Foreword

The field of Bose–Einstein condensation in atomic gases has been full of surprises. What happened after the first realization of Bose–Einstein condensates in 1995 has far exceeded the vision of their creators. Originally, I expected interesting studies of equilibrium properties and dynamics, but the Bose–Einstein condensate became a pristine platform for a host of scientific studies. The condensate turned out to be a well-controlled medium for nonlinear wave phenomena including four-wave mixing, dark and bright solitons, and dynamic instabilities. Rotating condensates gave access to the rich physics of vortices and vortex lattices. The availability of different hyperfine states led to multi-component or spinor condensates, and optical lattices opened up yet another major frontier which is still rapidly expanding. Feshbach resonances and condensation of fermion pairs will provide interesting phenomena to study for many more years to come.

This rapid development of the field has been fueled by a unique interplay between experiment and theory. Although experimentalists had the lead in realizing new systems, many phenomena were first predicted and then observed. The present book reflects this symbiosis by a balance of theoretical and experimental contributions. Twelve years after its beginning, the field has reached a degree of maturity which is much better represented by a comprehensive book than by a collection of original articles. I therefore expect this book not only to provide a valuable introduction to many young researchers who are joining this field, but also serve as a reference for further studies of nonlinear phenomena in this rich system.

Cambridge, MA, July 2007 *Wolfgang Ketterle*