Existence as / of Location

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A simple argument in favour of places

1. Some things are such that if they exist, they are somewhere. For example: Socrates.
2. Socrates is.
3. Socrates is somewhere.
4. Socrates is in some place.
5. There is some place where Socrates is.
6. There is some place.

Problems

Place is where some thing, e.g. Socrates, is. Where something is changes if the thing grows; where something is also changes if the thing moves.

Place is where something is, so its identity depends on and is determined by that thing; but it is separable from the thing to the extent that it can be occupied by some other thing (i.e. some other thing can be in the same place where this thing was earlier).

Solutions

In IV.3, Aristotle distinguishes eight ways in which one thing may (be said to) be *in* another:

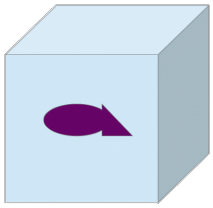
1. Parthood: the finger is in the hand.
2. Dependence: the whole does not exist apart from the parts and is in this sense in the parts.
3. Inclusion: MAN is in ANIMAL, the species in the genus.
4. Definition: ANIMAL is in MAN, the genus in the species, the part of the form in the definition.
5. Predication: HEALTH is in hot and cold things (that are healthy), the form in the matter.
6. Control / efficient causation: the affairs of Greece are in (the power of) the Persian king.
7. Telos: things are [fully realised] in their good.
8. Location: things are in a place.

Though this is not said very clearly, it seems safe to assume that for Aristotle, 'sense' (8) is the central one. This privileging affords us a way to explicate in what sense Aristotle gives a *place*-theory of location, rather than a *space*-theory as is more customary nowadays. A *space*-theory starts with a notion of space, taken primitively or 'from physics' and takes regions to be parts of space. Regions are parts of space in the sense of being included in it, in the following set-theoretical sense not listed by Aristotle (though it has some similarities to (3)): space consisting of points, a region R_1 is part of another region or the whole of space R_2 if every point that belongs to R_1 also belongs to R_2. But what does it mean for a point to 'belong' to a region, in what sense does space 'consist' of points? It is here that the 'taken from physics' aspect becomes

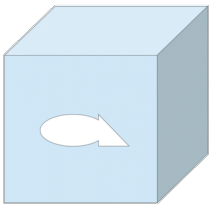
important. In physics, a space is always a set of points,[1] that is, space (where material things are) and spaces of all kinds (phase spaces, regions etc.) are *modelled* as sets of points. It is this *mathematical* notion of space that allows space-theories to be non-chalant with respect to its primitive and not to have to explain what subregion-hood is. The relation of set-membership, however, is not of the (1)-type of parthood; indeed, it is not a type of parthood at all and is deeply mysterious.

IV.4 and IV.5 present and defend Aristotle's account of place as the outer limit of the occupying body. Let us take some x which is 'in' y. If x is not divided from y, then x is a part of y in the sense (1) above and does not, within y, have a place at all. If x is divided from y, there is a separation between x and y: in the case of three-dimensional bodies, this is a two-dimensional surface. This surface, let us call it "z", bounds x in the sense of being its boundary and also shapes y in the sense of carving out a hole in it:[2] because it bounds x, it is not a part of it; because it shapes y (carving out, within in, an x-shaped hole), it has the same extension as x. This surface z, according to Aristotle, *is* the place: it is occupied by x in the sense of being its boundary.

We can picture the situation by considering a fish in an aquarium:



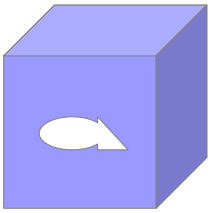
The fish carves a hole into the water that fills the aquarium: this hole has exactly the same shape as the fish and has the same location as the fish relative to the aquarium. We can picture it by removing the fish, and considering the hole that this removal leaves behind:



This hole, as we have seen, is *not* the place of the fish: it is a chunk of air that is in the same place in which the fish was before. The place that the fish occupied in the first situation is now occupied by some bubble of air; but the same place is present in both situations, and also in the following one, where the water has been replaced by some different liquid, e.g. oil:

1. If we are to allow for so-called 'gunky' space (where some regions are such that every subregion of them has proper subregions, i.e. where in parts of it there are 'regions all the way down' and in this sense there are no points), we model spaces within non-well-founded set-theory that lacks a foundation axiom.

2. This hole, let us call it "h", is different from both z and x: h is not the same as z because h is three-dimensional and z is two-dimensional; h is not the same as x because h is individuated with respect to y (it is a hole *of* y), and x is not.



In all three situations, we have the same place, marking first a boundary between a fish and water, then between air and water and finally between air and oil. The place consists of neither of these; it is not a material part of the aquarium, the air, the water, the oil or the fish at all. It is 'abstract' in the sense of surviving unchanged the replacement of everything material, but is 'concrete' in the sense of having a precise location in time and space.

If the fish now moves for an interval $[t_1, t_2]$, it moves *through* different holes: the hole it fills at t_1 is different from the hole it fills at t_2. It is in this sense that it *changes places*: the place it occupies at t_1 is different from the place it occupies at t_2. We have to distinguish this situation from the one where we move the entire aquarium and the fish within it does not move with respect to it. In this case, Aristotle could (but does not) say, the fish keeps its place with respect to the aquarium, or rather retains the same place-within-the-acquarium. He also tells us, however, to look beyond the aquarium in this case, to consider the space within which the aquarium moves: the room, let us assume. The fish carves out a hole not just within the aquarium, but within the room as well. At any time, this hole has exactly the same boundary as the hole in the aquarium.[3] This boundary, as we have seen, is the place of the fish, and so we should say, as seems right, that the fish does move when the aquarium is moved, because it changes its place over time.

Inner and outer boundaries

Aristotle makes a further conceptual distinction: even if the boundary of the fish *is* (the very same thing as) the boundary of the water that surrounds it, they differ in account: when the fish moves and while moving does not change its shape, there is a sense in which its boundary remains the same (for a change in its boundary would be an increase or a decrease of the fish), though the boundaries of the holes successively carved out by the moving fish within the water change – not with respect to their form, we assume, but at least with respect to their locations within the water. What it is to be the place of the fish, Aristotle says, is what it is to be the boundary of the water (and not what it is to be the boundary of the fish) – this is why the place changes when and because the fish moves.

We may also note that Aristotle's account of motion is much more 'relativist' (or at least can be interpreted in a much more 'relativist'-friendly way) than is ordinarily assumed. To be able to say that the fish moves when we move the aquarium, we need to make reference to the room; to be able to say that it moves even when the aquarium rests on the table, we make reference to the space around the earth within which it revolves around its axis: but this is alright, because we want to say that the fish moves, in this sense, *because* the room in which it is moves. To say that it moves in yet another way, revolving around the sun, we make reference to the solar system: it moves around the earth *because* the earth, where it is located, does. Will there be something absolutely stationary? Yes, there will be: the whole universe, everything there is, cannot move – not because it is metaphysically necessary for it to be at rest, but because it has no place at all: there is, by its very definition, nothing outside of it and so there is no boundary of anything outside, anything

3. Perhaps we feel inclined to say that it is the very same hole. Such a 'coarse-grained' individuation of holes has the advantage of avoiding the exact colocation of an indeterminate number of holes; it has the disadvantage, however, of not account for the essential extrinsicality of holes, that they essentially are holes *in* the things that bound them.

'surrounding'.[4] Because the universe does not have a place at all, there is no answer to the question where it is, and so it is unlocated even if it is of finite extent and thus has an inner boundary itself.

Advantages of primitivism

Aristotle's theory of place is primitivist: 'where' is one of the categories, i.e. one of the most fundamental ways for things to be, and it is, like all the other non-substance categories, posterior to the category of substance: it is always things that are somewhere and to be located here or there is *for them* a way to be. This cross-categorical 'relation' of occupation between substances (bodies) and places is primitive, and it is to be distinguished from the relation of parthood between bodies and the relation of inclusion between regions.

Because places are boundaries of holes, not of bodies, they are only extrinsically individuated by the bodies that occupy them, i.e. carve them out of some surrounding body.

Places are not extended in the same way as the bodies occupying them are. Bodies are extended in three dimensions by filling, to some degree, each of these three spatial dimensions. Places, by constrast, are extended derivatively, in virtue of the surrounding medium having a certain shape.

Aristotle sharply distinguishes the occupation relation (sense (8) above) from material parthood (sense (1) above) and limits the applicability of the latter to material things. If x is part of y and sufficiently divided from it (as e.g. my right thumb is from my right hand), we may say that the place of x is a part of the place of y, but this will be only derivatively so: the place of x is part of the place of y because they are occupied by x and y respectively and x is part of y.

Aristotle's distinction between the boundary of the surrounded body and the boundary of the surrounding body – which are one and the same in number and in reality, but different in account – allows for a plausible account of that weird thing which is the universe, the totality of everything there is, or of, at least, all the material things there are. The universe is bounded and has a shape, so needs to have a boundary. It is not, however, surrounded by anything so there is no boundary of the hole it carves out – it is even incoherent to assume that it carves out any hole at all, because there is nothing in which it could carve out such a hole. It is natural, it seems to me, to take such a 'one-sided' boundary to be topologically open: it is a boundary only 'from within', as it were, and not 'from outside'. If the universe is topologically open, it may both be indefinitely extended and finite; there is no question what *else* is beyond it because there are, for any one of the place it contains, other places further out. Its limits are unreachable, but still of finite extent, so it is infinite only in the sense in which Aristotle accepts infinite, as 'potentially' infinite, not as an infinite substance.

4. I am not claiming, that motion *is* change of place, as the at-at theory does, but only that change of place is a necessary condition for motion.