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CAMBRIDGE SCIENCE PARK NEWSLETTER

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Foreword: Rory Landman, Senior Bursar, Trinity College



I'm very pleased to introduce myself as the new Senior Bursar at Trinity College. Helping to ensure the continuing success of Cambridge Science Park is one of my key responsibilities, and it's a challenge I will enjoy.

In fact my relationship with Cambridge Science Park goes back to 1985, when as an accountant with KPMG I conducted a review of financing for Small to Medium-sized Enterprises which focused on a number of companies working on the Park at that time. Since then, my career has included working in venture capital in the UK and in Eastern Europe and investing in technology-based companies in South Korea, Taiwan, Israel and India, but I've always kept a strategic eye on what's been happening in the hi-tech sector here in Cambridge.

I believe that maintaining the status of Cambridge Science Park as a leading centre for scientific development and excellence will result from a co-operative approach between Trinity College and our many different tenants – an approach that brings benefit to all sides. I look forward to meeting and working with you in the near future.

New arrivals – Cambridge Science Park Innovation Centre

Sentinel Oncology

Sentinel Oncology is a drug discovery company developing a pipeline of small molecules that are designed to selectively target specific features inherent in human tumours. It has no laboratory premises on Cambridge Science Park; instead it outsources R&D from its offices and manages the drug discovery process efficiently. Its goal is to develop a pipeline of novel small molecules and deliver their first pre-clinical candidates during 2007.

www.sentineloncology.com

OptiSynx

With technologies as diverse as mobile phones, wireless Internet, in-car sat-nav and computer systems for stock exchanges all requiring increasingly accurate time sources, OptiSynx offers the only alternative to the caesium atomic clock or the rubidium+GPS clock. The former is too expensive to be commercial, while the latter takes the control of the most fundamental component of a network out of the hands of its operator. OptiSynx has no such problems. Its advantages include being lower initial cost together with much lower cost of ownership, long lifetime, solid-state, small, low-power, robust and auditable.

www.optisynx.com

NanoCentral

NanoCentral launched in November 2006 as part of the MNT Facilities Programme (www.nanocentral.eu). Working with companies such as Johnson Matthey, QinetiQ and ICI, NanoCentral provides leading-edge technologies relevant to the development of nanomaterials-based products. These technologies, spanning nanomaterial synthesis, functionalisation, application development, characterisation and SHE, are available to UK research companies on an open-access basis. The provision of these facilities will lower entry barriers and risk for UK companies to evaluate market opportunities offered by nanomaterials

www.nanocentral.eu

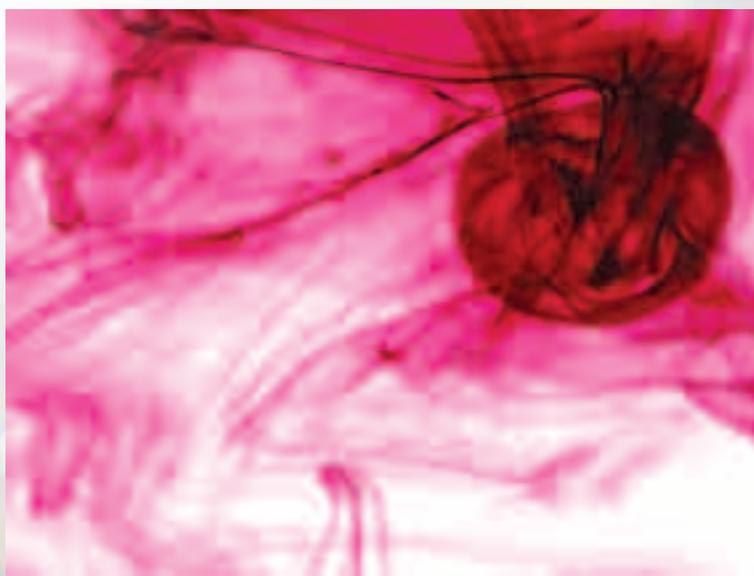
Networking for a nano world

NanoCentral and the growing business of nanomaterials

NanoCentral is a new organisation working to unlock the commercial potential of nanomaterials across the UK business and industry sectors. At its new office on Cambridge Science Park, Catalyst spoke to Business Development Director Dr Dan Gooding about NanoCentral's aims and ambitions.

"We're basically here to help UK businesses understand how nanomaterials might add value to their product or service offering and to help them find the most effective way of achieving this," explains Dr Gooding at the Cambridge Science Park Innovation Centre.

Understanding nanomaterials – the broad name for materials designed with dimensions of less than one micrometre (one-millionth of a metre) – is, in a very general sense, about



Above: ink dye dispersing in water

expecting the unexpected. At this tiny scale, the properties of well-known substances change to reveal unusual qualities: insulators such as plastics become conductors with the addition of a small quantity of nanomaterial; opaque materials like titanium dioxide turn transparent; and stable materials such as iron become combustible.

In fact, making use of the strange properties of nanomaterials for human benefit is nothing new: a bright red colouring in church windows was achieved by artists in the middle ages through the use of gold nanoparticles, which change colour at a microscopic size. In the 1920s, tyre manufacturers used nanoparticles

of carbon mixed with rubber to make them last longer – without really knowing why.

The huge advances made in all fields of science in the 20th and 21st centuries have resulted in a much greater understanding of the properties of nanomaterials, and the resulting opportunities for their commercial application are vast. Already they are being used to create new forms of computer memory and electronic circuits, new types of fabrics, packaging and materials, innovative optical and medical devices, solar energy generators and much more. Nevertheless, there are still significant challenges ahead.

"Businesses that are new to this field can find the expertise they need through us"

there has been a much slower take-up in terms of applying these technologies for commercial benefit – we're looking to help bridge this gap."

Supported by the Department of Trade and Industry and regional development agency One NorthEast, NanoCentral opened its headquarters at Wilton in Teesside in September 2006, an area renowned for its process engineering and chemical industries. Nevertheless, it is focused on a UK-wide approach that is aimed at creating a national network of expertise and opportunities.

"We operate on a hub-and-spoke model," explains Dr Gooding, "establishing links and

partnerships with a wide range of organisations and businesses working with nanomaterials so that others who are new to this field can find the expertise they need through us."

"In the UK, we're in danger of lagging behind parts of Europe and the US in the commercialisation of nanomaterials"

Through grants to companies and institutions such as Johnson Matthey, QinetiQ, ICI and the University of Liverpool, NanoCentral is helping to drive forward research into the commercialisation of nanomaterials – the results of which will be shared with other interested parties on an "open-access" basis.

Through its diverse network of service providers, NanoCentral hopes to act as a single point of access for a full range of services including nanomaterials synthesis, formulation, application, characterisation and the safety, health and environmental issues related to nanomaterials. It also recently hosted NanoMaterials 07, Europe's first annual conference on the commercialisation of nanomaterials held at The Sage Gateshead in Newcastle.

Having moved into its regional office for the South East on Cambridge Science Park in March 2007, Dr Gooding is keen to work with businesses here on his doorstep. "Cambridge is obviously a hi-tech hotspot and there is real potential for nanomaterials to add value to companies working in biotechnology, inkjet technology, hi-tech device manufacture, electronics and more. I'm looking forward to finding out more about some of these companies and how NanoCentral may be able to help them."

www.nanocentral.eu



Companies interested in finding out more about the potential benefits nanomaterials could bring to their business can contact Dr Dan Gooding, Business Development Director for NanoCentral.

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CSR leads the way

Innovation is key for wireless giant

CSR is the leading global provider of personal wireless technology; its product portfolio covers Bluetooth, GPS, FM receivers and WiFi and in 2006 it achieved revenue of \$705m. Catalyst spoke to Alan Woolhouse, VP Communications, about the way forward for this Cambridge success story.

You've achieved a market share of more than 50% in all Bluetooth market segments – what have been the key elements in achieving this?

Innovation has been a vital factor in CSR's impressive Bluetooth market share. CSR pioneered single silicon chip Bluetooth (with integral radio transmitter, microprocessor and baseband) at a time when our competitors were still producing two- and three-chip solutions. This gave us an innovative and competitive advantage. Product development is key, and CSR is now on its fifth generation of Bluetooth – all of which provide solutions for all kinds of wireless applications. CSR is adept at finding and exploiting new ways of using Bluetooth (for instance wireless controllers for games consoles, such as Sony's PS3). CSR's Bluetooth products are smaller, use less power and cost less.

You say that “we expect new waves of applications to be developed outside of the original core applications of mobile phones (Bluetooth) and PC connectivity (802.11)” – can you tell me about some of these?

Mobile phones and headsets have been core to Bluetooth's take-up by consumers. Now that more than one billion Bluetooth products have been sold and we're all more at ease with the technology, new media are being found. CSR is already leading the way with new applications, with Bluetooth and WiFi in products such as gaming, automotive, music players, PCs, cameras and satellite navigation systems. As CSR has expertise in Bluetooth, WiFi, UWB (makes Bluetooth faster), VoIP, GPS, Wibree (developed by Nokia), we are able to provide our customers with the ideal solution for their particular needs. In recent months CSR technology has appeared inside products from Sony, Motorola, Samsung, Sony Ericsson, TomTom and more.

You're looking at combining a GPS and Bluetooth chip – when can we expect to see this on the market?

After our acquisitions of CPS and Nordnav

earlier this year, we demonstrated our GPS E5000 product (based around BlueCore) at 3GSM in February. This solution is available now.

Can you outline your goals for this market sector?

CSR's recent acquisitions fall naturally into our strategy of innovation and product development. By applying our patented methods to reduce both the number of processor cycles and the time to first fix, CSR can provide an extremely power-efficient overall solution with less than half the processing requirements of alternative solutions, whilst remaining flexible enough to perform highly dynamic and accurate tracking. CSR has removed the barriers for mobile handset makers and operators to provide location-based services for the mass market on products such as low- and medium-end feature cellular handsets, Smartphones, PNDs, and other portable devices.

Can the system be made to work indoors? Are handset manufacturers likely to take it up?

CSR is combining its software-based GPS solution with cellular location technology and RF IC know-how to deliver a new generation solution for 2G/3G handsets, which will also provide fast location fixes indoors. ABI predicts that by the end of 2008, 25% of WCDMA handsets will have GPS capabilities; this is clearly a growing market.

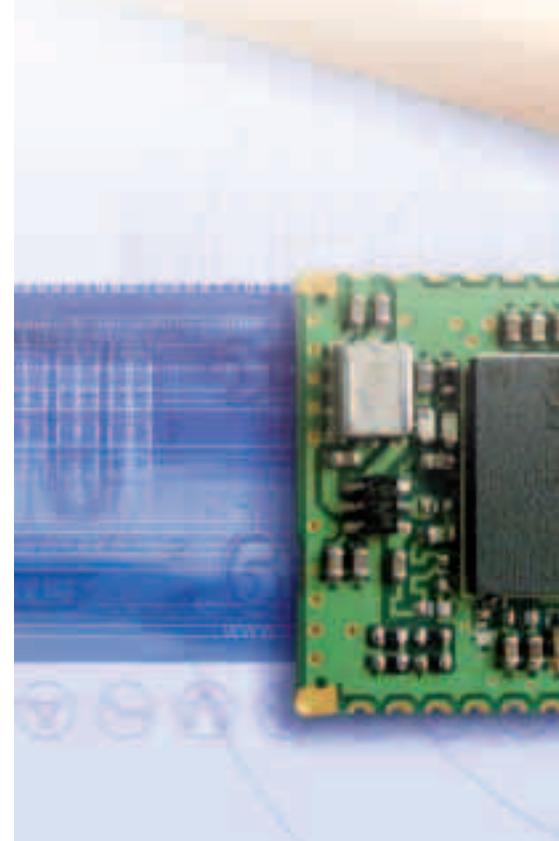
What are the key features and advantages of the new BlueVOX QFN chip?

BlueVOX QFN achieves a new low in power consumption and bill of materials (eBOM) for headset design. The example design offers talk times of up to 11 hours from a small, lightweight battery, and the eBOM (including a lithium battery) is less than \$6 in production volumes. Call clarity and range is superb, the technology eliminates annoying pops and clicks in long-range and difficult radio environments.

The design is based on a QFN-packaged BlueCore chip, and a low-cost two-layer PCB. CSR's new design is complete and interoperability-tested, yet still highly software-configurable. User-configurable features include the functionality of button presses, LED flashing, pairing operation, etc.

BlueVOX QFN will open up major new markets for consumer electronics, allowing ODMs/OEMs to create sophisticated Bluetooth headsets for mass volume markets in both mature and developing economies. The design is equally efficient as a platform for headset products for VoIP markets.

Below: CSR's Bluetooth technology

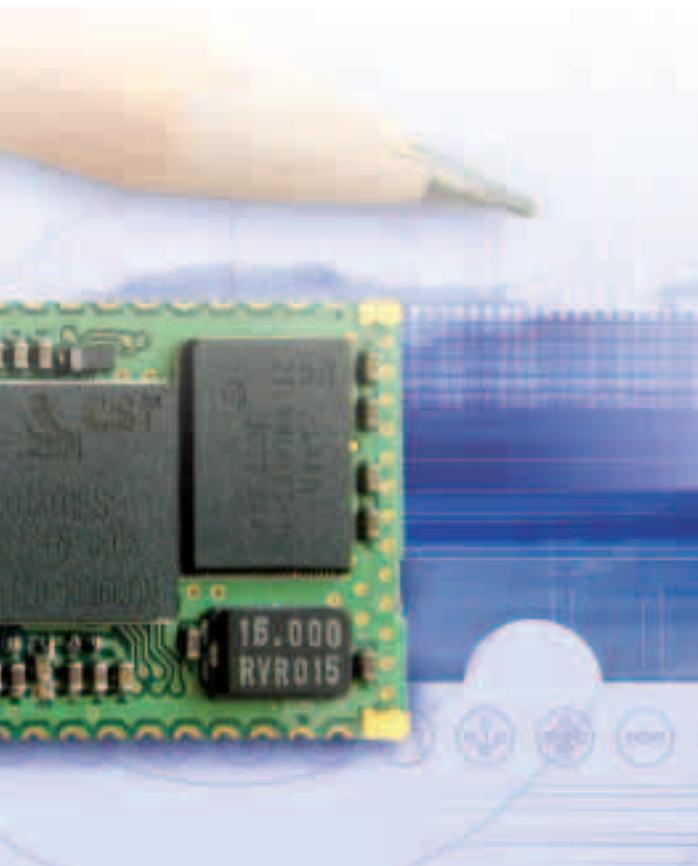


You talk about the need to “increase software content in new products” – why is this?

CSR believes that increased software content improves the robustness, flexibility, performance and functionality of its solutions and helps to distinguish them from competing offerings. CSR aims to continue to develop tools to allow its OEM and ODM customers to develop their own applications software. This, together with CSR's embedded software, will enable them and their customers to create highly featured and differentiated products.

One of your stated aims is to lower the cost of IC solutions – how are you going to achieve this?

In our industry, cost is closely associated with size. Essentially, our costs are lower because we generate more chips from a wafer, driving greater value from our investment. The size of



chip is the single biggest determinant of cost, and we design smaller. Secondly, we integrate as many technologies as possible onto the chip in order to provide greater design freedom and make it less expensive for customers to design and build around our products. Finally, because CSR chips provide more reliable connections, we can deliver lower lifetime costs to manufacturers.

Size matters. With consumers demanding greater capability from smaller devices, size is a critical commercial battleground – particularly in sectors such as headsets and handsets. CSR is the industry's pioneer, the first company to integrate all wireless technology on a single chip, and our current target is to reduce the size of a thin die from 670 micrometres to a maximum of 400 micrometres. In 2006,

we put FM radio on the chip and we're now helping customers incorporate GPS technology in their devices.

It's recently been announced that John Whybrow will stand down as chairman of the company – a position he has held since March 2004. Can you summarise some of his achievements?

John has been an excellent leader of the board and has successfully overseen a sustained period of growth for the company. During his tenure, CSR has grown from a company with revenues of \$68m to one with a 2006 revenue figure of \$705m. The company is no longer a small business, but a major player in the technology sector with expertise that has broadened out from Bluetooth into WiFi and now GPS, and has customers all over the world.

What are the key challenges ahead for the new chairman Ron Mackintosh?

Continuity and knowledge of the sector in which CSR operates were key considerations in identifying a suitable replacement. The board had due regard for Mr Mackintosh's independence

and considerable experience in both senior executive and non-executive capabilities in international technology companies, as well as his knowledge of CSR where he has been a director since May 2004. The key challenge for Ron will be to maintain the high standard that has been set before him.

Annual revenues grew by 45% in 2006 – can you hope to maintain this impressive level of growth?

CSR believes strong growth in the Bluetooth market will continue in 2007, and will spread beyond the cellular sector into applications including PCs, gaming, music and automotive. The evolution of existing standards, and the introduction of new ones with differing performance characteristics to enable new

applications, provides a substantial medium-term opportunity for CSR. CSR's single chip, RF and software design expertise, combined with its knowledge of the integration of wireless solutions with its customers' products, puts the company in a favourable position to pursue such future opportunities. CSR's core strength remains in Bluetooth, and we believe that the market will increase in strength through the global growth in mobile telephony. Our ability to offer handset manufacturers increased functionality on a single chip will be the cornerstone of CSR's future success. In addition, recent acquisitions (of Nordnav and CPS) secure our position in GPS technology and underpin our desire to incorporate location-finder technology on the chip at a price far lower than that currently on offer.

What has been the importance for CSR of being located on Cambridge Science Park?

CSR established itself in the Cambridge Science Park in 1999 after founders Phil O'Donovan, Glenn Collinson and James Collier split from Cambridge Consultants to set the company up. The location is attractive in that it boasts extensive facilities and has offered companies such as CSR comprehensive support from the ever-growing research and development community. As the centre of Silicon Fen, the Cambridge Science Park is clearly at the heart of technology innovation and is a focal point for world-class design and engineering talent. CSR now also has offices on the Cambridge Business Park – Churchill House.

www.csr.com



Getting personal

Lab21 and the changing approaches to health

The realisation of a new era of truly personalised medicine is the vision that drives the team at Lab21. Catalyst spoke to Chief Scientific Officer Dr Berwyn Clarke to find out more.

Drugs tailored to individual patients and a healthcare system more effectively focused on individual needs is no pipe dream – governments and pharmaceutical companies are both working towards a shared goal. But this shift in approach in healthcare provision cannot be achieved without the provision of high-quality diagnostic testing services – a field in which Lab21 is pioneering the way.

“This business is about the simple but very important fact that everybody is different and that therapies are therefore much more effective if they are targeted towards an individual’s specific needs,” explains Dr Clarke. “A person may have a particular condition and

US healthcare system some \$20bn per year; in the UK, this figure is around £600m per year. So governments are beginning to realise that they can save lots of money if they manage drug treatments better; tailoring drug treatments more closely towards the individual patient is more cost effective than not doing so. In the US, the Secretary of Health and Human Services has recently identified personalised healthcare as a top priority for the health system, with the intention to deliver the right treatment to the right patient at the right time – every time.”

The development of personalised medicine is also becoming increasingly important in the drug discovery process, with a shift away from the ‘one-size-fits-all’ approach that has previously dominated. Regulatory bodies are now asking drug companies undertaking clinical trials to provide more details relating to both patients who respond and patients

An increased focus on diagnostic testing both during the drug discovery phase and as an integral part of patient management is the context in which Lab 21 has developed its broad range of services.

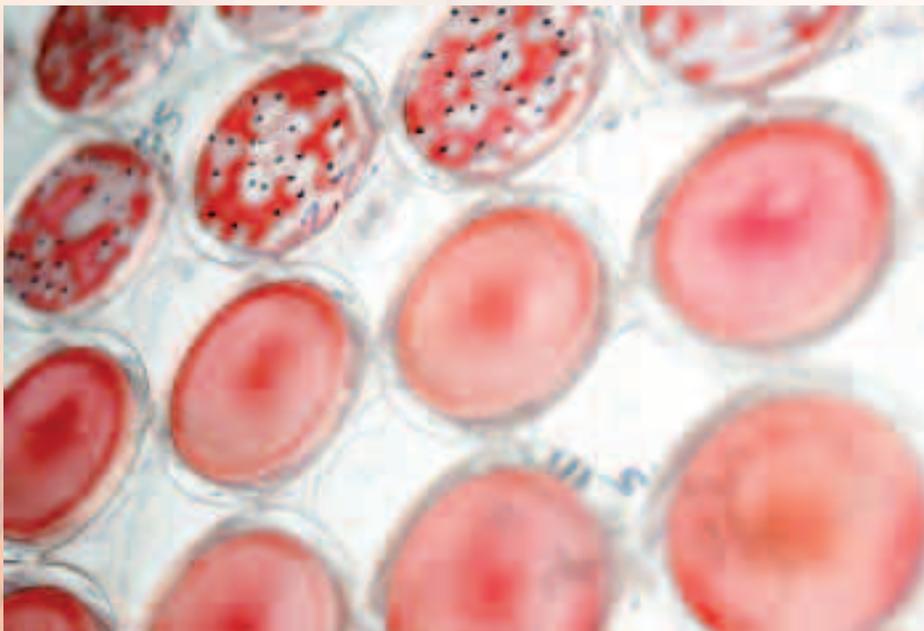
“In the US and to some extent in Asia, the shift towards more personalised medicine has led to the development of some very sophisticated, high-throughput molecular reference laboratories. That model has never been developed as such in Europe because of state healthcare providers such as the NHS, which tend to have much smaller localised testing centres. So we believe Lab21 meets a real market need for high-quality diagnostic testing across a wide range of different conditions.”

“Lab21 meets a real market need for high-quality diagnostic testing across a wide range of different conditions”

The company was founded in 2005 through the merger of clinical diagnostic experts Oneida TheraDiagnostics and MTI, which provides environmental testing services. Helping to broaden its service offering and as part of an ambitious growth strategy, Lab21 recently acquired Newmarket Laboratories. Providing low-cost immuno assays for major infectious diseases such as malaria or tuberculosis, the acquisition makes Lab21 the biggest global supplier of syphilis screening reagents to blood banks.

Lab21 has built a strong portfolio of services through licensing agreements to test for a wide variety of conditions including predisposition to cardiovascular disease, genetic predisposition to specific forms of breast, colorectal and skin cancer, and non-invasive assessment of liver health.

“At the moment, our area of specialism is virology, although we are evolving slowly into cancer as well,” explains Dr Clarke. “Our initial focus on virology is a result of the experience of the people who founded the company and also the fact that personalised medicine has been much more advanced in treating viruses than in other areas of medicine. Because we



there may be a well-established treatment for this condition, but if you give a certain patient the wrong dose at the wrong time, you can end up with some pretty severe problems – including death.”

“In the US, for example, Adverse Drug-Related Events – where a patient responds badly to a particular treatment – are the fourth leading cause of death. They cost the

who don’t, with a view to establishing a more personalised approach.

“Some drugs are now only getting licensed when accompanied by a diagnostic assay which determines whether a patient fits a specific profile,” comments Dr Clarke. “The use of Herceptin only for women with breast cancer who meet a certain profile is the best-known example of this approach.”

healthcare provision

work with viruses, we have a very high-quality containment facility in this building which means we can conduct tests for dangerous pathogens such as HIV and viral hepatitis."

"The things we do are relevant to almost any drug company that's developing a pharmaceutical"

In March 2007, Lab21 launched a revolutionary new assay able to detect any virus from a panel of 20 distinct respiratory viruses using multiplex detection technology. Testing a nasal swab sample, Lab21 can determine which, if any, of the respiratory viruses is present within six hours – including a test for avian flu. "The real value of this test lies in its ability to identify those respiratory viral infections for which therapeutic intervention is currently available, so hopefully conditions can be treated quickly and effectively," adds Dr Clarke.

The Lab21 group is growing steadily, with a team of nearly 25 based at its technical facility on Cambridge Science Park, and a further 20 people employed across sites at its Head Office and at MTI Diagnostics (both in Fareham, Hampshire) and at Newmarket Laboratories (in Newmarket). With the support of its venture capital partner Merlin Biosciences, the pace of expansion shows no sign of slowing.

"We're in a serious acquisition mode to build the company both in terms of bringing in new technologies and also getting us into new

geographical areas," says Dr Clarke. "We're looking to expand into North America and into other parts of the world – we want to be able to carry out the same tests in different areas with the same quality, uniformity and consistency. We think we can cover Europe from here, but we certainly want to go into Asia and with the Chinese market opening there are massive opportunities."

With preparations underway to float the company on the AIM market on the London Stock Exchange, Dr Clarke sees one of the most important short-term challenges as increasing awareness among potential clients of the diverse range of Lab21's services.

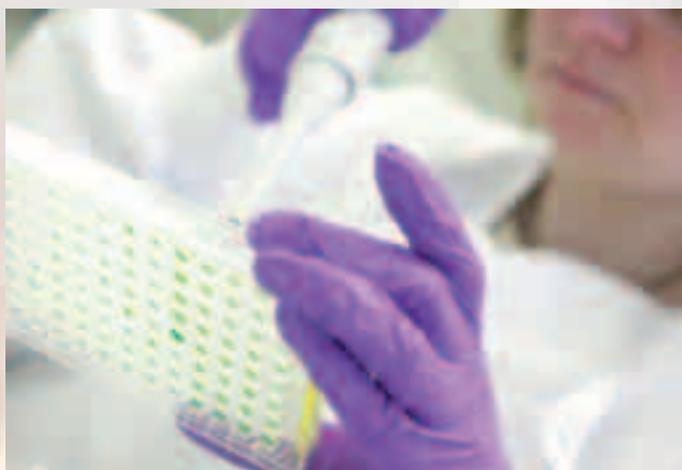
"The things we do are so relevant to almost any drug company that's developing a pharmaceutical or any organisation that's involved in human healthcare, from basic research and development in the pharmaceutical industry right through to the clinical management of patients," he says.

"It's great to be here in Cambridge and on Cambridge Science Park with so many exciting drug discovery companies around us. We hope we can start to interact with many of them and look at how we can add value to their business."

www.lab-21.com



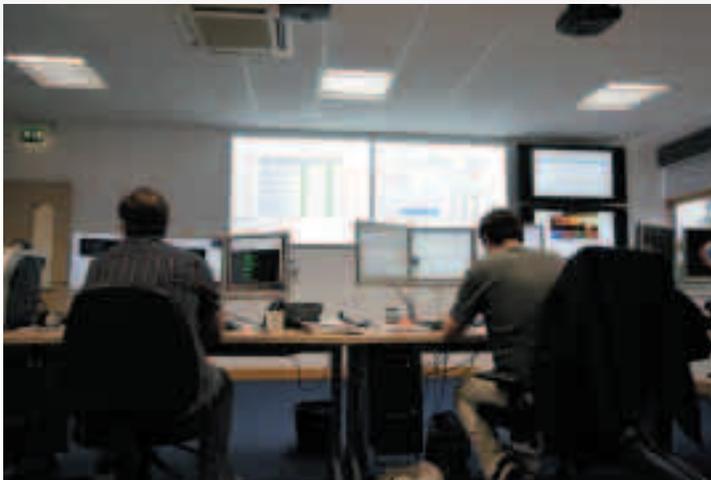
Left, top and below: diagnostic testing with Lab21



Ahead of its peers

CacheLogic is a company helping to revolutionise online media distribution through a radical new approach – Catalyst spoke to Chief Technical Officer Andrew Parker to find out how.

The dramatic growth in the popularity and capabilities of the Internet has created unprecedented opportunities for the sharing of information and rich media on a global basis. However, this growth has also created a new set of challenges for those companies



looking to provide the content, such as film, music, games or software, that is increasingly in demand by online users.

Having formed in 2002, CacheLogic was initially focused on helping Internet Service Providers (ISPs) deal with the network congestion being created by end-users making

use of peer-to-peer file-sharing applications such as KaZaA and eDonkey. These applications were consuming in excess of 60% of an ISP's network and making the supply of broadband services to consumers unprofitable.

CacheLogic was first to market with a solution to cure this problem. "We came up with a very novel solution which was based on the idea of installing devices across the ISP's network that would keep temporary copies of the most frequently requested content," says Andrew. "So if 10,000 people were requesting a download of *EastEnders* or *Top Gear* at the same time, only the first person would get it direct from source; the rest would download it from the copy stored in the cache across different points within the ISP's network. It was a system that dramatically reduced their costs and we went on to sell the platform very successfully to ISPs right across the globe."

"There is already a lot of capacity on the Internet, but you just need to harness it for where and when you want it"

The next major step in the company's evolution came in 2004 when CacheLogic was commissioned by the BBC to undertake a six-month study into the use of peer-to-peer file sharing as a means for distributing broadcast content over the Internet.

"At that point, companies really had two mechanisms for distributing their content,"

says Andrew. "They would either host all of it themselves with a large Internet pipe coming out of the building or they would use a content distribution network, which is typically a large network of servers distributed around the globe that keep temporary copies of the content close to the end-user.

"But the problem for television producers such as the BBC was that unlike broadcasting programmes over the air, broadcasting via the Internet actually becomes more expensive when more people watch due to the necessity of providing more bandwidth. In this model, it is often cheaper to make and ship a DVD of a programme or film than it is to broadcast it online.

"We realised that there was a great market opportunity to create a system that could distribute content faster and more cost effectively. What we created was in fact a hybrid between a traditional distribution network and a peer-to-peer infrastructure – it's a system which is scalable so that as your audience grows, so does the amount of resource you have available for distribution, thereby minimising the cost to the broadcaster and making the delivery of TV content over the Internet a reality.

"It's really based on the understanding that there is already a lot of capacity on the Internet, but you just need to harness it for where and when you want it. So our system uses a network of computers owned and run by CacheLogic that are distributed across the globe, coupled with a file-sharing system that utilises the resources of the individual users. This means that when demand goes up, users begin to download from each other as well as from our fixed network.

"We've taken technology and ideas that have been out in the public domain for some time and added security and quality of service on top. Our download software actually splits the content into small chunks which are then checked for corruption, which means the quality of the end product is guaranteed. But unlike most peer-to-peer systems, ours is a closed network. You can't publish and share your own files on it; only the content provider is able to distribute via the network.

Launched in July 2006, the Velocix system is already proving a hit with a number of major broadcast and media companies, with others currently in the process of encoding their video content or software for distribution via this

powerful platform. To provide round-the-clock support, CacheLogic has established teams in Madrid, New York, San Francisco, Los Angeles and Singapore which serve its international client base.

"We've taken technology and ideas that have been out in the public domain for some time and added security and quality of service on top"

"Because of the global nature of our business, we're working across different time zones simultaneously," says Andrew. "That means there is no off-peak or down time when we can take our servers offline and make modifications, and we are dealing with our customers' most valuable assets, namely their movie, TV or software content, therefore we have to guarantee 100% availability of content from our network."

The future certainly looks bright for a company which is helping to meet the ever-increasing demand for high-quality content via the Internet. "The success of YouTube and Google videos has been based upon low-bit-rate short-form content, much of which is user generated," explains Andrew.

"But an increasing number of manufacturers are producing devices to bridge the PC to television gap – meaning you can watch content from your computer on your TV. When this

Having been funded to date by venture capital firms 3i, Amadeus and the Cambridge Gateway Fund, the team at CacheLogic is now looking to build on its already impressive foundations.

"There's no one out there who is doing exactly what we are doing, so we believe we can really thrive in our market and become a household name alongside those of our core customers."

www.cachelogic.com

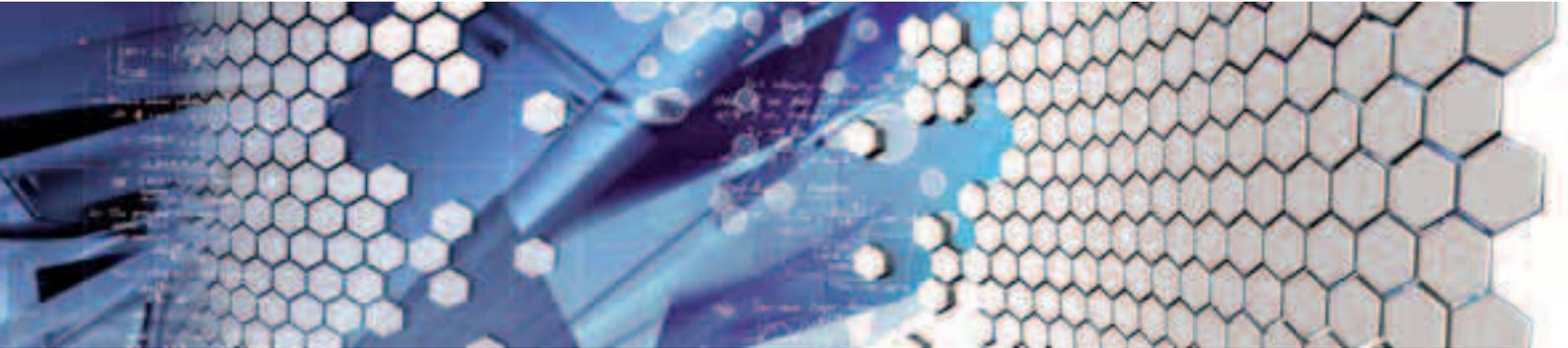


Above and left: CacheLogic's international control centre on Cambridge Science Park

happens, viewers are going to demand a higher picture quality and a broader catalogue of programmes, which drives cost and network impact. Because Velocix can help to meet this increase in demand, this trend is driving more and more customers in our direction."

Making the quantum leap

Toshiba Research Europe and the cryptography challenge



– such as factorising of very large numbers – that are virtually intractable using an ordinary computer. But while the development of quantum computers is still some way off, one practical application of quantum information technology is already in use: quantum cryptography.

“If we encode messages in individual quantum states, an eavesdropper who tries to intercept the message cannot avoid changing it”

“This ultra-secure way of sending messages is based on the fundamental idea that measuring a quantum state will, in general, alter it,” says Dr Shields. “So if we encode messages in individual quantum states, such as the phase of photons passing down an optical fibre, an eavesdropper who tries to intercept the message cannot avoid changing it. We can test therefore if the message has been read before it reaches the intended recipient – something that is impossible using classical signals.”

In a world where ever-increasing amounts of information are shared and distributed electronically, ensuring the privacy of such information has become a key priority for organisations, businesses and governments alike. Research in this field has been pioneered by Professor Sir Michael Pepper, who founded the Semiconductor Physics Research Group at the Cavendish Laboratory. Professor Pepper is also Managing Director of the Cambridge Research Laboratory of Toshiba Research Europe at Cambridge Science Park, where the Quantum Information Group headed by Dr Shields is based.

The basis of traditional encryption technology is the use of an algorithm to scramble a

message into a form that cannot be read except by using a so-called electronic ‘key’, which is then used to decrypt the information back into its original form. However, the security of this process is compromised by the possibility of the encryption key being obtained and used by a non-intended recipient. In contrast, quantum cryptography – more accurately termed Quantum Key Distribution (QKD) – uses an automated method for distributing secret keys using standard communication fibres.

“The revolutionary feature of QKD is that it is inherently secure; assuming that the laws of quantum theory are correct, we can prove that the key cannot be obtained by an eavesdropper without the sender’s and recipient’s knowledge,” says Dr Shields. “Furthermore, QKD allows the key to be changed frequently, reducing the threat of key theft or ‘cryptanalysis’, whereby an eavesdropper analyses patterns in the encrypted messages in order to deduce the secret key.”

The development of practical QKD applications is an ongoing scientific and engineering challenge, and the Quantum Information Group at Toshiba Research Europe led by Dr Shields has developed a market-leading solution. The Toshiba Quantum Key Server delivers digital keys across fibre-optic-based computer networks, and can be used for a variety of cryptographic applications including encryption and authentication of sensitive documents, messages or transactions.

“Our system provides world-leading performance, including key distribution over standard telecom fibre links exceeding 100km in length,” explains Dr Shields. “Our design has

From its base on Cambridge Science Park, Toshiba Research Europe has been helping to investigate the potential for quantum theory to revolutionise the world of information technology. Catalyst spoke to Dr Andrew Shields to find out more.

“Feature sizes in computer chips have been getting smaller and smaller at a rapid pace,” says Dr Shields. “As the length scales halve approximately every 18 months, it is predicted that within the next 10–15 years we will reach the limit where single electrons switch our information systems, and as this happens an understanding of quantum effects becomes increasingly important.”

The ultimate limit comes when a ‘bit’ containing binary information is represented by the quantum state of a single particle, such as the polarisation of a photon (the particles of light). At this quantum level, a quantum computer could work with bits that can be both “0” and “1” at the same time, allowing it to solve certain mathematical problems

been rigorously proven secure from all types of eavesdropping attack, meaning that it will be secure not only today, but also in the future."

"Toshiba is keen to establish further links with companies or organisations with an interest in the technology"

With the Toshiba Cambridge Research Laboratory based on Cambridge Science Park, it was only natural that part of the testing for the Quantum Key Server actually took place between different buildings on the site. A partnership approach in the field has been developed, including research on an international basis within the European SECOQC consortium, a collaboration of academic and industrial QKD researchers, cryptographers and telecoms engineers.

"It's a fast-moving and very dynamic field to be working in, and Toshiba is keen to establish further links with companies or organisations with an interest in the technology and its applications," adds Dr Shields.

Progress to date has been exciting, with alternatives to using a fibre-optic networks under development including the sending of quantum keys over long distance via free-space links to low-orbit communications satellites. In 2006 a collaboration between researchers at the universities of Vienna, Munich and Bristol implemented a free-space link over 144km between the Spanish islands of Tenerife and La

Palma. Nevertheless, there are still significant barriers to the adoption of new cryptographic technologies, as Dr Shields points out.

"A particular problem for QKD is selling technology based on quantum mechanics to clients who often know little about physics and are used to traditional cryptography. Another hurdle is the lack of a security certification process for the equipment. Users need reassurance not only that QKD is theoretically sound, but also that it has been securely implemented by the vendors. It is encouraging that there are several initiatives underway to establish common security standards for QKD.

"As the market for QKD develops, we can expect that the price of equipment will drop significantly. Within ten years, we may see QKD used not only in corporate and government networks, but also in networks serving home users.

"Optical fibres are already used to deliver television, phone and Internet services to domestic users in several countries. Although current QKD systems are too expensive for such applications, they may become viable if miniaturisation to microchip scale and mass production lead to the expected price reductions.

"The days when the products of the quantum-information industry serve every household may not be too distant."

www.toshiba-europe.com/research

Below: Toshiba Research Europe's quantum key distribution system



Enterprising company

Cambridge Enterprise evolves to improve technology transfer services



Above: the team at Cambridge Enterprise

Cambridge Enterprise, the University of Cambridge's knowledge and technology transfer service, has become a limited company. Catalyst spoke to Chief Executive Teri Willey about what the change means and what the organisation hopes to achieve.

It's now nearly three years since the University of Cambridge brought together its Technology Transfer Office, consultancy business and seed fund operations to create a single organisation: Cambridge Enterprise. Marking a new milestone in its evolution, on 1 December 2006, Cambridge Enterprise became a limited company wholly owned by the University and headed up by Chief Executive Teri Willey.

"Being a limited company helps us in our drive to create a more transparent financial structure, which in turn makes it easier to monitor our income and distributions and to what extent these are helping us to achieve our objectives," explains Teri from the Cambridge Enterprise offices on Trumpington Street.

"We're here to help to create a better world by enabling innovations and discoveries to become practical marketplace realities"

"It's also been an important opportunity to refocus our goals, looking at what we want to achieve and how we are going to achieve it. A business like this is not just about revenue generation, although that is one of our objectives. We are also tasked with providing an interface between academia and industry,

a service for academics and students in the University, a driver for growth in the UK economy, and ultimately helping to create a better world by enabling innovations and discoveries to become practical marketplace realities.

"But when push comes to shove, our primary objective is to be trusted business advisors to our academics; they are our primary market and source of innovation. If we can't provide a good business resource to them then the other things are not going to happen."

To achieve this, the 30-strong team at Cambridge Enterprise is working to understand better its internal audience of academics, in particular through a group of "Enterprise Champions" who form a crucial link between individual University departments and the Cambridge Enterprise organisation.

"We've been asking ourselves what our asset pools are and how well we really understand them"

The new limited company is also seeking to achieve a renewed commercial perspective, including what it describes as "an asset-management approach" to growing portfolios which include a growing number of commercialisation contracts and equity holdings.

"We've been asking ourselves what our asset pools are and how well we really understand them," explains Teri. "Certainly revenue streams from contracts and realisations for equity are important assets. Our relationships with academics and students are very important assets as well, and we're working hard to get the most out of these.

"Our assets also include a portfolio of over 350 patent families. Most of those are already licensed or under commercialisation agreement with companies, but for some we are still trying to find the right partner to develop them.

"We also have equity in about 60 companies who are using technology developed at

the University. We've been taking a fresh look at our assets in this area to see if we are managing this equity well, whether it is advisable to sell or retain equity, and whether there is additional support we might give such companies to increase their probability of success.

"Commercialisation arrangements are another key asset. There are over 250 active arrangements – technical licence agreements with companies who are commercialising inventions that we own on behalf of the University and the academics. Of these, about 100 are generating revenue. We've been looking at whether these generate sufficient levels of revenue; for those that don't, we've been looking at the reasons why and whether further investment is needed."

Prior to becoming a limited company, Cambridge Enterprise was already achieving some impressive results. In 2005/06, it generated £6.26m in revenue from the exploitation of intellectual property and consultancy, distributing in excess of £5.29m to academics and University departments and an additional £565k to the University Chest. It also closed 61 commercialisation deals and filed 58 new patent applications. Teri attributes this performance to the dedicated team at Cambridge Enterprise who achieved this performance during a period of patent policy revisions and organisational change. Nevertheless, having joined on 1 August 2006, she is focused on the challenges ahead.

"We need to strike a balance between doing good deals that bring resources back to our stakeholders in the University, bringing resources back into our organisation to operate, and achieving broader aims and aspirations – helping to create the 'better world' through bringing important Cambridge innovations to the public through commercial channels."

cambridge enterprise
commercialising University technology

www.enterprise.cam.ac.uk

PARKLIFE

Go-ahead for redevelopment of Building 101

Exemplar Properties on behalf of Hermes have commenced the redevelopment of Building 101 on Cambridge Science Park. Acting on behalf of Exemplar, Bidwells' Planning and Development Teams have secured planning permission for a new 80,000 sq ft net office building replacing the dated 1980s building on the site.

Dick Wise, Head of Commercial Development at Bidwells, said: "It is the largest speculative

building that has been undertaken since the late 1980s and reflects strongly improving market conditions."

Completion of 101 is due in the summer of 2008 and the building is available to let either as a whole or in parts. For further information please contact Jamie Green at Bidwells on 01223 841841.

Right: Artist's impression of the new Building 101



Xaar collaborates to develop inkjet printed memory applications

Industrial inkjet technology leader Xaar has signed an agreement with the Norwegian and Swedish company Thin Film Electronics (TFE) to jointly develop industrial inkjet methods and processes that can be used for producing printed memory applications efficiently and in high volumes suitable for commercial applications.

This collaboration is a continuation of TFE's and Xaar's previous collaboration leading up to the successful development, realisation and announcement of the world's first printed ferro-electric memory array at IPEX '06 held in Birmingham, UK in April 2006.

Werner Zapka, head of Xaar's Advanced

Applications Technology team, stated that: "As the printed electronics market continues to evolve and expand, we see numerous opportunities for products that include memory and with that we see a market need for our inkjet solutions for production of printed electronics products in general."

CSR wins Queen's Award for Enterprise

Cambridge Silicon Radio (CSR) has won the renowned Queen's Award for Enterprise in the Innovation category in recognition of its successful development of the BlueCore family of single-chip Bluetooth ICs.

John Scarisbrick, CEO, commented: "We are thrilled to have been awarded the UK's most prestigious honour in business performance for a second time. Our strength is in the delivery of highly integrated wireless systems on silicon,

and we will continue to provide customers with the best quality, ready-to-use software solutions and hardware reference designs for their products."

CSR previously received the Queen's Award for Enterprise: International Trade in 2004 following the success of its initial public offering on the London Stock Exchange, the industry's biggest UK technology flotation for three years.

Below: CSR's BlueCore™01



PARKLIFE

Cambridge Science Festival

Cambridge Science Park was proud to be an associate sponsor for the Cambridge Science Festival, which featured a programme of exciting events across the city from 12 to 25 March.

The Festival, now in its 14th year, gave children, young people and adults unique opportunities to share in the excitement of

science through lectures, demonstrations, roadshows and workshops under the theme 'The Big and the Small'.

Attracting more than 25,000 visitors, the Cambridge Science Festival is the UK's largest free science event of its kind and included more than 100 events across 40 departments and five sites.



Above: Dr Pete Wothers gave his explosive chemistry lecture

Takeda acquires Paradigm Pharmaceuticals

Takeda Pharmaceutical Company, Japan's largest pharmaceutical company, acquired Paradigm Therapeutics on 29 March 2007.

Founded in 1999 by University of Cambridge researchers, Paradigm established world-class target identification and validation capabilities based on genetic engineering and in vivo pharmacology. Paradigm Therapeutics Ltd and its subsidiary Paradigm Therapeutics Singapore Pte Ltd are now renamed Takeda Cambridge

Ltd and Takeda Singapore Pte Ltd.

"Takeda have been an excellent partner in our CNS collaboration and this deal represents a logical and positive extension to that. The company looks forward to continuing with its drug discovery and development activities within the global reach and long-term planning horizons of Takeda," said Alastair Riddell, CEO of Paradigm.

www.takeda.com



Above: Takeda Cambridge Ltd at Cambridge Science Park

BioProgress launches new tablet technology

BioProgress has launched a new tablet technology, FastWrap™, which facilitates the rapid disintegration of coated tablets and thereby a faster action onset of a drug.

FastWrap™ uses the company's TabWrap™ enabling technology platform to create competitive advantages in the over-the-

counter drugs market such as pain relief and cough/cold therapeutic areas.

Richard Trevillion, Chief Executive Officer, BioProgress, said: "The launch of an additional technology within our portfolio is another important step in creating a compelling enabling technology range for our own products whilst enhancing our ability to work

with partners. Speed of onset of action is an important weapon in the war against illness and we are now able to compete effectively within the marketplace."

PARKLIFE connections

Biology in Business (BiB) is a Cambridge-based non-profit organisation with more than 1,700 members that bridges academic and commercial life science to promote career development and technology transfer through events, online resources and networking opportunities.

Email: info@biologyinbusiness.org

Web: www.biologyinbusiness.org

The Eastern Region Biotechnology Initiative (ERBI)

ERBI's objective is to facilitate and accelerate the growth of biotech in Cambridge and the East of England. Its core activities include: hosting networking events, special interest groups, training, partnering and member promotion, publications, regional and national initiatives.

Email: info@erbi.co.uk

Web: www.erbi.co.uk

Research Services Division (RSD) helps to identify, secure and manage research funding for the University from regional, national and international sponsors. It encourages collaboration between the University and industry, and fosters long-term research partnerships between companies and academics for mutual benefit. RSD also organises Horizon, the leading seminar series, which provides participants with a first look at new developments in the most exciting areas of science and technology at Cambridge University.

Contact: **Jo Ryan**

Email: jo.ryan@rsd.cam.ac.uk

Web: www.rsd.cam.ac.uk

The Great Eastern Investment Forum (GEIF) is a leading UK business angel network located in Cambridge which exists to introduce ambitious, innovative companies seeking funding to business angels and other early-stage funders seeking quality investment opportunities.

Web: www.geif.co.uk

Cambridge AWiSE (Association for Women in Science and Engineering)

AWiSE is a multi-disciplinary membership organisation composed of individuals, businesses, associations, institutions and other organisations, all of whom share the common goal of advancing the interests of women in science, engineering and technology. The Cambridge branch holds regular meetings and events; for details see the website or get in touch.

Email: camawisemeetings@yahoo.co.uk

Web: www.camawise.org.uk

The Cambridge Network is a membership organisation with the mission to link like-minded people from business, finance and academia to each other and to global partners for the benefit of the Cambridge region. It helps Cambridge raise its game by delivering over 40 networking, partnering and special interest group events per year (mostly in Cambridge, but also in London, Boston and Shanghai) and a high-profile website where its 1,300 corporate members publish profiles, news, jobs and events every day.

Web: www.cambridgenetwork.co.uk

Tel: 01223 422362

Enterprise Link, a Business Link service for Cambridgeshire, is a membership network providing advice and support for early-stage, entrepreneurial/aspirational businesses. It holds a variety of networking events and seminars at the St John's Innovation Centre in Cambridge, and also sends out regular bulletins to members with information, advice and opportunities. It can also arrange access to sector specialists.

Email: info@enterprise-link.co.uk

Web: www.enterprise-link.co.uk

i10 provides large and small businesses with easy access to the expertise, resources and innovation within universities and higher education institutions in the East of England.

Contact: **Catherine Atkins**

Email: c.atkins@i10.org.uk

Tel: 07738 455166

The Cambridge Science Park is managed by Bidwells on behalf of Trinity College.

Catalyst is a forum for companies on the Cambridge Science Park.

The next issue will be published in Autumn/Winter 2007. If you have any comments or suggestions for stories to be included in the next issue, please get in touch with Julie Bushell or Sherri Brazear (see right).



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Dr Fairbrother - Senior Bursar at Trinity College from 1993 to 2007

Viewpoint

Dr Jeremy Fairbrother was Senior Bursar at Trinity College from 1993 until his retirement in 2007

Cambridge Science Park has been here since 1973 – and a lot of things have changed in 34 years. But throughout that time, the development of the Park has been driven by a passionate feeling from the Fellows at Trinity College that science and technology should be for the benefit of mankind, and that the commercial development of ideas is a crucial part of that.

By the time I became Senior Bursar in 1993, Cambridge Science Park had already been well established for 20 years. Since that time, however, there have been a number of big changes in technology that have influenced the way the Park has developed. We've seen the development of mobile communications, the huge growth of the Internet, and the tremendous strides taken in the unravelling of the human genome and our understanding of how drugs work.

These changes are reflected in the type of companies that have set up and grown on Cambridge Science Park. The role of Trinity College has been to respond to the changes in the market and to provide the facilities to ensure that Cambridge Science Park maintains its premier status as a centre for research and development.

You need to be evolutionary but also flexible – by the mid 1990s there were a number of significant developments that needed to be made. It was very important that we could improve access to the Park, which involved a number of different elements. We widened the entrance road from

three to five lanes. This also coincided with improvements by the road authorities outside the Park on Milton Road, and more recently the construction of a direct lane onto the A14.

One of the other prominent developments has been the agreement which was secured with Trinity Hall to develop the land they owned at the back of Cambridge Science Park as an integral part of the Park. That enabled us to build a second entrance for the Park and provided additional land for the construction of several major new buildings.

We also completely redeveloped the conference facilities with the establishment of the new Trinity Centre. At the same time, we turned the old conference centre into a fitness centre and created a purpose-built nursery which has been an extremely successful addition to the Park.

“The development of the Park has been driven by a passionate feeling at Trinity College that science and technology should be for the benefit of mankind”

Now we've reached a stage where we have developed most of the available land on the site. But some of the simple buildings that were first put up in the 1970s have in fact proved very popular with new tenants over the years, with the now mature landscaping providing a most attractive working environment.

Flexibility has been the key throughout, because technology companies may grow or contract, but they certainly don't stand still. Our clients may not want to occupy the whole of a building right from the start – but they might want space that they can grow into. The development of the new Innovation Centre is typical of the kind of flexible and practical letting arrangements that

help new companies to get off the ground within a prestigious setting for research and development.

“Flexibility has been the key throughout, because technology companies may grow or contract, but they don't stand still”

I think it's been important for Trinity College to provide the fundamentals of what creates a successful science park, and to leave the actual science and commerce side to the companies themselves. We need to provide top-quality buildings, good access and infrastructure, attractive landscaping and flexible leasing. If you can get these things right, the companies should come to you and prosper.

It's been a wonderful privilege to have been involved with the ongoing development of Cambridge Science Park over these years, during which time the amount of building space let by Trinity College has almost doubled. Of course there will be some important developments ahead, so I look forward eagerly to learning about the ongoing success of Cambridge Science Park and what happens next in this remarkable story – one which continues to attract genuine interest and admiration from right around the world.