Project Title	Next-Generation Drug Synthesis: Optimizing bioreactors with lasers
Supervisor	Dr Christopher Rowlands
Theme(s)	Biomedical Sensing Diagnostics and Imaging Molecular and Cellular Bioengineering
Project Type	Lab based
Project Description	A great many modern drugs are manufactured, not in chemical reactors, but in bioreactors: steel or glass vessels housing many litres of cell culture medium and a colony of genetically-modified cells which produce the drug itself. As this mass-manufacturing technology underpins the production of pharmaceuticals worldwide, there is considerable interest in achieving even modest gains in efficiency and yield which, when scaled out over a large-scale manufacturing process, contribute to dramatic cost-savings. Unfortunately, if optimising a chemical reactor is hard (with all the inhomogeneities in temperature, pressure, reagent concentration and so on), optimising a bioreactor is much harder still, because cells are much more sensitive to their local environment. Fortunately, researchers in the Polizzi lab in Chemical Engineering, and the Rowlands Lab in Bioengineering are working on a way to monitor these cells in situ, using optical imaging and fluorescent reporter cells. The student will work on a system to image the fluorescence from a variety of locations within a large (liter-scale) volume using a large number of optical fibers coupled to a microscope. The student will use the system to monitor reactions in the reactor and try to reconstruct the resulting fluorescence distribution. The student will need some basic precision manufacturing skills and an ability to prototype ideas quickly, but the most important is a willingness and ability to learn quickly.