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Ab-initio Green's function calculations of medium-mass open-shell nuclei

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Ab-initio approaches - starting from the sole knowledge of a realistic nuclear force - aim at eventually achieving parameter-free predictions of nuclear properties. Although considerable progress has been made in recent years, e.g. using couple-cluster or self-consistent Dyson-Green's function methods, ab-initio nuclear structure calculations of medium-mass and heavy nuclei are still restricted to a limited number of (doubly-magic) nuclei. Besides the challenging numerical scaling, one reason is the inadequate account of pairing correlations that is essential to any realistic treatment of single- and doubly-open shell nuclei.

We are currently developing an ab-initio many-body method based on Green's function theory in the Gorkov formalism that allows for an explicit treatment of pairing correlations. Such approach is therefore applicable to a much larger set (~500) of semi-magic nuclei, including systems up to, e.g., the tin isotopic chain. The talk will introduce the context within which such nuclear calculations take place, describe the many-body method and present the first results in the oxygen and calcium isotopes.

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