

The Scale Revolution in Physics

Initiative: Pioniervorhaben Exploration

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The concept of scale has come to play a fundamental role in theoretical physics, shaping the way physicists think about physical problems and attempt to address them. Entities and structures are now systematically organized in terms of their characteristic size. Physical effects are systematically analyzed according to their relative importance and dependency across scales (e.g., distance, velocity, energy). Most physicists even believe that our best current theories only work at certain scales. When and why did this transformation happen? How does it affect our world picture? The aim of this project is to trace the historical origins and explore the philosophical implications of this new way of doing physics "scale by scale". The working hypothesis is twofold: (i) a fundamental shift in physics practice centered around the concept of scale took place in the 1950s-70s in physicists' attempt to understand the structure of matter; (ii) this new practice underwrites a partial picture of the world structured in a complex hierarchy of largely independent levels. The research team will explore these hypotheses by taking some of the most successful scale-based theories and methods developed since the 1950s as case studies. The project's ambition, ultimately, is to uncover a major historical transformation in 20th-century physics practice and disclose fundamentally novel ideas likely to make a difference in current philosophical debates.

Projektbeteiligte

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