

## On Field's Nominalization of Physical Theories

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Quine and Putnam's Indispensability Argument claims that we must be ontologically committed to mathematical objects, because of the indispensability of mathematics in our best scientific theories. Indispensability means that physical theories refer to and quantify over mathematical entities such as sets, numbers and functions. In his famous book *Science Without Numbers* Hartry Field argues that this is not the case. We can "nominalize" our physical theories, that is we can reformulate them in such a way that (1) the new version preserves the attractivity of the theory, and (2) the nominalized theory does not contain quantifications over mathematical entities.

I'm going to reconsider Field's nominalization procedure for a toy physics theory formulated in a first order language, in order to make a clear distinction between the following three steps:

- the physical theory in terms of empirical observations;
- the standard physical theory, which contains quantification over mathematical entities, as usual;
- the nominalized version of the theory without any reference to mathematical entities.

Having Field's nominalization procedure reconstructed, it will be clear that there is no difference between the original and the nominalized versions of the theory, at least, there is no difference from a formalist point of view. It is because the only difference would come from the different "meanings" of the variables over which the quantifications are running. The formalist philosophy of mathematics, however, denies that the variables have meanings at all. So, the formal systems as abstract mathematical entities are still included in physical theories; and this fact is highly enough for the structural platonist or immanent realist to apply the Quine-Putnam argument.

Finally, therefore, I will suggest a completely different way for the objection to the Quine-Putnam argument.