

## ***Impact Case Study***

### **UoA 3B: Allied Health Professions, Dentistry, Nursing and Pharmacy (Biomedical Sciences)**

#### **Electron Microscopy**

##### **Summary**

Ulster University's microscopy facilities have greatly benefited from the lengthy association with FEI, the largest European electron microscope manufacturer. This connection has led to the production of the groundbreaking Nova cryostage dual-beam instrument, and encouraged FEI to set up their European reference laboratory at the university.

This collaboration has been a substantial success, establishing numerous world firsts in bioimaging. The Nova instrument generates a focused beam (FIB) of ions, allowing precision milling of a specimen at the nanometre scale. This makes possible three-dimensional imaging of biological samples and generating previously inaccessible data at an ultrastructural level.

Ulster University has also pursued research into the biological effects of nanoparticles of sizes 1–100 nm. Both the potential benefits and the health hazards of these are receiving great attention, largely on account of the extreme reactivity of their surfaces, and their very high surface:mass ratio.

Research into a variety of toxic mechanisms that apply to nanoscale particles containing heavy metals, and has established our laboratory as a leading European nanotoxicology centre, with nine research papers over the last few years.

##### **Impact**

The impact of the university's research in this area of electron microscopy area falls under two distinct categories. In the commercial arena, we are providing major imaging and analysis for companies operating in sectors ranging from agri-food and pharmaceuticals to oil exploration and biomedical technology.

Ulster University has also delivered consultancy work with public bodies, primarily in terms of alerting national and EU bodies to the hazards of nanoparticles.

As FEI's European Reference Laboratory for advanced EM techniques, the university has had more than a dozen sponsored visits from laboratories in the UK and other parts of Europe. This is now being extended through our investment in a Leica tissue-imaging laboratory with a STED instrument capable of resolving nanoparticles at below the normal limits of light resolution.

The facility now contains three advanced instruments: a Tecnai 12 deep-field transmission EM for tomography, an environmental SEM that can image hydrated specimens, plus the cryo-cooled Nova Nanolab 200 dual-beam instrument.

Ulster University led a gathering of scientists from Unilever's worldwide measuring and instrumentation laboratories, and the world's first Biological Dual-Beam EM Symposium. Ulster is currently collaborating on dual-beam analysis of cryo-samples with Unilever, who have funded three CAST PhD awards.