



UNIVERSITY OF MIAMI
COLLEGE of
ARTS & SCIENCES

Miami Physics Conference 2025

Date: Dec 12-19, 2025
Location: Lago Mar Resort
Affiliation: University of Warsaw

Marek Szczepanczyk

The Next Ten Years of Core-collapse Supernova Gravitational-wave Astronomy

Abstract

Core-collapse supernovae (CCSNe) are among the most violent explosions known to occur in the Universe, and the next Galactic or near-extra-Galactic exploding massive star will be one of the most interesting, and most important astronomical events of the century. They are directly or indirectly responsible for the lion's share of the elements and they serve as laboratories for high-density nuclear physics and high-energy neutrino physics that cannot be investigated in terrestrial experiments. In particular, gravitational waves (GWs) will give us direct access to these laboratories. In recent years, the multidimensional CCSN simulations allowed us to perform a more detailed physical inference upon a GW discovery. However, each method focuses on a limited parameter space. This work is influenced by the recent SN2025gw Symposium that took place on 21–25 July 2025 (Warsaw, Poland). In the first part of this talk I will discuss selected lessons learned at the Symposium and I will outline some recommendations for the next ten years. The second part presents an effort to construct a global low-latency CCSN physical inference.