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## Cosmic-ray escape from accelerators: the case of pulsar wind nebulae and TeV gamma-ray halos

*Wednesday 16 July 2025 11:00 (30 minutes)*

The escape of particles from their accelerators is a major open problem in cosmic-ray physics. It is intrinsically connected to the ability of sources to accelerate particles up to very high energies, and influences deeply the spectrum released in the interstellar medium, the propagation in the source region, and all direct and indirect observables of the phenomenon. The study of these phenomena is made particularly challenging both for theory and simulations due to their multi-scale and non-linear nature.

Middle-aged pulsar wind nebulae constitute a unique laboratory to investigate particle escape.

Indeed, the detection of bright X-ray filaments protruding from a number of bow-shock pulsar wind nebulae and of extended TeV gamma-ray halos around a few middle-aged pulsars is now unambiguously understood as resulting from relativistic leptons released from these objects and challenged our current understanding of escape and transport.

In this talk, I will discuss the theoretical issues that emerged from these observations, the main ideas that have been put forward to explain them, and how current and future gamma-ray detectors could help in discriminating among different theoretical models.

### Collaboration(s)

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