

Region-Relative Parthood

Maureen Donnelly

ABSTRACT:

The ordinary notion of parthood is temporal. We assume that objects like people, cars, computers, and so on, may gain and lose parts. In such cases, we describe an object as having certain parts at one time and different parts at another time. The battery that was part of my car ten years ago is now longer part of it. Most of the cells that are part of me today were not part of me ten years ago.

How are we to make sense of the ordinary notion of temporal parthood in terms of a relativistic spacetime in which there are no absolute times? One possibility is that, in a Minkowski spacetime, parthood is linked to frame-relative times. But a more promising approach-- one that shows greater potential for generalization to different sorts of spacetimes-- is to relativize parthood not to times but to spatio-temporal regions. As [Sattig, 2006] argues, facts concerning which relations objects stand in at a given time plausibly supervene on facts about which objects relations stand in at certain three dimensional slices of spacetime.

In recent work, philosophers such as Hud Hudson and Yuri Balashov have introduced region-relative parthood relations ([Hudson, 2001], [Balashov, 2008]; see also [Crisp and Smith, 2005]). So far, however, not enough attention has been paid to the logical properties of region-relative parthood relations. In fact, the different region-relative parthood relations proposed by Hudson, Balashov, and others, have different logical properties and rely on different assumptions about the way in which objects are located in spacetime.

This paper is an attempt to work out in detail some of the more promising options for interpreting and axiomatizing region-relative parthood relations. I proceed by first introducing specific parthood relations over classes of mathematical models that represent the locations of objects at regions of spacetime. I compare the logical properties of different region-relative parthood relations over a very general class of models. I then consider how special assumptions about the way in which objects are located in spacetime (e.g., whether objects have unique locations in spacetime or whether every subregion of an occupied region is occupied) affect the logical properties of the original parthood relations. A particular objective of this paper is to evaluate different region-relative parthood relations in terms of ternary counterparts of classical mereological principles. I show that some of the proposed parthood relations fit the assumptions of classical mereology better than others. But it is not obvious that there is any region-relative parthood relation that satisfies ternary counterparts of all classical mereological and preserves ordinary assumptions about parthood.

References

Balashov Y 2008 "Persistence and Multilocation in Spacetime" in D Dieks ed., *The Ontology of Spacetime*. Philosophy and Foundations of Physics Series, Vol. 2, Elsevier.

Crisp T and Smith D 2005 “ ‘Wholly Present’ Defined” *Philosophy and Phenomenological Research* 71: 318-344.

Hudson H 2001 *A Materialistic Metaphysics of the Human Person* Ithaca: Cornell University Press.

Sattig T 2006 *The Language and Reality of Time* Oxford: Clarendon Press.

Here we will not expect an exact match. Whereas classical mereology assumes a binary parthood region, region-relative parthood relations considered in this paper are ternary. Still, we will see that natural ternary counterparts of classical mereological principles are satisfied by some of the region-relative parthood relations considered below.