Preface

Symplectic geometry has its origin in physics, particularly as a mathematical framework for Hamiltonian mechanics, but it has undergone a remarkable development in the past thirty years as an independent subject in mathematics. Through the work of many outstanding mathematicians, symplectic geometry and its offspring, symplectic topology, have become very active research areas. There are now many applications of symplectic methods back to mathematical physics; for example, Floer theory has contributed new insights to quantum field theory. In a related direction, noncommutative geometry has developed an alternative mathematical quantization scheme, based on a geometric approach to operator algebras. Finally, deformation quantization, a blend of symplectic methods and noncommutative geometry, approaches quantum mechanics from a more algebraic viewpoint, as it addresses quantization as a deformation of Poisson structures. Thus, symplectic geometry and noncommutative geometry offer unique but related perspectives on quantum theory, and with deformation quantization they have led to many fruitful connections between mathematics and physics.

Two research programs, the 2009–2010 MSRI (Mathematical Sciences Research Institute at Berkeley) thematic year on Symplectic and Contact Geometry and Topology and the 2010 RIMS (Research Institute of Mathematical Sciences at Kyoto University) thematic year on Perspectives in Deformation Quantization and Noncommutative Geometry, held joint workshops at MSRI in May 2010.

The conference on *Symplectic and Poisson Geometry in Interaction with Analysis, Algebra and Topology* was held at MSRI on May 4–7, 2010. It coincided with the first anniversary of Professor Alan Weinstein's retirement from UC Berkeley and was organized jointly with the UC Berkeley Mathematics Department. Professor Weinstein has been one of the most influential figures in symplectic and Poisson geometry and analysis over the past forty years. His fundamental work has inspired many others and has greatly contributed to the development of central concepts in symplectic and Poisson geometry, as well as to the establishment of symplectic geometry as an independent discipline within

mathematics. This conference served to celebrate Professor Weinstein's contributions to symplectic and Poisson geometries and analysis, and to mathematics at large.

The second MSRI conference was one of the two Hayashibara Forum conferences on *Symplectic Geometry, Noncommutative Geometry and Physics*, which were held at MSRI on May 10–14, 2010, and at RIMS on November 1–5, 2010, as part of the RIMS thematic year 2010. These conferences aimed to highlight connections among the fields in their title and to further interactions between mathematicians and physicists working in related areas. The talks at these conferences were devoted to recent developments in symplectic geometry and noncommutativity in geometric settings, as well as possible physical applications.

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The present volume consists of refereed papers by the invited speakers at these workshops, and are either presentations of new results which have not previously appeared or comprehensive reviews including recent developments in these areas.

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