

Are Physics Principles Needed to Justify Theories in Space-time & Gravity?

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Scientific principles in physics can be understood as useful in the context of discovery, but rarely crucial in the context of justification (to recall a distinction due to Hans Reichenbach)—at least not in the physics of space-time and gravity, where principles have seemed particularly important. Consequently neither the need to evaluate principles philosophically nor the apparent failure of some attractive principle(s) generates a crisis for physics or the philosophy of science.

The dispensability of principles in the justification of space-time physics can be understood using two converg

The particle physics tradition in gravity, involving key contributions by Pauli, Fierz, Kraichnan, Gupta, Feyn

Recent historiography on Einstein's process of discovery, due to Stachel, Renn, Janssen, Norton, Sauer, van Don

Hence the prominence of principles in space-time physics is historically contingent; physics still primarily rests on mathematics, logic and experiment.

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