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# A theory overview of high-energy cosmic neutrinos

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Please supplement the content of the abstract.High-energy cosmic neutrinos hold vast potential to propel particle physics and astrophysics forward. They have the highest detected neutrino energies—up to the PeV scale and beyond—and travel the longest distances—up to billions of light-years, the size of the observable Universe. These unique properties make them piercing probes of particle-physics properties, possibly tiny in size and emerging only at extreme energies, and of the most luminous, violent, and distant astrophysical phenomena of the Universe. Realizing this particle-physics potential is inextricably linked to understanding their astrophysical origins, and vice versa. I will discuss our current understanding of how and where these neutrinos are made, what we have learned over the past decade, and how we can extract robust constraints on neutrino properties in spite of astrophysical uncertainties. Finally, I will outline how the forthcoming generation of neutrino telescopes will dramatically sharpen these tests, simultaneously constraining fundamental theory and revealing the nature of the Universe's most powerful particle accelerators.

## Collaboration you are representing

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