



## The microbiology of radioactive environments

Professor Jonathan R Lloyd, University of Manchester, Industry Fellow 2010 – 2014

Hosted at the National Nuclear Laboratory, Warrington and Sellafield



### Introduction

With the UK Government's clearly stated intention to increase our nuclear power generating capability to meet an impending energy gap, there is intense public and scientific interest in the impact of the nuclear fuel cycle on the biosphere; fuelled recently by well publicized events in Japan at the Fukushima Nuclear Facility.

The 2002 Government White Paper on "Managing the Nuclear Legacy" has also highlighted an urgent need to develop remediation options for land contaminated by the UK's extensive nuclear legacy (costs of clean-up estimated at >£50 billion), while the UK Government Committee on Radioactive Waste Management has proposed the urgent establishment of a nuclear disposal research programme to underpin plans for geological disposal of legacy and future high and intermediate level nuclear waste. Both areas require a dramatic increase of our knowledge of the interactions between microbial communities and radioactive materials in engineered and natural environments.

### Overview of Industrial Fellowship research programme

This Industrial Fellowship is enhancing links between the University of Manchester's internationally leading geomicrobiology programme (based in a new Research Centre for Radwaste and Decommissioning) and the nuclear industry via the National Nuclear Laboratory Ltd (NNL). It is underpinning the development of sustainable biological programmes that address the decommissioning of nuclear contaminated environments and the safe long-term storage of nuclear wastefoms. These are being tackled via three interlinked research programmes which incorporate cutting edge microbiological, mineralogical and geochemical techniques including genome sequencing, metabolomics, proteomics, nuclear and synchrotron imaging, HR-TEM and modeling, making the most of complementary facilities being developed in Manchester's research centres and NNL's active laboratories.

- Microbial ecology of contaminated environments including "megsites" such as Sellafield.
- Microbial adaptation mechanisms to high radiation fluxes.
- Bioremediation of land contaminated with radioactive waste.

### Deliverables

Significant progress has already been made towards the following deliverables:

- Stronger engagement between Manchester University and the nuclear industry, including a sustainable microbiology programme in a new radwaste research centre with full industrial links, and complimentary biological facilities in NNL's active laboratories.
- A new and unique internationally-leading programme on radiation biology.
- Bioremediation options for nuclear mega sites.
- A series of authoritative and widely disseminated reviews related to these areas.
- Major RCUK/nuclear industry funded grants to underpin future interactions between the University and NNL, supporting a unique and internationally-leading cross-disciplinary team of research staff.



The University of Manchester



Research Centre for Radwaste &  
Decommissioning

National Nuclear Laboratory

### My Industry Fellowship...

*Is giving me invaluable links into the UK's nuclear sector, needed to develop an internationally leading research programme on the microbiology of the nuclear fuel cycle. This will help with the safe disposal of the UK's radwaste inventory, the remediation of land and water contaminated with radioactive waste and give a unique insight into how microbial life survives in some of the most inhospitable environments on Earth.*