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Ab initio Bogoliubov coupled cluster theory ANGELO SIGNORACCI, GAUTE HAGEN, University of Tennessee/Oak Ridge National Laboratory, THOMAS DUGUET, CEA-Saclay/IRFU/SPhN — Coupled cluster (CC) theory has become a standard method in nuclear theory for realistic ab initio calculations of medium mass nuclei, but remains limited by its requirement of a Slater determinant reference state which reasonably approximates the nuclear system of interest. Extensions of the method, such as equation-of-motion CC, permit the calculation of nuclei with one or two nucleons added or removed from a doubly magic core, yet still only a few dozen nuclei are accessible with modern computational restrictions. In order to extend the applicability of ab initio methods to open-shell systems, the superfluid nature of nuclei must be taken into account. By utilizing Bogoliubov algebra and employing spontaneous symmetry breaking with respect to particle number conservation, superfluid systems can be treated by a single reference state. An ab initio theory to include correlations on top of a Bogoliubov reference state has been developed in the guise of standard CC theory. The formalism and first results of this Bogoliubov coupled cluster theory will be presented to demonstrate the applicability of the method.

Angelo Signoracci
University of Tennessee/Oak Ridge National Laboratory

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