A Brief Ontology of Spatial and Temporal Localization

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1. Preliminaries

A *location in space* or *spatial location* will here be not a point in space, but what is produced by enclosing a (in three dimensions positively extended) part of space in an outward boundary (the boundary, too, is to belong to the location). A *location in time* or *temporal location* will here be not a point in time, but a closed interval in time (the boundary-points, too, are to belong to the location). L, L´, L´´, … will be used to designate locations in space; T, T´, T´´, … will be used to designate locations in time; t, t´, t´´, … will be used to designate *points in time*; l, l´, l´´, … will be used to designate *points in space*; X, X´, X´´, … will be used to designate *objects* of any kind (including temporal and spatial locations, points in time and points in space). The word "object" is not used as a synonym for "entity" here. Rather, it designates any individual-like entity that is necessarily of finite extension in all the dimensions it may happen to have.

Spatial locations are special sets of points in space, temporal locations special sets of points in time. Accordingly, "t is in T," "l is in L" simply means that t is an element of T, that l is an element of L. Note that, presupposing the continuity of space and time, every spatial location is an infinite set of points in space, and every temporal location an infinite set of points in time.

The fundamental localization-predicate for space is "X is at t in L"; the fundamental localization-predicate for time is "X is in T". We will also be using the fundamental mereological predicates "X´ is at t a spatial part of X," "X´ is a temporal part of X," and "X´ is a part of X."

2. Two fundamental principles

P1   For all X, t, and L: X is at t in L ≡ some X´ is at t a spatial part of X, and every spatial part of X at t is at t in L.

P2   For all X and T: X is in T ≡ some X´ is a temporal part of X, and every temporal part of X is in T.

3. Two consequences of these principles

C1   For all X and t: X has no spatial part at t ⊃ X is in no spatial location at t.

C2   For all X: X has no temporal part ⊃ X is in no temporal location.

Note that an object's being in no spatial location does not preclude that a spatial location can be *analogically associated* with the object. Likewise, an object's being in no temporal location does not preclude that a temporal location can be *analogically associated* with it. Important examples will be presented below.

4. The definitions of exact localization and exact location

D1   X is at t *exactly* in L := X is at t in L, and there is no part L´ of L which is such that there is at t no spatial part X´ of X with X´ being at t in L´.

D2   L is *the* spatial location of X at t := X is at t exactly in L.

D3   X is *exactly* in T := X is in T, and there is no part T´ of T which is such that there is no temporal part X´ of X with X´ being in T´.

D4   T is *the* temporal location of X := X is exactly in T.

5. Two questions, leading to further questions

If X is at t in L, does is follow that there is a spatial location L´ such that X is at t *exactly* in L´? If X is in T, does it follow that there is a temporal location T´ such that X is *exactly* in T´? The answer to the second question is "No." Suppose X is an object with temporal parts and with an intermittent existence: first it exists for a while, then it does not exist for a while, then again it exists for a while. Then there is nevertheless a temporal location T such that X is in T, but obviously there cannot be a temporal location T´ such that X is exactly in T´. (Remember that T´, as a temporal location, must be a closed interval in time.) Taking the idea from the

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must be a closed interval in time.) Taking the idea from the temporal counterexample, it is easily seen that one cannot conclude from X being in L at t that X is at t exactly in any spatial location L´.

While being in some spatial location will often be (we may take it) without being exactly in any spatial location, it would (come to think of it) be a very strange universe indeed if being in some spatial location were *in each and every case*, of a point in time t and an object X that is not itself a spatial location, *without* being exactly in any spatial location. X is at t a *spatially full* object if, and only if, there is some spatial location in which, at t, X exactly is. Trivially, every spatial location is a spatially full object at any point in time. But is any object ever spatially full that is not itself a spatial location? Yes, a finite part of a *gravitational field* seems to be an example. But, so far, *spatially full material objects* have never been observed. Indeed, spatially full material objects seem to be impossible, since it seems such objects would have to be of infinite density (and therefore of infinite mass). But if there is no material object that is ever spatially full (which entails that there are no Democritean atoms), what, then, is the nature of the composition of material objects? If one delves into this question, all initial clarity quickly disappears. Thus, what many still consider to be the most lucid – least obscure – kind of entity, *material object*, is by no means as lucid as it seems at first sight to be.

6. Definitions concerning physical objects

D5   X is a physical object := it is (metaphysically) possible that there is a point in time, t, and a spatial location, L, such that X is at t in L.

Since metaphysical possibility is an S5-modality – which implies that the principle *what is possible is necessarily possible* is valid for it – D5 entails that every physical object is a physical object with metaphysical necessity.

The relevant logical structure here *is not* the trivial □(A ⊃ A), but rather this: (A ⊃ □A).

Note also that being a physical object does not entail being *purely* a physical object. This remains true if "physical" (in "physical object") is augmented as follows: "at t existing physical," "existent physical," "persistent physical," "enduring physical," "perduring physical" (concerning these augmentations of "physical," see below). However, while it is true that

every physical object is a physical object with metaphysical necessity, it is not true that every *at t existing* physical object is an *at t existing* physical object with metaphysical necessity. And what results if "at t existing" is, in the previous sentence, replaced by "existent" is also not true. The simple reason for this is that there are certainly *at t existing* – respectively, (simpliciter) *existent* – physical objects for which it is not metaphysically necessary that they exist at t – respectively, that they are existent.

D6   X is at t an existing physical object := there is a spatial location, L, such that X is at t in L.

D7   X is an existent physical object := there is a point in time, t, such that X is at t an existing physical object.

D8   X is a persistent physical object := there is a location in time, T, such that for every t in T there is a spatial location L such that X is at t in L.

Note that even though it seems certain that there are existent physical objects, it does not automatically follow that there are also persistent physical objects.

D9   X is an *enduring* physical object := X is a persistent physical object, and there is no X´ such that X´ is a temporal part of X.

D10   X is a *perduring* physical object := X is a persistent physical object, and there is an X´ such that X´ is a temporal part of X.

7. An ontological classification

(I)   Objects that do not have, at any point in time, any spatial part and that do not have any temporal part.
(II)   Objects that have some temporal part, but do not have, at any point in time, any spatial part.
(III)   Objects that have, at some point in time, some spatial part, but do not have any temporal part.
(IV)   Objects that have, at some point in time, some spatial part, and that also have some temporal part.

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For purely logical reasons, no object can be subsumed under two of the above four headings, and for purely logical reasons, every object must be subsumed under one of the four headings. It is a curious fact of the history of metaphysics that most modern metaphysicians are more or less eager to argue that there is in fact no object that falls under the headings (I), (II), and (III). The opposition to (I)-objects is very old, the opposition to (II)-objects more recent; the most recent opposition is the opposition to (III)-objects.

Before discussing each of the above four categories of objects, we assume the following two additional, highly plausible principles:

P3   For all X and t: X has at t some spatial part $\supset$ there is some L such that X is at t in L.

P4   For all X: X has some temporal part $\supset$ there is some T such that X is in T.

These principles, taken together with C1 and C2, have the following logical consequences:

C3   For all X and t: X has at t some spatial part $\equiv$ X is at t in some spatial location.

The left-to-right part of the biconditional C3 is just P3. The right-to-left part of the biconditional C3 is the contraposition of C1 (which itself is logical consequence of P1).

C4   For all X: X has some temporal part $\equiv$ X is in some temporal location.

The left-to-right part of the biconditional C4 is just P4. The right-to-left part of the biconditional C4 is the contraposition of C2 (which is itself a logical consequence of P2).

Now, *concerning (I)-objects*: According to C3 and C4, the objects that do not have, at any point in time, any spatial part and that do not have any temporal part are precisely the objects that are in no temporal location and never in any spatial location. In other words, (I)-objects are outside of time and space. Putative examples of such objects are not only numbers and other *type-objects* (i.e., *non-predicative universals*), like *the lion* and *the homo sapiens*, but also non-physical substances, like human souls. Though

(I)-objects are outside of space, a spatial location can be *analogically associated* with (I)-objects if they are *exemplified* by objects that are, literally, in a spatial location. If an *exemplum* X´ of a (I)-object X is at t in L, then X, too, can be said – *analogically* – to be at t *in* L. Thus, the type-object *homo sapiens* is at t *in* any spatial location in which there is at t a human being. The *analogical being-in* a spatial location is quite different from the *literal being-in* a spatial location, since, obviously, *homo sapiens* is at one and the same point in time *analogically-in* separated spatial locations – while no human being can be *literally-in* separated spatial locations at one and the same point in time.

Exemplification is not the only way to locate (I)-objects analogically in space. Spatial locations can also be analogically associated with, say, human souls, which are (I)-objects of a quite different sort than type-objects (the latter being individual-like universals, whereas souls are true individuals), via the living human bodies to which these souls are connected: a soul is at t (analogically) in every spatial location in which its body is at t (literally). It should not go unmentioned that temporal locations, too, can easily be analogically associated with souls: Consider the non-empty set of points in time at which a given soul (of a body) is connected to its body. Every temporal location that includes this set is a temporal location *in* which that soul is (analogically speaking, *not* literally).

Concerning (II)-objects: According to C3 and C4, (II)-objects are outside of space, but in time. The putative examples of (II)-objects that immediately come to mind are *conscious mental occurrences*, *(conscious) experiences* in the broadest sense. But in these times of the predominance of materialism, one is constrained to offer further specifications: experiences *as they are traditionally conceived of*, i.e., experiences *as they are conceived of by psychophysical dualists, or by idealists*. It goes without saying that experiences *thus conceived of* are nowadays almost as much out of favor as *souls* are (and as *universals* would still be, I dare say, if the authoritative materialist David Armstrong had not had pity on them).

Concerning (III)-objects: According to C3, D6, and D7, all (III)-objects are existent physical objects. This may make it seem easy to find examples of (III)-objects that are not only putative examples of them. Unfortunately, according to C3 and C4, (III)-objects are not only in space, but also outside of time, which for many metaphysicians makes them very dubious entities indeed. Their being outside of time can easily be eclipsed, since a temporal

location can very naturally be *analogically associated* with any (III)-object: Take the non-empty set of all points in time at which a given (III)-object exists, in short: *its duration*; a (III)-object is *analogically* in every temporal location that includes its duration. But *literally* – because of its lack of temporal parts – it is in *no* temporal location.

Frequently, the absence of a (literal) temporal location for (III)-objects is expressed in the following highly suggestive, but somewhat misleading way: (III)-objects are said to be "wholly present at each point in time at which they exist." The same can be said of (I)-objects: they, too, are "wholly present at each point in time at which they exist." The formulation is somewhat misleading since, contrary to its real intention, it suggests that (III)-objects and (I)-objects are (literally) in time, albeit in a strange way. Despite their recent dubiousness to many metaphysicians, (III)-objects constitute, in the history of ideas, the standard conception of existent physical objects. Note that so-called Aristotelian material continuants are (III)-objects. Note also that one could define (III)-objects as existent physical objects *that have no temporal parts*.

Above, (III)-objects have been defined as "objects that have, at some point in time, some spatial part, but do not have any temporal part." But the first part of that definition – "objects that have, at some point in time, some spatial part" – is synonymous to "existent physical objects," according to D6 and D7.

Concerning (IV)-objects: According to C3 and C4, (IV)-objects are both in space and in time. According to D6 and D7, they are the existent physical objects *that have some temporal part*. For most modern metaphysicians, the spatio-temporal double locatedness of (IV)-objects is a mark of ontological distinction that confers to them, so to speak, *the right of there-being* – given that those metaphysicians tend to deny this right to the three other categories of objects in the above fourfold classification. Direct examples of (IV)-objects are *physical occurrences*, goings-on in time and space; in fact, physical occurrences do seem to exhaust the (IV)-objects.

8. Reductionism and eliminativism regarding objects other than (IV)-objects

If one believes, as modern metaphysicians tend to believe, that there just aren't any other objects than physical occurrences, one still has a choice with respect to objects other than physical occurrences: either one thinks it worthwhile to try to model, on the basis of (IV)-objects, at least some of

those objects that one considers to be, in fact, non-entities (i.e., the (I)-objects, (II)-objects, and (III)-objects), *or* one does not think it worthwhile. Usually, the *first alternative* has seemed much more attractive than the second (and this bespeaks the considerable intuitive force which is retained by the assumption that there are other objects than physical occurrences even after this assumption has been discarded).

Adopting the first alternative *with regard to (I)-objects*, has led to re-construction-theories for *abstract objects*. With regard to (I)-objects, how-ever, that are *not* abstract objects – like souls, God, and *non-existent physical objects* –, one has, as a rule, not gone to so much trouble; simple denial has usually been thought good enough for them.

Non-existent physical objects are (I)-objects? – Yes, they are. According to D6 and D7, a non-existent physical object is a physical object such that there is no point in time, t, such that there is a spatial location, L, such that X is at t in L. In short, a non-existent physical object never is in a spatial location; it is, therefore, not in space. But if a physical object is not in space, it is not in time either, because if it never is in a spatial location, it does not exist at any point in time – according to D6 – and *hence* cannot be in a temporal location, since the following statement certainly is a true general principle:

P5   For all X and T: X is in T $\supset$ there is a t in T at which X exists.

Thus, non-existent physical objects are indeed (I)-objects.

The said reconstruction-theories for abstract object have not been entirely successful, since one is forced to postulate (besides (IV)-objects) certain non-reconstructed, hence non-reduced, abstract objects – for example, *sets* – as forming *the basis* for the reconstructions. It's not only true: *de nihilo nihil*, it's also true: *de nihilo abstracto nihil abstractum*.

Adopting, in turn, the above first alternative *with regard to (II)-objects*, has led to physicalist reductionism in the philosophy of mind, one of its manifestations being the notorious token-identity theory. Finally, to adopt the said alternative also *with regard to (III)-objects* may seem an easy thing to do, because to all putative (III)-objects there correspond one-to-one certain (IV)-objects, certain *physical occurrences*: Clearly, each puta-tive (III)-object has exactly one *course of existence*, and different putative (III)-objects have different courses of existence; and if X is a putative (III)-object, then its course of existence is no doubt a physical occurrence. Therefore, *why not* simply replace the putative (III)-objects – while retain-ing their names – by their courses of existence, which are (IV)-objects?

Here is a reason *why not*: It might have been otherwise with a putative (III)-object than it is in fact; for example, this stone might now have lain over there instead of over here. It seems that there is no way of reconstructing this way of speaking truly about *this stone* if *this stone* is no longer regarded as a certain (III)-object but as a course of existence (namely, the initially assumed (III)-object's course of existence); for if the stone had lain over there, its course of existence would have been a course of existence that is numerically different from its actual course of existence, while the stone itself, even if it had lain over there, would still be numerically identical to the stone that actually lies over here.

But, in fact, there is a way of reconstructing the above true assertion of a specific counterfactual possibility within a – broadened – (IV)-object ontology. It is another question, however, whether that way of reconstruction is plausible. Suppose this stone is identified with a certain physical occurrence. Then we can say some things truly about the stone that we could not say formerly, when we still regarded the stone as a (III)-object; for example, that an *earlier stage of this stone* lay over there. That's not a bad thing. But we would certainly also like to still say some things truly about the stone that we could already say truly about it formerly, when we still regarded the stone as a (III)-object; one of these things is that this stone might now have lain over there instead of over here. Now, one who is inspired by David Lewis will argue that asserting that *this stone* (qua (IV)-object, qua physical occurrence) might now have lain over there instead of over here amounts to asserting that, while this stone is now actually lying over here, there is a *counterpart* of it, X, that now lies over there and not over here – but of course not in the actual word but in some other, non-actual possible world. This counterpart, X, of the stone is, indeed, a non-existent physical object. Hence (see above in this section) it is neither in space nor in time (in other words, it does not have, at any point in time, any spatial part, and it does not have any temporal part, either), which, however, does not prevent it (1) from being (simpliciter) a physical object (see D5), and (2) from being a *(IV)-object in another possible world* – that is, an *in another possible world existent physical object that has some temporal part* (compare the end of the previous section), in other words: a *physical occurrence in another possible world.*

The Lewis-inspired proposal just described should not be criticized, in my eyes (others will think otherwise), on account of relying on non-existent objects (or non-actual objects, if you prefer; Lewis, in fact, would have very much preferred the latter verbalization, since he did not believe

that existence and actuality could be legitimately identified). It also should not be criticized on account of introducing a notion of existence which is *relative* in what may seem to be a weird way: existence *in* a possible world. The real problem with this proposal is that it leaves one with nothing but arbitrary stipulation regarding the question what counts as a counterpart of a given (IV)-object *in another possible world*, *once* unreduced reference to (III)-objects is forbidden (and such reference must be forbidden if all putative (III)-objects are to be reducible to (IV)-objects). If one *does* accept (III)-objects, then the counterpart-relation need not be an arbitrary concoction even when it straddles possible worlds: the possible course of existence $X´_1$ of the (III)-object X_1 is a *counterpart* of the possible course of existence $X´_2$ of the (III)-object X_2 if, and only if, $X_1 = X_2$. This is certainly a non-arbitrary definition of $X´_1$ being a counterpart of $X´_2$ (one that makes the counterpart-relation an equivalence relation *if* that relation holds precisely between the possible courses of existence and *if* each such course is the possible course of existence of some (III)-object). But if one *does not* accept (III)-objects, what will *then* be the necessary and sufficient condition for $X´_1$ being a counterpart of $X´_2$?

As is well known, Lewis relied on overall-similarity to define the counterpart-relation: a counterpart $X´$ of a (IV)-object X is maximally overall-similar to X among all the *(IV)-objects in X´'s world* (in the space-time to which $X´$ belongs). But like love, similarity is a fickle thing, and like beauty, it is in the eye of the beholder. Thus, a person may at a time legitimately judge that $X´$ – *a (IV)-object in another possible world* – is a counterpart of X, and just as legitimately at another time that it is not (having shifted her emphasis from certain similarity-aspects to others); and one person may at a time legitimately judge that $X´$ is a counterpart of X, but another person at the same time just as legitimately that it is not. This is certainly not an ontologically satisfactory situation.

9. The strangeness of ontological denial

A classification of objects is easily made. Some object-classifications are uninteresting; others are interesting. I submit that the above classification of objects into (I)-objects, (II)-objects, (III)-objects and (IV)-objects is a rather interesting classification. The intriguing thing is that the ingredients of that classification – (1) *having some temporal part* and the negation of this: *not having any temporal part*, and (2) *having, at some point in time, some spatial part* and the negation of this: *not having, at any point in time,*

any spatial part – seem harmless enough, in themselves and in relation to each other. There seems to be *no* a priori reason why any of the four categories that can be formed by consistently combining the said classification-ingredients should be *empty*. Why, then, is it nevertheless assumed by so many that three of the categories are in fact *empty*? That seems strange. Do they have *straight empirical* reasons for this assumption? Most certainly not; for the questions whether there are (I)-objects, (II)-objects, (III)-objects, (IV)-objects are quite far removed from, say, the questions whether there are mammals with neither tail nor beak, mammals with beak but without tail, mammals with tail but without beak, mammals with both tail and beak. The former questions are, so to speak, on a plane of inquiry that is quite different from the plane of inquiry to which the latter questions belong. The latter questions are *empirical*, the former *metaphysical.*

The distinction between *empirical* and *metaphysical inquiry* does, however, not imply that metaphysical inquiry is bound to be *a priori* (to assume that the distinction *does* imply the apriority of metaphysical inquiry would just amount to making all over again the old, Kantian mistake regarding the conception of metaphysics, which has been so detrimental to the subject). Metaphysical inquiry is not empirical inquiry, but it is nevertheless strongly related to human experience, and therefore certainly not a priori. Metaphysical inquiry aims at a *basic interpretation of experience*; it is, so to speak, the basic hermeneutics of experience.

In this light, what position should one adopt regarding (I)-objects, (II)-objects, (III)-objects, and (IV)-objects? The answer is quite clear: all four kinds of objects have, for a very long time, been objects of reference in that interpretation of experience that is manifest in everyday, and also in scientific, human discourse. Contrary to what eliminativists of various stripes are wont to claim, it is not likely that this situation will change in any non-negligible way. The best explanation of this, in turn, is that not only (IV)-objects but also (I)-objects, (II)-objects and (III)-objects are indeed needed for a basic interpretation of experience. Therefore, it is reasonable to assume that *there are* not only (IV)-objects but also (I)-objects, (II)-objects, and (III)-objects; it is reasonable to assume that all four categories of objects are non-empty, it is *not reasonable* – or at least *less reasonable* – to assume the contrary. I am well aware that a huge amount of literature has been dedicated to arguing *the contrary* – literature that I cannot even begin to do justice to in this short paper –, but it seems to me that all that is shown by this remarkable phenomenon is the staggering extent to which the ontological community has been ruled by a mentality that is by no

means rationally necessary for it to adopt: a mentality which one might term *the Democritean Ockham's Razor Mentality*. (or in short: *Quineianism*). It is time for a change. Ontological tolerance is better than ontological intolerance, and Ockham's Razor – *Entia non sunt multiplicanda praeter necessitatem*, no more than an ontological rule of thumb – needs to find its partner and correcting principle in *Husserl's Boat* (as the following quite different ontological rule of thumb may with good reason be dubbed): *Intra finem possibilitatis entia sunt salvanda.*

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