UKRI Future Leaders Fellowships

The UK research and Innovation (UKRI) has just launched a new scheme to support early career researchers and innovators with outstanding potential in universities, UK registered businesses, and other research and user environments including research councils’ institutes and laboratories.

The UKRI Future Leaders Fellowship scheme is a single scheme across the entire UKRI remit that will:

- develop, retain, attract and sustain research and innovation talent in the UK
- foster new research and innovation career paths including those at the academic/business and interdisciplinary boundaries, and facilitate movement of people between sectors
- provide sustained funding and resources for the best early career researchers and innovators (up to seven years support available on a 4+3 model)
- provide long-term, flexible funding to tackle difficult and novel challenges, and support adventurous, ambitious programmes

We apologise for the late distribution of this issue due to a transition period with mail sending clients (this is all to do with GDPR)
This is scheme is additional to existing Research Council fellowship schemes and is distinct as the Future Leaders Fellowships;
• are available across the entire UKRI remit,
• are open to individuals based in business as well as those based in universities,
• provide long term support of up to seven years (on a 4+3 model with review at 4 years),
• come with additional expectations of host organisations in their support to the fellow, for academic host organisations this includes tapered salary commitment from year 3 of the fellowship and commitment to an open-ended position for the fellow during or at the end of their fellowship.

There will be six calls for these fellowships; two calls per year between 2018-19 and 2020-21 (financial years), typically awarding at least 100 fellowships per call across UKRI’s remit (with the initial round being smaller, aiming to award ~50 fellowships).

The key dates for the first call are:
• Thursday 7 June - host organisations must submit an Expression of Interest (EOI) for each of the applicants they intend to submit in the first round
• 16:00 on Tuesday 3 July 2018 – first round full application deadline

The second call deadline will be on 31 October 2018 (EOI deadline 4 October 2018). Dates for subsequent calls will be published on the UKRI website.

For further information please see the [UKRI Future Leaders Fellowship pages](https://www.ukri.org/), questions about the scheme should be directed to fellows@ukri.org. Please feel free to disseminate this information to those that might benefit from this new funding opportunity.
SBRI: identify, catalogue and analyse terrorist still imagery online

Organisations can apply to develop solutions for automatic identification, cataloguing and analysis of online still imagery. This is phase 1 of a 2-phase competition.

Competition opened: Monday 14 May 2018
Registration closes: Wednesday 20 June 2018 12:00pm

Description

One of the Research, Information and Communications Unit’s (RICU) primary objectives is to help prevent people from being drawn into extremism and terrorism. This is mainly achieved through the removal of terrorist propaganda online and the promotion of counter narrative communications campaigns.

More than 80% of terrorist media shared online by the group’s supporters is still imagery. RICU forecast that terrorist propaganda will increasingly be used to exploit local issues in the UK, Europe and North America. For this purpose they will rely on supporter-produced imagery. Such propaganda is highly dangerous because it is so often created both by and for our own citizens.

We are looking to develop technology that automates the detection of still imagery.

This is phase 1 of a 2-phase competition. Phase 2 is dependent on the success of this phase.

Competition information

- Eligibility
- Scope
- Dates
- How to apply
- Supporting information

Funding type: Procurement

Project size: We expect projects in phase 1 to range in size up to total costs of £50,000 including VAT per organisation for up to 3 months. We expect to fund up to 5 projects.
UK businesses can apply for a share of £1 million for early-stage, human-centred design projects that will determine future R&D activity in immersive experiences. This is from the Industrial Strategy Challenge Fund.

Competition opened: Monday 21 May 2018
Registration closes: Wednesday 4 July 2018 12:00pm

Description
Innovate UK, as part of UK Research and Innovation, will invest up to £1 million to fund early-stage, human-centred design projects through the Industrial Strategy Challenge Fund (ISCF). These will seek to understand customer needs and create new or better ideas for:

- immersive audience experiences across the creative industries
- products or services used to create, deliver and experience immersive content across the creative industries

Projects must use established human-centred design principles (such as the Design Council’s ‘double diamond’ process).

Immersive experiences blur the line between the physical and simulated world. They use virtual, mixed, and augmented reality technologies, haptics and other sensory interfaces coupled with data.

This competition is for early-stage projects that use customer research to generate ideas that meet customer needs. Fast, low-cost prototyping and user testing of those ideas is also within scope. Projects should deliver well-defined, user-validated ideas ready for further technical research and development (R&D).

This is part of the Industrial Strategy Challenge Fund’s Audience of the Future programme. Successful applicants will have an opportunity to apply for later stage R&D funding from this programme in 2019.

Competition information
- Eligibility
- Scope
- Dates
- How to apply
- Supporting information

Funding type: Grant

Project size: Your project’s total costs should be between £20,000 and £60,000. We expect projects to be able to start from 1 October 2018. They must last between 2 and 6 months and end by 31 March 2019.
Improving patient diagnosis and treatment: apply for funding

Businesses can apply for a share of up to £5 million to develop new technologies in the field of precision medicine.

More accurate identification and treatment

Disease processes and treatments can vary highly from person to person. Only between 30% and 70% of patients are thought to respond positively to any drug.

More than 80% of terrorist media shared online by the group’s supporters is still imagery. RICU forecast that terrorist propaganda will increasingly be used to exploit local issues in the UK, Europe and North America. For this purpose they will rely on supporter-produced imagery. Such propaganda is highly dangerous because it is so often created both by and for our own citizens.

Precision medicine - also known as stratified medicine or personalised medicine - seeks to improve this through more accurate identification of disease and of the right treatment to pursue. It combines knowledge of clinical biomarkers with advances in diagnosis and data analysis.

The aim is to ensure patients receive an accurate diagnosis and get the best treatment for their personal circumstances.

Supporting our ageing society with earlier diagnosis and precision medicine is part of the government’s modern Industrial Strategy. Find out more about how we are tackling this challenge through the Industrial Strategy Challenge Fund.

What we are looking for

This competition is for both early-stage feasibility studies and for collaborative research and development. Projects may combine different research categories if needed.

Feasibility studies

Projects could conduct feasibility studies into:

• initial technical activities
• the value proposition of a concept
• understanding the technical, operational, clinical and regulatory requirements of a technology and the challenges of getting it adopted by medical professionals
• determining relevant regulatory and health technology assessments
• analysing progress and developing a clear development plan for a technology

Collaborative research and development

We will support collaborative research and development under one of the following themes:

• rapid and accurate diagnosis of commonly misdiagnosed ailments to help pick cost-effective remedies already on the market
• mental health and precision psychiatry
• paediatric and maternal-foetal medicine
• inflammatory diseases including psoriasis, respiratory, autoimmune, Crohn’s and transplant rejection

Competition information

• the competition opens on 14 May 2018, and the deadline for applications is at midday on 11 July 2018
• a briefing event will be held on 31 May 2018
• for feasibility projects, these:
  • must be led by a business working alone or with other businesses or research organisations
  • have project costs of up to £100,000 and to last up to 12 months
For collaborative research and development projects, these:

• can be led by a business or a research and technology organisation and must include another organisation such as a healthcare provider, business or research organisation
• have project costs of up to £2 million and to last up to 24 months
• businesses could attract up to 70% of their project costs

Find out more about this competition and apply
Open programme funding competition round 1

Innovate UK have allocated up to £20 million to fund innovation projects in this Open competition.

**Competition opened:** Thursday 10 May 2018
**Registration closes:** Wednesday 11 July 2018 12:00pm

This competition is open to the best cutting-edge or disruptive ideas or concepts with a view to commercialisation. These can come from any area of technology, science or engineering, including arts, design, media or creative industries, and be applied to any part of the economy.

**Projects can focus on:**
- feasibility studies which may include market research
- industrial research
- experimental development depending on the challenge identified and proposed solution

**To be in scope, a proposal must demonstrate:**
- a clear game-changing and/or disruptive innovative idea leading to novel, new products, processes or services that are significantly ahead of others in the field
- a strong and deliverable business plan that addresses (and documents) market potential and needs
- a team, business arrangement or working structure with the necessary skills and experience to run and complete the project successfully and on time
- awareness of all the main risks the project will face with realistic management, mitigation and impact minimisation plans for each
- sound, practical financial plans and timelines that represent good value for money
- a clear, evidence based plan to deliver significant economic impact, return on investment (ROI) and growth through commercialisation, as soon as possible following project completion

**To lead a project you must:**
- be a UK-based business of any size or a research and technology organisation (RTO)
- carry out your project in the UK
- intend to exploit the results from the UK
- work alone or in collaboration with others (businesses, research base and third sector)

The lead organisation must claim funding through this competition.

All projects must include at least one micro, small or medium-sized enterprise (SME).

**Total eligible project costs must be within the following ranges:**
- project duration between 6 to 18 months: total costs must be between £25,000 and £500,000
- project duration between 6 to 18 months may be either single company or collaborative
- project duration between 19 to 36 months: total costs must be between £25,000 and £2,000,000
- project duration between 19 to 36 months must also be collaborative (cannot be a single company)

Competition demand is likely to be very high. Only those proposals with clear cutting-edge, game changing innovation which demonstrate the most robust business plans and highest potential for return on investment and impact are likely to be funded.

For more information [click here](#)
STFC will shortly be launching two calls for:

- **21st Century Challenges Networks**: building multidisciplinary communities to enable the STFC research community to build engagement with challenge owners and stakeholders in the areas of environment, infrastructure and resources; health; defence, security and resilience.
  
  **Closing date 02/10/18**

- **Global Challenges Research Fund**: maximising the practical impact of STFC-funded research and innovation address challenges faced by developing countries and to strengthen capability for research and innovation in support of economic development.
  
  **Closing date 11/09/18**

The event will showcase a selection of existing 21st Century Challenges Networks and Global Challenge Research Fund Foundation awards and will be of interest to STFC-funded researchers with an interest in applying STFC science and technology to challenges in the UK and in developing countries, as well as researchers and stakeholders from other disciplines interested in partnering with STFC-funded researchers.

On the day, there will be showcases from both the 21st Century Challenges Networks and GCRF award recipients as well as 1 to 1 surgery sessions.

To register for this event, please go [here](#)

For more information on the Network Call, please go [here](#)

For more details on the GCRF Call, please go [here](#)
£3.5 million for STFC spin out using space technology to monitor the environment

STFC spin-out MIRICO has secured a £3.5 Million investment to support its technology for the instant, high precision measurement of greenhouse gases and pollutants in the environment.

Tighter regulations on air quality and the growing sophistication of manufacturing processes are driving the demand for more accurate, reliable and versatile gas sensing technologies.

Using laser techniques developed at STFC’s RAL Space to analyse gasses in planetary atmospheres, MIRICO produces equipment for real-time, high precision sensing of gases to meet these global needs and markets. This includes measuring air quality and greenhouse gases, and industrial process control where control of gas mixtures can improve efficiency and yield.

The technology uses next generation lasers to measure very low levels of greenhouse gases in real-time, targeting molecules with immense precision and very few components. It can detect where traces of carbon dioxide come from in the field, for example if they originate naturally from plant respiration or through the burning of fossil fuels.

Dr Liz Kirby, Head of Innovation at STFC, said “We are thrilled that MIRICO has reached this next stage in realising the commercial potential from STFC patented technology. This is a fantastic example of how world leading technology teamed with innovation and business support in the early days can help a company flourish.”

MIRICO’s £3.5 million investment was secured from a combination of its existing investors, including, Longwall Ventures ECF, STFC Innovation Ltd, UK Innovation and Science Seed Fund (UKi2S) and a new investor Foresight Williams Technology EIS Fund.

Find out more about MIRICO on their website.
Technology at the heart of the Large Hadron Collider is being developed in the North West to treat cancer. A new proton therapy assembly and test facility will be built at the STFC Daresbury Laboratory in a collaboration with British firm Advanced Oncotherapy. The treatment produces fewer side effects than conventional radiotherapy. It uses beams of protons – part of the atom – to precisely target cancerous tumours while limiting damage to surrounding organs or tissue. Offering higher disease-free survival rates, proton therapy is most often used to treat brain tumours in young children whose organs and tissues are still developing, or cancers adjacent to critical part of the body (liver, lung, head and neck, prostate, breast).

The company said the Lab, at the Sci-Tech Daresbury Campus in the Liverpool City Region, will become the mass-assembly and testing location for the next generation of proton particle accelerator. It said its ‘LIGHT’ system is expected to be the first commercially available linear proton accelerator and would be a milestone advancement in cancer therapy.

UK Science Minister Sam Gyimah said: “Almost all of us have been affected by cancer in some way, whether that’s receiving treatment ourselves or through people we know who have battled the disease. Today’s investment will help develop the next generation of treatments and could take us one step closer to finding a cure, making a huge difference to millions of peoples’ lives. The UK remains a leading destination for science, research and innovation and has been home to many of the world’s greatest medical discoveries and development of treatments. Through the Government’s modern Industrial Strategy and Life Sciences Sector Deal, we are encouraging collaboration between industry, academia and business to ensure the UK remains at the forefront of the latest technologies and developments – building a Britain fit for the future.”

Professor Susan Smith, Head of STFC’s Daresbury Laboratory, said the decision was recognition of the Laboratory’s world leading skills and experience in the field of particle accelerators. “At STFC we are committed to developing accelerator technology and expertise to address the world’s key challenges, as well as to help businesses innovate to the benefit of our society and our economy,” Professor Smith said.

Particle accelerators are the heart of the Large Hadron Collider at CERN, where scientists confirmed the existence of the Higgs Boson in 2012. The work of STFC, as part of UK Research and Innovation, supports the UK’s Industrial Strategy and contributes to the UK continuing to be a leading global destination for science and innovation.

Further information on the Advanced Oncotherapy website.
The Harwell EnergyTec Cluster has been formally launched unifying STFC alongside 29 other academic, public and private organisations all working to find solutions to the energy challenges laid out in the UK’s Industrial Strategy as well as addressing the world’s energy problems.

Experts from the UK’s energy industries and leading research institutions met at the launch of the Harwell Campus EnergyTec Cluster and the opening of the Faraday Institution’s headquarters.

The EnergyTec Cluster aims to become a global hub for innovation and Harwell is already acting as a catalyst in accelerating the UK’s energy capabilities with its distinguished heritage in energy research and many world firsts, including its innovation and commercialisation roles in battery research. Dr Barbara Ghinelli, STFC Director of Campus Business Development and Cluster Lead commented on the launch: “The Harwell EnergyTec Cluster is part of a well-established entrepreneurial ecosystem that facilitates collaboration and risk sharing, makes it easier to attract new investments and gain economies of scale whilst also tapping into a pool of highly-skilled people.”

Core areas of focus for the cluster will include energy storage and battery technologies, carbon neutral alternatives to fossil fuels and smart technologies that will shape the future of carbon-free building design. These innovations and their derivatives will influence every aspect of life across work, leisure and recreation, improving the environment and developing sustainable alternatives for the future.

The Business Secretary Greg Clark said: “The way we live, travel and work is changing rapidly with the development and adoption of new technologies. The UK leads the world in tackling climate change and batteries will form a cornerstone of our future low carbon economy. This landmark investment to launch the Faraday Institution and Harwell EnergyTec Cluster, through our Modern Industrial Strategy, ensures the UK will lead the world in powering the next global energy revolution.”

Professor Bill David, Professor at the Inorganic Chemistry Laboratory, Oxford and at STFC’s ISIS Neutron and Muon Source, was part of John Goodenough’s team who worked on the discovery of the modern lithium-ion battery in the early 1980s; he added: “There is a recognised worldwide imperative to move to green and clean energy solutions and the UK is well placed to make major contributions to this global grand challenge. The Faraday Institution and the Harwell Campus are key exemplars of initiatives that will educate, enable and inspire new generations of UK scientists, engineers and entrepreneurs to invent, innovate and commercialise radically new solutions that will create UK jobs, UK companies and global solutions.”
Welcome

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) 315th Century Global Challenge Networks Programme. Government sponsorship and oversight comes from the Home Office, BEIS, DfT, CPNI, GDS, MoD and 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, 55% 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
Hold 2 Scientific Workshops involving more than 90 Academic, Industrial and Government scientists and engineers.
Awarded 6 Personal Development Grants totalling more than £4000.
Funded through Home Office Detection Science programme 5 Nuclear Security Summer Pilot Projects involving £32,207 covering topics such as Var Anneal IoT signatures, Compact X-ray source, Scintillator Signatures, Athena Meeting, compact and gamma/x-ray 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 network members and Summer Pilot Projects, some of which are being taken forward by our network partners.

NuSec Summer Pilot Projects
Our Network is pleased to announce a competition for up to 10 short-term ‘PDRA’ support grants worth up to £6,000 each.
These grants are intended to support the direct salary costs of PDRAs so that they can work on 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.


Looking Ahead 2018/2019

Personal Development Grants Applications Required
We are continuing to work on 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, except for PhD students where funding will normally be 50% matched.

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 £6,000 each.
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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.

NuSec network members will be invited once 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: Detectors, Detection systems and associated activities (including WATCHMAN), Algorithms and Autonomous decision making and Care Monitoring and Environmental Monitoring.

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.co.uk

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UK supported climate satellite successfully launched into Earth orbit

UK scientists celebrated the successful launch of the newest Earth monitoring satellite in Europe’s Copernicus programme, Sentinel-3B, from the Russian Plesetsk Cosmodrome on a Rockot at 17:57 GMT on 25 April.

STFC’s RAL Space has been involved in developing the Sea and Land Surface Temperature Radiometer (SLSTR), one of the five instruments on board Sentinel-3B. SLSTR’s job is to provide highly accurate measurements of global Earth surface temperatures, vital information for monitoring events like the El Niño phenomenon in the Pacific Ocean, even tracking wildfires.

The satellite has now taken its place in orbit to work with its twin, Sentinel 3A, to monitor the land and sea. Part of the ESA/EU Copernicus family of Earth observation missions, Sentinel 3 supports ocean forecasting systems, as well as environmental and climate monitoring. The two satellites will fly in tandem providing better estimates of the quality of data coming from both satellites and help record accurate long-term climate data records, an area in which the UK has world-class capability.

Scientists and engineers at RAL Space calibrated SLSTR for both Sentinels 3A and 3B to ensure that the instruments provide the high level of accuracy required. To ensure that data from SLSTR, can be reliably traced to reference standards required for accurate climate monitoring, RAL Space were responsible for the overall calibration strategy, including the on-board calibration sources, pre-launch test campaigns and on-orbit verification.

Dr Chris Mutlow, Director of STFC RAL Space said, “A successful launch of a satellite is always a great moment in a project, particularly when it’s a project you have worked on yourself. We’re now looking forward to the enhanced global coverage Sentinel 3B will provide, working in tandem with Sentinel 3A. This data is vital to our understanding of environmental phenomena. I’m proud of the role RAL Space scientists and engineers play as part of the European team making this as accurate as possible.”
SLSTR continues the dataset of global surface temperatures collected by the Along-Track Scanning Radiometer (ATSR) series on ERS1, ERS2 and ENVISAT. The ATSR series, originally developed by a UK consortium led by RAL Space, are considered amongst the most accurate remote sensing instruments in terms of data calibration. As such, the data from ATSR are used as a reference for other satellite instruments measuring sea surface and land surface temperature.

Dave Smith, SLSTR Calibration Scientist at STFC RAL Space said: “The launch of Sentinel-3B completes the latest chapter in the story of the Along Track Scanning Radiometer that began in the 1980’s. From its beginnings as a research instrument to measure sea surface temperatures to unprecedented accuracy, we now have two operational instruments that will be providing global, daily measurements of the highest quality. The story will continue with SLSTR-C and D and beyond.”

As well as calibration, STFC RAL Space played a key role in the development of the instrument design, and the definition of the data products and processing algorithms. RAL Space lead the SLSTR Expert Support Laboratory to ensure that the data quality are of the standard required for operational and climate users. Data from Sentinel 3B will be made available to scientists through the Centre for Environmental Data Analysis archive; which already holds over 3.5 Petabytes and 2.8 million data products of Sentinel data.

Work is now in progress on the SLSTR instruments for Sentinels 3C and 3D which will replace 3A and 3B at the end of their operational lifetime. SLSTR for Sentinel 3C will be arriving at STFC RAL Space in 2019 for calibration.

Speaking from the a meeting of the international space co-ordination body, the Committee on Earth Observation Satellites, Professor John Remedios Director of the UK’s National Centre of Earth Observation (NCEO) said: “Sentinel-3B marks an important step forward in our capability to provide high quality data as fast as possible for wherever people live and move.”

Together with Sentinel-3A, it marks a point of markedly improved precision and regional representations in our climate records for land, ocean and particles in the atmosphere."

Sentinel 3B

The Sentinels are a fleet of satellites designed to deliver the wealth of data and imagery that are central to the European Commission’s Copernicus programme.

This unique environmental monitoring programme is making a step change in the way we view and manage our environment, understand and tackle the effects of climate change and safeguard everyday lives. It serves European citizens, both directly through its products and applications, and indirectly through social, economic and environmental benefits.

SLSTR has been developed through a European collaboration between Leonardo Company (Italy), Jena Optronik (Germany), and STFC RAL Space for the ESA/EU Copernicus Sentinel 3 satellite led by Thales Alenia Space in France.
Global scientists come together to make better use of Earth Observation data

Hundreds of data scientists from across the world gathered at the UK Space Cluster in Harwell, Oxfordshire to contribute to an international conference focussed on addressing the opportunities in understanding vast datasets. The scientists at PV 2018 were assessing ways to take that new information and make it accessible and useable to the widest variety of disciplines for societal benefit and commercial growth.

Vast datasets now exist in many areas of science and society but we need the right tools to process and make sense of it. STFC RAL Space, the UK Space Agency and the National Centre for Earth Observation (NCEO) are hosting the conference bringing together participants from academia and industry. PV 2018 will highlight the cutting edge of data exploitation and preservation science and technologies from satellites and science experiments.

Esther Conway, Head of the Scientific Programme Committee for PV 2018 and Senior Data Scientist at STFC’s RAL Space, welcomed delegates to the conference “The way we manage large datasets underpins our ability to do big science. We have speakers from across the world sharing their projects to help realise the social and economic benefits of data. It’s a fantastic opportunity to forge new international partnerships and strengthen existing ones.”

With over 310 authors from five continents contributing, talks will range from pest control in sub-Saharan Africa to the UK transport network. The programme will feature speakers from NASA, CERN, ESA, the Japanese Space Agency (JAXA), Chinese meteorological office and Kenyan Agricultural and Livestock Research Organisation as well as British institutions.

One of the innovative UK projects being presented at the conference is Pest Risk Information Service (PRISE). It has been funded by the UK Space Agency International Partnership Programme (IPP), to develop a crop pest and disease risk forecasting system designed for smallholders and commercial producers in developing countries. Bringing together a broad range of stakeholders, including plant protection authorities, data experts, private sector companies, and the farmers themselves, PRISE uses state-of-the-art crop and pest modelling techniques to provide users with advanced warning of a damaging outbreak and appropriate advice on mitigation responses.
Global scientists come together to make better use of Earth Observation data

Beth Greenaway, Head of Earth Observations and Climate at the UK Space Agency, said: “We generate so much fantastic data now from cutting-edge Earth observation missions. It’s vital for the community who really know how to manage and preserve the data to talk with those who will be using it for applications we haven’t even thought of yet. This conference provides a space for key discussion at a time of rapid change in the Earth observation sector, with many smaller and cheaper missions evolving as well as users waking up to the potential.”

While the PRISE project is all about combining readily available data and making it accessible to the people who need it, the same challenges are being faced by the team behind the UK Data Analytics Facility for National Infrastructure (DAFNI). This new UK national facility will enable researchers and policy makers to understand and predict stresses and strains on UK infrastructure. As our society and environment changes so our infrastructure, whether from energy suppliers, water systems and transport routes must adapt. This project will enable smarter investment and better planning for extreme events for more resilient infrastructure. Scheduled to be operational in 2021, conference delegates will hear from STFC’s Scientific Computing Department about what it takes to design such a sophisticated system.

Other work presented demonstrated how machine learning and artificial intelligence (AI) can enhance the way scientists work. The BACI project has perfected machine learning to automate methods to detect changes to ecosystems using satellite data. It has used JASMIN, a supercomputer and data store for environmental science, managed jointly by STFC’s RAL Space and Scientific Computing Department in Harwell to process almost 20 years of Earth Observation data for use in biodiversity and land use studies. Growing quantities of data make this kind of AI system vital to our understanding of the planet.

John Remedios, Director of NCEO said “The PV2018 conference provides a window on a worldwide development of advanced computing, data-driven methods and space which is set to fuel a new information economy based around observing our planet.”
A number of eminent scientists from the STFC research community have been elected as Fellows of the Royal Society for their exceptional contributions to science.

Distinguished scientist Professor Sheila Rowan MBE FRS and Director of the Institute for Gravitational Research, University of Glasgow, who were part of the UK team instrumental in the detection of gravitational waves, has been elected as Fellow of the Royal Society for her exceptional contributions to science.

Professor Rowan, who is a member of STFC’s Council, contributed to one of the most significant breakthroughs of this century when the international LIGO collaboration made the first detection of gravitational waves, announced in February 2016 in the 100th anniversary year of the prediction by Albert Einstein. This discovery has opened up an entirely new field of physical science – that of ‘gravitational wave astronomy’ – enabling the study of black holes and other exotic phenomena far out in our Universe.

Other scientists honoured from within the STFC research community have included:

- Jim Al-Khalili OBE FRS, Professor of Physics and Professor of Public Engagement in Science, Department of Physics, University of Surrey
- Guy Wilkinson FRS, Professor of Physics, Department of Physics, University of Oxford, and
- Dr Fabiola Gianotti, Physicist, Director-General, CERN who has been honoured as a Foreign Member of the Royal Society.

In addition Lord Willetts FRS, Executive Chair of the Resolution Foundation, member of the Board of UK Research and Innovation and member of the House of Lords has been made an Honorary Fellow of the Royal Society.

Professor Rowan said: “I’m honoured to have been elected as a Fellow of the Royal Society. As a new Fellow, I know that I’ll be joining a group which counts some of history’s most accomplished and distinguished scientists amongst its ranks, and I’m pleased and proud that the current Fellows have chosen to add me to their number. The work that my colleagues and I at the University of Glasgow have done, in collaboration with our partners around the world, to establish the new field of gravitational wave astronomy has been a real labour of love, and it’s tremendous to see it recognised at this level. I’m very much looking forward to being formally admitted to the Royal Society in July, and I’m excited to continue working with my colleagues to unravel the secrets of the cosmos as the LIGO and Virgo detectors become ever-more sensitive to gravitational wave signals.”

Speaking of all of this year’s fellows, Sir Venki Ramakrishnan, President of the Royal Society, said: “Our Fellows are key to the Royal Society’s fundamental purpose of using science for the benefit of humanity. From Norwich to Melbourne to Ethiopia, this year’s newly elected Fellows and Foreign Members of the Royal Society are testament that science is a global endeavour and excellent ideas transcend borders.”

The Fellowship of the Royal Society is made up of the most eminent scientists, engineers and technologists from or living and working in the UK and the Commonwealth along with a number of other international institutions.
British astronomers working on the international space mission Gaia have contributed to a revolution in our understanding of the Milky Way with the release today of a new 3-D map of over one billion stars in our Galaxy. The Gaia data is a globally accessible resource that is available for anyone to study, not just professional astronomers.

Way and discovered that it was composed of a huge number of faint stars. Now four hundred years on everyone has an opportunity to study the Milky Way and the celestial bodies that it contains in detail thanks to the latest data release from the European Space Agency (ESA) Gaia mission.

Unlike other major space missions a very special aspect of the Gaia mission is that the teams involved do not keep the results for their own science interests. Instead the Gaia data is released with free access to everyone for analysis and discovery. This means that amateur astronomers from school age and up have as good an opportunity as anyone of finding new supernovae or to do real science with transients.

The detailed information that Gaia has collected in this latest census of over one billion stars allows their positions and distances to be mapped to unprecedented precision giving us a true 3-dimensional map of our Milky Way Galaxy.

This new release of information is showing us 600 times more stars than previously available, covering a volume 1000 times larger than Gaia’s own first data release two years ago, with precision some one hundred times improved. These results allow enhanced study of almost all branches of astronomy: from traces of the formation of the Solar System; through how stars evolve; through the current structure, the assembly and evolutionary history of the Milky Way; to mapping the distribution of Dark Matter in the Galaxy; to establishing the distance scale in the Universe; to discovery of rare objects.

This second data release allows progress in all these studies by providing not only distances and apparent motions across the sky for 1.3 billion sources, but also very precise measurements of brightness and colour for an even larger catalogue of 1.7 billion sources. Seven million stars have their line of sight velocities measured, providing full 6-dimensional – three space positions, 3 space motions – information, determining full orbits for those stars in the Milky Way. This is the information needed to weigh the Galaxy, and determine the distribution – and perhaps the properties – of Dark Matter, the mysterious substance which dominates the mass of the Galaxy and the Universe.

UK Science Minister Sam Gyimah said: “Projects such as GAIA, which is mapping over one billion stars and producing a 3D map of our Milky Way, demonstrate human endeavour and exploration at its best. The truly remarkable new project will help inspire people all over the world, from professional scientists to amateur star gazers, making it easier than ever before to navigate the sky above us. This project is further proof that the UK space sector, and the scientists who work in it, are truly world-leading, and through the government’s modern Industrial Strategy we are realising the opportunities available, helping to build a Britain fit for the future.”
The unique mission is reliant on the work of UK teams at the Universities of Cambridge, Edinburgh, Leicester, Bristol, the Mullard Space Science Laboratory (MSSL) at UCL London and the Science and Technology Facilities Council’s (STFC) RAL Space facility, all of whom are contributing to the processing of the vast amounts of data from Gaia, in collaboration with industrial and academic partners from across Europe.

“The combination of all these unprecedented measures provides the information for astronomers to take the next big steps in mapping the formation history and evolutions of stars and our Milky Way Galaxy. There is hardly a branch of astrophysics which will not be revolutionised by Gaia data. The global community will advance our understanding of what we see, where it came from, what it is made from, how it is changing. All this is made freely available to everyone, based on the dedicated efforts of hundreds of people. There are so many exciting things to do better with the exquisite Gaia data we anticipate new science papers appearing every day after this release.” said Professor Gerry Gilmore from the University of Cambridge, UK Principal Investigator for the UK participation in the Gaia Data Processing and Analysis Consortium, and one of the original proposers of the mission to ESA.

Professor Mark Cropper leads the team at Mullard Space Science Laboratory/UCL that made the UK contribution to the spectroscopic processing effort and said “We use Gaia to measure the Milky Way, star by star - where they were born, how they were generated, what their temperatures are and their radial velocity. It’s given us direct evidence of the rotation of our galaxy and opens the door to many more detailed studies on the way other disk galaxies evolve. So far, we’ve calculated the radial velocities of over 7 million stars from analysing nearly 20 billion separate spectra, which is a demanding but worthwhile process! These numbers are only set to increase – most likely up to 100 million stars – as we analyse more distant, fainter stars, and we eagerly anticipate what else Gaia uncovers.”

Dr Floor van Leeuwen from the University of Cambridge has been Project Manager for the UK and European photometric processing work, and is a leading co-author on the example science papers illustrating Gaia’s impact on our knowledge of star clusters and satellite galaxies in the outer Milky Way. Speaking of the new findings he said “Groups of dwarf galaxies, including the Magellanic Clouds, can now be observed to be moving around in very similar orbits, hinting at a shared formation history. The accurate observed motions and positions of the globular clusters and dwarf galaxies provide tracers of the overall mass distribution of our galaxy in a way that has not been possible with this level of accuracy before.”

Nearby stars brightness-colour relation Credit: DPAC/ESA
UK astronomers contribute to 3D map of a billion stars

STFC helped the set-up of the data applications centre for the project and STFC’s current support involves the UK exploitation of the scientific data that is now being yielded from the mission. In addition the photometric data processing software to which STFC contributed, as part of the UK-led team, offers the ability to precisely measure the brightness of the billion objects that GAIA is observing, while contributions from the rest of Europe are charting the positions, distances and movements of those one billion stars.

Professor Ian McCrea, Space Physics and Operations Division Head at STFC’s RAL Space said: “Four years into the Gaia mission and it is incredible to see that our work in the UK on developing the photometric data processing software, that precisely measures the brightness of the billion objects that GAIA is seeing, is now successfully giving us comprehensive and detailed information that helps us better understand our true place in the Milky Way, our home galaxy. With this new data release and those that will follow, I am excited to see what new celestial objects, such as extra-solar planets, brown dwarfs, supernovae, asteroids, and of course, things that we have not even imagined have now been recorded.”

UK participation in the mission itself has been funded by the UK Space Agency and scientists and engineers from around the UK played key roles in the design and build of Gaia.

The UK Space Agency has already contributed £15 million to Gaia and is committed to spending a further £4 million on processing and analysing the data. Dr Graham Turnock, Chief Executive of the UK Space Agency, said: “We’re working with industry and academia to support cutting-edge science that will lead to new discoveries about our Galaxy. The UK involvement in this exciting mission shows that our academics and engineers are world leaders in the space sector. As part of ESA we will continue to be at the forefront of research and deeply involved in missions such as ExoMars, with its Airbus-built rover, and the BepiColombo mission to Mercury.”

Gaia orbits the sun at a distance of 1.5 million kilometres from the earth and was launched by the European Space Agency in December 2013 with the aim of observing a billion stars and revolutionising our understanding of the Milky Way.

The all-sky map of median velocities of stars towards or away from the Sun. The large scale pattern caused by rotation of our Galaxy is evident.

Credit: DPAC/ESA
External Innovations and Innovations Club

The External Innovations team manages the activities that aim to realise the impacts and benefits that flow from STFC’s investments in science and technology towards commercialisation through one to one brokering, events and a range of funding schemes.

If you wish to contact the teams for more information please see the following contacts and email addresses.

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The Innovations Club newsletter contains a selection of articles drawn from our partner organisations that we think you will find interesting. We welcome your comments innovationsclub@stfc.ac.uk