Contribution ID: **62** Type: **Invited talk**

Ab-initio computations of exotic nuclei in and around the island of inversion

Thursday, 3 August 2023 09:00 (30 minutes)

Neutron-rich nuclei at and beyond the magic neutron number 20 are interesting because of the breakdown of this shell closure, and the interplay between nuclear deformation and weak binding in the so-called island of inversion. Here I report on recent ab-initio computations of exotic nuclei in this region starting from chiral Hamiltonians. By breaking and restoring rotational symmetry ab-initio methods can now be used to address how rotational structure and shell-evolution evolves from the valley of beta-stability towards the dripline. Recent calculations indicate shape co-existence in ^{30}Ne, ^{32}Mg and ^{40}Mg, predict a well deformed ^{34}Ne, reveal systematic trends of charge radii, questions the existence of certain magic shell closures in neutron-rich nuclei, and confrontation with data also expose challenges for ab-initio methods.

New ways to make quantified predictions are now possible by the development of accurate emulators of ab-initio calculations. These emulators reduce the computational cost by many orders of magnitude. This allows us to perform global sensitivity analysis, and use novel statistical tools in making quantified predictions of nuclei. Using this approach, we predict with 98% probability that ^{28}O is unbound and that it takes fine-tuned nuclear interactions to describe the subtle structure of neutron-rich oxygen isotopes within theoretical uncertainties. We also recently addressed the question: *What drives deformation in exotic neon and magnesium isotopes from chiral interactions*?

Primary author: HAGEN, Gaute (Oak Ridge National Laboratory)

Presenter: HAGEN, Gaute (Oak Ridge National Laboratory)

Session Classification: Shell Evolution towards 28O