Abstract Submitted
for the CUWIP22 Meeting of
The American Physical Society

Exotic Dynamics in the Early Universe Could Explain Cosmological Mystery: Resolving the Hubble Tension with the Early Dark Energy Monodromy Potential[1] SHAR DANIELS, TRISTAN SMITH, ALEXA BARTLETT, Swarthmore College — The Hubble Tension implies that our understanding of cosmology may be incomplete. This tension is a discrepancy between the expansion rate of the universe today inferred from direct measurements and the value predicted from observations of the afterglow of the Big Bang. The Hubble Constant (H_0) is measured to be 741.4 km/s/Mpc from observations of the present-day universe given by the SH0ES absolute luminosity calibration of type Ia supernovae. The measured anisotropies of the Cosmic Microwave Background using the Planck satellite and assuming the standard cosmological model predict the value of H_0 is 67.8 1.3 km/s/Mpc. An intriguing proposition to bring these values into accordance is "early dark energy" (EDE): a scalar field in the early universe that temporarily accelerates its expansion and then dilutes away, leaving few traces. We explore the novel Monodromy model of an EDE scalar field as a potential resolution to the Hubble Tension by coding the Monodromy model into the linear perturbation Boltzmann code CLASS and executing Markov Chain Monte-Carlo simulations to explore the parameter space. We find the most improvement to H_0 with a value of the free parameter q of q =.10 (H_0 =72.53 km/s/Mpc) and a likewise improved H_0 of 71.85 from q =1.0, whereas q's greater than 1.0 correspond to lower values of H_0. These results show the potential of the EDE Monodromy model as an improvement over Lambda CDM to address the Hubble Tension.

[1]Swarthmore College, National Science Foundation

Shar Daniels
Swarthmore College

Date submitted: 11 Jan 2022 Electronic form version 1.4