The Royal Academy of Engineering

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News release

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The race is on to find the UK's top engineering innovators

Four top UK engineering teams have been selected as finalists for Britain's biggest engineering prize, but which project will triumph:

- the long-awaited catalytic converter set to clean up diesel car emissions?
- the robotic retrieval system for the UK Biobank, working at −80°C with 10 million samples?
- the dime-sized sensor on a chip that can detect a whiff of explosives or a hint of disease?
- or the world's first bionic hand?

The four finalists for the **2008 Royal Academy of Engineering MacRobert Award** represent the very best of current British innovation. Now the judging panel must agree on the best of the best of these exciting entries. HRH the Duke of Edinburgh will present a £50,000 prize and the solid gold MacRobert award medal to the winner at the Academy Awards Dinner in London on Monday 9 June.

"Yet again, the MacRobert Award has attracted entries demonstrating an amazing talent for engineering innovation" says Dr Geoff Robinson, Chairman of the judging panel. "I am delighted to see UK companies developing world-leading ideas across such a wide range of engineering activities."

Shortlisted for this year's Award are:

The Automation Partnership, for Polar, a new robotic system designed specifically for the UK Biobank, based in Stockport – the world's leading programme to create a large-scale resource for medical research.

For Biobank to work, Polar must keep 10 million human blood and urine samples at a steady −80°C for 25 years but at the same time ensure any sample is instantly accessible at any time. The team devised a modular ultra low temperature compartment design to hold the samples, which can be accessed automatically. The whole system is cooled with liquid nitrogen in a closed circuit and operates in an ultra dry atmosphere to prevent frosting

Biobanks of this size are intended to reveal the underlying causes of a variety of diseases and may shed light on many of the most common life threatening and debilitating diseases such as cancer, heart disease and diabetes as well as rarer conditions, or those with less profile, such as mental illness, Parkinson's and Alzheimer's diseases and motor neuron disease

Thanks to its novel design, Polar ensures reliable access to samples with no increase in temperature when the drawers are opened so samples can be requested as often as they are required. The samples are protected even in the event of a power loss or failure in refrigeration or robotics, and the robotics are also protected from the ultra-cold environment.

"Until now it has not been possible to automate a repository with this unprecedented number of unique specimens – over 20 tonnes in total – while maintaining storage conditions," says Justin Owen, chief engineer on the project. "Now that we have achieved this breakthrough we plan to establish the company as a leader in automated biological storage, which is a major growth area."

Team members: Head of Hardware Engineering Justin Owen, Senior Project Manager Robert Meaker, Engineer Frank Tully, Software Engineer James Pilgrim and Product Manager Peter Woods, all based at The Automation Partnership in Royston, Herts.
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Johnson Matthey, for their compact catalysed soot filter for diesel cars. Following up on their success as the winner of the 2000 MacRobert Award for the Continuously Regenerating Trap® - now the leading technology for controlling soot emissions from trucks and buses - the Johnson Matthey Team have turned their attention to a much more challenging application.

The diesel engine is taking over Europe's car market – more diesel cars are made here now than petrol – they are more fuel efficient and produce less carbon dioxide than the equivalent petrol version, although there are concerns about the tiny soot particles they produce. These can be trapped in a filter but they are very difficult to efficiently remove at the relatively very low temperature in a car exhaust.

Earlier filter designs were complex and heavy using several units in individual housings. The Johnson Matthey team has developed special catalysts and an innovative precision manufacturing process that combines catalyst and filter into a single unit that is small enough to fit into the restricted space in the engine compartment of a car. Here it can use all the heat from the engine to control hydrocarbon and carbon monoxide as well as soot emissions. The compact soot filter is not only energy and materials efficient to manufacture, in use it contributes to reduced carbon dioxide emissions due to its high thermal efficiency and much reduced weight.

"We have already exported over 1.5 million of these filters for use in European cars ahead of new emissions control legislation which comes into force from 2009", says Johnson Matthey's Chief Scientist Dr Martyn Twigg. "These alone will stop millions kilogrammes of soot entering the atmosphere over the life of these vehicles. We have built two new state of the art plants in Royston Hertfordshire to manufacture these products, and this has resulted in the creation of 300 new jobs on the site".

Team members: Chief Scientist Dr Martyn Twigg, Diesel Development Manager Dr Paul Phillips and General Manager Sales and Operations Antoine Bordet, all based at Johnson Matthey in Royston, Herts.
Media contact: Dr Martyn Twigg, tel. 01763 253141, martyn.twigg@matthey.com

Owlstone Ltd, for their 'dime' sized chemical sensor on a silicon chip that provides a miniature detection system for trace amounts of a wide variety of chemicals. Owlstone's chip can detect explosives at airports, protect workers against gas exposure in heavy industry or detect fires before they begin from precombustion fumes.

Owlstone uses microprocessor-type manufacturing methods to cram huge capability onto a single chip – the sensor, which uses a using a technique called Field Asymmetric Ion Mass Spectroscopy (FAIMS), can easily be reprogrammed to look for different chemical fingerprints. One of its most exciting potential applications is a 'health breathalyser' that will diagnose illness by analysing chemicals on a patient's breath.

The company was spun out of Cambridge University in 2004 with $2 million and venture capital finance – since then it has raised another $7 million and built a world class team with offices in both the US and UK.

"Our success in winning multiple contracts from the US government illustrates not only the significance of our technology innovation but also the scope of its commercial potential," says Billy Boyle, Owlstone's President Operations.

Team members and company co-founders: President Operations Billy Boyle, President Products Andrew Koehl and President Technology David Ruiz-Alonzo, all based at Owlstone Ltd at the St John's Innovation Centre in Cambridge.
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Touch Bionics, for its revolutionary i-LIMB Hand – the first commercially available bionic hand. Many years in development, the i-LIMB Hand is a prosthetic device that looks and acts like a real human hand with five individually powered digits and it heralds a new generation in bionics and patient care.

The key innovation behind Touch Bionics' i-LIMB Hand is the multi-articulating finger technology, which has underpinned the product's resounding commercial success since its launch. The i-LIMB Hand is developed using leading-edge electronic and mechanical engineering techniques and is manufactured using high-strength plastics. The result is a next-generation prosthetic device that is lightweight, robust and highly appealing to both patients and healthcare professionals.

The i-LIMB Hand started life in 1963 in a research programme at Edinburgh's Princess Margaret Rose Hospital to help children affected by Thalidomide. Touch Bionic's core intellectual property is patent-secured and, through the development of the i-LIMB Hand, the company now leads the upper limb prosthetics market in three core areas: cosmesis (skin), controls and mechanical form factor.

"The i-LIMB Hand is one of the most compelling devices in the world prosthetics market," says Touch Bionics CEO Stuart Mead. "Since we launched it in July 2007 over 200 patients have been fitted with it all over the world – in just a few months it has evolved from an exciting new technology into a new benchmark in prosthetic devices."

Team members: Chief Executive Officer Stuart Mead, Director of Research and Founder David Gow, Project Manager Stewart Hill, Director of Technology and Operations Hugh Gill and Director of Marketing Phil Newman, all based at Touch Bionics in Livingston.
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Notes for Editors

1. First presented in 1969, the MacRobert Award honours the winning company with a gold medal and up to five team members with a tax-free prize of £50,000 between them. HRH the Duke of Edinburgh, Senior Fellow of the Academy, takes a close interest in the MacRobert Award and has presented it almost every year since it was created.

2. Founded by the MacRobert Trusts, the Award is now presented by the Academy after a prize fund was established with donations from the MacRobert Trusts, the Academy and British industry.

3. This year's judging panel for the MacRobert Award is as follows:

   Dr Geoffrey Robinson CBE FREng (Chairman)
   Formerly Director of Technology, IBM UK
   Professor John Burland CBE FREng FRS
   Emeritus Professor of Soil Mechanics, Imperial College London
   Professor Haroon Ahmed FREng
   Emeritus Professor of Microelectronics, University of Cambridge, Former Master Corpus Christi College, Higher Education Advisor to the Government of Pakistan
   William Edgar CBE FREng FRSE
   Chairman, European Marine Energy Centre, Chairman, Subsea UK, Visiting Professor in Mechanical Engineering, University of Strathclyde
   Professor Malcolm Mackley FREng
   Professor of Process Innovation, University of Cambridge
   Dr Michael Shears CBE FREng
   Chairman, Arup Trustees, Charter Visiting Professor in Principles of Engineering Design, University of Bristol
   Ian Ritchie CBE FREng FRSE
   Chairman: Interactive University, Sonaptic Ltd, F7 Technology
   John Robinson FREng
   Chairman, Bespak Plc
   Professor Chris Taylor FREng
   Formerly Vice Chancellor & Principal, University of Bradford
   Keith Davis (MacRobert Trustee)
   Director, Engineering Affairs, The Royal Academy of Engineering
   Philip Greenish CBE
   Chief Executive, The Royal Academy of Engineering

4. Founded in 1976, The Royal Academy of Engineering promotes the engineering and technological welfare of the country. Our fellowship – comprising the UK's most eminent engineers – provides the leadership and expertise for our activities, which focus on the relationships between engineering, technology, and the quality of life. As a national academy, we provide independent and impartial advice to Government; work to secure the next generation of engineers; and provide a voice for Britain's engineering community.

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