Noticeboard

On the web

You are a click away from these resources

Photonics resource

The newly updated *Photonics Focus* website provides a comprehensive online resource for the photonics community. The site provides regularly updated information on news and events, useful websites, key figures and organisations within the industry. It also highlights the work of the projects supported under the LINK ISD and OSDA programmes.

Visit **www.photonics.org.uk** to explore the new features and sign up for website updates as well as your own copy of the *Photonics Focus* newsletter.

Website: www.photonics.org.uk

Opto & Laser Europe

Opto & Laser Europe is the leading European magazine for the photonics industry. Covering the global photonics industry, including opinion and analysis on the latest research and technologies, it provides its readers with news, R&D, features, Product Guides, extensive show previews and the quarterly EOS newsletter.

To subscribe free of charge to Opto & Laser Europe complete the online form at: **http://optics.org/subscribe/ole**

Technology programme goes photonic

There may be opportunities for the photonics community under the DTI's Technology Programme. Keep an eye on the website for news on future developments and information on the latest calls.

Website: www.dti.gov.uk/technologyprogramme

ECOC 2005

The 31st European Conference on optical communication will be held at the Scottish Exhibition Conference Centre, Glasgow from 25 to 29 September. Keep an eye on the website for the latest news on the conference and details of the events and workshops to be held.

Website: conferences.iee.org/ecoc2005

Comments or questions?

We would like to hear what you think about *Photonics Focus* and the articles featured in this issue. If you would like to suggest an interesting project, person or business for us to profile in the future, please send us an email or visit the feedback page on the website.

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Website: www.photonics.org.uk

Address: 26 City Lofts, 112 Tabernacle Street, London EC2A 4LE
Telephone: 020 7253 4488
Fax: 020 7253 4496

In the diary

Some key events where the photonics community will compare notes

LASER 2005 will take place from 13 to 16 June at the Munich Trade Fair Centre in Germany. The exhibition will focus on the world market for optical technologies.

Start-up companies and established key players will present the latest developments and products, such as lasers and optronics, optics, optical manufacturing technology, sensors, test and measurement, laser medical and bio technology, imaging, optical measurement systems and illumination.

Website: www.global-electronics.net/id/21308

SID 2005, from 22 to 27 May, in Boston, Massachusetts, is the leading North American show for the electronic-display industry.

With more than 500 booths and 6,000 attendees, the event provides access to a wide range of technology and applications – from high-definition flat-panel displays to the latest in OLED displays and large-area projection-display systems.

Website: www.sid.org/conf/sid2005/sid2005.html

EuroDisplay 2005

The SID's EuroDisplay 2005 will take place from 19-22 September in Edinburgh. The conference and exhibition will cover all aspects of display-related science and technology from fundamentals to advanced developments in established as well as novel display fields.

Website: www.eurodisplay-2005.org

OFMC 2005

OFMC 2005, on the subject of optical fibres and optoelectronics, will take place from 21 to 23 September 2005 in Teddington.

Contributions are currently being sought on all experimental and theoretical aspects of measurements in guided light technology and the deadline for abstracts is 27 May 2005.

Website: www.ofmc2005.npl.co.uk

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photonics focus
the newsletter for the photonics community
issue 04

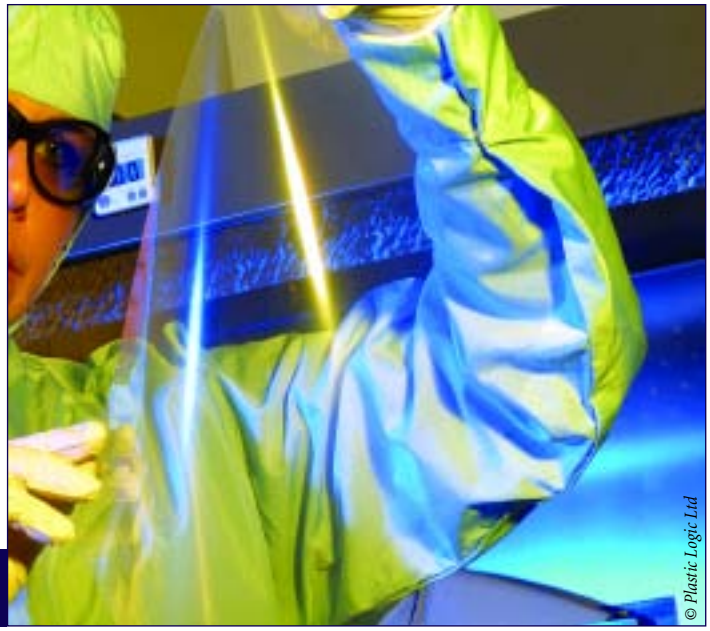
Flexible film stars

Electronic displays are on the brink of a technological revolution

Just a year into its three-year programme, the LINK Information Storage and Displays (ISD) FAMS project is changing the shape of electronics as we know it. If progress continues at its current pace, FAMS, which stands for *Flexible Active Matrix Backplane Substrates for Low Cost Electronic Paper*, could help to make electronic displays go all floppy on us.

Plastic Logic, a spinout from the Cavendish Laboratory at the University of Cambridge, is developing polymer equivalents of electronic devices. Polymers are inherently more 'bendy' and easier to turn into flexible displays than conventional silicon electronics. Polymers allow low temperature 'wet' chemical processing, so production lines could cost millions rather than the billions of dollars it takes to set up the high-tech vacuum systems for silicon electronics.

Continued on page 6



Just a year into the FAMS project, Plastic Logic is already manufacturing its first flexible displays

£100m boost for great British ideas

Science and Innovation Minister, Lord Sainsbury, recently announced the next £100 million of funding under the DTI's Technology Programme.

Lord Sainsbury urged organisations to apply for the latest competition. "This investment gives vital support to businesses taking forward emerging technologies to help make the UK a key knowledge-driven economy."

The specific technology areas covered will be:

- High performance materials in extreme and hostile environments
- Biopharmaceutical bioprocessing: a key technology that uses a wide range of techniques used in the development and manufacturing of bioscience-based medicines
- Direct writing: producing or depositing materials on complex two or three-dimensional structures
- Emerging energy technologies: technologies that can help the sustainable development of new and renewable energy sources
- Next generation lasers in manufacturing, healthcare and security
- Zero emission enterprise: developing new technologies to tackle waste creation, to find new ways to re-use and recover waste products, treat hazardous wastes, and find alternatives to landfill
- Validation of complex systems: maximising the exploitation of complex systems
- Micro and nanotechnology: nanostructured materials technology

Given the underpinning nature of photonic technologies, there are likely to be opportunities in many areas for the photonics community. The competition opens on 25 April; the deadline for registering interest is 13 June.

For more information, visit:
Website: www.dti.gov.uk/technologyprogramme/open_comps.html

Contents

Photonics looks west for record performance

Burgeoning growth in the global photonics and optoelectronics industry reported on by David Jack (see story opposite) was reflected in the outstanding success of Photonics West, hosted by the International Society for Optical Engineering (SPIE) in California's San Jose between 22 and 27 January.

The world's largest photonics event broke last year's attendance records with 15,000 attendees and a total of 876 companies exhibited, including 90 at the Biomedical Optics Symposium (BiOS) weekend exhibit.

Still glowing from the success of the show, SPIE Europe's Karin Burger is already looking forward to Optics East, formerly called Photonics East, which this year is being held in Boston from 23 to 26 October.

"The call for papers is open," she says. "Exhibit sales are in their very early days too, but the initial response is enormously encouraging and we hope to more than match last year's event, which itself had a highly satisfying exhibitor turnout."

Website: **www.spie.org/conferences/calls/05/oe**

Karin also wants the world to know about this autumn's Optics & Photonics in Defence and Security event, set to take place between 23 and 26 September in Bruges.

According to Karin, "This is the only event to draw together people from industry, government labs and academia from across the world, an approach which led to considerable success last year. We're confident of at least matching that performance this time round."

Website: **www.spie.org/events/eud**

For details of contributions from UK companies which attended Photonics West, see below.

Photonics on the march

In some enormously encouraging news, it was announced in January at the Lasers and Photonics Marketplace Seminar during San Jose's Photonics West conference and exhibition that optoelectronics revenues grew substantially during 2003.

According to David Jack, the DTI's International Technology Promoter for Electronics/ICT in North America, "We saw growth in both components and equipment enabled by optoelectronics – and this is despite severe price erosion in certain market segments such as telecom diode lasers."

With 33% growth (source: OIDA, 2005) in the overall market, the star performer was photonics components, which hit a highly impressive figure of 40%. David points out, however, that much of this growth comes from emerging manufacturing markets in Asia and does not necessarily reflect significant advances in the US and Europe.

"It's still a very strong endorsement for the growing importance of the industry worldwide," he says. "We have also seen a major shift in application patterns for components. Telecoms is no longer the major driver – displays, including flat-panel televisions and monitors, led the way with lasers for DVD players and other recordable disks also showing strong growth. Sources and detectors also show signs of recovery, driven in part by new applications including homeland security and terahertz imaging."

David highlights the speed with which market dynamics can change, particularly as new applications emerge and new technologies are developed and refined. "During the telecoms boom, the proportion by value of components used by the industry rose from 10% of the overall market in 1997 to 31% in 2000. By 2003, this had fallen again to 7%, at least in part reflecting falling prices.

"This has led our industry to seek new applications in areas such as security and defence and the life sciences. Overall, it is clear that we are operating in a buoyant, dynamic and increasingly important industry."

The DTI's International Technology Promoter programme is designed to help UK companies keep abreast of developments in the marketplace, and effect introductions to providers of technology with a view to licensing opportunities or research collaborations (not sales).

For further information, contact David Jack:
Tel: 0141 584 9585
Email: david.jack@pera.com
Website: www.globalwatchonline.com

UK firms bask in the California spotlight

Over 30 UK companies attended or were represented at the Photonics West exhibition and conference in San Jose, California, in late January. With the world's largest photonics event setting new attendance records, this was the ultimate showcase for the diversity and quality of the UK industry – and according to John Lincoln, director of business development at Southampton-based Mesophotonics Ltd, which specialises in continuum generation chips and photonic crystal devices, it was a highly successful venture.

"We launched a new product there, and were very pleased at the time with the amount of press interest we generated," he says. "Since then, it's got even better with hard orders coming to us as a direct result of our attendance at the show. We'll certainly be there again next time."

John believes that a significant proportion of the company's success was down to the DTI support that UK exhibitors received. As he says, "You just turn up with your products and graphics and get on with it. It means you can concentrate on your customers, not on administration or set building.

"For small companies like us this is extremely important, and we owe a great deal of the interest we received from the focus that the DTI's role enabled us to have."

For further information on the support available for UK companies contact:
UK Trade and Investment: www.uktradeinvest.gov.uk
Trade Fair Support: www.tradefair.co.uk

Service justifies distributors' margins

For many businesses in the UK photonics industry, seeking to sell direct to customers here and overseas can be a time-consuming distraction from the core business of developing and creating products based on new research.

This is why a sub-market of specialist distribution companies, including businesses like Laser 2000, Photonic Solutions, AstraNet Systems, Pro-Lite Technology and Engis (UK), continues to grow and prosper alongside the expansion of the photonics industry itself.

Using the distributor route to market has several advantages for business, particularly those that sell tangible products into sectors with large numbers of customers. Chief among these is the distributor's existing customer network, which may be leveraged to access new markets without needing to invest time and money in creating and nurturing relationships.

This alone is worth the additional cost of sale represented by the distributor's margin, which is justified by the end customer for the local service that they may receive. And when the distributor has specialist knowledge of the technologies and markets of both its photonics clients and end-users, it can actively help build brands.

According to David Bannon, VP of Sales and Marketing at Headwall Photonics, which has recently appointed AstraNet Systems to distribute its spectroscopy products, "Their knowledge and expertise in the field is extremely valuable to customers and provides great compatibility with the application-specific performance of spectrometers and spectral engines."

For further information:

Laser 2000: www.laser2000.co.uk
Photonics Solutions: www.psplc.com
AstraNet Systems: www.astranetsystems.com
Pro-Lite Technology: www.pro-lite.uk.com
Engis (UK): www.engis.uk.com

UK business activity

Photonics Cluster (UK) is delivering an ambitious industry awareness and technology adoption events-driven programme.

The cluster delivered seminars at the IPOT & Machine Vision 2005 exhibition at the NEC in February. Over 6,000 people visited the successful two-day exhibition and the cluster will provide a similar programme next year.

In March, the cluster opened its Aston Science Park facilities to the local business community. Demonstrations on micro-machining, etching, reverse engineering, surface profiling, measurement and high-speed photography using lasers were given to representatives from the metals, plastics, ceramics and general engineering sectors.

In April, it co-hosted "Lighting the Way Forward" with LEDs Magazine. This two-day event, covering the technology and applications of high-brightness LEDs, brought together leading manufacturers, suppliers, designers and end-users to discuss the latest opportunities and advances in the technology and applications of LEDs.

Speakers at the event – including Supertex, Color Kinetics, Enfis, Universal Science, Vossloh-Schwabe, Westinghouse, Carclo Technical Plastics, Visteon, Forge Europa, Lumileds and TridonicAtco – provided technical insight into areas such as high-power LEDs and arrays; thermal management; the use of LEDs in applications; as well as the challenge of moving LEDs into mainstream lighting markets.

Janice Walker, SPIE director of events, presenting to Photonics Cluster (UK) clients at Photonics West

International business activity

Photonics Cluster (UK) is also strengthening its role as an influential player on the international stage.

Glenn Barrowman, Photonics Cluster (UK), commented: "Through a number of strategic partnerships the team continues to generate domestic and international opportunities for members. For instance, this year we will be supporting the leading conference and exhibition organiser, SPIE, with its European programme of events as well as facilitating overseas business visits."

Recent visits included taking four West Midlands-based companies to Boston for a high brightness LED funding event in November 2004; taking 12 UK companies to Photonics West in January; and, in March, taking 10 companies to the OFC exhibition in the US.

This internationalisation is also evident in Europe. The cluster supported the Anglo-Swiss technology transfer brokering conference in Zurich in February, linking 20 UK companies with Swiss counterparts in a focused networking event. One of the keynote speakers was technology entrepreneur Dr Geoff Archenhold, who has been seconded from industry to commercialise the activities of the cluster's Photonics Application Centre.

The cluster also promoted the European Imaging Show for the Medical & Life Sciences conference in Strasbourg in March, which facilitated collaboration between companies and scientific laboratories in the emerging imaging technologies sector.

To find out how you can become involved in Photonics Cluster UK's activities please register at www.photonicscluster-uk.org

A PROJECT WITH A MISSION

The Advanced Displays Research Integration Action project (ADRIA), whose creation was reported in issue two of *Photonics Focus*, has published details of its mission and objectives.

Its mission is to strengthen the advanced displays community in Europe by creating a network of businesses and research bodies as the basis of a permanent European platform on the technology and applications for advanced displays.

Dr Eric Maiser, general manager of the German Flat Panel Display Forum, announced at launch that the question of weak European production is a primary focus for the project.

ADRIA's objectives in more detail are to enable:

- structured analysis of current Europe-wide research activities, industrial capabilities and markets in a global context
- roadmapping technology and applications to highlight opportunities for research and product development
- a coherent pan-European approach to education and training needs and implementation
- consolidation and improvement of knowledge transfer between European advanced display industries
- better dissemination of information and promotional activities

The UK Displays Network (see opposite) is an active partner in the ADRIA consortium and helps liaise with members to organise events in the UK on ADRIA's behalf.

The Scottish Optoelectronics Association (SOA) and the University of Dundee are also members of the consortium. For full details on ADRIA and the work it is undertaking, please visit **www.adria-network.org**.

Heeding the call

The fifth call under the 6th Research Framework Programme (FP6) of the European Commission for proposals on projects appropriate for funding opens on 17 May and closes again on 21 September this year.

With a total budget of 638 million, a specific sum of 47 million is being allocated to photonics components, with application areas including health care and life science, communications and infotainment, and environment and security.

According to Peter Walters, the national contact point for the Information Society Technologies aspects of FP6, "We are funded by the DTI to help UK organisations to understand the Commission's offer and to guide them in accessing the necessary information to enable them to make high quality proposals.

"Our website **fp6uk.ost.gov.uk/ist** is a good starting point. We are pleased to take calls on our support line 0871 919 0112. If you are interested you are advised not to delay as the proposal process can take longer than you think".

For further information, contact:
Peter Walters, national contact point for IST
Tel: 0871 919 0112
Website: fp6uk.ost.gov.uk/ist

An EPIC response to fragmentation

EPIC, the European Photonics Industry Consortium, was born from the sheer diversity of applications enabled by the technology.

According to Andy Carter, VP Research and Development at Bookham Technologies, "Photonics is applicable across so many industries that companies active in the field were in danger of being perceived as not part of an industry at all, more a fragmented group of businesses that simply happened to be involved in the same enabling technology."

"This is why EPIC was created – to unify our voice to give us the weight of a recognised industry across Europe and so help gain more credibility in our lobbying activities across Europe."

Other benefits for members that EPIC highlights include free or low-cost access to cutting edge information and the development of standards that enable higher manufacturing margins.

EPIC is a members' organisation that already includes UK companies such as CDT and Bookham, as well as European companies such as Philips, Osram, Aixtron and Sagem.

For more information, contact Thomas Pearsall:
Email: pearsall@epic-assoc.com
Website: www.epic-assoc.com

Networking for a stronger display industry

The use of photoelectronics in displays is rapidly infiltrating everybody's life, from everyday consumer devices like mobile phones, PDAs and laptops to more specialist professional applications in health services, aerospace and meeting public information needs.

Indeed, as the United States Display Consortium announces on its website: "Displays are the face of the digital economy, providing users with a critical link to view and interact with electronic devices that are involved in their everyday lives as tools for communication, work and play."

But according to Chris Williams, managing director of Logystyx and a co-founder of FLEXYNET (see below), there is a need in the UK for better exchange of information and expertise between disciplines if all displays are to reach the level of quality and practicality that today's technology enables.

"There are several examples in public life of major organisations that have got their display solutions desperately wrong," he says. "Often this is simply because they're not aware of the existing expertise that they could tap into. This is one reason why the DTI asked us to set up a knowledge-transfer network to enable the straightforward exchange of knowledge that would ensure failures become less common."

One example he cites is the cinema area at the Millennium Dome, where displayed images were notoriously poor. "The reason was straightforward," says Chris. "The area was predominantly white, and there was no-one in the design team who understood the fundamentals of how light would behave in such an environment. Had the architects and designers known where to find the right people, the result may have been quite different. And for every poor major public installation, there are probably hundreds of small-scale business and private displays that could be better."

The answer that has been developed is the UK Displays Network (UKDN). As Chris says, "It is a support infrastructure that gives organisations that are not specialists in displays rapid access to the right people, materials and technologies. It doesn't just cover major installations, though – it is also to be a venue where different organisations can co-operate for research as well as delivery."

For these reasons, there will be a major emphasis on training and education – but not just for end-users. There will also be a focus on training businesses to appreciate the importance of approaching venture capital firms in the most effective way and developing products and applications for which there is a genuine market.

But above all, the network exists to provide end-users with easy access to the expertise they need, when they need it. "A major problem in the UK is that there are no flat panel display manufacturers, so that people have to deal with distributors who may not have the right levels of technical expertise. UKDN is their gateway to the help they need."

That help will not invariably be highly technical, but will also provide straightforward, practical advice from network members who, collectively, have centuries of design experience between them.

The network will soon be developing and promoting best practice guidelines for public consumption and providing training for people and organisations who feel they need it. "I believe that this development will work in the interests of the UK photonics industry," Chris continues. "After all, as the public and professional users become more aware of the potential afforded by today's technology when it's correctly installed and used, the more the industry will benefit."

Anybody with an interest in becoming a member of the UK Displays Network should contact: Chris Williams
Tel: 01635 298395
Email: chris@logystyx.co.uk

Flexibility in action

FLEXYNET, a DTI-funded LINK ISD network that represents the interests of anyone active in flexible electronics and displays has recently passed its first birthday.

Founded in early 2004 to identify and address weaknesses in the UK's business and academic landscape in the sector, FLEXYNET's main objectives are to provide access to training and education resources, and create a forum to facilitate industrial and academic collaboration.

According to founder Chris Williams, "It's been a fascinating year. We've found companies with expertise in areas we didn't know existed in the UK, and are working with some of them to develop new applications for their technology."

One example is a company called General Vacuum Equipment, which has particular expertise in coating aluminium on to plastic. Says Chris, "The company produces equipment that is involved in coating the insides of crisp packets in very high volume, but now FLEXYNET members are looking at new applications which will create additional markets for them."

He sees this as just one example of how FLEXYNET is moving towards its overall objective of helping develop a "vibrant and active UK membership that is motivated to collaborate in research, development and production… to enable the creation of a globally competitive UK industry."

Project details: FLEXYNET
Started: January 2004
Duration: Two years
Contact: Chris Williams
Telephone: 01635 298395
Email: chris@logystyx.co.uk
Website: www.flexynet.net

Flexible film stars

Continued from front cover

FAMS is developing an essential core technology for the creation of flexible electronic displays. Working with DuPont Teijin Films and the Thin Film Centre at the University of Paisley, Plastic Logic is creating plastic films that are suitable for electronic displays. In particular, the project is developing an inexpensive substrate that is the foundation for the 'backplane,' needed to drive a flexible display.

One of the keys to producing commercially viable flexible displays is the use of low-cost backplane materials. Dr John Mills, VP for engineering at Plastic Logic, explains that "you have got to be able to carry out your processes on a low-cost substrate film".

FAMS has opted for PET, polyethylene terephthalate, a ubiquitous material with many uses, including bottles for soft drinks. DuPont Teijin Films is a leading supplier of PET films for industrial uses, packaging and advanced magnetic media and photo systems, and electronics.

Creating a PET film for displays requires some novel processing techniques. To begin with, the surface has to be very smooth. While many applications can live with the 'spikes,' several hundred nanometres high, that occur on good PET film, these spikes can puncture layers placed on top of them. DuPont Teijin Films has developed a way of reducing these spikes to no more than 10 nanometres, smooth enough for Plastic Logic to add its electronic layers.

Smoothness is just the beginning. The PET film has to be processed to add further layers, which can mean heating the materials. Polymer films usually expand when heated. Unfortunately, they do not always shrink back to their original size when they cool, which would also wreck the layers put on top of them. Here, too, DuPont Teijin Films has found a solution. The result is a film that reverts to its original size when it cools.

With the right PET film to hand, the Thin Film Centre at Paisley has devised ways to lay down the materials that Plastic Logic needs if it is to create the right electronic sandwich. The result is a sequence of processes that has enabled Plastic Logic to make its first flexible displays, less than a year after the project began.

The challenge now for FAMS, says Dr Mills, is to turn techniques used to make small single sheets of substrate into processes that can mass produce rolls of materials. "We need to get a substrate that you can buy by the square mile," he explains.

Thanks to the success so far, Dr Mills is confident that by the time FAMS comes to an end "we will probably have something ready for manufacturing".

Dr Kieran Reynolds, who heads the group at Plastic Logic that is running the project, is equally optimistic. "It has gone so well," he says, "that it would be good to take it forward, and to have a way of making substrates for a variety of applications."

Project details: FAMS

Started: March 2004
Duration: Three years
Contact: Nick Cousins, Plastic Logic
Telephone: 01223 706000
Email: nick.cousins@plasticlogic.com
Website: www.photonics.org.uk/project _showcase.php

Celebrating excellence: the LINK OSDA projects

The LINK Optical Systems for the Digital Age (OSDA) programme was launched in 2000 to increase the commercial exploitation of the UK science base in the field of optical technologies.

Now closed for proposals, the 25 projects supported by the OSDA programme aim to adapt the latest academic research and maximise the transfer and exploitation of technologies into a wide range of application areas, including:

- communication systems and devices
- sensing and imaging
- laser systems and applications
- displays

The LINK OSDA projects

AEROFED An evaluation of a research opportunity to realise a low voltage, field emission display for use as a multifunction, avionic flat panel
AIMS Affordable integrated monitoring systems
ALFONSO Adaptive long-wave free-space optical network solutions
DENTIM Dental terahertz imaging
DISPLAY Laser processing for OLED microdisplay manufacture
E-HOLOCAM Development of an electronic holographic camera and its application to high resolution imaging, both subsea and in-air
ELM Enhanced LCOS microdisplays
EMPIRE Embedded photonic infrastructure
FORTRAN Low cost forty gigabit transceiver
FRIDAY Fibre-radio for in-building distributed antenna systems
GAINS GaInNAs semiconductor optical amplifiers for future optical networks
IMAGER In-cylinder fuel mapping by absorption tomography for gasoline engine research
LASEWAVE Laser processing of materials for photonic waveguides and circuits
LASMAP Laser machines for advanced PCB manufacture
LASSI Laser air-speed sensor instrument
LEAP Light emission from active polymers
MOPS Multiwavelength optical processors
OFSTUNN Optical fibre sensors for remote tunnel displacement monitoring
PFIDEL Photonic fibre for industrial laser beam delivery
POROPTIC Characterisation of the physical properties of porous media (rugose surfaces) using incident light
PROTAGON Protocol agnostic optical networks
Q-LED Quantum light emitting diode for secure communications
ROFMOD RF on fibre mobile data network demonstrator
SOAPS Smoothed optical ATD packet switching
THORNS Terabit holographic optical routing network switches

Celebrating excellence

A LINK OSDA project directory is now available, highlighting the work of the 25 OSDA projects and providing contact details for further information.

There are a limited number of project directories available. If you would like to receive a free copy, please email: **editor@photonics.org.uk**

Lab notes

Reports on progress with LINK Information Storage and Displays projects

Blue lasers

The focus for the BLURAYDS project, which started last Autumn, is not so much blue movies as DVDs with blue lasers. The aim of the project is to improve the manufacturing and packaging of semiconductor lasers for use in blu-ray DVD systems.

Blue lasers create light with a shorter wavelength than the traditional red and infrared semiconductor lasers used in today's DVDs and CD players. So these lasers can read and write data at a higher density.

The project brings together academic scientists from the University of Bath with researchers from Arima Optoelectronics (UK) Ltd, a Taiwanese company with R&D operations in the UK. Together, with the support of Advanced Technology Coatings in Plymouth, the team hopes to identify and exploit new design, techniques and processes for manufacturing and packaging blue-violet DVD laser diodes for blu-ray DVD recording systems.

Project details: BLURAYDS

Started: August 2004
Duration: Three years
Contact: Professor W Wang
Telephone: 01225 383776
Email: pyswnw@bath.ac.uk
Website: www.bath.ac.uk/physics/blurayds

BLURAYDS' HVPE reactor

Organic circuits

The growing interest in creating transistors in which the electrodes, dielectric and semiconductor are all organic materials has sent materials scientists to their laboratories in search of suitable ingredients for this promised revolution. The RPOLED project – it stands for *Reactive Polymerisable Organic Light Emitting Diodes* – brings together Merck Chemicals and researchers in the physics department at Imperial College London.

The project started in January 2004 and is a combination of synthesis, formulation, solution processing, in-situ polymerisation, construction of OLEDs using lithography and an in-depth understanding of the photophysics of novel devices. The group at Imperial College is working on the construction, characterisation and photophysics of OLED devices. For its part, Merck will develop the synthesis and formulation of any new materials that come out of the project.

RPOLED is currently working on the synthesis and screening of new materials for efficient light emission. The research team has already identified a number of interesting compounds and has started to investigate their photophysics.

Project details: RPOLED

Started: January 2004
Duration: Three years
Contact: Dr Martin Heeney
Telephone: 02380 763 351
Email: martin.heeney@mercknbsc.co.uk
Website: www.merckscltd.co.uk, www.imperial.ac.uk/physics

BLURAYDS' Blue-violet laser diode

Inkjet manufacturing

Inkjet printers have already revolutionised the way in which we print from our home computers, all but wiping out the market for dot-matrix printers. Industry is increasingly interested in using similar techniques for the mass production of such devices as electronic displays. The idea is to develop electronic 'inks,' materials that can be sprayed on to surfaces.

The ELJET project, *Electroluminescent Displays by Inkjet Printing*, is developing a printable transparent conductor for thick film electroluminescent backlights for LCDs and displays. The project brings together a number of industrial partners and scientists at Nottingham Trent University.

During the two-year project the partners hope to develop an inkjet print-based manufacturing process to produce high quality transparent electrode layers on flexible substrates. Their ultimate goal is to prove the effectiveness of their process by making a flexible electroluminescent display.

So far, the project has produced a baseline formulation for a transparent conductive ink. Keeling & Walker Ltd and Patterning Technologies Ltd, two of the industrial partners in ELJET, have produced inkjet printed films with good properties.

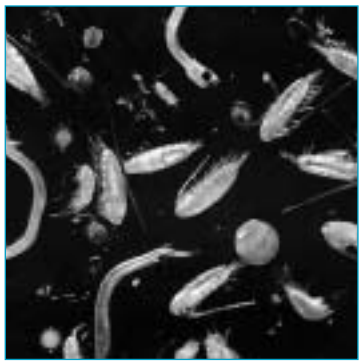
The university group is studying the effects of annealing these materials to maximise the electrical and optical properties of the inkjet printed films. The next step will be to use these materials to make the first display panels.

Project details: ELJET

Started: June 2003
Duration: Two years
Contact: Stephen Lipiec
Email: s.lipiec@keelingwalker.co.uk

Meeting the demands of plankton

An adaptation of an existing laser from Daventry-based Elforlight is set to become a major component of the electronic holographic camera (the LINK OSDA supported E-HOLOCAM project, see page 6) under development by the University of Aberdeen.



The primary function of E-HOLOCAM will be in creating underwater holographic movies of events such as the lifestyle of the plankton, although as automatic underwater vehicles (AUVs) become more commonplace many commercial spin-offs are also expected.

According to Elforlight managing director David Gibson, designing an underwater holographic camera places some specific technical demands on the lasers used. As he says, "Lasers using so-called Q-switches to produce intense pulses of light are in relatively common usage, but most don't feature the important property of coherence which is vital to recording a three-dimensional image of the filmed object.

"To create a high-quality hologram, the laser light has to be split into what we call an 'object beam' and a 'reference beam'. The object beam is reflected from the sample (a plankton, in this case) and the reference beam is mixed with this light to encode all the necessary intensity and phase information."

The challenge doesn't end there. According to David, "We also need efficient transmission through seawater. This is achieved by using a frequency doubling crystal in the laser cavity that converts its natural infrared wavelength to green light at 532nm.

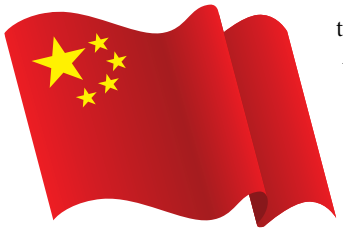
The core Elforlight laser produced 2mJ at 532nm, but because it emitted a multi-transverse mode beam with a coherence length of just a few centimetres, it was not suitable for e-holography without significant adaptation."

"Coherence length was increased to around 80cm through the careful choice of components to optimise the laser resonator and narrow the linewidth," David continues. "Overall, the coherence length was increased to around 80cm while pulses as short as four nanoseconds may be generated. The laser is now more than adequate for the applications currently envisaged for E-HOLOCAM."

Elforlight is now planning to develop further variants of the new design to meet the demands of emerging applications in the infrared and ultraviolet regions of the electromagnetic spectrum. And in a separate development, the company has developed a new compact power supply that's sufficiently robust to operate in the demanding undersea environments met in the offshore industry.

For more information, visit: www.elforlight.co.uk

The China Syndrome



The Chinese photonics industry has the opportunity to emerge among the most important in the world over the next few years – provided companies there are backing the right technological horse.

This is the view of some of those who have visited the country that's now home to the world's fastest-growing economy twice last year, most recently as part of a DTI Display Mission in September.

Mission members were extremely impressed by the quality of the people they met. Many are China-born and have gained their experience abroad – the US, Europe, Japan and Korea, for example – before being recruited back. Also, vast sums are being pumped into new university research departments and fostering close relationships between academia and business that they believe the UK could learn from.

While the outlook is very bright for the industry there in many ways, there are concerns that much of the work they saw revolves around LCD technology. If major manufacturers from Korea and Japan successfully pursue the LEP route by 2007, as they appear to intend, they may gain an immediate 50 to 60% price advantage which would make LCD unviable.

During the trip, the group visited four companies as well as research departments and the Ministry of Information Industry. According to those who attended, the trip was extremely well organised and provided a useful insight into the state of the Chinese industry.

One of the highlights was a visit to the Visionex Technology Co Ltd, the pioneer of OLED commercialisation in China. Since 2003, Visionex has become the only company that can produce commercial products. It's poised to move fabrication technology of OLED devices from pilot run to mass production, and is planning its OLED mass-production plant and evaluating equipment suppliers. The company welcomes all kinds of co-operation.

Other major companies visited included the Senzhan Tianma Microelectronic Company Ltd, an LCD and LCM manufacturer with 3,600 employees, offices in Germany and a $160 million turnover, and BOE Technology Group Company Ltd, the world's ninth-largest manufacturer of TFT-LCD display devices.

The team also found contact with the Chinese government extremely encouraging, with an open encouragement for UK industries to work with Chinese companies and institutes. To stimulate interest, they would like to hold a seminar in the UK, and are very keen to establish R&D links with British businesses.

Driving the road to profitability...

The burgeoning commercial success of photonics businesses in the UK and elsewhere is focusing minds on the drivers that companies like Southampton Photonics, Cambridge's Plastic Logic Ltd and the once-British, now US-based Diomed Inc, have in common.

Diomed has recently announced a 46% growth in its total revenues, up to $13.4 million in 2004, while Plastic Logic announced in January an $8 million first closing of its next round of private funding, with participation from new investors including Siemens Venture Capital GmbH and Nanotech Partners.

In a recent article on **www.optics.org**, David Parker – CEO of Southampton Photonics Inc (SPI), a developer of high-power fibre lasers – looked at some of the critical factors in moving a business forward from a research-based entity to one that generates revenues and profits. As he said, "Today, valuations are firmly based on a company's ability to perform and deliver the numbers."

This clearly suggests that Plastic Logic's successful funding round is based on hard commercial reality – and a comment by Teruyuki Nakazawa of Nanotech Partners demonstrates the key importance of the company's understanding of the opportunities available in its markets, which today are centred on creating active-matrix backplanes for flexible electronic paper displays.

He said, "Plastic Logic has made impressive progress over the last few years in converting exceptional science into outstanding technology. It is an incredibly innovative company and is enabling electronics to be put into places where silicon can't go."

As David Parker says, "All too often I hear academics and R&D scientists in firms say they really understand a technology and its potential. In my experience, they are actually talking about having an in-depth knowledge of the scientific issues. Before embarking on any commercialisation of a technology, it is important to conduct a serious appraisal of what is needed to create a viable product."

And by "viable", David means a product that will sell within a clearly defined market.

This makes detailed, meaningful market research a vital commodity, both for business-planning purposes and for raising the investment money necessary to develop the business. So businesses need to identify precisely in which sector their product will sit, the problems it will solve and exactly for whom it will solve them.

While Plastic Logic is seeking to develop an array of market sectors that will benefit from its technology, Diomed is focused on the medical sector with an emphasis on its patented EndoVenous Laser Treatment (EVLT®) for varicose veins. This is an outstanding example of a product that is succeeding thanks to an effective application that addresses a very real and common need. The company has now sold some 600 EVLT® systems worldwide.

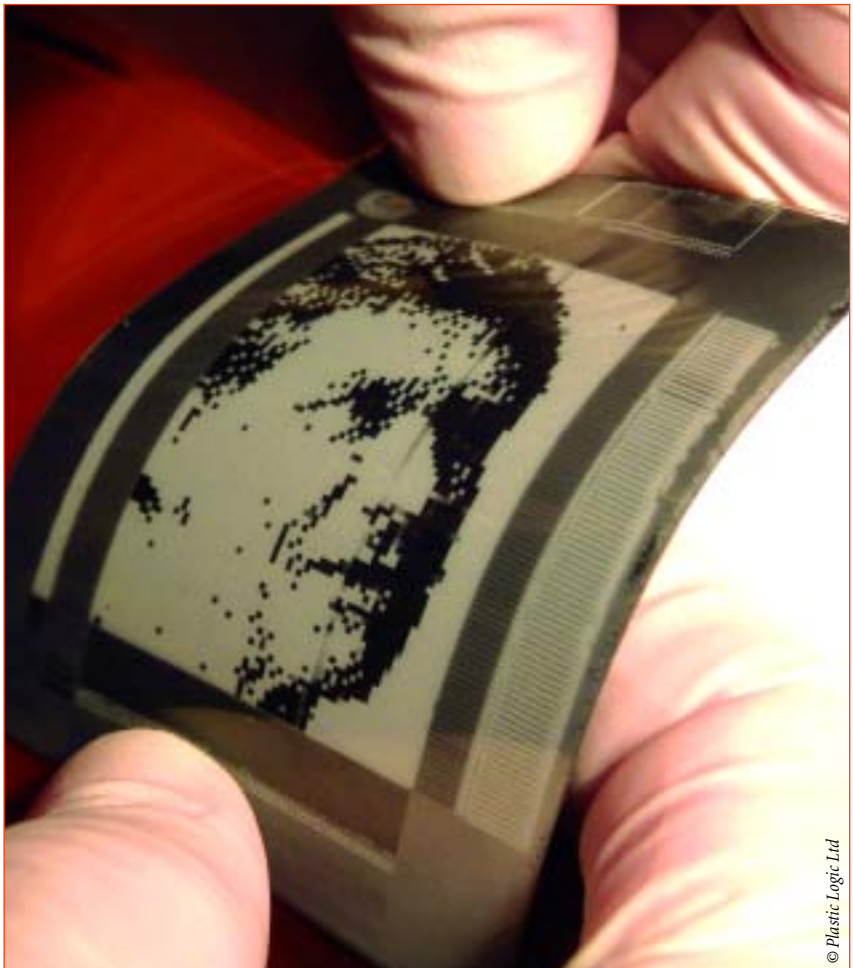
Once the product and the market have been identified and refined, it is important to consider the most effective and efficient channel, whether through direct selling or creating OEM (original equipment manufacturer) or distribution partnerships. Parker points out that the best route may change with time, "so beware of getting locked into any partnerships too early."

All young businesses need financial support – even Diomed has recently completed a $10.6 million financing round. David Parker simply advises in seeking venture capital that businesses first need to consider carefully the sums required and the timescale over which they will be needed. "Too much too early is dilutive, and too little can hinder real progress and potentially kill a company before it has had a chance to get off the ground."

And on choosing the right funding partners, he advises that businesses should look beyond simply their ability to provide money. "Work with high-calibre individuals and firms. Yes, you want their money but, perhaps more importantly, you also want them on your team. Their experience, credibility and network of contacts should be an asset."

Of course, there are countless influences, many of them uncontrollable, which affect the performance of any business. But there are factors that may be controlled, that radically boost the chances of success.

As David Parker says, "You need to marry a strong vision, a real focus on the basics and a load of hard work from everyone in the team with just a smattering of that fickle ingredient – luck.



© Plastic Logic Ltd

Plastic Logic is developing flexible displays using imaging film from E Ink Corporation

Making connections with EPSRC

Feedback following Interconnections 2005, held by EPSRC at Reading's Madejski Stadium in late February, suggests that the conference achieved its stated aims of promoting collaboration and knowledge transfer between industry and academe in the electronics sector.

A report on the event and its outcomes, together with copies of all presentations made, will shortly be available on **www.epsrc.ac.uk**, and anyone seeking information in the meantime should contact Dr Emma Lawrence on 01793 444017 or emma.lawrence@epsrc.ac.uk.

Following the event's launch at a dinner the previous evening, where Intellect Director General John Higgins made the after-dinner speech, the morning of 23 February featured an update on EPSRC strategy and activities including a presentation from David Kynaston of the Electronics Innovation and Growth Team (EIGT).

The focus then shifted to the challenges of getting a new venture off the ground – Ian Underwood, CEO of MicroEmissive Displays, presented the start-up perspective, followed by a talk from venture capitalist Paul Atherton. The morning session closed with a question and answer session.

The afternoon was made up of breakout meetings, giving delegates the opportunity to contribute practically to developing the EPSRC strategy. These focused on creating closer links between industry and academe, on current and emerging technological challenges, and on how the commercial exploitation of research outcomes may be improved.

Running alongside the conference, an exhibition enabled universities to showcase their research to members of the electronics industry and give them insights into the cutting edge research that EPSRC supports.

For further information, contact Emma Lawrence:
Tel: 01793 444 017
Email: emma.lawrence@epsrc.ac.uk
Website: www.epsrc.ac.uk

Academe and commerce – tying the knot?

"We have excellent links in the UK between academics and businesses, that are forming the next phase of the industry – but we need an overview of everything that's going on. Otherwise there's a danger that all the individual elements of research and co-operation will go their separate ways, meaning that we never see the full potential of formal co-operation being realised."

These are the words of Bookham Technology's Andy Carter, VP Research and Development, and a thought echoed by Dr Jeremy Burroughes of CDT, who was extremely impressed by the quality of links between business and universities during a recent visit to China (see report on page 8).

"We could learn a great deal from the Chinese approach, where superbly equipped universities are driving the research that's helping build a highly competitive industry," he says.

Moves are underway in the UK to strengthen such links. The newly created Integrated Manufacture by Printing Symposium (IMPS), for example, has been developed to create new applications for advanced printing techniques away from traditional uses such as for wrapping and graphics.

According to Tim Claypole of the Welsh Centre for Printing and Coating at Swansea University, "Printing technology offers a host of new applications in areas including bio-medicine and electronics," he says. "Much of the best work is at universities, and in IMPS we've created a forum where academics can meet to discuss research, applications and facilities, as well as interfacing with businesses to move work in progress on to practical reality."

This interface is set to take place this year for the first time at the IMPS conference, called Colloquie. This is to be held from 5 to 7 July at the University of Wales' Gregynog conference centre near Newtown.

For more information, on Colloquie, contact: meprint@swan.ac.uk

New DTI guides in photonics and flat panel displays

The DTI will shortly publish a new guide to the photonics sector and the flat panel displays sector in the UK. *Photonics in the UK* will focus on telecommunications, biophotonics and other industrial photonic applications and will include entries from key commercial, academic and support organisations working within the field.

The free guide will be distributed widely, both within the UK and overseas. It aims to encourage broader interactions and more active networking in the fields of photonics and displays, and will be used by companies and universities who are looking for development partners or suppliers.

The DTI guide *Flat Panel Displays in the UK* is also being updated and will be available in the next few months.

More details about *Photonics in the UK* and *Flat Panel Displays* in the UK will be available on the Photonics Focus website soon. To be kept informed of all latest news, register your details at: www.photonics.org.uk/contact.php

Photonics focus CONFERENCE 22062005

This year's Photonics Focus Conference will be held on Wednesday 22 June 2005. The exciting event is being staged at the CBI Conference Centre, in central London.

What is the conference about?

The *Photonics Focus Conference 2005* has been organised as a key networking event to engage the photonics, displays and information storage communities in the discussion of areas of common interest and to highlight the latest developments in these fields.

The event will comprise a number of formal presentations given by high-profile speakers from relevant university and industry sectors, supplemented by a poster exhibition of LINK ISD and LINK OSDA projects.

The day will focus on the following key topics:

- Biophotonics in healthcare
- Lasers and LEDs
- Flexible electronics and displays
- Networks and future direction

A more detailed agenda is available online at **www.photonics.org.uk/conference2005**

Who should attend?

Whether your background is in industry or academia, this conference will give you an insight into recent developments, will enable you to share experiences with other business users and will help you to find out how current work is finding its way into a range of applications.

How much does it cost?

Rate	Available to	Amount
Standard delegate rate	Up to the event	£117.50 (£100 +VAT)
Early-bird delegate fee	27 May 2005	£94 (£80 + VAT)
3 early-bird delegate places for the price of 2	27 May 2005	£188 (£160 + VAT)

Enquiries

Contact us today to register your details for the conference. If you have any questions or require any further information, please contact:

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www.photonics.org.uk/conference2005

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The Photonics Focus Conference 2005 is sponsored by the DTI through the LINK ISD and LINK OSDA programmes.