Funding and awards

Birmingham's research spans an impressive range of academic areas – one of the broadest of any UK university. Funding for our fundamental, novel and applied research activities is drawn from an equally wide range of sources, from Research Councils to 'blue chip' commercial partners, and accounts for around a third of the University's annual income.

- **Latest research awards (/research/funding/latest-awards.aspx)**
- **Wellcome Trust Institutional Strategic Support Fund (ISSF) (/research/funding/WellcomeISSF.aspx)**

Highlighted research awards

These projects represent a sample of our funding awards. This list also provides an overview of the scale of Birmingham research, and how it will impact across many different aspects of daily life in the future.

Open all sections

Nature inspired computation and its applications

Award: £202,677 from April 2011-March 2015

Principal Investigator - Professor Xin Yao

Nature inspired computation and its applications, is a 4 year exchange programme of researchers in the field of computational intelligence across 3 universities in the European Union and 4 universities in China.

The field of nature inspired computation is a relatively new interdisciplinary area of research that is concerned with the computational capabilities of natural systems and their interpretation in a computational framework. Each of the seven participants has dedicated research groups that are amongst the world's best in this highly relevant field of research. The collaboration is expected to share its research outcomes in the form of publications, seminars and workshops.

Further information on the NICaiA project (http://www.cercia.bham.ac.uk/projects/research/NICaiA/)

QRGraph (Quasirandomness in graphs and hypergraphs)

Starting Grant €743,000

Principal Investigator - Daniela Kuhn

Graph Theory is a dynamic field in both theory and applications. Graphs consist of a set of vertices and a set of edges connecting some of these vertices. Many problems of practical importance can be modelled using graphs: for instance a network of cities (which are represented by vertices) and connections between them give rise to a weighted graph. The well known travelling salesman problem then asks for the shortest tour which visits all the cities. Similarly, one can also model scheduling problems in terms of the chromatic number of a graph (which is the smallest number of colours with which one can colour its vertices so that no adjacent vertices receive the same colour).

A graph is called quasi-random if it has a number of properties that one would expect from a random graph with similar parameters. In particular, a graph is quasi-random if its edges are spread evenly over the vertices. This concept has been remarkably useful in many areas, including Number Theory, Graph Theory and the design of algorithms.

One area where I believe that quasirandomness is crucial to further progress is the hypergraph matching problem. As an illustration of this, consider a group of people and construct a graph by drawing an edge if they like each other - a perfect matching splits the people into teams of 2 which can work together. How and when this can be achieved for teams of 2 is well understood, but not for teams of 3 or more people. This can be formulated as a hypergraph matching problem. I believe that quasi-random decompositions can be used to give quite general sufficient conditions which guarantee a perfect hypergraph matching.

INFLAME (Indoor contamination with flame retardant chemicals: Causes and impacts)

Total award - €3,631,300, over 4 years commencing January 2011.

Principal Investigator - Stuart Harrad

INFLAME aims for a further understanding of how and to what extent flame retardant chemicals used in everyday consumer goods and construction materials enter humans and of the risk to health that such exposure presents. It is intended that this enhanced understanding will inform assessment of risk associated both with recent and current-use flame retardant chemicals, and of those under development, and ultimately lead to more sustainable approaches to meeting fire safety regulations. INFLAME's principal objectives are to discover:

- The mechanisms via which flame retardant chemicals migrate from products within which they are incorporated
- How and to what extent such migration leads to human exposure
- The effects of such exposure

A range of state-of-the-art techniques associated with analytical chemistry, electron microscopy, mathematical modelling, in vitro toxicology, and "omics" will be used. In total, INFLAME incorporates 12 PhD and 2 postdoctoral projects, hosted at 9 different Universities, public and private sector research organisations in the UK, Belgium, the Netherlands, Norway, and Sweden. Birmingham will act as main host to 2 PhD students (in collaboration with Kevin Chipman and Mark Viant in Biosciences, and Ian Jones in Metallurgy and Materials), provide secondments to several other researchers within the network, and will host a short secondment from Prof. Tom Webster from Boston University School of Public Health as a Visiting Researcher.

The International Greek New Testament project: A critical edition of the Gospel of St John

Award: Full economic cost £963,692.40 Research Council contribution £770,953.92 (Funder AHRC - 2010-2015)

Principal Investigator - David Parker

The Gospel of John is one of the most influential texts in the development of western thought. It has survived in two thousand Greek manuscripts and ancient translations into Latin, Syriac, Coptic and Gothic. The International Greek New Testament Project is a network of professional scholars and volunteers spread over Europe and North

America, who are using the latest technology to produce the most sophisticated edition of the text ever to have been made. As well as reconstructing the oldest available form of the text, it will describe the way in which readers changed it in the course of the first millenium. The text of the edition will be adopted as the basis for all editions of the text and translations throughout the world. For further details see **www.igntp.org (http://www.igntp.org)**

Manufacturing Technology Centre (MTC)

£130 million private and public sector joint investment over 10 years.

Advantage West Midlands (AWM) and the East Midlands development agency (emda) have committed £40 million in building and equipping the MTC. A further £90 million private and public sector revenue is planned over the next 10 years.

A groundbreaking technology centre, in which the University of Birmingham is a leading partner, is on schedule to open next summer. The Manufacturing Technology Centre (MTC) at Ansty Park, Coventry, will help put the Midlands at the forefront of global manufacturing research. The MTC will be operated by a partnership of research led universities and major industrial companies. The partnership is comprises the University of Birmingham, University of Nottingham, Loughborough University, TWI Limited, Rolls-Royce, Aero Engine Controls and Airbus UK.

The MTC will support UK manufacturing companies, and their supply chains, to initiating major improvements in their manufacturing competitiveness. Using existing manufacturing related research to address key industry challenges, it will provide resource and a high quality environment for the development and demonstration of new technologies on an industrial scale.

Economic impact assessments show that investment in the project will return £46 for every £1 invested. In addition, over 10 years, the MTC is expected to create or safeguard 2,100 jobs, support 625 businesses, and generate around £5.5 billion for the UK economy.

Strategic partnership in structural metallic systems for advanced gas turbine applications

Funding: EPSRC £6.8M, industrial partners and Rolls Royce - total £50m

Principal Investigator - Prof Paul Bowen

Rolls-Royce, the Engineering and Physical Sciences Research Council, (EPSRC), and Birmingham, Cambridge and Swansea universities are to work together in a new £50 million strategic partnership, which is the first of its kind. The partnership will develop materials skills and knowledge to support the development of future gas turbines which power many applications including aircraft, ships and electricity generation.

At present, almost all aircraft propulsion and over 1/3 of the UK's total generating capacity rely on gas turbines. Their flexibility and efficiency compared with the alternatives mean that their use in power generation is predicted to dramatically increase for the foreseeable future. Achieving drastic reductions in the emissions from gas turbines, without bringing national economic activity to a standstill, requires urgent activity on a very wide number of fronts. This is particularly important for the UK. It has Europe's largest gas turbine industry, second only to the US.

Over the next ten years, the universities will undertake fundamental materials research that will develop materials required to improve the efficiency and environmental sustainability of these gas turbines.

The partnership will include research, fellowships and postgraduate training to help create the next generation of world-class materials scientists and metallurgical engineers over the next 10 years.

Analysing security and privacy properties

EPSRC £1M Mar 2010 – Mar 2015

Leadership Fellowship for Prof Mark Ryan

Security systems break because design practices focus too much on mechanisms, at the expense of clearly-defined properties. This research seeks to shift the emphasis to highlight the properties that security systems are expected to provide. This will be achieved by developing methods for the verification of security systems, focusing on a selection of interconnected real-world problems that are of great importance to society, but that are currently in need of greater industry/academe co-operation. The combination of fundamental research and close collaboration with industry, government and users is expected to achieve significant results and impact.

Trusted computing is an industry-led technology that aims to root security in hardware. Since its launch, academics including the PI, have discovered significant issues that threaten to undermine its potential at providing a range of security benefits. This has arisen because industry does not have the expertise to analyse the protocols.