

# Colloquium

Antwerp Young Minds – Department of Physics

## Ultracold Fermions in an Optical Box

*prof. dr. Nir Navon (Yale University)*

For the past two decades harmonically trapped ultracold atomic gases have been used with great success to study fundamental many-body physics in flexible experimental settings. However, the resulting gas density inhomogeneity in those traps makes it challenging to study paradigmatic uniform-system physics (such as critical behavior near phase transitions) or complex quantum dynamics.

The realization of homogeneous quantum gases trapped in optical boxes has marked a milestone in the quantum simulation program with ultracold atoms. These textbook systems have proved to be a powerful playground by simplifying the interpretation of experimental measurements, by making more direct connections to theories of the many-body problem that generally rely on the translational symmetry of the system, and by altogether enabling previously inaccessible experiments.

I will present a set of studies with ultracold fermions trapped in a box of light. This platform is particularly suitable to study problems of Fermi-system stability, of which I will discuss two cases: the spin-1/2 Fermi gas with repulsive contact interactions, and the three-component Fermi gas with spin-population imbalance. Both studies lead to surprising results, highlighting how spatial homogeneity not only simplifies the connection between experiments and theory, but can also unveil unexpected outcomes.

Wednesday 15<sup>th</sup> March

16h00 G.T.105 Colloquium

17h00 G.T.Hall Reception



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