

Abstract Submitted  
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**The Proposed CYGNUS Directional Recoil Observatory**<sup>1</sup> SVEN VAHSEN, University of Hawaii, CYGNUS PROTO-COLLABORATION COLLABORATION — The identity of dark matter remains one of the most urgent mysteries in fundamental physics. With some leading direct detection experiments now observing background events and WIMP-nucleon scattering limits approaching the neutrino floor, there is renewed interest in constructing an observatory capable of detecting and distinguishing WIMP and coherent elastic neutrino-nucleus scattering (CEvNS) via directionality. The CYGNUS proto-collaboration aims to deploy gas-target time projection chambers (TPCs) capable of event-by-event nuclear recoil imaging. Smaller, near-term detectors with this capability would enable new precision measurements, searches for beyond the Standard Model (BSM) physics, and measurements of solar neutrinos. A large detector could establish the galactic origin of a dark matter signal, and subsequently be used to map the local WIMP velocity distribution and explore the particle phenomenology of dark matter. Therefore, there exists an opportunity to develop a long-term, diverse, and cost-effective experimental program around directional detection of nuclear recoils in gas TPCs at different scales. I will discuss the projected dark matter sensitivity, compare the suitability of different technological approaches, and comment on the broader physics case.

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Sven Vahsen  
University of Hawaii

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