Preface

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Received: 1 December 2010 / Accepted: 7 December 2010 / Published online: 14 December 2010
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This special issue is an exciting collection of works in quantum foundations and information, quantum geometry and probability, philosophy, methodology of measurements, and results of new exciting experiments testing the foundations of quantum mechanics and quantum field theory. There are even a few papers on applications of the formalism of quantum mechanics to cognitive science, psychology (nonclassical decision making), and finance.¹ Readers will find a broad spectrum of interpretations defended: from the orthodox Copenhagen interpretation to recently elaborated ones such as, e.g., extended semantic realism and statistical classical field theory (an attempt to make Einstein's dream of a purely classical field model of reality come true). Most of the contributions are devoted to new achievements in conventional quantum theory. However, attempts to go beyond this theory are also well represented; the issue of possible experimental violation of the basic probabilistic laws of quantum mechanics (including Born's rule) is raised. Thus quantum theory is enlightened from all possible angles: from seeing it as a complete theory which is developed through new applications, especially to quantum information, to "quantum mechanics as an emergent phenomenon".

We hope that this volume will be useful for experts working in all domains of quantum physics: theoreticians, experimenters, mathematicians, philosophers. The papers on applications of quantum mathematics may be interesting for mathematically oriented psychologists and researchers in decision making.

¹They are based on the observation that the mathematical formalism which was initially developed for a particular physical theory can, in principle, be applied in other domains of science, cf. the differential and integral calculi which were developed to serve Newtonian mechanics, but nowadays used everywhere.

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