

How Hume and Mach Helped Einstein Find Special Relativity

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Abstract

In recounting his discovery of special relativity, Einstein recalled a debt to the philosophical writings of Hume and Mach. I review the path Einstein took to special relativity and urge that, at a critical juncture, he was aided decisively not by any specific doctrine of space and time, but by a general account of concepts that Einstein found in Hume and Mach's writings. That account required that concepts, used to represent the physical, must be properly grounded in experience. In so far as they extended beyond that grounding, they were fictional and to be abjured (Mach) or at best tolerated (Hume). Einstein drew a different moral. These fictional concepts revealed an arbitrariness in our physical theorizing and may still be introduced through freely chosen definitions, as long as these definitions do not commit us to false presumptions. After years of failed efforts to conform electrodynamics to the principle of relativity and with his frustration mounting, Einstein applied this account to the concept of simultaneity. The resulting definition of simultaneity provided the reconceptualization that solved the problem in electrodynamics and led directly to the special theory of relativity.

Keywords: Einstein Hume Mach concepts time simultaneity

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