DE MUNDO

BY

E. S. FORSTER

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PREFACE

This interesting little treatise has no claim to be regarded as a genuine work of Aristotle. In his careful examination of it (*Neue Jahrbücher*, xv (1905), pp. 529–68) Wilhelm Capelle has traced most of its doctrines to Poseidonius, and comes to the conclusion that it is a popular philosophic treatise founded on two works of Poseidonius, the *Μετεωρολογικὴ στοιχείωσις* and the *Περὶ κόσμου*.

The treatise is addressed to Alexander, who must either be Alexander the Great (in which case the author doubtless wished to have his work attributed to Aristotle, and therefore addressed it to Aristotle's most distinguished pupil), or else some other Alexander must be intended. From the fact that he is spoken of in 391ᵇ6 as *ἡγεμόνων ἄριστος*, it has been supposed that Tiberius Claudius Alexander, nephew of Philo Judaeus and Procurator of Judaea, and in A. D. 67 Prefect of Egypt, is intended. In this case the treatise must be dated early in the second half of the first century A. D. Capelle, however (l. c. p. 567), dates it in the first half of the second century A. D.

The description of the natural phenomena of the universe is the most Aristotelian portion of the work, and many close parallels are to be found in the *Meteorologica*. It has been thought better not to multiply references to the *Meteorologica* in this part of the treatise, but a certain number of references have been added in other places.

The text used for this translation is that of Bekker in the Berlin edition. A complete account of the literature upon the *De Mundo* will be found in Capelle's article (l. c. p. 532). I have to thank Mr. W. D. Ross, who read the translation in manuscript and in proof, and my colleague, Professor W. C. Summers, who read the greater part of it in manuscript, both of whom made a number of valuable suggestions.

E. S. F.

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DE MUNDO

1 MANY a time, Alexander [1], has Philosophy seemed to me 391[a]
a thing truly divine and supernatural, especially when in
solitude she soars to the contemplation of things universal
and strives to recognize the truth that is in them, and
while all others abstain from the pursuit of this truth
owing to its sublimity and vastness, she has not shrunk
from the task nor thought herself unworthy of the fairest
pursuits, but has deemed the knowledge of such things at
once most natural to herself and most fitting. For seeing
that it was not possible (as once the foolish Aloadae [2]
attempted) by means of the body to reach the heavenly
region and leaving the earth behind to spy out that
heavenly country, the soul by means of philosophy, taking
the intellect as her guide, finding an easy path has tra-
versed the intervening space and fared forth on its pilgrim-
age, and by intelligence comprehended things very far
removed in space from one another, easily, methinks,
recognizing those things which have kinship with one
another, and by the divine eye of the soul apprehending
things divine and interpreting them to mankind. This
she felt, being desirous, as far as in her lay, freely to give
to all men a share of her treasures. And so men who
have laboriously described to us either the nature of a
single region or the plan of a single city or the dimensions
of a river or the scenery of a mountain, as some ere now
have done,—telling of Ossa or Nysa or the Corycian
cave [3] or giving us some other limited description,—such
men one should pity for their small-mindedness in admir-
ing ordinary things and making much of some quite
insignificant spectacle. They are thus affected because they
have never contemplated what is nobler—the Universe

[1] See preface. [2] Otus and Ephialtes. [3] Paus. x. 32. 2.

and the greatest things of the Universe; for if they had really given attention to these things, they would
391[b] never marvel at anything else, but all else would appear insignificant and, compared to the surpassing excellence of those other things, of no account. Let us therefore treat of all these matters and, as far as possible, inquire into their divine nature, and discuss the nature and position
5 and movement of each of them. And I think that it is but fitting that even you, who are the noblest of rulers, should pursue the inquiry into the greatest of all subjects and in philosophy entertain no trivial thoughts, and make the noblest among men welcome to these only of her gifts.

The Universe then is a system made up of heaven and **2**
10 earth and the elements which are contained in them. But the word is also used in another sense of the ordering and arrangement of all things, preserved by and through God.[1] Of this Universe the centre, which is immovable and fixed, is occupied by the life-bearing earth, the home and the mother of diverse creatures. The upper portion
15 of the Universe has fixed bounds on every side, the highest part of it being called Heaven, the abode of the gods. Heaven is full of divine bodies, which we usually call stars, and moves with a continual motion in one orbit, and revolves in stately measure with all the heavenly bodies unceasingly for ever. The whole heaven and universe being
20 spherical and moving, as I have said, continually, there must of necessity be two points which do not move, exactly opposite to one another (as in the revolving wheel of a turner's lathe), points which remain fixed and hold the sphere together and round which the whole universe moves. The universe therefore revolves in a circle and the points
25 are called poles. If we imagine a straight line drawn so as to join them (the axis, as it is sometimes called), it will form the diameter of the Universe, occupying the centre
392[a] of the earth, with the two poles as its extremities. Of

[1] Reading with W. Capelle, *Neue Jahrb.* xv (1905), p. 535, ὑπὸ θεοῦ καὶ διὰ θεόν: Bekker's reading, ὑπὸ θεῶν τε καὶ διὰ θεῶν, contradicts the pantheistic character of the treatise. R reads διὰ θεόν, Q διὰ θεοῦ.

these fixed poles the one is always visible, being at the summit of the axis in the northern region of the sky, and is called the Arctic Pole[1]; the other is always hidden beneath the earth to the south and is called the Antarctic Pole.

The substance of the heaven and stars we call Ether,[2] not because it blazes, owing to its fiery nature (as some explain the word, mistaking its nature, which is very far removed from fire), but because it is in continual motion,[3] revolving in a circle, being an element other than the four indestructible and divine. Of the stars which are contained in it, those called 'fixed' revolve only with the whole heaven, always occupying the same positions. A belt is formed through their midst by the so-called Circle of the Zodiac, which passes crosswise through the tropics, being divided up into the twelve regions of the Signs of the Zodiac. Others, which are called 'planets', do not naturally move with the same velocity as those stars of which I have already spoken, nor with the same velocity as one another, but each in a different course, so that one will be nearer the earth, another higher in the heavens. Now the number of the fixed stars cannot be ascertained by man, although they move in one surface, which is that of the whole heaven. But the planets fall into seven divisions in seven successive circles, so situated that the higher is always greater than the lower, and the seven circles are successively encompassed by one another and are all surrounded by the sphere containing the fixed stars. The position nearest to this sphere is occupied by the so-called circle of the 'Shining star', or Cronos; next is that of the 'Beaming star', which also bears the name of Zeus; then follows the circle of the 'Fiery star', called by the names both of Heracles and of Ares; next comes the 'Glistening star', which some call sacred to Hermes, others sacred

[1] 'Arctic' and 'Antarctic' are not Aristotelian terms; cp. *Meteor.* 362ª 32, 33, 363ª 34, ᵇ 4, 31.

[2] Cp. *Meteor.* 339ᵇ 19 ff.

[3] i.e. αἰθήρ, 'ether', is here derived not from αἴθεσθαι, 'to blaze', but from ἀεὶ θεῖν, 'to be in continual motion'; cp. Plat. *Crat.* 410 B, and *de Caelo* 270ᵇ 22.

to Apollo; after that is the circle of the 'Light-bearing star', which some call the star of Aphrodite, others the star of Hera; then comes the circle of the Sun, and lastly that of the Moon, which borders on the Earth. The ether encompasses the heavenly bodies and the area over which they are ordained to move.

After the Ethereal and Divine Element, which we have shown to be governed by fixed laws and to be, moreover, free from disturbance, change, and external influence, there follows immediately an element which is subject throughout to external influence and disturbance and is, in a word, corruptible and perishable. In the outer portion of this occurs the substance which is made up of small particles
392[b] and is fiery, being kindled by the ethereal element owing to its superior size and the rapidity of its movement. In this so-called Fiery and Disordered Element flashes shoot and fires dart, and so-called 'beams'[1] and 'pits'[2] and comets have their fixed position and often become extinguished.

Next beneath this spreads the air, which is in its nature murky and cold as ice, but becomes illuminated and set on fire by motion,[3] and thus grows brighter and warm. And since the air too admits of influence and undergoes every kind of change, clouds form in it, rain-storms beat down, and snow, hoar-frost, hail with blasts of winds and of hurricanes, and thunder too and lightning and falling bolts, and the crashing together of countless opaque bodies.

Next to the aerial element the earth and sea have 3
their fixed position, teeming with plant and animal life, and fountains and rivers, either winding over the earth or discharging their waters into the sea. The earth is diversified by countless kinds of verdure and lofty mountains and densely wooded copses and cities, which that intelligent animal man has founded, and islands set in the

[1] *trabes* of Seneca, *Quaest. Nat.* i. 1. 5, vii. 4. 3, *Epp.* 94. 56; Plin. ii. 26. 26.

[2] Cp. Seneca, *Quaest. Nat.* i. 14. 1.

[3] Q reads ἐκείνης for κινήσεως: Capelle, *l. c.*, p. 536, adopts ἐκείνης, but cp. above, l. 2.

sea and continents. Now the usual account divides the inhabited world into islands and continents, ignoring the fact that the whole of it forms a single island round which the sea that is called Atlantic flows. But it is probable that there are many other continents separated from ours by a sea that we must cross to reach them, some larger and others smaller than it, but all, save our own, invisible to us. For as our islands are in relation to our seas, so is the inhabited world in relation to the Atlantic, and so are many other continents in relation to the whole sea; for they are as it were immense islands surrounded by immense seas. The general element of moisture, covering the earth's surface and allowing the so-called inhabited countries to rise in patches as it were of dry land, may be said to come immediately after the aerial element. Next to it the whole earth has been formed firmly fixed in the lowest position at the midmost centre of the Universe, closely compacted, immovable and unshakable. This[1] forms the whole of what we call the lower portion of the Universe.

Thus then five elements, situated in spheres in five 393ᵃ regions,[2] the less being in each case surrounded by the greater—namely, earth surrounded by water, water by air, air by fire, and fire by ether—make up the whole Universe. All the upper portion represents the dwelling of the gods, the lower the abode of mortal creatures. Of the latter, part is moist, to which we are accustomed to give the names of rivers, springs, and seas; while part is dry, which we call land and continents and islands.

Of the islands, some are large, like the whole of what we call the inhabited world (and there are many other such surrounded by mighty seas); other islands are smaller, which are visible to us and in our own sea. Of these some are of considerable size, Sicily, Sardinia, Corsica, Crete, Euboea, Cyprus and Lesbos; others are less extensive, such as the Sporades and Cyclades and others bearing various names.

Again, the sea which lies outside the inhabited world

[1] i.e. the earth and sea. [2] Cp. *Meteor.* 340ᵇ 19 ff., 341ᵃ 2 ff.

is called the Atlantic or Ocean, flowing round us. Opening in a narrow passage towards the West, at the so-called Pillars of Heracles, the Ocean forms a current into the inner sea, as into a harbour; then gradually expanding it spreads out, embracing great bays adjoining one another, opening into other seas by narrow straits and then widening out again. First, then, on the right as one sails in through the Pillars of Heracles it is said to form two bays, the so-called Syrtes, the Greater and the Lesser as they are called; on the other side it does not make such bays, but forms three seas, the Sardinian, the Gallic, and the Adriatic. Next to these comes the Sicilian sea, lying crosswise, and after it the Cretan. Continuing it come the Egyptian, Pamphylian, and Syrian seas in one direction, and the Aegean and Myrtoan seas in the other. Over against the seas already mentioned extends the Pontus, which is made up of several parts; the innermost portion is called Maeotis, while the outer portion in the
393[b] direction of the Hellespont is connected by a strait with the so-called Propontis. Towards the East the Ocean again flows in and opens up the Indian[1] and Persian Gulfs, and displays the Erythraean sea[2] continuous with these, embracing all three.[3] With its other branch it passes through a long narrow strait and then expands again bounding the Hyrcanian and Caspian country. Beyond this it occupies the large tract beyond the Lake of Maeotis; then beyond the Scythians and the land of the Celts it gradually confines the width of the habitable world, as it approaches the Gallic Gulf and the Pillars of Heracles already mentioned, outside which the Ocean flows round the earth. In this sea are situated two very large islands the so-called British Isles, Albion and Ierne, which are greater than any which we have yet mentioned and lie beyond the land of the Celts. (The island of Taprobane[4] opposite India, situated at an angle to the inhabited world, is quite as large as the British Isles, as also is the island

[1] The Gulf of Cutch or the Gulf of Cambay.
[2] The Arabian Sea.
[3] For the use of διειληφώς cp. 396[b] 31 and L. and S., *s. v.*, ii. 1, 2.
[4] Ceylon, cp. Strabo, xv. 14 (p. 690).

called Phebol[1] which lies over against the Arabian Gulf.[2]) There is a large number of small islands round the British Isles and Iberia, forming a belt round the inhabited world, which as we have already said is itself an island. The width of the inhabited world at the greatest extent of its mainland is rather less than 40,000 stades, so the best geographers say, and its length about 70,000 stades. It is divided into Europe, Asia, and Libya.

Europe is the tract bounded in a circle by the Pillars of Heracles, the inner recesses of the Pontus, and the Hyrcanian sea, where a very narrow isthmus stretches to the Pontus. Some have held that the river Tanais carries on the boundary from this isthmus. Asia extends from the said isthmus and the Pontus and the Hyrcanian sea to the other isthmus which lies between the Arabian Gulf[2] and the inner sea, being surrounded by the inner sea and the Ocean which flows round the world. Some, however, define the bounds of Asia as from the Tanais to the mouths of the Nile. Libya extends from the Arabian isthmus to the Pillars of Heracles; though some describe it as stretching from the Nile to the Pillars; Egypt, which 394[a] is surrounded by the mouths of the Nile, is given by some to Asia, by others to Libya; some exclude the islands from both continents, others attach them to their nearest neighbour.

Such is our account of the nature of land and sea and their position—the inhabited world as we call it.

Let us now deal with the most remarkable conditions which are produced in and around the earth, summarizing them in the barest outline. There are two kinds of exhalation[3] which rise continually from the earth into the air above us, namely, those[4] composed of small particles and entirely invisible, except when they occur in the east, and those which rise from rivers and streams and are visible. Of these the former kind being given off from the earth is dry and resembles smoke, while the latter being exhaled from the element of moisture is damp and vaporous. From

[1] Capelle, l.c., p. 539, suggests Madagascar. [2] The Red Sea.
[3] Cp. *Meteor.* 341[b] 6 ff. [4] Reading (*ai*) λεπτομερεῖς.

the latter are produced mist and dew and the various forms of frost, clouds and rain and snow and hail; while from the dry exhalation come the winds and the different kinds of breezes, and thunder and lightning, and hurricanes and thunderbolts, and all other cognate phenomena. Mist is a vaporous exhalation which does not produce water, denser than air but less dense than cloud; it arises either from the first beginnings of a cloud or else from the remnant of a cloud. The contrary of this is what is called a clear sky, being simply air free from cloud and mist. Dew is moisture minute in composition falling from a clear sky; ice is water congealed in a condensed form from a clear sky; hoar-frost is congealed dew, and 'dew-frost' is dew which is half congealed. Cloud is a vaporous mass, concentrated and producing water. Rain is produced from the compression of a closely condensed cloud, varying according to the pressure exerted on the cloud; when the pressure is slight it scatters gentle drops; when it is great it produces a more violent fall, and we call this a shower, being heavier than ordinary rain, and forming continuous masses of water falling over earth. Snow is produced by the breaking up of condensed clouds, the cleavage taking place before the change into water; it is the process of cleavage which causes its resemblance to foam and its intense whiteness, while the cause of its coldness is the congelation of the moisture in it before it is dis-
394[b] persed or rarefied. When snow is violent and falls heavily we call it a blizzard. Hail is produced when snow becomes densified and acquires impetus for a swifter fall from its close mass; the weight becomes greater and the fall more violent in proportion to the size of the broken fragments of cloud. Such then are the phenomena which occur as the result of moist exhalation.

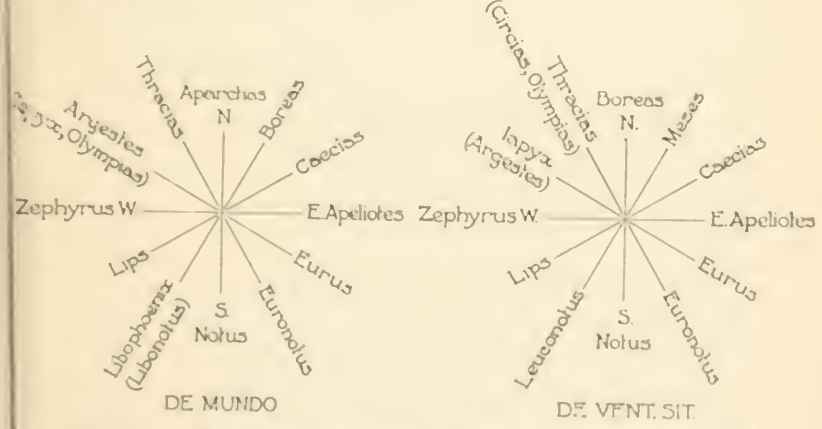
From dry exhalation, impelled into motion by cold, is produced wind; for wind is merely a quantity of air set in motion in a mass. Wind is also called breath, a word used in another sense of the vital and generative substance which is found in plants and living creatures, and permeates all things; but with this we need not deal here. The

breath which breathes in the air we call wind, while to the expirations from moisture we give the name of breezes. The winds which blow from moist land we call 'land-winds', those which spring up from gulfs we call 'gulf-winds'; somewhat similar to these are those which blow from rivers and lakes. Winds which are produced by the bursting of a cloud causing an expansion of its density in their own direction,[1] are called 'cloud-winds'. Those which are accompanied by a mass of water breaking forth are called 'rain-winds'.

The winds[2] which blow continuously from the rising sun are called Euri; those from the north, Boreae; those from the setting sun, Zephyri; those from the south, Noti. Of the east winds, that which blows from the region of the summer sunrise is called Caecias; that which blows from the region of the equinoctial sunrise is known as Apeliotes; while the name of Eurus is given to the wind which blows from the quarter of the winter sunrise. Of the west winds, on the other hand, that which blows from the summer setting is Argestes, though some call it Olympias,[3] others

[1] Lit. 'which cause a dissolution of its density against themselves'.

[2] The chart of the winds as given here is almost identical with that given in *de Vent. Sit. et Appellat.* (973[a–b]).



The following are the other principal passages describing the winds in classical authors: Aristot. *Meteor.* 363[a] 2–365[a] 13; Seneca, *Quaest. Nat.* v. 16; Pliny, ii. 119 ff.; Ioannes Lydus, *de Mensibus* iv. 119.

[3] In *de Vent. Sit.* 973[b] 21 Olympias is given as a synonym for Thracias, not for Argestes as here.

Iapyx; that which blows from the equinoctial setting is Zephyrus, and that which blows from the winter setting is Lips. Of the north winds (Boreae) that which is next to Caecias is called Boreas in the specific sense of the word.[1] Aparctias[2] is next to it, and blows in a southerly direction from the pole. Thracias[3] is the wind which blows next to Argestes; by some it is called Circias.[4] Of the south winds, that which comes from the invisible pole and immediately faces Aparctias is called Notus; that between Notus and Eurus is called Euronotus. The wind on the other side between Lips and Notus is called by some Libonotus, by others Libophoenix.

Some winds are direct, those, that is, which blow along a straight line; others follow a bending course, as for
395[a] instance the wind called Caecias.[5] Some winds hold sway in the winter, the south winds for example; others in the summer, such as the Etesian winds (Trade winds), which are a mixture of northerly and westerly winds. The so-called Ornithian[6] winds, which occur in the spring, are a northerly type of wind.

Of violent blasts of wind, a squall is one which suddenly strikes down from above; a gust is a violent blast which springs up in a moment; a whirlwind, or tornado, is a wind which revolves in an upward direction from below. An eruption of wind from the earth is a blast caused by the emission of air from a deep hole or cleft; when it comes forth in a whirling mass it is called an 'earth-storm'. A wind which is whirled along in a dense watery cloud and being driven forth[7] through it violently breaks up the continuous masses of the cloud, causes a roar and crash, which we call thunder, similar to the noise made by wind

[1] Called Meses in *de Vent. Sit.* 973[a] 3-7, where see note.
[2] Called Boreas in *de Vent. Sit.*
[3] Reading Θρᾳκίας (R Θρακίας): cp. *de Vent. Sit.* 973[b] 17.
[4] Καικίας, the MS. reading, cannot possibly be right here, the name having been already given to the N. E. wind (394[b] 22). I therefore read Κιρκίας: cp. *de Vent. Sit.* 973[b] 20 Θρᾳκίας . . . ἐν δὲ Ἰταλίᾳ καὶ Σικελίᾳ Κιρκίας (emended by Rose for Κίρκας).
[5] Cp. *Meteor.* 364[b] 12.
[6] i.e. the winds which bring the birds of passage.
[7] Reading ἐξωσθέν for ἔξωθεν.

driven violently through water. When the wind in breaking forth from a cloud catches fire and flashes it is called lightning. The lightning reaches our perception sooner than the thunder, though it actually occurs after it, since it is the nature of that which is heard to travel less quickly than that which is seen; for the latter is visible at a distance, while the former is only heard[1] when it reaches the ear, especially since the one, the fiery element, travels faster than anything else, while the other, being of the nature of air, is less swift and only reaches the ear by actually striking upon it.[2] If the flashing body is set on fire and rushes violently to the earth it is called a thunderbolt; if it be only half of fire, but violent also and massive, it is called a meteor; if it is entirely free from fire, it is called a smoking bolt.[3] They are all called 'swooping bolts', because they swoop down upon the earth. Lightning[4] is sometimes smoky, and is then called 'smouldering lightning'; sometimes it darts quickly along, and is then said to be 'vivid'; at other times it travels in crooked lines, and is called 'forked lightning'; when it swoops down upon some object it is called 'swooping lightning'.

To sum up, some of the phenomena which occur in the air are merely appearances, while others have actual substance and reality. Rainbows and streaks in the sky and the like are only appearances, while flashes and shooting-stars and comets and the like have real substance. A rainbow is the reflection of a segment of the sun or of the moon, seen, like an image in a mirror, in a cloud which is moist, hollow, and continuous in appearance, and taking a circular

[1] ὁρώμενον is used in its proper sense in the clause in which it stands, and by a sort of *zeugma* for ἀκουόμενον in the next clause.

[2] Lightning is immediately seen by the eye, thunder can only be perceived by the ear when the original movement has set up other movements which eventually strike upon the ear. (Cp. *de Aud.* 800ª 6–12.)

[3] τυφών cannot here be used (as in 400ᵇ 29) of a 'violent storm', 'hurricane'; as applied to a thunderbolt, it seems to mean one which smokes, and to be connected with the verb τυφειν, 'to smoke'.

[4] The word κεραυνός is used in Greek to mean either (1) 'a thunderbolt', or (2) 'lightning', which were more or less identified by the Greeks. The context seems to show that it has the former meaning in 395ª 22, the latter in this passage.

form. A streak is a rainbow appearing in the form of a straight line. A halo is an appearance of brightness shining
395[b] round a star; it differs from a rainbow, because the latter appears opposite the sun and moon, while the halo is formed all round a star. A light in the sky is caused by the kindling of a dense fire in the air; some lights shoot along, others are fixed. The shooting is the generation of fire by friction, when the fire moves quickly through the air and by its quickness produces an impression of length; the fixture is a prolonged extension without movement, an elongated star as it were. A light which broadens out towards one end is called a comet. Some heavenly lights often last a considerable time, others are extinguished immediately. There are numerous other peculiar kinds of appearances seen in the sky, the so-called 'torches', 'beams',[1] 'barrels', and 'pits',[1] which derive their names from their similarity to these objects. Some of them appear in the west, others in the east, others in both these quarters, but rarely in the north or south. None of them are subject to fixed laws; for none of them have been discovered to be always visible in a fixed position. Such are the phenomena of the air.

As the earth contains many sources of water, so also it contains many sources of wind and fire. Of these some are subterranean and invisible, but many have vents and spiracles, as Lipara, Etna, and the volcanoes of the Aeolian islands. Some of them frequently flow like rivers and cast up red-hot lumps. Some, which are under the earth near springs of water, warm them and cause some streams to flow tepid, others very hot, others tempered to a pleasant heat. Similarly, many vent-holes for wind open in every part of the earth; some of them cause those who draw near to them to become frenzied, others cause them to waste away, others inspire them to utter oracles, as at Delphi and Lebadia,[2] others utterly destroy them, as the one in Phrygia.[3] Often, too, a moderate wind engendered

[1] Cp. 392[b] 4.

[2] Paus. ix. 39. 5; Strabo, ix. 2. 38 (p. 414); Philostratus, *Vit. Apoll.* viii. 19.

[3] Strabo, xiii. 4. 11 (p. 628).

in the earth, being driven aside into distant holes and crannies of the earth and displaced from its proper locality, causes shocks in many parts. Often, too, a strong current from without becomes involved in the hollows of the earth, and, its exit being cut off, it shakes the earth violently, seeking an exit, and sets up the condition which we commonly call an earthquake. Earthquakes of which the shock is oblique, at a sharp angle, are known as 'horizontal 396[a] earthquakes'; those which lift the earth up and down at right angles are known as 'heaving earthquakes'; those which cause the earth to settle down into hollows are called 'gaping earthquakes'; those which open up chasms and break up the earth's surface are called 'rending earthquakes'. Some of them also emit winds, others stones or mud, while others cause springs to appear which did not exist before. Some earthquakes cause a disturbance by means of a single shock and are known as 'thrusting earthquakes'. Others which swing to and fro and by inclinations and waves in each direction remedy the effect of their shock, are called 'vibrating earthquakes', setting up a condition which resembles trembling. There are also 'bellowing earthquakes', which shake the earth with a roar. Underground bellowing, however, is often heard unaccompanied by shocks, when the wind, though insufficient to cause a shock, is compressed together in the earth and beats with the force of its impetus. Blasts which penetrate into the earth are materialized also from moisture concealed underground.

We find analogous phenomena occurring in the sea. Chasms form in it and its waters often retire or the waves rush in; this is sometimes followed by a recoil and sometimes there is merely a forward surge of water, as is said to have occurred at Helice and Bura.[1] Often, too, there are exhalations of fire from the sea, and springs gush out and river-mouths are formed and trees suddenly grow up, and currents and eddies appear, like those caused in the air by

[1] An account of this tidal wave in northern Achaea in 373 B.C. is given by Strabo, viii. 7. 2 (p. 384), and Pausanias (vii. 25. 8); cp. also *Meteor.* 343[b] 1, 17, 344[b] 34, 368[b] 6.

blasts of wind, sometimes in the middle of the sea, sometimes in straits and channels. Many tides and tidal waves are said always to accompany the periods of the moon at fixed intervals. In short, owing to the mingling of the elements together, similar conditions are produced in the air and in the earth and in the sea, causing decay and generation in detail, but preserving the whole free from destruction and generation.

Yet some have wondered how it is that the Universe, 5
if it be composed of contrary principles—namely, dry and moist, hot and cold—has not long ago perished and been destroyed.[1] It is just as though one should wonder how a city continues to exist, being, as it is, composed of opposing classes—rich and poor, young and old, weak and strong, good and bad. They fail to notice that this has always been the most striking characteristic of civic concord, that it evolves unity out of plurality, and similarity out of dissimilarity, while it admits every kind and variety. It may perhaps be that nature has a liking for contraries and evolves harmony out of them and not out of similarities (just as she joins the male and female together and not members of the same sex), and has devised the original harmony by means of contraries and not similarities. The arts, too, apparently imitate nature in this respect. The art of painting, by mingling in the picture the elements of white and black, yellow and red, achieves representations which correspond to the original object. Music, too, mingling together notes, high and low, short and prolonged, attains to a single harmony amid different voices; while writing, mingling vowels and consonants, composes of them all its art. The saying found in Heracleitus 'the obscure' was to the same effect: 'Junctions are: wholes and not wholes, that which agrees and that which differs, that which produces harmony and that which produces discord; from all you get one and from one you get all.'[2]

[1] Cf. Seneca, *Quaest. Nat.* vii. 27. 3 ff.

[2] Reading συνάψιες (O R) ὅλα καὶ οὐχ ὅλα (P) with Diels, *Vorsokr.*[3] i, p. 80, l. 2.

Thus then a single harmony orders the composition of the whole—heaven and earth and the whole Universe—by the mingling of the most contrary principles. The dry mingling with the moist, the hot with the cold, the light with the heavy, the straight with the curved, all the earth, the sea, the ether, the sun, the moon, and the whole heaven are ordered by a single power extending through all, which has created the whole universe out of separate and different elements—air, earth, fire, and water—embracing[1] them all on one spherical surface and forcing the most contrary natures to live in agreement with one another in the universe, and thus contriving the permanence of the whole. The cause of this permanence is the agreement of the elements, and the reason of this agreement is their equal proportion and the fact that no one of them is more powerful than any other, for the heavy is equally balanced 397a with the light and the hot with the cold. Thus nature teaches us in the greater principles of the world that equality somehow tends to preserve harmony, whilst harmony preserves the universe which is the parent of all things and itself the fairest thing of all. For what created thing is more excellent? Any that one can name is but a part of the ordered Universe. All that is beauteous bears its name, and all that which is arranged well, for it is said to be well 'ordered', being thus called after the 'ordered' Universe.[2] And what subordinate phenomenon could be likened to the ordered system of the heavens and the march of the stars and the sun and the moon, which move on in unvarying measure through age after age? Where else could be found such regularity as is observed by the goodly seasons, which produce all things and bring in due order summer and winter, day and night, to the accomplishment of the month and the year? Moreover, in greatness the universe is pre-eminent, in motion swiftest, in radiance most bright, and in might it knows not old age or corruption. It has divided the various creatures that live in the sea, on the earth, and in the air, and regulated their lives by its

[1] For this use of διαλαμβάνω cp. 393b 4 and note.
[2] Cp. 391b 10–11.

movements. Of it all living things breathe and have their life. Even all the unexpected changes which occur in it are really accomplished in an ordered sequence—diverse winds conflicting together, thunderbolts falling from heaven, and violent storms bursting forth. The expulsion of moisture and the exhalation of fire by these means restores the whole to harmony and stability. The earth, too, clothed with diverse vegetation, gushing forth with streams and trodden by the feet of living creatures, in due season bringing forth, nurturing, and receiving back all things, producing countless varieties and changes, none the less always preserves its nature untouched by age, though shaken by earthquakes, washed by floods, and in parts burnt up by fires. All these things seem to work its welfare and to ensure its eternal permanence. For when it is shaken by earthquakes, the winds which have been diverted into it escape forth, finding vents through the clefts, as we have already said ;[1] when it is washed by rain, it is cleansed of all that is unhealthy : and when the breezes blow about it, it is purified above and beneath. Again, 397[b] the fires soften that which is frost-bound, while the frosts abate the fires. Of individual things upon the earth some are coming into being, others are at their prime, others are decaying ; and birth checks decay and decay lightens birth. Thus an unbroken permanence, which all things conspire to secure, counteracting one another—at one time dominating, at another being dominated—preserves the whole unimpaired through all eternity.

There still remains for us to treat briefly, as we have 6 discussed the other subjects, of the cause which holds all things together. For in dealing with the universe, not perhaps in exact detail, yet at any rate so as to give a general idea of the subject, it would be wrong to omit that which is the most important thing in the universe. The old explanation which we have all inherited from our fathers, is that all things are from God and were framed for us by God, and that no created thing is of itself sufficient

[1] Cp. 395[b] 20.

for itself, deprived of the permanence which it derives from him. Therefore some of the ancients went so far as to say that all those things are full of God which are presented to us through the eyes and the hearing and all the other senses, thus propounding a theory which, though it accords with the divine power, does not accord with the divine nature. For God is in very truth the preserver and creator of all that is in any way being brought to perfection in this universe; yet he endures not all the weariness of a being that administers and labours, but exerts a power which never wearies; whereby he prevails even over things which seem far distant from him. He hath himself obtained the first and highest place and is therefore called Supreme, and has, in the words of the poet,

Taken his seat in heaven's topmost height;[1]

and the heavenly body which is nighest to him most enjoys his power, and afterwards the next nearest, and so on successively until the regions wherein we dwell are reached. Wherefore the earth and the things upon the earth, being farthest removed from the benefit which proceeds from God, seem feeble and incoherent and full of much confusion; nevertheless, inasmuch as it is the nature of the divine to penetrate to all things, the things also of our earth receive their share of it, and the things above us according to their nearness to or distance from God receive more or less of divine benefit. It is therefore 398[a] better, even as it is more seemly and befitting God, to suppose that the power which is stablished in the heavens is the cause of permanence even in those things which are furthest removed from it—in a word, in all things,—rather than to hold that it passes forth and travels to and fro to places which become and befit it not, and personally administers the affairs of this earth. For indeed, to superintend any and every operation does not become even the rulers among mankind—the chief, for example, of an army or a city, or the head of a household, if it were necessary to bind up a sack of bedding or perform any other some-

[1] *Il.* i. 499, &c.

what menial task, such as in the days of the Great King would not be performed by any ordinary slave. Nay, we are told that the outward show observed by Cambyses and Xerxes and Darius was magnificently ordered with the utmost state and splendour. The king himself, so the story goes, established himself at Susa or Ecbatana, invisible to all, dwelling in a wondrous palace within a fence gleaming with gold and amber and ivory. And it had many gate-ways one after another, and porches many furlongs apart from one another, secured by bronze doors and mighty walls. Outside these the chief and most distinguished men had their appointed place, some being the king's personal servants, his bodyguard and attendants, others the guardians of each of the enclosing walls, the so-called janitors and 'listeners', that the king himself, who was called their master and deity, might thus see and hear all things. Besides these, others were appointed as stewards of his revenues and leaders in war and hunting, and receivers of gifts, and others charged with all the other necessary functions. All the Empire of Asia, bounded on the west by the Hellespont and on the east by the Indus, was apportioned according to races among generals and satraps and subject-princes of the Great King; and there were couriers and watchmen and messengers and superintendents of signal-fires. So effective was the organization, in particular the system of signal-fires, which formed a chain of beacons from the furthest bounds of the empire to Susa and Ecbatana, that the king received the same day the news of all that was happening in Asia. Now we must
398[b] suppose that the majesty of the Great King falls as far short of that of the God who possesses the universe, as that of the feeblest and weakest creature is inferior to that of the king of Persia. Wherefore, if it was beneath the dignity of Xerxes to appear himself to administer all things and to carry out his own wishes and superintend the government of his kingdom, such functions would be still less becoming for a god. Nay, it is more worthy of his dignity and more befitting that he should be enthroned in the highest region, and that his power, extending through the

whole universe, should move the sun and moon and make the whole heaven revolve and be the cause of permanence to all that is on this earth. For he needs no contrivance or the service of others, as our earthly rulers, owing to their feebleness, need many hands to do their work; but it is most characteristic of the divine to be able to accomplish diverse kinds of work with ease and by simple movement, even as past masters of a craft by one turn of a machine accomplish many different operations. And just as puppet-showmen by pulling a single string make the neck and hand and shoulder and eye and sometimes all the parts of the figure move with a certain harmony; so too the divine nature, by simple movement of that which is nearest to it, imparts its power to that which next succeeds, and thence further and further until it extends over all things. For one thing, moved by another, itself in due order moves something else, each acting according to its own constitution, and not all following the same course but different and various and sometimes even contrary courses; although the first impulse, as it may be called, was directed to a single form of motion. It is just as though one should cast from one vessel at the same time a sphere, a cube, a cone, and a cylinder; each of them will move according to its particular shape. Or if one should hold in the folds of a garment a water-animal, a land-animal, and a bird, and let them go; clearly the animal that swims will leap into its own element and swim away, the land-animal will creep away to its own haunts and pastures, the bird of the air will raise itself aloft from the earth and fly away, though one original cause gave each its aptitude for movement. So is it with the universe; by a single revolution of the whole within 399a the bounds of day and night, the different orbits of all the heavenly bodies are produced, though all are enclosed in a single sphere, some moving more quickly, others more slowly, according to the distances between them and the individual composition of each. For the moon accomplishes her circuit in a month, waxing and waning and disappearing; the sun and the heavenly bodies whose course is of equal length, namely those called the 'Lightbearer' and Hermes,

perform their revolution in a year; the 'Fiery star' in double that period; the star of Zeus in six years; and lastly the so-called star of Cronos in a period two and a half times as long as the heavenly body next below it. The single harmony produced by all the heavenly bodies singing and dancing together springs from one source and ends by achieving one purpose, and has rightly bestowed the name not of 'disordered' but of 'ordered universe' upon the whole. And just as in a chorus, when the leader gives the signal to begin, the whole chorus of men, or it may be of women, joins in the song, mingling a single studied harmony among different voices, some high and some low; so too is it with the God that rules the whole world. For at the signal given from on high by him who may well be called their chorus-leader, the stars and the whole heaven always move, and the sun that illumines all things travels forth on his double course, whereby he both divides day and night by his rising and setting, and also brings the four seasons of the year, as he moves forwards towards the north and backwards towards the south. And in their own due season the rain, the winds, and the dews, and all the other phenomena which occur in the region which surrounds the Earth, are produced by the first, primaeval cause. These are followed by the flowing of rivers, the swelling of the sea, the growth of trees, the ripening of fruits, the birth of animals, the nurturing and the prime and decay of all things, to which, as I have said, their individual composition contributes. When, therefore, the ruler and parent of all, invisible save to the mind of the eye, gives the word to all nature that moves betwixt heaven and earth, the whole revolves unceasingly in its own circuits and within its own bounds, sometimes unseen and sometimes appearing, revealing and again hiding diverse manners of things, from one and the same cause. Very like is it to
399[b] that which happens in times of war, when the trumpet sounds to the army; then each soldier hears its note, and one takes up his shield, another dons his breast-plate; another puts on his greaves or his helmet or his sword-belt; one puts the bit in his horse's mouth, another mounts

his chariot, another passes along the watchword; the captain betakes himself straightway to his company, the commander to his division, the horseman to his squadron, the light-armed warrior hastens to his appointed place; all is hurry and movement in obedience to one word of command, to carry out the orders of the leader who is supreme over all. Even so must we suppose concerning the universe; by one impelling force, unseen and hidden from our eyes, all things are stirred and perform their individual functions. That this force is unseen stands in the way neither of its action nor of our belief in it. For the spirit of intelligence whereby we live and dwell in houses and communities, though invisible, is yet seen in its operations; for by it the whole ordering of life has been discovered and organized and is held together—the ploughing and planting of the earth, the discovery of the arts, the use of law, the ordering of constitutions, the administration of home affairs and war outside our borders and peace. Thus, too, must we think of God, who in might is most powerful, in beauty most fair, in time immortal, in virtue supreme; for, though he is invisible to all mortal nature, yet is he seen in his very works. For all that happens in the air, on the earth, and in the water, may truly be said to be the work of God, who possesses the universe; from whom, in the words of Empedocles, the natural philosopher,

Whatsoever hath been and is now and shall be hereafter,
All alike hath its birth—men, women, trees of the forest,
Beasts of the field and fowls of the air and fish in the water.[1]

To use a somewhat humble illustration, we might with truth compare the ordering of the universe to the so-called 'key-stones' in arches, which, placed at the junction of the two sides, ensure the balance and arrangement of the whole structure of the arch and give it stability. Moreover, they say that the sculptor Pheidias, when he was setting up the Athena on the Acropolis, represented his own features in the centre of her shield, and so attached it to the statue by a hidden contrivance, that any one who tried to cut it out, 400[a]

[1] Diels, *Vorsokr.*[3] i, p. 233, 9–11.

thereby necessarily shattered and overthrew the whole statue.[1] The position of God in the universe is analogous to this, for he preserves the harmony and permanence of all things; save only that he has his seat not in the midst, where the earth and this our troubled world is situated, but himself pure he has gone up into a pure region, to which we rightly give the name of heaven, for it is the furthest boundary[2] of the upper world, and the name of Olympus, because it is all-bright[3] and free from all gloom and disordered motion, such as is caused on our earth by storms and the violence of the wind. Even thus speaks the poet Homer—

> Unto Olympus' height, where men say that the gods have their dwelling,
> Alway safe and secure; no wind ever shaketh its stillness,
> Nor is it wet with the rain; no snow draweth nigh; but unclouded,
> Ever the air is outspread, and a white sheen floateth about it.[4]

This, too, is borne out by the general habit of mankind, which assigns the regions above to God; for we all stretch up our hands to heaven when we offer prayers. Wherefore these words of the poet are not spoken amiss,

> Heaven belongeth to Zeus, wide spread mid the clouds and the ether.[5]

Therefore also the objects of sense which are held in the highest esteem occupy the same region, to wit the stars and the sun and moon. For this cause the heavenly bodies alone are so arranged that they ever preserve the same order, and never alter or move from their course, while the things of earth, being mutable, admit of many changes and conditions. For ere now mighty earthquakes have rent the earth in diverse places, and violent rains have burst forth and flooded it, and the inroads and withdrawals

[1] Cp. *de Mir. Ausc.* 846a 19 ff.; Plut. *Pericles* 31; Cic. *Tusc.* i. 15, 34; Val. Max. viii. 14. 6; and for the Strangford shield, which is a copy of the shield of the Athena Parthenos, see A. H. Smith, *Cat. of Gk. Sculpture in the Brit. Mus.* i, no. 302.

[2] οὐρανός is here derived from ὅρος, 'boundary'.

[3] Ὄλυμπος is here derived from ὅλος and λάμπειν, 'to shine'.

[4] *Od.* vi. 42–45.

[5] *Il.* xv. 192.

of waves have often turned the dry land into sea and sea into dry land, and the might of winds and hurricanes has sometimes overthrown whole cities, and fires and flames have consumed the earth, either coming forth from heaven in former times, even as men say that in the days of Phaethon they burnt up the eastern regions of the earth, or else gushing forth and breathing from the earth in the west, as when the craters of Etna burst and flowed like a torrent over the earth. (There also the favour of heaven bestowed 400ᵇ especial honour upon the generation of the pious, when they were overtaken by the fiery stream, because they were carrying their aged parents upon their shoulders and seeking to save them. For when the river of fire drew near to them, it was parted asunder and turned part of its flame this way and part that way, and preserved the young men and their parents unscathed.[1])

To sum up the matter, as is the steersman in the ship, the charioteer in the chariot, the leader in the chorus, law in the city, the general in the army, even so is God in the Universe; save that to them their rule is full of weariness and disturbance and care, while to him it is without toil or labour and free from all bodily weakness. For, enthroned amid the immutable, he moves and revolves all things, where and how he will, in different forms and natures; just as the law of a city, fixed and immutable in the minds of those who are under it, orders all the life of the state. For in obedience to it, it is plain, the magistrates go forth to their duties, the judges to their several courts of justice, the councillors and members of the assembly to their appointed places of meeting, and one man proceeds to his meals in the prytaneum, another to make his defence before the jury, and another to die in prison. So too the customary public feasts and yearly festivals take place, and sacrifices to the gods and worship of heroes and libations in honour of the dead. The various activities of the citizens in obedience to one ordinance or lawful authority are well expressed in the words of the poet,

> And all the town is full of incense smoke,
> And full of cries for aid and loud laments.[2]

[1] Cp. Lycurg. *in Leocr.* 95 *sq.* [2] Soph. *O. T.* 4, 5.

So must we suppose to be the case with that greater city, the universe. For God is to us a law, impartial, admitting not of correction or change, and better, me-
30 thinks, and surer than those which are engraved upon tablets. Under his motionless[1] and harmonious rule the whole ordering of heaven and earth is administered, extending over all created things through the seeds of life in each both to plants and to animals, according to genera and
401a species. For vines and date-palms and peach-trees and 'sweet fig-trees and olives'[2], as the poet says, and trees which, though they bear no fruits, have other uses, plane-trees and pines and box-trees,

Alder and poplar-tree and cypress breathing sweet odours,[3]

5 and trees which produce autumn crops pleasant but also difficult to store,

Pear-trees and pomegranate-trees and apple-trees glorious-fruited,[4]

and animals, both wild and tame, feeding in the air or on the earth or in the water, all are born and come to
10 their prime and decay in obedience to the ordinances of God; for, in the words of Heraclitus, 'every creeping thing grazes at the blow of God's goad'.[5]

God being one yet has many names, being called after 7
all the various conditions which he himself inaugurates. We call him Zen and Zeus, using the two names in the
15 same sense, as though we should say 'him through whom we live'.[6] He is called the son of Kronos and of Time, for he endures from eternal age to age. He is God of Lightning and Thunder, God of the Clear Sky and of Ether, God of the Thunderbolt and of Rain, so called after the rain and the thunderbolts and other physical phenomena. Moreover, after the fruits he is called the Fruitful God,
20 after cities the City-God: he is God of Birth, God of the House-court, God of Kindred and God of our Fathers

[1] Reading ἀκινήτως with O.
[2] *Od.* xv. 116.
[3] ib. v. 64.
[4] ib. xi. 589.
[5] Reading πληγῇ for τὴν γῆν with Diels, *Vorsokr.*[3] i, p. 80, l. 8.
[6] i.e. Zeus is here derived from ζῆν, 'to live', and its accusative Δία, apparently, from the preposition διά.

from his participation in such things. He is God of Comradeship and Friendship and Hospitality, God of Armies and of Trophies, God of Purification and of Vengeance and of Supplication and of Propitiation, as the poets name him, and in very truth the Saviour and God of Freedom, and to complete the tale of his titles, God of Heaven and of the World Below, deriving his names from all natural phenomena and conditions, inasmuch as he is himself the cause of all things. Wherefore it is well said in the Orphic Hymns,

> Zeus of the flashing bolt was the first to be born and the latest,
> Zeus is the head and the middle; of Zeus were all things created;
> Zeus is the stay of the earth and the stay of the star- 401[b]
> spangled heaven;
> Zeus is male and female of sex, the bride everlasting;
> Zeus is the breath of all and the rush of unwearying fire;
> Zeus is the root of the sea, and the sun and the moon in the heavens;
> Zeus of the flashing bolt is the king and the ruler of all men,
> Hiding them all away, and again to the glad light of heaven
> Bringing them back at his will, performing terrible marvels.[1]

I think also that God and nought else is meant when we speak of Necessity, which is as it were invincible[2] being; and Fate, because his action is continuous[3] and he cannot be stayed in his course; and Destiny,[4] because all things have their bounds, and nothing which exists is infinite; and Lot,[5] from the fact that all things are allotted; and Nemesis,[6] from the apportionment which is made to every individual; and Adrasteia,[7] which is a cause ordained by nature which cannot be escaped; and Dispensation,[8] so

[1] Kaibel, *Orphica*, 46.
[2] Ἀνάγκη, 'necessity', is here derived from ἀνίκητος, 'invincible'.
[3] Εἱμαρμένη, 'fate', from εἴρειν, 'to plait together'.
[4] Πεπρωμένη, 'destiny', from πεπρωτοῦν, 'to bound'.
[5] Μοῖρα, 'lot', from μερίζειν, 'to allot'.
[6] Νέμεσις, from νεμεῖν, 'to apportion'.
[7] Ἀδράστεια, from ἀ-, 'not', and διδράσκειν, 'to run away'.
[8] Λάτη, 'dispensation', from ἀεὶ οὖσα, 'ever existing'.

called because it exists for ever. What is said of the Fates and their spindle tends to the same conclusion; for they are three, appointed over different periods of time, and the thread on the spindle is part of it already spent, part reserved for the future, and part in the course of being spun. One of the Fates is appointed to deal with the past, namely, Atropos, for nothing that is gone by can be changed [1]; Lachesis is concerned with the future, for cessation [2] in the course of nature awaits all things; Clotho presides over the present, accomplishing and spinning [3] for each his own particular destiny. This fable is well and duly composed. All these things are nought else but God, even as worthy Plato tells us.[4]

God, then, as the old story has it, holding the beginning and the end and the middle of all things that exist, proceeding by a straight path in the course of nature brings them to accomplishment; and with him ever follows Justice, the avenger of all that falls short of the Divine Law—Justice, in whom may he that is to be be happy, be from the very first a blessed and happy partaker!

[1] Ἄτροπος, from ἀ-, 'not', and τρέπειν, 'to turn'.
[2] Λάχεσις, from λήγειν, 'to cease'.
[3] Κλωθώ, from κλώθειν, 'to spin'.
[4] The reference appears to be to the account of the Fates given in the Vision of Er (Plato, *Rep.* 617 c).

INDEX

DE SPIRITU

BY

J. F. DOBSON

PROFESSOR OF GREEK IN THE UNIVERSITY OF BRISTOL

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PREFACE

THIS treatise has been rejected as spurious by practically all editors, one of the chief reasons being the confusion of the senses assigned to *ἀρτηρία*. It is sometimes ascribed to Theophrastus. Its author had certainly studied the Aristotelian Corpus, and analogies may be traced to the *de Respiratione* and some of the zoological treatises.

The earliest attempt to elucidate its numerous difficulties was made by Daniel Furlan, who in 1605 appended a text with comments and a Latin translation to the edition of Theophrastus of which he and Adrian Turnebus were joint editors. He apologizes for his temerity in approaching this work, '*quod Julius Caesar Scaliger, vir extra communem ingeniorum aleam positus, frustra convertere et commentariis explanare conatus sit*'. Jaeger, the latest editor, calls the author 'a second Heraclitus'.

The text, as given in Bekker's edition, is often untranslatable, and the Latin version in the same Corpus, by an anonymous author, is a free paraphrase, based in some cases on a different text. Its seeming fluency often conceals difficulties without explaining them. The emended text in the Didot edition is more intelligible, and the translation gives some help; but many passages remain in a hopeless state. It is to be regretted that the *de Spiritu* was omitted by Barthélémy Saint-Hilaire from his translation of all Aristotle.

Since this version was in proof, a new edition of the text has appeared by W. W. Jaeger (Teubner, 1913). The editor has taken from Furlan and others many useful conjectures, and added some of his own. Though in some cases his corrections appear unnecessary, the new text is

so great an improvement on Bekker that it has seemed desirable to adapt this translation to the text of Jaeger's edition.

No amount of emendation will remove the incoherence of the work, which must be regarded rather as a collection of Problems than as a finished treatise.

My best thanks are due to Mr. W. D. Ross, of Oriel College, for numerous suggestions and criticisms which have helped me greatly. I have also to thank Mr. R. W. Livingstone, of Corpus Christi College, Oxford, for his kindness in allowing me to collate the MS. which is the property of his College.

J. F. D.

CONTENTS

The *de Spiritu* is found in the following MSS.:

(1) *Z*, Oxoniensis, 12th cent.; Corpus Christi College, Oxford — considered by Bekker and Jaeger the most important.

(2) *L P Q B*^{3}, an independent group (Jaeger, Introd., p. xxi).

L, Vaticanus 253, 14th cent.

P, Vaticanus 1339, 12th or 13th cent.

Q, Marcianus 200, 12th cent.

B^{3}, Palatinus Vaticanus 162, 15th or 16th cent.

DE SPIRITU

1 WHAT is the mode of growth of the natural breath and 481ª
its mode of maintenance? For we see that it increases in
volume and strength in accordance with both changes of
age and the varying condition of the body. May we sup-
pose that it increases as the other parts do, through the
addition of some substance to it? Now it is nutriment
that is thus added to living creatures; so that we must 5
consider the nature and origin of the nutriment in this case.

Nutrition may result in either of two ways—by means
of respiration, or, as in the case of the other parts of the
body, by the digestive process consequent on the introduc-
tion of the nutriment; and of the two the process by
means of the nutriment[1] is perhaps the more likely; for
body is nourished by body, and the breath is of the nature
of body.

What then is the method? Clearly we must suppose 10
that the breath is nourished by drawing and digesting
nutriment from the vein-system, for the blood is the ulti-
mate and universal nutriment. So the breath receives
nutriment into the hot element as into its vessel and re-
ceptacle.[2]

The air[3] draws the nutriment and imparts the activity,
and applying to itself the digestive power is the cause of
its own growth and nutrition.[4]

Perhaps there is nothing absurd in this, but rather in 15
the proposition that the breath is originally derived from
the nutriment; for that which is akin to the soul, as the
breath is, is purer—unless we were to say that the soul

[1] i.e. by digestion, 481ª 8.

[2] Omitting καὶ in l. 12, and reading περιέχον in l. 13 (W. D. R. L. Jaeger's supposition of a lacuna is then unnecessary.

[3] ἀήρ is here identified with breath; contrast 481ᵇ 4 ἠέρ.

[4] These words are curious in view of 482ª 16 and other passages where the breath is supposed to be for the sake of refrigerating the body.

itself is a later product than the body, arising when the seeds are sorted out[1] and move towards the development of their nature.

Again, if[2] there is some residue left from all nutriment, by what passage is it ejected in this case? It is not reasonable to suppose that it is by the process of exhalation, for this succeeds immediately to the inhalation.[3] Clearly there remains only the explanation that it is through the ducts of the wind-pipe.[4]

The residue which is secreted from it must be either finer or coarser; in either case there is a grave difficulty;[5] if the breath is assumed to be the purest of all substances, how can the residue be finer than the breath? while if it is coarser we shall have to assume that there are certain ducts of larger size.[6]

The assumption that we take in and expel the breath by the same ducts is again strange and unreasonable.

Such then are the questions raised by the theory that the breath is maintained and increased by nutriment.

2 Aristogenes supposes that the growth of the breath is due to respiration, the air being digested in the lungs; for the breath, he holds, is also a form of nutriment, and 481b is distributed into the various vessels, and[7] the refuse is ejected again.

This theory involves more difficulties, for what can cause this digestion? Apparently the breath digests itself, as it digests other things; but this is strange intrinsically, unless the breath is different from the external air. If it is different, perhaps the bodily warmth in it may cause digestion.

[1] i. e. from the μίγμα. Cf. *de Caelo*, iii. 305b 4, of Empedocles.
[2] Reading εἴ τε.
[3] Cf. ch. ii. 481b 9 εὐθὺς γὰρ μετὰ τὴν εἰσπνοὴν ἡ ἐκπνοή.
[4] ἀρτηρίας—which seems to mean here ἡ τραχεῖα ἀρτηρία, *the trachea*; but elsewhere in the treatise ἀρτηρίαι must mean air-ducts in general, *vide infra*, 482b 8.
[5] Adopting the reading which is assumed by the Latin translation: ἄτοπον· εἰ τοῦτο . . . καθαρώτατον, ⟨πῶς λεπτότερον;⟩ εἰ δὲ κτλ.
[6] Here, perhaps, we should place 481b 5–8, 'However . . . not convincing'.
[7] Insert καί after διαδίδοσθαι.

[1] However, it may be reasonably maintained that the breath [2] is coarser than the outside air, since it is combined with the moisture from the vessels and from the solid parts in general; so that digestion will be a process towards corporeality; but the theory that it is finer is not convincing.

Moreover, the rapidity of its digestion is contrary to reason; for the exhalation follows immediately on the inhalation. What then is the agent which so quickly changes and modifies it?

We must naturally suppose that it is the warmth of the body, and the evidence of sense supports this, for the air when exhaled is warm.

Again, if the substance which is digested is in the lungs and the wind-pipe, the active warmth must also reside there: but the common view is that it is not so, but that the nutriment is evaporated by the motion of the breath.

It is still more astonishing if the breath in process of digestion attracts the warmth to itself or receives it because some other agent sets it in motion; moreover, on this theory it is not in itself the primary moving cause.[4]

Then again, respiration extends as far as the lungs only, as the followers of Aristogenes themselves state; but the natural breath is distributed throughout the whole body. If it is from the lungs [5] that the breath is distributed to all parts of the body, including those lower than the lungs, how can the process of its digestion be so rapid? This is more remarkable and involves a greater difficulty; for the lungs [5] cannot distribute the air to the lower parts during the actual process of its digestion. And yet to some extent it would seem that this must be the case, if the digestion takes place in the lungs, and the lower parts also are affected by the respiration.

[1] Lines 5–8 seem to be out of place: they should, perhaps, come at b 25.

[2] Reading αὐτὸ for αὐτὸν, and ὃν for ὅπερ in l. 6. If αὐτὸν is read, it must refer to the air, which is unintelligible.

[3] Here, perhaps, we should add lines 25–26 (*ἀφίστ.*): 'but the conclusion . . . contact'.

[4] Which was assumed in b 2: ἀεὶ . . . ὑπ' ἀέρος.

[5] I take τούτου (l. 19), τοῦτο (l. 22), to refer to the lungs.

[1] But the conclusion in this case is still more remarkable and important—namely that the digestion is effected, as it were, entirely by transit and contact.

This also is unreasonable, and still more untenable,[2] since it assumes that the same account can be given of the nutriment and the excretions;[3] while if we assume that digestion is effected by any of the other internal parts, the objections already stated will apply: unless we were to assume that excrement is not formed from all nutriment, 482a nor in all animals, any more than in plants, for we cannot find it in every one of the bodily parts, or even if we do, at least not in all animals.[4]

But according to this view the vessels grow just like the other parts, and as they become broadened and distended, the volume of air which flows in and out is increased: and if there must inevitably be some air contained in them, the actual question which we are now asking,[5] 'What is the air which naturally exists in them; and how does this increase under healthy conditions?' will be obvious from the preceding statement.

How is the natural breath nourished and developed in the case of creatures which have not respiration? For in their case the nutriment can no longer come from without. If in the former case it was from forces within, and from the common nutriment of the body, it is reasonable to say that the same is true in their case also, for similar effects come in like manner from the same causes—unless really in the case of these creatures too it is from without, like their perception of smell; but then they must have some process similar to respiration.[6]

Under this head we might raise the question whether such creatures can truly be called non-respiratory—pointing to this argument and also to the way in which they take in nutriment; for we should say that they must draw

[1] This seems to be out of place. Cf. *supra*, l. 14.
[2] Reading λογοδεέστερον and λόγος.
[3] i.e. that the nutriment of the lower parts is really a περίττωμα.
[4] Keeping the reading of the MSS. εἰ δὲ μή, οὔτι γε παντός.
[5] Reading τοῦτο αὐτὸ ⟨ὁ⟩ ζητεῖται, τίς ὁ φυσικὸς καὶ κτλ. (W. D. R.).
[6] Keeping οὕτως γε, with Z.

in some breath at the same time; and we should further urge that they must respire for the sake of refrigeration, which they must require just as other creatures do.

But if in their case the refrigeration takes place through the diaphragm, it is clear that the entry of the air must also be by the same passage; so that there is some process similar to respiration.

But it cannot be determined how or by what agency the air is drawn in; or if there is a drawing in, how the entry takes place—unless, indeed, it is spontaneous. This is a subject for separate investigation.

But how is the natural breath nourished and increased in the case of creatures that live in the water? Apart from their inability to respire, we say further that air cannot exist in water: so it only remains to say that in their case it is by means of the food: and so either all creatures are not uniform in their methods, or else in the case of the others also[1] it is by means of the food. Such are the three possible theories, of which one must be right. So much, then, as regards the nutrition and growth of the breath.

3 With regard to respiration, some philosophers—such as Empedocles and Democritus—do not deal with its purpose, but only describe the process; others do not even deal with the process at all, but assume it as obvious. But we ought further to make it quite clear whether its purpose is refrigeration. For if the bodily heat is inherent in the upper parts, it follows that the lower parts would have no need of refrigeration:[2] but the heat is not in the upper parts only, for as a matter of fact the innate breath pervades the whole body, and its origin is from the lungs.

The inspired breath also is thought to be distributed uniformly over all parts, so that it remains to be proved that this is not the case.[3]

Again, it is strange if the lower parts do not require

[1] Omitting τῷ ἔνεγμα a 25. Cf. the Latin translation.
[2] Read οὐκ ἂν ἔτι ἐνῆν ⟨τὸ⟩ αὐτοῖς. Cf. the Latin translation.
[3] i.e. that the lower parts require no refrigeration.

some motive force and, as it were, some nutriment. And [1] it is strange that it should no longer be for the sake of refrigeration, if it does pervade the whole.

Further, the process of the breath's distribution in general is imperceptible, and so is its speed; and again, the matter of its counter-flow, if, as assumed, it is from all parts, is remarkable, unless it flows back from the most remote parts in some different way, while in its proper and primary sense the action takes place from the regions about the heart.

In many instances such a want of symmetry in functions and faculties may be observed.

However, it is at any rate [2] strange if breath is distributed even into the bones—for they say that this is the case, and that it passes there from the air-ducts. Therefore, as I have shown, we must consider the respiration—its purpose, and the parts which it affects, and how it affects them. Again, it appears [3] that nutriment is not carried by the air-ducts to all parts, for instance to the vessels themselves and certain other parts; but nevertheless plants, which have not air-ducts, live and receive nourishment.[4] This question belongs rather to a treatise on methods of nutrition.

4 Whereas there are three motions belonging to the breath in the windpipe—respiration, pulsation, and a third which introduces and assimilates the nutriment—we must define how and where and for what purpose each takes place.

Of these, the motion of the pulse is perceptible by the senses wherever we touch the body. That of the respiration is perceptible up to a certain point, but is recognized in the majority of parts by a reasoning process. That of nutrition is in practically all parts determinable by reasoning, but by sense in so far as it can be observed from its results.

Now clearly the respiration has its motive principle from the inward parts, whether we ought to call this principle

[1] Understand (*ἄτοπον εἰ*) *οὐκέτι . . . εἴη*, rejecting Jaeger's emendation *οὐκ ⟨ἂν⟩ ἔτι*.
[2] Read *γοῦν* for *οὖν*.
[3] Reading *φαίνεται*.
[4] Rejecting Jaeger's ⟨*ὥσπερ*⟩.

a power of the soul, the soul, or some other combination of bodies which through their agency causes this attraction; and the nutritive faculty would seem to be caused by the respiration, for the respiration corresponds to it, and is in reality similar to it. And to discover whether the whole body is not equable[1] with regard to the time taken by such motion, or whether there is no difference as to its simultaneity, we must consider all the parts.

The pulse is something peculiar and distinct from the other motions and in some respects may be seen to be contingent, assuming that when there is an excess of warmth in a fluid, that fluid which is evaporated must set up a pulsation owing to the air being intercepted in the interior, and pulsation must arise in the originating part and in the earliest stage, since it is inborn in the earliest parts. For it arises firstly and in the greatest degree in the heart, and thence extends to the other parts. Perhaps this must be an inseparable consequence of the essential nature underlying the living creature, which is manifested when the creature is in a condition of activity.

That the pulse has no connexion with the respiration is shown by the following indication—whether one breathes quickly or regularly, violently or gently,[2] the pulse remains the same and unchanged, but it becomes irregular and spasmodic owing to certain bodily affections and in consequence of fear, hope, and anguish affecting the soul. 483a

Next we ought to consider whether the pulse occurs also in the arteries and with the same rhythm and regularity.[3] This does not appear to be so in the case of parts widely separated and,[4] as has been noted, it seems to serve no purpose whatsoever.

For, on the other hand, the respiration and reception of food, whether they are regarded as quite independent or as correlated, clearly exist for a purpose, and admit of rational explanation.

[1] Omit comma after μὴ and full stop after ταχεῖαν.
[2] Reading πρᾴως.
[3] Reading καὶ ὁ αὐτὸς ὡς μεμιγμένη καὶ ὁμαλῶς, σκεπτέον.
[4] There is no passage in the present treatise to which these words can refer.

And of the three, we may reasonably say that the pulsatory and respiratory motions are prior to the other, for nutrition assumes their pre-existence. Or is this not so? for respiration begins when the young is separated from the mother; the reception of nutriment, and nutrition, both while the embryo is forming and after it is formed; but the pulsation at the earliest stage, as soon as the heart begins to form, as is evident in the case of eggs. So the pulse comes first, and resembles an activity and not an interception of the breath, unless that also can conduce towards its activity.

They say that the breath which is respired is carried **5** into the belly, not through the gullet—that is impossible—but there is a duct along the loins through which the breath is carried by the respiration from the trachea into the belly and out again: and this can be perceived by the sense.

The question of this perception raises a difficulty: for if the windpipe alone has perception, does it perceive by means of the wind which passes through it, or by its bulk or by its bodily constitution? Or if the air comes first below soul, may it perceive by means of this air which is superior and prior in origin?

What then is the soul? They make it out to be a potentiality which is the cause of such a motion as this. Or is it clear that you will not be right in impugning those who say it is the rational and spirited faculty? for they too refer to these as potentialities.

But if the soul resides in this air, the air is at any rate a neutral substance. Surely, if it becomes animate or becomes soul, it suffers some change and alteration, and so naturally moves towards what is akin to it, and like grows by the addition of like. Or is it otherwise? for it may be contended that the air is not the whole of soul but is something which contributes to this potentiality or in this sense makes it,[1] and that which has made it is its principle and foundation.

[1] Reading *ἀήρ, ἢ οὕτω ταύτην ποιοῦν.*

In the case of non-respiring creatures[1] where the internal air is not mixed with the external—or is this not the case, is it rather mixed in some other way than by respiration?—what is the difference between the air in the air-duct and the outside air? It is reasonable—perhaps inevitable—to suppose that the former surpasses the latter in fineness.

Again, is it warm by its inherent nature or by the influence of something else? For it seems that the inner air is just like the outer, but it is helped[2] by the cooling. But which is really the case? for when outside it is soft, but when enclosed the air becomes breath, being as it were condensed and in some manner distributed through the vessels. Or must it be mixed in some way, when it moves about in the fluids, and among the solid particles of the body? It is not, therefore, the finest of substances, if it is mixed. We may, however, reasonably expect that the substance which is first capable of receiving soul should be the finest, unless, indeed, soul is something such as has been described, i. e. something not pure nor unmixed; and[3] that the air-duct should be capable of receiving the breath, while the sinew is not.

There is this difference too, that the sinew is tensible, but the air-duct is easily broken, just like a vein.

The skin contains veins, sinews, and air-ducts—veins because when pricked it exudes blood, sinews because it is elastic, air-ducts because air is breathed through it—for only an air-duct can admit air.

The veins must have pores in which[4] resides the bodily heat which heats the blood as if in a caldron; for it is not

[1] 483b 1. Substituting a dash for the full stop after ἔχει (W. D. R.). This seems to be the only way of translating the words as they stand. The relative use of ὅσα is found occasionally in Attic writers. In Bonitz' Index the only instances given are ὅσα πρό, *Problems* 876a 11, and ὅσα in a quotation from Euripides, *Rhetoric* 1371b 32 and *Prob.* 917a 14; but as examples occur sporadically from the time of Homer to that of Lucian, the construction must at any rate have been possible to the author of the *de Spiritu*.

[2] Apparently an echo of *de Part.* 473a 24, where οὐδὲν ἧττον 'helps' πρὸς ταύτην τὴν φθορὰν, i. e. is a safeguard against destruction by causes of θερμόν.

[3] τὴν ⟨δ'⟩ ἀρτηρίαν. So, perhaps, the Latin translation.

[4] Reading ἐν οἷς.

hot by nature, but is diffused like molten metals. [[1] For this reason too the air-duct becomes hardened, and has moisture both in itself and in the coats which surround its hollow passage.[1]]

[2] It is also proved both by dissection and by the fact that the veins and air-ducts, which apparently conduct the nutriment, connect with the intestines and the belly. From the veins the nutriment is distributed to the flesh —not sideways from the veins but out at their mouths, as it were through pipes. For fine veins run sideways[3] from the great vein and the windpipe along each rib, and a vein and an air-duct always run side by side.[4]

The sinews and veins form the connexion between the bones, joining them with the centre of the body, and also form the meeting-place[5] between the head and the body, through which fishes receive nutriment and breathe; if they did not respire, they would die immediately on being taken out of the water.

484[a] But it is plain even from observations of sense that the veins and air-ducts connect with each other; but this would not occur if the moisture did not require breath and the breath moisture,—because there is warmth both in sinew, in air-duct, and in vein, and that which is in the sinew is hottest and most similar to that of the veins. Now the heat seems unsuited to the space where the breath is located, especially with a view to refrigeration: but if the animal produces and as it were re-kindles the heat by heat from without, then there may well be heat there. Besides this, permanence is in a sense natural to all things which have warmth, provided that nothing resists or cools it;[6] for that all things require refrigeration is practically proved by the fact that the blood retains its heat in the veins and as it were shelters it there; so when the blood has flowed

[1] This passage seems to be out of place.
[2] Here again there seems to be a dislocation, for it is not clear what is proved by dissection.
[3] Omitting φλεβῶν.
[4] Cf. the account of the veins in *H. A.* 513[b] 29.
[5] L. and S. 'The sutures of the skull', which is absurd; Lat. trans. 'magnum capitis os'.
[6] Reading σύμ‡υτόν πως . . . καταψύχοντος· ὅτι κτλ.

out it loses its heat, and the creature dies, through the liver having no air-duct.[1]

6 Does the seed pass through the air-duct? Is its passage due also to pressure, and does this take place only in process of emission?[2] Through this we have evidence of the transformation of the blood into flesh—through the fact that the sinews are nourished from the bones; for they join the bones together. Or is this not true? For sinew is found in the heart, and sinews are attached to the bones: but those in the heart do not connect with anything else, but they end in the flesh. Or does this amount to nothing, and would those which connect the bones be nourished from the bones? But we might say, that rather the bones themselves get their nutriment from the sinew. For this too is strange—since the bone is dry by nature and has no ducts for fluid:[3] while the nutriment is fluid. But we must consider first, if the nutriment of the sinews is from the bones, what is the nutriment of the bone. Do the ducts carry it both from the veins and from the air-duct into the bone itself? In many parts these ducts are visible, particularly those leading to the spine, and those[4] leading from the bones are continuous, e.g. in the case of the ribs; but how do we suppose that these ducts lead from the belly, and how does the drawing of the nutriment take place?[5]

Surely most bones are without cartilage like the spine, in no way adapted to motion. Or are they designed to form connexions?[6] And similarly, if bone is nourished from sinew, we must know the means by which sinew is nourished. We say that it is from the fluid surrounding the sinew, which is of a glutinous nature: but we must determine

[1] I take this obscure passage to mean that the fluids in the body is maintained by the warmth of the breath, the hot blood passing to the liver from the veins. The liver cannot be kept warm otherwise, because it has no air-duct to admit the breath to it as when the venous blood is cooled, the liver grows cold.

[2] There seems to be no connexion between this and what has gone before; we must assume a lacuna.

[3] Read ὑγρὸς. [4] Read καὶ τὰς &c. [5] Cf. on 5 4.

[6] The sentence is out of place here. It seems rather to belong to the next chapter, on the purposes for which the bones exist.

whence and how this arises. To say that the flesh is nourished from vein and air-duct, on the ground that blood comes from any point where you prick it, is false in the case of the other[1] animals, e. g. birds, snakes, and fishes, and oviparous creatures in general. The universal dispersion of the blood is a peculiarity of creatures with a large blood-supply: for e. g. even when a small bird's breast is cut, not blood but serum flows.

Empedocles says that nail is formed from sinew by a hardening process. Is the same true of skin in relation to flesh?

But how can hard and soft-shelled creatures get their nutriment from outside? On the contrary it seems that they get it from inside rather than out. Again, how and by what course does the passage of foods from the belly take place, and again their return into the form of flesh, unaccountable as it is? For this process seems extraordinary and absolutely impossible.

Do different things, then, have different nutriment, not all things being nourished by the blood except indirectly?

7 We must then consider the nature of bone, whether it exists with a view to motion or to support, or covering and surrounding, and further, whether some bones are as it were originators of motion, like the axis of the universe.[2]

By motion I mean, e. g. that of the foot, the hand, the leg, or the elbow, both the bending motion and motion from place to place—for the latter cannot take place either without the bending, and usually the supporting functions belong to these same bones. And by covering and surrounding I mean as e. g. the bones in the head surround the brain; and those who make the marrow the originator

[1] i. e. other than mammals.

[2] The motion of the circumference presupposes the fixity of the axis, and he is thinking of the spine, which can originate motion while itself unmoved. Cf. the account of the γίγγλυμος in *de An.* iii. 10. For πόλος = axis, cf. Plato, *Tim.* 40 B, quoted in *de Caelo*, 239[b] 30. Hesychius mentions πόλος = the crown of the head, which may be due to a misunderstanding of the present passage.

of motion treat the bones as primarily meant to protect it.[1] The ribs are for the purpose of locking together: the originator of motion, itself immovable, is the spine, from which spring the ribs for the purpose of locking the body together: for there must be something of this kind, since everything that is in motion depends on something that is in a state of rest.

At the same time a final cause must exist—under which head some class the originator of motion; i. e. the spinal marrow and the brain.

Besides these there are others which are at a joining[2] and whose purpose is locking together, e. g. the collar-bone, which perhaps is named the 'key-bone' from its functions. Every one is well adapted for its purpose, for there could be no flexion either of whole or parts, if the parts were not such as they are: e. g. the spine, foot, and elbow: for the bending of the elbow must be inwards to serve our purpose. Similarly the bending of the foot and the other parts must be such as it is. All exist for a purpose, and so do the smaller bones contained in these larger ones—e. g. the radius in the fore-arm to enable us to twist the fore-arm and the hand; for we should not be able to turn the palm down or up nor lift nor bend the feet if there were not the two radii[3] which are used in these motions. Similarly we must investigate the other details, e. g. whether the motion of the neck is due to only one bone or more. Also we must examine all that are for the purpose of gripping or knitting together, e g. the patella over the knee; and why other parts have no such bone.

Now all parts which are capable of motion are connected with sinews—and perhaps those concerned with action in a positive way[4] are especially so—thus we find sinews in the elbow, the legs, the hands, and the feet: the other sinews are for the purpose of fastening together all those bones which require fastening; for perhaps some, e. g. the

[1] Cf. Plato, *Tim.* 73 B.

[2] Reading *ἐπ' ἀναβολήν*.

[3] i. e. what we call the *radius* in the arm and the *tibia* in the leg.

[4] *πρακτικῶν κινήσεων*, i. e. necessary for a *πρᾶξις* which may also be a *πρᾶξις*, an action potentially 'moral', as opposed to *κινήσεις* which are involuntary, or connote no 'moral' impulse at all.

spine, have little or no function except that of bending,[1] for the substance which connects the vertebrae is a serum or mucous fluid; others are bound together by sinews—thus we find sinews in the joints of the limbs.

The best description of everything may be obtained by 8
an investigation like the present[2]; but we must adequately
5 investigate the final causes. We must not suppose that the bones are for the sake of movement; that is rather the purpose of the sinews or what corresponds to them, viz. the immediate receptacle of the breath which causes motion, since even the belly moves and the heart has sinews—but only some, not all parts have bones: every part must have sinews appropriate for performing such
10 motion or for[3] ⟨performing it well.⟩ For the cuttle-fish walks little and walks badly. We must take as a starting-point the fact that all animals have different organs for different purposes with a view to the peculiar motion of each, e. g. terrestrial animals have feet—those that are upright having two; others which move altogether upon the earth, the material of whose bodies is more earthy and colder, have several.

15 Some creatures again may be entirely without feet,[4] for it is possible for them under these conditions to be moved only by external force. Similarly, flying creatures have wings, and their shape is appropriate to their nature. The parts differ in proportion as they are to fly faster or slower. They have feet for the purpose of seeking food and to enable them to stand; bats are an exception; as they cannot use their feet, they get their food in the
20 air, and do not need to rest for the purpose; for they certainly do not need to do so for any other reason.[5]

The hard-shelled aquatic animals have feet on account

[1] Read ἀλλ' ἢ κάμψις.

[2] i. e. physiological.

[3] There is a lacuna in the MSS. which has not been satisfactorily filled. My conj. τὸ ⟨εὖ⟩ is not quite suitable, but is suggested by κακῶς of foll. line. Didot reads τὸ ⟨βαδίζειν⟩.

[4] ἐγχωρεῖ, sc. εἶναι.

[5] Reading οὐ δέονται γὰρ δὴ ἄλλως. For the feet of bats cf. *de Inc. An.* 714[b] 10–13, *Hist. An.* 487[b] 23. Bats do not need to rest, because animals with bad feet usually have good wings, *Hist. An.* 487[b] 26.

of their weight; thus they are enabled to move from place to place: all that concerns their other needs is as ordered by the individual requirements of each, even if the principle is not clear—e. g. why many-footed creatures are the slowest, and yet quadrupeds are swifter than bipeds. Is it because the whole of their body is on the ground or because they are naturally cold and hard to move, or for some other reason?

9 We cannot agree with those who say that it is not the heat-principle which is active in bodies, or that fire has only one kind of motion and one power—the power to cleave. For in the case of inanimate things the action of fire is not universally[1] the same on all – some it condenses, others it rarefies; some it dissolves, others it hardens; and so we must suppose that in the case of animate creatures the same results are found, and we must investigate the fire of nature by comparing her processes to those of an art; for different results are achieved by fire in the work of the goldsmith, the coppersmith, the carpenter, and the cook— though, perhaps, it is truer to say that the arts themselves 485[b] achieve these different results, for that by using fire as an instrument they soften, liquefy, and desiccate substances, and some they temper.

Individual natures work in the same way, and so they differ one from another; so that it is ridiculous to judge by externals; for whether we regard the heat as separating or refining, or whatever the effect of warming or burning is, the results will be different according to the different natures of the agencies which employ it. But while the crafts use the fire merely as an instrument, nature uses it as a material as well.

Certainly no difficulty is involved in this; but rather it is remarkable that nature, who employs the instrument, is herself an intelligent agent, who will assign to objects their proper symmetry together with the visible effects of her action: for this is no longer a function either of fire or of breath, so it is remarkable that we should find such

[1] Reading ἅπαν.

a faculty combined with these two bodies. Again, with regard to soul we find the same cause of wonder, for it must be assumed in the functions of these two, and therefore there is some sense in referring to the same agent—either generally or to some particular creative part—the fact that its motion always operates [1] in the same way; for nature, from which they are generated, is always constant. But now what variation can there be in individual heat, whether we regard it as an instrument or material, or both? The variations in fire are simply quantitative; but this is practically a question of whether it is mixed with other substances or unmixed, for the purer substance has the proper qualities of its kind in a higher degree.

The same statement applies in the case of all other simple things; for whereas there is a difference between the bone and flesh of a horse and those of an ox,[2] this must be the case either because they are produced from different materials, or because the materials are used differently. Now if they are different, what are the distinctive characteristics of each of the simple things and what is . . .? for it is these that we are seeking.

But if they are the same in nature, they may be different in their proportions: for one or the other must be the case—as holds good with other things—for the consistencies of wine and honey are different on account of the difference of substance; difference in wine itself, if there is any, is a matter of proportion.

And so Empedocles [3] stated the nature of bone too simply; for, on the supposition that all bones follow the same proportion in the mixture of elements, the bones of a lion, a horse, and a man ought to be indistinguishable; whereas they actually differ in hardness and softness, density, and other qualities. Similarly [4] with the flesh and other parts of the body.

Further, the various parts in the same creature differ in density and rarity, and in other qualities, so that the

[1] Reading *ἐνέργειαν*.
[2] Reading *ἡ ἵππου καὶ ἡ βοός*.
[3] Reading 'E. *λίαν ἁπλῶς . . . φύσιν, ⟨ἐπεὶ⟩ εἴπερ* κτλ. (W. D. R.): cf. *Meteor.* 339b 34, 365a 26.
[4] Reading a colon after *ἄλλοις*.

blending of their constituents cannot be identical; for, granted that coarseness and fineness, greatness and smallness are quantitative differences, hardness, density, and their opposites certainly depend on the qualitative nature of the mixing. But those who give this account of it must know how the creative element can vary, by excess or deficiency, by being in isolation or in combination or heated in something else, like food that is boiled or baked,—which last is perhaps the true explanation; for in the process of mixing it produces the effect designed by nature. 486[a]

So I suppose we must give the same account of flesh; for the variations are the same; and practically the same observations apply to the veins and air-ducts and the rest; so that, in conclusion, either the proportion observed in their mixture is not constant, or the definitions must not be stated in terms of hardness, density, and their opposites. 486[b]

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