

PREFACE**Quantum physics with non-Hermitian operators**

The main motivation behind the call for this special issue was to gather recent results, developments and open problems in quantum physics with non-Hermitian operators. There have been previous special issues in this journal [1, 2] and elsewhere on this subject. The intention of this issue is to reflect the current state of this rapidly-developing field. It has therefore been open to all contributions containing new results on non-Hermitian theories that are explicitly \mathcal{PT} -symmetric and/or pseudo-Hermitian or quasi-Hermitian. In the last decade these types of systems have proved to be viable self-consistent physical theories with well defined unitary time-evolution and real spectra. As the large number of responses demonstrates, this is a rapidly evolving field of research.

A consensus has been reached regarding most of the fundamental problems, and the general ideas and techniques are now readily being employed in many areas of physics. Nonetheless, this issue still contains some treatments of a more general nature regarding the spectral analysis of these models, in particular, the physics of the exceptional points, the breaking of the \mathcal{PT} -symmetry, an interpretation of negative energies and the consistent implementation of the WKB analysis. This issue also contains a treatment of a scattering theory associated with these types of systems, weak measurements, coherent states, decoherence, unbounded metric operators and the inclusion of domain issues to obtain well defined self-adjoint theories. Contributions in the form of applications of the general ideas include: studies of classical shock-waves and tunnelling, supersymmetric models, spin chain models, models with ring structure, random matrix models, the Pauli equation, the nonlinear Schrödinger equation, quasi-exactly solvable models, integrable models such as the Calogero model, Bose–Einstein condensates, thermodynamics, nonlinear oligomers, quantum catastrophes, the Landau–Zener problem and pseudo-Fermions. Applications close to experimental realization are proposed in optics, including short light pulse models, waveguides and laser systems, and also in electronics.

We hope that this issue will become a valuable reference and inspiration for the broader scientific community working in mathematical and theoretical physics.

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Guest Editors**References**

- [1] Fring A, Jones H F and Znojil M (ed) 2008 *J. Phys. A: Math. Theor.* **41** 240301
- [2] Geyer H, Heiss D and Znojil M (ed) 2006 *J. Phys. A: Math. Gen.* **39** 9963