

Global Innovation Initiative 2013-14 Grantees

Established as a joint effort of the United States and the United Kingdom, the Global Innovation Initiative is a Higher Education grant opportunity with the goal of strengthening research collaborations between universities in the U.S., UK, and other selected countries. The Global Innovation Initiative awards grants to university partnerships focusing on science, technology, engineering, and mathematics (STEM) related issues of global significance.

Awardees

A total of 23 partnership grants were awarded through the inaugural cycle of the U.S. and UK grant competitions:

UK Awardees

Environmental DNA for Rapid Assessment of Biodiversity and Conservation Priorities in Indonesia

Bangor University, University of California Los Angeles, Udayana University (Indonesia)

- **Project Description:** Monitoring species populations is essential for conservation and policy-based decision making, such as the delimitation of protected areas and setting of fisheries quotas. This multidisciplinary project aims to develop environmental DNA (eDNA) for marine and freshwater aquatic species detection in Southeast Asia for biodiversity monitoring and conservation planning. eDNA sampling detects trace DNA left in the environment by species without the need to sample the species directly.

Design and Development of International Electricity Highway Systems

Brunel University, University of Oklahoma, Sichuan University (China), Tsinghua University (China)

- **Project Description:** The partnership will identify, assess, and manage the design and developmental risks encountered in the engineering and economic operations of future electricity highway systems through applied research and technology development. Such research will represent a significant contribution to the decarbonisation of the electricity supply industry in reducing carbon dioxide emissions to internationally agreed-upon standards to minimise global warming by the year 2050.

Develop a novel vaccination method combining electric stimulation and PLGA micro-needles

Cardiff University, University of California Davis, China Medical University (China)

- **Project Description:** To more efficiently prevent life-threatening diseases, innovative vaccination protocols are required to increase the compliance and efficacy of vaccination programs. This project will develop a novel method of micro-needle based vaccination to induce a strong host T-cell memory response against infectious microbials.

Reducing global energy use in buildings while improving occupant comfort and well-being: reversing the growing trend toward AC

Loughborough University, University of California Berkeley, CEPT University Ahmedabad (India)

- **Project Description:** Buildings contribute more greenhouse gas emissions than the industrial or transportation sectors, primarily due to air conditioning and heating energy use, driven by the basic human need for thermal comfort and good indoor air

quality. The partnership will develop a better understanding of human thermal comfort in residential and commercial buildings across the globe and explore opportunities for reducing energy demand through natural ventilation, mixed-mode practices (combination of operable windows and air-conditioning) and other low-energy techniques.

Development of Sustainable Technologies to Investigate, Restore and Protect the Urban Water Environment

Newcastle University, University of Maryland Baltimore County, Federal University of Minas Gerais (Brazil), Indian Institute of Technology Delhi (India), CSIR-National Environmental Engineering Research Institute Nagpur (India)

- **Project Description:** Urban water quality is under enormous pressure around the world because of increasing population density and economic activity in cities. This project will seek to recover urban water resources and their recreational and health values for the people living in cities. This global partnership will develop innovative methods to detect and monitor existing and emerging threats to the urban water environment. The team will also create sustainable technologies to reduce identified pollution releases and remediate existing pollution deposits.

Ensemble Estimation of Flood Risk in A Changing Climate

Swansea University, University of Maine, Sichuan University (China), Hohai University (China), Indian Institute of Technology Bombay, Bandung Institute of Technology (Indonesia)

- **Project Description:** This project will provide global leadership in the development of innovative yet resilient flood risk assessment methodologies. It will build capacity and lasting international collaboration between international flood risk centres of excellence that will provide the underpinning knowledge that enables novel flood-related enterprises to flourish.

TransAtlantic Discovery, Characterization and Application of Enzymes for the Recycling of Polymers and Composites

University of Bath, Ohio State University, University of São Paulo (Brazil)

- **Project Description:** This partnership will examine the effective recycling of polymers to keep carbon in the manufacturing loop through two research areas. In the first instance, potent enzymes developed for the second generation biofuel industry will be applied in the deconstruction of novel 'green' composite cellulosic materials to release and recover valuable components, e.g. rare metals used in electronics. The second, even more impactful, research area entails discovering, characterizing and applying enzymes for low-energy depolymerization of more challenging targets, including biopolymers, that are becoming more widely used to replace oil-based polymers and, potentially, even some of the oil-based polymers themselves.

Seeing with Sound-Developing an Echolocation Device based on sensing principles derived from Human Users

University of Birmingham, Ohio State University, Beijing Institute of Technology (China)

- **Project Description:** This project uses human behaviour as a model system to create foundational knowledge for echolocation-based artificial perception and cognition. Experiments with human expert echolocators will capture processes to be used for the development of synthetic systems. Combining the behavioural science and engineering disciplines facilitates an approach able to distil relevant cognitive processes and developing artificial forms of cognition. By tackling the specifics of echolocation in collaboration with blind experts, the outcome will be a determination

of the design parameters required to fabricate wearable echolocation devices for blind people, thus improving their independence in daily life through enhanced spatial sensing.

Nanostructured materials for the control of contaminants detrimental to health
University of Brighton, Drexel University, Northwestern Polytechnic University (China)

• **Project Description:** The project aims to develop a range of advanced nanostructured materials with the potential to act as cost-effective, broadly acting healthcare solutions to microbial, chemical and biological toxin exposure. The project will provide a platform for the creation of a global consortium of expertise in “nanosmart materials” for healthcare applications centred on adsorbent strategies to combat non-communicable disease progression, adsorbent antimicrobials to treat infection and nanostructured filters for water remediation.

Global Farm Platforms for Sustainable Ruminant Livestock Production
University of Bristol, University of Wisconsin Madison, Zhijiang University (China), Kerala Veterinary and Animal Science University (India)

• **Project Description:** There are pressures on livestock agriculture to both maximise production and minimise pollution on a global scale – a process known as sustainable intensification. Ruminants make an important contribution to global food security as they can convert feed that is unsuitable for human consumption to high value protein, demand for which is increasing at an unprecedented rate. To this end, the consortia will create a global network of ‘farm platforms’ across different climatic and eco-regions of the planet as a crucial resource for optimising and exemplifying research on the contribution of sustainable ruminant livestock production to global food security.

Land Use Change, Biodiversity and the Community Ecology of Amazonian Vector-Borne Diseases

University of East Anglia, Oregon State University, Cary Institute of Ecosystem Studies, Federal University of Mato Grosso (Brazil), State University of Mato Grosso (Brazil)

• **Project Description:** This environmental health research network will investigate how land-use change and biodiversity loss drives infectious disease dynamics across a gradient of deforestation and forest fragmentation in the Brazilian Amazon. The main goal is to test the hypotheses that forest fragmentation increases the population density of reservoir hosts and disease vectors in Amazonia, thus increasing the risk of contracting vector-borne diseases, and to examine the spatial correlation between arthropod vector infection rates, landscape structure, and disease prevalence in humans.

New Answers For Old Problems: A Global Interdisciplinary Training Network to Address Key Questions in Plant Development for Food

University of Nottingham, University of Delaware, Shanghai Jiao Tong University (China)

• **Project Description:** The partnership will provide novel opportunities for understanding traits of agronomic importance and deploying these to maintain and enhance crop yields. The programme will enable the application of interdisciplinary research approaches to key topics in plant and crop biology that are of importance to plant growth, crop production, yield enhancement and overall food security. These will include both above and below ground issues, including root development, fertility and fruit ripening.

Wireless Charging Technologies for Electric Vehicles to Improve Energy Utilisation and Reduce Emissions in the Urban Environment

University of Strathclyde, New York University, Wuhan University (China)

- **Project Description:** This consortium will form a centre of excellence in the field of highly efficient wireless power transfer techniques. The research will focus on wireless technology for electric vehicle (EV) charging – in particular, designing and demonstrating a novel 25 kW wireless charging station for use with commercial vehicles. This will lead to a new generation of EV charging stations exhibiting high power capacity, exceptional efficiency across the air gap and minimal leakage of electromagnetic fields.

US Awardees

Crowdsourcing Water Quality: Using Mobile Technology to Monitor Access to Safe Drinking Water

Georgia Institute of Technology, London School of Hygiene and Tropical Medicine, and National Environmental Engineering Research Institute (India)

- **Project Description:** This project will utilize rapid crowdsourcing methods to monitor access to safe drinking water and estimate village-scale drinking water risks. By engaging the local communities and using mobile phones, the project seeks to produce a rapid monitoring tool-kit for use by the international community, ideally providing an alternative to expensive standard water testing methods.

Transforming Arsenic and Fluoride Crisis into an Economic Enterprise *Lehigh University, Queen's University Belfast, Indian Institute of Technology Bombay (India)*

- **Project Description:** The threat of arsenic or fluoride poisoning from contaminated drinking water affects 200 million people worldwide. Lehigh University, a leader in the development of a nanotechnology-based arsenic and fluoride absorbent, will partner with Queen's University Belfast and the Indian Institute of Technology Bombay to develop an absorbent for use in India that seeks to provide safe drinking water to resource-limited communities and stimulate economic growth by providing employment opportunities.

Sustainable Forest Management in Indonesia *Northern Arizona University, Aberystwyth University, University of Mataram (Indonesia)*

- **Project Description:** This research project will address the needs of local Indonesian universities and policy makers by creating stronger linkages between research and policy for sustainable forest management. In particular, this project will focus on the Payments for Ecosystem Services (PES) in which developed countries compensate developing countries for ecologically friendly land use practices and the impact these incentives to combat deforestation have on the local ecosystem and community.

Increasing Global Food Security by Controlling the Dissemination of Antibiotic Resistance *Ohio State University, Queen's University Belfast, Shanghai Academy of Agricultural Sciences (China)*

- **Project Description:** Antibiotic Resistance (AR) is one of the top priority health and food safety issues globally. This project specifically addresses the Antibiotic Resistance risk factors in poultry production and seeks to facilitate AR reduction through innovative research; enhancing global capacity building by training future generations of microbiologists; and furthering global knowledge dissemination through consortium activities, workshop and conference presentations.

Increasing Energy Efficiency Using Rapid Smart Grids *Purdue University, De Montfort University, São Paulo State University (Brazil)*

• **Project Description:** This project seeks to establish a framework to realize the benefits of smart grid technology, a modernized electric grid that gathers information about suppliers and consumers, in each country. The partner institutions will seek to build a collaborative research arrangement to reduce electricity demand in rural areas of Brazil, increase the quality of power through engineering analysis, introduce effective feedback to change consumer behaviors, and establish collaborative research activities through exchange programs and applied research.

The Impact of Outdoor Air Pollution on Indoor Air Quality in China *Rutgers University, University of Reading, Chongqing University (China)*

• **Project Description:** Although air pollution is a global crisis, there are no studies that directly focus on *indoor* air quality. This project will investigate the impact of changes outdoor air pollution on indoor air quality and whether commercial air cleaners might help confront this issue. The project will also include an education and training component for engineering faculty, staff and students from both Chongqing University and the University of Reading about exposure science methodology, individual and public health implications, and community outreach.

Reducing Carbon Emissions through a Hydrogen Economy *University of California Davis, Oxford University, Shanghai Institute of Applied Physics (China)*

• **Project Description:** Many studies show the environmental benefits of transitioning to a hydrogen economy, in which renewably produced hydrogen from sunlight and water would replace fossil fuels. However, processing hydrogen requires a catalyst, many of which are expensive and rare. This project seeks to understand the catalyst [NiFe] Hydrogenase (H₂ase) which could help create better synthetic, more readily-available catalysts needed for processing hydrogen.

Salt Intrusion into Estuaries Related to Global Climate Change *University of Florida, University of Liverpool, Federal University of Pernambuco (Brazil)*

• **Project Description:** Sea-level rise poses a primary threat to coastal freshwater resources and ecosystems worldwide due to the increase in salt water. This project seeks to enhance the resilience of coastal communities by assessing the extent of salt intrusion into estuaries. The findings will be highlighted in a short course on estuarine dynamics and environmental change, intended for graduate students from the three countries.

Improving Environmental Impacts of Cattle Farming in Brazil

University of Michigan, Oxford University, University of São Paulo (Brazil)

• **Project Description:** Avoided deforestation is a global priority to mitigate climate change, but cattle ranching in Brazil poses a challenge in this arena. This project will investigate private sector certification, a promising mechanism to improve climate and environmental impacts of cattle farming. The data analysis will include determination of land use change, carbon sequestration and modeling of direct greenhouse gas emissions.

Aquaculture Carrying Capacity and Water Quality in Indonesian Lakes and Reservoirs

University of Rhode Island, University of Stirling, Bogor Agricultural University (Indonesia)

• **Project Description:** Aquaculture, also known as aquafarming, is the fastest-growing agriculture sector in the world but, when done poorly, the waste materials



can have detrimental effects on the ecosystem. This project will look at three lakes in Indonesia to examine the country's aquaculture industry and how to mitigate the harming effects of waste materials.