

IN BRIEF

INVENTORS OF DIGITAL IMAGING SENSORS WIN GLOBAL ENGINEERING PRIZE

The four engineers responsible for the creation of digital imaging sensors have won the 2017 Queen Elizabeth Prize for Engineering (QEPrize). The winners, Eric Fossum and George Smith, both from the USA, Nobukazu Teranishi from Japan, and Michael Tompsett from the UK, were awarded with the prize for their contributions to revolutionising the way that visual information is captured and analysed. Their work, a collaboration across three countries, reflects the international outlook of the prize. The announcement was made by Lord Browne of Madingley FREng FRS at the Royal Academy of Engineering on 1 February, in the presence of HRH The Princess Royal.

The QEPrize is an international £1 million prize that celebrates the engineer or engineers responsible for a groundbreaking innovation that has been of global benefit to humanity. Its objective is to raise the public profile of engineering and to inspire young people to become engineers. It is estimated that the announcement reached a potential audience of more than 1.3 billion people through global media coverage in countries including the UK, USA, China and Japan.

The prize was awarded for three innovations spanning



(L-R) Dr Michael Tompsett, Professor Eric Fossum and Professor Nobukazu Teranishi attended the announcement in London on 1 February; and fourth winner George Smith

three decades that have radically changed the visual world: the charge coupled device (CCD), the pinned photodiode (PPD) and the complementary metal oxide semiconductor (CMOS) image sensor. Together, this image sensor technology has transformed medical treatments, science, personal communication and entertainment. Today's cameras can fit on a fingertip and are found in countless portable devices across the world.

Every second, around 100 cameras are made using CMOS technology, and more than three billion images a day are shared. From uploading photographs and videos to social media, to enabling autonomous vehicles or biometric fingerprint recognition on smartphones and tablets, the

global use of digital imaging has grown at a phenomenal rate.

In the 1970s, George Smith and Willard Boyle (now deceased) developed the CCD, which was later used in imaging by Michael Tompsett. The CCD is the image sensor found inside early digital cameras that converts individual particles of light, or photons, into an electrical signal. The charge is then converted into a binary digital form by an analogue-to-digital converter, and the image is stored as digital data.

The CCD was originally intended for use in computer memory, but Tompsett recognised its imaging potential, inventing the imaging semiconductor circuit, complete with analogue-to-digital converter. The following decade, Nobukazu Teranishi invented

the modern PPD, which reduced the size of light-capturing 'pixels' and significantly improved the quality of images. The development of the CMOS sensor by Eric Fossum in 1992 allowed cameras to be made smaller, cheaper and with better battery life.

The winners were decided by an international panel of judges, chaired by Professor Sir Christopher Snowden FREng FRS. As well as the £1 million prize, the winners will each receive a trophy at a ceremony at Buckingham Palace later this year. The 2017 trophy was designed by 15-year-old Samuel Bentley, from Wales, winner of the international *Create the Trophy* competition.

More information about the prize and winners can be found at qeprize.org

NEW MANUFACTURING HUBS ANNOUNCED

Six new UK research hubs have each received government funding of £10 million to improve the UK's manufacturing processes.

The hubs, formed of partnerships between universities and industry, will explore and improve various manufacturing techniques, each within a specialist area, as a key part of the government's industrial strategy to further UK economic growth. They aim to ensure that the UK creates new products and explores new business opportunities, helping the UK become more competitive and productive.

The new hubs are funded by the government through the Engineering and Physical Sciences Research Council, with additional funding from partners, academia and industry.

Two hubs will focus on medical manufacturing. The Future Manufacturing Hub in Targeted Healthcare, led by University College London, will focus on providing the infrastructure and capabilities needed to ensure that new targeted biological medicines can be developed quickly and affordably. A second medical hub, led by the University of Strathclyde, aims to design a

process to quickly and reliably manufacture medicines.

A hub led by the University of Sheffield will explore how powder-based manufacturing processes can provide low-energy, low-cost and low-waste manufacturing. At the Future Composites Manufacturing Hub, led by the University of Nottingham, researchers will look into the development of automated manufacturing technologies that deliver components for sectors such as aerospace, transport, energy and construction.

A hub led by the University of Huddersfield will create

embedded metrology systems to be applied across manufacturing, which aim to improve product quality and decrease waste. At Cardiff University, a hub will research large-scale compound semiconductor manufacturing to boost the uptake and application of the technology.

Jo Johnson MP, Minister of State for Universities, Science, Research and Innovation, said: "This investment will lay the foundations to allow industry and our world-leading universities to thrive for years to come and is exactly the type of project that our upcoming industrial strategy will look to support."

FILMS AIM TO INSPIRE LGBT ENGINEERS

A new series of online videos profiling lesbian, gay, bisexual and transgender (LGBT) engineers has been launched by the Royal Academy of Engineering, InterEngineering and Mott MacDonald with an aim to inspire prospective engineers who are LGBT, as well as existing engineers who may wish to come out or transition at work.

Launched as part of LGBT history month, the *What's it like?* video series features 20 successful LGBT engineers, working in a variety of roles and settings, from a nuclear quality director to a lead design engineer in the British Army. The engineers share their stories



The LGBT engineers who took part in the new video series increasing the visibility of LGBT people in engineering

of being LGBT in an engineering environment, and encourage others to 'be yourself'.

Dr Hayaatun Sillem, Deputy Chief Executive and Diversity

and Inclusion Champion at the Royal Academy of Engineering, said: "Experience of leading our programme to increase diversity and inclusion across

engineering tells us that role models have a pivotal role to play in encouraging people to join and stay in the profession. It is really good to see LGBT engineers making themselves visible, and working with us to increase and extend diversity and inclusion across the sector."

UK LGBT History Month is celebrated in February and aims to increase the visibility of LGBT people and their experiences, as well as raising awareness of matters affecting the LGBT community.

The videos can be viewed at www.interengineeringlgbt.com/lgbt-in-engineering-video-profiles

ENERGY MARKET TRIALLED IN CORNWALL

A £19 million trial to establish a local energy market in Cornwall will see the development of a virtual marketplace and new technology installed in over 150 homes and businesses. Over the next three years, the trial will test the use of flexible demand, generation and storage, in both business and home settings.

As part of the programme, free smart technology upgrades will be given to renewable energy generators, local businesses and large energy users. These aim to help establish how energy storage, flexible demand and generation can be combined with smart technologies to support the

local electricity distribution network. It could also potentially reduce the cost of energy for local homes and businesses. The virtual marketplace will allow users to buy and sell energy to the grid and wholesale energy market.

The trial's findings aim to inform the government, National Grid and regulators on how the UK can develop new and effective markets for flexible energy. It is being funded by Centrica and the British Gas Energy for Tomorrow Fund, as well as a £13 million grant from the European Regional Development Fund.

Jorge Pikunic, Managing Director of Centrica Distributed



The trial in Cornwall recognises the key role that flexible, smart energy will play in supporting a secure, affordable and lower carbon system for the UK © Centrica

Energy and Power, said: "Cornwall has been at the forefront of harnessing renewable generation, but that has brought challenges to the local grid. Our ambition is to explore how battery storage,

flexible demand and generation can reduce pressure on the UK's electricity grid, avoid expensive network upgrades and support future decarbonisation."

To find out more, please visit www.centrica.com/cornwall

REVIEW BACKS PLANS FOR TIDAL LAGOONS



An artist's impression of the Swansea Bay Tidal Lagoon © Tidal Lagoon Power

An independent review of tidal lagoons, commissioned by the government, has supported plans for a £1.3 billion development to be built in Swansea Bay.

The Hendry Review, led

by former UK energy minister Charles Hendry, stated that "the evidence is clear that tidal lagoons can play a cost-effective role in the UK's energy mix" and that tidal lagoons could "at scale deliver low-carbon power in a

way that is very competitive".

Project scoping, design, feasibility studies and early consultation for Swansea Bay Tidal Lagoon began in 2011, with a development consent order made in 2015. Construction is scheduled to start in 2018. It will be the world's first tidal lagoon power plant – a U-shaped breakwater, built out from the coast, which has a bank of hydro turbines in it. Electricity will be generated on both the incoming and outgoing tides, four times a day, every day.

The review highlighted the benefits to the local economy

that a tidal lagoon could bring and that the UK "should seize the opportunity to move this technology forward now".

It is hoped that agreement for the Swansea project to go ahead will lead to further developments across the country. However, Hendry was quick to point out that this should not happen until the first project is operational and a clear long-term government strategy is in place. This includes the establishment of a Tidal Power Authority to oversee the industry.

The full report can be read at hendryreview.wordpress.com

REPORT CALLS FOR ENERGY EFFICIENCY STANDARD

A review jointly published by the Department for Business, Energy and Industrial Strategy and the Department for Communities and Local Government has set out a list of key recommendations to improve energy efficiency in the UK and encourage the uptake of renewable technologies.

Each Home Counts (also known as the Bonfield Review) suggests a new approach to how consumers can be properly protected and advised when they install energy efficiency

and renewable energy measures in their homes. It proposes the use of a chartermark so that consumers can have confidence in providers, while companies in the sector will have a simplified and certain route to market.

Companies applying to use the chartermark will have to abide by three key elements in a framework: a consumer charter to ensure that all consumers receive excellent levels of customer service, a clear redress process and guarantee protection; a code of conduct that sets out how

companies behave, operate and report; and codes of practice so that the risk of poor-quality installation is minimised.

Dr Peter Bonfield OBE FREng, who conducted the review, said: "My review seeks to ensure that in the future conventional measures, such as insulation, always deliver the quality levels and outcomes that consumers have every right to expect, underpinned by the protection, service and advice so critical for householders."

"It also seeks to ensure that

new opportunities offered through the rollout of smart meters and other energy efficiency and renewable energy measures fulfil their potential in a way that informs and protects householders."

The independent review was developed with input from across the sector. Feedback gathered since its publication in December will be incorporated into detailed plans to implement the vision set out in the report.

The full report can be read at bit.ly/2lfsgOm

MATHS AND ROBOTICS AT THE SCIENCE MUSEUM



The layout of Mathematics: The Winton Gallery has been designed to resemble airflow around a 1929 Handley Page aircraft © Nick Guttridge

The Science Museum has unveiled two new exhibitions that take a look at engineering and the increasingly important role that it plays in everyday life.

The museum opened its permanent *Mathematics: The Winton Gallery* in December. It contains a variety of mathematical objects, such as

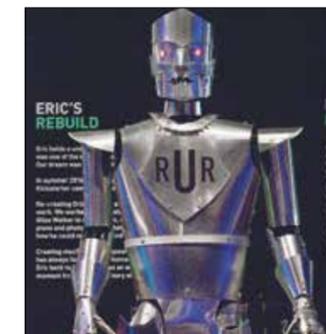
an early version of the Enigma machine and a 1920s calculator for reinforced concrete. The gallery aims to demonstrate how maths underpins a number of disciplines, including engineering.

Designed by Zaha Hadid Architects, the gallery's main feature is a 1929 Handley Page

aircraft, which is enclosed in an overhead structure designed to represent air flowing around the craft. Based on the equations of airflow used in the aviation industry, this design is also incorporated into the gallery's layout.

The Science Museum's *Robots* exhibition, which opened in February, features a collection of more than 100 robots, from a 16th-century mechanical monk to robots from science fiction and modern-day research labs. The exhibition explores more than 500 years of humanoid robots, looking at how robots and society have been shaped by religious belief, the industrial revolution, 20th-century popular culture and dreams about the future.

Visitors will also learn



Originally built in 1928, Eric was Britain's first robot. The model on display at the Science Museum was recreated in 2016, thanks to a Kickstarter campaign © The Board of Trustees of the Science Museum

about recent development in robotics research, exploring how roboticists are building robots that resemble people and interact in human-like ways.

Visit the website at www.sciencemuseum.org.uk