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Reviewer Name: de Paz, María

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Address:
Dep. de Filo., Log. y Filo. de la Cien.
Fac. de Filosofía, Univ. of Sevilla
C/Camilo José Cela S/N
41018 Seville
SPAIN
maria.depaz@hotmail.com

Author: Darrigol, Olivier

Title: Deducing Newton's second law from relativity principles: a forgotten history.

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Review text:

This is a very interesting and well written paper on the history of mechanical principles. It is restricted to a particularly forgotten part of this history: the deduction of Newton's second law from several variants of the relativity principle. The author connects this history with Einstein's General Theory of Relativity, arguing that Einstein knew part of the sources in which this deduction was made, and consequently, he could have been inspired by it in the formulation of the equivalence principle that led to the construction of General Relativity. The author analyzes the path of this connection between the law of force and the principle of relativity from the seventeenth to the turn of nineteenth to twentieth century. After the introduction of the topic, the paper is divided into seven sections. In the first two sections, we can find an overview of the main principles and of the basic derivations of the second law -for impulsive forces and continuous forces-. After that, Darrigol analyzes the work of seventeenth (section 3), eighteenth (section 4), and nineteenth century authors (section 5). Regarding seventeenth century, we can see the work of Huygens as essential for Darrigol's main argument, since Huygens is one of the first authors to see the relativity principle as a constructive one, i.e. a principle from which we derive others as theorems. Thus, he can deduce Newton's second law from this principle, opening a tradition that will be transmitted to the nineteenth century through the works of Euler and D'Alembert, but especially through that of Laplace. The fact that we can associate such relevant names to this particular view of the principles of mechanics shows that Darrigol's work, although dealing with a for-

gotten part of the history of science, is far from trivial, since it concerns some of the main actors in the history of mechanics. When coming to the nineteenth century, the paper deals with less known authors, but given that most of them were students or professors in one of the most relevant French institutions, i.e. the Ecole Polytechnique, this points to a tendency that might very well have influenced the whole view of French nineteenth century mechanics. Section 6 of the paper is devoted to the analysis of the principle of relativity in two turn of the century authors: Poincare and Einstein. Their works and views are analyzed and compared, showing the connection in both authors between the rejection of ether and the relevance of the relativity principle in its restricted form. Of course, Einstein's ideas took him further, since he presented a General Theory of Relativity whereas Poincare did not. Here is where Darrigol shows also Einstein's familiarity with French nineteenth century versions of a more general principle of relativity which refers to accelerate motions. In the final section the author discusses different philosophical approaches for the history of mechanics showing the connection between philosophical conceptions of scientific theories, and different grades of commitment to reality for those theories. In many works of secondary literature, when the problems of mechanics are addressed, it is quite common to see on one side the questions associated with inertia and relativity and on the other the questions connected to the notion of force. This paper shows that in order to properly address a complete picture of the history of mechanics, such disconnection is not reasonable.