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Probing neutrinos and nuclei with COHERENT

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The COHERENT collaboration operates multiple detectors at Oak Ridge National Laboratory to measure coherent elastic neutrino-nucleus scattering (CEvNS) in a variety of target nuclei. CEvNS cross sections scale as the square of the number of constituent neutrons in a given nucleus, thus giving large event rates compared to other neutrino detection modes. At the same time, the low recoil energies involved demands highly-sensitive low-threshold detectors. The COHERENT effort leverages the intense, pulsed source of neutrinos from pion decay-at-rest at the Spallation Neutron Source (SNS), combined with low-threshold detector technology, to facilitate precision measurements of CEvNS nuclear recoil distributions. These CEvNS measurements will be sensitive to a variety of new physics, such as beyond-standard model non-standard interactions and accelerator-produced dark matter. Further, there are opportunities for the measurement of charged- and neutral-current inelastic scattering cross sections at 10-50 MeV energies, needed to refine the predicted signal for supernova neutrinos in future large-scale detectors. Here we outline the ongoing and future COHERENT experimental program, and survey the potential physics studies with these efforts.

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