A WORLD WITHOUT PHYSICAL SCIENCES WOULD MEAN A WORLD WITHOUT...

- EVERLASTING DATA STORAGE
- FAST INTERNET ACCESS
- ENOUGH FOOD FOR ALL
- SUSTAINABLE PLASTIC MATERIALS
- NEW BATTERY TECHNOLOGIES
- ENERGY-EFFICIENT VEHICLES
- TREATMENT FOR SERIOUS MEDICAL CONDITIONS
- REVOLUTIONARY HEALTHCARE

EVERLASTING DATA STORAGE
EPSRC-supported scientists have developed a thumbnail-sized hard drive which could conceivably store all the books ever written – and is likely to outlast our current information era, opening a new age of ‘eternal’ data archiving.

The device was created with five-dimensional optical storage technology using nanostructured glass and ultra-fast laser writing at speeds of one millionth of one billionth of a second. It was developed through fundamental research led by Professor Peter Kazansky at the Optoelectronics Research Centre at the University of Southampton, which EPSRC has supported for over 20 years.

The technology supports a data bank of human history incorporated into a Tesla Roadster electric car, currently on its way to Mars aboard a SpaceX Falcon Heavy spacecraft, which will subsequently journey forever around our solar system.

FASTER INTERNET ACCESS
Professor Alf Adams’ ground-breaking 1980s research at the University of Surrey into infrared lasers paved the way for low-cost, low-power technology that has transformed the 21st century, from systems that cost the technology that drives the internet to barcodes and Blu-ray disc technology.

Supported by EPSRC’s predecessor, the Science and Engineering Research Council, Professor Adams’ research was based on new ways to transform information into pulses of light, and led to ‘strained quantum well laser’ technology. It can provide much higher data capacity than conventional laser devices while using less electrical energy. The internet in particular relies on this feature, which makes it possible to send information around the planet much more quickly than has ever been possible.

At first, there were no takers for Professor Adams’ technology – his idea was considered too radical – until the Dutch manufacturer Philips saw its potential. The rest is history that’s still in the making.

ENOUGH FOOD FOR ALL
FungiAlert, a company set up by two EPSRC-supported PhD students to bring their research to market, has developed a unique device for the early detection of plant disease.

The award-winning technology is the brainchild of Kerry O’Donnelly and Angela de Manzano, former students at the EPSRC Centre for Doctoral Training in Chemical Biology at Imperial College London.

The low-cost disposable device can detect the presence of soil- and water-borne plant pathogens before infection occurs – the only in-field device capable of doing so. The technology could become a key weapon against the highly destructive Phytophthora pathogen, estimated to account for up to US$7 billion of worldwide crop failure annually.

The team are working with the UK agricultural sector to ensure its products are suitable for all agricultural crops and for different farming practices and were recently granted Innovate UK funding to develop new diagnostic sensors.

SUSTAINABLE PLASTIC MATERIALS
It is estimated that whenever many people around the world take a shower the products they use to wash with can result in 100,000 plastic ‘microbeads’ entering the ocean, contributing to the eight million tonnes of plastic that reach the sea every year.

Microbeads are little spheres of plastic less than 0.5 mm in size that are added to personal care and cleaning products including cosmetics, sunscreens and fillers to give them a smooth texture.

Now, scientists and engineers from the University of Bath have developed a way to produce a biodegradable renewable alternative to plastic microbeads in a scalable, continuous manufacturing process. The beads come from a sustainable cellulose source and could potentially replace harmful plastic ones that contribute to ocean pollution.

The research team, from the university’s EPSRC-funded Centre for Doctoral Training in Sustainable Chemical Technologies, is led by Professor Janet Scott, who is also the centre’s training director. The team have received follow-on funding from EPSRC to develop their research with industrial partners.
A new battery technology has enabled lithium ions to move at rates that far exceed those of typical electrode materials – equating to a much faster-charging battery. The battery enables lithium ions to move at rates that far exceed those of typical electrode materials – equating to a much faster-charging battery. The breakthrough came from Professor Grey’s application of nuclear magnetic resonance inspection techniques to the field of materials science. Her methodology makes it possible to monitor structural changes that occur during the operation of a battery, leading to an understanding of how batteries charge and discharge.

The research behind ITM Power began with a small grant to develop a new material for use in hydrogen fuel cells. The project built on a unique material that Dr Highgate had originally developed for soft contact lenses.

In August 2018, Ziylo – a spin-out company from the University of Bristol co-founded by Professor Anthony Davis – was acquired by global healthcare company Novo Nordisk in a deal worth £623 million. Ziylo has developed an innovative technology platform which could lead to safer, more effective treatment of diabetes and benefit millions of people around the world. Novo Nordisk aims to incorporate a groundbreaking glucose-binding molecule developed by Ziylo into a radical new type of insulin that makes it easier for diabetics to manage their condition and minimises the risk of potentially fatal episodes of hypoglycaemia. The breakthrough comes out of 20 years of EPSRC-supported research at the university.

Innovative businesses based on EPSRC-supported research generate £17 billion a year for the UK economy, creating almost one million jobs. The sector’s success is in no small part due to the University of York’s work on magnetic imaging techniques.

Professor Grey, from the University of Cambridge, is co-founder of the Faraday Institution, has pioneered the development of new battery technologies including a prototype lithium-air battery. The battery enables lithium ions to move at rates that far exceed those of typical electrode materials – equating to a much faster-charging battery. The battery enables lithium ions to move at rates that far exceed those of typical electrode materials – equating to a much faster-charging battery. The breakthrough came from Professor Grey’s application of nuclear magnetic resonance inspection techniques to the field of materials science. Her methodology makes it possible to monitor structural changes that occur during the operation of a battery, leading to an understanding of how batteries charge and discharge.

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