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Studies in History and Philosophy of Modern Physics 37 (2006) 559–576

Studies in History and Philosophy of Modern Physics

www.elsevier.com/locate/shpsb

Absolute becoming, relational becoming and the arrow of time: Some non-conventional remarks on the relationship between physics and metaphysics

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Abstract

The literature on the compatibility between the time of our experience—characterized by passage or becoming—and time as is represented within spacetime theories has been affected by a persistent failure to get a clear grasp of the notion of *becoming*, both in its relation to an ontology of events "spread" in a four-dimensional manifold, and in relation to temporally asymmetric physical processes.

In the first part of my paper I try to remedy this situation by offering what I consider a clear and faithful explication of becoming, valid independently of the particular spacetime setting in which we operate. Along the way, I will show why the metaphysical debate between the so-called "presentists" and "eternalists" is completely irrelevant to the question of becoming, as the debate itself is generated by a failure to distinguish between a *tensed* and a *tenseless* sense of "existence". After a much needed distinction between absolute and relational becoming, I then show in what sense classical (non-quantum) spacetime physics *presupposes* both types of becoming, for the simple reason that spacetime physics presupposes an ontology of (timelike-separated) events. As a consequence, not only does it turn out that using physics to try to provide empirical evidence for the existence of becoming amounts to putting the cart before the horses, but also that the order imposed by "the arrow of becoming" is more *fundamental* than any other physical arrow of time, despite the fact that becoming cannot be used to explain why entropy grows, or retarded electromagnetic radiation prevails versus advanced radiation.

Keywords: Becoming; Minkowski spacetime; Arrow of time; Metaphysics; Presentism; Eternalism; Temporal order

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doi:10.1016/j.shpsb.2006.03.003

1. Introduction

The first and main claim of this paper is that physics cannot provide *empirical* evidence for the objectivity (mind-independence) of *absolute* becoming, for the simple reason that it must presuppose it, at least to the extent that a classical (i.e., non-quantum) spacetime theory presupposes an ontology of events a priori. However, the fact that a theory of absolute becoming must be situated in the abstract realm of metaphysics does not make becoming completely irrelevant for physics, since my second claim will consist in showing that *relational* becoming, once appropriately defined and understood, properly belongs to the tangled set of issues usually referred to with the label "the arrow of time".

The paper is divided into three parts. In the *first* I will strike a blow against the traditional, received views of becoming, typically requiring *the unreality of the future* as a necessary condition for the objectivity or mind-independence of temporal passage. After having severed the misleading link between the concept of becoming and the unfortunate debate between presentism and eternalism, in the *second* part I will offer a much needed, clear explication of becoming, given in terms of the simple *occurrence of events*. I will then defend this approach to becoming from foreseeable objections, especially concerning its faithfulness to the time of our experience. After having crucially distinguished between absolute and relational becoming, in the *third* part I will bring spacetime physics to bear on the explication of becoming. In particular, I will show why the definability of a becoming relation in terms of the relation of past causal (or chronological) connectibility of Minkowski spacetime gives us no clue as to how we should use physics to establish the mind-independence of the former relation.

2. What becoming is *not*

As is sometimes the case in philosophy, one way to solve a problem is to dissolve it, that is, to show that what had so far been considered a substantial debate is in fact not genuine at all. The debate I have in mind is between those who claim that the future and the past are as real as the present (the *eternalists*, or block-view theorists) and those holding that only the present, properly speaking, is real or exists (*presentists*). In part fueled by this debate—and often without having a clear idea of what becoming really meant or entailed—in the last few decades there have been various attempts to find out whether becoming, whatever that meant, was compatible with, or definable within, physical theories like the special or the general theory of relativity.

Despite the confusions afflicting the literature, the prevailing idea seems to have been that becoming (or the flow of time) is connected to *ontological* issues, i.e., issues of the kind debated by presentists and eternalists. In particular, for quite some time, and by virtually all the authors engaged in the debate, *the unreality of future events* has been regarded as the main, necessary condition for an objective, *ontological* (non-merely subjective) becoming. This unreality is typically either mirrored by that of past events, as presentists have it, or contrasted with the reality of the past, as "empty view theorists" or "possibilists" have it (see Dorato, 1995; Savitt, 2001).

Quite significantly, despite their disagreement on how to interpret the ontology of Minkowski spacetime, Putnam (1967), Rietdijk (1966), Weingard (1972) and Stein (1991), just to name a few, seemed to presuppose that the crucial issue at stake in trying to understand whether the time of our experience conflicts with special relativistic time