1167-82-279 **Eric A. Carlen**, **Markus Holzmann**, **Ian Jauslin*** (ijauslin@princeton.edu) and **Elliott H. Lieb**. *An effective equation to study Bose gases at all densities.*

I will discuss an effective equation, which is used to study the ground state of the interacting Bose gas. The interactions induce many-body correlations in the system, which makes it very difficult to study. A successful approach to solving this problem is Bogolubov theory, in which a series of approximations are made, after which the analysis reduces to a one-particle problem, which incorporates the many-body correlations. The effective equation I will discuss is arrived at by making a different set of approximations, and, like Bogolubov theory, ultimately reduces to a one-particle problem. But, whereas Bogolubov theory is accurate only for very small densities, the effective equation coincides with the many-body Bose gas at both low and at high densities. I will show some theorems which make this statement more precise, and present numerical evidence that this effective equation is remarkably accurate for all densities, small, intermediate, and large. That is, the analytical and numerical evidence suggest that this effective equation can capture many-body correlations in a one-particle picture beyond what Bogolubov can accomplish. (Received March 09, 2021)