

A Study in Theory Unification: The case of Kaluza-Klein Theories

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Abstract

In this paper, I call attention to the higher dimensional unified field theory program that has culminated in a class of higher dimensional spacetime theories, called the Kaluza-Klein (KK) theories, aiming to unify gravity with gauge fields in a higher dimensional Riemannian spacetime. I examine theory unification both in the original KK theory, which originated in the works of Theodor Kaluza and Oskar Klein in the twenties, and in the modern KK theories—namely, the higher dimensional superstring and supergravity theories—which date back to the late seventies and which are still considered by the majority of the physics community to be the best hope for a complete unified theory of all fundamental interactions. I use the conclusions of this case-study to assess the merits of the unificationist account of scientific explanation advanced by Philip Kitcher. In conclusion, I argue that the conceptions of unity leading to the construction of the KK theories have features that are quite distinct from those asserted by Kitcher's account.

Keywords: Unification; Explanation; Scientific Understanding; Argument Patterns; Higher Dimensions; Gauge Symmetries; Kaluza-Klein Theories; Yang-Mills Theories, Standard Model of Particle Physics.

Subjects: [General Issues: Explanation](#)

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