DYNAMIS AND THE SEEDS

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Although the chief purpose of the author of *De morbis IV* is to explain his theory of the causation of disease in man, he begins his treatise by presenting, in *résumé*, his conception of generation and of the origin of the human seed:[1] *τοῦ ἀνθρώπου ἐς τὴν γένεσιν ἀπὸ πάντων τῶν μελέων τοῦ ἀνδρὸς καὶ τῆς γυναικὸς ἐλθὸν τὸ σπέρμα καὶ ἐς τὰς μήτρας τῆς γυναικὸς πεσὸν ἐπάγη· χρόνου δὲ γενομένου φύσις ἀνθρωποειδὴς ἐγένετο αὐτεοῦ.*[2] Both woman and man, he continues, have four forms (*ideai*) of the moist (*hygrou*) in the body from which diseases arise, except those caused by violence. These *ideai* are phlegm, blood, bile, and water (*hydrôps*), and *ἀπὸ τούτων ἐς τὸ σπέρμα οὐκ ἐλάχιστον οὐδὲ ἀσθενέστατον συνέρχεται, καὶ ἐπειδὴ τὸ ζῶον ἐγένετο, κατὰ τοὺς τοκῆας τοσαύτας ἰδέας ὑγροῦ ὑγιηροῦ τε καὶ νοσεροῦ ἔχει ἐν ἑωυτῷ.* With this preface, he then promises to explain how each of the *ideai* of the moist increases and decreases in the body, how because of these changes man becomes ill, what are the *archai* of diseases, and what effects each of the forms of the moist produces in the body to bring on diseases. In this opening statement, the author is clearly concerned to express the rationale of his conception of the *physis* of man, beginning with the *sperma*, as the necessary basis for the medical theory which he will enunciate.

[1] Cf. É. Littré, *Oeuvres d'Hippocrate* VII, 542.3–11. References to the text of *De morbis IV*, *De genitura*, and *De natura pueri* are to page and line of volume 7 of Littré's edition.

[2] This is a simple statement of the basic principle of the theory of "pangenesis" in generation and heredity, which may have originated with Democritus and was later widely held and developed. Cf. the discussion of this theory by E. Lesky, *Die Zeugungs- und Vererbungslehren der Antike und ihr Nachwirken, Abhandlungen d. Mainzer Akad. d. Wissen.*, 1950, 19, 70–84.

First, however, he undertakes to describe how the bile, the blood, the water (*hydrôps*),[3] and the phlegm become greater or less in the body. This results, as he believes, from the foods and drinks which man consumes, in the following fashion. The abdomen, when it is full, is the source (*pêgê*) for the body of all the forms of the moist, though, when it is empty, the abdomen in turn draws from the body. But there are also four intermediate sources in the body, from which the forms of the moist pass into the body when they have received the humors from the abdomen.[4] For the blood, the heart is the *pêgê*, for phlegm the head, for water the spleen, and for bile the region around the liver. Now in all the foods and drinks of man, there exists χολώδεός τι καὶ ὑδρωποείδεος καὶ αἱματώδεος καὶ φλεγματώδεος, τῇ μὲν πλέον, τῇ δὲ ἔλασσον. In this manner, when man eats or drinks, the body draws (*helkei*) into itself from the abdomen the several humors; and the four *pêgai* likewise draw the humors through the veins from the abdomen, the similar humor (*ikmas*) of each *pêgê* drawing the similar humor,[5] and then distributes them to the body. This happens, the author adds, just as in the case of plants, each humor draws a similar humor from the earth.

This conception of the nourishment of the body depends essentially upon the argument which is now introduced to support the analogy which he has asserted between the nourishment of plants and that of man:[6]

ἔχει γὰρ ὧδε ἡ γῆ ἐν ἑωυτῇ δυνάμιας παντοίας καὶ ἀναρίθμους. Ὁκόσα

[3] Cf. 542.18–544.15. The use of the word *hydrôps* for "water" or "the aqueous humor" is peculiar and, I think, unexampled in the *Corpus* elsewhere. Apparently, its use contains no particular significance, since later (552.20–26), in explaining the increase of *hydrôps* in the body, the word *hydôr* is everywhere used instead of *hydrôps*, as it is also found elsewhere in the work.

[4] These four organs are *pêgai* for the several humors, all apart from their drawing from the abdomen. On the author's usage of *pêgê*, cf. W. A. Heidel, "On Anaximander," *CP* 7 (1912) 219–23. It should be noted that the important principle of *helxis* is fully accepted by the author, and an attempt made to demonstrate its validity by his argument by analogy to the process in plants.

[5] Cf. 544.13–21. The importance of the principle of "like to like" in this treatise is discussed by C. W. Mueller, *Gleiches zu Gleichen: Ein Prinzip frühgriechischen Denkens, Klass.-Philol. Studien*, Heft 31 (Wiesbaden 1965) 129–134. In this treatise, the word *ikmas* is constantly employed instead of *chymos*, but Mueller (134–37) has shown that this does not justify belief in the direct influence of Diogenes of Apollonia.

[6] Cf. 544.22–27.

γὰρ ἐν αὐτῇ φύεται, πᾶσιν ἰκμάδα παρέχει ὁμοίην ἑκάστῳ, οἷον καὶ αὐτὸ τὸ φυόμενον αὐτῷ ὁμοίην κατὰ ξυγγενὲς ἔχει, καὶ ἕλκει ἕκαστον ἀπὸ τῆς γῆς τροφὴν, οἷόν περ καὶ αὐτό ἐστι.

As evidence for the validity of this principle, two proofs are adduced: the rose draws from the earth just such a humor as it itself is δυνάμει, as does garlic also; and all other things growing in the earth draw from it likewise, each drawing a humor καθ' ἑωυτό. If this were not true, plants growing in the earth would not be similar to the seeds. Further, that plant which draws from the earth a kindred humor much greater in quantity than fitting (*tou deontos*) becomes diseased; the plant drawing a kindred humor less than proper (*tou kairiou*) withers. And if there were not to begin with a similar humor in the earth, the plant would not germinate and grow at all.[7]

But, just as there are in plants many different *dynameis*,[8] some more poisonous, others sweeter, moister, drier, harsher, and thousands of others, so in the earth itself μύριαι . . . δυνάμιές εἰσι, καὶ διὰ ταῦτα γένεα ἐκ τῆς γῆς πρῶτον οὐδὲν ἕτερον ἑτέρῳ ὅμοιον ἔφυ, ὅ τι μὴ συγγενές. Each plant (and its seed) is, therefore, nourished and increased by drawing from the earth *dynameis* equal and similar to those of which it is composed. Likewise, each of the plants growing in earth and used for food and drink for man draws into itself many *dynameis* from the earth; and in everything (i.e. all foods and drink from plants) there is something phlegmatic and sanguineous.[9] Thus, by reasoning from his analogy,[10] the author arrives at the necessity (*ananke*) that, when foods and drink come into the abdomen, the body draws from them through the four *pêgai*, each drawing a similar humor

[7] To support this last argument, the author offers a further proof (546.8–18), the fact that silphion cannot grow in Ionia and the Peloponnesus, although many attempts to grow it have been made and though the sun and the seasons are sufficient for its growth, while in Libya silphion grows spontaneously, because in the former places the earth does not contain a kindred *dynamis* to nourish the plant. For the same reason, many other plants growing spontaneously in one region will not grow, if transplated only a short distance.

[8] Cf. 546.22–26.

[9] Cf. 548.6–9. The author here, through haste or inadvertence, fails to include reference to the bilious and the aqueous. But he has already, in 544.13, made reference to all four humors, and will repeat it later.

[10] As the author makes plain in this passage, it is his understanding of the function of the *dynameis* in the increase and growth of plants from the seed which has led him to the principle by which he understands the growth and increase of the human body.

through the veins into itself and then distributing it to the body. To prove further that this is true, the author proceeds in the chapters following to present additional evidence that each humor draws a similar humor into the body from food and drink, and describes in some detail how each humor increases or decreases. Thereafter he continues to his main subject, the manner in which the constituents of the body may cause disease, when, through excess or deficiency, their natural equilibrium is disturbed in the body.

Such is the author's rather summary description of his conception of the origin and nature of the constituents of the body of man and of plants, and of the principle of the increase and nourishment of both man and plants beginning with the *sperma* of either. It is apparent that one of the concepts essentially underlying and determining his thought has been the concept of *dynamis*, which is applied, in part, to a new sphere of nature and also utilized in a somewhat novel fashion. For, while in some other "Hippocratic" treatises,[11] the concept of *dynamis*, developed in various ways, has been essential to the author's theory of the *physis* of man and health, the attribution to the earth itself of innumerable *dynameis* is not elsewhere[12] conceptualized in the *Corpus* and made the foundation for a theory of the origin, nature, and increase of plants. It is, in fact, largely in terms of his conception of *dynamis*, which doubtless owes much to previous usage of the concept in medicine and natural philosophy, that the author has arrived at his understanding of the origin, nature, and increase of the *physis* of both

[11] As in, perhaps most importantly, *De vetere medicina*, for whose author the mixing and blending of the innumerable *dynameis* constituting the *physis* of man results in a state of health, their disturbance in illness. The use of the concept in medicine possibly originated with Alcmaeon's theory of health as the *symmetros krasis* of the *dynameis* of the body—the moist and the dry, the cold and the hot, the bitter and the sweet, and the rest, the *dynameis* being conceived as elemental bodies or forces. Plato in the *Phaedrus* 270D defines the *dynamis* of a thing as *τίνα πρὸς τί πέφυκεν εἰς τὸ δρᾶν ἔχων ἢ τίνα εἰς τὸ παθεῖν ὑπὸ τοῦ*. For *De morbis IV*, *dynamis* means not an abstract quality or property but a simple qualitative substance, with its individual "power" for action and manifesting its natural "power" by observable effects. On the term in the works now under consideration, cf. also G. Plamboeck, *Dynamis im Corpus Hippocraticum*, *Abhandlungen der Mainzer Akad. d. Wissen.*, 1964, 2, 55–58.

[12] The author of *De natura hominis* 6 introduces a similar argument to illustrate his view of the action of drugs in the body, but does not otherwise make use of it. As he writes: things sown and growing in the earth all draw to themselves *τὸ κατὰ φύσιν αὐτῷ ἐνεὸν ἐν τῇ γῇ, ἔνι δὲ καὶ ὀξὺ καὶ πικρὸν καὶ γλυκὺ καὶ ἁλμυρὸν καὶ παντοῖον*.

man and plant, and from his reasoning to conclude that these, with their processes, are essentially analogous.

Principles and conceptions very similar to those of *De morbis IV* underlie the thought of two other brief works, *De genitura* and *De natura pueri*, which have long been thought to be closely associated with the doctrine of *De morbis IV*.[13] The two works attempt to describe with some fullness the origin of the seed and the development of the embryo, aspects of the human *physis* which *De morbis IV* stated only in principle. *De genitura* expresses basically the same conception of the constituents of the body and the origin of the seed:[14] the seed of man is separated off from all the body, from the solid parts (*stereôn*) and from the soft (*malthakôn*) and from all the moist (*hygrou*) in the body. There are four *ideai* of the moist: blood, bile, water (*hydôr*), and phlegm. On the basis of this conception, the author then discusses with much ingenuity the manner of production of the seeds from the moist in both male and female, the movement of the seeds through the body, the determination of sex, the cause of eunuchism, and various external aspects of procreation and the development of the embryo.

The explanation and description of the development of the embryo from the seed which follows in *De natura pueri* is remarkable for the attempts to understand the entire process on the basis of purely natural principles, utilizing especially the traditional "opposites" or *dynameis*, the hot and the cold, the wet and the dry. The essential steps in the process, which the author describes in some detail, are as follows. When the seeds from both parents are mingled together in the womb and compacted, since they become heated, the seed, being in a hot place and being heated, forms breath (*pneuma*).[15] Thus the hot breath

[13] Littré, and others since him, have concluded that all three works were composed by the same author, and Littré arranged them in his edition as one continuous treatise. More recently, W. Kahlenberg, "Die zeitliche Reihenfolge der Schriften *περὶ γονῆς*, *περὶ φύσιος παιδίου* und *περὶ νούσων* 4 und ihre Zusammengehoerigkeit," *Hermes* 83 (1955) 252–56, concluded that the first two works are by the same author, but that the last is by a different author but derives from the same school. This may possibly be correct, although it seems unlikely that the conclusion can be established beyond doubt. For the present study, the question is not vital.

[14] Cf. 474.5–9. This is stated somewhat more simply at the beginning of the work, (470.1–4): the seed of man comes from all the moist in the body, the strongest part (*to ischurotaton*) of the moist having been separated off.

[15] Cf. 486.3–5. This is understood to result naturally from the expansive action of the hot upon the four forms of the moist contained in the seed.

bursts out from the seed, and forms a passage (*hodos*) for itself, through which it thereafter acquires cold breath from outside. In this manner breathing begins for the seed, since "the hot" draws and is nourished by "the cold."[16] The external portion of the seed, being sticky and clinging together, as it becomes heated and swollen because of the *pneuma*, forms a membrane around the seed, except for the passageway already formed for breathing at the middle of the seed; thereupon, the remainder of the seed within the membrane, being further heated and swollen, becomes rounded.[17] When the membrane has formed around the seed, blood comes down into the womb from all the body of the mother and surrounds the membrane; and being drawn inside through the membrane by the breathing, the blood is compacted at the passageway for breath and increases the seed within, and thereafter other membranes form within the first membrane, extending from the passageway for breath.[18] When this has happened, flesh forms from the seed nourished by the blood of the mother continuing to come down and being compacted; and the *omphalos* extends from the middle of the flesh, through which thereafter the flesh within the membrane receives breath and increase from the blood. The breathing and the blood from the mother, at first weak and slight, gradually increases, and thus furnishes ever greater nourishment to the flesh and the surrounding membranes, as well as forming the *chorion*.[19] The flesh, thereafter, continuing to be increased, is articulated and differentiated by the *pneuma*, since each substance in the flesh (and derived from the blood) goes to its own place, according to its affinity to that substance

[16] Cf. 486.10–14 and especially 21–23, for the principle involved: *πᾶν γὰρ τὸ θέρμον τῷ ψυχρῷ τρέφεται τῷ μετρίῳ*. In the first of many comparisons of processes and phenomena of plants, the author describes the same process as he has observed and understood it, in burning wood and leaves, and all foods and drink which have been heated. It is "the moist" in wood which, being heated, produces *pneuma*, which then begins the reciprocal process of the exchange of "the hot" and "the cold." As he says, in 488.8–12: *καὶ αὗταί μοι ἀνάγκαι προηγμέναι εἰσὶν, ὅτι ἡ γονὴ θερμαινομένη ἐν τῇσι μήτρῃσι πνεῦμα ἴσχει καὶ ἀφίησι· ἅμα δὲ καὶ ἀπὸ τῆς μητρὸς πνεούσης πνοὴν ἴσχει καὶ ἡ γονή κτλ.*

[17] Cf. 488.13–15. As the author says (488.22–490.3), it is his observation of the development of a six-day-old seed from a woman, of which he gives a careful description, that he has largely formed his understanding of this stage in the development of the seed.

[18] Cf. 492.7–15.

[19] Cf. 496.11–16.

from which it came, the similar to the similar, the dense to the dense, the spongy to the spongy, and the moist to the moist.[20] As this process of nourishment by the *pneuma* and the blood continues, the bones are compacted by heat and ramify, all the inward and outward parts develop and differentiate, and the embryo comes into being. *Pneuma* is of particular significance in this last stage of differentiation, for, as the author attempts to explain the process, it is because of *pneuma* and breathing in the flesh that the different substances in the flesh and blood move toward their kind,[21] and thus it causes the differentiation.

Perhaps the most notable aspect of the author's "embryological" thought, however, is the essential similarity which he has perceived between the development of the human seed and the seed of plants, which he now states explicitly.[22] The nourishment and the increase of the infant (i.e. of the *sperma* developing into the embryo and the infant), he writes, takes place according as the constituents from the mother come into the womb, and just as the mother is in health or weakness, so also is the plant growing in the earth.[23]

To substantiate this analogy, the author undertakes to describe and explain his conception of the process of the "germination" of the seed of plants with some fullness. The seed (*sperma*) of the plant, when it is cast into the earth, is filled with moisture (*ikmas*) from the earth. For the earth has in itself every sort of moisture, so as to nourish growing things. The seed, then, when it is filled with moisture, becomes inflated and swollen, and the *dynamis* which is lightest (*kouphotatê*) in the seed, is compelled to condense and harden by moisture in the seed. Thus, the *dynamis*, condensed by the *pneuma* and the moisture, becoming leaves, bursts the seed. At first, the "leaves" begin to grow

[20] Cf. 496.17–20. The principle is the same as that of *De morbis IV*, but has been expanded and stated more precisely.

[21] As the author comments (498.15–17): τουτέων δὲ διαρθροῦται ὑπὸ τῆς πνοῆς ἕκαστα· φυσώμενα γὰρ δίσταται ξύμπαντα κατὰ συγγένειαν. To demonstrate this, the following "experiment" is suggested. If one attaches a pipe to a bladder and then introduces earth, sand, and fine shavings of lead into the bladder, when he has poured in water and then blown in air, at first all will be mingled together. But if he allows the contents to dry, he will find upon examination that lead has gone to lead, earth to earth, and sand to sand. So also in the case of the seed and flesh: each substance in them proceeds because of breathing to join its kindred, the similar to the similar.

[22] Cf. 514.6–13.

[23] The underlying principle is that of *De morbis IV*, where it is stated and argued more fully. Cf. above, p. 283.

upward out of the seed. But when the "leaves" are no longer able to be nourished by the moisture in the seed, then the seed and the leaves burst downward. Thus forced by the leaves, the seed sends downward the part of the *dynamis* which, because of its heaviness (*barutêta*), remains in the seed. In this manner, roots come into being, extended from the "leaves." When the plant has been strongly rooted below and is securing its nourishment from the earth, then the entire seed is consumed in the growth of the plant, except for the husk, because it is the most solid part of the seed. This, too, in turn rots in the earth and disappears. Since the plant has come into being from a seed, that is, from its moisture, and is impelled toward increase both upwards and downwards, so long as it is tender and watery, it is not able to produce fruit, for it has no strong and rich *dynamis* from which the seed may be condensed. But when the plant has been firmly rooted by time and has become more solid, it then acquires broad veins upwards and downwards. Thereafter it no longer draws from the earth moisture that is watery, but thicker, richer, and more abundant; and this, being heated by the sun, boils out at the extremities and becomes fruit, according to its affinity to that from which it came into being. Much arises from little, because the growing plant draws from the earth *dynamis* more abundant than that from which it arose. But when the fruit boils out, it is nourished by the growing plant which, drawing its nourishment from the earth, distributes it to the fruit. And the sun, drawing to itself from the fruit the most watery substance of the fruit, concocts and solidifies it.[24]

With this description of fructification the author concludes his analysis of the processes responsible for the development of the seed into the plant;[25] and when later, at the completion of his discussion of other aspects of the growth of plants,[26] he reiterates the analogy which he has perceived between the development of the human and the plant seed, he adds that if one reflects upon what has been written about

[24] Cf. the more detailed explanation of fructification at 526.18–25, in which the importance of the *dynamis* is clearly expressed.

[25] In the chapters immediately following (23–26), essentially the same explanation and one involving the same factors is applied to the rooting and growth of cuttings, or branches, of a plant or tree. The *De natura pueri* displays an extraordinary interest in and attention to plants and the understanding of their nature.

[26] Cf. 528.17–25.

them, one will discover *τὴν φύσιν πᾶσαν παραπλησίην ἐοῦσαν τῶν τε ἐκ τῆς γῆς φυομένων καὶ τῶν ἐξ ἀνθρώπων*. Throughout all his attempt to explain the nature of the seed and its development, it is apparent that the concept of *dynamis* plays a vital role. For it is the "powers" or functions of the constituents of man and plant which make up the processes of living things, and which he seeks to penetrate and understand. These *dynameis* are the "powers" of the substantial constituents of *physis*, and especially the hot and the cold, the moist and the dry, the light and the heavy, along with *pneuma*. These factors in his analysis of the nature of the seed and its growth, reinforced by observation and reasoning, have revealed to him the perception that these processes are essentially analogous, in man and plant.[27]

Examination of the views advanced in *De morbis IV*, *De genitura*, and *De natura pueri* thus discloses that the conception of *dynamis* is vital to the physical and medical principles developed in them. *De morbis IV* undertakes to explain the nourishment of the body and the maintenance of the supply of the natural "humors" of the body, the equilibrium of which is necessary to preserve the health of the body. As a foundation for his discussion of these topics, the author reveals his conception of the origin and nature of the constituents of the body; and he reveals also his conception of the origin and nature of plants, as well as of their growth, which he considers to be analogous to that of man, employing here also the concept of *dynamis*. The other treatises examine in greater detail the origin of the seed, and describe the nature of the development of the human embryo from the seed, as well as that of the plant from its seed, which processes are interpreted to be in essence analogous. These treatises achieve, therefore, a theoretical basis which affords a rational description and explanation, very comprehensively, of the origin and nature of the seed, of man and of plant, their increase and growth, heredity, and the physical basis of health.

Underlying all the attempts to understand and explain these disparate but related phenomena and to subsume them under one general principle is the conception of the *physis* of man and of the plant, and of the seed of each. In this view, the *physis* of each consists of certain

[27] On the use of analogy, and its implications, in Greek thought, cf. O. Regenbogen, "Eine Forschungsmethode antike Naturwissenschaft," *Quellen und Studien zur Geschichte der Mathematik*, Abt. B, I, Heft 2 (1930) 131–152.

simple and individual constituents which may be perceived and known as "humors" or *dynameis*. It is the latter especially which determine the nature of the seed and its processes. For these constituents are not merely substantial and concrete, but, as individual *dynameis* with specific properties or "powers" for action, contain within themselves particular capacities for specific activities and effects. Most fundamental to the entire conception is the concept of *dynamis*[28] and its function, since the various capacities for action and interaction of the *dynameis* constitute the basis of the processes of living things and, in particular in these works, the processes of the formation of the seeds, their increase and development. Further, it is through the activities of the *dynameis* that these processes and phenomena are manifested and may, in some degree, be observed and understood. The extension of the concept of *dynamis* to the understanding of the plant and the seeds, and the attempt to describe with some fullness processes which result in the growth of the seeds, as well as the perception of the analogy between the processes of the seeds of plant and man, suggest that these treatises utilize the concept in a more complex fashion and in a more advanced stage in the development of the concept.[29]

[28] On the origin and meaning of the concept of *dynamis*, cf. above, note 11.

[29] On the usage of the concept in *De vetere medicina*, cf. my discussion in *TAPA* 83 (1952) 184–97, and on that of *De victu*, *TAPA* 90 (1959) 147–64.