

## Nuclear education and research

The Birmingham Centre for Nuclear Education and Research was launched in 2010 and provides the investment and infrastructure to grow the nuclear expertise and capacity that has existed at Birmingham for over 50 years.



The University of Birmingham is making a significant new investment in the area of Nuclear Engineering, Waste Management and Decommissioning. This is timed to support the UK's investment in new construction in the Nuclear Power sector, the need to manage the legacy waste, the decommissioning of the current generation power stations and the tremendous challenges in developing the next generation nuclear facilities. The demand for highly skilled graduates and postgraduates is set to rise, which will be met by increasing provision at both levels.

### Nuclear research

The University of Birmingham has a long and established track record in working in areas of decommissioning, health monitoring and residual life prediction of existing nuclear power stations, dating back to the first phase of nuclear construction. Birmingham has made significant contributions in metallurgy and materials in the study of the extension of the lifetime of reactor materials; Prof. John Knott received an OBE "for services to Nuclear Safety" in recognition of his contribution to this area. Important contributions have also been made to the effects of radiation damage to nuclear materials.

In the Geoscience area the University has active research programmes in geosphere characterisation for nuclear waste disposal, in particular groundwater engineering, groundwater pollution and the modelling of contaminant transport in complex aquifer systems. This area now has strong links to research in Bioscience on studies of micro-organisms in the accumulation of radionuclides, which is of use in the remediation of contaminated streams and soils. The group is examining the underlying biochemical and chemical mechanisms of this, and using immobilised cells and bio-films for biodegradation of wastes and pollutants. Researchers are investigating corrosion mechanisms of waste drums and the consequences for long term storage. There is an active research programme in Chemistry into improvements in the ion-exchange process and the chemical disposal of the ion-exchange materials post utilization. There are already established links between the research goals in these latter three areas.

The University also has an established record in research into radioactive waste assay, having supported PhD programmes in collaboration with industry on assay of waste drums containing uranium and plutonium using both gamma-ray and neutron detection techniques. There have also been materials defect characterisation projects in high neutron-flux environments (as part of the fusion programme). Research into micron-scale microsensors (MEMs) to be used to passively characterise neutron-flux characteristics is being pursued in Mechanical Engineering. Birmingham has a long tradition of supporting research at Culham in the context of the fusion programme, with a particular emphasis on materials resilience.



In addition to these established areas, we foresee several exciting new developments exploiting research programmes already established in other areas. The University has a strong intelligent robotics group, as well as a group employing innovative 3D simulation - used, for example, to train submariners in submarine safety. The extension to nuclear handling systems or other such safety critical environments is also being pursued.

The new University of Birmingham investment programme will: build on the successes of the earlier nuclear materials research with the development of infrastructure to tackle key issues for current and future generation nuclear reactors; develop research expertise in waste encapsulation and provide new research impetus in characterising the geological and hydrological issues key in deep site waste disposal.

### Nuclear education



The University runs the longest-standing Masters level course in reactor technology (over 50 years), Physics and Technology of Nuclear Reactors (PTNR). This course delivers 30-40 graduates per year of whom 90% progress to careers in the nuclear and radiological sectors. The course is sponsored by the nuclear industry with a steering committee formed from Magnox North, NNL, British Energy, AMEC, Rolls-Royce M, Serco, HSE (NII), Atkins, Babcock Marine, AWE, Nuclear Tech., Frazer-Nash, BAE Systems, Westinghouse, Canberra, UKAEA, Aldersgate, EDF, E.ON and RWE NPower. Birmingham delivers two of the modules on the NTEC consortium programme (Reactor Physics, Criticality & Design and Management of the Decommissioning Process). The Masters level "Medical and Radiation Physics" course produces up to 15 students per year who graduate to jobs in nuclear medicine and radiation therapy.

To meet the future graduate demand in the nuclear sector a new Masters level course in "Radioactive Waste Management and Decommissioning (RWMD)" will be launched in 2011 as will a new undergraduate degree in Physics and Materials of Nuclear Engineering.