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Preface

Interactions between mathematics and physics have often been complicated and, interestingly enough, quite fruitful. The main goal of the school *Entropy and the Quantum* was to give young mathematicians access to some of the intuitions of quantum mechanics and bring clarity to certain mathematics that has been motivated by this field. This too is the goal of the present lecture notes. They include an excellent introduction to quantum mechanics by William Faris which explains many important ideas to a mathematical audience. Analytical inequalities have been developed over the years for, and because of, quantum mechanics. These are the subject of two contributions to this volume, one by Eric Carlen and one by Robert Seiringer. Far-fetched applications to the Shandrasekhar limit of stellar masses are explained by Christian Hainzl. Another topic related to quantum mechanics, and the object of much current research, is quantum information theory. The lecture notes of Bruno Nachtergaele and Robert Sims, and of Christopher King, are devoted to recent developments herein that are especially relevant to mathematics. These lecture notes have been written primarily for PhD students and for postdocs, but they will certainly be valuable to more experienced researchers as well.

These notes are motivated by the school *Entropy and the Quantum* that took place in Tucson, Arizona, on March 16-20, 2009. The participants were treated to beautiful lectures by Carlen, Nachtergaele, Seiringer, and Wehr. There were also regular talks by Betz, Hainzl, Kawai, Newman, Rey-Bellet, and Ruskai. This event was a pleasant week on the sunny campus of the University of Arizona, with invigorating, post-lecture discussions at a variety of places near the campus. The excursion to the Arizona-Sonora Desert Museum, near Tucson, constituted a welcome break and a memorable introduction to the wildlife of the area.

The organizers would like to thank the many people who made this pleasant and useful school possible. Tom Kennedy and Jan Wehr gave encouragements and advice, Bill Faris suggested the catchy (and accurate!) title of the school. The enthusiasm and dedication of the lecturers were vital. The efficiency and patience of Annette Horn, the conference coordinator, allowed the event to run smoothly. We also want to thank our sponsors: the University of the Arizona, for financial support and for use of their facilities; and the National Science Foundation, which provided the bulk of the financial support (grant DMS-0852422). Finally, the organizers thank all the participants of *Entropy and the Quantum* for their interest, for their questions, and for their good humor.

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