Project 1: Fluorescence excitation light path diffraction pattern
Supervisors: Antonia/RMP (Sebastian/Ian).

Goals: To build a simple excitation path and get familiar with the basic principles of optics, polarisation and the generation of patterned illumination as used in Structured Illumination Microscopy (SIM).

Skill Set: Optics; alignment; polarization; structured illumination, super-resolution**.**

Day-to-day:

Tuesday: Setting up the optics for specimen excitation by expanded laser beam. Separating and re-combining red/green laser light (laser pointers). Using simple optics to steer multiple beams into the IX-70 microscope body.

Wednesday: Finalising the beam paths and examining fluorescent samples (beads). If there is enough time we will investigate applying a polarizer and different laser pointers to understand the basics of polarization and its significance.

Thursday: Using the optical setup to apply structured illumination to a sample. Integration of a diffraction grating into the beam path.

Friday Demo: The DV-OMX-V2 and 3 commercial 3D SIM imaging systems

Comparing the optical setups used to produced structured illumination in the V2 and V3 SIM systems.

Using a high-end commercial microscope to apply structured illumination and to achieve "super-resolved" images

Presentation Goals:

- Outline the important features of a fluorescence excitation path.
- Explain the application of structured illumination in super-resolution imaging and how this can be achieved.
- Compare the optical solutions used in the V2 and V3 systems highlighting the benefits and drawbacks of each approach.

Suggested Revisions:
** need to get quad dichroic and filters – to allow recombining of the split red/green / need sections of stiff white card.

** need alternative laser sources, three colour
** need one more 90x30 purchased and for the excitn path demo need 3 plates and a 1 cm stand base plate for the microscope
** alignment laser rig
** 2x half wave plates
** Alignment targets printed onto acetates
** Fluorescent plastic slides, bead slide