WELCOME

Once again, we feel the change of seasons is upon us. However, at DCF it somehow feels more like spring than autumn, as there is a real sense of growth and welcoming. In recent months we've been delighted to greet new colleagues — from Dr Merry Gupta joining us as Application Scientist, to PhD student Krasimir Maslarov, and Professor Mats Jonsson, who joins us through his Leverhulme Research Fellowship. Their arrival, together with the continuing dedication of our on-site research and technical teams which they have joined, brings a renewed sense of purpose and vitality to our work.

Alongside these personal developments, new initiatives are also blossoming. Several of us have been working to develop a fully automated platform for medical isotope production and manufacture — an exciting new direction described in the article about the OPTICS Project. Together, these changes reflect our continuing mission to innovate, collaborate, and grow as part of the wider DCF community.

Fred Currell

Director of DCF

C Pateras

Christina Pateras

Editor

PROJECT SPOTLIGHT: Optimised Production of Theragnostic Isotopes of Copper and Scandium (OPTICS)

In a recent project, our research team, led by our Director, Prof. Frederick Currell, successfully developed a fully automated process for the preparation of radioactive nanoparticles of Copper (Cu) and Scandium (Sc) isotopes - marking a significant advancement in the field of radionuclide production.

The project utilized nickel (Ni) and calcium carbonate ($CaCO_3$) as target materials were irradiated using the Dalton Cumbrian Facility's (DCF's) 5 MV pelletron accelerator. Through a precisely controlled automated system, the entire sequence, from target preparation and irradiation to chemical separation and nanoparticles synthesis, was performed with fully automated process.

This automated approach not only enhances reproducibility, operational safety, and efficiency, but also lays the groundwork for scalable and reliable production of medically relevant isotopes. Nanoparticles of copper and scandium hold tremendous potential for diagnostic imaging and therapeutic applications, and the outcomes of this project contribute directly to strengthening the isotope supply chain for advanced radiopharmaceutical research. Importantly, this project paves the way for a revolution in personalised nuclear medicine, offering a means to produce prescribable, chemically identical formulations, each with unique radiological signatures tailored for specific diagnostic or therapeutic purposes. The project also demonstrated that our in-house Ion accelerators can be effectively adapted for medical isotope production. The team's achievement exemplifies the Institute's commitment to advancing innovative, safe, and efficient technologies in the field of nuclear science and radiochemistry.

Automated radiochemical production system enabling safe and efficient preparation of medical isotopes (left) and our researcher Dr. Dipak Babar and Dr. Volkan Yasakci explains the system's operation and its potential impact on healthcare innovation (right) during a recent visit by our local MP Josh MacAlister.

OUR PEOPLE

Dr Merry Gupta, Application Scientist, DCF and Henry Royce Institute.

Merry has extensive experience in the irradiation of materials, especially nuclear materials, using accelerator facilities like 15 UD Pelletron Accelerator and 30 kV Tabletop Ion Accelerator. Her expertise spans post-irradiation examination using a wide range of analytical techniques such as powder XRD, SEM-EDS, Raman, XPS, AFM, TEM, EXAFS, and Ion Beam Analysis for Rutherford Backscattering Spectrometry. With a strong background in both research and teaching, Merry thrives in interdisciplinary environments, blending material synthesis and characterization to drive innovation and share knowledge.

Krasimir Maslarov, PhD Student

Tell us about your journey in education so far.

In 2024 I graduated with a Bachelor's in Chemistry with Medicinal Chemistry from The University of Manchester. That same year, I was also an intern at DCF, where I focused on automating nickel/copper separation, and scandium nanoparticle synthesis. I have just started the second year of my PhD.

What brought you to DCF?

My experience as an intern last summer was great, thanks to the very skilled and supportive staff. Additionally, my PhD's area, focused on the effects of radiation on materials, means that there are few other places in the country that have the suitable material base.

What are your research interests?

My research is focused on fluoropolymer degradation, and on potential PFAS release during use. Fluoropolymers have a wide variety of applications, such as in the nuclear industry, where they are irreplaceable. On the other hand, PFAS' adverse health effects and long lives in the environment have made them the focus of regulators around the world.

What do you enjoy doing when you aren't at work?

Outside of work, I like going on walks (for which the vastness of Cumbria is perfect), going out with friends, playing board and card games and reading, among other things. I have dabbled in creative writing, but there are few opponents as insurmountable as that first blank page.

PROFESSIONAL PROFILE

DCF has been pleased to welcome Professor Mats Jonsson, who is working in collaboration with Dr Aliaksandr Baidak and Prof Fred Currell under the Leverhulme Research Fellowship.

Professor Jonsson kindly answered a few questions for us:

1. You have been a leading figure in radiation chemistry for over 25 years. What first drew you to this field, and what continues to inspire your work today?

I would say it was curiosity. As a student in chemistry and chemical engineering I was a bit frustrated that we didn't have courses on radioactivity and nuclear reactions. When it was time for me to choose a project for my MSc-thesis, I went to the department of Nuclear Chemistry at KTH (Royal Institute of Technology) and asked them if they could offer a project. They could and this project happened to be in radiation chemistry. I had absolutely no background knowledge in radiation chemistry, but this only triggered me more. I have given a longer answer to this question about ten years ago to the Japanese Society for Radiation Chemistry (https://doi.org/10.32157/jsrc.100.0_23). I would say that it is still primarily curiosity that inspires me today.

2. Your research has significantly influenced how we understand the dissolution of spent nuclear fuel. Could you explain why this is such an important issue for nuclear safety?

Everyone has an opinion about nuclear energy. In some cases, the opinion is based on facts while in other cases the opinion is more based on emotions and the opinions of other people. When it comes to nuclear safety, there are two major risks that we have to consider. The first one is the risk of a catastrophic event in an operating nuclear power plant (or fuel reprocessing plant), i.e., a severe accident,

and the second one is the risk of a failing barrier system for radioactive waste. Most of us find it easier to relate to the first type of risk since it is something that has happened during our own lifetime (if we are old enough). The second scenario is something that could happen in 1 000 years or more. In other words, we will most likely not experience this ourselves and it is therefore more difficult to relate to. Still, we must be able to guarantee the safety of future generations. Dissolution of spent nuclear fuel is a process that can occur after multiple barrier failure resulting

in groundwater coming in contact with the fuel. This is the process that would eventually release the radionuclides from the fuel matrix. In order to assess the consequences of such event, we must understand the process and know how fast it is.

3. You bring unique expertise in interfacial radiation chemistry to the UK. What specific skills or methods do you hope to transfer to researchers and students during your fellowship?

I hope that transfer of skills can be mutual. From my side, I think it is mainly my approach to interfacial radiation chemistry that I want to transfer. It is not method specific. I also hope to be able to contribute to the development of experimental set-ups for studies of interfacial radiation chemistry.

4. You've collaborated widely across Europe and North America. How do you see international collaboration shaping the future of nuclear science?

International collaborations are essential in all scientific areas as it gives us the opportunity to exchange ideas with people from other cultures and to get access to research infrastructures that we would otherwise never use. In many countries, there is a growing interest in nuclear science for the development and construction of new nuclear reactors. This growing interest is also reflected by a significant increase in funding opportunities. However, the number of highly qualified people who could directly contribute to the development is limited and this applies to many countries. The only way to be able to carry out R&D-projects in every country is probably through international collaborations and coordination. For this reason, I believe that international collaborations will become increasingly important in nuclear science.

5. During your time at DCF, you will be mentoring PhD students and postdocs. What advice do you give young scientists who are just starting in radiation chemistry?

Be curious and do not limit your interest to the topic of your own project. The best inspiration for your own research could very well come from research performed in a different area. Talk (and listen) to your fellow PhD-students and postdocs about your projects.

6. The UK is planning for deep geological disposal of nuclear waste, similar to Sweden and Finland. What lessons from the Swedish experience do you think are most valuable for the UK?

I think there are many lessons to learn on several different levels. From a technical/scientific point of view, UK can try to build on knowledge from the programmes in Sweden, Finland, Canada and Switzerland (to name a few) and try to avoid making the same mistakes. On a more political level, selecting a site for a repository and get public acceptance for this is a challenge. In Sweden and Finland, the selected sites are located where there are nuclear power plants today.

This probably made public acceptance much easier. There have also been discussions about other sites but in these cases public acceptance quickly became a major issue.

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8. Finally, what do you most look forward to about your time in Cumbria and working with the DCF team?

I look forward to learning more about ongoing projects and to interact with everyone in the DCF team. I also hope to participate in the development of new experimental set-ups that can be used to study interfacial radiation chemistry. Outside the DCF-team I also hope to establish other new collaborations in the UK.

EQUIPMENT DEVELOPMENT (SEM)

The newly acquired TESCAN CLARA-2 scanning electron microscope (SEM) is an ultra-high resolution (UHR) FEG instrument capable of image resolutions in the order of 1–10nm.

The SEM is also equipped with an Oxford Instruments UltiMax EDS and Symmetry S3 EBSD detectors.

The addition of the TANIST (TESCAN and NewTec In-Situ Testing) system enables material characterisation studies that combine deformation (strain) experiments with High-Resolution Digital Image Correlation (HRDIC) with simultaneous

acquisition of SEM images and EBSD maps. The system comprises a heated (up to 1000°C) and water-cooled tensile stage (MT1000) that is compatible with the beam-line end stations. This offers the potential for dual experiments on irradiated, as well as non-irradiated materials, while using the full capabilities of the SEM.

RECENT EVENTS

ARR Conference 2025

In June, DCF hosted the Association for Radiation Research (ARR) meeting at Lodore Falls in Cumbria. We were delighted with the success of the conference. It proved to be a stimulating and productive meeting, that brought together both established and early career researchers for interdisciplinary networking discussions. Thanks to all of our sponsors for the meeting, including our two Platinum Sponsors, RPS Service and Screen Europe. There were a variety of sessions, encompassing and reflecting the broad scope of the societies interests and fields, including Radiation Protection, Nuclear & Radiation Chemistry/Physics, Radiation Biology & DNA Damage/Repair, Clinical & Translational Medicine, Medical Isotopes and a session on Radiotherapy hosted by the British Institute of Radiology (BIR). It was also fantastic to host the first ever Space session at the meeting, with Prof. Andrew Coates giving the invited lecture on Space Weather, with a variety of additional talks on radiation effects in space.

A range of prizes were awarded, including the prestigious Weiss Medal, awarded for distinguished contributions to radiation science, as well as Early Career Researcher Oral and Poster prizes, and we would like to take the opportunity to congratulate the winners of these awards once again.

Weiss Medalist 2025

Anthony Chalmers: Chair of Clinical Oncology at the University of Glasgow and Director of the CRUK Glasgow RadNet Centre

Oral Presentation Awards

1st Place: Lydia McQuoid for Impact of Novel Gold Nanoparticle Formulations on Indirect Effects of Radiation

2nd Place: Jonathan Cousins for Mechanical and Chemical Evolution of Potential Lunar Construction Materials Under Simulated Lunar Conditions

3rd Place: Adrija Bhowmick for Molecular Dynamics Simulations of Thermal Cycling Effects on Lunar Construction Materials

Poster Presentation Awards

1st Place: Milaan Patel for Supersonic Gas Curtain Ionization Profile Monitor: A Non-Invasive Beam Diagnostics for FLASH Proton Therapy

2nd Place: Jordan Elliot for Investigating Damage to Folded RNA Using X-ray Radiation

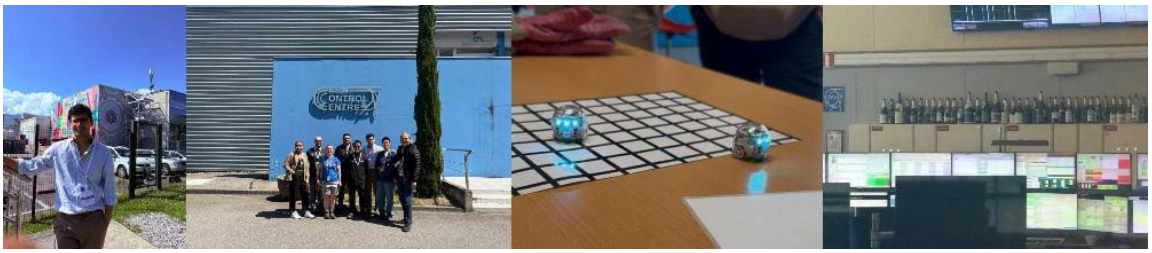
3rd Place: Volkan Yasakci for Radioisotopic-Blended Copper Nanoparticles: Target Development, Separation and Synthesis

(L to R) Dr Marcus Webb, the DCF team, Dr Dipak Babar, Dr Volkan Yasakci, Dr Aidan Milston and Dr Kay Dewhurst.

DCF Researchers shine at the 33rd Miller Conference on Radiation Chemistry

Three researchers from the Dalton Cumbrian Facility (DCF) — Dr. Aliaksandr Baidak, Dr. Volkan Yasakci, and Dr. Mel O'Leary — proudly represented The University of Manchester at the 33rd Miller Conference on Radiation Chemistry, held in Dubrovnik from 5–10 October 2025. The Miller Conference, one of the most prestigious international meetings in the field, brought together leading scientists to discuss the latest advances in radiation chemistry across disciplines ranging from materials science and energy to environmental and medical applications. Dr Alex Baidak presented new insights into the formation of short-chain PFAS during radiolysis of fluoropolymers used in the nuclear industry, while Volkan Yasakci reported on the DCF-led innovative research into radioisotope-enriched copper nanoparticles. Mel O'Leary introduced the "Spinning Wineglass," a novel apparatus enabling precise ion-beam irradiation studies. Their talks highlighted DCF's expanding capabilities and its contribution to advancing radiation-driven science and technology. The conference provided an excellent platform for networking, inspiring discussions, and strengthening DCF's international profile within the global radiation chemistry community.

The next Miller Conference will be hosted in Sweden by Prof Mats Jonsson from KTH Royal Institute of Technology, Stockholm. Prof Jonsson, who currently holds a Leverhulme Visiting Professorship with DCF as the host institution, has dedicated over 25 years to studying radiation-induced dissolution of spent nuclear fuel and the behaviour of barrier materials for deep geological repositories, establishing himself as a world-renowned expert in this important field.



M.U.C.S Trip to CERN May 2025

From 9–11 May, researchers from RAICo and DCF travelled together to CERN for a technical visit. The goal was to understand the technical advancement at the facility, personally I hoped to see the use of robotics at CERN. We got to see the extent of the world's largest particle accelerator, the 27 km-long Large Hadron Collider, and even heard about plans for an even bigger one in the future. A highlight was our tour of the CERN Control Centre, huge thanks to Kay from DCF (who used to work there) for showing us around. It was surreal seeing the control room with its endless monitors and a proud row of champagne bottles marking big scientific milestones.
Wealso explored the CERN museum and Science Gateway, walking through the history of discoveries that have shaped modern physics. Being a robotics PhD student at RAICo, I was especially interested in the robotics used at CERN; hearing about the rover and manipulator systems for remote maintenance, and the smaller bots used for education at the science gateway were fun to look at.

Beyond the tech, the trip was a chance to connect with fellow researchers and think about how our work at RAICo and DCF could feed into similar challenges, like remote inspection, automation, or robotics in extreme environments. All in all, an inspiring few days, a lot of walking, and a lot of ideas to take back home.

Naseel Sinan

Robotics PhD student, RAICo1

DCF Open Afternoon, Tuesday 18th November 15:00 - 16:30

We are holding an open afternoon on Tuesday 18th November. Explore our state-of-the-art facility, meet our team of experts, and learn about the ground-breaking research happening here.

We are taking a different approach this time and having three concurrent tours running, covering the Accelerator, Irradiator and Analytical equipment, and our new SEM with the XRD and RAMAN. There will also be demos and the chance to meet the team. Please note the tours will start at 15:00 prompt. Book your place here:

https://DCFOpenAfternoonNov2025.eventbrite.com

Access DCF's world-class analytical capabilities

DCF has an outstanding analytical infrastructure supporting research across materials science, chemistry, physics and biology. If you or your organisation are interested in accessing DCF's suite of analytical instruments, including SEM, UV-Vis, FTIR, and Raman spectrometers, as well as XRD, TGA-MS, and many more, you can explore the full list of available equipment here: Irradiation Environments - Henry Royce Institute.

Access to analytical equipment at DCF is available through an open call with no deadline, ensuring flexibility for academic and industrial users alike. Several external funding routes are available to support instrument use, and the DCF team is happy to advise on the most suitable options. For enquiries or requests for quotations, please contact us at dcf.experiments@manchester.ac.uk We look forward to supporting your research and innovation needs.

Grant proposals - staff and students at DCF

If you intend to base staff or students at DCF as part of a grant proposal, we strongly recommend consulting us before grant submission. Due to the remote nature of DCF, researchers staying for more than two weeks must have local line manager appointed at least one month before arrival.

Note: We require at least two weeks' notice to produce letters of support for grant applications.