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Paleo detectors for Dark Matter and Neutrinos

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Paleo-detectors are a proposed alternative approach to the direct detection of Dark Matter. In lieu of using large target masses to search for nuclear recoils in real time, the idea behind paleo detectors is to use small detectors that could integrate signals from nuclear recoils over large timescales to achieve the necessary exposure for Dark Matter searches. Natural minerals found on Earth have formed as long as two gigayears ago, and many of these minerals are excellent solid state track detectors. In this talk I will present a number of possible use cases of measurements of nuclear recoil tracks in such natural samples: Paleo detectors could be used to search for Dark Matter as well as for solar, supernova, and atmospheric neutrinos. By using a collection of paleo-detectors of different ages one could furthermore obtain information about the time-evolution of the signal rate over 10 Myr – 1 Gyr timescales. This would open up unique possibilities to explore Dark Matter substructure in our galaxy and to track the evolution of our Sun, the Milky Way's star formation history, and the low-energy cosmic ray flux on Earth over these timescales.

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