Project Title	Diagnosing Disease with Speedy-Scanning Raman Readout
Supervisor	Dr Christopher Rowlands
Theme(s)	Biomedical Sensing Diagnostics and Imaging Molecular and Cellular Bioengineering
Project Type	Lab based
Project Description	Ordinary microscopes can use light to diagnose diseases, but they do so using a limited number of colours. If we replace the three colours of the spectrum with thousands of wavelengths in a spectrum, we can learn much more about each pixel in an image. This is the promise of Raman microscopy. Raman microscopy uses highly intense laser light to illuminate a sample. When the laser scatters from the sample, a very small fraction of it changes in wavelength, and this change is unique to a particular chemical bond. By mapping the sample using a spectrometer (which can image and quantify these wavelength changes) we can therefore gain chemical information about the sample, which is sufficient to diagnose a number of diseases, including (most notably) cancer. The downside of Raman microscopy is that it is slow, and while it can be sped up by increasing the illumination intensity, eventually this comes at the cost of damaging the sample. The key to increasing imaging speed is therefore to share the laser out over more pixels, recording from them in parallel. The student on this project will develop a new system that can illuminate dozens of points simultaneously, thus significantly speeding up the imaging process. This will involve working on an existing Raman microscope, modifying it to implement this new scanning process. The work will then progress to methods for rapidly diagnosing cancer using tissue biopsies. The ideal student on this project would have a reasonable background in programming, but all other skills and techniques can be taught.