UNIVERSITÄT DUISBURG ESSEN

PHYSIK

# Physikalisches Kolloquium

**Mittwoch, 20.11.2024**
**13:00 Uhr**
**MC 122 und Zoom**

https://uni-due.zoom-x.de/j/64228670246?pwd=RjVQeFNIUkRKRkpiNVpKYXhJaFNLdz09 (valid for all presentations)

## Unveiling the secrets of massive stars with detailed stellar atmosphere models

Dr. Andreas Sander, Center for Astronomy, University of Heidelberg

Albeit rare in absolute numbers, massive stars are shaping our cosmic history as they are connected to many astrophysical key processes. Commonly defined as stars with an initial mass of more than eight times the mass of our Sun, massive stars are the progenitors of black holes and neutron stars, reaching all nuclear burning stages before eventually undergoing their inevitable core collapse. In their relative short, but wild life, these luminous objects have an enormous impact on their galactic environment, enriching the surrounding medium with momentum, matter and ionizing radiation. This so-called „feedback" of massive stars is a building block for the evolution of galaxies, initiating and inhibiting further star formation. In the „afterlives" of massive stars, black holes and neutron stars can merge with each other, giving rise a to Gravitational Wave events. Yet, the quantitative impact and evolution of massive stars are poorly understood. In fact, the overall picture we draw in textbooks often does not hold once we actually try to bring all the observational and theoretical constraints together.

Investigating the massive star puzzle with a combined approach of theory, observation and numerics is at the very heart of my Emmy Noether research group at the ARI in Heidelberg. Our central tool in this endeavour is the application and development of dedicated stellar atmosphere models. I will briefly introduce the techniques and challenges of atmosphere modelling for hot, massive stars and their winds as well as their empirical and theoretical applications. Afterwards, I will provide an overview about the multi-ranged research efforts in my group, ranging from the spectral analysis of individual stars and the identification of „hidden" companions over theoretical studies on radiation-driven winds up to the generation of new predictions for stellar feedback.