

Education and Training in Instrumentation for Physics

James Nikkel
Associate Director of
Instrumentation and Education

Wright Laboratory
Yale University

Instrumentation Education

Science Hill is well supported with traditional shop resources and training

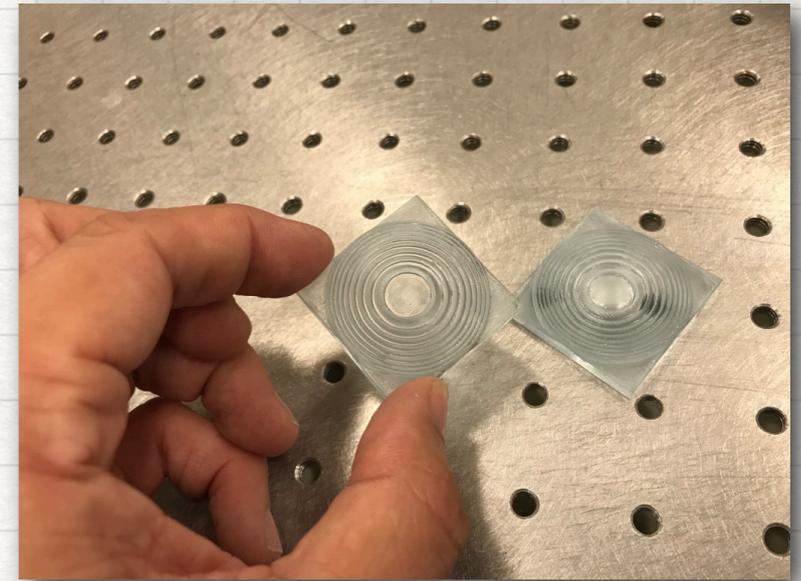
A comprehensive semester long machining course is offered, as well as a welding course

However, many physics students are lacking in other areas such as drawing, CAD, and other practical skills



Instrumentation Education

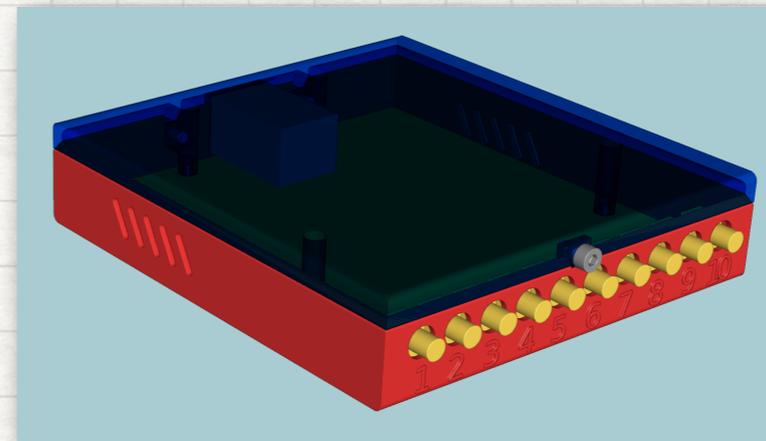
- ◆ Ongoing
 - ◆ One-on-one instruction in design and fabrication
- ◆ Short term proposal
 - ◆ Course covering instrument design and rapid prototyping for physics
- ◆ Long term proposal
 - ◆ Master's program
 - ◆ 2 years with some course work, but focusing on a single project
 - ◆ Targeted towards students that want to learn how to design and build scientific apparatus, but not be academics



Instrumentation in Physics Course

Semester long class to help prepare undergraduate students for research

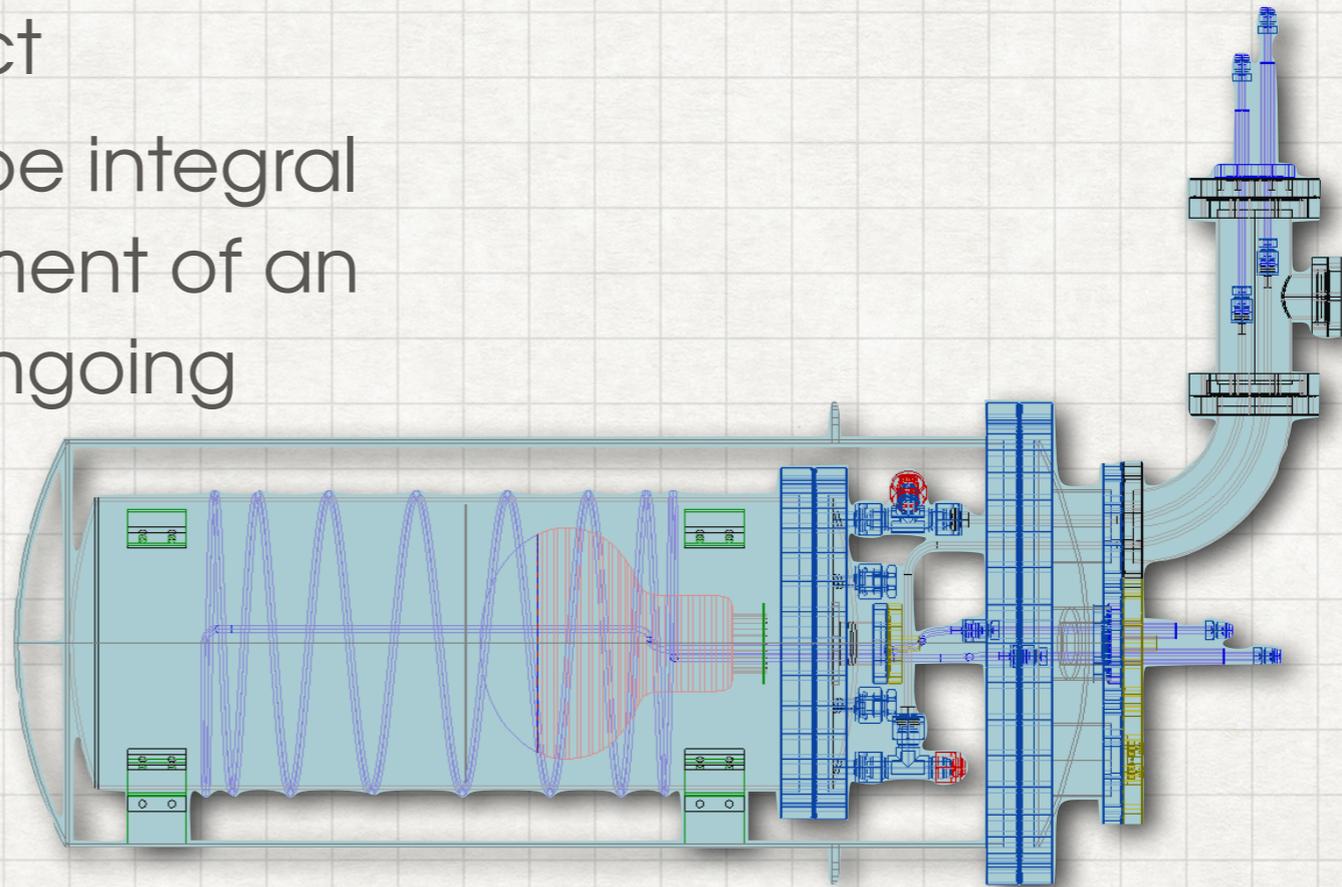
- ◆ Course topics include:
 - ◆ Energy deposition in matter
 - ◆ Signal detection and collection
 - ◆ Basic data acquisition and analysis
 - ◆ Design and fabrication of scientific instrumentation
- ◆ Culminates with a final project



Instrumentation Master's

Program description:

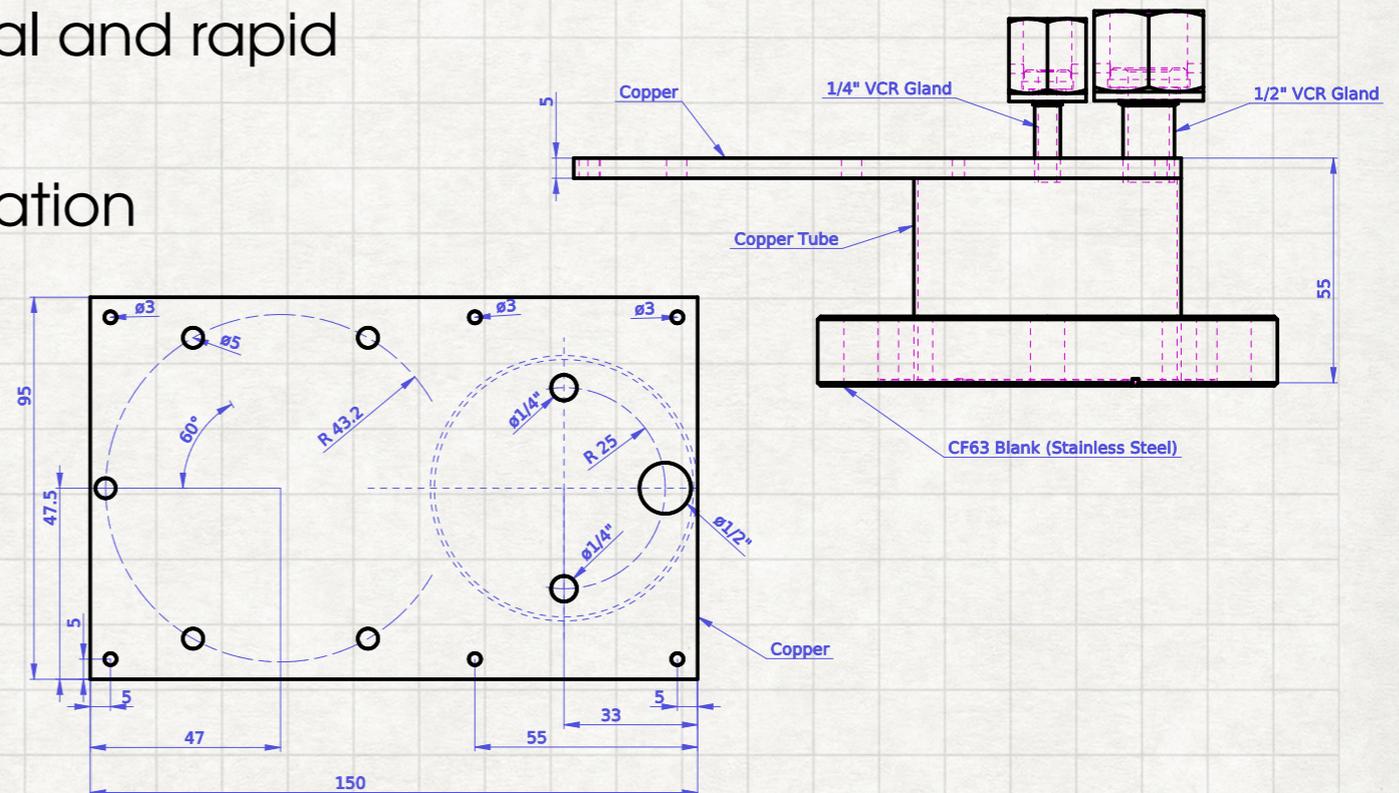
- ◆ Two years long
- ◆ Class work (including small projects)
- ◆ Single large project
 - ◆ Student would be integral to the development of an instrument for ongoing research



Instrumentation Master's

Program coverage:

- ◆ Mechanical design and fabrication
 - ◆ CAD/CAM
 - ◆ basic machining (traditional and rapid prototyping)
- ◆ Electronics design and fabrication
 - ◆ microcontrollers
 - ◆ FPGAs
 - ◆ soldering
- ◆ Data acquisition
 - ◆ signal processing
- ◆ Cryogenic / vacuum systems
- ◆ Detector theory
 - ◆ sensors, transducers, strategies, etc.
- ◆ Project management



Summary

- ◆ We are well equipped with excellent facilities and personnel
- ◆ There is a gap in education that could be addressed by one or two focused undergraduate courses
- ◆ A Master's program could enhance the scope of existing programs, and could increase relationships with non-academic institutes

