



## HiPER Laser: The new approach to Fusion energy



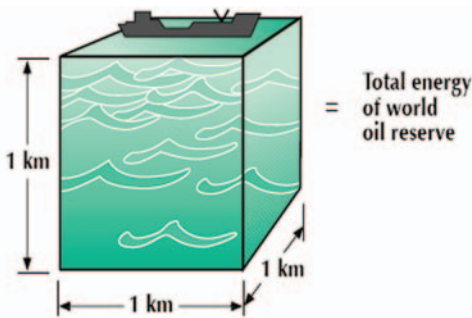
**We celebrate 50 years of lasers with an extended edition of the Newsletter and lead with an update on the world leading HiPER project. WOF has long since championed this initiative – the ultimate source of green energy – not least because of the connection with the large optics capability at OptIC!**

As you soak up a healthy level of the sun's rays this summer, think of the processes taking place deep inside the sun... our own natural 'fusion reactor'. If we could reproduce the process of fusion on earth, we could have a long term sustainable energy source for the future.

The HiPER project is a UK led European research collaboration, focussed on harnessing Fusion for energy. Funding for a 3-year Preparatory Phase is approved and already underway. Funding of the final design and build for the HiPER facility will be by agreement between governments involved.

Focusing of high energy, mega joule level, laser pulses for a brief instant onto a small(50 microns) target fuel pellet produces extremely high (Gigabar) pressures within that tiny piece of fuel ... equivalent to the weight of ten aircraft carriers pressing down on the end of your thumb! Such immense pressures cause fusion to begin in the 'heavy' hydrogen isotopes, deuterium and tritium.

So where would we find these materials? The primary fuel source (deuterium) is easy to extract from water, in fact a 1 cubic kilometre of water contains the fusion fuel equivalent of the entire world's oil reserves!



Fusion produces no carbon emissions and no long lived radioactivity. A fusion power plant would be intrinsically safe, as it contains only tiny amounts of stored energy. Stop firing the laser and the reactions stop too!

A sustainable supply of energy for the future is a priority for mankind and fusion could ultimately be the answer. It is too important to risk taking a single path to this energy goal. Both magnetic confinement and laser driven inertial confinement approaches are working in parallel to solve the challenges we face.... a logical strategy when the stakes are so high!

As we move towards harnessing fusion many different lines of development will run in parallel to achieve the aim. These include plasma physics, fuel pellet production and delivery, laser technology, fusion chamber materials and the technology for conversion to electricity.

Why is this all happening now? In the next 2 years the National Ignition Facility at Lawrence Livermore in the USA is set to exceed 'energy break-even' for inertial confinement fusion, a World First for fusion experiments, with more energy released from the reaction than is

needed to drive it. Once this is achieved we need to improve and integrate these processes, defining how electricity can be produced on the industrial scale ... from nature's own energy source.

HiPER will be a 'test bed system', with two groups of powerful lasers. First a very short pulse at 200 kilojoules will strike the fuel pellet from many angles delivering a symmetrical shock wave towards the pellet's centre.



'Fusion target – Green arrows show compression beams - Red arrow the ignition pulse'

This will compress the core of nature's lightest element to 35 times the density of lead and raise its temperature to a searing 100 million degrees Celsius. Precisely timed to synchronise with the pellet reaching maximum temperature and density, a second laser pulse will strike the core's centre, a thousand times shorter yet with three hundred times the energy-density of the compression pulses. This will raise the fuel's temperature and pressure higher still, to the point at which fusion begins ..... 'Ignition'!

This final 'triggering pulse', delivered when the fuel when it is already so hot and dense, is like the spark plug in a petrol engine. The HiPER project will fire this short and intense 'ignition' pulse to strike each target fuel pellet as it reaches the centre of the fusion chamber.

Perhaps the key challenge for the photonics industry is that HiPER will repeat the process ..... ten times per second !

The preparatory phase of the HiPER Project will complete in 2011, with the technology demonstration phase scheduled to run until 2018. Once the Governments involved are ready to proceed, the construction phase is planned to begin in 2016 with the HiPER Facility operational around 2023.

A project of the scope of HiPER will develop in planned stages, each setting in place the necessary elements for the next. Preliminary projects whose output feeds into HiPER include: PETAL; a high power long and short pulse laser system based in the Aquitaine region of France, DiPOLE; a proposed diode-pumped development at the UK's Central Laser Facility, HiLASE; a diode-pumped high repetition rate laser system in the Czech

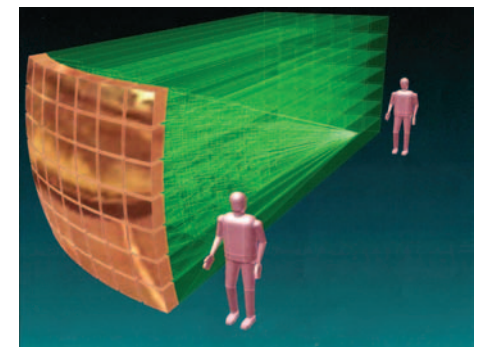
Republic, ELI; a European high intensity laser facility with a number of individual sites in the EC; and the Vulcan 10PW project; a large UK laser upgrade using new amplification techniques. These projects, including HiPER, collectively represent a huge potential investment.

All of these projects will have specific and unique optical requirements and, between them, they will commit a significant percentage of their budget to acquiring high specification optics.

The British Isles has a long tradition of manufacturing high quality optics, but has never specialised in extremely large aperture requirements. Recent advances, driven by the Extremely Large Telescope field, have increased the options in the UK for manufacture of large laser optics. The UK optics industry will derive significant benefit from increasing investment in large coating capability with high damage threshold, coupled with the new capabilities in polishing large scale optics.

With perhaps 70 large aperture beams, the optics requirement for HiPER is likely to be for hundreds of large aperture mirrors and lenses, all with demanding specifications.

Looking at developments in other fields which may benefit the HiPER project, Rutherford Appleton Labs are keen to develop ideas with the telescope community to apply phase matched segmented focussing optics to the Ignition Laser.



'Potential 'ignition' laser focussing array – a way to bring telescope and laser technology together'

Other technologies in which major development is required include diode technology, for pumping the laser medium, large aperture sintered Ytterbium doped YAC ceramics as a laser medium, and high damage threshold coatings capable of handling sustained high rep rate (10 Hz) laser pulses.

With suitably targeted investment in equipment and product development there is high potential for optics suppliers in the British Isles to win a significant share of these projects. [www.hiper-laser.org](http://www.hiper-laser.org)

**PHOTONEX 10, Telford 3rd & 4th November**  
**WOF look forward to meeting colleagues at the new PHOTONEX venue**

# Objectives of the ESO/E-ELT Mirror Project at OpTIC Glyndŵr are Closer

Since the last newsletter in the autumn of last year, the OpTIC led consortium has made astonishing progress in developing the production and testing facility for the E-ELT primary mirror segment prototypes project. This facility has two substantial and interdependent components: The polishing machine on which the large glass segments will be figured to meet the demanding ESO (European Southern Observatory) specification and the Optical Test Tower (OTT), which will measure the segments to monitor the polishing progress and prove that the specification has been met. Both the Zeeko IRP1600 polishing machine and the Test Tower structure were delivered and assembled over the Christmas period. Since then the polishing machine has been undergoing acceptance tests and process trials and is now ready to polish the first major piece of glass, the "Master Spherical Segment" which will become a key part of the system for testing the mirror segments.

Work on the essential equipment required to deliver the functionality of the Test Tower has progressed at an aggressive rate since Christmas, including the acceptance testing of various major mechanical, optical and electrical components of the OTT.

An essential part of the OTT, the "Top Spherical Mirror", was originally planned to be mounted into its cell, and then fitted in position on the tower by a team from the US company, Brashear L3-Communications, who had manufactured the mirror to our specification. Unfortunately, their travel plans fell foul of the Icelandic Ash Cloud, and so they were unable to visit OpTIC to complete the work. However every cloud...! The absence of the Brashear engineers meant that an alternative had to be found quickly. The project team at OpTIC took a deep breath and agreed to take on the challenge of completing the work, which they have now done in excellent fashion, which has culminated in acceptance of its capability by the customer ESO in May.

On the downside, the Ash Cloud has introduced a two week delay to the project plan, although we have introduced extended working arrangements to mitigate the effect.

There has also been excellent progress by the polishing development team in meeting the exacting ESO mirror optical surface and edge specifications. Confidence is high that these will be met when the first segment begins its treatment in August this year for a planned



OpTIC Glyndŵr E-ELT team

completion by September which will coincide with our Large Optic conference on 21st and 22nd September.

The Project Team at OpTIC is now around 20 people all working flat out to achieve these demanding timescales.

In parallel a new report has been completed detailing the future opportunities for the World Class Development Facility that has been developed at OpTIC, and the commercial department are hard at work securing the next contract! So the future looks just as encouraging and exciting as it is now!

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The Duke of York's duties in his role of UK Special Representative for International Trade and Investment, include visiting industrial businesses, such as Corus, to find out more about them.

Corus took pride in showing His Royal Highness, around its galvanizing line and PV Accelerator facility.

Corus's objective remains to manufacture (at an industrial scale) dye-sensitised solar cells on metal roof

## HRH The Duke of York tours Corus's Deeside plant

cladding. They are still in the development phase of the project, which has benefited from support by the Welsh Assembly Government. The visits of HRH Prince Andrew and the Deputy First Minister Ieuan Wyn Jones recently shows the amount of interest in the development of new photovoltaic technologies.

The Duke of York was joined by a number of local dignitaries for the unveiling of a plaque to commemorate his visit. Lady Janet Jones (High Sheriff of Clwyd), Lord Barry Jones, Councillor Colin Legg and Mr Colin Everett of Flintshire County Council, and Councillor David Barratt, Chair of the Council at Connahs Quay.

Peter Strikwerda, Managing Director, at Corus Colors, commented: "It is a fantastic honour to all at Corus to have a member of the Royal family visit. We are delighted

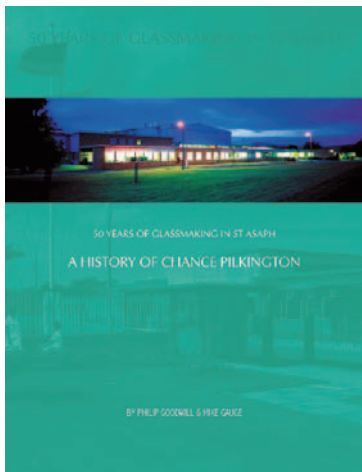
to host the visit and thoroughly enjoyed meeting with The Duke of York.

"As one of Shotton's biggest local employers, Corus has a vital role to play in providing jobs for local people and contributing to the local economy. It meant a lot to us that HRH took time out of his busy schedule to visit us and find out more about our business."

The Duke of York is the third generation of royal visitors to the Corus site. Both King George VI and Queen Elizabeth paid a visit in 1941 and 1943, to help boost local morale during the War. Prince Phillip then followed suit in 1953 to mark the opening of the new melting shop and first blast furnace and coking plant on the site.

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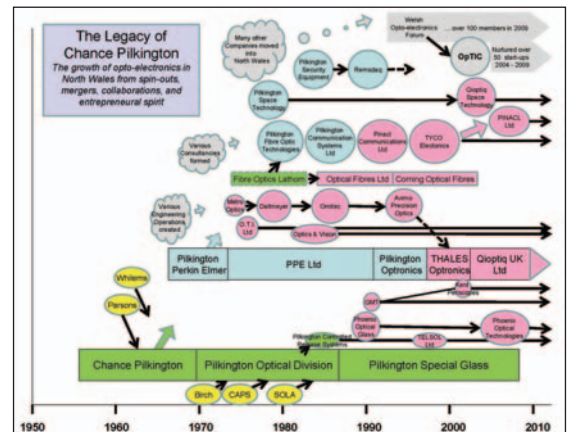
## 50 years of glassmaking in St Asaph



Chance Pilkington generated prosperity for its employees and families which still today is a cornerstone of everything that happened in the Vale of Clwyd from that point. The one common thread through the journey is the people. The former farm labourers, clerks and shop assistants who secured jobs at wages they only dreamed of were given career opportunities in a modern technical and business environments. These people created opportunities in a modern technical and business environment. These people created the many 'spin offs' which today are so successful and important to the locality, to industry and to the future, see the Pilkington legacy chart extract from the foreword by Trefor Jones, CBE & Lord Lieutenant of Clwyd.

Many thanks from WOF to Mike Gauge and Phil Goodwill, two former colleagues of CP for compiling the excellent history of CP and its people which was published recently. Copies are available at £10 each, the proceeds of which will be donated to St Kentigern's Hospice.

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Tel: 01745 535235



# Dulas Ltd and the Heron Tower Project

Heron Tower in the City of London is proposed to be the tallest building in the UK and have an aim to break out of the box of commercial high rise developments, by using inventive technologies which enhance the efficiency and sustainability of the building.

Dulas Limited, are pleased to announce, that their Solar Department is providing expert advice and technical backup, whilst helping to Project Manage this development. The high tech building will create an advanced business life environment successfully integrating the latest PV laminate technology, providing shading whilst generating low carbon electricity at the same time. The vertical walls of the 6 glass lift shafts incorporate Solar Optical Glass laminates with a total output of around 150kW creating a minimum 10% planning regulation for on site energy generation.

The development will be 202 metres high (663 ft) creating 48,836 square metres of business

accommodation on 36 levels. The office accommodation is designed on a 3 floor village concept which is an original and inspiring development in office design and efficiency. Floor 38 to 40 houses a restaurant and sky bar with the basement levels used for retail, parking, storage and management services.

Sustainability was high on the design agenda and the building has achieved a BREEAM rating of "Excellent". Extensive use of clear glass on the building facades maximises daylight to the office floors, whilst a veil of photovoltaic cells on the South elevation generates renewable energy and helps to create a solar shield.

Visit [www.herontower.com](http://www.herontower.com)  
To see what Dulas have to offer on renewable energy, visit [www.dulas.org.uk](http://www.dulas.org.uk)



Heron tower



## Phoenix Optical Technologies Ltd opens a new sales office in Leicestershire

Phoenix Optical Technologies Ltd CEO Tony Palframan is delighted to announce that Mr Graham Cole has joined the Company. Graham has many years experience in a sales role dealing with prime Contractors both in UK and Europe.

He started his working life in Leicestershire as a trainee coating engineer at what was Vinten Electro Optics which became Coherent and is now CVI Melles Griot and worked his way through the organisation finally joining the sales team in 1995.

Tony Palframan said that as his Company is now developing more into the supply of finished optics there was a need for an experienced sales person working together with Peter Williams, Sales Director, Clare Wagstaff, IR Sales and Karen Driver "key account manager" Visible Optics.

Graham will be based in Phoenix's new sales office in Lutterworth, Leicestershire but will attend the main factory two days a week.

Graham is married with one child, his hobbies include Mountain biking, restoration of old buildings and camping weekends with his family.

Graham said "I know this is a very exciting time to be joining Phoenix and whilst after 20 years at Coherent / CVI it was a big decision to move, I felt it was the right time and I am very much looking forward to the future at Phoenix. North Wales is a beautiful location and has become a centre for Optronics in the UK."

[www.phoenixopticaltechnologies.co.uk](http://www.phoenixopticaltechnologies.co.uk)



Graham Cole



## Qioptiq – a one stop shop for photonic solutions



Fredrik Arp

Qioptiq is a global company who design and manufacture photonic products and solutions that serve a wide range of markets and applications in the areas of Defense and Aerospace, Industrial Manufacturing, Medical and Life Sciences, as well as Research and Development. In 2010 they have implemented a number of changes that herald the start of an exciting new era.

Fredrik Arp is the new Chairman and CEO. Mr Arp has held senior executive positions in large global companies for the last 20 years, most recently as CEO and president of the Volvo Car Corporation (2005—2008).

"Qioptiq is an impressive and well-positioned company in an industry that I believe is set to enjoy notable growth in the next decade," said Fredrik Arp, "Though I have just begun my work here, I can already see that Qioptiq has the people, the manufacturing abilities and the overall 'know-how' and experience to be a global frontrunner and cutting-edge innovator in this industry. I look forward to leading Qioptiq into the future."

The company is known for its high-quality standard components, products and instruments, its custom modules and assemblies, its leading-edge innovation, its precision manufacturing and its responsive global resourcing.

A new logo and style have been developed to assist Qioptiq in better serving its customers with an even broader range of products and services in an even wider selection of countries. Qioptiq's 2,300 employees across North America, Europe and Asia will be working ever more closely together, under one single name and brand. The new visual identity will be progressively rolled out in all of the group's business units across 2010.

LINOS (acquired by Qioptiq in 2007) and Point Source (acquired by Qioptiq in 2008), and which are currently operating under their own names and logos, will also be changing their names and logos to come together under the new Qioptiq brand.

"This rebranding project is just part of a set of broader efforts to better serve our customers and make it easier to do business with us," said John Lowe, General Counsel and Director of Communication for Qioptiq, "We are also going to be able to reduce some of our costs because we'll have only one brand to support instead of several."

Current branding and marketing material will be changed into the new look progressively over the course of the year. Qioptiq's now-separate websites, including those of LINOS and Point Source, will become one global website via a major overhaul not just to reflect the new style, but more importantly to make it easier for site visitors to find what they are seeking.

Finally, the company announced strong numbers in a challenging context: Despite the very difficult economic environment in 2009, Qioptiq was able to increase its sales over those of 2008 by two percent at constant exchange rates. Sales were close to US\$ 400 million. Order intakes were significantly above that level and the book-to-bill ratio for 2010 is close to 1.2. In addition, Qioptiq maintained profitability at a similar level to 2008 and is strongly cash-generative at the operating level.

[www.qioptiq.com](http://www.qioptiq.com)

# New Solar apprentices start work at DULAS – a leading renewable energy company

Dulas is based around a highly skilled and experienced team who work in all aspects of renewable energy. From policy and resource assessment right through to system specification and installation for wind, solar PV and thermal, biomass and hydro projects, Dulas provides renewable energy solutions to all sectors in the economy.

With 28 years experience, Dulas' name is associated with high quality robust engineering, and projects that deliver excellent financial returns.

As of 1st June, two new apprentices will start their three year training as part of a new scheme introduced by Dulas Ltd, the Machynlleth based renewable energy company..

Dulas' new apprenticeship scheme will provide a well paid engineering based fixed term placement, which will involve both on-site electrical installation training as well as a vocational qualification as an electrical technician.

As one of the largest employers in the Machynlleth area, Dulas designed the apprenticeship to retain young people with talent in the local economy. The offer was open to 18-24 year olds resident in Wales, with good practical skills, including ability to work at heights, and an interest in renewable energy.

The apprentices will work with Dulas engineers primarily in the installation of grid-linked solar photovoltaic (PV) systems, but there is also the opportunity for them to work with small scale wind turbines and other microgeneration technologies.

Due to a surge in the renewable energy market in recent months, Dulas' expanding solar division has already taken on two new solar installers this year. The surge for microgeneration technologies has been accelerated by the Government's new feed-in tariff initiative which came into force in April this year.

The feed-in tariff incentive means that both homeowners and businesses alike can earn a fixed income for the energy that is produced from their microgeneration installation, as well as the clean energy that is produced on their own property. The scheme also allows the owner to sell any unused electricity back to the grid for a small premium.

One such project is the installation of solar PV to 40 existing houses on Anglesey. Funded by the Welsh Assembly government's Arbed scheme, the project is part of their sustainability drive. Further work for the apprentices will include a range of sites both throughout

Wales and the UK.

PV installations are carried out in a wide range of situations including private and social housing, schools and commercial buildings. The skills required to install solar PV are primarily electrical, but good general practical skills are required to enable high quality and effective installation work across a broad range of building types.

Nick Jenkey, Electrical Engineer at Dulas said of the apprentices, "It's an exciting time for them to join the solar projects team, working with an experienced company to help deliver sustainable energy for people all over the UK".

The training programme for the apprentices will include attendance at Coleg Powys' City and Guilds (C&G) Electrical Installation Engineering Course, resulting in gaining a level 3 NVQ. Along with a few additional short courses, this along with work based training and assessment will make up a Modern Apprenticeship qualification, a transferable skill which will allow the apprentice a future career as an engineer in the rapidly expanding low carbon economy.

[www.dulas.org.uk](http://www.dulas.org.uk)

## Industrial Support for the PV Sector

The Centre for Solar Energy Research, a research group of Glyndŵr University, was established at OpTIC Technium in April 2008. The team recognized that in order to become more commercially viable and offer applied research to industry, it would be necessary to be located within an environment where business interaction was readily available.

The CSER team has previously worked collaboratively with industry through knowledge transfer projects and many of the collaborative links would not have been possible without funding from the A4B (Academic Expertise for Business) scheme. The Centre has recently been awarded funding for a Knowledge Centre entitled "CSER Thin Film Photovoltaic KTC (Knowledge Transfer Centre)". The Centre would like to thank the Welsh Assembly Government (A4B) and EU structural funds for funding this project.

The KTC project will focus on a rapidly growing Photovoltaic (PV) solar energy market area, thin film PV, the fastest growing sector, expected to become 30% of

the market by 2015 (10% presently). The project will provide businesses in Wales working in this sector with R&D problem solving support using new analytical equipment and processing/production capacities not available in the UK. This will provide the opportunity to carry out R&D and new product trials with assistance from a research centre with renowned PV experience, thereby allowing CSER to expand its research support into a new area.

The project will;

1. offer a knowledge transfer based service to businesses working in the thin film PV supply chain, where currently no support exists in Wales or the UK for the needs of this sector.
2. attract new businesses to the thin film PV supply chain.
3. support WOF and LCRI in their knowledge exploitation missions to expand opportunities in thin film PV.

### CSER Thin Film Photovoltaic KTC

**Purpose:** To assist businesses in Wales in exploiting the Thin Film Photovoltaic (PV) market either by helping businesses to identify whether current products or processes could be applied to the Thin Film PV supply chain or identify and test new products or processes that could be developed and be applicable to the Thin Film PV supply chain.

**Services:** Consultancy, Research & Development, Materials and Device Characterisation, Analytical Services, Equipment demonstrations and workshop sessions.



**Equipment:** The Centre for Solar Energy Research (CSER) has state of the art facilities capable of testing and developing a variety of PV products. Equipment includes: 4 MOCVD (Metal Organic Chemical Vapour Deposition) reactors capable of developing prototypes to commercial products, 100m2 clean room, Wet chemistry facilities, vacuum and spin coating deposition, Solar simulator, Micro LBIC, Optical Microscopy, In-situ growth monitoring, Spectral response (EQE & IQE), UV/Vis Spectrometer, 4 Point Probe, Hall-effect Measurement. The KTC will expand this capability to include a bench top SEM EDAX and a new gas handling system for commercial applications in depositing thin films.

**Users:** Thin film Materials Industry, Speciality chemical manufacturers, Solar Cell manufacturers, Analytical equipment manufacturers, Substrate manufacturers, Lamination companies, PV Installers, Electronic component manufacturers, PV Module recycling industry and any businesses interested in joining the PV supply chain.

**Contact:** [louise.jones@opticttechnium.com](mailto:louise.jones@opticttechnium.com), [web www.cser.org.uk](http://www.cser.org.uk)



CSER lab



# Pinac Solutions – High speed networking access whilst redefining long term business partnerships

## Innovation for the City of York Council

The company's most recent example in its 25-year history of developing long-term, managed service relationships is with the City of York. With Pinac Solutions' help and guidance, York is set to become one of the most technologically-advanced cities in the UK. This follows the announcement of plans to invest in a city-wide fibre-optic network, which will provide access to high-speed services up to 5,000 times faster than traditional communications technologies.

By installing a new 'dark fibre' network – to be provided and fully managed under a £13.7m 8-year contract – Pinac Solutions and one of its key partners H2O Networks will provide a fully future-proof networking environment for York, capable of supporting bandwidth speeds of up to 10Gbps, while delivering much-needed and much-improved high-speed network access to the city's 70 schools, 14 libraries, accommodation and council offices. The managed service contract will initially combine the currently separate council and education networks onto a single, unified IP network using dark fibre as the medium. Work will begin on installing the dark fibre network around the city in November, with much of the cable being laid in the city's existing sewer network – a fast and effective technique, which not only minimises disruption, but also significantly speeds up the implementation process. As well as providing super-fast broadband connectivity, the new network will also permit the delivery of innovative services such as IP telephony and videoconferencing, as well as CCTV and a variety of traffic management services. Most importantly, it will exceed

upcoming BECTA guidelines for school connectivity and will support services to around 24,000 pupils in the York area.

In periods of uncertainty, organisations have often looked for stability and reassurance through the development of long-term partnerships, in recognition of the fact that such long-term commitments provide an ideal platform for quality, business confidence and technical innovation. While this model applies across a wide range of industries, North Wales-based communications and networking specialist Pinac Solutions has been particularly successful across the public and local government sectors, where stability and service remain essential elements in the delivery of performance and value for taxpayers.

In recent years, Pinac Solutions has also completed projects for other major clients such as Reading Borough Council, the Ministry of Defence, the Health and Safety Laboratories in Buxton, Staffordshire and Wiltshire Police and a number of NHS trusts.

### Supporting the Health & Safety Laboratories (HSL)

The new state-of-the-art laboratory in Buxton included a complete IT infrastructure worth £1.65m provided by Pinac Solutions. From the very beginning, Pinac provided consultative advice on HSL's IT requirements, ranging from the core of its central IT infrastructure to advising on the type of infrastructure required to support both future and emerging technologies. Pinac Solutions also assisted in the delivery of an enabling programme, which involved moving staff from their existing buildings to other existing and new



H&S Lab Buxton



Pinac engineer

temporary buildings to allow demolition works within the 'new facility'. This required the provision of a new site-wide fibre and voice infra-structure to ensure that all retained buildings and temporary accommodation had access to their voice and data services throughout the project.

Pinac Solutions' dedicated on-site service team are fully familiar with the HSL network and can provide instant and consistent engineering resource. This type of contract delivery allows HSL to control expenditure through the Pinac Solutions team that has now become part of the organisation's culture. [www.pinaclsolutions.com](http://www.pinaclsolutions.com)

## A new versatile optical table containment system from Laser Physics



Laser Physics, a UK distributor for laboratory laser safety solutions have brought a new and exciting optical bench laser safety system to Europe, the **Kentek Table Guard Barrier System™** is now available. Highly configurable, the system can be fitted to any optical bench in standard configuration or a customised layout, with options suitable for both imperial and metric optical tables.

Panels comprise of the very successful Kentek EverGuard barrier system or acrylic viewing windows.

The EverGuard panel utilises the latest techniques for absorbing and diffusing the laser beam with a black anodised surface & light-diffusing texture.

BS EN 12254 :1998 tested and rated at over 1200 watts/cm<sup>2</sup> for at least 3 minutes

Acrylic windows, appropriate for your laser, provide ideal viewable window protection, workstation viewing ports, and optical table enclosures. Benefits include durability and scratch-resistance with excellent optical clarity.

**contact: Tel: 01829 773155 info@laserphysics.co.uk**



## IQE announces new 6" wafer capability for CPV solar applications



Increased wafer sizes are an essential step in ensuring the provision of high quality and highly efficient solar power generation at lowest possible cost. Current CPV technology is based on 4" diameter wafers but IQE's new capability has demonstrated unsurpassed performance and excellent uniformity across 6" (150mm) diameter wafers. Peak multi-sun device performance is the same for both types of substrate and approaches the best previously achieved on 4" substrates using the same process.

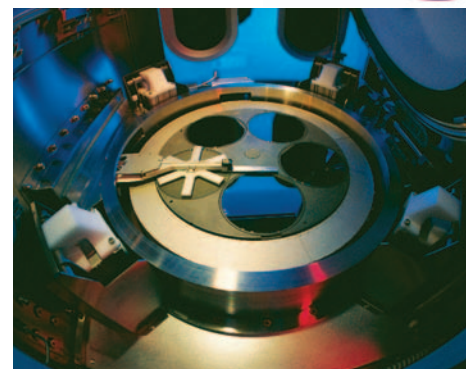
**Dr. Drew Nelson, Group CEO and President said:** "Delivering 6" diameter wafers for CPV applications is an important milestone for IQE and our experience as the world leading outsource manufacturer of GaAs based wafers has enabled us to develop the capability to produce multi-junction solar cells on both GaAs and Ge substrates with comparable results, fully scalable from our well-established 4" process in terms of performance, uniformity, and yield.

"Our 6" CPV wafer products have generated a great deal of interest at both the cell supplier and systems-

supplier level, and have demonstrated excellent performance and uniformities on which we will continue to build"

IQE the leading global supplier of advanced semiconductor epitaxial wafer products and wafer services to the semiconductor industry, has developed epitaxial processes for producing high efficiency, triple junction concentrator photovoltaic (CPV) solar cells with comparable results on both 6 inch diameter germanium (Ge) and gallium arsenide (GaAs) substrates.

IQE has been supplying the global chip industry as a pure-play contract manufacturer for more than two decades and is established as a leading player in GaAs based epiwafer products for wireless applications including RF components for mobile phone handsets. The Group, which has manufacturing sites across Europe, Asia, and the USA has been working with a number of key partners during the last two years to develop advanced, multi-junction solar technologies for the provision of large scale renewable energy.



MOCVD supply tool

**Contact: cmeadows@iqe.com**



The Advanced Photon Source Synchrotron, Chicago

Paul Murray and Jon Kelly from Instrument Design Technology LTD attended the Advanced Photon Source

## Instrument Design Technology at the APS Users Meeting in Chicago

(APS) annual synchrotron users conference in May, 2010. Dr Jon Kelly was an invited speaker on the subject of "cutting edge" double crystal monochromator (DCM) design. The talk was well received and helps to give IDT a good name on the international synchrotron instrumentation stage. IDT manned a popular stand within the trade exhibition and met with many of Paul Murray's contacts, which he made during his time working at the APS. There was a lot of interest in our small KB, X-ray micro focus mirror system. The attendance at the trade show provided a good opportunity for IDT to discover useful companies and products which are available in the US.

The facility is receiving a significant amount of funding for an upgrade program in the coming months. IDT managed to firmly place its name on the supplier list as well as meet to discuss detailed design studies and products.

Contact: [www.idt.co.uk](http://www.idt.co.uk)



## Light in the East

Professor Alan Shore from Bangor University has been awarded support by the Japanese Society for the Promotion of Science (JSPS) to enable him to make a 5 month research visit to the Nara Institute of Technology (NAIST), Japan. As a national university composed solely of graduate schools, NAIST conducts advanced research and educates accomplished individuals to support the development of society through science and technology.

At NAIST Professor Shore will work in the Ultrafast Photonics laboratory headed by Professor Hitoshi Kawaguchi in the Graduate School of Materials Science. During his visit to NAIST Professor Shore will perform collaborative research on advanced semiconductor lasers including nanolasers.

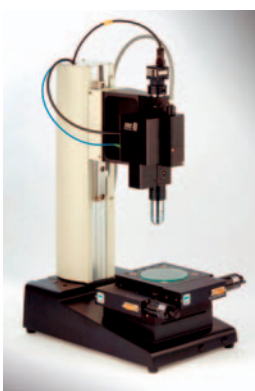
During the period in Japan he will also undertake duties as an invited speaker International Conference on Communications and Electronics (ICCE 2010) in

Nha Trang, Vietnam. He also plans to attend the International Semiconductor Laser Conference (ISLC), in Kyoto, Japan. This conference is included in the Laserfest celebrations of the 50th anniversary of the first report of laser action by Theodore Maiman on May 16 1960.

**Professor K Alan Shore**  
**School of Electronic Engineering**  
**Bangor University**



Photonics tubes



### Microscopic vibrations measured

Armstrong Optical Ltd, founded in Northampton in 1997, are known throughout the metrology market as suppliers of a wide range of systems for the measurement of parameters such as shape, form, finish, distance, vibration etc as well as supplying

high-precision optical components and optomechanical assemblies for all wavebands, thermal imaging cameras and optical test instruments

Armstrong have added the new laser microscope vibrometer from SIOS Me,technik GmbH to their product portfolio. The **Nano Vibration Analyser (NVA)** is a fibre-coupled laser interferometric vibrometer integrated into a

precision technical microscope designed for dynamic studies of micro structures, MEMS and cantilevers.

Flexible sample positioning is achieved with a 50x50mm X/Y translation stage and the vibrating object can also be viewed on a PC by means of a USB camera. DC deflection measurements as well as spectral analysis up to a frequency of 2 MHz are possible. Amplitudes can be measured with sub-nanometre resolution. The control software controls scans and displays results of the FFT transform and allows data storage and export.

This is set to become an essential in any MEMS or microstructure lab as it allows the determination of vibrational spectra and shapes and resonant frequencies using non contact technology.

Contact: [info@armstrongoptical.co.uk](mailto:info@armstrongoptical.co.uk)  
Web: [www.armstrongoptical.co.uk](http://www.armstrongoptical.co.uk)



## MediWales

MediWales is the industry-owned forum, supported by the Welsh Assembly Government which exists to address the needs of the life science sector in Wales. Over the years this role has evolved to become the sector-representative voice, point of contact and source of sector intelligence.

We provide our members with networking opportunities, and work towards updating them on current industrial issues, such as how to access clinical expertise and NHS markets, international trade opportunities, and support for research and development.

During this time the forum has delivered promotional opportunities through publications. We produce 2 magazines, the MediWales Review, which includes articles and case studies of our members, and sector specific information for Welsh life science companies, and is distributed both across Wales and at international trade fairs and exhibitions.

We also produce a national magazine on behalf of the UK Medilink network, called UK Lifescience Industry. Replacing the former Medilink Review, this magazine has a distribution of 10,000, and covers national industry developments and case studies across the UK. Both members and non-members are invited to advertise in our magazines, and with a wide ranging distribution covering many regional and international events, they are an excellent way of increasing awareness of companies, products and services to professionals across the sector.

MediWales runs a programme of events throughout the year, designed to provide relevant information on key topics, and provide networking opportunities for our members. The 2010/2011 programme will cover the themes of; technology and market future watch; members showcase; research and development support; and an academic, industry, clinical networking event.

In December we will be holding our annual MediWales Awards Dinner, which recognises the achievements of our members throughout the year. The winners of the various categories are then put through to the national Medilink awards, and we are pleased that one of our members claimed the national award for Partnership with the NHS/Academia.

We also actively support collaborative events where our database and sector knowledge can be used to promote events that will deliver value to members. These may include subjects such as funding support, skills development, e business, international trade and special interest events such as wound healing and e health, and over the last year we have worked with the Welsh Assembly Government and International Business Wales to promote Medica 2009, the International Business Wales trade mission to Dubai, and BioWales 2010.

For more information, to discuss advertising opportunities and membership, please visit our website, or contact Debbie Laubach at the following details:

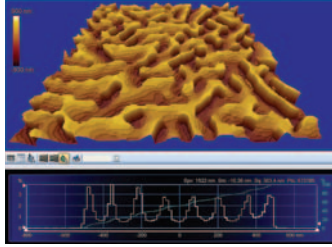
Contact: [debbie.laubach@mediwales.com](mailto:debbie.laubach@mediwales.com)  
Web: [www.mediwales.com](http://www.mediwales.com)

# New from OMNISCAN the ZeMapper Non-Contact 3D Surface Measurement System

Omniscan Ltd is a supplier of leading edge surface science instrumentation and metrology solutions to industry and academia. We provide instrumentation and consulting for measurement of surface topography (roughness, waviness and shape); layer thickness and optical properties with scales ranging from the sub-nanometre to metres, along with surface modification and laser lithography.

ZeMapper Surface Mapping System is the most accurate, highest resolution, commercially available optical surface metrology system.

A new concept in non-contact surface profiling, ZeMapper offers precise surface measurements in 3D, with the highest resolution available. Not just another optical profiler, ZeMapper 3-D Optical Surface Profilometer moves your measurement capability forward, surpassing other surface measuring systems which have not changed much in the last twenty years.



What you need to know about ZeMapper Optical 3-D Surface Profilometer:

- Non-destructive: uses only visible light for measurement
- Rigid platform improves stability and increases accuracy by reducing vibration-induced errors
- Custom precision motorized stages are computer controlled in 5 directions
- Extremely high accuracy non-contact 3D optical surface profiling
- 3D surface measurements deliver volume, shape, roughness and step heights
- Measure surface height variations to sub-nanometer resolution
- Highest resolution of any optical profiler: 4megapixel camera provides unmatched resolution and data density

Demonstrations are being scheduled. We'll measure your samples so you can see for yourself what this system can do.

Figure1 - 3D images and line profiles from stochastic grating and microlens array.

**For further information contact Russell Evans at Omniscan on 01978-844155 or e-mail us at [info@omniscan.co.uk](mailto:info@omniscan.co.uk). [www.omniscan.co.uk](http://www.omniscan.co.uk).**

# Swansea University Enhanced light-capture in solar cells using smart nano-coatings

Researchers from Swansea University's School of Engineering together with Swansea based Pure Wafer International Limited, are using nano-structures to enhance light-capture into silicon solar cells.

Clusters of gold, between 200 and 700 nm in size have unusual effects on the way light interacts with a silicon surface coated with "nano-gold". Metallic nano-structures can increase light-capture via a combination of enhanced scattering and increased absorption of incident light in the vicinity of the metal nanostructures induced by a phenomenon known as surface plasmon resonance or SPR. SPR is known to significantly increase the photocurrent of silicon on insulator (SOI) photo-detectors, and the Swansea-based solar team are now utilizing this property to enhance the performance of their silicon solar cells.

Swansea University's Dr. Owen Guy explained "The nano-gold coatings result in a huge reduction in the amount of light reflected from the surface of the solar cell. This means more light enters the cell and generates electricity. We estimate up to 20% improvements in efficiency using the nano-coatings."

"We are also experimenting with other nano-coatings including zinc oxide (ZnO) nanowires. Because they are a similar size to the wavelength of incident light, the nanowires can interfere very effectively with the light, channeling it into the solar cell."

The nano-structured surfaces can also be produced at low cost and, crucially for renewable energy technologies, using a low-energy production process – reducing energy payback times.

The next step is to incorporate the smart coatings into a working cell – made from Pure Wafer's reclaimed silicon wafers. The reclaimed silicon, a waste product from Pure Wafer's core semiconductor wafer reclaim business, gives the solar cells the lowest carbon footprint of any crystalline silicon photovoltaic product.

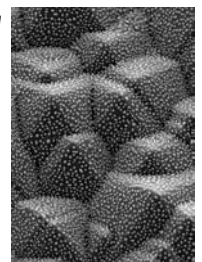
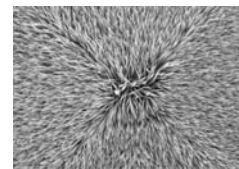
The research is funded under the Welsh Assembly Government's Academic Expertise for Business (A4B) programme, who also funded the high resolution electron microscope used to provide the crystal-clear images of the nano-coated surfaces.

The open-access microscope, based at Swansea University's Multidisciplinary Nanotechnology Centre, is a uniquely versatile imaging and chemical analysis tool. The multifunctional SEM has the capability of "seeing" materials and devices in unprecedented detail (down to 1 nm in size) in a range of technology sectors from semiconductors, biotech, to healthcare, aerospace, steel, printed electronics and energy.

The microscope can also perform Scanning Transmission Electron Microscopy (STEM) and Energy-dispersive X-ray spectroscopy (EDX). STEM is available similar to TEM, with a 0.5nm resolution and is particularly good for high contrast imaging, while EDX allows detailed elemental analysis. EDX has a 200nm resolution, but if samples are thin enough it can be used in conjunction with the STEM to give a 20nm resolution. This is the perfect tool for surface analysis of metals and polymers.

**For more information about nano-coated surfaces or the new Scanning Electron Microscope at Swansea, contact Dr. Owen Guy.**

Images: Gold nano-clusters on silicon on the right and ZnO nanowires grown on silicon on the left



# Laser Manufacturing Industry

Laser Micromachining Ltd. (LML) of St. Asaph, North Wales, has been working with industry since 2005 to promote the uptake of laser-based manufacturing and provides laser services for applications development, prototyping and batch production. Over this time LML has helped over 250 companies benefit from advanced laser-based methods and has been particularly involved in new product development cycles, where the flexibility of laser machining allows new ideas to be tried quickly and cost-effectively.

Lasers provide huge benefits to get products to market quickly – they offer a direct, single-step, in-air method for machining all materials and for producing a wide variety of 2D and 3D structures with micron precision. LML has brought these benefits of laser processing to aid industries in a diverse set of sectors including medical, biotech, displays, microelectronics and energy. This shows the great flexibility which laser manufacturing brings. In addition, laser machining can also be easily scaled-up from prototype quantities up to large volume production.

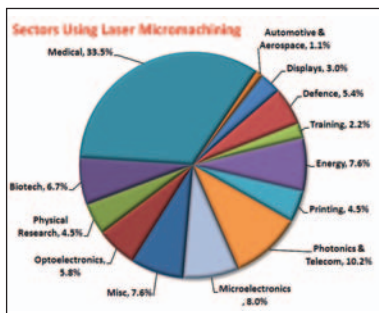
Despite the economic slowdown, UK companies are continuing to innovate and develop new products for emerging markets. Recent strong areas of interest have included: (a) patterning of thin-film coatings for flexible displays and electronic products; (b) machining of novel (often biocompatible) materials for medical products; (c) production of highly repeatable micro-features for microelectronic and energy devices; (d) production of micro-patterns on curved surfaces for miniature sensors.

These examples typify why laser manufacturing processes are becoming so important – the above tasks cannot be done easily (or at all) with alternative techniques and the simplicity with which laser processes can demonstrate design concepts allows designers the freedom to trial ideas and optimise product performance rapidly. In this regard laser micromachining really is the most flexible, diverse and powerful technique for the production of precision parts.

**Further information can be found on [www.lasermicromachining.com](http://www.lasermicromachining.com) or by contacting [r.rizvi@lasermicromachining.com](mailto:r.rizvi@lasermicromachining.com).**



Laser-cut micro-gaskets with precision 300µm holes



Sectors which have benefited from advanced laser manufacturing methods (LML data, 2005-10).

## New Focus at Millenium Lasers

Millennium Lasers is a leading manufacturer of sealed CO<sub>2</sub> laser tubes and laser systems. The laser tubes are ideal as stand alone devices for integration into laser cutting and processing systems, however, they can also be retrofitted into existing systems providing a high quality, low cost, cutting and engraving tool.

Recent developments (based on 30 years expertise in the field) include the reprocessing and repair of RF and DC excited sealed CO<sub>2</sub> lasers and power units. The Company offers this service with fast turnaround, providing a low cost option to buying new as a replacement or returning your laser to the original manufacturer. Millennium is presently servicing customers worldwide.


Another recent addition is the introduction of a range of cost-effective laser marking and flatbed cutting systems. Cutting systems with bed-sizes from A4 upto 1500cm with varying CO<sub>2</sub> laser powers from 30W to 200W are available. Laser marking systems are available at powers from 10W to 100W with marking fields from 50-300mm and above. Marking on the fly is also possible with these systems. The Company is currently working on the miniaturisation of similar systems for niche applications.

Recently, we have undertaken bespoke contracts developing new industrial processes particularly in the field of laser encoding and plastic electronics. These include manufacturing systems for electronic circuits made from flexible membranes and the company is in the process of finalising its designs for both on-line (reel-2-reel) and off-line systems for patterning of flexible electronic circuits.

Contact: paul@ntlworld.com

### Has your CO<sub>2</sub> laser run out of gas?

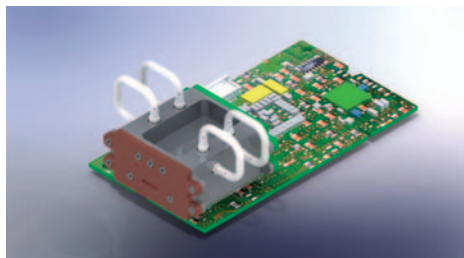
Millennium Lasers offer a cost-effective, reliable and quick re-gassing service for all types of CO<sub>2</sub> laser including: Coherent, Synrad, Rofin Sinar, Universal and many more. All lasers are re-gassed to the original manufacturers specifications and guaranteed for 12 months, contact us for a quote on your re-gassing needs.



**CO<sub>2</sub>**  
**LASER**  
**REFILL**  
**SERVICE**

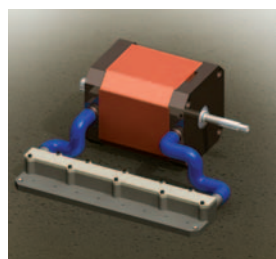
Millennium Lasers, Units 4 & 5, Llancoed Court,  
Llandarcy, NEATH, UK, SA10 6FG  
Tel: +44 (0) 1792 321828  
email: info@millenniumlasers.co.uk  
www.millenniumlasers.co.uk

## Regenerating Innovation



Energy Regeneration Solutions are a start up company based at OpTIC, in St Asaph, North Wales, and have developed a revolutionary technology, branded CHanGE, designed to Capture Heat and Generate Energy. The technology has the ability to offer a solution, with multiple applications, across a number of markets.

With increased national and international awareness on Green Energy, Green Recycling and the Environment, Energy's technological designs are centred on Regeneration Innovation. Energy intend to offer innovative regeneration solutions that change the way in which the business and wider community regenerate energy with the intention of changing loss into profit and waste into saving.



Energy motor

CHanGE, the first technology to be launched by Energy, captures low grade waste thermal energy and converts it into high grade re-usable electricity. The technology behind CHanGE has no moving parts which sets it apart from conventional

energy generators which makes it very efficient.

There is no mechanical load which optimises the conversion efficiency and can extract energy from a temperature difference of just a few degrees up to 750 degrees.

CHanGE is a closed system which ensures the well being of the environment, with no exhaust or harmful emissions which converts 25% to 35% of the low grade heat energy, currently being wasted, into reusable energy.

Steve Cobby, CEO Energy said: "Energy's marketing strategy is to enable businesses by selling them a licence to manufacture our technology and are initial focus is on the IT & Telecoms, Transportation & Automotive, Manufacturing and Developing World markets. We are currently in licensing discussions with one leading high brand vehicle manufacturer, three utilities providers, one developing world solution provider and three IT & Telecoms service providers."

"We believe the technologies Energy develops will attract new businesses into Wales, and we will assist them to increase their production capacity with applications of our technology" added Steve.

Energy are currently working in partnership with Cranfield University, who have carried out performance data and optimisation tests, providing reputable third party validation and the designs are currently going through the patent application process. Energy are looking to publish the European Patent Awards for two elements of the CHanGE technology in June-Sept 2010.

Energy have a portfolio of energy regeneration solutions they wish to bring to market following the launch of CHanGE, initially with the same IP, with applications in Kinetic and Tidal power.

**Anyone who is interested in finding out more about Energy or the technology suite CHanGE should telephone Steve Cobby, CEO Energy Regeneration Solutions on 07740087425 or visit the website [www.energy.co.uk](http://www.energy.co.uk).**

## Patentability and the search for intelligence

To be patentable, an invention must be new and not obvious (inventive). An invention, defined by the claims of a patent application, is new if no identical invention has been disclosed to the public prior to the filing date.

Whether an invention is new is taken to be a matter of fact. It is determined by comparing the feature of the invention with the content of a given prior disclosure. A game of 'spot the difference' is then played - only a single difference is required for an invention to be considered novel.

Whether an invention is inventive is a more subjective matter, but a variety of tests exist to aid us. In one test, the mind of a notional skilled person in the field of the invention is considered. The question posed is whether this skilled person would find it obvious to overcome the differences between the invention and the prior disclosure.

Clearly, the starting point of any such assessment must be an awareness of prior disclosures relevant to the invention. As part of the patent examination process, patent examiners conduct patentability searches to identify such disclosures. These may include published patent literature and other scientific or technical papers accessed by a variety of databases. Examiners then assess whether the invention is new and inventive.

A variety of tools also exist to aid organisations conduct their own in-house searches. The services of trained intellectual property (IP) professionals can also be engaged. A wealth of information can be obtained from these searches.

For example, as well as being a useful aid to assessing patentability, patent searches can provide valuable intelligence on the activities of competitors. This is because patent applications are generally published around 18 months after their filing date. The searches can also be useful in identifying potential customers for a given technology.

However they are conducted, patent searches can undoubtedly form an important part of an organisation's IP protection strategy. Managed effectively, they have the potential to feed valuable and timely information to decision makers in both the lab and the boardroom. **Dr Mark Yeardon, Yeardon IP, [markyeardon@yeardonip.com](mailto:markyeardon@yeardonip.com)**

**Technium**  
Optics

**Focus on Innovation**  
Wednesday 7th July 2010 10am - 5pm

Technium OptIC in St Asaph, North Wales is hosting an innovation showcase for everyone developing or investing in new product designs, capabilities and technologies within the optoelectronics and related sectors.

This one day event will bring together the business, academic and investment community to share knowledge and new developments in the industry.

Find out more about the exceptional R&D skills that are emerging across a wide range of photonics technology from both industry and academia including:

- Lasers
- Holography
- Large Optics & Structured Surfaces
- Photovoltaics and Solar Energy
- Polymers and Composites
- Plastic Electronics
- Ultra Efficient Lighting
- Advanced Imaging

The event will also combine seminars, investment pitches, an exhibition, tours of the facility and plenty of networking.

To register your interest, and book your place please e-mail [sonja.hardy@opticttechnium.com](mailto:sonja.hardy@opticttechnium.com) or telephone 01745 535140.









## WorldSkills Wales Team Challenge Wales in the Photonics Academy at OpTIC

This competition devised and organized by Tony Leahy, Senta, the employer-led Sector Skills Council for Science, Engineering and Manufacturing Technologies comprised of twelve teams from FE Colleges and Industries within Wales. The team's mission at the Photonics Academy at OpTIC on 26th May 2010, was to achieve a Low Power Laser Photonics Prototype Design to be focused on the benefit of Mankind, with a particular emphasis for disabled or handicapped people.

An illustrated Tutorial was initially provided to the students, with demonstrations of some of the techniques for manipulating and detecting the coherent light from a Laser. The Teams then incorporated whatever Photonics components they collected from the central equipment hub, to gel together their imaginative thinking. The emphasis of this initial phase of the Competition was to develop design ideas which were consequentially based on the investigative observations of what can be achieved with all the characteristics of a Laser Diode beam of light.

Three Judges circulated around the twelve teams, asking questions about the development of their innovative design ideas, and making observations of how the teams carried out their investigations which led to their final achievements.

The final outcome from this Skills Wales Photonics Competition resulted in the creation of twelve highly original, and very impressive, working models of low

power Laser Photonics projects. Each team provided an illustrated Presentation of their design idea to the audience. The Judges had the task of differentiating between the ingenuity and originality of each of the twelve teams Prototype Designs, and how they presented the evidence of their two-day achievement.

The Prototype Designs ranged from a wheel-chair movement optical warning device to fibre-optic vibration sensors, from a blind person's optical walking stick to deaf person's audio-to-optical indicator, from an optical water level sensor to an optical speed sensor, and from an optical proximity sensor to an optical guidance system for a blind person, and all with variations on how a Laser beam might be manipulated, and subsequently detected, in ways that would be of benefit to Mankind.

The Judges Caroline Gray MD Phoenix Optical Technologies, John Proudlove founder of Laser Physics, and Matt Bibby PhD & KTP made incisive observations and it was their extremely difficult task to select one winner from the twelve teams. Finally, the Judges selected the Swansea College Laser Signal Walking Stick for a blind person as the final Winning Prototype Design. Swansea College was presented with an engraved Glass Trophy for the Skills Wales Photonics Competition 2010, designed and created by Phoenix Optical Technologies.

The three members of the Swansea team each received an I-Pod, and every Competitor was presented with a Skills Wales Rucksack containing several gifts.

The event was supported by the European Social Fund (ESF) and the Welsh Assembly Government (WAG). The project contributed to ESF policies in Wales, particularly concerned with providing skills training to the workforce and improving vocational skills levels across the industry.

Participants of the competition were likely to be following an Apprenticeship Framework Programme in Engineering at Level 2 or 3, with some being supported via the Pathway to Apprenticeship initiative sponsored by the Welsh Assembly Government (WAG). The teams were from Deeside College, Airbus UK, Yale College, Hawker Siddeley, Swansea College, Coleg Sir Gar, Coleg Merion Dwyfor, Bridgend College, Neath and Port Talbot College, UPS Shotton, Coleg Llandrillo and Coleg Ystrad Mynach

SEMATA's initiative and input towards this highly successful first ever Photonics Design Skills Competition is appreciated. The Photonics Academy at OpTIC staff, Jane Jepson, Fraser Hogg, and Ray Davies contributed many days of preparation and organisation towards the success of this Skills Wales Photonics Competition 2010.

Contact [jane.jepson@optictanium.com](mailto:jane.jepson@optictanium.com)



## The Art of Teaching - Ingenuity in Light

The Teaching of Photonics is not a Science - it is an **Art!**

The **Art** is discovering how to enthuse more Students and Teachers towards becoming **Photonics Scientists**.

**Photonics Scientists** are involved in applying the Ingenuity that is within every **Photon** of Light.

A **Photon** of Light contains an oscillating Electric Vector which clearly defines the **Photon Data** within Photons.

**Photon Data** interacts with any given material through associating with the atom's **Orbital Electrons**.

**Orbital Electrons** have to solve the Quantum Theory equations presented to them by the **Photon Data**.

**Red Photon Data** Quantum Theory equations seem easier to solve than **Blue Photon Data** equations.

**Blue Photons**, as a consequence, are slowed down more than Red Photons in a **Transparent Material**.

**Transparent Materials** also contain some atoms which are not good at solving **Quantum Theory Equations**.

**Quantum Theory Equations** (some) cause the less able atom's Orbital Electrons to fail to produce the necessary Quantum Theory Solutions for transmission, and these Orbital Electrons simply **Scatter Photon Data** in the form of reflected Photons.

**Scattered Photon Data** gives rise to the amazingly valuable concept of **Laser Speckle**.

**Laser Speckle** is a Photonics phenomenon which always interests Students and Teachers who **See** it.

To **See** anything, one needs to possess the marvellous sensors called **Eyes**.

**Eyes** transmit to the brain one of the most amazing electrochemical responses about the concept of **Colour**.

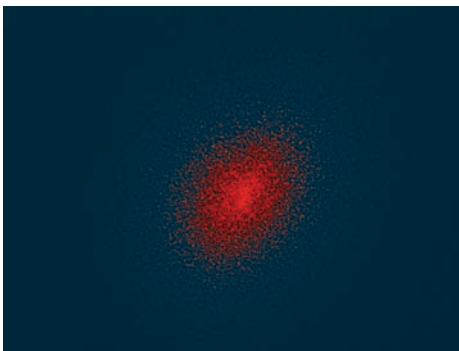
**Colour** is a response to the interpretation, by each Student's and Teacher's brain, to **Photon Data**.

**Photon Data** influences each Student's and Teacher's brain to recognize the amazing **Ingenuity in Light**.

The **Ingenuity in Light** gives rise to so much of all we recognize within our 21st Century **Art of Teaching**.

The **Art of Teaching** Photonics promises to give rise to an increase in the number of **Photonics Scientists!**

**Ray Davies, Photonics Academy at OpTIC**  
[ray.davies@optictanium.com](mailto:ray.davies@optictanium.com)



Laser Speckle

## Leader Optec Limited

Leader Optec Limited are local Welsh born company, established for over 17 years and based on the St Asaph Business Park.

We are a manufacturer of an extensive range of both fibre and copper patch leads together with pre-terminated fibre assemblies for use within data and telecommunications projects. In our specially designed copper manufacturing area we are now able to offer Copper Looms, both Cat5e and Cat6 up to lengths of 90m.

To compliment the above product offerings we are able provide a full range of fibre containment products including patch panels, splice boxes and wall boxes along with termination kits and data cabinets.

Leader Optec are a Distributor of Exfo Test Equipment. We also offer a wide range of Active products including Ethernet Media Converters, Chassis and switches.

We are pleased to announce we have recently added products to our Portfolio from the Reichle De-Massari (R&M) range.

Leader Optec's 2nd Edition catalogue is currently being printed and will include our standard products along with our new ranges. Please call our Sales Office on 01745 586600 to reserve your copy.

Contact: [sales@leaderoptec.com](mailto:sales@leaderoptec.com)

# New Knowledge Transfer Network embraces electronics, sensors and photonics

As of 1 July 2010, the Electronics, Sensors, Photonics KTN is officially launched as a consolidation of the three previously separate networks. The ESP KTN has been established by the Government's Technology Strategy Board as part of the wider consolidation of the Knowledge Transfer Networks.

The TSB says this refinement will both secure the future of the unified KTN's activities and significantly increase its critical mass, strengthening its support activities for many thousands of members across the country. The formation of the ESP KTN will also mean greater opportunities for networking, collaboration and establishing new partnerships to bid for R&D projects and tranches of UK and international funding.

Steve Welch, CEO, appointed in November 2009, commented, "I am thrilled to have this opportunity at what is an exciting time for the people and organisations, both industrial and academic, that make up the ESP and KTN communities. There are undoubtedly some fantastic emerging opportunities, despite the current economic climate." Welch was previously director of the Centre for Advanced Instrumentation Systems at University College London.

This consolidation completes one year after the consultation process commenced to identify and prioritise the activities of the constituent members of the ESP KTN, which together represent thousands of academics, engineers, scientists and other people working in these sectors. Welch added, "What won't be changing is the KTN's open door policy, meaning that our management team will always be keen to receive input and ideas from across the communities."

The ESP KTN is considering technology-inspired activities, where new inventions and developments are promising new opportunities and solutions, as well as challenge-led ideas where the KTN can take a strategic view of how to aggregate technology programmes towards specific goals. These technology areas are divided into five themes that correspond to various national and international initiatives: Smart Moves, Secure World, Quality of Life Technologies, Electricity for the Future, and Connected World.



Steve Welch, CEO ESP KTN

David Coates, Head of Knowledge Exchange at the Technology Strategy Board, answers some of the key questions about the reasons behind the launch of the ESP KTN and how it represents a step change for the better in developing the UK's great potential for innovation.

## 1. How will ESP KTN sum be greater than the parts?

The optimisation-rationalisation of the KTNs has resulted in there being fewer, more tightly-coupled organisations, which can be both a lot more efficient with their delivery costs, and more easily understood from the outside. The new challenge-led programme of ESP KTN now aligns very well with the other programmes of the TSB, such as the Innovation Platforms and hence ESP is powerfully placed to help its members participate in these programmes, and be a voice to TSB for its members.

## 2. What will be ESP KTN impact on UK sci-tech business?

The KTNs have been doing an excellent job for their communities. Going forwards, we are expecting that they will not only continue with this, but also increase the visibility of the impact that they are making. The KTNs are not a separate activity line for the TSB, they are integrated into our activities, such as support for Collaborative R&D and SBRI, and all the European funding programmes we take part in.

## 3. What are key objectives of ESP KTN in 2010-11?

Having built a sizeable network across its technology domains, the ESP KTN's management team will be concentrating on ways to capitalise on this by reaching out to new networks within the portfolio of KTNs, to connect to end-users and owners of problems that ESP members can solve.

## 4. Will the ESP KTN be more international in its objectives?

The ESP KTN is already developing an international strategy that will build on the successful engagements that we already have to increase visibility of UK capability and UK success in participation in international opportunities and programmes.

Matthew Peach, ESP KTN  
[www.innovateuk.org/espktn](http://www.innovateuk.org/espktn)

Knowledge Transfer Network

Electronics, Sensors Photonics

## Academy For Change

BIC Innovation are experts in change management, innovation and improvement – skills that are key to growing your business. BIC has launched a programme, led by highly experienced tutors, which provides the opportunity to gain best practice knowledge and includes the opportunity to take a break from the workplace, gain new practical skills and enjoy networking opportunities whilst learning. This can be provided as bespoke support, or through courses.

The Academy for Change courses have been designed to provide businesses and organisations across Wales with skills to successfully change, improve and innovate.

The programme features Six Sigma, Lean and Quality Management training, along with Innovation, New Product Development, and Project Management courses.

The following courses are available in June and July:

- **Introduction to Negotiation – 28 June, Wrexham & 1 July Bridgend**
- **Introduction to Project Management – 5 July, Bangor**
- **Global Supply Chain Management – 15 July, Bridgend**
- **Reinvigorating Lean Operations – 21 July, Newtown**
- **Developing Effective People – 27 July, Bridgend**

All courses may be supported with funding through the Welsh Assembly Government's Work Force Development Programme and other skills funding.

**For bookings and information**  
email: [a4c@bic-innovation.com](mailto:a4c@bic-innovation.com) or  
visit: [www.bic-innovation.com](http://www.bic-innovation.com)





# Chairman's report



Lyndon Jones, WOF Chairman

To mark the laser turning 50, we have devoted the front page of this edition to HiPER (High Power Laser Energy Research Facility).

From Max Planck and Albert Einstein in the 1900s to 1957 when the acronym LASER (Light Amplification by the Stimulated Emission of Radiation) was first used and the essential elements for constructing one described, to 2010 when NIF (National Ignition Facility) in the US successfully delivered a level of laser energy more than 1 MJ to a target in a few billionths of a second, demonstrating the target drive conditions required to achieve fusion ignition.

To support the UK's many high tech industries there will be a need for students to be encouraged to take up STEM (Science, Technology, Engineering, Maths) subjects to ensure their dynamic future. It is to be hoped these progressive projects will not be affected by the cutbacks in funding to our Universities.

On the subject of skills, we wish Prof Alan Shore, Bangor University who is the Photonics Academy Steering Group

Chair, all the best during his five months in the NARA Institute of Technology in Japan.

We also wish the Technology Strategy Board's ESP KTN (Electronics, Sensors & Photonics) KTN every success and look forward to continuing our association with them.

KTNS are ever supportive of industry and academia initiatives and this year the Photonics & Plastics Electronics KTN (PPE KTN) have supported several WOF initiatives. One of them 'The Solar Energy Feed in Tariff and Supply Chain event' was part of the WOF PV Special Interest Group's agenda and held in Port Talbot which as you will see from the report was of interest to government, industry and academia.

WOF were honoured to be awarded a 'Regional Cluster Mark Award' from the UK Government's Department for Business, Innovation and Skills (BIS) - see new logo. These Awards highlight Best Practice and WOF were acknowledged as an excellent example of best practice and commended for its track record in catalyzing its

network into action to deliver initiatives like OpTIC which continue to support regional growth. Read the full report on this page.

A Welsh Assembly Government Networks Projects funding grant has been awarded to fulfill specific criteria over 18 months.

A Green Photonics event in collaboration with CAFMaD is planned for October, a Bio-Photonics event and an update of the UK PV Solar Energy Roadmap will also be held this year.

**Lyndon Jones  
Chair**

## WOF PV Subgroup Feed in Tariff and Supply Chain Event at Sustainable Energy Technium, Baglan, Nr Swansea

Supported by the PPE KTN this event highlighted the opportunities to Welsh Industry with the introduction of the Feed in Tariff and the anticipated expansion of PV Solar Energy adoption in Wales.

Prof Stuart Irvine from Glyndwr University's Centre for Solar Energy Research Lab based in OptIC Glyndwr Ltd, chaired the event.

**A Welsh Assembly Government Perspective was given by Gareth Hall; Director General, Dept Economy & Transport** who advised that the topic of PV was recognised as a major contributor to this priority sector as capability in Wales and research excellence in Welsh universities was recognised. Stuart Irvine was cited as an example. However, it was stressed that R&D is only effective when tied in with commercial prosperity. To create prosperity and wealth we need the involvement of key industry players and need to be mindful of the supply chain. Expertise is not just the domain of universities. Business should be informing the research agenda of universities. He acknowledged the successes of PV in attracting new companies and creating new market opportunities and that the R&D roadmap has commercialised new products and approach.

Gareth Hall stressed that collaborations between universities are very important to allow us to "punch above our weight". He saw good examples of this in PV and said that LCRI, Swansea and Glyndwr were great partners.

Challenging targets have been set for the low carbon initiative but an opportunity exists to make PV part of the new fabric of buildings. There is already a major scheme in Heads of the Valley. Investment will include all aspects of Low Carbon: heat pumps, insulation, cladding, PV cells. Corus, Dyesol and Swansea University were mentioned in developing new materials and Corus was working with the LCRI on demo buildings. Technology demonstrators are very important as this gives an opportunity to get involved with the technology and the procurement process. The use

of networks to move innovative products into the market such as the A4B grant scheme which provides funding support to Universities. It was hoped that this would allow further enhancement of the supply chain - University to University and University to supply chain.

The FIT is an opportunity to develop the Renewables Agenda. Attendees were encouraged to capitalise on networks - particular praise was given to WOF, KTN, and LCRI who were key in encouraging the collaboration between universities and the supply chain.

**Presentations to the appreciative industry, academic and government audience were delivered by**

- **Swansea University, Prof David Worsley on the Commercialisation of dye sensitized solar cells on metal substrates.** Prof Worsley provided an insight to the link between the well established metal coating research at Swansea with the latest developments in dye sensitized solar cells. The collaboration between the Universities of Swansea and Bangor with the companies Corus and Dyesol has led to pilot line at Corus in Shotton to develop low cost solar cells onto steel roofing.
- **IQE, Andy Johnson on PV Technology and activity at IQE.** Andy Johnson advised that IQE has grown from a Welsh start-up to a global epitaxial wafer supplier for wireless and opto-electronic applications. This has placed them in a strong technical position to engage in the next major growth area of compound semiconductor materials, concentrator photovoltaics (CPV). Andy described how very high efficiency but also high cost PV cells have been developed for the space market.
- **Swansea University & Pure Wafer, Dr Owen Guy and Keith Baker on Pure Wafer crystalline silicon (green silicon).** This presentation proved the effectiveness of a strong industry and academic collaboration in silicon cell technology. Pure Wafer have

a global business in recovering partly processed silicon wafers and re-polishing to be re-used as silicon wafers. Keith Baker described the silicon wafer recovery and Owen Guy describing how these wafers could be turned into PV cells.

- **Dulas, Ben Robinson on the FiT, MCS Issues and the Skills Gap.** Ben Robinson's talk provided the vital link between our growing PV manufacturing base in Wales and the anticipated expansion in PV, module installation through the stimulation of the Feed-in Tariff (FiT) Ben explained the certification and accreditation needed by installers so that customers can benefit from the FiT when it is introduced. Maintaining high standards in the industry is vital for it to gain credibility but the lack of accredited installers in the UK will limit the rate at which PV installation will grow.
- **G24i, Stephen Burt - Personalising solar power for the global community.** G24i was the largest PV investment in Wales when it started in 2006 and by 2009 was in production with dye sensitized solar cells fabricated onto a plastic roll-to-roll process. The enterprise has brought together by the inventor of dye sensitized solar cells, Michael Grazel, with leading figures from the consumer electronics business. One of the advantages of the G24i PV cells is their excellent response under low light conditions which means they can still produce useful amounts of power indoors.

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## Cluster Mark Award for Welsh Optoelectronics Forum raises profile of Photonics Industry

The WOF was one of 15 finalists awarded Regional Cluster Marks earlier this year. This is a new award established to give recognition to the best of Britain's manufacturing clusters and their contribution to the country's economic growth.

The UK Government's Department for Innovation and Skills (DBIS) introduced this new initiative to raise the profile of UK manufacturers involved in cluster activity and to help promote their local strengths internationally. The "Cluster Mark" award is aimed to boost the reputation of the manufacturing sector as a whole and identify and highlight best practice to allow this to be shared with others.

DBIS say that successful clusters should have well-functioning networks and partnerships enabling co-operation and collaboration. In particular, the judges were searching for examples of entrepreneurial activity, collaborations and partnerships, access to a skilled

workforce and strong educational base, international links and overall profile.

The (then) Business Minister and Wrexham MP Ian Lucas, presented the UK's first-ever "Cluster Marks" at a gala event in London on the 24th March 2010. He said the judges were impressed by the way that WOF had encouraged the involvement of both large and small companies and enabled interaction between them.

WOF was acknowledged as an excellent example of best practice and commended for its track record in catalysing its network into action to deliver initiatives like OptIC which continue to support regional growth. Key elements of its success, along with details of other winners, will appear on the DBIS web site in due course <http://www.bis.gov.uk/policies/regional-economic-development/clusters-in-the-uk/cluster-mark>.

The WOF Chairman, Lyndon Jones said "Receipt of the Welsh Cluster Mark is a great honour. It raises the profile



Lyndon Jones, Ian Lucas MP Wrexham and Dave Rimmer

of our membership and, through this national event, helps to bring focus on the Photonics Industry generally and highlight its importance to the British economy".

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## Green Photonics Conference: Cardiff: 19 October 2010

The Centre for Advanced Functional Materials and Devices ([www.cafmad.ac.uk](http://www.cafmad.ac.uk)) and the Welsh Opto Electronics Forum are hosting a Green Photonics Event in Cardiff on 19th October 2010.

CAFMaD has a focus on new materials and this event focuses on new materials for green photonic devices and applications. Optoelectronics is identified as strength in Wales in both academic and industrial sectors, and is identified in the Welsh Assembly Government's 'For our Future' document, the 21st Century Higher Education Strategy and Plan for Wales.

The headline speaker is Dr Mike Leppy, who, until April 2010 was the President at the Optoelectronics Industry Development Association (OIDA), and is now General Manager and Chief Technical Officer at Translucent Inc ([www.translucentinc.com](http://www.translucentinc.com)).

During his five years with OIDA, Mike positioned OIDA as a

national USA resource in the field of optoelectronics and photonics, and represented the industry in many capacities, from talks and papers to market and technical reports, and he has been a headline speaker at many prestigious events. He drove new industry-based initiatives in fiber optics broadband as well as in green photonics...a movement which became global?

Mike positioned OIDA to assist the optoelectronics industry in its recovery, and also to help US state and federal governments in their drive to increase skilled optoelectronic jobs, R&D, and manufacturing. The annual OIDA market technology report became one of the most extensive reviews of the industry, with forecasts of the optoelectronics and photonics technologies looking out a full decade. Mike's activities at OIDA raised the profile of "green photonics," from both a technology and a marketing standpoint. It became clear to OIDA that green photonics was poised for significant global growth. With a



green photonics workshop (Sept 2008), a full peer-reviewed technical conference with over 100 papers (May 2009), and a green photonics forum (June 2010), Mike helped to better define the segment. In numerous plenary and keynote talks, he stated that photonics would quickly grow to be a strong enabler for energy efficient systems in the future.

Other speakers are to be confirmed, but there will be a mix of academic and industry presentations. There will also be workshops where industrialists can share their current challenges to inform the academic and research community of their requirements. It is hoped that some research partnerships will be formed from this event.

To register your interest or to book a place, please contact [partnership@aber.ac.uk](mailto:partnership@aber.ac.uk) or +44 (0) 1970 628734 or [susan.sheridan@optictchnium.com](mailto:susan.sheridan@optictchnium.com)

## Deeside College offer Engineering Apprenticeship courses

Supporting an apprentice within your company couldn't be easier. Deeside College with support from SEMTA and the Welsh Assembly Government is offering engineering



apprenticeship courses for the optoelectronics sector. If you are an SME you could also qualify for a wage subsidy for the first year under the shared apprentice scheme. Take a leaf out of Kent Periscopes or Optic Glynŵr's book. They were two of the first companies to sign up for the shared apprentice scheme with their apprentices Fraser Hogg and Chris Leonard. They have followed the new optoelectronics pathway and will qualify as time served engineers later this year. As an employer you can provide a structured programme to help the apprentice develop their skills as they work, in the way that is right for your business. September 2010 will see the last year of the pilot scheme so don't delay.

For more information on taking an apprentice and the support available from the shared apprentice scheme, contact Dave Vernon on 01244 831531 ext 4420.



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