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Particle acceleration: theory versus observations

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Over the recent years, we have witnessed several extraordinary findings in Astrophysics - amongst them the discovery of Ultra High Energy gamma-ray sources, the astronomical objects whose electromagnetic spectra extend beyond 100 TeV. We believe that the discovery of UHE gamma rays should allow us to finally solve the century-old puzzle of the origin of galactic cosmic rays. But the significance of the discovery goes beyond that specific issue. The detection of ≥ 100 TeV photons implies the existence of particle accelerators boosting the energy of electrons and protons out of 1 PeV, the so-called PeVatrons. The galactic PeVatrons have been detected in diverse forms - Pulsar Wind Nebulae, Massive Stellar Cluster, SNRs, Microquasars, etc. These discoveries confirm some early phenomenological predictions, but, more importantly, they reveal serious challenges for the current theories of particle acceleration in the Milky Way. I will briefly highlight the recent observations and discuss their implications for the Cosmic Ray Factories in the Milky Way.

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