Developing instrumentation & studying the Universe

James Nikkel
Research Scientist

James Nikkel is an experimental physicist who specializes in detector design and development for nuclear and particle astrophysics applications. Leveraging his varied experience and expertise, he created an instrumentation development program that serves research groups all across campus.

Dr. Nikkel has appointments in Physics, the School of the Environment, and the School of Architecture, where he teaches a design and fabrication class.

Wright Lab Advanced Prototyping Center (APC)

Dr. Nikkel founded and supervises operations at the Advanced Prototyping Center (APC), which provides modern fabrication and design support for instrumentation development within the Yale community. Users include researchers, teachers, technicians, and artists from a variety of fields, including: medicine, physics, environmental science, and art restoration.

The APC group has experience with mechanical systems, electronics, fabrication, systems integration, and visualization. Projects have included creating the interior structure of a large model for the Yale Peabody Museum and developing a novel water analysis instrument for the Yale School of the Environment.

In addition, the APC provides one-on-one training and workshops in modern design and fabrication techniques.

Dark matter detection experiments

Dr. Nikkel has developed instruments for direct detection dark matter searches using noble liquids, including primary systems for the liquid argon based DEAP/CLEAN projects, and the liquid xenon-based LUX. He also designed mechanical components for the NaI-based dark matter detectors in COSINE, located in an underground lab in South Korea, and for a potential upgrade to DM-Ice, an experiment under 2km of ice at the South Pole.

Neutrino experiments

Dr. Nikkel led the design, fabrication, and deployment efforts of the radioactive source calibration system for the PROSPECT neutrino detector. This detector—built at Wright Lab and installed near a test reactor at Oak Ridge National Laboratory in Tenessee—was used to study nuclear processes and search for new species of neutrinos.

He also works on Project 8, an experiment located at the University of Washington that aims to measure the mass of neutrinos using radio wave emission. This project is in the R&D phase with a variety of instrumentation challenges.

The New Haven Harbor Living Laboratory, with the collaboration of the APC, provides solutions to planetary challenges by developing and monitoring a local oyster reef. Read more at wlab.yale.edu/nhll23.