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A Constraint on Fundamental Physics

A rarely mentioned assumption that underlies all empirical science is that the studied phenomena must at least be describable or predictable. In other words: there must exist some fundamental connection between properties of the studied phenomena. If the properties of two phenomena are unrelated, it is not sensible to compare them. If trying to describe nature is useful at all, there must be a structure of fundamental connections between natural phenomena, a set of true laws of nature.

This assertion can be used to deduce concrete constraints on theories of physics, by investigating the implications of theorems on the properties of such structures in general, as provided by mathematical logic. Even the demand that nature is consistent already has consequences for this structure because of the incompleteness theorems, which will be discussed. More generally, this type of consideration offers a route to a more ontological approach to theoretical physics.

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