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Constructive Axiomatic Method and Modern Physics

In 1900 David Hilbert announced his famous list of then-opened mathematical problems; the problem number 6 in this list is the axiomatization of physical theories. Since then a lot of systematic efforts has ben invested into this project. However the results of these century-long efforts (including Hilbert's own work) turned to be less successful than the proponents of using the axiomatic method in hoped for. The existing axiomatizations of physical theories arguably provide a valuable logical analysis but they do not constitute anything like a standard presentation of these theories, which can be used for transmission, evaluation and justification of physical knowledge.

This state of the art in the axiomatization of physics is a strong evidence that the standard notion of axiomatic theory stemming from Hilbert and Tarski is not quite appropriate for the task. However in the recent years in mathematics there emerged a new axiomatic approach best represented by the Homotopy Type theory. I shall argue that this new axiomatic approach, which I shall call constructive (see arXiv: 1408.3591), better fits the needs of modern physics, and review attempts to use it for axiomatizing Quantum Field theory by Urs Schreiber and co-authors (arXiv: 1109.0955, 1408.0054).