Newton Fund

Newton Prize
2017

Foreword from the Minister

The UK takes pride in being a leading global player and collaborator in science, research and innovation. The pioneering ideas and innovation that come from our international partnerships are key to our economic growth and are at the heart of our modern Industrial Strategy.

That's why I created the annual £1 million Newton Prize – to celebrate the enduring partnerships and excellent research and innovation that have been developed through the Newton Fund.

The Newton Fund, launched in 2014, builds research and innovation partnerships with partner countries to support their economic development and social welfare. This benefits both nations; building partnerships and networks, and developing the science and the research base for the UK and our partner countries – so a win-win.

The impact of the research in this year's Newton Prize projects will change lives,

building capacity and addressing critical development challenges with innovative solutions. Projects are addressing challenges from sustainable food production to renewable energy; from disease prevention to transformational technology; from city planning to disaster management.

Through all of this work we are developing shared capacity and talent through researcher fellowships and mobility schemes with the UK's excellent universities.

I'd like to congratulate the researchers for their excellent work on the projects. The work demonstrates the importance of science and research collaborations working together with global partners to develop the solutions to the key global challenges.

Rt Hon Jo Johnson
UK Minister of State for Universities, Science, Research and Innovation

Department for
Business, Energy
& Industrial Strategy
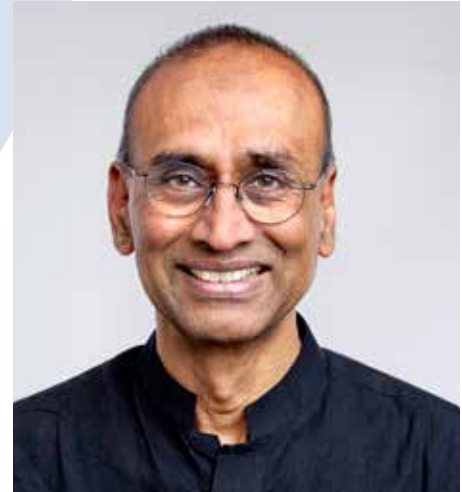
Foreword from the Newton Prize Committee Chair

It was with great pleasure that I agreed to be the Chair of the Newton Prize Committee, responsible for awarding the first ever Newton Prize.

I began my career as a scientist in India and it took me to the USA and now the UK. So I know all too well the importance of international collaboration. Innovative science often depends on working in partnership with fellow scientists across the globe: sharing knowledge and resources to enhance our understanding and make discoveries with the potential to change lives.

That's why I'm supporting the Newton Prize – not only because it recognises excellent science and research, but also because it helps the Newton Fund countries develop their science and innovation capacity for sustainable long-term economic growth.

There were over 150 applications, reflecting the breadth and depth of Newton Fund work. I would like to recognise the excellent work of the peer reviewers in narrowing this down to the 25 excellent shortlisted projects. Choosing the eventual winners was not an easy task and the wisdom of the independent Newton Prize Committee was essential in making sure the very best were selected. I'd like to thank my fellow committee members for their hard work and contributions to the 2017 Newton Prize.

Science is a global enterprise. The work done through these projects, and many others, demonstrates the UK's continued commitment to collaborating with overseas partners on cutting-edge research and innovation to help solve global challenges in diverse areas from energy and food security to healthcare.

Sir Venki Ramakrishnan, FRS
Newton Prize Committee Chair
President of the Royal Society

Introduction

The Newton Fund builds research and innovation partnerships with 18 partner countries to support economic development and social welfare, and research and innovation capacity for long-term sustainable growth.

It tackles global challenges such as sustainable food and water resources, natural hazards, atmospheric pollution, and resistance to antibiotics. These issues have a major impact on the lives of people across the globe.

The total budgeted UK investment for the Newton Fund is £735 million from 2014 to 2021, and partner countries provide matched resources within the Fund, making it a truly equitable partnership. It is managed by the UK Department for Business, Energy and Industrial Strategy (BEIS) and delivered through 15 UK delivery partners.

The Newton Prize

The Newton Prize is a £1 million fund which recognises and celebrates the exciting research and innovation the Newton Fund has funded since its launch in 2014. It aims to incentivise researchers to participate in the Newton Fund as partners with the UK, and to work to address some of the world's most pressing challenges. The concept for the Newton Prize has been developed to demonstrate how UK partnerships with Newton countries are solving key global challenges.

Each year, from 2017 until 2021, a minimum of five Newton funded projects, fellowships or other awards will be awarded the Newton Prize. Each Prize will be worth up to £200,000, and must be used to advance or develop existing Newton funded work. The Prize will be awarded for the best research or innovation that promotes economic development and social welfare.

In 2017, the Newton Prize is being awarded for projects, fellowships or other awards as part of the Newton partnerships with India, Malaysia, Thailand and Vietnam.

The partner countries

Newton-Bhabha Fund

The **Newton-Bhabha Fund** is named after the famous Indian scientist Homi Jehangir Bhabha who played an important part in the discovery of the quantum theory in the 1930s. The UK will contribute up to £104 million to Newton-Bhabha, which is match-funded by the Government of India. The priority areas identified are sustainable cities and urbanisation; Energy-food-water nexus; public health and wellbeing; and understanding oceans, with two underpinning capabilities – big data and advanced manufacturing.

Newton-Ungku Omar Fund

The **Newton-Ungku Omar Fund** was established as a partnership between the Malaysian and British government to promote science, technology and innovation collaborations between both countries. It plays a vital role in growing the capabilities and capacities of Malaysia's scientific community, allowing local researchers the opportunity to collaborate with research partners in the UK on projects that address global challenges. More than 250 collaborations have been initiated, which involves over 55 institutions and 50 industrial partners, supporting more than 300 researchers, and with approximately 500 participating students and teachers.

Newton Fund

The **UK-Thailand Research and Innovation Partnership Fund** is the first formal research and innovation partnership programme between the UK and Thai Governments. Both countries have agreed five priority areas of mutual interest: health and life sciences; agri-technology; future cities; environment and energy; and digital innovation and creativity. To date, there has been total of 18 Newton programmes which are divided into three categories: people, research and translation. The UK and Thailand will jointly invest at least £27 million from 2014 until 2021.

Newton Fund Viet Nam

The **Newton Fund Vietnam** is the first formal research and innovation partnership programme between the UK and Vietnamese Governments. Both countries have agreed the five priority areas of mutual interest as health and life sciences; agriculture; environmental resilience and energy security; future cities; and digital innovation and creativity. Over the last three and a half years, the fund has disbursed nearly £5 million and rolled out 35 calls over 15 schemes. This has resulted in 162 grants that benefit nearly 400 individuals, mostly researchers from 60 Vietnamese and 43 UK research organisations.

Case Studies

India

Malaysia

Thailand

Vietnam

India

Creating more efficient solar energy

The supply of clean, sustainable, and affordable energy is a key issue in India and across the world. There is a need for a low upfront cost, high-efficiency source of energy production to improve the quality of life in villages in India.

The Newton-Bhabha APEX-II programme is a flagship project in solar energy between India and the UK, building on the achievements of an early programme. It focuses on addressing the challenges of perovskite solar cells (PSC) which have proved successful in terms of efficiency and costs but have shown materials and device instability from ambient humidity and oxygen in the air.

The project has advanced the technology and led to patents. Cheaper and low upfront cost processing has attracted interest from manufacturing companies in India and abroad, which may wish to adopt PSC technology for manufacturing once it gains stability against ambient factors.

In addition, the project has built up strong partnerships between academic groups from the two countries, marked by several offshoot projects, high-quality, high-impact joint publications, patents and more than 50 exchange visits of early career researchers.

> **The impact of the project has been significant – it is providing a technology that will be environmentally friendly, cost effective, efficient, and stable for global need. The upfront cost of the manufacturing is much lower compared to other front-line technologies.**
>
> Professor Hari Upadhyaya

Advancing the Efficiency and the Production Potential of Excitonic Solar Cells (APEX)-II

Lead PI: by Professor Hari Upadhyaya of Brunel University in London - UK group made up of Brunel University, University of Oxford, University of Cambridge, University of Swansea, Imperial College London and University of Edinburgh

Lead PI: Professor Viresh Dutta of the Indian Institute of Technology in Delhi – India group made up of the Indian Institute of Technology in Delhi and Kanpur, Indian Institute of Science in Bangalore, National Physical Laboratory in Delhi, Jawaharlal Nehru Centre for Advanced Scientific Research in Bangalore, Indian Institutes of Science Education and Research Pune and Indian Institute of Chemical Technology in Hyderabad

Project partners

Engineering and Physical Sciences Research Council

Department for Science and Technology, India

Cutting fertiliser use in rice production

Efforts over the last 50 years to boost food production have relied on increasing the yield of dwarf varieties of rice and wheat, using large quantities of chemical fertiliser in areas with poor soil. Increased fertiliser use means increased cost to farmers and fertiliser run-off brings water pollution issues. India accounts for almost half of the global imports for phosphorus fertilisers.

This Newton-Bhabha project looked at the way root systems in rice acquire water and nutrients. Researchers discovered the key genes that control the rice root traits that improve the plant's ability to forage for phosphate in low nutrient soils. This is providing innovative new tools to advance the performance of rice varieties and minimise the use of phosphate fertilisers for rice production.

The development of new rice varieties able to grow efficiently in low nutrient soils promises to have major economic impact by supporting the sustainable intensification of agriculture and reducing environmental pollution.

Photo from © iStock

> **Our Indian-UK project will generate novel rice genotypes able to grow on low nutrient soils and minimise phosphate fertilizer imports, use and environmental pollution.**
>
> Dr Jitender Giri
> Professor Malcolm Bennett

To Engineer Elite Rice Genotypes Which Can Sustain Under Low Phosphate Conditions in Soils Without Compromising Yield

Lead PI: Professor Malcolm Bennett, Future Food Beacon at the University of Nottingham, UK

Lead PI: Dr Jitender Giri, National Institute for Plant Genome Research in New Delhi, India

Project partners

British Council

Department for Biotechnology, India

Urban observatories for better city planning

With more than 31% of the urban population deployed in 7,935 cities and towns, among which nine cities account for over 23% of the country's urban population, India is poised for unprecedented growth. New approaches to using data need to be found to drive the way cities are planned, built, and operated.

This Newton-Bhabha funded project team used an urban observatory approach to develop future thinking to increase the

Photo provided by the project

sustainability of Indian cities. Workshops were held in seven cities, which were awarded Smart City status by the Indian government to explore the diverse issues they were facing, such as traffic congestion, affordable housing, recycling of wastes, access to services, and crime.

The team identified that data was not openly shared, and the voices of residents, NGOs, students, academics, businesses and public servants were not generally included in the urban planning process, especially those in lower income groups. Including them in the planning process resulted in dynamic multi-disciplinary conversations which lead to improved framing of cities' needs and opportunities.

Using the concept of city-level urban observatories is helping several municipal authorities to reframe their approach to Smart City information gathering to inform better decision making

> " **Urban observatories offer real-time information on the dynamics of urban life, enabling citizens of the smartest cities, including the poor, to inform inclusive city-level decision-making.**
>
> Professor Michele Clarke

SMArt CitIES Network for Sustainable Urban Futures (SMARTIES Net)

Lead PI: Professor Michele Clarke, University of Nottingham, UK

Lead PI: Dr Ajith Kaliyath, National Institute of Urban Affairs, India

Project partners

Economic and Social Research Council

National Institute of Urban Affairs, India

Using graphene-based hybrid materials to tackle water pollution

Waste water has various pollutants made up of organic and inorganic compounds. Organic compounds need to be removed from water bodies due to their higher carcinogenic and mutagenic characteristics, which have health impacts on people.

The Newton-Bhabha Fund supported PhD student Parameshwari Ramalingam to carry out a six-month research internship with the Electrochemical and Nanotechnology Research Group at Manchester Metropolitan University in the UK.

Parameshwari investigated the photocatalytic and electrochemical properties of graphene-zinc oxide nanocomposites, and their dual role as photocatalyst to degrade organic pollutants using visible light and anti-microbial agents against bacterial pathogens that possibly available in waste water. She used graphene oxide and graphene-palladium nanoparticles in the detection of environmentally hazardous pollutants using electrochemical and surface enhanced Raman spectroscopic sensing techniques respectively.

This work will impact on the waste water management process where one can easily harvest both organic pollutant degradation and antimicrobial activity against bacteria or other microbial systems which spread a number of diseases in humans.

Photo from © iStock

> 66 **Synergistic electron adaption in graphene hybrids paves the horizon for photo-electrochemical waste water purification and sensing of toxics.**
>
> Parameshwari Ramalingam

Investigations on Photocatalytic and Electrochemical Properties of Graphene Based Hybrids

Lead PI: Parameshwari Ramalingam, PhD student at Bharathidasan University in Tamil Nadu, India.

Lead PI: Professor Craig E Banks, Electrochemical and Nanotechnology Research Group at the Manchester Metropolitan University, UK

Project partners

British Council

Department of Science and Technology, India

Improving rotavirus vaccinations to reduce infant deaths

Rotavirus vaccines (RV) taken by mouth have the potential to prevent severe diarrhoea and greatly reduce infant deaths, but they work less well in countries where they are needed most. In Sub-Saharan Africa and South Asia vaccine efficacy is 43-66%.

This collaborative project has built a partnership with the College of Medicine at the University of Malawi and established birth cohorts in three countries – Malawi

Photo provided by the project

and India where RV efficacy is poor in infant populations, and the UK where vaccine efficacy is high. Infants are followed from birth up to 16 weeks of age. Stool, blood and breast milk samples are collected to investigate maternal antibody transfer, and infant stool samples are used to investigate the role of the gut bacteria (the microbiota), early exposure to natural rotavirus infections, and co-administration of other oral vaccines (poliovirus: OPV) on the ability to develop immune protection after RV vaccination.

The results of this research have the potential to influence vaccine implementation policy, and lead to tailored approaches to immunisation to improve the health of different populations and vulnerable people. To address the need for qualified people to take this work forward, the team is developing the capacity of clinician scientists in Malawi and India in vaccinology, microbiome studies and bio-informatics through workshops and mentoring programmes.

> **Understanding key factors that impair rotavirus vaccine performance among the most vulnerable children will allow us to improve them and reduce health inequities across populations.**
>
> Professor Miren Iturriza-Gómara

Impact of Maternally Derived Antibodies and Infant Microbiota on the Immunogenicity of Rotavirus Vaccines in African, Indian and European Infants

Lead PI: Professor Miren Iturriza-Gómara, Institute of Infection and Global Health at the University of Liverpool, UK

Lead PI: Professor Gagandeep Kang, Wellcome Trust Research Laboratory at the Christian Medical College in Vellore, India

Project partners

Medical Research Council

Department for Biotechnology, India

Two Centuries of Indian Print

The British Library holds extensive collections of South Asian early printed material in the many languages of the subcontinent. In order to make these collections more accessible to researchers and the general public in India and around the world, the British Library is undertaking a major project to catalogue and digitise all its South Asian language printed books published before 1914.

The Newton-Bhabha Fund has supported the pilot phase of this project, focusing on early printed Bengali books as many are unavailable in other library collections or are extremely difficult to locate and access. The British Library team is cataloguing 3000 Bengali titles and using cataloguing metadata and digital images of the books to undertake new research using digital humanities tools and techniques. The project is also providing a programme of digital skills sharing and capacity building workshops for library professionals and archivists from cultural heritage institutions in India.

By digitising these collections to make them openly available and communicating their significance through public outreach, this project is contributing to the world's knowledge base, and enhancing standards for cataloguing, metadata and imaging in the digital research community in the UK and India.

Photo provided by the project

The eight ages of the Goddess Durga.
British Library 279.42.b.59, Debijuddha Namak Grantha, 1852, Kolkata, India

> **This collection will fundamentally alter the landscape of research.**
>
> Professor Abhijit Gupta

Two Centuries of Indian Print

Lead PI: Dr Nur Sobers-Khan, British Library, UK

Co-investigators: Professor Abhijit Gupta, Jadavapur University and Dr Padmini Ray Murray, Sristhti Institute of Art, Design and Technology

Project partners

Arts and Humanities Research Council

Jadavapur University and Sristhti Institute of Art, Design and Technology, India

Smart materials treating eye infections

Eye infections are a common cause of blindness. Treatment can be difficult where there are no laboratories to identify the pathogens, and due to growing antibiotic resistance.

The Newton-Bhabha funded UK-India Centre for Advanced Technology Minimising Anti-Microbial Resistance, is developing novel systems that can be built into diagnostic contact lenses for the detection of infection in the eye, and a particulate delivery system that can administer the antibiotics needed by patients.

The core of the project is developing polymers that respond to bacteria by binding and then losing water, leading to significant changes in the properties of the polymers, which further enhances binding. The polymer bound bacteria will then be detected by a simple colorimetric test. The team is also exploring strategies to tackle antibiotic resistance, such as interfering with bacterial signalling molecules which slows multiplication and disrupts colonisation.

The work of the centre in developing new smart material solutions that prevent the excessive and inappropriate use of antibiotics in one area of healthcare, will also find applications in the treatment of other infectious diseases.

Photo from © iStock

> **Our work brings together aspects of unique polymer science in both synthesis and behaviour to tackle both detection of bacteria and targeted delivery of antibiotics. The project could only succeed by close working in a multi-disciplinary team including polymer science, clinical ophthalmology, microbiology and pharmacology.**
>
> Dr Prashant Garg

UK-India Centre for Advanced Technology Minimising Anti-Microbial Resistance

Lead PIs: Professor Stephen Rimmer at University of Bradford

Lead PIs: Dr Prashant Garg, L V Prasad Eye Institute, Hyderabad and Dr Venkata Vamsi Krishna Venuganti PhD, Birla Institute of Technology and Science, Hyderabad

Project partners

Medical Research Council

Department of Biotechnology, India

Better monitoring of maternal health will help save lives

Obstetric haemorrhage, pre-eclampsia and sepsis account for more than 50% of maternal deaths worldwide. Early detection and effective management of these conditions relies on vital signs monitoring, including pulse and blood pressure.

This Newton-Bhabha funded project is testing the introduction of a new vital sign device into routine maternity care at community and hospital level in 10 sites in India, Ethiopia, Zimbabwe, Zambia, Uganda, Sierra Leone, Malawi and Haiti. Developed at KCL in London, the CRADLE Vital Signs Alert (VSA) is a hand-held semi-automated device which measures blood pressure and pulse, detecting hypertension and circulatory shock with an early warning system. It is affordable, easy-to-use, and portable with low power requirements.

Through the project, the CRADLE VSA has now been implemented in all 10 sites. More than 3,300 devices have been delivered to hospitals and clinics, and successfully incorporated into routine care, sometimes as the first blood pressure device available in the clinic. A simple

Photo provided by the project

training package has been developed and more than 1,500 health care workers have been trained to use the device. Results show that the VSA traffic light system strongly predicts the risks of complications and its introduction into maternity care will help save lives.

> **To be able to impact on care in those parts of the world where it is desperately needed has been our most fulfilling research experience.**
>
> Professor Andrew Shennan

Evaluation of the Introduction of a Novel Device in the Management of Hypertension and Shock in Pregnancy in Low Resource Settings

Lead PI: Professor Andrew Shennan, KCL Women's Health Academic Centre at St Thomas' Hospital in London, UK

Lead PI: Professor Shivaprasad Goudar, Women's and Children's Health Research Unit at Jawaharlal Nehru Medical College in Belgaum, India

Project partners

Medical Research Council

Department for Biotechnology, India

Developing Smart Manufacturing

The Indian Government has set an ambitious target of increasing the contribution of manufacturing output to 25% of GDP by 2025 and providing employment to 100 million people in the manufacturing sector.

Smart manufacturing is the next global revolution in manufacturing, underpinned by self-aware machines that communicate with each other and make decisions to improve system performance. But there are significant challenges in upgrading existing manufacturing equipment with intelligence capabilities and in building a skilled workforce to operate in an increasingly digital environment.

This Newton-Bhabha funded project has developed a 'cyber twin' approach to provide legacy equipment with intelligence. A cyber twin is a digital representation of a piece of manufacturing equipment, and is able to replicate the equipment's behaviour and make decisions on its behalf through embedded data analytics and optimisation algorithms. The approach used in the

project makes it convenient to capture data through a manual but standard and user-friendly interface, making it viable for legacy machines. In addition, data can also be collected through externally mounted sensors, embedded sensors, and/or the machine controllers.

This new approach has been developed and tested in collaboration with Indian manufacturing companies, providing research opportunities for 30 undergraduate and postgraduate students from around India. These smart manufacturing technologies will see benefits to manufacturing industry in both India and the UK, particularly small and medium enterprises embarking on their journey towards Digital Manufacturing.

> " There has been tremendous advancement in the area of digital manufacturing. However, small and medium enterprises have been slow in adopting digital technologies primarily due to low level of advanced automation and the legacy nature of their equipment. This project takes a radically new approach to low-cost digitisation that will enable those companies to ensure they get on to the journey towards digital manufacturing and improve their competitiveness and productivity.
>
> Dr Ajith Parlikad

Building Capacity in Collaborative Research for Advanced Manufacturing

Lead PI: Dr Ajith Parlikad, Institute for Manufacturing at the University of Cambridge

Lead PI: Dr Bhupesh Lad, Indian Institute of Technology Indore in Madhya Pradesh, India

Project partner

Royal Academy of Engineering

Federation of Indian Chambers of Commerce and Industry

Reducing exposure to second-hand smoke for mothers and babies

In India and Bangladesh nearly 50% of women are exposed to second-hand smoke at home. For pregnant women, this exposure is linked to adverse health outcomes such as low birth weight in babies, still birth and sudden infant death syndrome. There is a lack of research on effective and scaleable interventions.

The Newton-Bhabha project team reviewed published information on the issue and interviewed pregnant women, their husbands and family members in rural Comilla in Bangladesh, and urban and semi urban Bangalore in India. They found poor family knowledge of the risks of second-hand smoke and difficulties expressed by women in changing smoking behaviour in the home.

Working with medical experts, psychologists, and behaviour change specialists, the team developed a number of products to support affected pregnant women and educate their families. They produced a picture booklet with information to help the family move towards a smoke-free home, and a letter from the unborn child about the effects of exposure to second-hand smoke. Automated telephone messages to the husband reinforced the key messages. A saliva screening test was introduced for pregnant women to use to show their families their level of exposure to second-hand smoke.

A key outcome was a reduction in cotinine levels in maternal saliva after three months of intervention. The results of this pilot trial, Intervention for Mothers during Pregnancy to Reduce Exposure to Second-hand Smoke (IMPRESS), also indicates that in this small group of women there has been a significant change in the household smoking behaviour of husbands and family members which should improve outcomes for mothers and babies. There has also been valuable learning on the feasibility and acceptability of the tailored interventions that were offered which will be helpful in scaling up the intervention in South Asian countries.

> **The World Health Organization identifies maternal exposure to second hand tobacco smoke as a major unaddressed public health problem. The intervention developed through our collaborative research holds great promise to address this concern.**
>
> Professor Atif Rahman

A Multicomponent Intervention to Reduce Home Exposure to Second Hand Smoke During Pregnancy and Postnatal Period – A Randomised Control Trial

Lead PI: Professor Atif Rahman, Institute of Psychology at the University of Liverpool, UK

Lead PI: Professor Prabha Chandra, National Institute of Mental Health and Neurosciences in Bangalore, India

Project partners

Medical Research Council

Department for Biotechnology, India

Malaysia

New sensors to predict occurrence of landslides

A key issue facing Malaysia is sudden and unexpected landslides following heavy rain causing loss of homes, crops, and infrastructure. This particularly impacts low-income and disadvantaged families.

The Newton-Ungku Omar Fund supported two highly experienced research groups from the UK to work closely with the leading research group in Malaysia to develop novel optical fibre-based pressure, rain and humidity sensors to detect the key factors to identify landslide movement. Together, they created a lightweight, packaged suite of new sensors with low battery power consumption, robust enough for use in the demanding Malaysian environment.

These sensors enable remote monitoring of the increasingly heavy monsoon rains that are a precursor to landslide disasters, providing predictions about areas at risk to inform the decisions of policy makers. The project also organised capacity building workshops for participants from academia and industry from all over Malaysia, supporting SMEs to work in this field.

> **We have developed novel optical rain and pressure sensors to monitor prolonged rainfall and pore-pressure development in rain-soaked soils, providing early landslide and ground movement warning.**
>
> Professor Azizur Rahman

Ubiquitous Optical Sensors for Environmental Monitoring Impacting Climate Change

Lead PI: Professor Azizur Rahman, City University of London, UK

Lead PI: Professor Harith Ahmad, Photonics Research Centre at the University of Malaya, Malaysia

Project partners

British Council

Malaysian Industry-Government Group for High Technology

Photo provided by the project

Sustainable energy from effluent waste processing

Palm oil production is a major contributor to the Malaysian economy but this industry is also a large source of highly polluting waste effluents. Work to develop a sustainable bioremediation method has connected up with interest in biofuel production to boost the supply of energy to urban and rural areas in Malaysia.

The Newton-Ungku Omar Fund project aimed to tackle the challenge of generating electricity and biofuel from effluent waste. The team developed an integrated approach to renewable energy, algal biomass technologies and sustainable bioremediation of waste waters. This involved selecting photosynthetically efficient tropical algae suitable for use in fuel cells and the development of a photobioreactor prototype Integrated Microbial Fuel Cell.

The project represents a blueprint for a platform that aims to meet the demands for sustainable energy and cleaner waste water in rural areas such as Sabah and Sarawak.

Photo provided by the project

> **Our success exemplifies the evolution of mentorship into equal partnership in the development of an innovative environmental-friendly Algal Biophotovoltaic Device that integrates bioelectricity generation with bioremediation.**
>
> Professor Siew Moi Phang

Integrating Algal Biophotovoltaics for Bioelectricity Production with Agro-industrial Wastewater Remediation using Tropical Algae

Lead PI: Dr Adrian Fisher, Department of Chemical Engineering and Biotechnology at the University of Cambridge, UK

Lead PI: Professor Siew Moi Phang, Institute of Ocean and Earth Sciences at the University of Malaya, Malaysia

Project partners

British Council

Malaysian Industry-Government Group for High Technology

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Improving infectious disease surveillance and vaccination policies

Many vaccines for infectious diseases only target a limited number of bacterial strains, allowing new strains to emerge that may be more pathogenic, antibiotic resistant and increase the risk of epidemics. Climate change in Malaysia due to industrial air pollution along with changes in seasonal monsoon patterns is likely to increase the prevalence of infectious diseases, particularly of the respiratory tract.

Photo provided by the project

The project team has developed an infectious disease research network which implemented a multi-centre respiratory tract carriage study, analysing samples from different urban and rural sites in both Peninsular and East Malaysia. Basic demographic data and information on vaccine history, recent illness and antibiotic usage was also gathered from participants, who included people from indigenous communities. The work has gained data on the potential emergence of microbial strains, the epidemiology of vaccine preventable infections and the prevalence of antibiotic resistance.

This network aims to improve health by improving infectious disease surveillance of respirator pathogens and influencing vaccine policy in Malaysia. Workshops have been held for Malaysian academics and healthcare practitioners to build their skills in cutting edge microbiology techniques, genomics-based technologies and bioinformatics.

> **Our studies will look at the burden of infectious diseases in relation to urbanisation and climate change, to see how these threats are interlinked in Malaysia with the aim of informing vaccine policy.**
>
> Dr Stuart Clarke

Assessing the Risk of Emerging Microbes During Vaccine Implementation and Climate Change through Population Based Carriage Studies of the Upper Respiratory Tract in All Age Groups.

Lead PI: Dr Stuart Clarke, Faculty of Medicine at the University of Southampton, UK

Lead PI: Professor Dr Norazmi Mohd Nor, Universiti Sains Malaysia

Collaborators: International Medical University Malaysia, Universiti Malaysia Sarawak, Universiti Sultan Zainal Abidin, Universiti of Malaya and Universiti Tunku Abdul Rahman

Funding partners

British Council

Malaysian Industry-Government Group for High Technology

Cross-sectoral systems approaches for healthier cities

Cities are now the dominant human habitat, housing 54% of the world's population and 75% of Malaysians. Yet despite economic and technological progress, intractable urban health problems persist, particularly for disadvantaged groups. These problems often originate in decisions made in non-health sectors such as housing or transportation. Identifying linkages between health and physical, social and ecological environments can lead to better understanding of cross-sectoral impacts and thus healthier, greener, more equitable cities.

The SCHEMA project – which features expertise in systems and place-based methods, urban planning and public health – has examined the interlinked systems that impact urban health in Malaysia. A series of workshops were held to bridge disciplines and sectors, focusing on green infrastructure and food systems in relation to urban health. In addition to developing participants' skills in systems- and place-based methods, these workshops have nurtured transdisciplinary networks of policy makers, practitioners, academics, community leaders and civil society representatives around urban health and sustainability challenges. Participants have generated a diversity of new initiatives focused on issues such as river restoration, walkability, food systems, and indigenous knowledge.

The SCHEMA team continues to engage with workshop participants and build local and international transdisciplinary communities of practice to tackle serious challenges to urban health and sustainability in Malaysian cities.

Photo from © iStock

> **This project innovatively joins cross-national expertise linking systems and place-based approaches, so as to catalyse and inform decision-making for progressing urban health and SDGs, while developing local research and professional capacity.**
>
> Professor Terry Marsden

Systems Thinking and Place Based Methods for Healthier Malaysian Cities (SCHEMA)

Lead PI: Professor Terry Marsden, Sustainable Places Research Institute at Cardiff University, UK

Lead PI: Dr Jose Siri, United Nations University International Institute for Global Health, Malaysia

Project partners

British Council

Malaysian Industry-Government Group for High Technology

Development of more secure wireless medical devices

The development of effective, affordable wireless medical devices is expected to reduce inefficiencies in health care delivery, improve patient access, lower costs and increase quality of care. Wireless communication is playing a vital role in real time monitoring, but is a potentially easy target for hackers, with life threatening consequences. Security is a primary design constraint for these devices.

This Newton-Ungku Omar Fund project has developed a simulator which provides accurate reliability and variability information for the circuits with arbitrary workload. By incorporating into commercial electronic design automation flow, the simulator will not only transform the design and verification for more reliable systems, but it can also help develop more secure medical devices for patients in Malaysia and across the world in the future.

The research has been shared with Malaysian companies including Infineon, Silterra, and the Malaysian National R&D Centre, and training events held for students and young circuit designers.

Photo from © iStock

> **It is a privilege to work alongside Malaysian researchers in providing vital tools for future security-enabled circuit design, shedding impact in the era of IoT healthcare.**
>
> Dr Zhigang Ji

Development of Accurate Circuit Reliability Simulator for Malaysia's Electronics Industry

Lead PI: Dr Zhigang Ji, Liverpool John Moores University, UK

Lead PI: Dr Sharifah Fatmadiana Bt Wan Muhammad Hatta, University of Malaya in Kuala Lumpur, Malaysia

Project partners

Royal Academy of Engineering

Academy of Sciences Malaysia

Thailand

International network for shrimp health

Shrimp farming is a major economic activity in Asia, generating millions of jobs and supporting rural communities. Periodic and unpredictable massive production drops occur in shrimp due to disease, resulting in severe economic losses – early mortality syndrome in Thailand led to a production drop from 610,000 metric tons in 2010 to less than 200,000 in 2014. Efforts towards disease control are relatively fragmented or poorly developed.

This Newton Fund project built on a previous Researcher Links workshop to establish a UK-Thai network in shrimp health focused on knowledge exchange and capacity building, and challenging disease control in aquaculture. New paradigms were co-designed with the driving principle being the need for joint responsibility in securing the global aquatic food chain between producer nations such as Thailand, and consumer nations. The project is applying cutting edge technologies for 'point of need' diagnostics, smartphone reporting systems for field data and developing disruptive technologies for reporting disease from the 'pond side'.

The team has carried out collaborative research on priority shrimp disease issues and pathogens, trialing a novel portable pond-side diagnostic device (Genedrive™), and working with farmers and government to test this new paradigm in disease management.

Photo provided by the project

> 66 **Decentralising diagnostics for use by the farmer at 'pond side' will revolutionise the fight against disease in global aquaculture. Reporting that data via smartphone apps will minimise onward spread and contribute to greater food security from this sector.**
>
> Professor Grant D Stentiford

International Network for Shrimp Health (INSH)

Lead PI: Professor Grant Stentiford, Centre for Environment, Fisheries and Aquaculture Science (Cefas) in Weymouth, UK

Lead PI: Dr Kallaya Sritunyalucksana, Shrimp-pathogen interaction (SPI) Laboratory, National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency, Pathum Thani, Thailand

Project partners

British Council

Thailand Research Fund

Climate ready rice

Changing climatic conditions such as drought and heat stress are a major threat to rice crops, incomes and food security in South East Asia. Stomata on the surface of leaves allow gas exchange between plants and the atmosphere, and regulate water loss and temperature.

This Newton Fund collaboration aims to identify and create rice cultivars with altered requirements for water or with enhanced heat tolerance that are suitable as crops for Thailand. It is part of the Newton Fund UK-China-Philippines-Thailand-Vietnam collaborative research programme. They are screening thousands of Thai rice cultivars and mutants to identify plants with altered number or size of stomata that could be grown in drier or hotter areas. Other screenings will aid Thailand in developing new rice varieties with additional traits such as enhanced nutrition and low glycaemic index.

The researchers have built links to internationally regarded rice researchers in the Philippines and China, filed a patent in the area, and provided employment and training for Thai workers and information for farmers. The Kasetsart research group holds workshops for local farmers about developments in rice breeding, and to help identify priority targets for crop improvement.
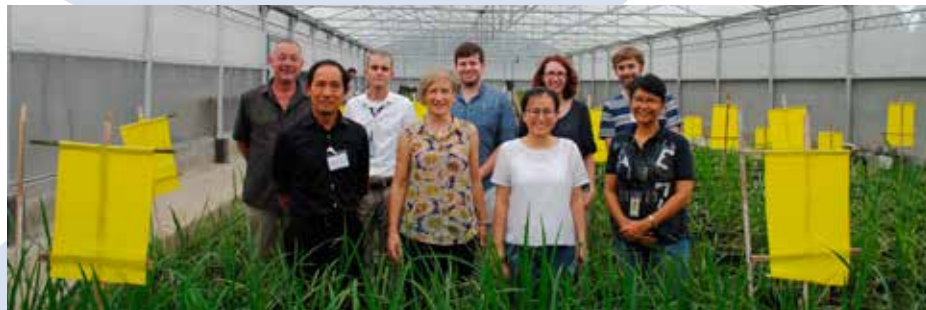

Photo provided by the project

> **My researchers are delighted to be working alongside Thai scientists to improve rice drought tolerance and enhance food security. We have already learnt so much from working together.**
>
> Professor Julie Gray

Climate Ready Rice – Optimising Transpiration to Protect Rice Yields under Abiotic Stresses

Lead PI: Professor Julie Gray, Department of Molecular Biology and Biotechnology at the University of Sheffield, UK

Lead PI: Dr Apichart Vanavichit, Rice Gene Discovery Unit at Kasetsart University, Bangkok, Thailand

Lead PI: Professor W. Paul Quick, International Rice Research Institute, Philippines

Project partners

Biotechnology and Biological Sciences Research Council

National Science and Technology Development Agency, Thailand

Understanding the early stages of scrub typhus

Orientia tsutsugamushi is a bacterium that causes the life threatening human disease scrub typhus. Endemic in Thailand and throughout much of Asia, this mite-borne infection is neglected in both epidemiological recognition and in the understanding of its fundamental biology. While it is treatable, late and incorrect diagnosis can result in serious complications and death. It causes between 5% and 25% of fever cases reaching hospital in rural areas, which have a mortality rate of around 4%.

Recognising the need for research into the basic biology of the pathogen, this Newton Fund project has supported research into the early stages of cellular invasion by the bacterium. The team brought together expertise in bacterial cell biology and biochemistry, clinical aspects of scrub typhus, and high throughput screening approaches to develop a robust and reproducible high throughput genome wide RNAi imaging screen. This approach has never been reported for *Orientia tsutsugamushi* or for any other ricksettial

bacteria and involves techniques new to the Thai and UK partners.

The research has already had a direct impact on scrub typhus clinical work with new methods for bacterial propagation from clinical samples being adopted with improved results on isolation rates from infected patients. The team also focused on raising public awareness of scrub typhus as delayed diagnosis is strongly associated with morbidity and mortality.

Bacterial Pathogenesis: Dissecting the Early Stages of Cellular Invasion by the Obligate Intracellular Bacterium Orientia Tsutsugamushi

Lead PI: Dr Jeanne Salje and Professor Nicholas Day, Centre for Tropical Medicine and Global Health, University of Oxford, UK

Lead PI: Dr Somponnat Sampattavanich, Department of Pharmacology at Mahidol University in Bangkok, Thailand

Project partners

Medical Research Council

National Science and Technology Development Agency

> **Because of the Newton Fund we now have a completely new collaboration with highly accomplished Thai scientists at the Siriraj Initiative in Systems Pharmacology, one in which both partners contribute equally to a scientifically exciting project on scrub typhus – an understudied but important disease in Thailand.**
>
> Professor Nick Day

> **The Newton Fund makes possible this exciting collaborative research work. Our work will not only help improve the understanding and the treatment of Orientia but will also create new breeds of young scientists who are equipped to apply quantitative biology in solving real-life problems in Southeast Asia.**
>
> Dr Somponnat Sampattavanich

Improving diagnosis of rare genetic diseases in children

As much as 8% of the Thai population is affected by rare genetic diseases. Patients with rare diseases typically endure around seven years of investigation. Timely diagnosis can mean improved healthcare and better life outcomes, as well as savings in the health system.

Using the recognised expertise of the UCL Great Ormond Street Institute of Child Health, this Newton Fund project supported Chulalongkorn Paediatrics to develop their own genomics platform and supporting analytics and infrastructure.

This has translated into patient benefit by solving around 100 undiagnosed cases through the sequencing, analysis and diagnosis of children with debilitating disorders.

As well as supporting the patients and their parents and informing treatments, the collaboration has also enabled genetic counselling and prenatal diagnoses for families at risk. Improved diagnoses and clinical management will drive significant savings across the Thai health system.

> **This unique funding opportunity has made a huge difference to dozens of Thai families who have been searching for causes of their child's illness for several years. Furthermore, it has catapulted genetics services in Bangkok to serve thousands more children and their families.**
>
> Professor Philip Beales

Molecular Pathology of Rare Genetic Diseases in Children

Lead PI: Professor Philip Beales, UCL Great Ormond Street Institute of Child Health, London, UK

Lead PI: Professor Vorasuk Shotelersuk, Centre of Excellence for Medical Genetics at Chulalongkorn University, Thailand

Project partners

British Council

Office of the Higher Education Commission

Photo provided by the project

Tackling infectious diseases with genome technology

With its tropical climate, South East Asia is at risk of emerging infectious diseases. As with many regions, inadequate governance around drug usage for infectious disease control contributes to the development of drug resistant pathogens. Genomic technology is a new field of research that presents a real opportunity for effective infectious disease control in Thailand, but there is a critical shortage of people with the skills required to deploy the technology.

The Newton Fund supported a three-day genomics workshop and a two-day symposium focused on equipping more than 100 researchers with knowledge about genomics technology in the surveillance, management and control of infectious diseases, as well as practical skills to implement the technology locally. Infectious disease researchers and public health officials were able to network with genomics experts from the UK and Singapore who are using cutting-edge sequencing technology in their research and in clinical practice.

Several research collaborations resulted from the workshop including ones addressing dengue, malaria, tuberculosis and Zika, and a health economics evaluation of new diagnostic techniques for clinical care. These are now progressing towards funding that would offer the genomic analysis inspired control mechanisms that could have a big impact in Thailand.

> **66 Newton funding was used to expose Thai public health researchers and experts to cutting-edge genome technologies that are revolutionising healthcare and disease control, and follow-up work is seeking to implement this in a clinical setting to assist patient management.**
>
> Professor Taane Clark

Genomic Epidemiology in Infectious Diseases – Pathogen Genomics Capacity Building Workshop

Lead PI: Professor Taane Clark, London School of Hygiene & Tropical Medicine, UK

Lead PI: Dr Prapat Suriyaphol, Mahidol University, Thailand

Project partners

British Council

Thailand Research Fund

Vietnam

3D printing of metamaterials

With one of the fastest growing economies in the world, Vietnam faces challenges with unbalanced development of the regional economy and public services, pollution and lack of high value industries. New high performing metamaterials have the potential to transform telecom infrastructures and services, optical computing, solar energy and medical devices, but usage is limited by the manufacturing challenges involved.

The Newton Fund project built the first super-resolution metamaterial 3D printing system in the world, and designed and fabricated multiple shaped metamaterials characterised for multiple applications using this novel technology.

The collaboration enables 3D metamaterials to be directly printed from 3D CAD models with higher design freedom and lower cost compared to conventional photolithography methods. Impacts of this work can be found in the Vietnamese telecommunications and photonics industries, as well as in the energy, environment and health sectors.
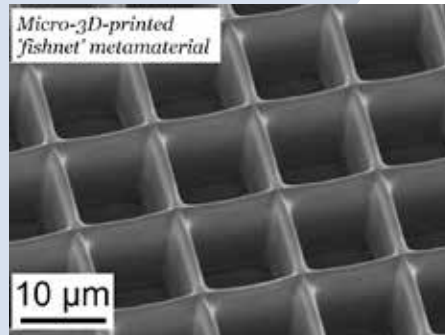

Micro-3D-printed 'fishnet' metamaterial

10 µm

Photo provided by the project

> " The 3D printer is able to fabricate the metamaterial – an artificial electromagnetic media structured as tiny unit cells in micro/nano scale. This 3D printing platform is a practical and meaningful research tool for the fundamental nanotechnology research in the developing countries. It can print small objects but generate huge impact.
>
> Dr Liyang Yue

3D Printing of Functional Photonic and Teraherz Metamaterials

Lead PI: Dr Liyang Yue, School of Electronic Engineering at Bangor University, UK

Lead PI: Dr Nguyen Trung Hieu, Institute of Materials Science, Vietnam Academy of Science and Technology in Hanoi, Vietnam

Project partners

Royal Academy of Engineering

Vietnam Academy of Science and Technology

Locally driven flood management systems

The Mekong delta is Vietnam's key rice production area and has a complex system of dykes, sluices and canals designed to reap the benefits of floods while mitigating the damage to life, property and food production. However, upstream hydropower dams, a rise in sea level and changing rainfall patterns have led to uncertainty in how to manage the Mekong's rapidly changing flow and how to design effective flood management policies.

There is an increasing need for policy makers to formulate inclusive flood management policies and strategies that work for a diverse range of stakeholders. In collaboration with the United Nations Development Programme (UNDP) Vietnam, the Ministry of Agriculture and Rural Development, and the Ministry's think tank and training institute IMARD, this project engaged with policy-makers and communities to provide decision support in flood mitigation. The team set up a Stakeholder Competency Group with representatives of the North Vam Nao Project Management Office, the An Giang

Photo provided by the project

Provincial Department of Water Resources and farmers, creating a platform for project co-design and knowledge sharing.

Interdisciplinary training and awareness workshops were held for stakeholders from policy, practice and research in flood management, local knowledge systems, watershed governance and ongoing policy reform in disaster and flood management. Approaches developed by the project, and the issues it has identified, are reshaping approaches to disaster management policies, practices and research in Vietnam and the wider Mekong region.

> " **Responding to floods under uncertainty requires inclusive policy-making, including bridging local/lay and scientific/professional knowledge in order to meet the complex needs of a diverse and pluralistic society.**
>
> Dr Oliver Hensengerth

Soft Engineering Approaches to Disaster Risk Reduction: A Case Study on Flood Management in the Mekong River Delta in Vietnam

Lead PI: Dr Oliver Hensengerth, Northumbria University, Newcastle, UK

Lead PI: Associate Professor Dr Nguyen Thi Lan Huong, Thuyloi University, Hanoi, Vietnam

Project partners

Royal Academy of Engineering

Thuyloi University

Developing new resilient rice strains for farmers

Food security and the need to curb greenhouse gas emissions are major global challenges and rice production affects both areas. Rice is one of the most important staple crops, but the burning of hundreds of millions of tonnes of rice straw causes widespread and severe air pollution.

This Newton Fund project aims to develop alternative uses for rice straw and move it from a problem to a resource. It is part of the Newton Fund UK-China-Philippines-Thailand-Vietnam collaborative research programme. The team has established a state-of-the-art crop improvement platform based on genomic studies with a key group of rice cultivars. They are using this platform to make rice straw more attractive for animal feed and biofuels production, as well as to improve the resilience of rice crops to salt and drought stress.

The project has identified commercial rice cultivars with good quality straw characteristics such as improved digestibility, higher starch and lower silica content, for applications in animal feed and biofuel production. It is training Vietnamese rice breeders, academics and students in the techniques involved in improving rice cultivars.

> **It is a great privilege to be supporting the efforts of our colleagues in Vietnam and the Philippines in their work to find attractive applications for rice straw that will take it away from being burned and generate enhanced livelihoods for farmers.**
>
> Professor Simon McQueen-Mason

Developing Rice Resources for Resilience to Climate Change and Mitigation of Carbon Emissions

Lead PI: Professor Simon McQueen-Mason, Biology Department at the University of York, UK

Lead PIs: Professor Nguyen Van Tuat, Vietnam Academy of Agricultural Sciences, Vietnam Professor Nguyen Tri Hoan and Dr Duong Xuan Tu, Field Crops Research Institute, Vietnam

Project partners

Biotechnology and Biological Sciences Research Council

Ministry of Science and Technology, Vietnam

Photo provided by the project

Communicating in a disaster

From 2005 to 2014, Vietnam was hit by 649 natural disasters destroying almost half a million homes and causing 10,000 casualties annually. Although the country has devoted efforts to reducing the impact of floods, landslides, tornados and droughts, technical and scientific solutions are still a long way off.

This Newton Fund project tackled the problems of maintaining communications under hostile conditions. The team designed an integrated heterogeneous wireless system (IHWS), which is robust in disaster scenarios, coping with issues such as physical destruction of telecommunication networks, lack of power supply and network congestion. The system also provides early warning of natural disasters by detecting water level, vibration and wind. In cities, the IWHS can detect increases in dust, temperature, noise and carbon dioxide levels.

Photo provided by the project

The system has many potential applications in disaster, climate change and carbon dioxide level monitoring and management, as well as in the provision of e-health services. Academic staff and students from 20 universities throughout Vietnam have been trained in the system and several leading telecommunication companies are interested in bringing it into production.

Building a Foundation for Sustainable Development: Networked Societies for the Cities of Tomorrow

Lead PI: Dr Trung Duong, School of Electronics at Queen's University Belfast, UK

Lead PI: Dr Vo Nguyen-Son, Faculty of Electrical and Electronics Engineering at Duy Tan University, Vietnam

Project partners

British Council

Duy Tan University, Vietnam

> **Our Newton-funded project aimed to leverage contemporary wireless technologies and infrastructure to meet the demand for connectivity in the context of natural disasters in Vietnam. This is where poor infrastructure and underdeveloped economy in rural areas and high energy consumption and pollution in urban areas, due to fast urbanisation, are affecting people's lives.**
>
> Dr Trung Duong

Innovation in maritime logistics

Maritime logistics is an essential driver of Vietnamese economic growth with 90% of imports and exports delivered by sea. The maritime sector is facing a critical challenge in addressing issues of high costs and low performance caused by the lack of ICT integration in logistics services.

The Newton Fund has supported the establishment of a unique network in the logistics industries of Vietnam and the UK. This network aims to promote economic development, reduce environmental impact, and enhance logistics research and education. The collaboration of industry, academia and policy makers has led to significant technical advances including new optimisation techniques and algorithms capable of solving large scale logistical scenarios.

Within one year the network has led to nine collaborations and partnerships from 18 different organisations who are working together for the first time. Five of these partnerships are with Vietnamese companies transforming innovative research ideas into technical products

Photo provided by the project

that can address challenges in areas such as fleet sizing, berth and vessel stowage planning, port simulation, and container stacking and filling.

The network has been making a major input into the Vietnamese Government's national strategy plans and will make an important contribution to reducing maritime emissions and pollution across the world.

The partners for the project include: Liverpool John Moores University; University of Engineering and Technology, Vietnam National University, Hanoi; Vietnam Maritime University; Viconship; Mersey Maritime; AECOM; and Nippon Express.

> **Thanks to the Newton Fund, a number of academia and industry partners from both countries have been able to work together for the first time. Given the importance of maritime logistics to both countries, this partnership will help us prepare for future challenges as well as embrace opportunities in these uncertain times.**
>
> Dr. Trung Thanh Nguyen

UK-Vietnam Institutional Link in Digital Innovation for Sustainable Maritime Logistics in Vietnam

Lead PI: Dr Trung Thanh Nguyen, Liverpool John Moores University, UK

Lead PIs: Associate Professor Nguyen Ha Nam and Associate Professor Nguyen Viet Ha, University of Engineering and Technology, Vietnam National University in Hanoi, Vietnam

Project partners

British Council

University of Engineering and Technology, Vietnam National University Hanoi

Membership of the Newton Prize Committee

Chair

Sir Venki Ramakrishnan — President, Royal Society

Committee members

Professor Elizabeth Tanner — Professor of Biomedical Materials, University of Glasgow
Discipline – chemistry and materials

Professor Jonathan Weber — Director of Research for the Faculty of Medicine,
Imperial College
Discipline – medicine

Dr Irene Gujit — Head of Research, Oxfam
Discipline – international development

Professor Sir Howard Newby CBE — Retired Vice Chancellor, University of Liverpool
Discipline – social science and humanities

Nicholas Jennings CB, FREng — Vice-Provost, Chair of Artificial intelligence, Imperial College
Discipline – computing and engineering

Professor Georgina Mace DBE, FRS — Head of the Centre for Biodiversity and Environment
Research, University College London
Discipline – biodiversity and environment

Jonathan Hague — Vice President Operations and Open Innovation, Unilever
and Chair of the Innovation Board for the Liverpool LEP

Professor Armida Alisjahbana	Professor of Economics, Founder of Sustainable Development Goals Centre at the Padjajaran University, Fellow at Indonesian Academy of Sciences *Discipline – Global South scientist (Indonesia) and development economist*

Azim Surani CBE FRS FMedSci — Director of Germline and Epigenomics Research, University of Cambridge
Discipline – biology

Observers

Claire Durkin — Head of Global Science and Innovation, International Science and Innovation Directorate, Department for Business, Energy and Industrial Strategy

Dr Jasdeep Sandhu — Science Adviser and Head of Chief Scientific Advisers Cabinet, Research and Evidence Division, Department for International Development

Dr Beth Taylor — Chair of the UK National Commission for UNESCO

Delivery Partners

We would like to express special thanks to the UK National Commission for UNESCO, in particular Liz Bell and Kia Da Silva Cunha, for all their work in delivering the 2017 Newton Prize.

We would also like to thank all of the UK and partner country delivery and funding partners involved in this year's Prize for their role in supporting the application and verification process, as well as their continuing work in making the Newton Fund such a successful and impactful initiative.

UK

Academy of Medical Sciences
Arts and Humanities Research Council (AHRC)
Biotechnology and Biological Sciences Research Council (BBSRC)
British Academy
British Council
Economic and Social Research Council (ESRC)
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India

Department of Biotechnology (DBT)
Department of Science and Technology (DST)
Federation of Indian Chambers of Commerce and Industry (FICCI)
Global Innovation & Technology Alliance (GITA)
Indian Council of Historical Research (ICHR)
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Malaysian Industry-Government Group for High Technology (MIGHT)
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National Disaster Management Agency Malaysia (NADMA)
National Hydraulic Research Institute of Malaysia (NAHRIM)
Department of Irrigation and Drainage Malaysia (DID)

Thailand

Institute for the Promotion of Teaching Science and Technology (IPST)
National Astronomical Research Institute of Thailand (NARIT)
National Science and Technology Development Agency (NSTDA)
Office of the Basic Education Commission (OBEC)
Office of the Higher Education Commission (OHEC)
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Science, Technology and Innovation Policy Office (STI)
Synchrotron Light Research Institute (SLRI)
Thailand Research Fund (TRF)

Vietnam

Ministry of Science and Technology (MOST)
National Foundation for Science and Technology Development (NAFOSTED)
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