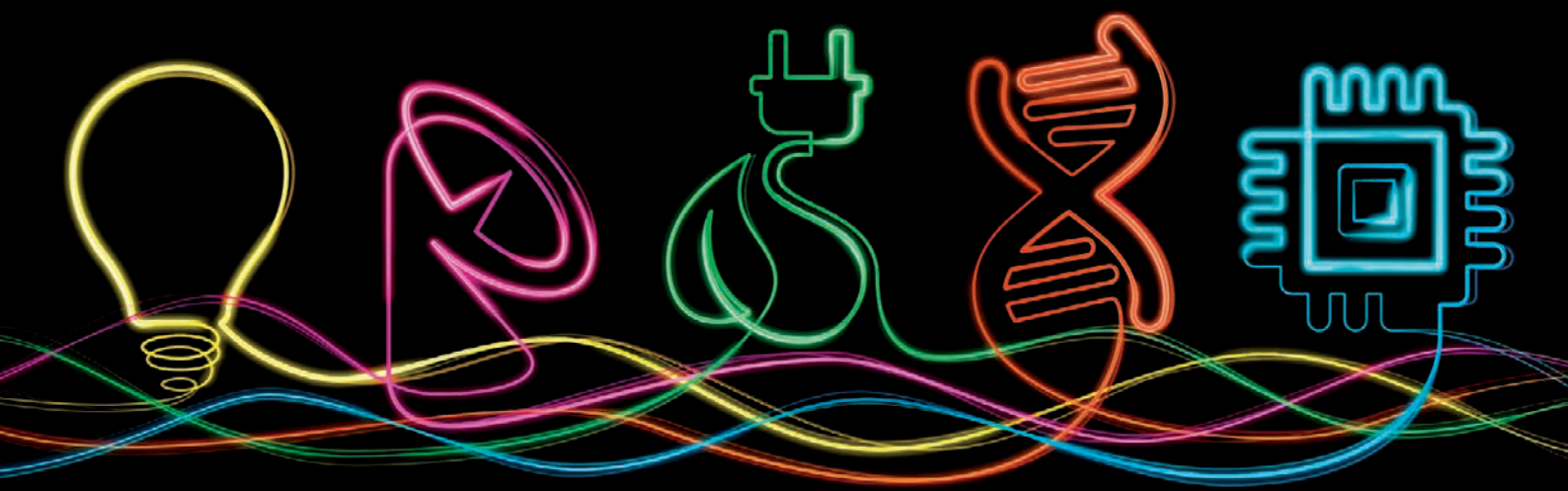
IOP INNOVATION AWARDS 2013

Innovative physics. Winning solutions.



IOP Institute of Physics

The Institute of Physics is a leading scientific society. We are a charitable organisation with a worldwide membership of more than 50 000, working together to advance physics education, research and application.

We engage with policymakers and the general public to develop awareness and understanding of the value of physics and, through IOP Publishing, we are world leaders in professional scientific communications.

Reception sponsored by the Rt Hon Dr Vince Cable MP

The Churchill Room, Palace of Westminster
Wednesday 6 November 2013

Event programme

19:00 DRINKS, CANAPÉS AND NETWORKING

20:00 WELCOME –
DR FRANCES SAUNDERS, PRESIDENT OF IOP

20:10 AWARD PRESENTATIONS –
THE RT HON DR VINCE CABLE MP

20:30 DRINKS, CANAPÉS AND NETWORKING

21:00 EVENT CLOSES

Contents

WELCOME TO THE AWARDS

Physics has been at the heart of innovations from the light bulb to the Large Hadron Collider. Today physics powers industries across the UK and Ireland. From oil exploration to aerospace and regenerative medicine to robotics, physics and physicists drive the success of the best and brightest companies.

The IOP Innovation Awards celebrate companies that make the most of physics.

They are the only awards recognising companies in the UK and Ireland that have built success on the innovative application of physics.

FOREWORD

I am delighted to support this year's Institute of Physics Innovation Awards.

The recent award of the 2013 Nobel Prize for Physics to Peter Higgs underlines the UK's pre-eminence in physics, a subject that explores the fundamental questions but, as these Awards demonstrate, also brings wide ranging benefits to our society and economy.

The Institute of Physics has done excellent work in highlighting these benefits, showing for example how physics-based sectors such as manufacturing and telecommunications contribute more than £77 bn to UK's economic output per year. Those businesses employ more people than the construction industry with the gross value of each worker being twice the national average.

It is notable how the work of our pioneering physicists feeds into new commercial opportunities for the UK: Higgs Boson helped to advance the particle physics technology that is behind MRI scanners; the Nobel prize winning discovery of graphene by Manchester University has brought within reach revolutionary new products and technologies for the UK to exploit – which is why we announced £50 m funding to create a Graphene Hub in the UK.

The five winners of the Awards – as well as the many others like them in the UK – will have their own stories to tell.
I congratulate them all. I also applaud the work of the Institute of Physics in so effectively publicising the direct and indirect impact on the economy of physics-based innovation.

The Rt Hon Dr Vince Cable MP

INTRODUCTION

DR FRANCES SAUNDERS CB FREng CEng CPhys FinstP
President, Institute of Physics

Physics at the heart of the UK economy

The value of physics to the UK economy cannot be overstated. From the skills offered by highly-trained physics graduates to the technologies brought from research labs to the marketplace, physics is central to sustaining and growing the UK economy. The five winners of the IOP Innovation Awards 2013 profiled in this booklet represent this strength, each have built on physics knowledge and expertise to create value, jobs and growth across different sectors of the economy.

1 million

PHYSICS-BASED BUSINESSES EMPLOY MORE THAN ONE MILLION PEOPLE IN THE UK – 4% OF THE TOTAL WORKFORCE.

Physics-based businesses account for more than one million jobs in the UK and contribute £77 bn to the UK economy directly; this grows to nearly four million jobs and £220 bn when indirect effects such as supply chains are taken into account. The winners of the IOP Innovation Awards 2013 put a human face to these statistics and demonstrate that the impact of physics goes far beyond these numbers.

> "The technologies described in this booklet have the potential to enable whole sectors; new discoveries, new technologies, new businesses."

The winners have produced innovations that have had significant impact, improving processes and services across medical treatments, renewable energy generation, oil and gas processing, advanced materials and biophysics. All key areas of the UK's economy, and essential areas for the UK's future prosperity.

The competitive advantage of these companies, and many like them, is drawn from the research base – without new physics, without the application of new knowledge and skills that are developed in research labs, these companies would rapidly lose their market position.

Whether through the spinning out of new technologies, or innovative, incremental gains in processes, or translating the long established principles of physics into new areas and new uses, physics can drive the UK economy. For this to be achieved we must ensure that we have a stable and sustained funding and investment environment for science and innovation in the UK, that we promote the excitement of careers in science and engineering and that we continue to increase the number of children, particularly girls, studying physics.

We celebrate the five winners of the IOP Innovation Awards 2013, and we encourage them and the UK onto further physics-based success.

£77 bn

PHYSICS-BASED BUSINESSES DIRECTLY CONTRIBUTE £77 BN TO THE UK ECONOMY.

THE WINNERS

COHERENT SCOTLAND LTD

For the development of a range of table-top, ultra-fast tuneable lasers which have underpinned advances in the biological and medical research sectors.

Advanced laser imaging has opened up new possibilities in the field of biomedical research, allowing scientists to see cellular processes as they happen, to image organs as they function, and enabled a greater understanding of how the body works.

The specialised equipment needed has until recently been restricted to dedicated facilities or to laser research labs. Coherent Scotland's Chameleon laser has allowed these technologies to move into the biology labs themselves. The key innovation was in bringing together the physics of wavelength-tunable lasers with user-oriented design to create a system fit for purpose: a one-box, table-top, tunable laser suitable for use in biological imaging systems in non-specialist laser laboratories.

The lasers are now being used to make new discoveries in a wide range of areas of bio-medical research, including in-vivo brain imaging for neurodegenerative diseases such as Alzheimer's and Parkinson's.

The company
Based on West of Scotland Science Park, Coherent Scotland was originally a spin-out of the University of Strathclyde and is now a business unit of Coherent global. Research and development, production and marketing are undertaken at their site in Glasgow, where the Chameleon laser was developed.

"The lasers are now being used to make new discoveries in a wide range of areas of bio-medical research, including in-vivo brain imaging for neurodegenerative diseases such as Alzheimer's and Parkinson's."

£100 m

SALES GENERATED TO DATE.

THE WINNERS

"Agility has enabled clinics to deliver a variety of treatment techniques more efficiently and reliably, with many patients benefiting from high-precision, faster treatments and reduced unwanted doses."

1 million

PATIENTS BENEFIT EVERY YEAR.

ELEKTA LIMITED

For the development of a novel multi-leaf collimator for use in medical imaging. The innovation is at the heart of a range of successful products, enabling safer and more efficient diagnosis and treatment.

Radiotherapy has revolutionised the treatment of cancer, providing a direct and effective tool to address treatment areas. It is a challenge to those administering the treatments to ensure that they are as safe and comfortable as possible for the patient.

Agility, developed by the Elekta team at Crawley, West Sussex is a novel device which enables rapid and precise 'shaping' of the treatment beam to meet these challenges. The product of many years of research and development, built on an understanding of the properties of electromagnetic radiation and material science, the flexible, optically-controlled 'leaf and diaphragm' design of the device allows exact beam shapes to be produced quickly, to enable focussed treatments and more controllable doses.

Since being introduced to hospitals, Agility has enabled clinics to deliver a variety of treatment techniques more efficiently and reliably, with many patients benefiting from high-precision, faster treatments and reduced unwanted doses.

The company
Elekta Limited is part of the Elekta AB group, whose oncology and neurosurgery solutions are used in over 6000 hospitals worldwide. Physicists based in Crawley worked as part of a large multi-disciplinary team, including clinical partners at Leeds and Middlesbrough, to develop the Agility device.

THE WINNERS

SIMPLEWARE LTD

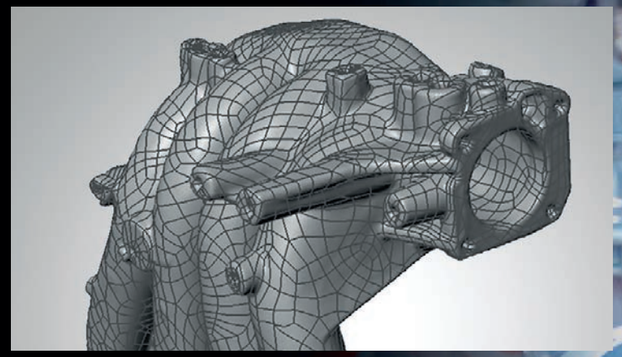
For the development and commercialisation of a physics-based computer modelling package which has brought significant benefits to the aerospace, advanced engineering and medical technology sectors.

The ability to construct computer models of real life systems, and to then manipulate them and see how they interact with other components and their surroundings, has enabled faster and more efficient manufacturing, cheaper testing and better products.

The standard techniques to create such computer models are based on first knowing the precise measurements of all aspects of a system. This is not always possible, for example in the case of the human body or mechanical components that have experienced wear. Simpleware have brought traditional techniques of physics-based modelling together with advanced scanning technologies, to develop ScanIP, a package that can use a scan of an object to create a computer model.

Using the ScanIP software, companies can simplify and reduce the cost of product testing by replacing physical trials with early virtual tests. The product is an advance in computer-aided engineering and is being used by many companies and numerous research institutes in sectors ranging from oil and gas to medical devices to advanced manufacturing.

The company
Simpleware's product range is based on research undertaken as part of an Engineering and Physical Sciences Research Council fellowship, which was successfully transferred from a university setting into a viable commercial entity. The company is based in Exeter, where product development and support is based, with an additional office in the USA.

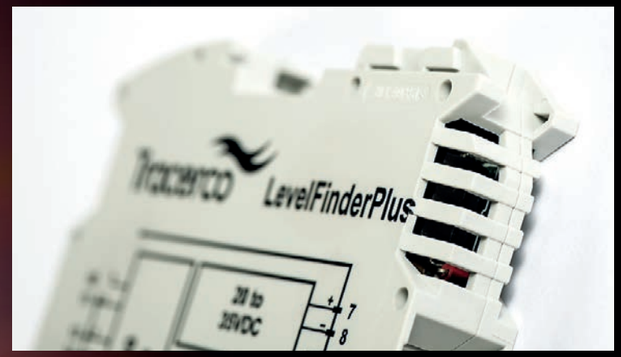


"The product is an advance in computer-aided engineering and is being used by many companies and numerous research institutes in sectors ranging from oil and gas to medical devices to advanced manufacturing."

40%

ANNUAL GROWTH.

THE WINNERS



"The innovation has led to considerable efficiency savings in the petrochemical industry and beyond by allowing for optimised processes, reduced downtime and safer operating conditions."

180

PEOPLE EMPLOYED IN THE UK.

TRACERCO

For the development of a gamma radiation-based thickness measurement system which has enabled significant increases in efficiency in the petrochemical industry.

The build-up of debris or unwanted chemical residues is a challenge in many areas of chemical processing, reducing efficiencies, obscuring the true levels of chemical or product in a system and, in some cases, creating a potential safety hazard.

Standard methods of measuring the level of liquid in a metal vessel can be inaccurate, as material build-up on the vessel's inside walls can obstruct the measurement. Tracerco's innovation, LevelFinderPlus, uses a gamma radiation source and segmented detector, together with advanced data processing, to determine both the level of a chemical in a vessel, and the amount of other material that may have built up within the container.

The innovation has led to considerable efficiency savings in the petrochemical industry and beyond by allowing for optimised processes, reduced downtime and safer operating conditions. Tracerco is in the process of building a £5 m facility specifically for their measurement unit and has plans for further development of the technology.

The company
Based in Billingham, Teesside, Tracerco began as a small research team within Imperial Chemical Industries. Today, the company is part of the Process Technologies Division of Johnson Matthey. They employ 150 people across four offices in Billingham and over 300 people in 28 locations globally.

THE WINNERS

ZEPHIR LTD

For the development and commercialisation of a novel lidar anemometry system which has allowed cheaper and more efficient wind farm siting and operation.

For wind turbines to be sited and operated cheaply and efficiently, an accurate understanding of local wind speed is critical, both to ensure that energy can be generated effectively, and also to protect the turbines from damage.

To obtain this information the standard solution is to construct a test turbine in the region of interest, however, this can be prohibitively expensive, especially in some offshore areas. The innovative solution developed by Zephir was to project a laser into the air and detect the Doppler-shifted backscatter from tiny particles and dust in the atmosphere, and use this to calculate the wind speed and direction at a given location.

The ZephIR lidar is portable, accurate, and able to take remote measurements from the ground up to and beyond the hub height of modern wind turbines. It is able to operate autonomously over many months in hostile locations, including offshore, enabling cheaper and safer development of wind farms.

The company
Now operating as a sister company to Natural Power, Zephir Ltd was originally a spin-out from research undertaken at Qinetiq. The company introduced the first commercially available lidar for the wind industry in 2004. Since then, they have grown into the market leader and an established global brand. They employ 30 staff at their base in Ledbury.

“It is able to operate autonomously over many months in hostile locations, including offshore, enabling cheaper and safer development of wind farms.”

700+

DEPLOYMENTS GLOBALLY.

A HOME FOR PHYSICISTS IN BUSINESS

With over 50 000 members the Institute of Physics has a fascinating and diverse membership that ranges from A-level students to Nobel laureates and includes thousands of engineers and industrial physicists based all over the world.

The IOP offers:

- Physics World – the leading physics magazine, recently celebrating its 25 year anniversary, available for members only in print, online and as android/ipad apps
- Chartered Physicist and/or Chartered Engineer – international qualifications for the physics trained working in all sectors
- Professional networking online via our members only LinkedIn group and our own 'MemberTalk' and face to face via our local Branches and over 50 special interest groups
- Access to scientific journals via IOPScience and the leading business journals via EBSCO business source complete
- Over 30 online learning courses on topics including negotiation skills and making money out of ideas
- Accreditation of company graduate training schemes for quality assurance and streamlined routes to Chartered Status

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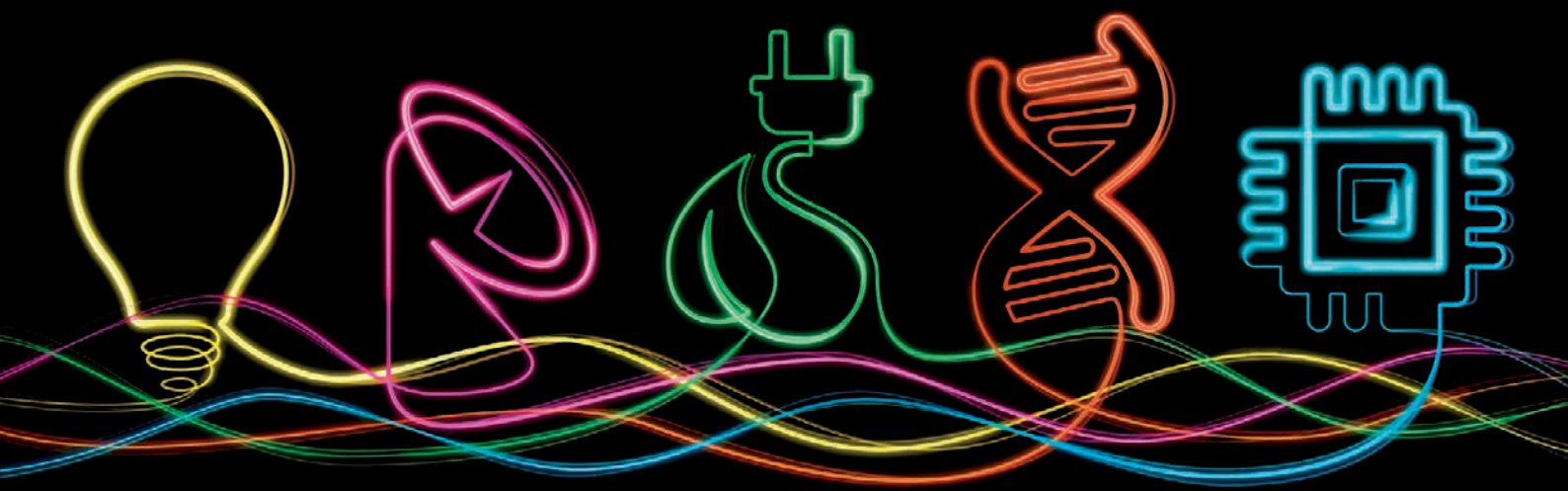

Charity registration number 293851
Scottish Charity Register number SC040092