasoning. cf. p. 113, note 2.
Galen’s idea is that if reversal of the direction of flow

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1 cf. p 95.  
2 I. xiii.; II. ii.  
3 Galen’s idea is that if reversal of the direction of flow
ON THE NATURAL FACULTIES, III. xiii

conduct food and drink into this organ, but in the condition of nausea it performs the opposite service. Further, the neck of the bladder which is beside the liver, albeit single, both fills and empties the bladder. Similarly the canal of the uterus affords an entrance to the semen and an exit to the foetus.

But in this latter case, again, whilst the eliminative faculty is evident, the attractive faculty is not so obvious to most people. It is, however, the cervix which Hippocrates blames for inertia of the uterus when he says:—"Its orifice has no power of attracting semen."¹

Erasistratus, however, and Asclepiades reached such heights of wisdom that they deprived not merely the stomach and the womb of this faculty but also the bladder by the liver, and the kidneys as well. I have, however, pointed out in the first book that it is impossible to assign any other cause for the secretion of urine or bile.²

Now, when we find that the uterus, the stomach and the bladder by the liver carry out attraction and expulsion through one and the same duct, we need no longer feel surprised that Nature should also frequently discharge waste-substances into the stomach through the veins. Still less need we be astonished if a certain amount of the food should, during long fasts, be drawn back from the liver into the stomach through the same veins³ by which it was yielded up to the liver during absorption of nutriment.⁴ To disbelieve such things can occur in the primae viae (in vomiting), it may also be expected to occur in the secundae viae or absorptive channels.⁴ For this "delivery," "up-yield," or anudosis, v. p. 13. note 5.
όμοιον ἐστι δήποπτω τῷ μηκέτι πιστεύειν μηδε ὅτι τὰ καθαίροντα χάρμακα διὰ τῶν αὐτῶν στομάτων ἐξ ὅλου τοῦ σώματος εἰς τὴν γαστέρα τοὺς οἰκείους ἐπιστάται χυμοῦς, δι' ὅν ἐμπροσθεν ἢ ἀνάδοσις ἐγένετο, ἀλλ' ἔτερα μὲν ξητεῖν ἀναδόσεως, ἔτερα δὲ καθάρσεως στομάτα. καὶ μὴν εἴπερ ἐν καὶ ταύτῳ στόμα διτταῖς ὑπηρετεῖ δυνάμεσιν, ἐν διαφοροῖς χρόνοις εἰς τὰν αὐτὰ τὴν ὀλίγη ποιομέναι, ἐμπροσθεν μὲν τῇ κατὰ τὸ ἦπαρ, ἐν δὲ τῷ τῆς καθάρσεως καρφῷ τῇ τοῦ φαρμάκου, τί θαυμαστόν ἦστι διττὴν ὑπηρεσίαν τε καὶ χρεῖαν εἶναι ταῖς φλεψὶ ταῖς ἐν τῷ μέσῳ τεταγμέναις ἦπατος τε καὶ τῶν κατὰ τὴν κοιλίαν, ὡσθ', ὅποτε μὲν ἐν τούτοις ἄφθονοι εἰπή περιεχομένη τροφή, διὰ τῶν εἰρήνων εἰς ἦπαρ ἀναφέρεσθαι φλεβῶν, ὅποτε δ' εἴη κενά καὶ δεόμενα τρέφεσθαι, διὰ τῶν αὐτῶν αὔθης ἐξ ἦπατος ἐλκεσθαι;

Πᾶν γὰρ ἐκ παντὸς ἐλκείνοι φαίνεται καὶ παντὶ μεταδίδοναι καὶ μία τις εἶναι σύρροια καὶ σύμπνοια πάντων, καθαρόν καὶ τούτῳ ὁ Θεότατος Ἰπποκράτης εἶπεν. ἐλκεῖ μὲν οὖν τὸ ἱσχυρότερον, ἐκκενοῦται δὲ τὸ ἀσθενεύστερον.

 Ἱσχυρότερον δὲ καὶ ἀσθενεύστερον ἔτερον ἔτερον μόριον ἢ ἀπλῶς καὶ φύσει καὶ κοινῇ πάσιν ἐστιν ἡ ιδίως τῶδε τινί γίγνεται. φύσει μὲν καὶ κοινῇ πάσιν ἄνθρωποις θ' ἀμα καὶ ξόος ἢ μὲν καρδία τοῦ ἦπατος, τὸ δ' ἦπαρ τῶν ἐντέρων τε καὶ τῆς γαστρώς, αἱ δ' ἀρτηρίαι τῶν φλεβῶν ἐλκύσαι τε τὸ χρύσιμον ἕαυταῖς ἀποκρίναι τε τὸ μὴ τοιοῦτον

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1 The mesenteric veins.
would of course be like refusing to believe that purgative drugs draw their appropriate humours from all over the body by the same stomata through which absorption previously takes place, and to look for separate stomata for absorption and purgation respectively. As a matter of fact one and the same stoma subserves two distinct faculties, and these exercise their pull at different times in opposite directions—first it subserves the pull of the liver and, during catharsis, that of the drug. What is there surprising, then, in the fact that the veins situated between the liver and the region of the stomach\(^1\) fulfil a double service or purpose? Thus, when there is abundance of nutriment contained in the food-canal, it is carried up to the liver by the veins mentioned; and when the canal is empty and in need of nutriment, this is again attracted from the liver by the same veins.

For everything appears to attract from and to go shares with everything else, and, as the most divine Hippocrates has said, there would seem to be a consensus in the movements of fluids and vapours.\(^2\) Thus the stronger draws and the weaker is evacuated.

Now, one part is weaker or stronger than another either absolutely, by nature, and in all cases, or else it becomes so in such and such a particular instance. Thus, by nature and in all men alike, the heart is stronger than the liver at attracting what is serviceable to it and rejecting what is not so; similarly the liver is stronger than the intestines and stomach, and

\(^2\) Linacre renders: "Una omnium confluxio ac conspiratio"; and he adds the marginal note "Totum corpus nostrum est conspirabile et confluxile per meatus communes." cf. p. 48.
ισχυρότεραι. καθ' ἐκαστον δ' ἡμῶν ἴδιως ἐν μὲν
τῶδε τῷ καίρῳ τὸ ἦπαρ ἰσχυρότερον ἐλκειν, ἢ
γαστὴρ δ' ἐν τῶδε. πολλὴς μὲν γὰρ ἐν τῇ κοιλίᾳ
περιεχομένης τροφῆς καὶ σφοδρῶς ὀρεγομένου τε
καὶ χρύσοντος τοῦ ἦπατος, πάντως ἰσχυρότερον
ἐλκει τὸ σπλάγχνον ἐμπαλιν δὲ τοῦ μὲν ἦπατος
190 ἐμπεπλησμένου τε καὶ διατεταμένου, τῆς γαστρὸς
δ' ὀρεγομένης καὶ κενῆς ὑπαρχοῦσης ἢ τῆς ὀλιχῆς
ἰσχύς εἰς ἐκείνην μεθίσταται.

'Ὡς γὰρ, εἰ καὶ ταῖς χερσὶ τινα σιτία κατ-
έχοντες ἀλλήλων ἀρπάζοιμεν, εἰ μὲν ὄμοιως εὑμεν
δεόμενοι, περιγίγνεσθαι τὸν ἰσχυρότερον εἰκὸς, εἰ
δ' οὔτος μὲν ἐμπεπλησμένος εἴῃ καὶ διὰ τοῦτ' ἀμελῶς κατέχων τὰ περίττα ἢ καὶ τινὶ μετα-
δοῦναι ποθῶν, ὁ δ' ἀσθενέστερος ὀρέγοιτο δεινῶς,
οὐδὲν ἀν εἰς κώλυμα τοῦ μη πάντα λαβεῖν αὐτόν,
οὔτω καὶ ἡ γαστήρ ἐκ τοῦ ἦπατος ἐπιστάται
ῥάφιος, ὅταν αὐτὴ μὲν ἰκανός ὀρέγηται τροφῆς,
ἐμπεπλησμένου δ' ἢ τὸ σπλάγχνον. καὶ τοῦ γε
μὴ πεινήν ἑνίοτε τὸ ξίφον ἡ περιουσία τῆς ἐν
ἡπατε τροφῆς αἰτία: κρείττονα γὰρ ἔχουσα καὶ
ἐτοιμότεραν ἡ γαστήρ τροφῆν ὑσδὲν δεῖται τῆς
ἐξωθεῖν εἰ δὲ γε ποτὲ δέοιτο μὲν, ἀποροὶ δὲ,
πληροῦται περιττωμάτων. ἰχώρες δὲ τινὲς εἰς
ταῦτα χολώδεις τε καὶ φλεγματώδεις καὶ ὀρρώδεις,
οὐς μόνον ἐλκοῦση μεθίσιν αὐτῇ τὸ ἦπαρ, ὡταν
ποτὲ καὶ αὐτῇ δέηται τροφῆς.

"Ωστερ οὖν ἐξ ἀλλήλων ἐλκει τὰ μόρια ||
191 τροφῆν, οὔτω καὶ ἀποτίθεται ποτ' εἰς ἀλληλα

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the arteries than the veins. In each of us personally, however, the liver has stronger drawing power at one time, and the stomach at another. For when there is much nutriment contained in the alimentary canal and the appetite and craving of the liver is violent, then the viscus\(^1\) exerts far the strongest traction. Again, when the liver is full and distended and the stomach empty and in need, then the force of the traction shifts to the latter.

Suppose we had some food in our hands and were snatching it from one another; if we were equally in want, the stronger would be likely to prevail, but if he had satisfied his appetite, and was holding what was over carelessly, or was anxious to share it with somebody, and if the weaker was excessively desirous of it, there would be nothing to prevent the latter from getting it all. In a similar manner the stomach easily attracts nutriment from the liver when it [the stomach] has a sufficiently strong craving for it, and the appetite of the viscus is satisfied. And sometimes the surplusage of nutriment in the liver is a reason why the animal is not hungry; for when the stomach has better and more available food it requires nothing from extraneous sources, but if ever it is in need and is at a loss how to supply the need, it becomes filled with waste-matters; these are certain biliary, phlegmatic [mucous] and serous fluids, and are the only substances that the liver yields in response to the traction of the stomach, on the occasions when the latter too is in want of nutriment.

Now, just as the parts draw food from each other, so also they sometimes deposit their excess substances

\(^1\) The alimentary canal, as not being edible, is not considered a splanchnon or viscus.
τὸ περιττὸν καὶ ὅσπερ ἐλκόντων ἐπλεονέκετε τὸ ἵσχυρότερον, οὕτω καὶ ἀποτιθεμένων καὶ τῶν γε καλουμένων ρευμάτων ἢδε ἡ πρόφασις. ἦκαστον γὰρ τῶν μορίων ἔχει τινὰ τόνον σύμφυτον, ὥς διωθεῖται τὸ περιττὸν. ὅταν οὖν ἐν ἐξ αὐτῶν ἀρρωστότερον γένηται κατὰ δὴ τινὰ διάθεσιν, ἐξ ἀπάντων εἰς ἐκεῖνο συρρείν ἀνάγκη τὰ περιττῶματα. τὸ μὲν γὰρ ἵσχυρότατον ἐναποτίθεται τοῖς πλησίον ἁπασιν, ἐκείνων δὲ αὐ πάλιν ἦκαστον ἐν ἐπε ἀττά τῶν ἁθενεστέρων, εἰτ' αὐθίς ἐκείνων ἦκαστον εἰς ἀλλά καὶ τοῦτ' ἐπὶ πλεῖστον γίγνεται, μέχρι περ ἂν ἐξ ἀπάντων ἐλαυνόμενον τὸ περίπτωμα καθ' ἐν τι μείνῃ τῶν ἁθενεστάτων ἐντεῦθεν γὰρ οὐκέτ' εἰς ἀλλο δύναται μεταρρέειν, ὡς ἂν μῆτε δεχομένον τινὸς αὐτὸ τῶν ἵσχυρότερων μῆτ' ἀπώσασθαι δυναμένου τοῦ πεποιθότος.

Ἀλλὰ περὶ μὲν τῶν παθῶν τῆς γενέσεως καὶ τῆς ἱάσεως αὐθίς ἦμῶν ἐπιδεικνύοντων ἱκανὰ καὶ ἐκείνων ἐσται λαβεῖν μαρτύρια τῶν ἐν τῷ ὁδῷ τὸν 192 λόγῳ παντὶ ἐν δεδειγμένων ὀρθῶς. ὅ δ' ἐν τῷ παρόντι δεῖξαι προὔκειτο, πάλιν ἀναλάβωμεν, ὡς οὔδεν θαυμαστόν εἴ ἦπαιν ἡμῶν τινὰ τροφὴν ἐντέροις τε καὶ γαστρὶ διὰ τῶν αὐτῶν φλεβῶν, δι' ὄν ἐμπροσθεν εἴ ἐκείνων εἰς ἡπαρ ἄνεδότο. καὶ πολλοὶς ἄθροίς τε καὶ τελέως ἀποστάσεων ἵσχυρῶν γυμνασίων ἡ τι κόλον ἀποκοπεῖσιν αἴματος διὰ τῶν ἐντέρων γίγνεται κένωσις ἐκ τινῶν περιόδων, ὡς που καὶ Ἰττοκράτης ἔλεγεν, οὔδεν μὲν ἄλλο λυποῦσα, καθαίρουσα δ' ὅξεώς τὸ πᾶν σῶμα καὶ τὰς πλησιμονὰς ἐκκενοῦσα, διὰ τῶν
in each other, and just as the stronger prevailed when the two were exercising traction, so it is also when they are depositing; this is the cause of the so-called fluxions,¹ for every part has a definite inborn tension, by virtue of which it expels its superfluities, and, therefore, when one of these parts,—owing, of course, to some special condition—becomes weaker, there will necessarily be a confluence into it of the superfluities from all the other parts. The strongest part deposits its surplus matter in all the parts near it; these again in other parts which are weaker; these next into yet others; and this goes on for a long time, until the superfluous, being driven from one part into another, comes to rest in one of the weakest of all; it cannot flow from this into another part, because none of the stronger ones will receive it, while the affected part is unable to drive it away.

When, however, we come to deal again with the origin and cure of disease, it will be possible to find there also abundant proofs of all that we have correctly indicated in this book. For the present, however, let us resume again the task that lay before us, i.e. to show that there is nothing surprising in nutriment coming from the liver to the intestines and stomach by way of the very veins through which it had previously been yielded up from these organs into the liver. And in many people who have suddenly and completely given up active exercise, or who have had a limb cut off, there occurs at certain periods an evacuation of blood by way of the intestines—as Hippocrates has also pointed out somewhere. This causes no further trouble but sharply purges the whole body and evacuates the plethoras;

¹ Lit. rheuma; hence our term rheumatism.
αὐτῶν δῆπος φλεβῶν τῆς φορᾶς τῶν περιττῶν ἐπι-
tελουμένης, δι’ οὖν ἐμπρόσθεν ἡ ἀνάδοσις ἐγίγνετο.

Πολλάκις δ’ ἐν νόσοις ἡ φύσις διὰ μὲν τῶν
αὐτῶν δῆπος φλεβῶν τὸ πᾶν ἐκκαθαίρει ξύλον, οὐ
μὴν αἰματώδης γ’ ἡ κένωσις αὐτοῦ, ἀλλὰ κατὰ
tὸν λυποῦντα γίγνεται χυμόν. οὔτω δὲ κἂν ταῖς
χολέραις ἐκκενοῦται τὸ πᾶν σῶμα διὰ τῶν εἰς
ἐντερά τε καὶ γαστέρα καθηκούσων φλεβῶν.

Τὸ δ’ οἶεσθαι μίαν εἶναι ταῖς ὑλαις φορὰν
193 τελεώς ἀγνοούντος ἐστὶ τὰς φυσικὰς ὡς δυνάμεις
τὰς τ’ ἄλλας καὶ τὴν ἐκκριτικὴν ἐναντίαν οὕσαρ
τῇ ἐλκυστικῇ ταῖς γὰρ ἐναντίας δυνάμεις ἐναντίας
κινήσεις τε καὶ φορᾶς τῶν ὑλῶν ἀναγκαῖον
ἀκολουθεῖν. ἐκαστὸν γὰρ τῶν μορίων, ὡταν
ἐλκύσῃ τὸν οἰκεῖον χυμὸν, ἐπειτα κατάσχῃ καὶ
ἄπολαύσῃ, τὸ περιττὸν ἅπαν ἀποθέσθαι σπεὸς,
καθότι μάλιστα δύναται τάχιστα θ’ ἀμα καὶ
καλλίστα, κατὰ τὴν τοῦ περιττοῦ ροπῆν.

"Ὅθεν ἡ γαστήρ τα μὲν ἐπιπολάζοντα τῶν
περιττωμάτων ἐμέτοις ἐκκαθαίρει, τὰ δ’ υφιστά-
μενα διαρροίαις. καὶ τὸ γε ναυτιῶδες γίγνεσθαι
τὸ χῦν τούτ’ ἐστὶν ὀρμῆσαι τὴν γαστέρα κενω-
θήναι δι’ ἐμέτον. οὔτω δὲ δὴ τὶ βιῶνοι καὶ
σφοδρὸν ἡ ἐκκριτικὴ δύναμις ἐχει, ὡστ’ ἐν τοῖς
eἴλεοις, ὅταν ἄποκλεισθῇ τελεώς ἡ κάτω διέξοδος,
ἐμεῖται κόπρος. καὶ τοιού τριὶ διελθέων τὸ τε λεπ-
tῶν ἐντερον ἅπαν καὶ τὴν υήσιν καὶ τὸν πυλώρον
καὶ τὴν γαστήρα καὶ τὸν οἰσοφάγον οὐχ ὁδὸν τε
διὰ τοῦ στόματος ἐκπεσεῖν οὐδεὶ τοιοῦτο περιτ-
tῶματι. τί δὴ θαυμαστόν, εἰ κἂν τῆς ἐσχάτης

1 Here Galen apparently indicates that vital functions are
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the passage of the superfluities is effected, of course, through the same veins by which absorption took place.

Frequently also in disease Nature purges the animal through these same veins—although in this case the discharge is not sanguineous, but corresponds to the humour which is at fault. Thus in cholera the entire body is evacuated by way of the veins leading to the intestines and stomach.

To imagine that matter of different kinds is carried in one direction only would characterise a man who was entirely ignorant of all the natural faculties, and particularly of the eliminative faculty, which is the opposite of the attractive. For opposite movements of matter, active and passive, must necessarily follow opposite faculties; that is to say, every part, after it has attracted its special nutrient juice and has retained and taken the benefit of it hastens to get rid of all the surplusage as quickly and effectively as possible, and this it does in accordance with the mechanical tendency of this surplus matter.

Hence the stomach clears away by vomiting those superfluities which come to the surface of its contents, whilst the sediment it clears away by diarrhœa. And when the animal becomes sick, this means that the stomach is striving to be evacuated by vomiting. And the expulsive faculty has in it so violent and forcible an element that in cases of ileus [volvulus], when the lower exit is completely closed, vomiting of faeces occurs; yet such surplus matter could not be emitted from the mouth without having first traversed the whole of the small intestine, the jejunum, the pylorus, the stomach, and the oesophagus. What is there to wonder at, then, if something at least partly explicable in terms of mechanical law. cf. Introduction, p. xxviii.  

\textsuperscript{1} cf. pp. 211, 247.


GALEN

194 τε καὶ τῆς γαστρὸς ἀφικνοῖτο τι || μεταλαμβανό-

μενον, ὡς καὶ τούθ᾿ Ἰπποκράτις ἡμᾶς ἐδίδαξεν,

οὐ πνεῦμα μόνον ἡ περίττομα φάσκων ἀλλὰ καὶ

τὴν τροφὴν αὐτὴν ἐκ τῆς ἐσχάτης ἐπιφανείας

αὕτης ἐπὶ τὴν ἀρχῆν, ὅθεν ἀνηνέχθη, καταφέρε-

σθαι. Ἐλάχισται γὰρ ῥοπαὶ κινήσεων τὴν

ἐκκριτικὴν ταύτην οἰκείζουσι δύναμιν, ὡς ἂν διὰ

τῶν ἐγκαρσίων μὲν ἰνῶν γεγομένην, ὡκύτατα δὲ

διαδιδομένην ἀπὸ τῆς κινησάσης ἀρχῆς ἐπὶ τὰ

καταντικρύ πέρατα. οὖκον ἀπεικός οὐδ᾽ ἀδύ-

νατον ἀγάθει ποτὲ ψύξει τὸ πρὸς τῷ δέρματι

μόριον ἔξαιφνης πιληθεῖν ἀμα μὲν ἀρρωστότερον

αὐτὸ γενόμενου, ἀμα δ᾽ οἰον ἀχθος τι μᾶλλον ἢ

παρασκευὴν θρέψεως ἔχουν τὴν ἐμπροσθεν ἀλύτως

αὐτῷ παρεσπαρμένην ὑγρότητα καὶ διὰ τούτ᾽ ἀπωθεῖσθαι σπεύδον, ἀμα δὲ τῆς ἔξω φορᾶς

ἀποκεκλείσμενης τῇ πυκνώσει, πρὸς τὴν λοιπὴν

ἐπιστραφῆναι καὶ οὖτω βιασάμενοι εἰς τὸ

παρακείμενον αὐτῷ μόριον ἄθρως ἀπώσασθαι τὸ

περιττὸν, ἐκεῖνο δ᾽ αὐ πάλιν εἰς τὸ μετ᾽ αὐτό, ||

195 καὶ τούτο μὴ παύσασθαι γεγομένου, ἄχρις ἂν ἡ

μετάληψις ἐπὶ τὰ ἐντὸς πέρατα τῶν φλεβῶν

teleυτήσῃ.

Ἀὶ μὲν δὴ τοιαύται κινήσεις θάττον ἀπο-

παύονται, αἰ δ᾽ ἀπὸ τῶν ἐνδοθεν διερηθείζοντων,

ὡς ἐν τε τοῖς καθαίρουσι φαρμάκοις καὶ ταῖς

χολέραις ἱσχυρότεραι τὲ πολὺ καὶ μοιμώτεραι

γίγνονται καὶ διαμένουσιν, ἐστὶ ἂν καὶ ἡ περὶ

tois στόμασθ π tôn ἀγγείων διάθεσις, ἡ τὸ πλησίον

1 See p. 298, note 1.
should also be transferred from the extreme skin-surface and so reach the intestines and stomach? This also was pointed out to us by Hippocrates, who maintained that not merely pneuma or excess-matter, but actual nutriment is brought down from the outer surface to the original place from which it was taken up. For the slightest mechanical movements determine this expulsive faculty, which apparently acts through the transverse fibres, and which is very rapidly transmitted from the source of motion to the opposite extremities. It is, therefore, neither unlikely nor impossible that, when the part adjoining the skin becomes suddenly oppressed by an unwonted cold, it should at once be weakened and should find that the liquid previously deposited beside it without discomfort had now become more of a burden than a source of nutrition, and should therefore strive to put it away. Finally, seeing that the passage outwards was shut off by the condensation of tissue, it would turn to the remaining exit and would thus forcibly expel all the waste-matter at once into the adjacent part; this would do the same to the part following it; and the process would not cease until the transference finally terminated at the inner ends of the veins.²

Now, movements like these come to an end fairly soon, but those resulting from internal irritants (e.g., in the administration of purgative drugs or in cholera) become much stronger and more lasting; they persist as long as the condition of things³ about the mouths of the veins continues, that is, so long as

² The ends of the veins in the alimentary canal from which absorption or anadosis had originally taken place.
³ Diathesis.
ΓΑΛΕΝ

ἐλκονοσα, παραλένη. αὐτή μὲν γὰρ τὸ συνεχὲς ἐκκενοὶ μόριον, ἐκεῖνο δ' αὐτὸ τὸ μετ' αὐτὸ καὶ τούτ' οὐ παύεται μέχρι τῆς ἐσχάτης ἐπιφανείας, ὡστε διαδιδόντων τῶν ἐφεξῆς ἀεὶ μορίων ἐτέρων ἐτέρους τὸ πρῶτον πάθος ὁκύτατα δικνεῖσθαι μέχρι τῶν ἐσχάτων. οὔτως οὖν ἔχει κατὶ τῶν εἰλεῶν. αὐτὸ μὲν γὰρ τὸ φλεγμαίνου ἐντερον οὔτε τοῦ βάρους οὔτε τῆς δριμύτητος ἀνέχεται τῶν περιττώματος καὶ διὰ τούτ' ἐκκρίνειν αὐτὰ σπεύδει καὶ ἀπωθεῖσθαι πορρωτάτω. κωλυόμενον δὲ κάτω ποιεῖσθαι τὴν δίωσιν, όταν ἐνταυθοὶ ποτε τὸ σφοδρότατον ἢ τῆς φλεγμονῆς, εἰς τὰ πλησιάζοντα τῶν ὑπερκειμένων ἐντέρων ἀπωθεῖται. καὶ οὕτως ἦδη 196 κατὰ || τὸ συνεχὲς τὴν ῥοπὴν τῆς ἑκκριτικῆς δυνάμεως ἀνω ποιησαμένης ἄχρι τοῦ στόματος ἐπανέρχεται τὰ περιττώματα.

Ταῦτα μὲν οὖν δὴ κἀν τοῖς τῶν νοσημάτων λογισμοῖς ἐπὶ πλέον εἰρήσεται. τὸ δ' ἐκ παντὸς εἰς πᾶν φέρεσθαι τι καὶ μεταλαμβάνεσθαι καὶ μιᾶν ἀπάντων εἶναι σύμπνοιάν τε καὶ σύρροιαν, ὡς Ἰπποκράτης ἔλεγεν, ἦδη μοι δοκῶ δεδείχθαι σαφῶς καὶ μηκέτ' ἂν τινα, μηδ' εὶ βραδὺς αὐτῷ νοῦς ἐνείη, περὶ τῶν τοιούτων ἀπορῆσαι μηδενός, οἷον ὅπως ἡ γαστήρ ἢ τὰ ἐντερα τρέφοντες καὶ τίνα τρόπον ἐκ τῆς ἐσχάτης ἐπιφανείας εἴσῳ τι δικνεῖται. πάντων γὰρ τῶν μορίων ἐλκεῖν μὲν τὸ προσήκον τε καὶ φίλιον, ἀποκρίνειν δὲ τὸ βαρύνου ἢ δάκνου ἐχόντων δύναμιν οὐδὲν θαυμαστῶν ἐναντίας συνεχῶς ἑγώνυσθαι κινήσεις ἐν

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these continue to attract what is adjacent. For this condition \(^1\) causes evacuation of the contiguous part, and that again of the part next to it, and this never stops until the extreme surface is reached; thus, as each part keeps passing on matter to its neighbour, the original affection \(^2\) very quickly arrives at the extreme termination. Now this is also the case in ileus; the inflamed intestine is unable to support either the weight or the acridity of the waste substances and so does its best to excrete them, in fact to drive them as far away as possible. And, being prevented from effecting an expulsion downwards when the severest part of the inflammation is there, it expels the matter into the adjoining part of the intestines situated above. Thus the tendency of the eliminative faculty is step by step upwards, until the superfluities reach the mouth.

Now this will be also spoken of at greater length in my treatise on disease. For the present, however, I think I have shewn clearly that there is a universal conveyance or transference from one thing into another, and that, as Hippocrates used to say, there exists in everything a consensus in the movement of air and fluids. And I do not think that anyone, however slow his intellect, will now be at a loss to understand any of these points,—how, for instance, the stomach or intestines get nourished, or in what manner anything makes its way inwards from the outer surface of the body. Seeing that all parts have the faculty of attracting what is suitable or well-disposed and of eliminating what is troublesome or irritating, it is not surprising that opposite movements should occur in them consecutively—as may

\(^1\) Diathesis, \(^2\) Pathos.
Galen

autōis, ὁσπερ ἐπὶ τῇ καρδίᾳ ὅραται σαφώς καὶ τῶν ἀρτηριῶν ἀπασὸν καὶ τοῦ θώρακος καὶ τοῦ πνεύμονος. ἐπὶ μὲν γε τοῦτων ἀπάντων μόνων οὐ καθ’ ἐκάστην καιροῦ ῥοπὴν τὰς ἐναντίας κινήσεις θ’ ἀμα τῶν ὀργάνων καὶ φοράς τῶν

197 ὴλῶν || ἐναργῶς ἐστὶν ἰδεῖν ὅμομένας. ἐκ’ ἐπὶ μὲν τῆς τραχείας ἀρτηρίας οὐκ ἀπορεῖς ἐναλλαξὶν ὑπὸ μὲν εἰσὶν παραγούσης εἰς τὸν πνεύμονα τὸ πνεῦμα, ποτὲ δ’ ἐξω, καὶ τῶν κατὰ τὰς βίνας πόρων καὶ ὅλου τοῦ στόματος ὠσάυτως οὐδ’ εἶναι σοι δοκεῖ θαυμαστῶν οὐδὲ παράδοξον, εἰ, δ’ οὐ μικρὸ πρόθεν εἰσὶν παρεκομίζετο τὸ πνεῦμα, διὰ τούτου νῦν ἐκτείνεται, περὶ δὲ τῶν ἐς ἡπατος εἰς ἐντερὰ τε καὶ γαστέρα καθηκουσῶν φλεβῶν ἀπορεῖς καὶ σοι θαυμαστῶν εἶναι φαίνεται, διὰ τῶν αὐτῶν ἀναδίδοσθαι θ’ ἀμα τὴν τροφὴν εἰς ἡπαρ ἐλκεσθαι τ’ ἐξ ἐκείνου πάλιν εἰς γαστέρα; διόρισαι δὴ τὸ ἀμα τοῦτο ποτέρως λέγεις. εἰ μὲν γὰρ κατὰ τῶν αὐτῶν χρῶνον, οὐδ’ ἤμεις τοῦτο γέ φαμεν. ὁσπερ γὰρ εἰσπνέομεν ἐν ἐτέρῳ χρῶνῳ καὶ αὕθις πάλιν ἐν ἐτέρῳ ἀντεκπνέομεν, οὐκι καὶ τροφήν ἐν ἐτέρῳ μὲν χρῶνῳ τὸ ἡπαρ ἐκ τῆς γαστρός, ἐν ἐτέρῳ δ’ ἡ γαστήρ ἐκ τοῦ ἡπατος ἐπιστάται. εἰ δ’ ὅτι καθ’ ἐν καὶ ταυτὸ ἐρὸν ἐν ὀργανον ἐναντίαις φοράς ὴλῶν ὑπηρετεῖ, τοῦτο σοι βούλεται δὴλον τὸ ἀμα καὶ τοῦτο σε ταράτ-198 τεῖ, τὴν τ’ || εἰσπνοὴν ἵδε καὶ τὴν ἐκπνοὴν. πάντως ποὺ καὶ αὕται διὰ μὲν τῶν αὐτῶν ὀργανῶν γίγνονται, τρόπῳ δὲ κινήσεώς τε καὶ φοράς τῶν ὴλῶν διαφέρουσιν.

1 He means, not only under the stress of special circumstances, but also normally.
be clearly seen in the case of the heart, in the various arteries, in the thorax, and lungs. In all these the active movements of the organs and therewith the passive movements of [their contained] matters may be seen taking place almost every second in opposite directions. Now, you are not astonished when the trachea-artery alternately draws air into the lungs and gives it out, and when the nostrils and the whole mouth act similarly; nor do you think it strange or paradoxical that the air is dismissed through the very channel by which it was admitted just before. Do you, then, feel a difficulty in the case of the veins which pass down from the liver into the stomach and intestines, and do you think it strange that nutriment should at once be yielded up to the liver and drawn back from it into the stomach by the same veins? You must define what you mean by this expression “at once.” If you mean “at the same time” this is not what we ourselves say; for just as we take in a breath at one moment and give it out again at another, so at one time the liver draws nutriment from the stomach, and at another the stomach from the liver. But if your expression “at once” means that in one and the same animal a single organ subserves the transport of matter in opposite directions, and if it is this which disturbs you, consider inspiration and expiration. For of course these also take place through the same organs, albeit they differ in their manner of movement, and in the way in which the matter is conveyed through them.

2 Lit. “rough artery.” The air-passages as well as the arteries proper were supposed by the Greeks to carry air (pneuma); diastole of arteries was, like expansion of the chest, a movement for drawing in air. cf. p. 317, note 1.
ΓΑΛΕΝ

'Ο πνεύμων μὲν οὖν καὶ οἴθωραξ καὶ ἀρτηρίαι αἱ τραχεῖαι καὶ αἱ λείαι καὶ καρδία καὶ στόμα καὶ ῥίναις εὖ ἐλαχίστως χρόνου ῥοπαίς εἰς ἐναντίας κινήσεις αὐτὰ τε μεταβάλλει καὶ τὰς ὀλιγὰς μεθίστησι. αἱ δ᾿ εἰς ἡπάτους εἰς ἑντερα καὶ γαστέρα καθήκουσαι φλέβες οὐκ ἐν οὕτω βραχέσι χρόνου μορίοις ἀλλ᾿ ἐν πολλαίς ἥμεραις ἀπαξ ἐνιότε τὴν ἐναντίαν κινούνται κίνησιν.

'Εχει γὰρ ὁδὸ ὁ σύμπαν. ἐκαστὸν τῶν ὄργανων εἰς ἑαυτὸ τὴν πλησιάζουσαν ἐπιστάται τροφὴν ἐκβοσκόμενον αὐτὴς ἀπασαν τὴν χρηστὴν νοτίδα, μέχρις ἂν ἵκανος κορεσθῇ, καὶ ταῦτην, ὡς καὶ προσθέν ἐδείκνυμεν, ἐναποτίθεται ἑαυτῷ καὶ μετὰ ταῦτα προσφύει τε καὶ ὦμοιοι, τοὺτο-ἐστὶ ἐπέφεται. διόρισται γὰρ ἵκανος ἐμπροσθεν ἐτερὸν τῇ τῆς θρέψεως εἰς ἀνάγκης αὐτὴς προηγούμενον ιδί πρόσφυσις ὑπάρχειν, ἐκείνης δὲ ἐπὶ πρότερον ἡ πρόσθεσις. ὡσπερ οὖν || τοῖς ἦνοις αὐτοῖς ὄρος ἐστὶ τῆς ἐδωδῆς τὸ πληρώσατι τὴν γαστέρα, κατὰ τὸν αὐτὸν τρόπον ἐκαστῷ τῶν μορίων ὄρος ἐστὶ τῆς προσθέσεως ἡ πληρωσίς τῆς οἰκείας ὑγρότητος. ἐπεὶ τοῖνυν ἅπαν μόριον τῇ γαστρὶ ὦμοίως ὀρέγεται τρέφεσθαι, καὶ περιπτύσσεται τῇ τροφῇ καὶ οὕτω σφύγγει πανταχόθεν αὐτὴν ὡς ἡ γαστήρ. ἔπεται δ᾿ εἰς ἀνάγκης τοῦτο, καθάπερ καὶ πρόσθεν ἔρρηθῃ, τὸ πέπτεσθαι τοῖς συνόις, τῆς γαστρὸς οὗ διὰ τούτο περιστελλομένης αὐτοῖς, ἢν ἐπιτίθεια τοῖς ἄλλοις ἐργάσηται μορίοις οὕτω γὰρ ἄν οὐκέτι φυσικῶν

1 cf. p. 39, chap. xi.
2 Lit. orexis.

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Now the lungs, the thorax, the arteries rough and smooth, the heart, the mouth, and the nostrils reverse their movements at very short intervals and change the direction of the matters they contain. On the other hand, the veins which pass down from the liver to the intestines and stomach reverse the direction of their movements not at such short intervals, but sometimes once in many days.

The whole matter, in fact, is as follows:—Each of the organs draws into itself the nutriment alongside it, and devours all the useful fluid in it, until it is thoroughly satisfied; this nutriment, as I have already shown, it stores up in itself, afterwards making it adhere and then assimilating it—that is, it becomes nourished by it. For it has been demonstrated with sufficient clearness already that there is something which necessarily precedes actual nutrition, namely adhesion, and that before this again comes presentation. Thus as in the case of the animals themselves the end of eating is that the stomach should be filled, similarly in the case of each of the parts, the end of presentation is the filling of this part with its appropriate liquid. Since, therefore, every part has, like the stomach, a craving to be nourished, it too envelops its nutriment and clasps it all round as the stomach does. And this [action of the stomach], as has been already said, is necessarily followed by the digestion of the food, although it is not to make it suitable for the other parts that the stomach contracts upon it; if it did so, it would no longer be a physiological organ, but an animal possessing reason

Lit. a "physical" organ; that is, a mere instrument or organon of the Physis,—not one of the Psyche or conscious personality. cf. semen, p. 132, note 1.
όργανον ἀλλὰ ξιδὸν τι γέγυοιτο λογισμόν τε καὶ νοῦν ἔχον, ὦς αἴρεσθαι τὸ βέλτιον.

'Αλλ' αὐτὴ μὲν περιστέλλεται τῷ τὸ πᾶν σῶμα δύσαμιν ἐλκτικήν τινα καὶ ἀπολαυστικήν κεκτῆσθαι τῶν οἰκείων ποιοτήτων, ὡς ἐμπροσθεν ἐδείκνυον· συμβαίνει δ' ἐν τούτῳ τοῖς σιτίοις ἀλλοιοῦσθαι. καὶ μέντοι καὶ πληροθείσα τῆς ἐξ αὐτῶν υγρότητος καὶ κορεσθείσα βάρος ἕγειται τὸ λοιπὸν αὐτὰ. τὸ περιττὸν οὖν εὐθὺς ἀπο-200 τρίβεται τε καὶ ἀθεὶ κάτω πρὸς || ἐτερον ἔργον αὐτὴ τρεπομένη, τὴν πρόσφυσιν. ἐν δὲ τούτῳ τῷ χρόνῳ διερχομένη τὸ ἐντερον ἅπαν ἡ τροφή διὰ τῶν εἰς αὐτὸ καθηκόντων ἀγγείων ἀναρπάζεται, πλείστη μὲν εἰς τὰς φλέβας, ὀλίγη δὲ τις εἰς τὰς ἀρτηρίας, ὥς μικρὸν ύστερον ἀποδείξομεν. ἐν τούτῳ δ' αὐτὸ τῷ χρόνῳ καὶ τοῖς τῶν ἐντέρων χυτῶσι προστίθεται.

Καὶ μοι τεμῶν ἢδη τῷ λογισμῷ τὴν τῆς τροφῆς οἰκονομίαν ἄπασαν εἰς τρεῖς μοῖρας χρόνων, ἐν μὲν τῇ πρώτῃ νόει μένουσαν θ' ἀμα κατὰ τὴν κοιλίαν αὐτὴν καὶ πεπτομένην καὶ προστιθεμένην εἰς κόρον τῇ γαστρὶ καὶ τι καὶ τῷ ἣπατι παρ' αὐτῆς ἀναφερόμενον.

'Εν δὲ τῇ δευτέρᾳ διερχομένην τά τ' ἐντερα καὶ προστιθεμένην εἰς κόρον αὐτοῖοι τε τούτοις καὶ τῷ ἦπατι καὶ τῇ βραχύ μέρος αὐτῆς πάντῃ τοῦ σώματος φερόμενον. ἐν δὲ δὴ τούτῳ τῷ καιρῷ τὸ προστεθέν ἐν τῷ πρώτῳ χρόνῳ προσφύεσθαι νόει τῇ γαστρὶ.

Κατὰ δὲ τὴν τρίτην μοίραν τοῦ χρόνου τρέ-
and intelligence, with the power of choosing the better [of two alternatives].

But while the stomach contracts for the reason that the whole body possesses a power of attracting and of utilising appropriate qualities, as has already been explained, it also happens that, in this process, the food undergoes alteration; further, when filled and saturated with the fluid pabulum from the food, it thereafter looks on the food as a burden; thus it at once gets rid of the excess—that is to say, drives it downwards—itself turning to another task, namely that of causing adhesion. And during this time, while the nutriment is passing along the whole length of the intestine, it is caught up by the vessels which pass into the intestine; as we shall shortly demonstrate, most of it is seized by the veins, but a little also by the arteries; at this stage also it becomes presented to the coats of the intestines.

Now imagine the whole economy of nutrition divided into three periods. Suppose that in the first period the nutriment remains in the stomach and is digested and presented to the stomach until satiety is reached, also that some of it is taken up from the stomach to the liver.\(^2\)

During the second period it passes along the intestines and becomes presented both to them and to the liver—again until the stage of satiety—while a small part of it is carried all over the body.\(^2\) During this period, also imagine that what was presented to the stomach in the first period becomes now adherent to it.

This period the stomach has reached

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\(^2\) Note that absorption takes place from the stomach as well as the intestines. \(cf.\) p. 118, note 1.
That is, among the ultimate tissues or cells.
the stage of receiving nourishment; it now entirely assimilates everything that had become adherent to it: at the same time in the intestines and liver there takes place adhesion of what had been before presented, while dispersal [anadosis] is taking place to all parts of the body,¹ as also presentation. Now, if the animal takes food immediately after these [three stages] then, during the time that the stomach is again digesting and getting the benefit of this by presenting all the useful part of it to its own coats, the intestines will be engaged in final assimilation of the juices which have adhered to them, and so also will the liver: while in the various parts of the body there will be taking place adhesion of the portions of nutriment presented. And if the stomach is forced to remain without food during this time, it will draw its nutriment from the veins in the mesentery and liver; for it will not do so from the actual body of the liver (by body of the liver I mean first and foremost its flesh proper, and after this all the vessels contained in it), for it is irrational to suppose that one part would draw away from another part the juice already contained in it, especially when adhesion and final assimilation of that juice were already taking place; the juice, however, that is in the cavity of the veins will be abstracted by the part which is stronger and more in need.

It is in this way, therefore, that the stomach, when it is in need of nourishment and the animal has nothing to eat, seizes it from the veins in the liver. Also in the case of the spleen we have shown in a former passage² how it draws all material from


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κατεργάζεσθαι τε καὶ μεταβάλλειν ἐπὶ τὸ χρηστότερον, οὐδὲν οὐδ’ ἐναιθάνθα θαυμαστόν ἐλκεσθαι τι κἂν τοῦ σπλήρους εἰς ἕκαστον τῶν κοινωνούντων αὐτῷ κατὰ τὰς φλέβας ὀργάνων, οἶνον εἰς ἐπιπλοῦν καὶ μεσεντέριον καὶ λεπτὸν ἐντερον καὶ κῶλον καὶ αὐτὴν τὴν γαστέρα. κατὰ δὲ τὸν αὐτὸν τρόπον ἐξερεύγεσθαι μὲν εἰς τὴν γαστέρα τὸ περίττωμα καθ’ ἐτερον χρόνου, αὐτὸν δ’ αὖθις ἐκ τῆς γαστρὸς ἐλκειν τι τῆς οἰκείας τροφῆς ἐν ἐτέρῳ καιρῷ.

Καθόλου δ’ εἰπεῖν, δ’ καὶ πρόσθεν ἠδὴ λέλεκται, πάν εἰ παντὸς ἐλκειν τε καὶ πέμπειν ἐγχορεῖν κατὰ διαφέροντας χρόνους, ὁμοιοτάτους γεγυμνούν τοῦ συμβαίνουτος, ὡς εἰ καὶ ἥδα νοήσας πολλὰ τροφήν ἄφθονον ἐν κοινῷ κατακεμένην, εἰς ὅσον βούλεται, προσφερόμενα. καθ’ ὅν γὰρ ἠδὴ πέπαιναι χρόνου ἐτερα, κατὰ τοῦτον εἰκὸς ἐσθίειν 203 ἐτερα, καὶ μέλλειν γε τὰ μὲν  || παύεσθαι, τὰ δ’ ἀρχεσθαι, καὶ τίνα μὲν συνεσθίοντα, τὰ δ’ ἀνὰ μέρος ἐσθίοντα καὶ ναί μὰ Δία γε τὸ ἐτερον ἀρπάζειν θατέρου πολλάκις, εἰ τὸ μὲν ἐτερον ἐπιδέοιτο, τὸ δ’ ἄφθονως παρακέοιτο. καὶ οὔτως οὐδὲν θαυμαστὸν οὔτ’ ἐκ τῆς ἐσχάτης ἐπιφανείας εἶχον τι πάλιν ὑποστρέφειν ὡστε διὰ τῶν αὐτῶν ἀγγείων εἰς ἦπατός τε καὶ σπλήρος εἰς κοιλίαν ἀνενεχθήναι τι, δὲ ὅν ἐκ ταύτης εἰς ἔκεινα πρότερον ἀνηνέχθη.

Κατὰ μὲν γὰρ τὰς ἀρτηρίας ἱκανοῖς ἐναργεῖς τὸ τοιοῦτον, ὧσπερ καὶ κατὰ τὴν καρδίαν τε καὶ τὸν θώρακα καὶ τὸν πνεύμονα. τούτων γὰρ ὑπάντων διαστελλομένων τε καὶ συστελλομένων ἐναλλαξάναγκαιον, εξ ὅν εἰλκύσθη τι πρότερον, εἰς ταῦθ' 312
the liver that tends to be thick, and by working it up converts it into more useful matter. There is nothing surprising, therefore, if, in the present instance also, some of this should be drawn from the spleen into such organs as communicate with it by veins, e.g. the omentum, mesentery, small intestine, colon, and the stomach itself. Nor is it surprising that the spleen should disgorge its surplus matters into the stomach at one time, while at another time it should draw some of its appropriate nutriment from the stomach.

For, as has already been said, speaking generally, everything has the power at different times of attracting from and of adding to everything else. What happens is just as if you might imagine a number of animals helping themselves at will to a plentiful common stock of food; some will naturally be eating when others have stopped, some will be on the point of stopping when others are beginning, some eating together, and others in succession. Yes, by Zeus! and one will often be plundering another, if he be in need while the other has an abundant supply ready to hand. Thus it is in no way surprising that matter should make its way back from the outer surface of the body to the interior, or should be carried from the liver and spleen into the stomach by the same vessels by which it was carried in the reverse direction.

In the case of the arteries\(^1\) this is clear enough, as also in the case of heart, thorax, and lungs; for, since all of these dilate and contract alternately, it must needs be that matter is subsequently discharged back into the parts from which it was

\(^1\) By this term, of course, the air-passages are also meant; cf. p. 305.
Galen

υστερον ἐκπέμπεσθαι. καὶ ταύτην ἂρα τὴν ἀνάγκην ᾗ φύσις προγενώσκουσα τοῖς ἐν τῇ καρδίᾳ στόμασι τῶν ἀγγείων ύμένας ἐπέφυσε κωλύσοντας εἰς τοὺπίσω 'φέρεσθαι τὰς ύλας. ἀλλ' ὅπως μὲν τούτο γίγνεται καὶ καθ' ὄντινα τρόπον, ἐν τοῖς περὶ χρείας μορίων εἰρήσεται δεικνύντων ἕμων τά τ' ἄλλα καὶ ὡς ἀδύνατον οὕτως ἀκριβῶς κλείσεσθαι τὰ στόματα τῶν ἀγγείων, ὥς || μηδὲν παλινδρομεῖν. εἰς μὲν γὰρ τὴν ἀρτηρίαν τὴν φλεβώδη, καὶ γὰρ καὶ τοῦτ' ἐν ἐκείνοις δειλησεται, πολὺ πλέον ἢ διὰ τῶν ἄλλων στομάτων εἰς τοῦπίσω πάλιν ἀναγκαῖον ἐπανέρχεσθαι. τὸ δ' εἰς τὰ παρόντα χρήσιμον, ὡς οὐκ ἐνδεχεται τι τῶν αἰσθητὴν καὶ μεγάλην ἑχόντων εὐρύτητα μὴ οὐκ ἦτοι διαστελλόμενου ἐλκεῖν εξ ἀπάνων τῶν πλησίον ἢ ἐκθλίβειν αὕθες εἰς ταύτα συστελλόμενου ἐκ τε τῶν ἢδη προειρημένων ἐν τὸ δὲ τὸ λόγῳ σαφὲς ἂν εἴη καὶ δὲν Ἔρασίστρατός τε καὶ ἥμεις ἐτέρωθι περὶ τῆς πρὸς τὸ κενούμενον ἀκολουθίας ἐδείξαμεν.

XIV

'Αλλὰ μὴν καὶ ὡς ἐν ἐκάστῃ τῶν ἀρτηριῶν ἐστὶ τις δύναμις ὧ τῆς καρδίας ἐπιρρέουσα, καὶ τὴν διαστελλόμεναι τε καὶ συστελλόμεναι, δεδεικταί δι' ἐτέρων.

Εἰτερ οὖν συνθείης ἄμφω τὸ τε ταύτην εἶναι τὴν κάνησιν αὐταῖς τὸ τε πάν τὸ διαστελλόμενον

1 cf. p. 34, note 1. 2 cf. p. 121, note 4.
3 Pulmonary vein, or rather, left auricle. Galen means a reflux through the mitral orifice; the left auricle was looked

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previously drawn. Now Nature foresaw this necessity,¹ and provided the cardiac openings of the vessels with membranous attachments,² to prevent their contents from being carried backwards. How and in what manner this takes place will be stated in my work “On the Use of Parts,” where among other things I show that it is impossible for the openings of the vessels to be closed so accurately that nothing at all can run back. Thus it is inevitable that the reflux into the venous artery³ (as will also be made clear in the work mentioned) should be much greater than through the other openings. But what it is important for our present purpose to recognise is that every thing possessing a large and appreciable cavity must, when it dilates, abstract matter from all its neighbours, and, when it contracts, must squeeze matter back into them. This should all be clear from what has already been said in this treatise and from what Erasistratus and I myself have demonstrated elsewhere respecting the tendency of a vacuum to become refilled.⁴

XIV

And further, it has been shown in other treatises that all the arteries possess a power which derives from the heart, and by virtue of which they dilate and contract.

Put together, therefore, the two facts—that the arteries have this motion, and that everything, when

on rather as the termination of the pulmonary veins than as a part of the heart. cf. p. 323, note 4. He speaks here of a kind of “physiological” mitral incompetence.

¹ Horror vacui.
ΓΑΛΕΝ

Έλλειν ἐκ τῶν πλησίων εἰς ἑαυτό, θαυμαστῶν οὐδὲν σοι φανεῖται τὰς ἀρτηρίας, οὐσία μὲν εἰς τὸ δέρμα περάνουσιν αὐτῶν, ἐπισπάσθαι τὸν ἔξωθεν ἀέρα διαστελλομένας, ὥσιν δὲ κατὰ τι πρὸς τὰς ἑκτέκαταν ἀνεστῶμονται, τὸ λεπτότατον ἐν αὐταῖς καὶ ἀτμωδέστατον ἐπισπάσθαι τοῦ αἵματος, ὥσιν δὲ ἐγγὺς τῆς καρδίας εἰσίν, ἐξ αὐτῆς ἐκείνης ποιεῖσθαι τὴν ὀλκήν, ἐν γὰρ τῇ πρὸς τὸ κενούμενον ἀκολουθία τὸ κουφότατον τε καὶ λεπτότατον ἐπεταί πρὸτον τοῦ βαρυτέρου τε καὶ παχυτέρου· κουφότατον δ' ἐστὶ καὶ λεπτότατον ἀπόντων τῶν κατὰ τὸ σώμα πρῶτον μὲν τὸ πνεῦμα, δεύτερον δ' ὁ ἀτμός, ἐπὶ τούτῳ δὲ τρίτον, ὥσιν ἄν ἀκριβῶς ἤ κατεργασμένον τε καὶ λεπτυσμένον αἴμα.

Ταῦτ' οὖν εἰς ἑαυτὰς ἔλκουσιν αἱ ἀρτηρίαι πανταχόθεν, αἱ μὲν εἰς τὸ δέρμα καθήκουσιν τῶν ἑξωθεν ἀέρα· πλησίον τε γὰρ αὐταῖς οὐτός ἐστι καὶ κουφότατος ἐν τοῖς μάλιστα· τῶν δ' ἀλλων ἡ μὲν ἐπὶ τῶν τράχηλων ἐκ τῆς καρδίας ἀναύσα καὶ ἡ κατὰ ράχιν, ἦδη δὲ καὶ ὡσιν τούτων ἐγγὺς ἐξ αὐτῆς μάλιστα τῆς καρδίας· ὥσιν δὲ καὶ τῆς καρδίας πορρωτέρῳ καὶ τοῦ δέρματος, ἐλκεῖν ταῦτας ἀναγκαῖον ἐκ τῶν φλεβῶν τὸ κουφότατον τοῦ αἵματος· ὡστε καὶ τῶν εἰς τὴν γαστέρα τε καὶ τὰ ἑντερα καθηκουσῶν ἀρτηρίων τὴν ὀλκήν ἐν τῷ διαστελλόμενας γίγνεσθαι παρά τε τῆς ἀρτηρίας αὐτῆς καὶ τῶν παρακείμενων αὐτῇ φλεβῶν παμπόλλων οὐσῶν. οὐ γὰρ δὴ ἐκ γε τῶν ἑντερῶν καὶ τῆς κοιλίας τροφὴν οὕτω παχεῖαν τε καὶ βαρεῖαν ἐν ἑαυτοῖς ἐχόντων δύνανται τι μεταλαμβάνειν, οὐ τι καὶ αἰζον λόγου, φθάνουσαι πληροῦσθαι τοῖς κουφότεροις. οὐδὲ γὰρ εἰ καθεῖς.
it dilates, draws neighbouring matter into itself—and you will find nothing strange in the fact that those arteries which reach the skin draw in the outer air when they dilate, while those which anastomose at any point with the veins attract the thinnest and most vaporous part of the blood which these contain, and as for those arteries which are near the heart, it is on the heart itself that they exert their traction. For, by virtue of the tendency by which a vacuum becomes refilled, the lightest and thinnest part obeys the tendency before that which is heavier and thicker. Now the lightest and thinnest of anything in the body is firstly pneuma, secondly vapour, and in the third place that part of the blood which has been accurately elaborated and refined.

These, then, are what the arteries draw into themselves on every side; those arteries which reach the skin draw in the outer air (this being near them and one of the lightest of things); as to the other arteries, those which pass up from the heart into the neck, and that which lies along the spine, as also such arteries as are near these—draw mostly from the heart itself; and those which are further from the heart and skin necessarily draw the lightest part of the blood out of the veins. So also the traction exercised by the diastole of the arteries which go to the stomach and intestines takes place at the expense of the heart itself and the numerous veins in its neighbourhood; for these arteries cannot get anything worth speaking of from the thick heavy nutriment contained in the intestines and stomach, since they first become filled with lighter elements. For if you let down a tube into a vessel

1 cf. p. 305, note 2 
αὐλίσκον εἰς ἐγγείου ὑδατός τε καὶ ψάμμου πλήρες ἐπιστάσαι τῶ ν στῶματι τούτ ἐκ τού αὐλίσκον ἀέρα, δύνατ' ἂν ἀκολουθήσαι σοι πρὸ τοῦ ὑδατος ἡ ψάμμος. ἀεὶ γὰρ ἐν τῇ πρὸς τὸ κενοῦμενον ἀκολουθίᾳ τὸ κουφότερον ἐπεται πρότερον.

XV

Οὐκον χρὴ θαυμάζειν, εἰ παντελῶς ὀλίγον ἐκ τῆς κοιλίας, ὥσον ἂν ἀκριβῶς ἢ κατειργασμένον, εἰς τὰς ἄρτηριας παραγίνεται φθανούσας πληροῦσθαι τῶν κουφότερων, ἀλλ' ἐκεῖνο γυμνόσκειν, ὡς δύ' ἐστον ὀλκῆς εἰδὴ, τὸ μὲν τῇ πρὸς τὸ κενοῦμενον ἀκολουθία, τὸ δ' οἰκείοτητι ποιότητος γυμνόμενον. ἐτέρως μὲν γὰρ εἰς τὰς φύσας ὁ ἀήρ, ἐτέρως δ' ὁ σίδηρος ὑπὸ τῆς ἤρακλείας ἐπιστάται λίθου καὶ ὡς ἢ μὲν πρὸς τὸ κενοῦμενον ἀκολουθία || τὸ κουφότερον ἐλκεῖ πρότερον, ἢ δὲ κατὰ τὴν τῆς ποιότητος οἰκείοτητα πολλάκις, εἰ οὕτως ἐτυχε, τὸ βαρύτερον, ἀν τῇ φύσει συγγενέστερον ὑπάρχῃ, καὶ τοινυν καὶ ταῖς ἄρτηριας τε καὶ τῇ καρδία, ὡς μὲν κοιλοῖς τε καὶ διαστέλλεσθαι δυναμένοις ὀργάνοις, ἀεὶ τὸ κουφότερον ἀκολουθεῖ πρότερον, ως δὲ τρέφεσθαι δεουμένοις, εἰς αὐτοὺς τοὺς χυτῶνας, οὐ δὴ τὰ σώματα τῶν ὀργάνων εἰσὶν, ἐλκεται τὸ οἰκεῖον. ὥσον ἂν οὖν εἰς τὴν κοιλότητα διαστελλομένων αὐτῶν οἴματος μεταληφθῇ, τούτου τὸ οἰκειότατον

1 The "mechanical" principle of horror vacui contrasted with the "physical" or semi-physiological principle of specific attraction. Appropriateness here might almost be rendered affinity or kinship. cf. note 2, infra.

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full of water and sand, and suck the air out of the tube with your mouth, the sand cannot come up to you before the water, for in accordance with the principle of the refilling of a vacuum the lighter matter is always the first to succeed to the evacuation.

XV

It is not to be wondered at, therefore, that only a very little [nutrient matter] such, namely, as has been accurately elaborated—gets from the stomach into the arteries, since these first become filled with lighter matter. We must understand that there are two kinds of attraction, that by which a vacuum becomes refilled and that caused by appropriateness of quality;¹ air is drawn into bellows in one way, and iron by the lodestone in another. And we must also understand that the traction which results from evacuation acts primarily on what is light, whilst that from appropriateness of quality acts frequently, it may be, on what is heavier (if this should be naturally more nearly related²). Therefore, in the case of the heart and the arteries, it is in so far as they are hollow organs, capable of diastole, that they always attract the lighter matter first, while, in so far as they require nourishment, it is actually into their coats (which are the real bodies of these organs) that the appropriate matter is drawn.³ Of the blood, then, which is taken into their cavities when they dilate, that part which is most proper to them and

³ The coats exercise the vital traction, the cavities the merely mechanical. cf. p. 165, note 2.
te kai malista trefein dynamevon oi xitones autoi ton aggeion epitupontai.

Toû d' ek ton phlebos eis tas arthrias meta-

lambanavsetai ti pros tois eirhmenois ikanov kai

touto ge tekmirion. ei pollass kai megalas

arthrias diatemon apokteinai to zoon bou-
lhtheis, eurhises autou tas phlebas omoios taiz

arthrias ekkenuumenas, ouk an toutou pote

genomenein chrkis ton pros allhlas autai

anastomoseson. waautos de kai kat' autin tin

kardiain ek tis deixiases koiilias eis tin

aristeteran 208 elketai to lepto|taton exeuntos tina trhmatia
tou meson diaphragnatos auton, a mekri men

pleistou dunaton estin idein, oion bothynous tinas

ei eurupteron stomatos avei kai malloon eis stene-
teron proiontas. ou men auta ge tais exkata

perata dunaton eti theiasethai dia te smikrothta

kai oti teudwotos the toun zou katepyktae te

kai pepinkwetai pantas. alla o logos kantaubha

prwton men ek tou moudein upo tis phuseos

gynesethai matin ormosenos exeriskei tas

anastomoses taun toun koiilow tin kardiain

ou gar dei einai ge kai os etuchon iei stenon oui

teleutwnies exenon to bothynou.

Deunteron de kaw tou douin ontou stomaetou en

th deixai tin kardiain koiilia tou men eiasagontos

to aima, tou d' eiasagontos polei meizou einai to

eisagwgon. os gar ou pantos tou aimitos, osou en

koiila phleps didosi tin kardiain, palin eis ekinei

1 Chap. xiv.

2 These fossae were probably the recesses between the
columnae carnea.

most able to afford nourishment is attracted by their actual coats.

Now, apart from what has been said, the following is sufficient proof that something is taken over from the veins into the arteries. If you will kill an animal by cutting through a number of its large arteries, you will find the veins becoming empty along with the arteries: now, this could never occur if there were not anastomoses between them. Similarly, also, in the heart itself, the thinnest portion of the blood is drawn from the right ventricle into the left, owing to there being perforations in the septum between them; these can be seen for a great part [of their length]; they are like a kind of fossae [pits] with wide mouths, and they get constantly narrower; it is not possible, however, actually to observe their extreme terminations, owing both to the smallness of these and to the fact that when the animal is dead all the parts are chilled and shrunken. Here, too, however, our argument, starting from the principle that nothing is done by Nature in vain, discovers these anastomoses between the ventricles of the heart; for it could not be at random and by chance that there occurred fossae ending thus in narrow terminations.

And secondly [the presence of these anastomoses has been assumed] from the fact that, of the two orifices in the right ventricle, the one conducting blood in and the other out, the former is much the larger. For, the fact that the insertion of the vena cava into the heart is larger than the

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1 He means the tricuspid orifice. cf. p. 121, note 4.

2 The right auricle was looked on less as a part of the heart than as an expansion or "insertion" of the vena cava.
Galen's conclusion, of course, is, so far, correct, but he has substituted an imaginary direct communication between the ventricles for the actual and more roundabout pulmonary

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1 This "vein" (really the pulmonary artery) was supposed to be the channel by which the lungs received nutriment from the right heart. cf. p. 121, note 3.

2 The coronary vein.

3 Galen's conclusion, of course, is, so far, correct, but he has substituted an imaginary direct communication between the ventricles for the actual and more roundabout pulmonary
vein which is inserted into the lungs suggests that not all the blood which the vena cava gives to the heart is driven away again from the heart to the lungs. Nor can it be said that any of the blood is expended in the nourishment of the actual body of the heart, since there is another vein which breaks up in it and which does not take its origin nor get its share of blood from the heart itself. And even if a certain amount is so expended, still the vein leading to the lungs is not to such a slight extent smaller than that inserted into the heart as to make it likely that the blood is used as nutriment for the heart: the disparity is much too great for such an explanation. It is, therefore, clear that something is taken over into the left ventricle.

Moreover, of the two vessels connected with it, that which brings pneuma into it from the lungs is much smaller than the great outgrowing artery from which the arteries all over the body originate; this would suggest that it not merely gets pneuma from the lungs, but that it also gets blood from the right ventricle through the anastomoses mentioned.

Now it belongs to the treatise "On the Use of Parts" to show that it was best that some parts of the body should be nourished by pure, thin, and vaporous blood, and others by thick, turbid blood, and that in this matter also Nature has overlooked nothing. Thus it is not desirable that these matters should be further discussed. Having mentioned, circulation, of whose existence he apparently had no idea. His views were eventually corrected by the Renascence anatomists. cf. Introduction, pp. xxii.-xxiii.

4 He means the left auricle, considered as the termination of the pulmonary "arteries"; cf. p. 314, note 3.

5 The aorta, its orifice being circular, appears bigger than the slit-like mitral orifice.
ΓALEN

ἀλλ' ὑπομνήσαντας, ὡς δύο ἐστὸν ὀλκῆς εἴδη, τῶν μὲν εὐρείαις ὅδοις ἐν τῷ διαστέλλεσθαι τῇ πρὸς τὸ κενούμενον ἀκολουθία τῆς ἐλξιν ποιομένων, τῶν δ' οἰκείοτητι ποιότητος, ἐφεξῆς λέγειν, ὡς τὰ μὲν πρότερα καὶ πόρρωθεν ἐλκεῖν τι δύναται, τὰ δὲ δεύτερα ἐκ τῶν ἐγγυτάτω μόνον. αὐλίσκοις μὲν γὰρ ὅτι μῆκιστον εἰς ὑδωρ ἐνεστι καθένα ῥαδίως ἀναστῆν εἰς τὸ στόμα δ' αὐτοῦ τὸ ὑγρὸν οὐ μὴν εἴ γ' ἐπὶ πλέον ἀπαγάγοις τῆς ἱρακλείας λίθου τὸν σίδηρον ἢ τούς πυρὸς τοῦ κεραμίου—καὶ γὰρ καὶ τοιοῦτον τι πρόσθεν ἐλέγετο παράδειγμα—δύνατ' ἂν ἐτί γενέσθαι τις ὀλκή.

Σαφέστατα δ' ἐν αὐτῷ μάθοις ἐπὶ τῶν ἐν τοῖς κήποις ὄχετῶν ἡκ τοῦτον γὰρ εἰς μὲν τὰ παρακείμενα καὶ πλησίον ἀπαντὰ διαδίδοται τις ἱκμᾶς, εἰς δὲ τὰ πορρωτέρω προσελθεῖν οὐκέτι δύναται, καὶ διὰ τούτ' ἀναγκαζοῦται πολλοῖς ὥχετοῖς μικροῖς ἀπὸ τοῦ μεγάλου τετμημένοις εἰς ἐκαστὸν μέρος τοῦ κήπου τὴν ἐπίρρυσιν τοῦ ὕδατος ἐπὶ-211 τεχνάσθαι· καὶ τηλικαίτα γε τὰ μεταξὺ διαστήματα τούτων τῶν μικρῶν ὅχετῶν ποιοῦσιν, ἴλικαι μᾶλλον νομίζουσιν ἄρκειν εἰς τὸ ἴκανός ἦπολαυειν ἐλκοντα τῆς ἐκατέρθωθεν αὐτοῖς ἐπιρροήσυσιν ὑγρότητος. οὕτως οὖν ἔχει καὶ τοῖς τῶν ἐξόνω σῶμαςιν. ὅχετοι πολλοὶ κατὰ πάντα τὰ μέλη διεσταρμένοι παράγονσιν αὐτοῖς αἷμα καθά-περ ἐν κήποις ὑδρείαν τυπ. καὶ τούτων τῶν ὅχετῶν τὰ μεταξὺ διαστήματα θαυμαστῶς ὑπὸ τῆς φύσεως ἐνθὺς ἐξ ἀρχῆς διατέτακται πρὸς τὸ μήτ' ἐνδεώς χορηγεῖσθαι τοῖς μεταξὺ μορφῶν ἐλκουσιν εἰς ἐαυτὰ τὸ αἷμα μίτε κατακλύζεσθαι

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however, that there are two kinds of attraction, certain bodies exerting attraction along wide channels during diastole (by virtue of the principle by which a vacuum becomes refilled) and others exerting it by virtue of their appropriateness of quality, we must next remark that the former bodies can attract even from a distance, while the latter can only do so from among things which are quite close to them; the very longest tube let down into water can easily draw up the liquid into the mouth, but if you withdraw iron to a distance from the lodestone or corn from the jar (an instance of this kind has in fact been already given) no further attraction can take place.

This you can observe most clearly in connection with garden conduits. For a certain amount of moisture is distributed from these into every part lying close at hand but it cannot reach those lying further off: therefore one has to arrange the flow of water into all parts of the garden by cutting a number of small channels leading from the large one. The intervening spaces between these small channels are made of such a size as will, presumably, best allow them [the spaces] to satisfy their needs by drawing from the liquid which flows to them from every side. So also is it in the bodies of animals. Numerous conduits distributed through the various limbs bring them pure blood, much like the garden water-supply, and, further, the intervals between these conduits have been wonderfully arranged by Nature from the outset so that the intervening parts should be plentifully provided for when absorbing blood, and that they should never

\[1\] p. 87.
ποτ' αυτὰ πληθεὶς περιττής υγρότητος ἀκαίρως ἐπιρρέονσιν.

'Ὁ γὰρ δὴ τρόπος τῆς θρέψεως αὐτῶν τοίοσδε τίς ἐστι. τοῦ συνεχοῦς ἑαυτῷ σώματος, οἶοντερ τὸ ἀπλοῦν ἀγγείον Ἐρασίστρατος ὑποτίθεται, τὰ μὲν ἐπιπολῆς μέρη πρῶτα τῆς ὁμιλούσης ἀπο-
καίει τροφῆς: ἐκ δὲ τούτων αὖ μεταλαμβάνει κατὰ τὸ συνεχὲς ἐλκοῦτα τὰ τούτων ἔξης, εἰτ’ ἐξ ἐκείνων αὐθίς ἑτέρα καὶ τούτ’ οὐ παύεται γι-
γνῶμενον, ἀχρὶς ἂν εἰς ἀπαντ’ αὐτοῦ διαδοθῇ τὰ μόρια τῆς τρεφούσης οὐσίας ἡ ποιότης. ὡσα δὲ
212 τῶν μορίων ἐπὶ πλέον ἀλλοιομενένου δεῖται τοῦ
μέλλουτος αὐτὰ θρέψεων χυμοῦ, τούτως ὡσπερ τι
ταμιεύον ἡ φύσις παρεσκεύασεν ἤτοι κοιλίας ἢ
σήραγγας ἢ τι ταῖς σήραγγις ἄναλογον. αἱ μὲν
γὰρ σάρκες αἱ τε τῶν σπλάγχνων ἀπάντων αἱ τε
τῶν μυῶν ἐξ αἷματος αὐτῶν τρέφονται βραχείαν
ἀλλοίωσιν δεξαμένου. τὰ δ’ οὔτα παμπύλλης ἐν
tῷ μεταξ’ δεῖται τῆς μεταβολῆς, ἱνα τραφη, καὶ
ἐστὶν οἶονπερ τὸ αἷμα ταῖς σαρκί, τοιούτος ο
μυελὸς τοῖς ὀστοῖς ἐν μὲν τοῖς μικροῖς τε καὶ
ἀκοιλίοις κατὰ τὰς σήραγγας αὐτῶν διεσπαρ-
μένως, ἐν δὲ τοῖς μεῖζοι τε καὶ κοιλίας ἐχουσίν ἐν
ἐκείναις ἑθροισμένοις.

'Ως γὰρ καὶ διὰ τοῦ πρῶτον γράμματος ἐδεί-
κυντο, τοῖς μὲν ὀμοίων ἐχόνσι τὴν οὐσίαν εἰς
ἀλληλα μεταβάλλειν ἐγχωρεί, τοῖς δὲ πάμπολ το
διεστῶσιν ἀμήχανον ἀλληλοὺς ὀμοιωθῆναι χωρὶς
τῶν ἐν μέσῳ μεταβολῶν. τοιούτων τι καὶ τοῖς

1 Or we may render it “corpuscle”; Galen practically means the cell. cf. p. 153, note 2.
be deluged by a quantity of superfluous fluid running in at unsuitable times.

For the way in which they obtain nourishment is somewhat as follows. In the body¹ which is continuous throughout, such as Erasistratus supposes his simple vessel to be, it is the superficial parts which are the first to make use of the nutriment with which they are brought into contact; then the parts coming next draw their share from these by virtue of their contiguity; and again others from these; and this does not stop until the quality of the nutrient substance has been distributed among all parts of the corpuscle in question. And for such parts as need the humour which is destined to nourish them to be altered still further, Nature has provided a kind of storehouse, either in the form of a central cavity or else as separate caverns,² or something analogous to caverns. Thus the flesh of the viscera and of the muscles is nourished from the blood directly, this having undergone merely a slight alteration; the bones, however, in order to be nourished, require very great change, and what blood is to flesh marrow is to bone; in the case of the small bones, which do not possess central cavities, this marrow is distributed in their caverns, whereas in the larger bones which do contain central cavities the marrow is all concentrated in these.

For, as was pointed out in the first book,³ things having a similar substance can easily change into one another, whereas it is impossible for those which are very different to be assimilated to one another without intermediate stages. Such a one in respect to

² cf. the term "cavernous tissue."
³ I. x.
χόνδροις ἔστι τὸ περικεχυμένον μυξώδες καὶ τοῖς συνδέσμοις καὶ τοῖς ύμέσι καὶ τοῖς νεύροις τὸ παρεσπαρμένον ἐν αὐτοῖς ὑγρὸν γλάσχον. ἐκα-ραφοῦ τῶν γὰρ τοῦτων ἐξ ἵνῶν σύγκειται πολλῶν, αὕτερ ὀμοιομερεῖς τ' εἰσ' καὶ ὄντως αἰσθητὰ στοιχεῖα. κατὰ δὲ τὰς μεταξὺ χάρας αὐτῶν ὁ οἰκεῖότατος εἰς θρέψιν παρέσπαρται χυμός, δι' εἴλκυσαν μὲν ἐκ τῶν φλεβῶν τοῦ αἴματος, ὡσον οἶόν τ' ἤν ἐκλεξάμεναι τόν ἐπιτηδεύοτατον, ἐξ- ὀμοιοῦσι δὲ κατὰ βραχὺ καὶ μεταβάλλουσιν εἰς τὴν ἔαυτῶν οὐσίαν.

"Ἀπαντ' οὖν ταῦτα καὶ ἀλλήλοις ὁμολογεῖ καὶ τοῖς ἐμπροσθεν ἀποδεδειγμένοις ἰκανῶς μαρτυρεῖ καὶ οὐ χρή μηκέτι ἔτι τὸν λόγον ἐκ γὰρ τῶν εἰρημένων ἐνεστὶν ἐκάστῳ τὰ κατὰ μέρος ἄπαντα καθ' ὄντια γίγνεται τρόπον ἑξευρήσκειν ἐτοίμως, ὡσπερ καὶ διὰ τὸ πολλοῖς κωθωνιζομένοις πάμ- ποιν μὲν ἀναδίδοται τὸ ποθὲν, οὐρεῖται δ’ ὀλόγον δειν ἄπαν ἐντὸς οὐ πολλοῦ χρόνου. καὶ γὰρ κἀγαθά τῇ τῇ τῆς ποιότητος οἰκείοτητι καὶ τῇ τῆς ὑγρότητος λεπτότητι καὶ τῇ τῶν ἀγγείων τε καὶ τῶν κατ’ αὐτὰ στομάτων εὐρύτητι καὶ τῇ τῆς ἐλκτικῆς δυνάμεως εὐρωστίᾳ τὸ τάχος συν- τελεῖται τῆς ἀναδόσεως, τῶν μὲν πλησίον τῆς κοιλίας τεταγμένων μορίων οἰκείοτητι ποιότη- τος | ἐαυτῶν ἕνεκα ἐλκύντων τὸ πόμα, τῶν δ’
cartilage is the myxoid substance which surrounds it, and in respect to ligaments, membranes, and nerves the viscous liquid dispersed inside them; for each of these consists of numerous fibres, which are homogeneous — in fact, actual sensible elements; and in the intervals between these fibres is dispersed the humour most suited for nutrition; this they have drawn from the blood in the veins, choosing the most appropriate possible, and now they are assimilating it step by step and changing it into their own substance.

All these considerations, then, agree with one another, and bear sufficient witness to the truth of what has been already demonstrated; there is thus no need to prolong the discussion further. For, from what has been said, anyone can readily discover in what way all the particular [vital activities] come about. For instance, we could in this way ascertain why it is that in the case of many people who are partaking freely of wine, the fluid which they have drunk is rapidly absorbed through the body and almost the whole of it is passed by the kidneys within a very short time. For here, too, the rapidity with which the fluid is absorbed depends on appropriateness of quality, on the thinness of the fluid, on the width of the vessels and their mouths, and on the efficiency of the attractive faculty. The parts situated near the alimentary canal, by virtue of their appropriateness of quality, draw in the imbibed food for their own purposes, then the parts next to them

1 Lit. homoeomerous, i.e. "the same all through," of similar structure throughout, the elements of living matter. cf. p. 20, note 3, and cf. also the "cell" of Erasistratus, p. 153.
έξῆς τούτοις ἐξαρπαξόντων καὶ αὐτῶν εἰς ἑαυτὰ κάπετα τῶν ἐξείς πάλιν ἐκ τούτων μεταλαμβανόντων, ἄχρις ἂν εἰς τὴν κοίλην ἀφίκηται φλέβα, τούντευθεν δὴ ἡ ἡτή τῶν νεφρῶν τὸ οἴκειον ἐπιστωμένων. ὡστ' οὖδὲν θαυμαστὸν οἶνον μὲν ὕδατος ἀναλαμβάνεσθαι θάττων οἰκείοτητι ποιότητος, αὐτῶν δὲ τὸν οἶνον τὸν μὲν λευκὸν καὶ καθαρὸν ἐτολμῶς ἀναδίδοσθαι διὰ λεπτότητα, τῶν δ' αὖ μέλανα καὶ θολερὰν ἅσχεσθαι τε κατὰ τὴν ὀδὸν καὶ βραδύνειν ὑπὸ πάχους.

Εἰς δ' ἂν ταῦτα καὶ τῶν ὑπὲρ τῶν ἀρτηριῶν ἐμπροσθεν εἰρημένων οὐ σμικρὰ μαρτύρια. πανταχοῦ γὰρ ὅσον οἰκεῖον τε καὶ λεπτὸν αἷμα τοῦ μὴ τοιούτου ῥἀον ἐπεται τοῖς ἐλκουσίοι. ἀτρομὸν ὅν ἐλκουσαι καὶ πνεῦμα καὶ λεπτὸν αἷμα κατὰ τὰς διαστάσεις αἱ ἀρτηρίαι τῶν κατὰ τὴν κοιλίαν καὶ τὰ ἐντερα περιεχομένων χυμῶν ἢ οὔδ' ὅλως ἢ παντάπασιν ἐπιστῶνται βραχύ.
ON THE NATURAL FACULTIES, III. xv

in their turn snatch it away, then those next again take it from these, until it reaches the vena cava, whence finally the kidneys attract that part of it which is proper to them. Thus it is in no way surprising that wine is taken up more rapidly than water, owing to its appropriateness of quality, and, further, that the white clear kind of wine is absorbed more rapidly owing to its thinness, while black turbid wine is checked on the way and retarded because of its thickness.

These facts, also, will afford abundant proof of what has already been said about the arteries; everywhere, in fact, such blood as is both specifically appropriate and at the same time thin in consistency answers more readily to their traction than does blood which is not so; this is why the arteries which, in their diastole, absorb vapour, pneuma, and thin blood attract either none at all or very little of the juices contained in the stomach and intestines.
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