Contribution ID: **6** Type: **Talk**

PaleoDetectors (Ancient Minerals from Deep Underground)

Monday 24 March 2025 10:35 (25 minutes)

Paleo-detectors are a proposed experimental technique to search for dark matter (DM). In lieu of the conventional approach of operating a tonne-scale real-time detector to search for DM-induced nuclear recoils, paleo-detectors take advantage of small samples of naturally occurring rocks on Earth that have been deep underground (⊠5 km), accumulating nuclear damage tracks from recoiling nuclei for ⊠(1) Gyr. Modern microscopy techniques promise the capability to read out nuclear damage tracks with nanometer resolution in macroscopic samples. Thanks to their ⊠(1) Gyr integration times, paleo-detectors could constitute nuclear recoil detectors with keV recoil energy thresholds and 100 kilotonne-yr exposures. This combination would allow paleo-detectors to probe DM-nucleon cross sections orders of magnitude below existing upper limits from conventional direct detection experiments. Paleodetectors have a variety of uses in addition to DM: as neutrino detectors, e.g. they may be used to ascertain the history of the past supernova rate in our Galaxy, to study cosmic rays, and for nuclear reactors.

Currently this field has become experimentally very active in a worldwide effort including the US, Germany, Japan, and others, with biannual meetings and plenty of funding: We received an NSF grant (based at VA Tech) for 3.5M dollars and Josh Spitz at University of Michigan received 1.5M dollars from the Moore Foundation.

Author: Prof. FREESE, Katherine (University of Texas)

Presenter: Prof. FREESE, Katherine (University of Texas)

Session Classification: SESSION 2: Astrophysics and Indirect Dark Matter Searches