

The Adolescence of Relativity: Einstein, Minkowski, and the Philosophy of Space and Time

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Abstract

An often repeated account of the genesis of special relativity tells us that relativity theory was to a considerable extent the fruit of an operationalist philosophy of science. Indeed, Einstein's 1905 paper stresses the importance of rods and clocks for giving concrete physical content to spatial and temporal notions. I argue, however, that it would be a mistake to read too much into this. Einstein's operationalist remarks should be seen as serving rhetoric purposes rather than as attempts to promulgate a particular philosophical position --- in fact, Einstein never came close to operationalism in any of his philosophical writings. By focussing on what could actually be measured with rods and clocks Einstein shed doubt on the empirical status of a number of pre-relativistic concepts, with the intention to persuade his readers that the applicability of these concepts was not obvious. This rhetoric manoeuvre has not always been rightly appreciated in the philosophy of physics. Thus, the influence of operationalist misinterpretations, according to which associated operations strictly define what a concept means, can still be felt in present-day discussions about the conventionality of simultaneity.

The standard story continues by pointing out that Minkowski in 1908 supplanted Einstein's approach with a realist spacetime account that has no room for a foundational role of rods and clocks: relativity theory became a description of a four-dimensional 'absolute world'. As it turns out, however, it is not at all clear that Minkowski was proposing a substantivalist position with respect to spacetime. On the contrary, it seems that from a philosophical point of view Minkowski's general position was not very unlike the one in the back of Einstein's mind. However, in Minkowski's formulation of special relativity it becomes more explicit that the content of spatiotemporal concepts relates to considerations about the form of physical laws. If accepted, this position has important consequences for the discussion about the conventionality of simultaneity.

Keywords: operationalism, Einstein, Minkowski, simultaneity, conventionalism

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