

Poincaré, Philosopher of Science – Problems and Perspectives, por
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The book *Poincaré, Philosopher of Science – Problems and Perspectives*, edited by María de Paz and Robert DiSalle, is the result of various colloquia and conferences organized by the Portuguese project bearing the same name. The project, initiated by University of Lisbon, brought together scholars of many different countries to speak about the three main philosophical facets of Henri Poincaré: as a philosopher of science in general, as a philosopher of mathematics, and as a philosopher of physics. In what follows, each chapter will be reviewed individually.

The first chapter written by Laurent Rollet has as its subject the origins of Poincaré's philosophy, a subject that has already received attention from many scholars such as Giedymin, Grümbaum and Nye. However, Rollet's approach is quite different because he focuses his research on the philosophical studies of young Poincaré before entering École Polytechnique in 1873. Rollet is very successful in putting together different kinds of biographical sources and coordinating them with the historical and social context of that time in order to provide us with a more detailed and colorful picture of a rather forgotten aspect of Poincaré's life. To extend this approach into a larger biographical scheme is arduous but highly desirable for all researches in the field.

Next, Folina presents us with a defense of Poincaré's conventionalism in face of some critics who claim that changes in physics promoted by general relativity made conventionalism invalid. Poincaré's epistemological thinking, usually labeled as

conventionalism, was far from being a systematic doctrine based on clear and exact arguments. For that and other reasons, scholars struggle to find an interpretation that would make it consistent by itself, especially when confronted with new advances in science. Experience has undoubtedly a very important role in conventionalism. However, which level of importance it has or what role its influence plays in choosing a convention is left unanswered by Poincaré. We should be careful not to give the main role to experience, otherwise the principles would stop being conventional and would be empirical. After all, conventionalism is a doctrine that shows how many important principles in science cannot be chosen based on experience, intuition or logic, but in a free and not arbitrary convention established by us. It is crucial to note that even experience itself can have multiple interpretations depending on which convention we initially adopt.

In the third chapter, *María de Paz* provides a detailed study about the different meanings that the concept of convention can acquire in the work of Poincaré, thus enhancing his epistemological thinking as a 'third way' option amongst traditional theories of knowledge. In the ambition to avoid mistakes, *De Paz* proposes a clarification of the different senses that the concept 'convention' can have to Poincaré. She reached a classification of eight different types; some of which have a function only in one of Poincaré's conventionalism (geometrical or physical) while others are present in both. Though the nature of each one can vary - arbitrary or not, guided more or less by experience or simplicity - all of them show the conventional aspect present in the principles of science and thus the creative role pursued by scientists.

Next, *Videira* proves that it is possible to fully understand an author while also directing criticisms towards it. In his opinion, Poincaré's attempt to avoid any metaphysical discussion turns his philosophical positions, such as realism, into weak points of his

epistemology. Given Poincaré's aversion towards any reference to metaphysics, Videira's research has to appeal to subtleties present in some texts and interpretations of both of him and other scholars. In his opinion the 'indifferent hypotheses' were the way Poincaré found to give metaphysics a place in the constitution of science, though a very limited one. Those hypotheses, according to him, could be discarded without prejudice to theory. Defending the contrary, Videira analyzes Poincaré's text 'New Concepts of Matter' showing that the arguments used by the French scientist are often short, obscure and avoid counterarguments; all marks of weakness caused by his refusal to face the ontological consequences of his own thinking.

Reinhard Kahle presents us his biographical research about the relationship between Poincaré and David Hilbert, particularly the visit of the French mathematician to Göttingen in 1909. It's a very well-done reconstruction of the encounter through letters, speeches and memories of many mathematicians. When Kahle puts all that information together it is possible not only to have a good sketch of the mathematical scenario of France and Germany in the turn of nineteenth to the twentieth century, but also to trace direct influences between each of the authors. An interesting example analyzed is that of *Hilbert's programme*, a list of mathematical problems that had its first version when Hilbert delivered a talk in 1900 for the International Congress of Mathematicians. The bold tone of the talk presented by the German mathematician was in fact a criticism to Poincaré's paper presented in the same congress three years before; in Hilbert's opinion all of Poincaré's statements were "expressed in such a mild form that one cannot take exception to them" (Reid, 1970, 69).

The next chapter, written by Augusto Franco de Oliveira, analyzes Poincaré's 1905 article "Cournot et les Principes du Calcul Infinitesimal", in which the focus is on Poincaré's thoughts about calculus and continuum, and also the resemblance of his position to

that of Cournot. While the author's conceptual analysis and comparison between Poincaré and Cournot's positions are irreproachable, his conclusions are few and uncertain; something Poincaré's scholars are used to. For this reason I think he should have included a connection between the results he achieved with some macro features of Poincaré's thinking. It would be interesting, for example, to question why and how Poincaré seems to adopt Cournot's realistic position or if Poincaré's intuition is enough to solve all problems concerning continuum. No doubt that in order to answer those questions one would have to interpret more than just analyze. It is more a matter of constructing the answer than finding it. But I personally think that is what makes an insightful text, especially when it comes about studying Poincaré. After all, his dubious positions and frequent lack of concrete evidence in most matters demand more of our own interpretative skills than usual.

In the end of the second part of the book we find a deep investigation into Poincaré's mathematical thinking. Gerhard Heinzmann analyzes Poincaré's and Lautman's work in the search of their stands about the meta-mathematical thesis that holds "mathematics concerns structures". In my opinion Heinzmann is very successful in his attempt to find a coherent interpretation that unifies Poincaré's conventionalism and some of his meta-mathematical positions. By the end of that chapter readers will probably understand better why Poincaré is considered by some scholars as a "structural realist".

The third and final part of the book is dedicated to the thoughts Poincaré developed in the foundations of physics. João Príncipe is the author responsible for the opening chapter, which is written in a language closer to that of a professional physicist, and he approaches some of the contributions Poincaré made to statistical mechanics. Príncipe starts with a short, albeit interesting, report of kinetic theory's

development in the French scenario until Poincaré's days and then he presents the steps Poincaré took in order to contribute to Helmholtz's approach to thermodynamics. The author does a great job in showing Poincaré's failed attempt to reduce the second law of thermodynamics into a mechanical interpretation and also how the pioneer probabilistic methods Poincaré used while working in the three-body problem assisted him in further contacts with statistical mechanics.

In the following chapter, Isabel Serra defends a position that embodies the whole spirit of the book. Her thesis is that Poincaré's work in so many different branches between and inside physics and mathematics was influenced explicitly and implicitly by his philosophical views. As the chapter progresses, she talks about the many unexpected correlations Poincaré drew - such as between Fuchsian functions and non-Euclidean geometry, differential equations and group-theoretic approach, etc. - and how his philosophical views implicitly influenced those connections. By the end of the text she approaches the thesis also defended by Giedymin that Poincaré's work in physics was directly influenced by his previous conventionalist position about geometry. The question raised by Serra at the very end of text is a very interesting one and should receive attention in further researches on the field: "Wasn't Poincaré working out his scientific ideas just like a philosopher?"

Closing the third part, and the book, we find an excellent chapter written by Robert DiSalle about the reasons of Poincaré's resistance towards the newly-born relativity theory. The question raised is a difficult one because it requires expertise in both Poincaré's and Einstein's thinking; but the result is remarkable. I particularly enjoyed when the author discusses the fact that Poincaré's conventionalism highlights not only decisions that scientists face while dealing with fundamental aspects of theories, but also that these decisions directly influence the results of empirical test. If we adopt the definition, for

example, that a ray of light necessarily travels through space in a straight line then the results of our experiments will lead us into a completely different conclusion than if we had adopted another definition. That misinterpretation is an important reason among others which make many scientists believe that Poincaré's conventionalism was totally refuted by relativity theory and that Poincaré resisted changing his mind in face of new developments because of a supposedly outdated conception of space. DiSalle refutes that naïve conception and demonstrates the reasons why according to Poincaré's thinking he resisted to adopt the recent space-time theory.

This edition of the book constitutes an important step for those interested both in Poincaré's research and in the philosophy of science because it solidifies the cutting-edge work that has been done by some of the most dedicated scholars in the field. The book also shows the importance Poincaré's work has had in the field by having such a diverse author list. In addition, it is an amazing initiative to the academic community that certainly will promote similar quality works in the future.

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