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## Acceleration to ultra-high energies

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The origin of the highest energy cosmic rays with energy  $\gg 10^{18}$  eV is a rather intricate puzzle, with a central question: how to accelerate particles to extreme energies  $\sim 10^{20}$  eV or more, and in which astrophysical source? Other questions arise as well, such as: are these cosmic rays protons or nuclei? Why is there no powerful source in the arrival directions of the highest energy cosmic rays? This talk will discuss constraints on the possible nature of these particles and of their sources, putting strong emphasis on the physics of acceleration to extreme energies.

**Primary author:** Dr LEMOINE, Martin (Institut d'Astrophysique de Paris)

**Presenter:** Dr LEMOINE, Martin (Institut d'Astrophysique de Paris)

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