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Searching for Dark Matter with Cosmic Rays

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One of the most exciting possibilities in cosmic ray research is the potential to discover new phenomena. A number of elementary particles were discovered in cosmic rays before modern-day accelerators became available to study their detailed properties. Since the discovery of cosmic ray antiprotons in 1979 using a balloon-borne magnet spectrometer, a series of magnet spectrometers have been flown to search for the signature of dark matter annihilation in antiprotons and positrons. Being the same as particles except for their opposite charge sign, antiparticles are readily distinguished as they bend in opposite directions in the magnetic field. As long-duration balloon flights over Antarctica became available, not only antiproton to proton ratios but also measurements of antiproton energy spectra became possible. More recently, space missions are also providing precision measurements of electron and positron energy spectra. With other measurements to constrain cosmic ray propagation models, these new measurements play key roles in constraining dark-matter models for understanding the nature of dark matter. Recent results, their implications, and outlook for the field will be presented.