# Possible future projects for Gemini-NTCO interns: 2019

Gemini would welcome candidates interested in any of these efforts. If interested students have other areas of interest, there is the possibility of generating a different project.

## Commissioning MAROON-X

One item we expect to have next year is work associated with bringing a new instrument, Maroon-X online at Gemini North. **https://www.gemini.edu/sciops/instruments/maroon-x**

MAROON-X is a high precision radial velocity spectrograph, and the original science case is detecting rocky planets. This instrument will be useful for much more, though. It is a large instrument, so it will sit in the pier lab under the telescope, and be fed by a fiber. MAROON-X is a Visiting Instrument, meaning it is being constructed off-site (at the Univ of Chicago), and will be delivered to us upon completion. So the commissioning project will be an end-to-end overview of accepting a new instrument on a telescope, starting with coming up to speed on the design and construction of the instrument to understand how it will work, helping with initial testing when it's installed in Hawaii, and then getting a handle on the data reduction pipeline (also being delivered by the Chicago team) to make sure that the data are good, the instrument lives up to expectation, and that the science users in the community will be able to get good science from it.

The following two projects would probably be done together:

## Detector Controller
The ARCHON controller from STA seems to be the new standard for ground based astronomy, replacing the ARC controller. Even if these 2 controller are similar in architecture they heavily differ in the way they are configured. Furthermore the ARCHON controller offers additional functionalities. An ARCHON controller has been purchased in the frame of the wavefront sensor camera Upgrade (longevity program) and will be delivered at Hilo. The objective is to have a first contact with the ARCHON controller, be able to configure it to execute given functionality and ideally configure it so it can interface a CCD39.

Position - seeking an energetic and responsible intern who has experience in electronics. This activity will require applying basic algorithm and be able to measure DC and transient signals (oscilloscope, logic analyser, multimeter).

Tasks
Synthesise the ARC controller user manual and have direct communication with STA for technical support

Produces configuration scripts to execute given functionalities: bias generation, clock waveform generation, analog to digital conversion.
Document the activity and transfer knowledge.


Skills
    Familiar with electronics.
    Ability to read schematics.
    Proficient computer skills.

## Fiber Transceiver

For the Fiber transceiver replacement project it would involve someone who could assist us with testing replacements for obsolete and hard to find transceivers for the GEN-II ARC controllers.  The tasks would involve working with custom PCBs, setting up a test bench to verify operation and possibly interfacing onto existing ARC boards.

Position - seeking an energetic and responsible intern who has experience or interest in electronics.  Electronic soldering experience with SMD components is desirable but not necessary.

Tasks
Research and gather documentation on possible fiber transceiver replacements.
Assembly of fiber transceivers onto custom PCB boards and testing end to end using function generator and oscilloscope.
Document test results.

Skills
Familiar with electronics.
Ability to read schematics.
Proficient computer skills.

## Upgrade of the Observatory International time Allocation process

Purpose is to help with upgrading our system/process to create  the list of semester programs for the observing queues for both telescopes North and South from the approved programs coming from the 7 Gemini partners time allocation committees.  Desired/relevant skills  : strategic thinking, machine learning and/or optimization process, python programming, MySQL, excel spreadsheet and knowledge of statistical methods.

## P1/P2 Flexure Models

Objective is to measure the flexure of the P1 and P2 guiding system probe arms relative to the instrument origin and implement a model which would automatically compensate that flexure, enabling longer exposures than currently possible with e.g. GNIRS and NIFS.
Desired/relevant skills  : python programming, excel spreadsheet and knowledge of statistical methods.

## GIRMOS Concept of Operations and Science Flow-down

Purpose is to help define the technical requirements and architecture for GIRMOS which will allow the instrument to tackle the range of science cases. Desired/relevant skills : strategic thinking and desire to learn instrumentation's developpement and system engineering.