

# SFB-TR 211: Stark wechselwirkende Materie unter extremen Bedingungen

Öffentlicher Vortrag

Speaker: Professor Andreas Weiler, TU München

Title: **New Forces at Finite Density: Dead Stars as Laboratories**

## *Abstract*

Compact stars and core-collapse supernovae probe strongly interacting matter at finite baryon density, in a regime where nuclear physics, QCD, gravity, and physics beyond the Standard Model meet. In this talk I will discuss how dense stellar environments can test light new particles, with the axion as a particularly well-motivated example. After introducing the axion as a solution to the strong CP problem and as a prototype of weakly coupled new physics, I will show how finite-density effects can qualitatively change its phenomenology.

In dense matter, the axion potential and its couplings to nucleons can differ substantially from their vacuum form. These effects can modify the equation of state, induce new branches of compact-star solutions, and lead to observable consequences in white-dwarf and neutron-star mass-radius relations. In core-collapse supernovae, density corrections to axion-nucleon interactions can substantially affect the predicted axion luminosity and hence the interpretation of the SN1987A bound.

Together, these systems open a third direction in the search for new physics: beyond higher energies and higher intensities, dead and dying stars provide high-density laboratories for new forces beyond the Standard Model.

Mittwoch, 17.06.2026, 16:15 Uhr

Hörsaal II, Hörsaalgebäude Physik, Heinrich-Buff-Ring 14