Looking Ahead 2017/2018

Nuclear Security Summer Pilot Research Projects

The Network is currently considering the applications we have received for our Summer 2018 Pilot Projects.

Research will be undertaken during the summer months and students will present their posters at our Nuclear Detection Workshop on 15-16 April 2019.

NuSec Post-Doctoral Support (PDRA) Support Grants

NuSec is pleased to announce a competition for up to 10 short-term "PDRA support grants" worth up to £15,000 each. These grants are intended to support the direct salary costs of PDRAs so that they can work 100% (or pro rata) on NuSec-related topics. The PDRA can either be a new position, or an extension to an existing post.

Priority will be given to proposals in the following topic areas:

1. *Detection systems for nuclear security*
2. *Algorithms, data and autonomous decision making*
3. *Alternative technologies for industrial use of radiation sources.*

Applications must be submitted by **1st June 2018.** Results will be announced on **1st July 2018**. All projects must be completed by **31st March 2019.**

Please visit our website to download the PDRA Application Form and Guidance Notes.


Nuclear Security Detection Research. Credit: ANSTO

Personal Development Grants Applications Required

We are continuing to seek applications from Early Career Researchers based either at a University, Research Establishment or a Company within the UK to support the development of their nuclear science research and innovation capacity. Personal Development Activities eligible for funding include attending a Research Conference or a Training Course or undertaking an Industrial Placement.

We offer grants of up to £2,000 to Researchers based either at a University, Research Establishment or a Company within the UK. 50% matched funding will normally be required, except for PhD students and Early Career Researchers. There is an open application deadline and applicants will be informed of a decision within 6 weeks of submission.

We have made **11 awards** to date totalling more than £13,000. For details of previous awards, an Application Form and further Guidance, visit www.nusec.uk

Nuclear Security Detection Workshop 15-16th April 2019

NuSec network members will be invited soon in 2018 to book a place at this event which will take place at the University of Surrey. The event will focus on current and future technical challenges. Potential topics include, *Detection systems, Muon detection for core monitoring (including WATCHMAN), Algorithms and Autonomous Decision Making and UAV Monitoring and Environmental Measurements*.


University of Surrey. Credit: Silversands

Join Us

If you would like to receive regular network updates please contact **info@nusec.co.uk**
For more information about our Nuclear Security Science Events, Funding and Research Opportunities visit: **www.nusec.uk**

UNIVERSITY OF SURREY | AWE | Science & Technology Facilities Council

NuSec Nuclear Security Science Network

NUCLEAR SECURITY SCIENCE NETWORK ANNUAL NEWSLETTER | WWW.NUSEC.UK ISSUE 2

Welcome

Welcome to the 2nd edition of our annual newsletter, aimed at Academic, Industrial and Government scientists and engineers working in Nuclear Security Science. In this edition, we summarise our 2017/2018 achievements and highlight our future Networking and Funding opportunities for Nuclear Security Research and Training in 2018/2019.

Our Role

The NuSec Science Network promotes research and technology in Nuclear Security Science, with an emphasis on radiological detection techniques and systems. The Network acts as a forum to support collaboration and capability amongst Academic, Industrial and Government stakeholders and engineers working in nuclear security and in other related areas.

The network is a 3 year project led by the University of Surrey in partnership with AWE and funded by the Science and Technology Funding Council (STFC) 21st Century Global Challenge Networks Programme. Government sponsorship and oversight comes from the Home Office, BEIS, DfT, CPNI, GDS MoD, Department of Health, and academic leadership includes Universities of Bristol, Liverpool, Sheffield, Manchester, Glasgow and Cambridge. The network has now been running for more than 2 years and has more than 310 registered network members of which 32% from Industry and funded Agencies, 53% from Academia and 15% are from Government Departments. If you would like to join the network and receive regular updates on funding and research opportunities, please contact **info@nusec.co.uk**

NuSec network 2017/2018 Achievements

Held 2 Scientific Workshops involving more than 90 Academic, Industrial and Government scientists and engineers.

Awarded 4 Personal Development Grants totalling more than £4,000.

Funded through Home Office Detection Science programme 5 Nuclear Security Summer Pilot Projects totalling £18,207 covering topics such as *Van Allen Belt Signatures, Compact X-ray sources, Source Localisation enhancement, Alpha Emitting isotopes* and *Scintillator Signals.*

Generated a wide range of collaborations between Academics and Industry and a broad range of Government Agencies.

Well attended network meetings, with strong interest in the network from the full range of stakeholders.

Good scientific outcomes delivered by ourworkshops and Summer Pilot Projects, some of which are being taken forward by our network partners.


NUSEC & AWE Well logging Workshop Participants, Cambridge. Credit: Nicky Athanassopoulou IFM ECS Ltd

NETWORK ACTIVITIES IN 2017/18

NuSec Technical Workshop - Algorithms for Autonomous Decision Making in Nuclear Security

The Network held its second technical workshop in London, September 2017. It focused on the role of algorithms in nuclear security and the data required for the application and testing of these algorithms. Around 60 researchers from Academia, Industry and Government attended.

Presentations were given by leading researchers working on Algorithms and Data. The session on *Improving the Use of Algorithms in Nuclear Security* was facilitated by Prof Simon Maskell of Liverpool University. It highlighted the need for sensor and algorithmic developers to work more closely together; that algorithms are required to anticipate potential future detection; and the composite human-machine demands state of the art extensions.

The session facilitated by Dr Matthew Stapleton of AWE focused on ways to obtain *Data to help develop further algorithm research.* It concluded that whilst there are data sources in the public domain there is also a significant amount of valuable data that is not available to the public. Industry and government need to work better at sharing data. There is a need to structure both the problem and the type of solution being sought from the data.

Algorithm Workshop Panel Discussion. Credit: Lisa Fletcher, NUSEC network

Our overall recommendations for the future include:

- Developers of algorithms and data producers should be involved in the same discussions.
- A more comprehensive capture of the properties of algorithms, its background and data context will ensure that it is used correctly for its original purpose and has other future uses.
- Data challenges lead by the NuSec Science network and or related stakeholders, would be a positive step to advance integrated data-algorithm working.

NuSec PDRA grants are available to take these recommendations forward.

A report of the workshop can be viewed on www.nusec.uk

A Technology Roadmap - Identifying Alternative Technologies for Radiation Sources in the Oil Industry

In January 2018, the NuSec network, AWE and the Institute for Manufacturing (IfM) organised a workshop in Cambridge with key stakeholders and subject matter experts from the UK & US energy industry, nuclear security, academia, Government agencies.

The aims of the workshop were to:

- Identify potential alternative technologies for well loggers.
- Scope out the best alternative technologies and identify required developments.
- Provide evidence for Policy Makers and Funders.

Using pre-selected criteria of Opportunity and Feasibility 5 technologies were selected for further exploration using Road Mapping Techniques including:

- Acoustic
- Pulsed neutron generators;
- Nuclear magnetic resonance (NMR)
- Data analytics and modelling
- X-rays.

An assessment was made of the technology developments the milestones and energy industry adjustments required for their commercialisation and adoption.

The following actions were considered important for reducing and eventually eliminating the use of radiological or nuclear material by the energy industry.

- Continuation of engagement of key stakeholders, including the UK Home Office, BEIS and the US government;
- Communication of results to the SPWLA Nuclear Logging SIG, Nuclear Threat Initiative (NTI) and the individual organisations that participated in the workshop;
- Identification of a project with industry and operators to compare data using different techniques;
- More education of industry (especially drilling engineers) about the risks of using radiation sources;
- Generating more detailed roadmaps on other technologies.

This evidence will be presented to industry, regulatory bodies, the UK government and RCUK to facilitate policy, programme and future investment decisions.

The Workshop report can be viewed on www.nusec.uk


Alternative Technologies Road Mapping Discussion. Credit: Nicky Athanassopoulou IFM ECS Ltd

Nuclear Security Summer Pilot Projects funded in 2017

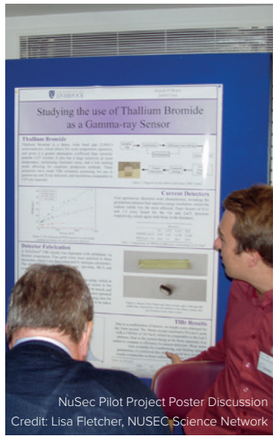
Following an external competition, the NuSec Science Network made five awards to 4 Universities for early stage research, on topics that could enhance the field of nuclear security.

Each award was worth around £4,000.

Research was undertaken in the summer by undergraduates and supervised by senior Academics. Industry was also involved in a couple of projects through the loan of research facilities and equipment.

Recipients presented a poster of their project at our Algorithms workshop, and wrote a brief summary report. Follow up work is planned to further develop some of these projects

2017 Nuclear Security Summer Pilot Project	University
Compact X-ray sources	University of York
Enhancing source localisation for threat detection	Imperial College London
Fluorescence spectra of alpha emitting isotopes for stand-off detector development	Lancaster University
Pulse Shape Analysis (PSA) for temperature dependent scintillator signals	University of York
Van Allen Belt Signatures of Nuclear Weapon Tests for Future Comprehensive Nuclear-Test-Ban Treaty (CTBT) Technologies	University of Bristol & St Marys Twickenham



NuSec Pilot Project Poster Discussion Credit: Lisa Fletcher, NUSEC Science Network

NuSec Network Personal Development Grants awarded in 2017/2018

NuSec Personal Development Grants are aimed at strengthening the research and innovation capacity of Nuclear Security researchers and at developing new collaboration between researchers and partner organisations. To date, we have made 11 awards to PhD students at UK Universities totalling more than £13,000, to support attendance and collaborations at Nuclear Security Science events and courses in the USA and Europe.

Events and courses that ECRs have attended include:

IEEE Nuclear Science Symposium and Medical Imaging Conference, Atlanta, Georgia, 21st-28th October 2017

Electromagnetic Non Destructive Evaluation (ENDE) conference, Saclay, France, 6-8th Sept 2017

ESARDA Course on Nuclear Safeguards and Non-proliferation, Ispra, Italy 3-7th April 2017

Waste Management Symposium, Phoenix (AZ, USA), 5th – 9th March 2017

Certified Nuclear Security Professional Course, World Institute for Nuclear Security (WINS)

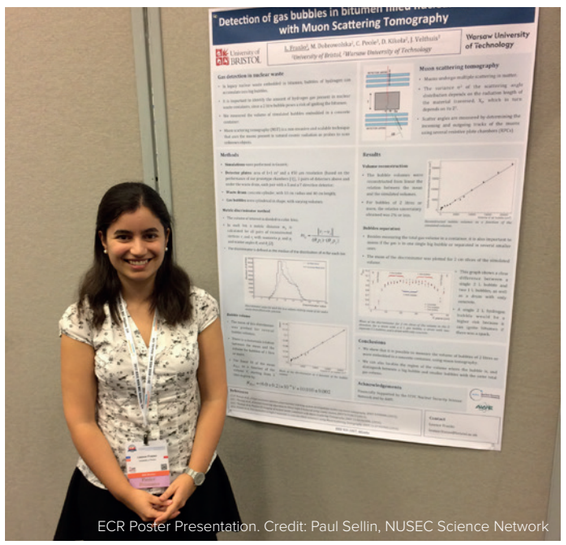
NuSec Supports 4 ECRs at the IEEE- MIC Nuclear Science Symposium, Atlanta

The NuSec network made 4 PDG awards to ECRs totalling around £6,000, to enable them to attend and present at the IEEE Nuclear Science Symposium and Medical Imaging Conference, Atlanta, Georgia, 21st-28th October 2017.

The young scientists gave oral presentations on a range of topics including *3D Printing Gaseous Radiation Detectors; X-ray Thermoluminescence and Monte Carlo Dosimetry Calculations; Muon Tomography to locate gas bubbles inside bitumen nuclear waste container and a Gamma Detector System for nuclear fingerprinting.*

They also attended short technical courses, on topics including *Integrated Circuits for Detector Signal Processing, Radiation Detection & Measurement, GATE and GEANT 4.*

Discussions and networking with technical specialists helped each attendee to address their personal research challenges and PhD research.



ECR Poster Presentation. Credit: Paul Sellin, NUSEC Science Network