Contribution Title:	HOT TOPICS IN COLD GASES
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Since the first experimental realization of Bose-Einstein condensation in cold atomic gases in 1995 there has been a surge of activity in this field. Ingenious experiments have allowed us to probe matter close to zero temperature and reveal some of the fascinating effects quantum mechanics has bestowed on nature. It is a challenge for mathematical physicists to understand these various phenomena from first principles, that is, starting from the underlying many-body Schroedinger equation. Recent progress in this direction concerns mainly equilibrium properties of dilute, cold quantum gases. We shall explain some of the results in this lecture, and describe the mathematics involved in understanding these phenomena. Topics include the ground state energy and the free energy at positive temperature, the effect of interparticle interaction on the critical temperature for Bose-Einstein condensation, as well as the occurrence of superfluidity and quantized vortices in rapidly rotating gases.