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FAREWELL TO SUBSTANCE: A DIFFERENTIATED LEAVE-TAKING

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Abstract

For most of the history of metaphysics, the subject has been dominated by the concept of substance. There is an everyday commonsense notion of substance which is perfectly harmless and which I shall defend against attempts to remove it or revise it away. But I deny that substance has to be construed as a primitive even in everyday terms. Borrowing Strawson's distinction between descriptive and revisionary metaphysics, I press the legitimate claims of revisionary metaphysics and argue that there is no place for a fundamental concept of substance within it, although aspects of the concept are likely to find their place therein.

> There are several senses in which a thing is said to be first; yet substance is first in every sense – (1) in definition; (2) in order of knowledge; (3) in time.
>
> Aristotle, *Metaphysics* 1028a30

1 Strands of Substance

The idea of substance was introduced by Aristotle as part of his critique of Plato's theory of forms and is at the core of his metaphysics. But Aristotle uses the word in two distinct senses, which apparently reflects a development in his thinking. The first sense is found in the *Categories*, where Aristotle distinguishes substance from the other nine categories. Examples of substance in the primary sense are an individual man, an individual horse. In a secondary sense the kinds to which these examples belong are also called substance, but I shall ignore this use. In the *Metaphysics* however, substance is identified not as the concrete individual, which is now analysed as the compound of matter and form, but as the form of the concrete individual, what the medievals called substantial form. This is prior to the compound, which presupposes it, and prior to the matter it informs, which exists only potentially, as informed, and which in any case is lent unity and individuality by the form. There are also passages in Aristotle

suggesting that substantial forms may subsist without matter, in the case of disembodied intelligences responsible for heavenly motion. The complexities of Aristotle's notions and the subsequent modifications the idea of substance received at the hands of the rationalists make it impossible to speak of a single unitary concept of substance in Western philosophy. Rather there are several strands to the concept and I shall unweave some of them relevant to my purpose.

1.1 Independent Beings

The ontological primacy of substances arises chiefly from their independence, or ability to subsist alone. In this they contrast with beings needing others for their existence, such as states, properties or boundaries. But what is meant by 'independent'? There are several senses. A particular object A is *weakly dependent* on another particular B when necessarily, if A exists, so does B. An object is then independent in the corresponding sense when it depends on no particular object (except itself). Objects with essential individual parts, such as the protons of an atom, are dependent in this sense on their essential parts. An object A is *strongly dependent* on an object B if necessarily, if A exists, so does B, and B is neither A nor part of A. When a cat grins, that grin could not exist without that cat, but the cat is not part of the grin, so the grin is strongly dependent on the cat. An object is independent in the corresponding sense when it depends on nothing apart from itself and perhaps parts of itself, giving a sense to the idea of something depending on nothing 'outside itself'. But there are also weaker generic senses of dependence, when an object A depends not on some particular object, but nevertheless could not exist unless there were some object or objects of a certain kind related to it in a certain way. A dog cannot exist without there being a large number of carbon atoms, but which particular carbon atoms go to make up the organic compounds in the dog's body and its food is indifferent.

Qualities, states, actions of a physical body or an organism are all strongly dependent on it; it may be weakly dependent on some essential part, and generically dependent on certain kinds of things, but it is not strongly dependent on any other individual. This allows individuals to have causes – on Aristotle's meaning – yet still be appropriately independent. If having a cause is taken (as in Spinoza) as a form of dependence, then only something uncaused or self-caused can be a substance.

1.2 Ultimate Subjects

Substances are sometimes characterized as the ultimate subjects of predication: that of which things can be predicated but which cannot be predicated of anything else. But this really only defines particulars. What can be predicated (rightly or wrongly) of something is a universal. Dependent particulars such as headaches are not substances. However if we replace 'predication' in the formula by 'inherence', we have the classical account of substances as substrata. A substance is something in which characteristics inhere but which does not itself inhere in anything. Inherence is then a form of dependence under which substances are independent. But if substrata must have characteristics, they are also dependent, though in a different sense: a substratum, while it does not inhere, cannot exist without some characteristics: a 'free substratum' cannot exist.

1.3 Individuators

Where a concrete thing's properties are shareable or universal, the substratum is also that which individuates: a collection of universal properties, no matter how extensive, cannot be immune to being realized twice, so some further, individuating ingredient is required in a concrete particular. Several candidates have been put forward for this role: Aristotelian prime matter is one, place in space is another, Gustav Bergmann's 'bare particulars' are another, like prime matter in being without essential characters, but unlike matter having a pure individuality: they are merely and irreducibly numerically different, and impose this difference on the substances they individuate. A bare particular differs from Duns Scotus's 'thisness' or *haecceitas* in that the thisness of Socrates is not only that which makes the common human nature to be an individual human being: it makes him this particular human being and no other.

1.4 Survivors of Change

Concrete particulars not only have attributes (universal or particular, according to one's theory); they undergo real change. A piece of iron heated in a furnace gets hot, expands, begins to glow, and becomes softer and more malleable. It is widely held that real change consists in this casting off old attributes for new. For something to change, it must exist before, during, and after the change, and so must survive it. Only so can we say it changes, rather than that it was created, replaced by something else, or

destroyed. The subjects of change thus 'outlive' whatever ceased to be at the change (the state or accident of the substance), whatever exists fleetingly during it, and pre-exist whatever comes into being at its completion. Concrete particulars also come into being and cease to exist. In familiar cases, they do so by the composition and decomposition of complex structures, or by the arising and subsiding of sustaining processes. Both of these facts suggest there might be more subtle survivors of the demise of substances, such as the matter of which they are made. If substance is primarily that which survives change, then the ultimate substance would be indestructible, whether Aristotle's matter, which never ceases to exist but is merely transformed, or the indestructible, sempiternal atoms of Democritus, or the conserved mass-energy of physics.

1.5 Basic Objects of Reference

Aristotle's *Categories* theory of substances as concrete individuals dovetails less with physical and metaphysical than with linguistic and epistemological concerns. Material things, organisms, geographical features and heavenly bodies are our constant companions through life. We are born of them, marry them, make them, change them, destroy them, buy and sell them, explore them. We fill our waking and sleeping hours talking and thinking about them. Piaget's psychogenetic studies and Strawson's transcendental arguments suggest we could not communicate or even think were we not able to manipulate them, identify, trace and reidentify them. For this to be possible, they must be discriminated by us into sorts, and each sortal concept must connote conditions of persistence and reidentification. To achieve this is, in Quine's words, to learn to divide reference,[1] mastery of which affords us the formal concept of individual and sets us on the road to understanding number. It is the key to further cognitive achievements such as comparing, locating in space and time, describing experiences; it leads us into other ontological categories: quality, amount, position, relation, situation etc., and, via the device of nominalization, making all of these subjects of further predication. If concrete particulars are not the first thing experience as such shows us, they yet seem to be our passport to higher cognition. That they should coincide with the substances of Aristotle's *Categories* is no happenstance:

[1] Quine (1960), Section 19.

Aristotle's work is about the meanings of the simple terms we use, so those persistent objects which are so important to our practice of using words were bound to have a salient role in the theory.

2 Everyday Substance Defended

Everyday substances are what we call things or objects, as distinct from their qualities, the relations they stand in to others, the states they have, the events they enter into, the processes in which they are involved. To make clear what everyday substances are we invariably use examples, just as Aristotle did. Of the roles substance is said to carry in the previous section, the most obviously applicable to everyday substances is that they are survivors of change. In recent years the ability of substances to fulfil this role has been challenged. Change, it is said, cannot be adequately explained by invoking substances, because these are three-dimensional objects enduring through time, what C.D. Broad called *continuants*.[2] Therefore they should be construed as or replaced by objects with temporal parts, what Broad called *occurrents*.[3] If this is argument is right, then everyday talk and Western metaphysics from Aristotle to Strawson has been fundamentally wrong about a large proportion of the objects there are in the world. There might be continuants other than substances, but the attack on them is primarily an attack on substances, which everyone can agree are the paradigm examples of continuants.

There are two positions in consideration here, which are not always clearly distinguished. Call them the *replacement position* and the *reconstrual position* respectively. The replacement position is that because continuants are metaphysically deficient, talk about them is to be replaced by talk about suitable occurrents. Thus talk about coffee cups, cats and comets should for metaphysical purposes be replaced by talk about coffee cup processes, cat processes, comet processes, where a coffee cup process is precisely not defined as the process of or history of a coffee cup, but as the kind of process, whatever it is, which leads the person in the street to talk about coffee cups. The metaphysical propriety of such replacement is an interesting and I think open question. If Strawson is right, then there are strong epistemological reasons why we should be unable to carry out such a programme,

[2] Broad (1933), pp.138 ff.
[3] Ibid.

because in order to be able to speak a language of subject and predicate we need stable, reidentifiable subjects. I am unconvinced. Quine describes a sequence of language acquisition and theoretic replacement in which we move from feature-placing mass terms to reidentifiable individuals as posits, and then for scientific reasons reconstrue these as four-dimensional processes. Why could we not miss out the middle stage? Or if not us, then an intelligent life-form not so preoccupied with mesoscopic dry individuals. If the metaphysical deficiency of continuants falls short of incoherence, then replacement processes and the continuants they replace could coexist and we could raise the question as to their relationship. The difficulty of the replacement position is that we should need to find ways systematically to develop a vocabulary apt for describing the replacement processes. We should not wish the replacement ontology to be weaker in expressive power than the one it replaced, and the idea that either the same predicates that we already use or some trivial syntactic modification of them will automatically serve up a rich enough vocabulary remains in my view an hypothesis completely untested in detail as it should be if it is to be made credible.

Many opponents of continuants however claim that they are in fact already occurrents, and that a widespread misapprehension prevents blinkered philosophers (and ordinary people perhaps?) from realising this fact. This is the reconstrual position: it is in fact claimed that the reconstrual is the 'proper' construal. Thus David Lewis claims that human beings have temporal parts,[4] and that a human being lasts for a certain number of years, has a temporal extent as well as a spatial extent.

Whichever of these positions is adopted, the chief argument against continuants is that it is impossible to explain properly what intrinsic change consists in.[5] For the advocate of continuants, a change in a continuant consists in a continuant's being first in one way and then in another. If you like properties, you can say that the object has one property at one time and the same object has a contrary property at a later time. If you like tropes, you can say that the object has a trope of one kind at one time and this is replaced by a trope of a contrary kind inhering in the same object at a later time. This is simply what change consists in

[4] Lewis (1983), pp.76 ff.
[5] Lewis (1986), pp.202–4.

for continuants. A four-dimensional account of change replaces this view with different properties' being borne by different temporal parts of one and the same extended process. But this is not change but mere temporal diversity, in the same way that a French tricouleur's having a red, a white and a blue part is spatial diversity. It is not change in the standard acceptation because the objects having the contrary properties, the temporal parts, do not survive the change.

It is said that expressions like 'John at 12:45 on 26 April 1997' stand for such temporal parts of the whole process bearing the name 'John'. This misparses sentences in which such strings might occur. If John is unhappy at 10:00 on 25 April 1997 and John is happy at 12:45 on 26 April 1997 then it is *John* who is first unhappy (at the earlier time) and then happy (at the later), not two objects related by genidentity, John-at-10:00-on-25-April-1997 and John-at-12:45-on-26-April-1997, that are respectively unhappy and happy.

The proponents of the four-dimensional view claim that the three-dimensionalist cannot make sense of the idea that the continuant is present as a whole at any time at which it exists. The expression 'present as a whole' gets its force by contrast with the case where at any time an extended occurrent is present only in virtue of the fact that a proper part exists solely at that time. For a continuant to be present or, better, simply to exist at a time, is not for some temporal phase or slice of it to exist and thereby some more compendious whole, but simply for it itself to exist then. A temporal part of an object O over an interval I is an object O_I which is a part of O, which exists at every time in I that O exists, which exists at no times outside I, and which is such that every part of O existing at any time within I is part of it. Occurrents have temporal parts for each interval over which they exist. For them such expressions as 'the part of the football match between 11:00 and 11:15' make sense, and if that part of the football match is exciting then the football match is at least partly exciting. But an individual football player, while he has a life which includes what he does and undergoes between 11:00 and 11:15, does not have a fifteen-minute slice. Rather he is that to which all these things happen: he changes, but does not leave temporal parts behind him as time advances.

It is said that a defence of continuants entails thinking of time in terms of McTaggart's A-series, as consisting of a real past, present and future, whereas the four-dimensionalist can use the

more plausible B-series conception of time as untensed, a series ordered by tenseless relations of earlier and later. But while it may be true that our thinking of time in terms of the relation to experienced and so temporally local events may have some general epistemological connection with our thinking of stable configurations around us as continuants, metaphysically there is no necessity for a continuant theorist to embrace A-time. The proof is that one can define and defend continuants while using only B-series talk.[6]

It is said that the relativity of simultaneity makes it impossible to talk about continuants because 'at a time' has no absolute meaning. The defender of continuants does not need to claim that it does. The difference that relativity makes to talk of continuants is that there is no longer an absolute fact of the matter about what parts and properties a large continuant has at a time, because what counts as the same time (for having parts or properties at different places of its extent) varies with frame of reference. That does not mean that what is a spatial part in one frame is a temporal part in another. Any object having parts with spacelike separation in one frame will have parts in spacelike separation in any other frame.

My conclusion is that attempts to shoulder aside the notion of a continuant everyday substance perduring through time fail. The notion is entrenched in our ordinary everyday way of thinking and speaking and it would require a conceptual revolution of unprecedented magnitude to remove or replace it. The motives of those wishing to proclaim its demise are legitimate: they are those of conceptual clarity and conformity to scientific progress. The motives are honourable, but their target is misplaced. The ordinary everyday notion of a continuant individual substance is in its own humble terms all right as it is. This is not to say that difficulties cannot arise. Precisely because it is an everyday notion, and so subject to vagueness and open texture in many cases, it may lead us into difficulty. The familiar problems of identity over time and the reidentification of individuals, in the case of persons and of artifacts like Theseus's Ship make this plain. The attacks on humble substance make the error of supposing the notion is fit to be tidied up and re-presented as belonging to fundamental metaphysics.

[6] Simons (1987), ch. 5.

3 Primitivity of Everyday Substance Contested

If everyday substance is defensible within its own terms, is it a primitive, unanalysable concept? I think not. I consider that the most promising account of everyday substance in its role as an independent being analyses substances as bundles of tropes.[7] This accords metaphysical priority to tropes and the formal relations which bind them together. Clearly the theory takes its place within an acceptance of tropes as promising to offer our overall best account of resemblance. With no universal properties and relations to require individuation and unification, there is no need to postulate an individuating substratum, a bare particular or portion of prime matter. The remaining difficulty is that of explaining the unity and relative independence of substances. To overcome the difficulties of both excessive essentialism and excessive anti-essentialism I proposed a two-tier theory of trope bundles, whereby a nucleus of tropes, each of which is necessary to all of the others, constitutes an individual essence while accidental characteristics are catered for by a peripheral halo of tropes which may be exchanged. The theory is flexible in allowing the extreme cases of bundles without nuclei and also bundles without halos. The relationships tying bundles together are not, as in most trope bundle theories, spatial or spatiotemporal compresence. These relations are too weak to engender union where distinct bundles can interpenetrate and they demand excessive togetherness where a bundle may be widely spread, as when a quantum coupled particle pair is formed and the particles fly apart. The binding relations, which are formal, not themselves further tropes and so do not engender a regress, are those of existential dependence as defined above, whether mutual or one-sided, whether rigid or generic. The tropes in a nucleus are bound by rigid dependence, those in the halo are rigidly dependent on their nucleus but the nucleus requires them, if at all, only generically.

The relative independence of substances may seem hard to explain: after all, how can something independent and substantial arise from ethereal, dependent tropes? But if a whole is composed of a collection of parts each of which has its existential needs (of whatever strength) met within the collection, then the collection and therewith the whole it composes requires nothing

[7] Simons (1994).

outside it, and is thereby independent. This principle can be used to argue plausibly, following Bolzano, that if there is anything at all, then there is at least one existentially independent thing.[8]

Tropes are standardly invoked to explain how individuals are. They are the truth-makers for atomic predications. If electron Emma is negatively charged, this is because one of her tropes is a negative electric charge trope, distinct from her mass trope and any others she might have. As fulfilling this role, they are best considered to be sparse in relation to logically possible predicates. Not every linguistic predicate corresponds to a trope kind. There are no tropes of existence or self-identity, for example, and many predications will be made true not by a kind of trope corresponding one-to-one with the predicate but by more complex arrangements involving tropes in relation or a whole range of different kinds.

Everyday substances will however be more than just a single trope bundle. Everyday material objects have smaller material objects as their material parts: a human being has limbs, organs, tissues, cells, etc. as parts, and all of these interacting parts are themselves substances and there are tropes, unary and relational, linking and characterising them. A human being is at any one time a hugely complex whole of interrelated parts in static and dynamic relations to one another: most predications are true of such complex wholes because of how the parts are and how they are related. Our shape, size, weight, density etc. derive from the properties of our parts and that they are our parts. Only objects without parts in the common or garden sense are pure bundles of tropes and nothing else. Everything else is a whole of parts which are wholes of parts which are... etc. until we come to the parts which are as they are not because they have parts but because they are bundles of tropes. How larger things are may or may not be determined by how their ultimate parts are and are related; the occurrence of holistic or Gestalt quality tropes dependent on larger wholes is not ruled out, nor is the emergence of tropes unpredictable from the properties of their bearers' parts.

The intricacies and flexibility of this picture are appealing, but it has been claimed by Hoffman and Rosenkrantz that the theory is both inconsistent and inadequate.[9] It is inadequate because it does not allow the possibility of unextended souls as substances.

[8] Simons and Ganthaler (1987), Simons (1987), pp.321–3.
[9] Hoffman and Rosenkrantz (1994), pp.77 ff.

Hoffman and Rosenkrantz's criticisms include several that are misplaced because they do not faithfully represent my theory. Among these are that there could be no trope bundle without a halo. Many of their objections ascribe to me the view that the members of a trope bundle need to be spatially coincident, which I did not assert in the paper they quote but in fact took some pains to criticise. Hence I am not committed to the non-existence of substantial non-spatial souls, though I am not rushing to sign up to that view.

They further claim that my theory is inconsistent in the following way. (I change their example but keep the point. For present purposes it does not matter whether the example is scientifically wholly accurate.) Consider a single atom of hydrogen well away from other atoms, containing the usual nucleus of a single protons and a single orbital electron. The proton is positively charged, that is, its bundle contains a positive charge trope. The electron is negatively charged, that is, in its bundle is a negative charge trope. The relationship of trope to bundle is that of part to whole, and part-whole is transitive. So the positive charge is part of the hydrogen atom bundle, so the hydrogen atom is positively charged, and the negative charge trope is part of the hydrogen atom bundle, so the hydrogen atom is negatively charged. But it is analytically contradictory for an atom to be (simultaneously) both positively and negatively charged. In any case, both are wrong: the atom is electrically neutral.

One way out of this would be to deny that part-whole is transitive, but that is a counsel of despair. Another way would be to deny that the trope-to-bundle relation is part-whole. I have considered this but I do not see what else it could be. It is true that Hoffman and Rosenkranz take as part of their pre-analytic data that a thing's properties are not parts of it, but this datum is defeasible if theory presses hard enough. The way out seems to me to be this. The atom does indeed contain both a negative charge trope and a positive charge trope, but they are not its immediate parts, rather they are trope parts of its more substantial parts, the electron and proton respectively. Mere presence of a trope of a certain kind in a substance is insufficient to ensure that the substance has the property associated with the trope kind. Only if the trope is an immediate part of the substance is this the case. The positive and negative charge tropes are not immediate parts of the atom, and hence they can cancel out overall in this case. Similarly an object composed of many atoms each

of which has a certain (small) mass has a much larger mass, not the small one. How tropes from substantial parts interact to produce a Gestalt quality for the larger whole is not something on which one can pronounce *a priori*; the cases have to be examined empirically.

I conclude that Hoffman and Rosenkrantz's attempt to discredit the flexible trope bundle theory is unsuccessful and that until further notice we can continue to regard the notion of substance *qua* independent entity as analysable. The only case which would obviously refute this position would be if a mereologically and logically atomic independent substance could exist. Not even Leibniz's monads would fulfil the second of these requirements, since a monad has successive states. A simple nature would have to be a metaphysical Lone Ranger, possibly without even a dependent companion, able to be the sole thing in the universe. I am not confident that such a simple nature is an inconsistent notion, but on the other hand I can see no use for it outside certain kinds of theology.

4 Revisionary Metaphysics

In *Individuals* Strawson distinguished between descriptive and revisionary metaphysics as follows:

> Descriptive metaphysics is content to describe the actual structure of our thought about the world, revisionary metaphysics is concerned to produce a better structure.[10]

'Revisionary metaphysics', says Strawson further, 'is at the service of descriptive metaphysics.'[11] In so far as any finally correct metaphysical framework for an account of the world will incorporate all the revisions which it will have been necessary to make in the meantime, there is nothing to dissent from here. But Strawson meant something more, namely that there is a core of metaphysical propositions and concepts which are not subject to revision, and which revisionist metaphysics, with all the 'intensity of their partial vision' (ibid.) can at most modify peripherally. As we know from above, one of the roles which everyday substances play is that of primary objects of reference, indeed that was much of the point of Strawson's book. But Strawson uses epistemological

[10] Strawson (1959), p.9.
[11] Ibid.

arguments to arrive at his metaphysical conclusion, and a metaphysician is entitled to claim that this gets the cart before the horse. Everyday substances may perhaps, as Aristotle says, be prior in order of knowledge, but that does not mean they are prior in the order of being. The thrust of early Greek naturalism and of natural science since the seventeenth century has been to attempt to explain what everyday substances are and how they behave in terms of other, more fundamental entities, which are far from first in the order of knowledge. A metaphysical scheme which describes the world by taking these more fundamental things into account cannot count as descriptive, unless and until that scheme become the one embodying 'the actual structure of our thought about the world.' Since natural science when appended to commonsense knowledge provides us with a more comprehensive and more satisfactory picture of the world than commonsense knowledge alone, a metaphysician aiming at a comprehensive and fundamental metaphysical framework is required to take the deliverances of established natural science into account, to the extent that their metaphysics does not contradict entrenched scientific results. The leading edge of metaphysics will therefore be revisionary unless and until we reach the final goal. Nor need revisionary metaphysics, as Strawson suggests, be partial. On the contrary, a metaphysics which does not aspire to universality does not deserve the name, and it is the conceptual scheme inherent in commonsense talk that will be incomplete for lack of coverage of outlying regions inaccessible to common sense.

4.1 Quantum Phenomena

The best theory we have of what makes up everyday substances and explains how they behave as they do is quantum mechanics. In quantum mechanics we lose identifiable individuals in the sense of Aristotle. This was recognised very early: here is what Schrödinger has to say:

> the elementary particle is not an individual; it cannot be identified, it lacks 'sameness'. The fact is known to every physicist ... In technical language it is covered by saying the particles 'obey' new-fangled statistics, either Einstein-Bose or Fermi-Dirac statistics. The implication, far from obvious, is that the unsuspected epithet 'this' is not quite properly applicable

to, say, an electron, except with caution, in a restricted sense, and sometimes not at all.[12]

The more we investigate the properties of matter and energy the less quantities of them look like reidentifiable substances. Photons, obeying Bose-Einstein statistics, tend to congregate in the same place at the same time and in the same state: this is the principle behind lasers. Even electrons, which, as fermions, cannot be in exactly the same state as one another, are still, when entangled, such that there is no fact of the matter which is which: they are not nameable distinct individuals. In standard quantum mechanics we can at least say of the electrons orbiting a helium nucleus that there are two of them. In quantum field theory we even lose the countability of particles: states with different numbers of particles are superposed.[13] It used to be thought that quantum phenomena only appear at small scales, but there is no limit to the size of an entangled multi-particle system: a particle pair can be light-years apart when a collapse occurs. Nor is it necessarily a question of low mass or number: at very low temperatures, millions of atoms can be trapped in the same quantum state, forming a so-called Bose-Einstein condensate.[14] The Leibnizian considers as individuals only those things distinguished from all other things by some attribute or other: this means that in most cases individual fundamental particles are not individuals, nor in some circumstances are large aggregates of them. The old substance/attribute model fails to apply at the level of fundamental physical reality. The trope-bundle view fares better here because of its flexibility, but it too may have its limitations.

4.2 Problems in the Mid-World

It might be thought that at least at the mid-world level, the things we perceive around us, the concept of substantial individual, although not scientifically sharp, is at least generally applicable. Unfortunately, finding straightforwardly reidentifiable individual substances turns out to be hard here too. Aristotle's paradigms, the individual organisms, are difficult in two ways. Their kinds or species are determined differently according to the general way in which they reproduce: the standard biological species

[12] Schrödinger (1950), pp.109.
[13] Teller (1995), ch. 2.
[14] Irion (1998).

definition only applies to sexually reproducing species at a time or over a short interval, whereas for diachronic purposes, for asexual and parthenogenetic creatures, other ways must be considered of differentiating their fundamental biological kinds.[15] Where it is open how to delimit an object's kind, it can on occasion also be open how to individuate members of that kind. More importantly, the bounds of individual organisms may be uncertain or arbitrary. Many creatures such as sponges, slime moulds, termite colonies, Portuguese men o' war, lichens, tree grafts and more are dubiously individual organisms: they may be connected multiplicities or colonies, or hover on the boundaries between individuals and collectives. It seems somehow artificial to force the question 'one individual or many?' on them: they are organised at different levels in different ways (and falling under different sortal terms) and there may be no distinguished level dictating the boundaries of 'the' biological individual.

Organisms, with their continual energy and matter exchange with the environment, lack perfectly clear boundaries. Even large inorganic things pose difficulties. A large object like the sun has no natural skin or other surface discontinuity, so that there are at any time many connected masses of matter and energy of which it is indeterminate whether they are its parts or not.[16] Geographical features such as mountains, islands, cities and rivers are all to a greater or lesser extent vague.[17] Whereas vagueness of predicates may be considered a necessary and perhaps largely benign product of human inexactness and lack of discrimination, the vagueness attending the part-predicate feeds its way down to the metaphysics, because if it is indeterminate what an object's part are, it can be indeterminate which object it is, if any.

Cartesians may wish to cite the self as one clear-cut case of an unambiguously identifiable individual with a clear identity. Sadly for them, the concept of the identity of the self or person is one of the most fraught: not only do there appear to be natural violations of the natural groupings of experiences by owner which are its standard test,[18] the concept of a person appears at least as much endowed with open texture as any we use.[19]

[15] See e.g. the papers in Ereshefsky (ed.) (1992).
[16] For this example and a theory of vague objects generally see Simons (forthcoming).
[17] The problem concerns geographers: see Burrough and Frank (eds.) (1996).
[18] See Wilkes (1988).
[19] See Parfit (1984).

5 Whither Substance?

Fundamental particles, organisms, persons, artifacts, geographical features and heavenly bodies, not to mention socio-political entities like firms and states, and all abstract entities, which have not even been considered here, all raise serious or even insoluble difficulties when considered as metaphysical substances. Suddenly it begins to look as though substance, far from being a widely applicable commonplace, is a concept rarely if ever fulfilled, an idealized limit of little or no use to metaphysics.

This conclusion should I think be accepted. Future metaphysics worthy of the name will need to be revisionary, and the concept *substance* will feature within it, at best, as a derivative construct. It is premature to say how such a future revisionary metaphysics will look, but it will need to both accommodate the advances of science as well as provide the platform for showing how we and our commonsense knowledge, including the knowledge of what have been thought of as individual substances, have a place within the same overall scheme. Substance will not be simply discredited, but its role as a fundamental metaphysical primitive is gone forever. Its formal moments, the notions of independence, of persistence, of unity and integrity, of discernibility, will need to be taken account of, but they will be analytical factors out of which the everyday notion is obtained, probably with some admixture of epistemological content in order to match the notion to its paradigm examples.

Aristotelian and Scholastic metaphysics assumed without argument a fundamental harmony between the world as it is in itself on the one hand and our knowledge of it, concepts for it and language for talking about it on the other. Kant questioned the direction of fit, turning it around so that the world fits our concepts and intuitions rather than vice versa, but he maintained the harmony. Wittgenstein, both early and late, maintained the harmony of language and world, and it is assumed by nearly all linguistically-inspired metaphysics, of whatever variety. As we have seen from only a sample, there are many ways in which language fails to mirror reality. If there is any mirroring at all, it is not between language and world but between language and experience. We are the language-moulders and users, and we learn language through our experience of it and the things it is used about. The world of things in themselves, which is a concept many people, in the grip of the harmony thesis, will not even

accept as legitimate, is obviously not unconnected to our experience and the concepts we employ to make sense of this, but the connection is not one of straightforward mirroring, but more of seeing through a glass darkly. Investigating the nature of the world and our relationship to it is not a task for *a priori* metaphysics but of a science revisable in the light of increasing knowledge about the world and ourselves, *a posteriori* but still with a metaphysical framework of maximal generality at any stage. A metaphysics is a theory of being *qua* being: it is a general theory of everything, or it is nothing at all. The concept *substance* served well enough as long as our knowledge was confined to what we could perceive through the unaided senses and infer from those data. It retains a role as a high-level concept in commonsense knowledge and such disciplines as cognitive science and natural language analysis and processing which remain at this level. As a fundamental metaphysical primitive, it belongs, like the horse and cart, to a bygone age. Neither the vehicle nor the concept will take us to the stars.

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