

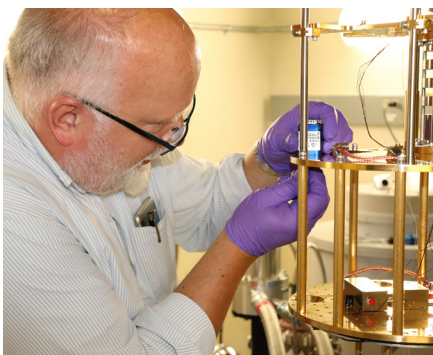
# Searching for dark matter & testing symmetries



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Professor of Physics

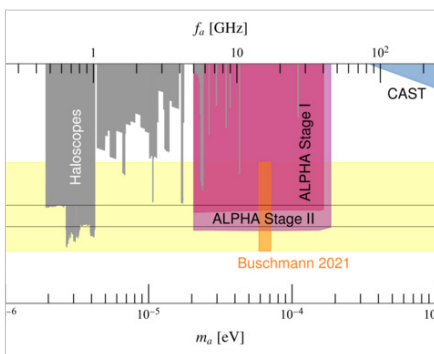
Steve Lamoreaux studies the properties of the Universe and the fundamental laws of physics by use of small-scale tabletop experiments. He searches for axion dark matter by developing technologies for, building, and using haloscopes at Wright Lab; and probes ultracold neutron (UCN) physics. Lamoreaux uses his prior experience in quantum computing, cryptography, and the Casimir force to develop advanced student laboratory projects.

Lamoreaux was awarded the Pipkin Award by the American Physical Society (APS) for precision measurement, three Los Alamos Distinguished Performance Awards, and the Henderson Prize for an outstanding dissertation by the University of Washington.



## Haloscope At Yale Sensitive To Axion Cold Dark Matter (HAYSTAC)

The Lamoreaux group develops and uses experiments to search for axions, which are very low mass particles that are a theorized candidate for dark matter. HAYSTAC, which Lamoreaux co-leads with Reina Maruyama, is a tunable radiofrequency cavity resonator that serves to build up the axion signal. HAYSTAC uses photon sensors often used for quantum computing, as well as an innovative quantum noise squeezing technique to speed up the data taking of the experiment. HAYSTAC is located at Wright Lab, and the Yale team is responsible for systems engineering, cryogenics, and magnetics.



## Axion Longitudinal Plasma HALoscope (ALPHA)

ALPHA will build on HAYSTAC's success and search for higher mass axions by employing a novel axion detector called a plasma haloscope. ALPHA, located at Wright Lab, will comprehensively investigate how new experimental ideas using plasmas can be used to detect the axion.



## Electron Dipole Moment

Lamoreaux brings his expertise in magnets and magnetometry to support a neutron electric dipole moment (EDM) experiment at the Los Alamos National Laboratory in New Mexico. The goal of the experiment and the general search for EDM is to investigate the matter-antimatter asymmetry of the Universe.



Steve Lamoreaux and co-author Robert Golub, professor of physics at North Carolina State University, recently published "The Historical and Physical Foundations of Quantum Mechanics".

Find out more at: [wlab.yale.edu/lamoreauxbook23](http://wlab.yale.edu/lamoreauxbook23)