PHIL 204/Week 7/2017: Notes on Reading 7

***Physics* 1.7, 2.1, 2.3; *On Generation and Corruption* 2.2-4.**

Background:

Aristotle begins the *Physics* with a discussion of method (*Physics* 1.1, not included in the reading). He notes that scientific knowledge is knowledge of what he calls PRINCIPLES and CAUSES. In another work, the *Posterior Analytics*, he gives a detailed account of the nature of scientific knowledge in general. In the *Physics* he is concerned with the special case of physical, or natural, change and permanence.

Aristotle 's goal is here is to give an account of the nature of the physical world. His procedure is strikingly different from that of a modern physicist. What he is trying to do is to locate the appropriate set of concepts for thinking and talking about the physical world. He starts from the observation that we do manage to say true things about the world and examines in detail the way we talk about change.

The analysis of the language of CHANGE begins in *Physics* I.5 (not included in the reading). Aristotle observes that though, for example, it may be true at one time that Socrates is both a non-vegetarian[1] and pale and at later time that he is a vegetarian and dark we do not properly describe a change by saying something like 'Socrates who was pale is now a vegetarian'. It is part of our concept of change that change always between OPPOSITES. So we say that Socrates changed from being a non-vegetarian to being a vegetarian. In effect, then, there is a change when at one time something is absent and at another, later time it is present[2]. We say, for example, that 'from being a child Socrates comes to be an adult', 'from being happy Socrates comes to be sad '. The general formula is 'from not being *X* (or from being non-*X*) *A* comes to be *X*. Here *A* is called the SUBJECT, or SUBSTRATUM, of the change.

So the proper description of any change requires us to mention CONTRARY OPPOSITES non-*X*, and *X*, that is features which cannot both be present at the same time, and an UNDERLYING subject.

In general there are two kinds of case to be considered. First, what Aristotle calls SUBSTANTIAL CHANGE, or UNQUALIFIED COMING-TO-BE. Something, just comes-to-be without qualification, that is something comes to exist which did not exist before. For example, Socrates, and so an individual human being, comes to exist. Second, ACCIDENTAL CHANGE, or QUALIFIED COMING-TO-BE. An existing subject comes to have some accidental feature which it did not have before. For example, Socrates who was pale (non-dark) comes to be dark by spending some time in the sun. Aristotle wants his general analysis to cover both kinds of cases. Note that for there to be a change the accidents have to belong to the same category and to belong to the same kind, i.e. genus, of item within that category. So Socrates changes from being pale = non-dark (i.e. lacking an individual accident of the genus colour in the category of quality) to being dark (i.e. possessing an individual accident of the genus colour in the category of quality)

The details are worked out in *Physics* I.7 (included in the reading). Aristotle notes that we talk about change in various ways:

We can properly say: (1) a man becomes a vegetarian. (2) a non-vegetarian becomes a vegetarian. (3) a non-vegetarian man becomes a vegetarian man.

[1] Aristotle 's example is 'musical ' which can mean something like 'able to play a musical instrument '. I've used non-vegetarian / vegetarian instead since we don't use 'non-musical' in the way that Aristotle does.

[2] In general the situation is more complictated since something changes if it has a feature at some time but does not have it at a later time but Aristotle is considering the simplest case.

According to Aristotle (1) and (2) characterise change in terms of 'simple things', whereas (3) characterises it in terms of 'composite things'.

Aristotle's fundamental thesis is that only (3) tells the full story. It locates something which remains throughout the change. That is, to properly characterise a change we must locate the subject of the change which remains one and the same thing through the change. As Aristotle puts it, there is something which remains NUMERICALLY ONE AND THE SAME during the change but which has a different FORM at the end to that which it had at the beginning. Aristotle often contrasts the beginning state in terms of PRIVATION and the end state in terms of FORM.

Aristotle thus holds that something which changes is ONE IN NUMBER BUT NOT ONE IN FORM.

Since the theory is supposed to be completely general the coming to be of substances must be analysed in the same way as accidental change.

In general Aristotle calls the subject of change MATTER and the two contrary determinations PRIVATION (which in the case of accidental change is an accidental form) and FORM. For example, a lump of bronze which starts as statue of Achilles and ends up as toasting fork.

The philosophical problem for Aristotle is to establish just how many distinct principles are needed to account for change. He notes that we can say that there here are two principles, privation and form but more properly there are three principles: (i) underlying subject, (ii) privation, (iii) form.

A consequence of Aristotle 's general theory is apparently that THERE MUST BE SOMETHING WHICH UNDERLIES ALL CHANGE, that is to say both acccidental and substantial change. See the paragraph at the bottom of p. 111: 'The underlying nature is an object of scientific knowledge, by an analogy. For as bronze is to the statue, the wood to the bed, or the matter and the formless before receiving form to any thing which has form, so is the underlying nature to substance, i.e. the "this" or existent.' Aristotle was understood in antiquity and the middle ages to be committed by this remark and others to the existence of an entirely undtetermined 'stuff' underlying all change, this was referred to as 'PRIME MATTER'.

In *Physics* Book II, Aristotle examines NATURE, CAUSE, or EXPLANATION, and NECESSITY.

Aristotle distinguishes:

(1) Two aspects of individuals (*Physics* II.1)

(a) their NATURES - what makes them the kinds of thing that they are

(b) their ACCIDENTS - features that could at least be imagined not to be present without the thing ceasing to exist - e.g. suppose that Socrates is bald, we could imagine him with hair, so his baldness is an accidental feature. Being an animal, however, is part of his nature.

(2) Four types of explanation (*Physics* II.3): An explanation may refer to (a) the MATTER, (b) the MOVER, (c) the FORM, (d) the GOAL. A full explanation will mention each of them

(3) Two types of necessity (*Physics* II.9 - extra reading below):

(a) unqualified, ABSOLUTE, or SIMPLE, necessity - for example the necessity with which fire is hot: if there is fire, then necessarily there is heat.

(b) conditional, or HYPOTHETICAL, necessity. Aristotle claims that we can say that, it is hypothetically necessary that humans have an organ of sight. He apparently means that it is true that if there is sight, then there is an organ of sight,(i.e. in order for there to be sight there must be an organ of sight). In

general his account of living things characterises them in terms of certain goals that have to be fulfilled - for example growth, movement, reproduction, and investigates what organs are (hypothetically) necessary for these goals to be achieved.

Physics II.8 argues that natures - the *PER SE*[3] PRINCIPLES of movement move individual substances in the direction of a goal. Aristotle insists that the regularity of the world and in particular the uniformity of reproduction cannot be explained by appealing to chance. Chance could not, for example, explain the suitability of particular kinds of teeth for eating particular kinds of food.

Examples of the application of Arisotle 's theory of explanation

1. Explanation of the existence of house: matter = bricks / wood; mover = builder; form = plan; goal = shelter

2. Explanation of the existence of a saw: matter = iron; mover = craftsman; form = idea in craftsman 's mind; goal = cutting wood.

3. Explanation of the existence of statue of Achilles: matter = bronze; mover = sculptor; form = idea in sculptors mind; goal = representation of hero (+ more complicated aims)

4. Explanation of the existence of a human being: matter = blood, bones, flesh; form = fully functioning adult (male) [more properly, the soul]; mover = fully functioning adult (male); goal = (reproduction of) fully functioning adult (male).

IMPORTANT: In the case of living things form, mover, and goal coincide.

So for human beings the form = the mover = the goal = the soul.

Physics II.9 worries about what kind of necessity natural movement towards a goal involves. Example: a saw:

Hypothetically necessary features of a saw: every feature of the saw that is explained by appealing to the purpose of a saw. Why does a saw have sharp teeth? - Because its purpose is to cut wood. Why is a saw flexible? - Because its purpose is to cut wood. General scheme: 'if something is to be a saw, it must be *X*' where *X* is sharp, hard, etc.

Absolutely, or simply, necessary features of a saw: - those features of a saw which are properties of the matter from which it is made. Example - why does a saw shine in the sunlight? - Because it is made of steel which reflects the light. Construction from the appropriate matter is a necessary condition for the existence of a saw, that without which there will not be a saw and so Aristotle sometimes characterises the absolutely necessary as 'that without which it cannot be'.

On Generation and Corruption Book II, chapters 2-4

Here Aristotle locates the two most basic pairs of contrary features. Hot:Cold and Dry:Wet. He argues that ultimately the physical world is constituted of four elements, or simple bodies, each of which has two of these features.

So fire = hot + dry; air = hot + wet; water = cold + wet; earth = cold + dry.

The elements may be transformed one into the other in cycle of change. Thus fire may be changed into earth by first replacing dry with wet, then hot with cold, then wet with dry:

[3] The *per se* or essential features of an individual of a particular natural kind are those features which it has because it is the kind of thing that it is. So, according to Aristotle, it is a *per se* feature of a human being that he or she is able to reason.

Hot & Dry → Wet

Hot → Cold & Wet → Dry

Cold & Fire → Air → Water → Earth

Extra Reading: Aristotle, *Physics* Book II, Chapter 9, on absolute and hypothetical necessity

'As regards what is "of necessity", we must ask whether the necessity is *hypothetical*, or *simple* as well. The current view places what is of necessity in the process of production, just as if one were to suppose that the wall of a house necessarily comes to be because what is heavy is naturally carried downwards and what is light to the top, wherefore the stones and foundations take the lowest place, with earth above because it is lighter, and wood at the top of all as being the lightest. Whereas, though the wall does not come to be without these, it is not due to these, except as its *material cause*: it comes to be *for the sake of* sheltering and guarding certain things. Similarly in all other things which involve production for an end; the product cannot come to be without things which have a necessary nature, but it is not due to these (except as its material); it comes to be for an end. For instance, why is a saw such as it is? To effect so-and-so and for the sake of so-and-so. This end, however, cannot be realized unless the saw is made of iron. It is, therefore, necessary for it to be of iron, it we are to have a saw and perform the operation of sawing. What is necessary then, is necessary on a hypothesis; it is not a result necessarily determined by antecedents. Necessity is in the matter, while 'that for the sake of which' is in the definition.

... If then there is to be a house, such-and-such things must be made or be there already or exist, or generally the matter relative to the end, bricks and stones if it is a house. But the end is not due to these except as the matter, nor will it come to exist because of them. Yet if they do not exist at all, neither will the house, or the saw - the former in the absence of stones, the latter in the absence of iron ...

The necessary in nature, then, is plainly what we call by the name of matter, and the changes in it. Both causes must be stated by the physicist, but especially the end; for that is the cause of the matter, not vice versa; and the end is 'that for the sake of which ', and the beginning starts from the definition or essence; as in artificial products, since a house is of such-and-such a kind, certain things must necessarily come to be or be there already, or since health is this, these things must necessarily come to be or be there already. Similarly if man is this, then these; if these, then those. Perhaps the necessary is present also in the definition. For if one defines the operation of sawing as being a certain kind of dividing, then this cannot come about unless the saw has teeth of a certain kind; and these cannot be unless it is of iron. For in the definition too there are some parts that are, as it were, its matter.