



Contribution ID: 43

Type: not specified

## Brueckner-Hartree-Fock Theory as an ab initio approach for nuclear density functionals

*Wednesday, December 11, 2024 4:10 PM (25 minutes)*

In recent years, significant progress has been made in ab initio calculations for nuclear structure. Most of them are restricted to relative light nuclei. Studies of medium-heavy and heavy nuclei are based on nuclear density functional theory. Very successful relativistic and non-relativistic functionals are available nowadays. However, most of them are phenomenological functionals. Therefore, studying the connection of such functionals to ab initio nucleon-nucleon forces is essential. Non-relativistic Brueckner-Hartree-Fock theory was a starting point of ab initio investigations in nuclear structure in the fifties and sixties. It failed because three-body forces were not included at that time. Later, it was found that the relativistic Brueckner-Hartree-Fock (RBHF) theory can reproduce the saturation properties of nuclear matter. In this contribution, we discuss recent developments in RBHF theory for infinite nuclear matter, finite nuclei, and applications for neutron stars.

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**Session Classification:** Nuclear structure-reactions-interaction