

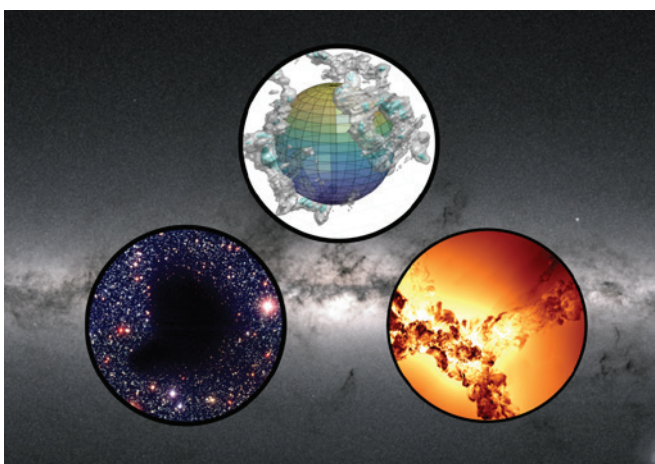


COLLOQUIUM

CRC 1601 HABITATS OF MASSIVE STARS ACROSS COSMIC TIME

June 17, 2025

University of Cologne
Physics Institutes
Lecture Hall III, 2:00 pm



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How stars shape Interstellar Gas via: Supernova, Cosmic-rays, and Turbulence

Cosmic Rays — Stars form within dense molecular gas, where cosmic rays (CRs) regulate ionization, chemistry, and magnetic coupling. Yet measuring the CR ionization rate (ζ) in these environments has remained a persistent challenge. I will present recent JWST observations of the starless core Barnard 68, revealing the first direct detection of CR-excited H_2 emission—a long-predicted but previously undetected signature. This allows a direct measurement of ζ , establishing molecular clouds as vast, naturally occurring CR detectors floating in space.

Supernovae — In the second part of the talk, I will shift gears to the large-scale structure of the ISM, highlighting how 3D dust maps uncover hidden features such as the recently identified “PerTau shell.” I will discuss the implications of such expanding shells for ISM dynamics and their potential role in driving turbulence and accelerating CRs.