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Abstract: Systems of non-relativistic interacting bosons at zero temperature, in two and three dimensions, are expected to exhibit a fascinating critical phase, famously known as condensate phase. While a proof of Bose-Einstein condensation for generic two body interactions is far from the reach of rigorous analysis, the mathematical physics community has recently gained an enhanced comprehension of the thermodynamic properties of low temperature Bose gases. In this talk we review part of these advances, and present some open problems and perspectives. Based on joint works with G. Basti, C. Boccatto, C. Brennecke, C. Caraci, A. Olgiati, G. Pasqualetti and B. Schlein.. (11:05 - 11:25)