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At the beginning of the Physics, Aristotle writes that "we do not think we know a thing until we are acquainted with its primary conditions or first principles, and have carried our analysis as far as its simplest elements" (184 a 12).[1] In this and other treatises dealing with the natural world, he pursues several such investigations with a variety of results. Physics i.6 recommends the opinion that there are no more than three elements, and that these are substratum, form, and privation, a doctrine repeated and expanded in Metaphysics xii.4. Are these passaged consistent with the assertion in De Caelo i.8 that there are three elements each distinguished by a characteristic form of locomotion? Shall we interpret De Caelo as distinguishing three or five elementary bodies? Are these elementary bodies less elementary than the qualities analyzed in Generation and Corruption? Or has Aristotle more than one doctrine of the elements of natural entities? Such questions as these have been dealt with by supposing that the texts in question have been subject to repeated revision and editing, either by the author or by later hands,[2] or by supposing that Aristotle sometimes uses the term "element" to conform to a traditional usage, and then again refines it to suit his own theory.[3]

In this paper I shall argue that Aristotle's use of στοιχεῖα is fundamentally in keeping with the definition stated in Metaphysics v.3. That definition states a common or traditional use of the term, and adds the author's specifications of his own precise meaning. It is a definition which provides for there being a variety of elements, a set for every analysis which begins with a compound, or which, in the order of coming to know, begins with somewhat confused ordinary experience.

In Aristotle's philosophical lexicon, the meaning of "element" common to all usages, literal and transferred, is stated this way: "the element of each thing is the first component immanent in each" (1014 b 15).[4] Aristotle's own more precise meaning adds to that formula "and indivisible in kind into other kinds" (a 26). Thus we may, as Aristotle does in illustrations which follow the definition, distinguish elementary parts of speech, elementary geometrical proofs, and elementary bodies. These may be, and indeed often are, open to further analysis of some kind. But if genuine elements have been correctly identified in some specific analysis, then any further analysis would have to follow some new principle of division. The result of the new operation will be either an arbitrary subdivision (a gallon of water is a portion of, not an element of, water), or else entities of a different order (a word, although part of a geometrical principle, is not a more elementary geometrical principle).

The definition provides, then, that there are many possible sets of elements, different sets being appropriately present in various objects of knowledge and therefore necessary to the corresponding science. This is of course an observation which is not only obvious but also commonplace when it is applied to generically different branches of study, such as grammar, geometry, and physics. But it also applies within the study of nature to

specifically different questions. In the discussion which follows, I shall consider a series of these sets as they are analyzed out in the series of studies of nature which begins with the Physics and goes on to the Meteorology.

The line of Aristotle's argument in the first book of the Physics is quite straightforward. Chapter one begins by remarking that if what we examine has causes, principles, and elements, our study is not complete until we have pursued the inquiry so far as the discovery of the simple elements. So it is with the study of nature; appropriate elements, causes, and principles must be elicited. Book one attends to the elements; other sorts of causes and principles are sought in subsequent books.

The familiar admonition that we must begin with what is obvious to us has its application in the search for elements. The study of nature has two starting points in what is ready to hand: the scholar's acquaintance with previous theories, and the ordinary experience of the man who has not yet attained scientific knowledge. Both of these must be used in order to ensure that the theory to be discovered is a comprehensive one.

In ordinary experience we encounter what is complex and composite. Aristotle uses previous theories as a tool with which to analyze components and discover principles. Chapters two through six lay a ground in previous opinions for Aristotle's own theory of unity and contrariety. Here also Aristotle makes it clear that what he is discussing is becoming. Thus the theory that being is one and immovable is not a theory of physics (184 b 25); by contrast, physicists study generation and becoming (185 a 13 et passim). The analysis of the tradition makes it seem likely that there are three elements (189 b 17).

Aristotle's own theory, put forward in chapter seven, examines what we experience of "becoming in its widest sense" (189 b 31). Five kinds of becoming are distinguished; each of the five involves a substratum which survives the change, and the result of the change is always a complex rather than a simple entity. Every case of becoming involves a contrariety, so in a sense there are two principles. But two is not enough; one must not forget the substratum which undergoes the change. Its appearance alters, but we can achieve a scientific knowledge of it by analogy. There are, then three principles of becoming. These are the elements of 189 b 17: a substratum and a contrariety of privation and form.

In this analysis, Aristotle uses both the term "element" (στοιχεῖα) and the term "principle" (ἀρχή), and seems to use them interchangeably. One explanation is that his mind is not quite made up on a doctrine of elements, and that the terms are used tentatively. Another is that his discussion of the Presocratics makes it natural to use their term, "arche", when discussing their theories; this hypothesis seems especially attractive because, at 188 b 29, Aristotle writes "so-called archai." But the joint use of the two terms is not a matter of mere indecision, or of mere convenience, as can be seen by reference to Metaphysics xii. There Aristotle is quite explicit about the relation of element to principle. In chapters three and four of Metaphysics xii, Aristotle repeats the argument of Physics i, six and seven, in an only slightly altered form.

The topic of Book twelve is substance. The chapters in question deal with sensible substance, which is changeable (1069 b 3). There are three elements and principles involved in the change; these are matter, form, and privation (1070 b 17). These three are elements of perceptible bodies qua changing, but change may also involve an external moving cause; this external efficient cause is a principle, though not an element (or constituent) in the thing changed (b 23). Thus all three elements are principles, although not every principle is an element. The elucidation of this relationship of principle to element was not possible in the first book of the Physics, since the clarification depends upon the definition of the four causes, and these are not defined until the second book. But with this clarification we can see that the analysis of the elements of becoming is complete and coherent.

Early in Physics ii, Aristotle mentions what we commonly think of as elements when he writes "'By nature' the animals and their parts exist, and the plants and the simple bodies (earth, fire, air, water)" (192 b 9). This promising start does not, however, lead to analysis of the elements of body. The remaining books of the Physics consider further questions having to do with change. These discussions are rather technical considerations of such conceptions as causation, time, and place, and the problems of the void and of continua. By these means Aristotle works forward finally to the doctrine of the rotation of the heavens under the influence of the unmoved mover. There is here no fresh opportunity to elicit elements. Nevertheless, Aristotle does allude in passing to fire and air as elements (iii. 5 204 b 13-17). I take this mention as an indication that he anticipated presenting the analysis which occurs in the first book of De Caelo. What the whole procedure of the Physics illustrates, in regard to the problem of elements, is that the quest for elements is characteristically a fundamental step taken upon confronting gross entities met in ordinary experience. The Physics as a whole exhibits the plan announced at its beginning, of proceding from what is prior in the order of learning to what is prior in the order of nature.

De Caelo begins with the whole array of systematic principles and theoretical conceptions arrived at in the Physics. Still it confronts one vast complex body given in ordinary experience: the whole perceptible cosmos. One of Aristotle's tasks now is to use the doctrines he has established to sort out the elements of body. So it is that the first book gives concentrated attention to bodies as such. The analysis of body uses the conception of locomotion introduced in the fifth and subsequent books of the Physics, and develops that conception further.

Aristotle writes: "the sum of physically constituted entities consists of (a) bodies and magnitudes, (b) beings possessed of body and magnitude, (c) the principles or causes of these beings" (268 a 4).[5] Body is described as "the only complete magnitude" (a 23), completeness following from the leading characteristic of body, that it is "divisible in all ways" (a 7), or is "completed by the number three" (b 26). This formula "a complete magnitude" is not to be taken as an identification of body with pure extension. A strictly mathematical entity would be an abstract notion rather than a real existent thing (278 a 1, and cf. 193 b 31). In order to be complete, body must have further characteristics in addition to pure magnitude. These are the principles, properties and motions mentioned in 268 a 6. Motion is of central importance to body, as it is to nature in general.[6] All bodies can

move, and indeed do so naturally (301 a 21), although only the primary body does so perpetually.

Local motion has been shown in Physics vii.2 to be primary in the order of nature (243 a 12); in viii.9, circular motion proved prior to rectilinear (265 a 13). Aristotle now shows that there are three kinds of simple locomotion (268 b 21). One wonders at first why he does not describe them as elementary. The answer to this question is that the analysis of elements belongs to the introductory stages of a study when compounds are being examined, as has been shown in regard to the analysis of the elements of becoming in Physics i. Locomotion is the last of the motions of things subject to becoming, although it is primary in the order of nature (260 b 29). Thus it would be inappropriate to describe the simple motions as elementary. Aristotle has arrived, in the study of change, at a stage of understanding primary principles; these include, now, the three kinds of simple motion. Therefore it is not necessary to arrive at them by analysis of complex movements, as it would be if moving bodies were only to be understood from observing, for instance, the complicated performance of an energetic child running, jumping, rolling a hoop, and falling down. The earlier study has led us to a place where we know, as it were, where to look to find simple motions occurring. Now it is possible to proceed, and use those simple motions to discover something about the elements of the bodies which perform the motions.

Chapters two, three, and eight are crucial for the division of the elements. Chapter two correlates simple body with simple motion: there are three simple motions, and three simple bodies. The possibilities are mathematically conceived; straight and circular lines are the only simple magnitudes; the motion of bodies in a cosmos must follow these lines or some combination of them. Motion along a straight line in a cosmos must be upward, away from the center, or downward, toward the center. Every motion may be resolved into one or more of these three. Bodies, like their motions, must be either simple or compound. The simple bodies are those which "contain a principle of natural motion, like fire and earth and their kinds, and the other bodies of the same order" (268 b 28), a remark which lays a basis for the later discussion of the elements. Circular motion is prior, and the body which rotates is of a higher nature than the others. Chapter three goes on to establish that the body which has circular motion has neither weight nor lightness, these being characteristics of bodies which move downwards or upwards, either relatively or absolutely. Nor can this body be susceptible to generation or destruction, or any other sort of becoming; these processes involve a substratum and contrariety (270 a 15), which the primary body does not have, since no motion is contrary to its perpetual circulation.

After further discussion of circular motion, and consideration of the opinion that the world is infinite, Aristotle goes on in chapter eight to demonstrate that there is only one world. It is here that he defines the elements of body.

Chapter eight begins with the question of whether there is any other world than this, and ends with Aristotle's remark that "we have now said sufficient to clear up the subject of the nature and number of the physical elements, and what is the natural place of each" (277 b 24). He argues from

the doctrines of natural place and natural motion that, were there more than one world, the natural motions of the bodies in each would unify them into a single whole. This conclusion follows from the "assumptions about the motions of simple bodies, namely that they are limited in number and that each of the elements has a particular motion assigned to it. Consequently if the motions are the same, the elements must also be the same wherever they are" (276 b 8). The "assumptions" are those established in the earlier chapters, where simple motion is associated with simple body. Here, as earlier, Aristotle's examples are of the upward movement of fire and the downward movement of earth (277 b 3).

Precisely how many bodies are elementary, according to this analysis? Translators and commentators seem frequently to discover four sublunary elements as well as the superlunary body. Four passages have particular bearing on this question. They are 268 b 28, where simple body is associated with simple motion: 269 b 29, which mentions air and water; 276 b 11, which asserts that if the motions are the same, the elements are the same; and 277 b 14, which describes (somewhat obscurely) the natural places of the elements. Let us take them in order.

Simple bodies "contain a principle of natural motion, like fire and earth and their kinds (τὰ τούτων εἴδη) and other bodies of the same order (τὰ ὁμογενῆ τούτοις)" (268 b 28). Guthrie following Cornford, suggests that the "kinds" are varieties within each element[7] (stone and clay are varieties of earth). "Other bodies of the same order" is generally taken to mean air and water. But need we take them to be elements properly speaking? There are only three motions (270 b 30), and bodies whose motion is rectilinear must move either upward or downward. Heavy bodies move downward, light upward, either absolutely or relatively; thus "air is light in comparison with water, but water in comparison with earth" (269 b 29). The inference is not that water and air are equally elementary with earth and fire. Even though light in relation to earth, water is still of the same order as earth because its most characteristic motion is downward. As Aristotle writes at 276 b 11, if the motions are the same, so must the elements be. Consequently, we must interpret the phrase "of the same order" to mean that air is of the same order as fire (upward moving) and water of the same order as earth (downward moving).

We noticed earlier that Aristotle's division of the elements of body is tied to his argument that the cosmos is finite and unique. He uses the doctrine of proper place as a tool with which to achieve both objectives. Chapter eight ends with a passage which, however obscure in relation to the question of the uniqueness of the cosmos, is quite definite about the number of elements. "There are three corporeal elements, therefore there must be three natural places for them, one around the center for the element which sinks, a second (the outermost) for the revolving element, and a third between them for the body of intermediate nature "(277 b 14). Aristotle goes on to argue that the place between center and circumference belongs to the body which rises (τὸ ἐπιπολάζον), and that it cannot be outside that place, since the center belongs to the heavy body; and anyhow if the rising body were elsewhere, in an unnatural position, there would have to be another body which had that position naturally. No such body exists. The difficulty occurs in 277 b 19, with the clause τὸ μὲν γὰρ ἄνω

τὸ δ' ἔχον βάρος. Guthrie takes Aristotle to intend a distinction between a weightless body (fire) above, and an intermediate body having a certain (but not absolute) weight below. This he interprets the whole passage as asserting earth at the center, revolving fire, and an intermediate between them.[8] But surely this explanation is overcomplicated. Perhaps it is preferable to read "as well as a weight-less body [τὸ ἐπιπολάζον] there is also a body with weight" (earth) and the lower place belongs to the latter. The subsequent steps in the argument may then be considered as a somewhat truncated form of the discussion in chapter nine, beginning at 278 b 24; supplementing 277 b 18-23 with what is said in the later passage, we can understand the line of arguments as follows. Since the lower place belongs to earth, the rising body cannot be there. Nor could the rising body be beyond the revolving body, in a place unnatural to the rising body but natural to something else, because there is nothing else. If there is no other body which would naturally occupy a place beyond the revolving body, then there is no place there, and consequently τὸ ἐπιπολάζον could not rise to it, even unnaturally.

On this interpretation, we can discern three bodies, three motions, and three places. Since the distinction of elementary bodies depends upon the difference of motions, we can only distinguish two kinds of bodies in addition to what revolves. Inside the revolution there can be only downward moving earth and upward moving fire.

From discussing the unity and uniqueness of the world, and the systematic relations of its bodily elements, Aristotle goes on to argue for the perpetuity of the world. In Book two he concentrates on the heavens: the discussion of elements does not arise as such.[9] The third chapter is nevertheless of particular interest to the present study, since it involves the three kinds of elements with which we are concerned here. In addition to the elements of body, as they are distinguished in De Caelo, this passage also considers what were found in the Physics to be elements of becoming, and looks forward to the doctrine of elementary qualities in Generation and Corruption. It does so without ever using the word "element," perhaps because to do so would lead to verbal confusion, but more likely because the focus of the chapter is upon the structural wholeness of the cosmos, rather than upon the search for components. The argument is not from observed facts, but from the necessities of the case, and it involves several kinds of opposition. First, circular motion must have a still center, therefore there is the earth. Earth requires fire, its contrary both in respect to place and in possession of the positive form, heat, required by the earth's privative state, cold. There are intermediate conditions between these contraries, earth and fire having a common substratum. Rectilinear motion not being eternal, there is generation and corruption. The interrelation of the elements of moving body (rotation, upward, and downward motion), the elements of becoming (substratum, form, and privation), and elementary perceptible qualities (represented by heat and coldness) is set forth in this one brief paragraph.

When in Book iii Aristotle turns his entire attention to the sublunary world, he introduces the discussion by remarking that "the study of nature is concerned for the most part with bodies;" (298 b 12) the simple bodies, their compounds, their movements and transmutations are to be examined. With this

enlarged range of topics, attention must be paid to a variety of things observed in addition to the theoretical principles of physics. Books iii and iv look forward increasingly to the problems and conceptions of Generation and Corruption. The earlier analysis of the elements of body by means of the three simple motions was useful for understanding the structure of the cosmos; it proves to be somewhat less adequate to explain the rich texture of terrestrial experience.

Conformably to the doctrine of the earlier books of De Caelo, Aristotle writes early in book iii that, having "dealt with the first element, it remains to speak of the other two" (298 b 6). The usual review of precious literature is conducted, this time so as to show that generation is a fact and motion is natural. There follow a definition expressed in terms strikingly similar to those of Metaphysics. This time, however, Aristotle is defining "element" as it applies to bodies: "that into which other bodies may be analysed, which is present in them either potentially or actually ... and which cannot itself be analysed into constituents differing in kind" (302 a 16). He goes on to point to the observation that fire and earth can be separated out of flesh and wood (302 a 21). The argument now proceeds on the same basis as the discussion in the first book, that is, kinds of movement (303 b 6), leading to the conclusion that there is a limited plurality of elements (304 b 21). The elements themselves are not eternal; their dissolution is an observed fact. Aristotle rapidly goes on to argue that they must be generated out of (as well as dissolved into) each other, since there is nothing else (305 a 32). There cannot be anything else, because all the places in the cosmos are occupied by the elements already derived. The phenomena of generation and corruption cannot be accounted for by mechanical separation as might seem likely, given the emphasis on motion; transmutation must then be the proper explanation (305 b 28). The looming problems of transformation lead Aristotle to write that the differences in bodies are to be sought in their affections, functions and powers (307 b 20), but he does not pursue the topics; these considerations must wait for Generation and Corruption.

Book iv goes on to examine the principles of weight and lightness, and arrives at an account of intermediaries which seems not entirely satisfactory to its author. The account should be straight-forward, since it concerns kinds of bodies distinguished by so clear a principle of division as motion and proper place. What seems to cause Aristotle concern is that water moves up relative to earth, but down relative to air. His estimate of the situation is that all bodies except fire have weight, and all except earth have lightness (311 b 5). Evidence drawn from such observations as that an inflated bladder weighs more than an empty one suggest that Aristotle may be prepared to consider that water and air are compound bodies with compound motions. But the derivation of water from earth and fire would be wholly contrary to fact; it would also have the disadvantage that it would make the form of water dependent on the form of earth, whereas Aristotle wants to argue that what "surrounds is on the side of form, that which is surrounded on the side of matter" (312 a 12). Instead of making water and air compound, the argument stipulates that the theory of place provides center, extremity, and a place between them. The intermediate place is an upper extremity of earth, and a lower extremity fire. It is also their center. "Owing to this there is something else heavy and light, namely water and air" (312 a 11). At the end of the chapter, the assertion is made that there is a single matter, distinguished logically into the heavy and the light (312 a 19). In the succeding

argument in the next chapter, the distinction is strengthened by an assertion that there are four kinds of matter to match the four bodies; it is then somewhat weakened when Aristotle adds apologetically that "there is no reason why there should not be either one or more intermediate stages, as in colours," generation proving that there is one common matter underlying the several stages. Aristotle does not refer to the four bodies as "elements," though he does say they are primary. What one finds in these later arguments in De Caelo, is an attempt to move away from the theory of the structure of the cosmos as a whole, towards the principles which will account for the observed transformations of the four simple bodies.[10] The earlier part of the treatise derives elements from theoretically different forms of motion, as these can be applied to the whole observed physical world. The arguments in the last book, however, seem to be of a different sort. We have noticed before that Aristotle elicits elements from given experience of complex unities when compounds are being examined; a derivation of this sort belongs to the introductory stages of a study. What we find in the last book of De Caelo is a study of a different sort. It aims toward adjusting a doctrine achieved mainly by a priori argument to the observed differences among the simple bodies. As Aristotle writes in Metaphysics, "no product of analysis is observed except the simple bodies" (1066 b 36). Observations of this nature guide Aristotle's argument. Another and equally important motive is also at work: a preliminary investigation is going forward towards the next study. The end of De Caelo does groundwork for Generation and Destruction. Naming earth, air, fire and water as primary (but withholding from them the epithet "element") clearly anticipates the doctrine of four elementary sensible qualities in the latter work.

The first book of Generation and Corruption concerns itself with achieving definitions of the various sorts of change which fall under the heading of coming to be and passing away. Book ii then enters upon the study of elements. Aristotle refers to the four simple bodies as "so-called elements" (328 b 32, 329 a 27); he does assert that some such principles as these are required here: "the primary materials from the changes of which, either by association or by separation or by some other kind of change coming to be and passing away occur, are rightly described as sources and elements" (329 a 6). The subject of Generation and Corruption is, of course, becoming. Appropriately, Aristotle returns to the doctrine of elements found in Physics i. 6 and 7: "there is matter of which the perceptible contraries consist...it is not separable but is always accompanied by contrariety, and it is from this that the so-called elements come into being ... Therefore, firstly, the potentially perceptible body, secondly, the contrarieties (for example, heat and cold), and thirdly, Fire and Water and the like" (329 a 25 ff). Not much more can be said about matter than that its continuity is necessary to any series of transformations, and that it is inseparable from the contraries which it supports.[11] We can, however, investigate contraries so as to determine which of them are primary with respect to the others. Aristotle lists a range of contraries according to touch: hot/cold; dry/moist; heavy/light; hard/soft; viscous/brittle; rough/smooth; and coarse/fine (329 b 19-21).

Elementary qualities must be mutually active and passive - Aristotle is, after all, trying to account for the observed phenomenon of bodies which change into one another - and he eliminates the heavy and the light on the

grounds that they are neither active nor passive. Of the other pairs of tangible qualities, hot/cold and dry/moist prove to be primary; the other pairs (including hard/soft) turn out to be derivative. The discussion of these characteristics (ii, 2-5) is worth attending to.

Hot and cold, dry and wet are perceptible qualities of which the first pair is active, and the second passive. Heat associates things of the same kind, a principle illustrated by the ability of fire to drive out impurities. Cold associates things whether of the same or different kinds, as is obvious in the process of freezing. Of the second pair, the wet is what is adaptable to shape, but not easily confined within its own limits, but not easily adaptable in form. According to this analysis, talcum powder is moist rather than dry, and so is very fine sand, such as might be found on the sea shore. Aristotle foresees this application of his definitions, and asserts explicitly that the fine is derived from moisture because it pours, and adapts to the shape of the vessel. The coarse, on the other hand, is derived from the dry. Of the other derivative qualities, the viscous is wet, the brittle is (completely) dry; the soft is moist, and the hard dry.

The possible combinations of the four elementary qualities are also four in number, since contraries cannot join together. The four bodies result from the pairing of qualities. Fire is hot and dry; air is hot and wet; water is cold and wet; earth is cold and dry (330 b 1-7).

It is here that Aristotle produces a surprise: fire of the ordinary kind that burns on the hearth is not a simple body; and it is not, because it is too hot to be a true blend of hot and dry. It is, he writes, a "boiling of dry and hot" (330 b 29), an "excess of heat" (330 b 27). The genuine simple bodies must be fiery, airy, watery and earthy, but all these in moderation, each proper blend of qualities yielding a simple body, these bodies again related to each other as new (derivative) pairs of contraries. Fire, for example, being hot and dry, is contrary to water, which is cold and wet; similarly air (hot and wet) is contrary to earth (cold and dry).

This account of the basic principles of nature shows a certain systematic neatness. From a limited number of principles, a substratum and two pairs of contraries, Aristotle has generated four simple bodies of such a nature that alteration from one to another is possible by the change of a single quality. Hot dry fire, becoming less dry, produces hot wet air; if the heat yields to cold, water emerges, if the wet yields to the dry, earth is generated. The qualities conceived by Aristotle account, among other things, for sand at the seashore: it is an intermediate state between water and earth, having properties of both, as well as intermediate position. As bodies alter in characteristics, each acquires its appropriate motion: as fire becomes air, it moves downward; again air becoming water moves down, and even further down when what was water becomes earth. The opposite process also occurs in an upward direction. Thus when what is wet ceases to be cold and becomes hot, air is generated out of the demise of water, and rises upward, a change of quality resulting in appropriate motion.

What Aristotle has discovered in Generation and Corruption is the set of

elementary qualities which provide a transition in explanation from the elements of Physics i. 6 and 7 to the elementary bodies of De Caelo. The former, a substratum and a contrariety of form and privation, seemed at first to have only the name "elements" in common with the bodies distinguished by motion in the later book. But Generation and Corruption shows that where one studies things subject to becoming, the first set of elements can be shown to be related to the second by the insertion of an intermediary set, the elements of perceptible qualities. These last do not constitute a set which is really different from the first set; what Aristotle has done is to specify which contrarieties are the most primary in natural transformation. At the same time, Aristotle has not really denied the analysis produced in De Caelo. There locomotion was the primary characteristic of elementary bodies, whereas in Generation and Corruption active and passive qualities are taken as elementary, weight and lightness derived from them, and motion derived from weight and lightness. What is prior in one analysis is subsequent in the other; but priority can be asserted in different senses. Aristotle specified in the Physics that locomotion is primary in nature, but it is the last of the changes of things that are subject to generation. Beginning from the phenomena, perceptible contraries come first; but absolutely, motion is primary. Thus in Meteorology Aristotle asserts that beneath the heavens is a matter which is potentially hot, cold, wet, or dry, but it only acquires these "and any others consequent upon these" as a result of motion and rest (340 b 15). The motion of the sun heats the region below it, causing the sequence of events which constitute generation and destruction of simple bodies; the progression of the sun produces the variations of primary perceptible qualities which we perceive as seasons and as weather.

In his studies of nature, Aristotle pursues a series of inquiries which are specifically different, but all of which are connected. In these studies, he elicits a series of sets of elements, each set being necessary to the investigation of which it is a fundamental step. None of the steps can be said to be abandoned in favor of later ones. Even Aristotle's derivation of the four simple sublunary bodies in the fourth book of De Caelo does not entirely contradict his earlier analysis in terms of upward and downward motion. It retains the main structure of that analysis, and works toward the investigation of the transmutation of bodies. Thus, in regard to the problem of elements, the last book of De Caelo is preliminary to Generation and Corruption.

Each of the sets of elements examined does discover primary constituents of an appropriate sort. Substratum, form, and privation are, as Aristotle insists, the most fundamental set for the study of generable objects. But the conception of the whole of body requires analysis in terms of the activity which belongs to indestructible body, and that is motion. The thorough analysis of generation requires not only the understanding of the principal role played by the motion of the sun, but also, in its focus on seasonal change, an account of such perceptual qualities as pervasive sensations of weather. The principles of eternal things are eternal; of sensible things, sensible (306 a 9). Yet eternal principles also operate in the sensible world. It is desirable to arrive at a theory of nature which works both on the way to first principles and on the way back from first principles to perceptions.

cf NE I, 4

Notes

[1]I have generally used the texts in the Loeb Classical Library, and have quoted from the translations of W. K. C. Guthrie, On the Heavens, E. S. Forster, On Coming-To-Be and Passing-Away, and H. D. P. Lee, Meteorologica. I have also used the Hardie and Gaye translation of the Physics, and the Ross translation of the Metaphysics in the Oxford edition.

[2]See Dr. A. P. Bos' interesting study On the Elements (Assen, 1973).

[3]Robert Sokolowski, "Matter, Elements and Substance in Aristotle," Journal of the History of Philosophy vii.3. July, 1970, pp. 263-288 is an especially helpful study.

[4]As "component" suggests, elements usually function as matter; but they may also be primary principles of a formal sort.

[5]Including elements

[6]Were a magnitude immovable, it would be a mathematical object (De Caelo 305 a 26).

[7]Guthrie's note in On the Heavens, p. 12.

[8]Ibid, pp. 80-81n.

[9]The sole mention of elements is an allusion to Empedocles (295 a 30).

[10]See Friedrich Solmsen, Aristotle's System of the Physical World, Cornell Studies in Classical Philosophy XXXIII (Ithaca, 1960), pp. 283-4; cf also the interpretation of Simplicius 20, 10, quoted by Guthrie, Op. Cit. p. 259n.: "fire and earth are more basic elements than are air and water.

[11]James W. Dye, in "Aristotle's Matter as a Sensible Principle" (unpublished MS), p. 15, points out that although the matter which underlines a specific process of change is not directly observable, it can be "gotten out of" the process by analyzing the steps of the transformation in a way analogous to equation - solving.