

Preface

I am proud to present the proceedings of the international workshop *Unification in Physics and Philosophy*. The workshop was arranged on May 9th-11th 2019 in Porvoo and Helsinki, Finland.

The workshop and its proceedings are devoted to dealing with hard problems in physics and philosophy by unification. The basic idea is to strive for a minimal ontological core of hypothetical laws of nature that naturally resolve hard problems which are caused by disunified theories, and which cannot be properly resolved by focusing only on details of isolated topics. Unification is urgently needed, for neither in physics nor in philosophy do we find a commonly accepted ontological core that could function as a unifying base.

A great majority of physicists and philosophers focus on technical details of specialized research areas, not on seeking comprehensive and intuitive solutions. Physics is mainly practiced by developing mathematical descriptions of new hypothetical laws of nature for each special area. Also philosophers tend to specialise in problems of a particular domain, say, what is time, what is possibility, what is persistence, what is causation, rather than developing unified views of interrelated domains. Furthermore, attempts to address interrelations between physics and philosophy are rare, and when it is done the focus is again within specialized domains.

The standard practice of physics and philosophy is in a dire contrast with the unifying approach, where we strive to found mathematics, logic, semantics and concepts on few understandable basic postulates that suffice for several different research areas or scales of phenomena.

The workshop brought together scholars with a mutual interest in a unified approach of this kind, to discuss particular unifying resolutions and what a unified approach should in general look like. These proceedings aim to provide answers to questions such as the following: What are the central problems in physics and scientifically oriented philosophy, and how did their historical development result into the problems? What are the criteria by which one theory is to be preferred over another? Can we identify provisional postulates that unify and resolve central problems of domains of inquiry that are currently disunified.

Organization

The workshop was arranged by The Finnish Society for Natural Philosophy, The Physics Foundations Society, Aalto University and The Finnish Society for the History of Science and Learning. Members of the program committee were Avril Styrman, Kari Kosonen, Tuomo Suntola, Tapio Ala-Nissilä, Heikki Sipilä, Cecilia af Forselles and Juha Samela. The workshop started by discussions between the invited speakers in Haikko Manor in Porvoo on May 9th-10th. The public presentations were given on May 11th at the House of Science and Letters in Helsinki. The welcoming words were given by Cecilia af Forselles. All speakers contributed to these proceedings, except for Laurence Gould who gave the speech *Quantum Ontology of de Broglie and Bohm with Reflections on the Meaning of Probability*, and Tapio Ala-Nissilä who gave the speech *Quantum Mechanics in Action: a Working Physicist's Point of View*. Heikki Koivo chaired the morning sessions and Avril Styrman chaired the afternoon sessions. The workshop ended at a panel discussion. The workshop received a grant from The Federation of Finnish Learned Societies.

The current workshop is the third in the series of international meetings concerning unification in physics and philosophy, whose main organizers are The Finnish Society for Natural Philosophy and The Physics Foundations Society. The first meeting in the series, *Models in Physics and Cosmology*, was arranged in 2010. The second meeting, *Scientific Models and a Comprehensive Picture of Reality*, was arranged in 2016.





Dinner at Haikko Manor on May 9th 2019. From left to right: Bihua Liu Wang, Heikki Sipilä, Martine Armand, C. S. Unnikrishnan, Tarja Kallio-Tamminen, Rögnvaldur Ingthorsson, Avril Styrman, Laurence Gould, Tapio Ala-Nissilä, Tuomo Suntola, Ling Jun Wang.

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Avril Styrman gives an introduction to theory evaluation and an historical outline of how physics and philosophy drifted apart in *Only a Unified Ontology can Remedy Disunification*. It is argued that working in the context of mutually and internally disunified theories of physics and philosophy is not optimally progressive, and that their hard problems can be naturally resolved by a unified ontology, not by investigating details only.

Ling Jun Wang scrutinises contemporary theoretical physics in *Physics Needs Nothing Less Than a Renaissance — On the Relation Between Physics and Philosophy*. He argues that theoretical physics has become an isolated enterprise and has severe philosophical, methodological and logical problems, and that especially relativistic physics and the standard model of particle physics have arrived at a dead end.

Tuomo Suntola argues in *Unification of Theories Requires a Postulate Basis in Common* that his theory, the Dynamic Universe, is genuinely unified. Namely, Suntola argues that by committing to absolute simultaneity and the conservation law of energy in spherically closed space, the Dynamic Universe predicts and explains phenomena in the domain of relativistic physics and cosmology, it is compatible with quantum mechanics and complements its ontological foundations, and it bridges the gap between philosophy and physics by providing an understandable scientific worldview.

Heikki Sipilä argues in *Is the Solar System Expanding?* that data gathered from coral fossils and sandstone layers supports the hypothesis that the Solar System expands along with the expansion of space. Sipilä shows that Suntola's Dynamic Universe gives accurate predictions of this data, and that the supposition that the Solar System expands resolves the Faint young Sun paradox.

Tarja Kallio-Tamminen argues in *Dynamic Universe — Natural Science and Philosophy in Unison* that the Dynamic Universe provides solutions to many fundamental questions in natural philosophy, by unifying physics and philosophy into a comprehensible whole, which explains phenomena in the domains of relativistic physics and quantum mechanics.

Rögnvaldur Ingthorsson maintains in *Ontological and Methodological Reflections on the Virtues of Unification* that the unifying approach is our best hope of understanding the world, if the world itself is a unified whole. Ingthorsson argues for the intelligibility of metaphysical naturalism in philosophy, where theories and findings of empirical science are taken seriously, and philosophical conclusions are drawn from them, in particular about causation.

C.S. Unnikrishnan formulates a gravitational theory called Cosmic Relativity in *A New Gravitational Paradigm for Relativity, Dynamics, and their Philosophical Basis*. Unnikrishnan argues that Cosmic Relativity, which commits to absolute simultaneity, saves all phenomena in the domain of relativistic physics, and avoids the ambiguities and paradoxes of relativistic physics.

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Avril Styrman
Chair of The Finnish Society for Natural Philosophy