

Special Issue on
**Mathematical Foundations of Quantum Mechanics and
Quantum Field Theories**

CALL FOR PAPERS

Major advances in quantum theories require a deeper understanding of the analytical methods and structures that make up their foundations. For instance, partial inner product spaces and distribution spaces (with their normal subspaces of distributions and their Hilbert and pre-Hilbert subspaces) reveal much richer structures than Hilbert spaces and Gelfand's triples. Distribution-based mathematical structures not only allow insights in many theoretical directions, but their applications also appear deeply meaningful. In quantum theories, Schwartz distributions are widely used, and some basic definitions even require them; however their essential foundational role at a structural level is hardly recognized in literature. Often, the structures inside distribution spaces are totally obscured, despite the fact that they are a much better representation of the quantum physics theoretical framework than the architectures of Hilbert spaces.

This special issue aims to provide a forum in which to investigate the foundational role of different mathematical structures (including the Hilbert subspaces of distribution spaces and the manifolds modeled on distribution spaces), within the scope of quantum physics, at the level of systematization, analysis, and development. We desire to attract original research and review articles regarding the mathematical architectures of quantum physics and to emphasize the role of various mathematical structures, beyond Hilbert spaces.

Potential topics include but are not limited to the following:

- ▶ Mathematical structures and axiomatizations of quantum mechanics
- ▶ Schwartz distribution theory in quantum mechanics and quantum field theory
- ▶ Quantum probabilities and Gleason-type measures
- ▶ Quantum-relativity foundations
- ▶ Haag–Kastler axiomatic framework
- ▶ C^* -algebra theory in QM
- ▶ Reasonable proposals for the Millennium Problem, regarding the construction of an axiomatic Yang–Mills theory
- ▶ Schwartz kernels and nuclear spaces in quantum mechanics and in elementary particle theory

Authors can submit their manuscripts through the Manuscript Tracking System at <https://mts.hindawi.com/submit/journals/amp/rmtfq/>.

Papers are published upon acceptance, regardless of the Special Issue publication date.

Lead Guest Editor

David Carfi, University of Messina,
Messina, Italy
davidcarfi@gmail.com

Guest Editors

Alfonso Agnew, California State
University Fullerton, California, USA
aagnew@exchange.fullerton.edu

Luiz R. Evangelista, Universidade
Estadual de Maringá, Maringá, Brazil
lrevang@gmail.com

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