Analytical-philosophical aspects of a new approach to unification

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One of the main achievements of physics research is that it has been irrefutably established that there are four fundamental interactions in nature: the gravitational interaction, the electromagnetic interaction, the weak interaction, and the strong interaction. Modern physics contains a theory for each of these: general relativity (GR), developed by Einstein, is a classical theory of gravitation; quantum electrodynamics (QED), developed in the first half of the 20th century, is a quantum theory of the electromagnetic interaction; quantum chromodynamics (QCD), developed during a brief period from 1972 to 1973, is a quantum theory of the strong interaction; electroweak theory (EW), developed mainly by Glashow, Salam, and Weinberg, is a unified quantum theory of the electromagnetic and weak interactions. One of the main aims of theoretical physics is then to develop a "unification" of these four interactions: an exact, consistent, and coherent model of a unified interaction that merges these four interactions into a single one. The basic idea is that

(i) at high energies, the electroweak and strong interactions merge into a single *electronuclear interaction*;

(ii) at Planck scale, gravity merges with the unified nongravitational interactions, that is, with the electronuclear interaction.

Theories of the electronuclear interaction, called Grand Unified Theories (GUTs) have been proposed, but none is generally accepted. A theory of a unified interaction encompassing all four interactions, called a Theory of Everything (TOE), has so far not been published. And so, the current state of affairs is that on the one hand there is a plethora of ongoing research programs that one way or the other aim to contribute to a unification of all fundamental interactions in the framework of quantum physics, but on the other hand no one can possibly deny that research has reached a stalemate already for decades in a row: despite the monumental effort, no substantial progress has been made—and that's a problem by itself. This is currently the most general, the most overarching problem in physics: it consists of the subproblem of unification and the subproblem posed by the failure of the mainstream research programs.

Recently a fundamentally new approach to unification has resulted in a relativistic model of an elementary process in the temporal evolution of a one-component system, during which a gravito-electromagnetic interaction with gravitational and electromagnetic aspects takes place between the system and its environment in a substantival spacetime [1]. In this talk I will discuss controversial analytical-philosophical aspects of this new approach to unification, in the hope to spur the audience to a discussion about the most fundamental assumptions about the physical world that are often considered to be untouchable.

References

[1] M.J.T.F. Cabbolet, Model of a gravito-electromagnetic interaction with gravitational and electromagnetic aspects: a fundamentally new approach to unification. Submitted (2024)