FutureStory

Bristol and the South West

Acknowledgements

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Chair of Talent & Enterprise Taskforce

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Department for Business Innovation & Skills

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Bristol and the South West

Bristol has always been a connected city. Its location on the South West coast made it an early staging post for the exploration of North America. It grew prosperous importing coffee and sugar, and exporting tin and copper from the mines in Cornwall. From ships to railways to planes, the region has benefited from the growth in global trade over the centuries. Connectivity to today's world markets and constant innovation is helping the region adapt to a changing global context and create prosperity for a new age.

A skilled workforce grew up to serve the world-leading aerospace companies based in and around Bristol including, Airbus, BAE Systems and Rolls-Royce. Involved in ground-breaking feats of engineering, such as the development of the A380, the world's biggest jumbo jet – these days thousands of people are employed by the giants of the industry, and the cluster of engineering companies which supply them.

First, Brunel's Great Western Railway and then the M4 Corridor have connected the city directly to the capital. In recent years, the high-tech Silicon Corridor has developed along this artery – with over fifty innovative micro-electronics and silicon design companies based there, and new ones starting up all the time. Knowledge and innovation bursting out of the region's universities has fuelled the growth of the digital technology sector – and attracted international companies, such as Hewlett Packard, to carry out cutting-edge research.

The digital age is bringing together the talents of creative technologists and creative artists, and Bristol's become a hub for creative media companies, including Aardman and the BBC's Natural History Unit, both world leaders in their field.

The South West has its sights set on playing a leading role in the new green economy. Bristol is home to some important environmental organisations, including the Environment Agency and the Soil Association. And in universities, major companies and newly created start-ups alike, innovative engineers and entrepreneurs are intent on developing new solutions to respond to the global challenge of climate change – and creating new jobs and businesses for the region.

So everywhere you look across the region today you begin to see the future story of Bristol and the South West.

Bristol is home to over **17,500 businesses –** and more than **a third of the UK-owned FTSE 100 companies** have **operations in the area**

A cluster of more than **50 high-tech companies** make up the **Silicon Corridor** running between **Bristol and Swindon**

Access to the world's trade routes, engineering skill and a spirit of enterprise made Bristol and the South West prosperous in the past, and will be the key to prosperity in the future.

Global trade and invention

A connected city

Bristol first started trading with Ireland. Then its position on the west coast of the UK made it well located to play its part in the globalisation of trade with British colonies across the Atlantic ocean. From that core of enterprise and innovation, it has branched out into new engineering and high-tech industries which connect the city to today's global markets.

15th Century

In the 15th century, Venetian merchant, John Cabot, launched his voyage to find a new route to Asia from Bristol. His ship, the Matthew, was 80 foot long and sailed with a crew of just 19 people. Financed largely by Bristol merchants, he became the first modern European to discover North America – which he called New – found – land.

18th Century

In the 18th century, Bristol was part of the Transatlantic Triangular trade which is abhorent to us today. The city fitted out 2,000 ships to travel with slaves taken from Africa to work on the plantations in America – and return from America with commodities, such as sugar, cocoa and tobacco. These imports led to related industries growing up around the region: chocolate-making, cigarettes and sugar refining.

19th Century

In the 19th century, engineering genius, Isambard Kingdom Brunel, built the 700 ft long, Clifton Suspension Bridge; the Bristol to London railway – introducing the broad gauge track, still used today; and the pioneering steam ships the SS Great Western and SS Great Britain – the first propeller-driven, ocean-going iron ship – which was, at the time, the largest ever built.

20th Century

In the 20th century, the supersonic jet, Concorde, was co-designed and built in Bristol, as part of the Anglo-French collaboration which pushed the boundaries of aerospace technology. And at the start of the 21st century – in a new international collaboration – Filton worked on the wings for the Airbus 380, with more than 2,000 local engineers contributing to the project overall.

From tin mining to tourism

During the 19th century, Cornwall was the greatest producer of copper and tin in the world. 600 steam engines were in action across the county and 30% of the male workforce were in the mining industry. The innovative technology developed for the Cornish mines created an export trade in the engines. Meanwhile, exports from local china clay pits held a virtual monopoly on the trade worldwide.

But when huge mineral deposits were discovered elsewhere in the world, the price of copper and tin fell and the local industry failed. In the first six months of 1875, ten thousand miners left Cornwall to find work overseas, as far afield as South Africa, Australia and North America.

Today tourism is the leading industry for the county – and one quarter of the economy. With 5 million visitors a year, it is one of the UK's most popular holiday destinations.

The Eden Project – inspiring regeneration

The site of the derelict clay pit in Bodelva has been transformed to become the South West's largest tourist attraction.

"We've taken a huge old derelict china clay pit that was mined for 160 years and transformed it into a living theatre of plants and people. It's telling the story of how we all rely on nature, on crops and plants and trees from different parts of the world – and without them we simply can't live," says Caroline Digby, Sustainability Director at Eden.

The two great biomes on the site are the largest greenhouses in the world: one housing a rain forest, the other re-creating the Mediterranean climate. It's a spectacle which people come to see from all over the country. Eden recently welcomed its 11 millionth visitor, and it is consistently in the top 5 paid-for visitor attractions in the UK.

"In the last fifteen years, we've seen thousands of people in this area losing their jobs in the mining industry. Tourism is the main industry to which people have switched," says Caroline. "So we've done a lot of work to look at our direct economic impact: what we call the Eden Effect. Building Eden here took an expenditure of about £142 million pounds. But we estimate that, since we opened in 2001, we've contributed close to £1 billion back into the local economy. That's through our supply chain and local businesses, including the bed and breakfasts, the restaurants and cafes and so on, which service the visitors who come to Eden."

"In catering, we really make it our business to work with local suppliers – this year about 84% of our food and beverages have been supplied locally." Aiming to minimise the waste they generate, 90% of Eden's food waste gets turned into compost for use on the site. They sell a range of products made of recycled materials, such as glass and paper, in their visitor shop.

"We've taken a huge old derelict china clay pit that was mined for 160 years and transformed it into a living theatre of plants and people."

> **“There are people in all sorts of jobs who are making a real difference for a greener future – from small entrepreneurs to people working in big companies who are turning around the way in which they’re actually doing business.”**

Eden’s famous and innovative architecture has given them a lot of experience with sustainable construction methods – and these days there’s more and more demand for that kind of expertise. “We’ve got a great opportunity with one of the country’s four eco-town sites just a couple of miles up the road from us. So we’re really looking forward to working with the developer and the Cornwall Council to help make it a world-class integrated project that’ll be fit for purpose as a place for working and living, leisure and transport, 50 years from now – and hopefully it will inspire others.”

Caroline is responsible for finding new ways in which the site at Bodelva can operate more sustainably. “We’ve signed an agreement with EGS Energy to build the first commercial geothermal plant here at Eden; the so called ‘Hot Rocks’,” she says. “It will allow us to generate all our own electricity and heat – and have some spare for the local villages as well.”

Eden has just launched a website, Real Cool Futures. “What we’ve identified is that there are people in all sorts of jobs who are making a real difference for a greener future – from small entrepreneurs to people working in big companies who are turning around the way in which they’re actually doing business. We’ve had a team out interviewing people doing some of these exciting and really cool jobs – low carbon jobs – to let young people know how much is going on that they can join-in on, when it gets to thinking about options for their own future.”

The dramatic visualisation of people’s dependence on the natural world which draws people to the Eden site has become increasingly relevant as the world grows more concerned about protecting the environment. With the South West now designated a low carbon economic zone, the Eden Project is developing partnerships all over the region to explore and develop the skills and new ways of operating that will be demanded to make the shift to a more sustainable society.

CORNISH sea salt
PURE AND NATURAL

“We really make it our business to work with local suppliers – this year about 84% of our food and beverages have been supplied locally.”

From engineering to digital media to food retail, today's businesses are adapting to serve customers and work with suppliers from all over the world.

Winning in the global markets

Rolls-Royce – advanced manufacturing and services on a global stage

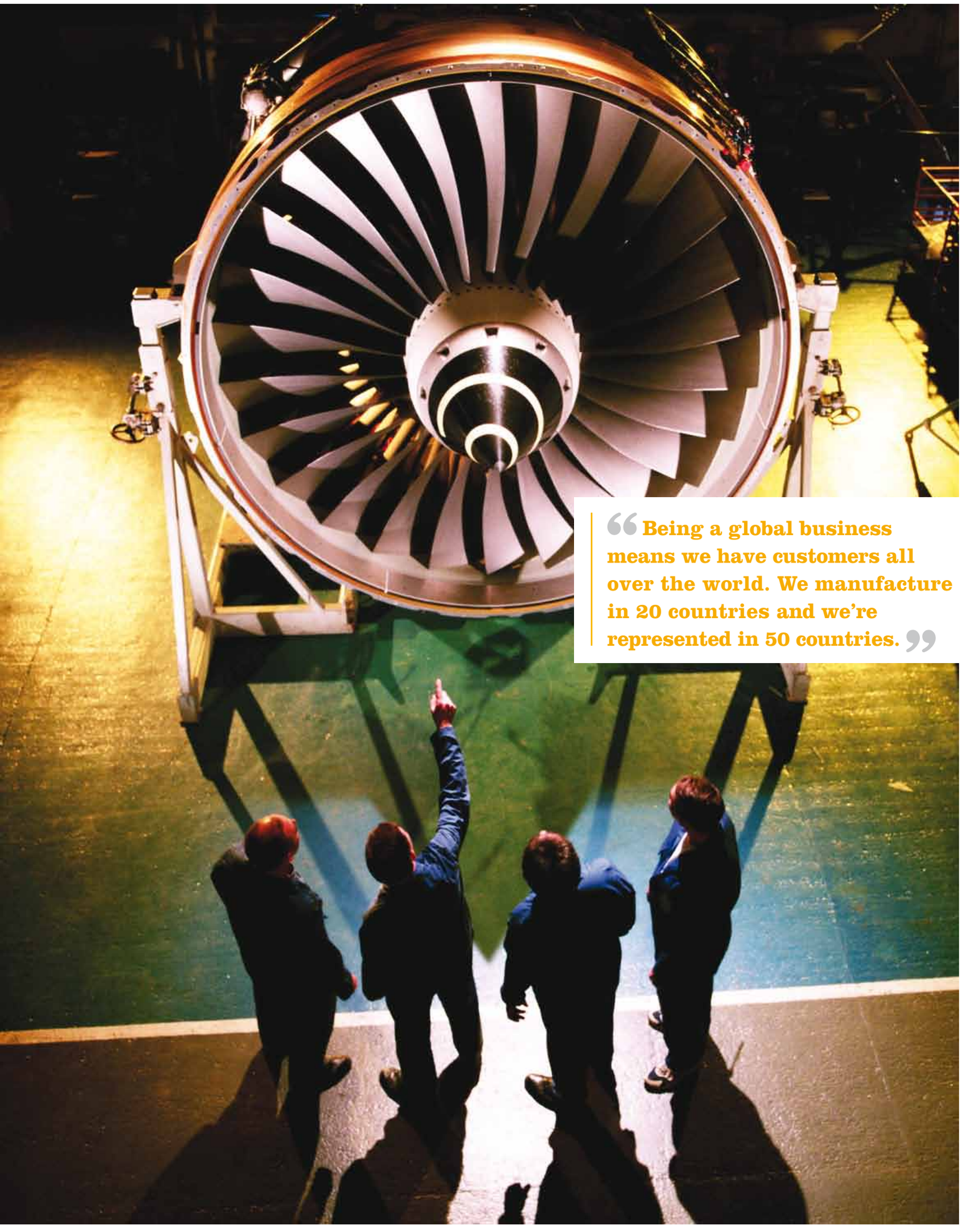
Sir George White, an entrepreneur from Bristol, was never one to miss an opportunity. When on holiday in France in 1909 he went to listen to a sales pitch by the Wright Brothers – the inventors of the first working aeroplane – who were selling licenses to build their aeroplane in Europe. Sir George took them up on their offer and founded the Bristol and Colonial Aeroplane Company. So aerospace in Bristol was born.

One hundred years on, Sir George's original company is part of Rolls-Royce. And today Rolls-Royce is a major global operator in aerospace, marine and energy power systems and one of the area's largest employers, with 3,500 people on its site in Filton.

"Being a global business means we have customers all over the world. We manufacture in 20 countries and we're represented in 50 countries," explains Martin Fausset, Managing Director of Defence Aerospace for Rolls-Royce.

His view on the key to success in today's global marketplace is clear: it's the ability to innovate. Modern manufacturing is all about inventing ever more advanced, ever more high-value technology. Around 18,000 parts come together to make one engine, incorporating many new patented technologies, drawing on cutting-edge research in multiple universities, and involving dozens of suppliers to manufacture components.

So among the many different kinds of engineers employed by Rolls-Royce are the software engineers who develop the IT systems which integrate how it's all brought together into an orchestrated whole. It's a far cry from the traditional manufacturing of the heavy-industries which generated the wealth of the UK during the 19th century.



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A vivid illustration of how engineering has changed in recent years is the growth of Rolls-Royce's service business. The site in Bristol has a 24 hour a day, 365 day a year, high-tech operations centre. And from there Rolls-Royce engineers can communicate in real-time with an aircraft pilot in flight anywhere in the world to diagnose problems – and often even repair them before the plane lands. With the fleets of more than 600 airlines around the world powered by Rolls-Royce engines, providing advanced services on long-term contracts now makes up more than half of the company's revenues.

"There's an important cluster of companies who supply us and the other aerospace companies around here. Just as Rolls-Royce alone, we spend about £85 million a year on contracts which go into the supply chain regionally."

The need for innovative products and sophisticated services is why the company sponsors a network of 29 University Technology Centres from the US to the UK and Europe, through to Singapore, enabling them to draw on the work of leading researchers worldwide. And Rolls-Royce along with other industry-leaders based in the area – Airbus, GKN and Vestas – is backing the recently announced National Research Centre for Composites in Aerospace which will be led by Bristol University.

With a mix of national and regional government funding and major corporate partners, the new multi-million pound, purpose-built centre aims to bring together top academic and commercial engineers to develop new light-weight, super-strong materials – which will also make a vital contribution to the next generation of low-carbon manufacturing.

So the group of global aerospace manufacturers, and the network of local companies which supply them, play an important part in the fabric of the economy in the South West.

"The supply chain Rolls-Royce uses has to be global; we source parts all over the world," says Martin Fausset. "But there's an important cluster of companies in the South West of England who supply us and the other aerospace companies around here. Just in Rolls-Royce alone, we spend about £85 million a year on contracts which go into the supply chain regionally."

He acknowledges that the local skill-base is a key factor their commitment to the area. "We have a strong business here. We've got a very highly-skilled workforce, talented engineers and very good people in the factory producing very high tech products. That's an important skill set for us to maintain," confirms Martin. "We've recently invested £75 million in re-developing the site here in Bristol, which is a strong vote of confidence in the future."

The Bristol and Colonial Aerospace Company was **founded in Filton in 1910** – and today **3,500 people are employed** there by Rolls-Royce

Rolls-Royce engines power more than 600 airlines around the world

Since the 1950s Rolls-Royce engineers have **reduced fuel burn** per passenger kilometre **by 70%**

Bart Spices – from family-owned enterprise to international business

Herbs and spices sourced from around the world, from Peru to China, are put in jars at Bart's factory right in the centre of Bristol by its workforce of 130 people.

Bart was formed in 1965 by Mr and Mrs Bartlam, a husband and wife team based in Bristol. They originally supplied empty glass jars to the local cookware trade, before spotting an opportunity to fill their jars with exotic herbs and spices. The name Bart Spices is now an established one on the supermarket shelves of Britain, and its products can be found in Spain, USA, Canada, South Africa and even Barbados.

So the company has grown into an independently-owned, international import and export business.

Bart's was the first company to supply Fairtrade spice to supermarkets in the UK, beginning in 2005 with vanilla pods and expanding steadily from there. The premium that Bart pays for these Fairtrade ingredients is used by the local farmers to fund projects to improve their community facilities, such as schools and water supplies, in some for the poorest parts of the world.

Everyone who works at Bart is passionate about food, so as well as leading the way on fair-trade sourcing as far afield as Sri Lanka, the company is involved in local initiatives to show people the importance of nutrition and the pleasure of cooking. Matthew Shaw, Managing Director at Bart, says "We're committed to helping people to cook, even at a basic level, because it is sad how many children today don't have any of these skills at all."

Matthew describes Bristol as a fantastic place to be located, "The proximity to the West Country and Cornwall makes the area an appealing place to live, and the transport links of motorways and railway connect us to London quickly. It's the best of both worlds."

And he's very positive about the city's future. "Bristol is very well placed to continue to thrive. We have a diverse and creative population, which makes me hugely excited about the next 10 years."

> **“Bart’s was the first company to supply Fairtrade spice to supermarkets in the UK, beginning in 2005 with vanilla pods and expanding steadily from there.”**

Aardman Animations – small characters, big impact

The Academy Award-winning animation company, which chose Bristol as its home, has been nominated for 7 Oscars and won 4.

David Sproxton and Peter Lord, co-founders of Aardman Animations, have been animating together since they were at school. They registered the name Aardman before they had even left university... it comes from the Dutch word 'aarde', meaning earth. Today they are famous across the world for the clay animation characters they've invented, including Nick Park's Wallace and Gromit.

In the early days, David and Peter used the summer holidays between their studies to produce animation for the BBC children's TV programme, Vision On. "It started as a hobby," says David, who has a geography degree but always had his sights set on being in the film business. "Creating the character Morph for the BBC was our first big break. We then got a commission on Channel 4 to do some five minute films based on real life conversations. These were seen by advertising agents and we started to make TV commercials."

> **"The company opens its toolbox to the public through exhibitions where people can get a hands-on feel of animation by making their own models and movies."**

"We thought doing ads was only going to last 6 months, but we're still doing adverts now. The money from those helped fund further work and allowed us to grow organically."

David cites the BBC in Bristol as a major factor in Aardman's decision to locate in the city. The BBC provided resources the two graduates needed, expertise and vital equipment – and David believes that the BBC's presence has helped to foster the city's creative and collaborative outlook.

The company has gone from strength to strength and has won global recognition through its most famous characters, Wallace and Gromit; its films, Chicken Run and Flushed Away. Shaun the Sheep, a children's spin-off series from Wallace and Gromit, is the team's latest success. "Shaun the Sheep is a silent comedy and the lack of a language barrier has allowed it to be sold to 172 different territories," explains David.

"We're very aware of our international market. Without it we wouldn't be in business," he adds. "Adverts are worth a third to a fifth of our revenue depending on whether we're doing a feature film – and about half of the adverts we do are for the US."

So the success of Aardman's productions outside the UK is very important to the business. "As a key player in the field you have to be aware of what's happening around the world. At the top are Pixar and Disney – and you have to be up there with them to compete."

As well as selling to markets around the world, Aardman needs investment from overseas too: it's the nature of the industry. And David acknowledges that the global recognition they receive gives Aardman access to the necessary finance. "On the finance front, all big productions have to be co-funded. After we won two or three Oscars, we were on the Hollywood

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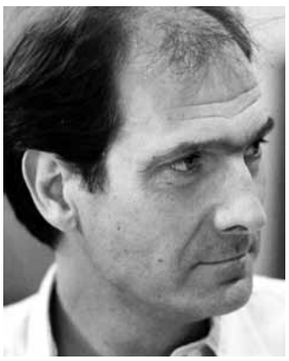
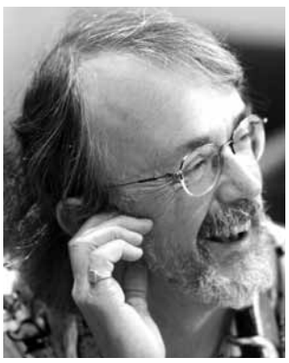




radar. The studios in LA are always looking for ideas, saw us and thought, 'Let's do a deal'."

"On the talent side we're like the United Nations! The French and German graduates here have very good computer animations skills, and we have some Americans on the team too. There's a great deal of exchange of talent around the world. We're in a global industry but it's relatively small. Once you know how to use the systems, the skills are transferable."

"There's a great deal of exchange of talent around the world. We're in a global industry but it's relatively small. Once you know how to use the systems, the skills are transferable."

Aardman's commercial activities reach far beyond its beginnings in short, plasticine, stop-motion animations, and it's involved with projects from video games to merchandising. "We've seen a lot of organic development. For example, the distributor wanted to release games on the back of our films, and then associated websites built from that. As a result, gradually we've built a digital department and now cover a lot of bases."

Part of this diversification includes the animation techniques themselves. Aardman has increased its use of computer generated – CG – animation. "Our CG department started 10 years ago and now we have a team of twenty to twenty five people. We're animators and creators foremost – who use a toolbox to achieve that. Stop-frame plasticine is great, but on CG animation we get faster turnover because we can have more people working on a project at one time."

Their creative work with a range of different techniques means there's a lot of Aardman content on TV which most audiences aren't aware that they've produced, such as the opening credits for BBC's Match of the Day Euro 2008 or the Duracell Bunny adverts.

The company opens its toolbox to the public through exhibitions where people can get a hands-on feel of animation by making their own models and movies. And the demand for these exhibitions is global too, spreading from the UK to Japan to France and Korea.

Did you know?

Wallace and Gromit's adventures in the Wrong Trousers scooped over 30 awards, making it one of the most successful animated films ever made.

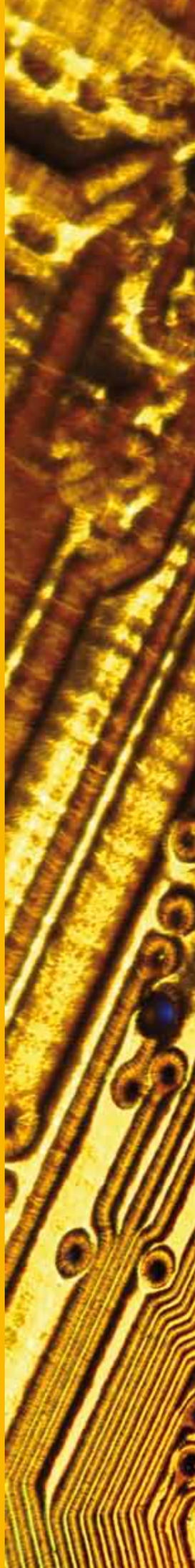
Chicken Run, Aardman's first full-length feature film, took over $220 million at the box office around the world.

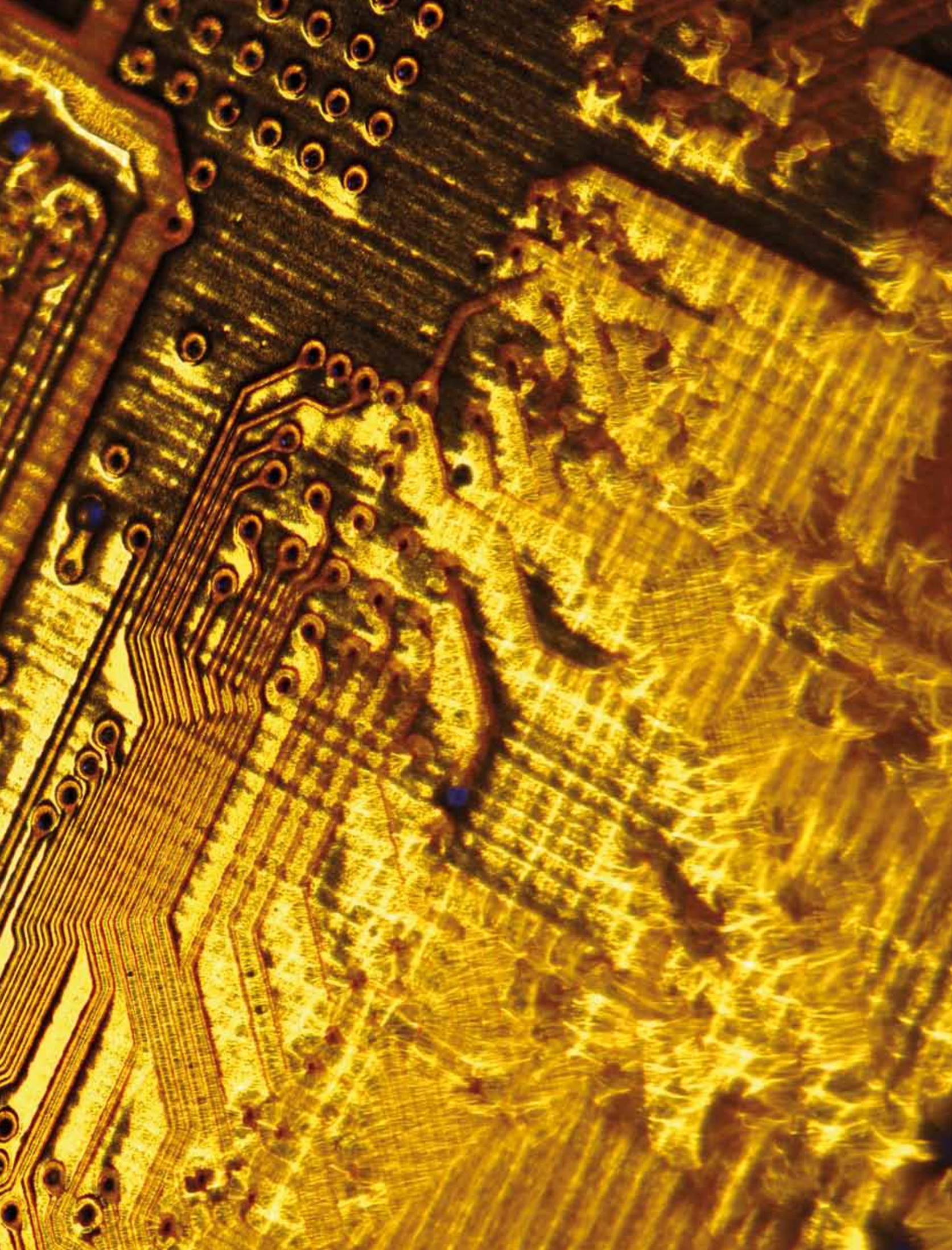
Wallace and Gromit's first feature film, The Curse of the Were-Rabbit, topped the box office charts in both the US and UK – and won an Academy Award for Best Animated Feature Film and a BAFTA for Best British Film.

Wallace and Gromit's latest adventure, A Matter of Loaf and Death, pulled an audience of 16.5 million on Christmas Day in 2008.

Expertise in the creative media sector is blending with the creativity of engineers in the many silicon businesses across the region to take advantage of today's digital technologies. The scope for innovation is enormous.

Technology and creativity in collaboration





The South West's silicon expertise on the map

The region is home to the largest concentration of silicon designers outside California's Silicon Valley.

It all began with Inmos in Bristol and GEC-Plessey Semiconductor, from which has grown up a whole generation of high-tech experts. Today the region has a cluster of about 50 silicon companies, employing around 5,000 people. The cluster has attracted investment from the global giants which have established bases in the region – such as HP Labs, Panasonic, Toshiba Telecoms Research Europe and others. And the vibrant start-up businesses have raised around £250 million in recent years to develop the technologies and jobs of the future.

In size and scale, in talent and expertise, microelectronics in the South West is a lively and diverse scene established at different times and based in different places, these are just a few examples:

Bristol

STMicroelectronics: A $9 billion global business and a European success story, it developed the processing technology that now powers the majority of UK Freeview set-top boxes and more than half of all the boxes in the world.

Icera: Founded in 2002 to specialise in G3 and G4 mobile handsets, it won a Red Herring 100 Global Award, ranking it one of the most promising global technology firms of 2007 – and by the end of 2008 it had opened in China.

Gnodal: Started up in 2008 to build innovative technologies which make it possible for today's huge data centres to be run at less cost and with less power, while maintaining high performance standards.

Swindon

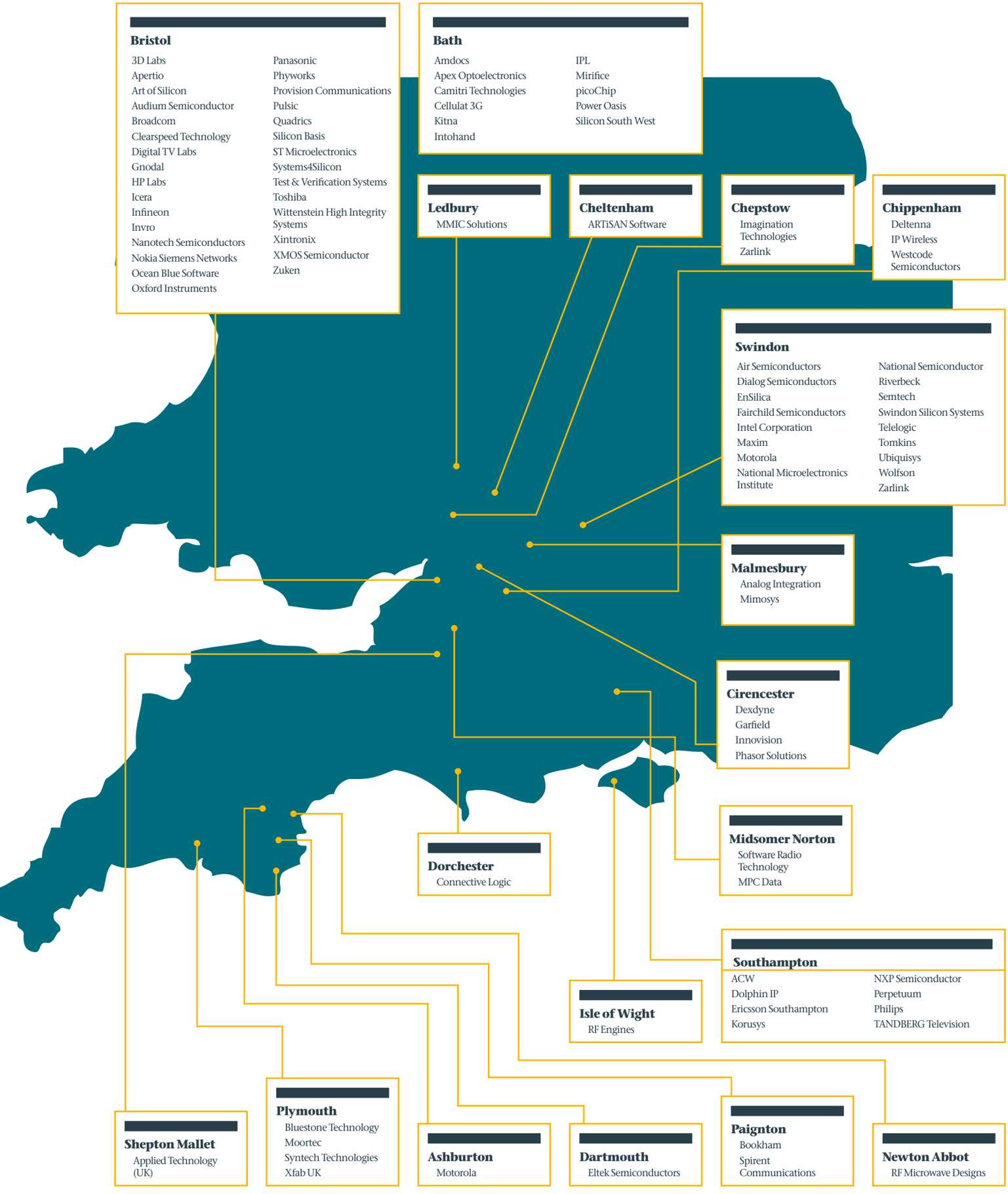
Ubiquisys: Founded in 2004, it used advanced femtocell technology to invent ZoneGate, which improves mobile coverage inside the home – attracting investment from three of the world's leading venture capitalists.

Ashburton

Motorola: Established in Devon in 2000 as Orthogon Systems and based near the UK's top wireless town of Exeter – it now leads the way in making broadband access available in rural areas.

Bath

PicoChip: Set up in 2000, its technology is used by hundreds of mobile phone networks, including eight of the global top ten in the market, to improve mobile coverage from a broadband connection.


Bristol
3D Labs
Apertio
Art of Silicon
Audium Semiconductor
Broadcom
Clearspeed Technology
Digital TV Labs
Gnodal
HP Labs
Icera
Infineon
Invro
Nanotech Semiconductors
Nokia Siemens Networks
Ocean Blue Software
Oxford Instruments
Panasonic
Phyworks
Provision Communications
Pulsic
Quadrics
Silicon Basis
ST Microelectronics
Systems4Silicon
Test & Verification Systems
Toshiba
Wittenstein High Integrity Systems
Xintronix
XMOS Semiconductor
Zuken
Bath
Amdocs
Apex Optoelectronics
Camitri Technologies
Cellulat 3G
Kitna
Intohand
IPL
Mirifice
picoChip
Power Oasis
Silicon South West
Ledbury
MMIC Solutions
Cheltenham
ARTiSAN Software
Chepstow
Imagination Technologies
Zarlink
Chippenham
Deltenna
IP Wireless
Westcode Semiconductors
Swindon
Air Semiconductors
Dialog Semiconductors
EnSilica
Fairchild Semiconductors
Intel Corporation
Maxim
Motorola
National Microelectronics Institute
National Semiconductor
Riverbeck
Semtech
Swindon Silicon Systems
Telelogic
Tomkins
Ubiquisys
Wolfson
Zarlink
Malmesbury
Analog Integration
Mimosys
Cirencester
Dexdyne
Garfield
Innovision
Phasor Solutions
Midsomer Norton
Software Radio Technology
MPC Data
Dorchester
Connective Logic
Southampton
ACW
Dolphin IP
Ericsson Southampton
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Philips
TANDBERG Television
Isle of Wight
RF Engines
Shepton Mallet
Applied Technology (UK)
Plymouth
Bluestone Technology
Moortec
Syntech Technologies
Xfab UK
Ashburton
Motorola
Dartmouth
Eltek Semiconductors
Paignton
Bookham
Spirent Communications
Newton Abbot
RF Microwave Designs

XMOS – hi-tech manufacturing at the heart of Europe's Silicon Valley

A government investment in a semi-conductor company called Inmos back in the '70s, kick-started the micro-electronics industry in the South West. From that has grown the largest cluster of its type outside the USA's Silicon Valley.

"Not only did Inmos attract other firms into the region, we also started to see spin-out companies," says David May, founder of XMOS, an example of one of the more recent spin-outs in the Bristol area. "Inside every thing like a mobile phone or set top box or DVD player are sophisticated chips, and a lot of those are designed in Bristol."

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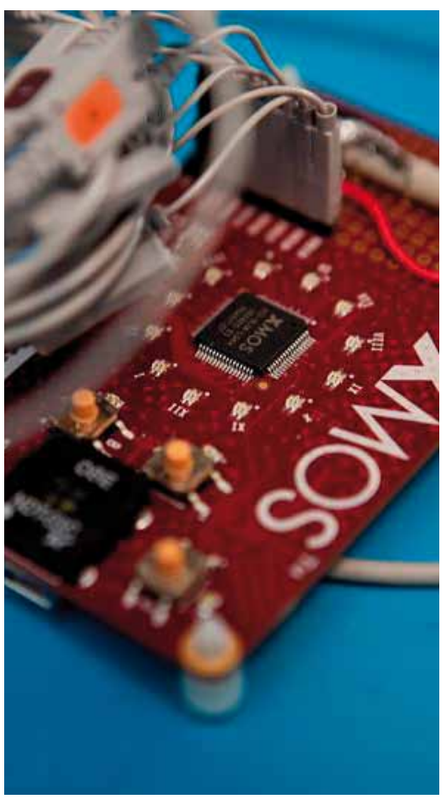
David worked at Inmos in its early days, until he went to run the Computer Science department at Bristol University in 1995. He had the idea for XMOS in around 2001 but, in the post dot-com bust, it was hard to get investors interested. Then one of his students, Ali Dixon, looking for a final year project, revived the idea, wrote the business plan, and together they raised money from the University's seed fund and launched the business around four years ago.

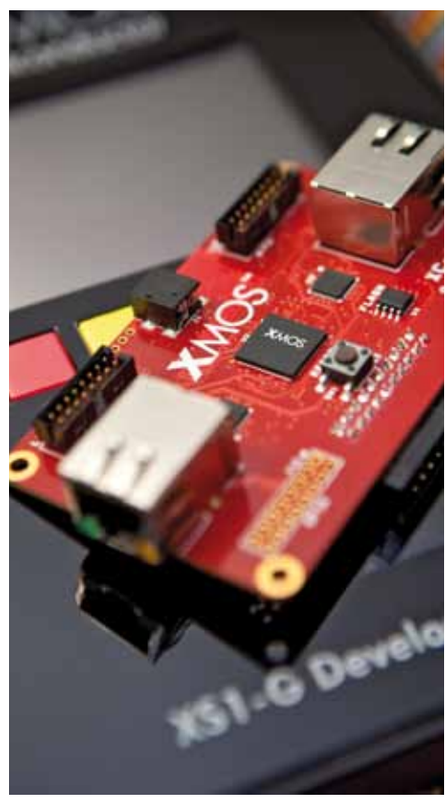
"What we're about is producing microprocessors for a new generation of electronic design. There's a shift from a time when we designed a chip with a specific purpose for every individual function, to a world in which we'll create a general purpose chip," explains David. "It goes hand-in-hand with electronics becoming much more about fashion items. You can't design a new chip for every new use; it's too expensive and takes too long. So XMOS provides the general purpose product which can be customised by programming quickly and built into many different products."

In four years, XMOS has grown to about 45 people and opened offices in California and India. "We're a local company really; we're rooted here and it's a great place to be – but we have to be able to operate as a global company as well," says David. "Like many of the

Bristol is **1 of 6 cities in the UK** to be granted **Science City** status in recognition of its work in science and technology

The region around Bristol and Bath is home to the **biggest silicon design cluster** anywhere in the world outside Silicon Valley – its start-up companies have **attracted more than $1.25 billion investment** in recent years





companies in Bristol which do design, our manufacture is actually in Taiwan. The packaging and assembly goes on somewhere else; in Malaysia or Singapore. Meanwhile, our customers are anywhere on the planet that designs and builds electronic products, so particularly the West Coast of America, then Korea, Japan and China."

One of the essential characteristics of the microelectronics design industry is the diversity of skills needed. In their Bristol office, XMOS does the design work, but even so they need people who understand the manufacturing process in detail. "We have people who do the physical level design, also people who do the logical design, people who build the tools, do the verification, build the website, design the applications, and people who do the finance and other management skills too. Bristol has one of the best concentrations of that diversity of talent that you'll find outside the US, and in significant quantities because of all the different companies based here."

With around 15,000 students right in the middle of the city, the University has a significant presence – and around a third of the people working

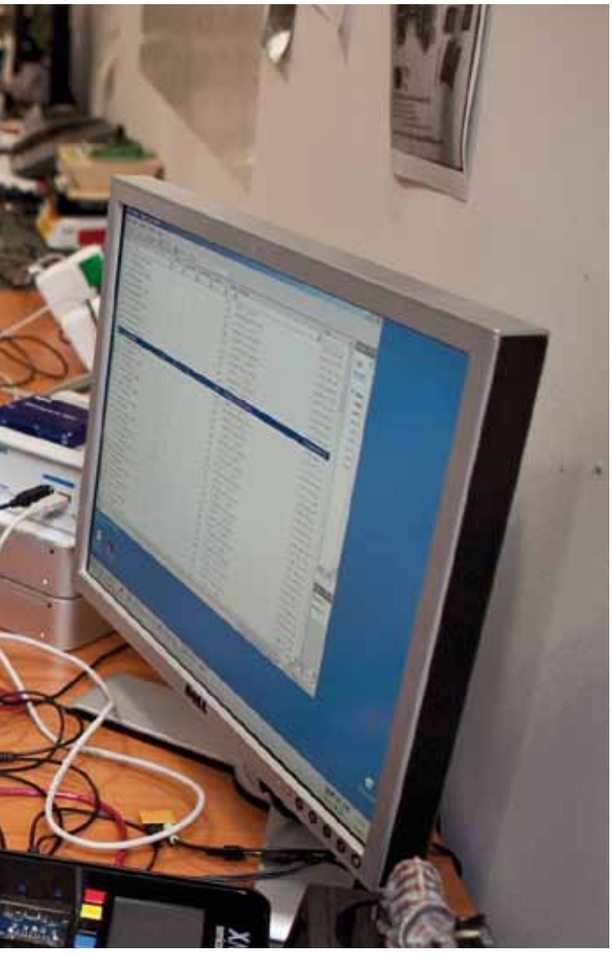
> **“We wouldn’t see India or China, or anywhere, as a threat. We see them as an opportunity. These are potentially huge emerging markets for exactly the kind of things we make.”**

at XMOS are ex-Bristol University students who’ve graduated in the last three or four years. “There’s a huge retention rate for students who come to the city to study and don’t leave – which is great because it’s important for a young company like us to be able to draw on that kind of talent pool.”

Consumers buying the electronic gadgets that the chips end up in are interested only in how easy they are to use, but behind the scenes it’s a complex business to produce them. It’s expensive and takes a long time to get to the first product. “The point is we’re putting millions of transistors down on a chip and they have to be absolutely right. It costs about $1 million dollars to do just one trial production run,” explains David. “Typically it takes a year or more to get to the first thing you can put into anybody’s hands for them to start building software and applications around. Plus you’ve got to identify the right customers for the technology and most of them are not here in the UK, so the network has to be built up. So it can be up to four years before you see any significant flow of money – and we’re more or less at that stage now.”

At a time when many people see global markets as a threat to British-based companies, David May has a different perspective, “We wouldn’t see India or China, or anywhere, as a threat. We see them as an opportunity. These are potentially huge emerging markets for exactly the kind of things we make. Do I think they could quickly replicate the kind of things we do? No. Over a 20 or 30 year period, they may well be able to, but you don’t grow this collection of expertise and culture overnight. Of course, there are lots of things that they can do very well and we’re currently in discussion with companies in India about them using our technology to do things with, to build applications on top of. But when you look at the scope for us now, it’s just an opportunity. It’s not a threat.”

One of the most exciting developments is the growing connection between what David calls the ‘artistic creative side’ and the ‘technological creative side’ of the industry. “Historically, there have been relatively few direct links but over the past few years the two have come



“One of the most exciting developments is the growing connection between the ‘artistic creative side’ and the ‘technological creative side’ of the industry.”

much closer. Film production today relies heavily on computer technology – while computer games are famous for their high-quality graphics.

“Some years ago, I had this vision looking at the credits on computer games and animated films. They listed all the conventional film roles; continuity, set design... Then all the computer roles; animation, software design and the rest of it. I thought, ‘Why are these two different groups of people?’ So we started a Masters programme at the University to make it possible for people to study both in one course.”

David believes creating these hybrid opportunities is very important because it can produce more effective and imaginative results. “With companies like Apple the electronics creativity goes into making it possible to fit all the technology into a beautifully designed must-have product – and as soon as it’s out there on the street it demands content: you’re downloading iTunes, searching out new applications.

“This is clearly the future of the industry: the integration between the styling sense, the technology sense and the provision of the content. And Bristol has pretty much all the talents to do that stuff.”

Pervasive Media Studio – where creative artists meet creative technologists

Think innovation and you may think about the technologies behind the next generation of the iPod or HD television. Yet innovation also applies to the ever more sophisticated content or applications that go onto your iPod or your TV.

The Pervasive Media Studio plays an important role in the creative life of the city – connecting the technologists with the creatives. The studio was set up 18 months ago by Watershed with HP Labs, the University of West of England and the Regional Development Agency as partners, to explore the possibilities for new forms of application or content which use wireless or mobile technology. Clare Reddington takes up the story of the Studio's evolution:

> **"The Studio gives us a physical location to bring together people from industry, academia, arts and technology to think and work side-by side."**

"The Studio gives us a physical location to bring together people from industry, academia, arts and technology to think and work side-by side. Bristol is unusual in that it has the largest concentration of silicon chip companies outside of Silicon Valley in the US. So there are a lot of research labs here. And there's also a proliferation of creative industries companies which have spun-out of organisations like the BBC Natural History Unit and Aardman Animations."

"About 10 years ago Watershed, a media centre on the Bristol harbour side, was invited into a research and development project by the University of Bristol to explore what would happen if you linked up creative businesses with really fast internet access. From this a long standing research relationship evolved with HP Labs, placing experimental technology into the hands of artists to shape ideas around its potential.

> **“...every Friday we have the doors open to absolutely anybody who wants to come and work here... it’s about inviting people in who want a different kind of conversation.”**

Three years ago Watershed set up iShed, to allow creatives and academics to work more actively together on research. Then came the Pervasive Media Studio, putting a building of the industrial revolution era to new use.

The Studio offers research and development space, and a wide variety of workshops, seminars and public events. “There’s an ethos of open innovation within the Studio,” says Clare. “People come to share knowledge and work on projects for different amounts of time, on short or long term projects. And every Friday we have the doors open to absolutely anybody who wants to come and work here.” Inspired by Jelly in New York, their term for it is Casual Co-working. “It’s about inviting people in who want a different kind of conversation – and it constantly refreshes the health of our network.”

“The Pervasive Media Studio is interesting because we don’t sit within a university campus or a corporate research lab. We sit at the heart of the city – and we’ve got our doors open, encouraging as many people as possible to join the conversation.”

In Clare’s view, the collaborative spirit is a special quality of Bristol, “For me, what’s unique about this city is that people understand that to make better content and products, having diverse voices in a project is really important.”

“So if you take that cross-over between the technology companies and the people who are making content – and then you add in the almost counter-cultural collaborative environment of a city like Bristol, you get some really exciting results.”

The BBC's Natural History Unit – world leaders in their field

Famous for programmes such as 'Planet Earth' and 'Big Cat Diaries', the BBC's Natural History Unit has been based in Bristol since its creation in 1957. It's now the largest wildlife documentary production house in the world – making around 100 hours of TV and 50 hours of radio programmes a year.

"Our job is no longer just about making a TV programme. There are the associated website and radio programmes. The whole approach is now to spread it to all other media as much as possible."

The Unit sustains its innovative programme making through international collaboration. Brian Leith, an Executive Producer at the BBC, says, "The Natural History Unit's main partner in America is the Discovery Channel. If we're making a flagship project like Planet Earth, then two thirds of the money will come from international broadcasters both in America and around the world."

And these Bristol-made programmes, made not only by the BBC but also the independent production companies in the area, aren't just shown to a UK audience; there's a global demand for their products. "Some of the series generate tens of millions of pounds in revenue from abroad," explains Brian. "For example, ORF, an Austrian broadcaster, screens about 50 hours of wildlife films a year, and a significant amount of that comes from the BBC and independent production companies in the South West. National Geographic and PBS, an American broadcaster, are also big partners to the BBC and others in the area."

> **"Someone once compared the BBC here to a medieval cathedral with a village growing round it."**

The location of the BBC in Bristol has encouraged many independent TV production companies to set up in the area. "Someone once compared the BBC here to a medieval cathedral with a village growing round it," says Brian. "The BBC has critical mass in production, around which a whole lot of other talent has aggregated. There are now all sorts of freelancers, including producers, directors and cameramen in the region, who specialise in natural history. Wildlife film making involves skills that are easily transferable to many other parallel and complimentary industries such as graphic design," he adds. "I think it's no accident that Aardman Animations ended-up working here for example, because there are a lot of excellent editors, graphic designers and post-production houses based locally."

The industry requires a wide range of skills in order to make the innovative content it produces. Andrew Jackson, Head of the Natural History Unit, says, "There's a huge range of jobs involved in television production of this kind, from researchers who may have a degree in biology or geography, to directors, editors, graphic designers, cameramen, finance people – even tree climbing experts."

TV production has transformed rapidly over the recent years, with technological innovation and the switch from film to digital, and now three quarters of the programming at the Natural History Unit is done on HD.

As Brian says, "Everything is now multi-platform. Our job is no longer just about making a TV programme. There are the associated website and radio programmes. The whole approach is now to spread it to all other media as much as possible. There's an on-going revolution in the technology we use."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Bristol is the **world capital of the wildlife and environmental film industry** – responsible for **25% of the sector's global output** and **employing around 1,500 people**

The **Wildscreen Festival**, a week long festival promoting excellence in the wildlife media industry, is held **every 2 years** in the city – and contributes around **£1 million to the local economy**

The **creative industries** are **worth around £360 million** to the local economy – **employing 3.7% of the workforce**

The worlds of education and industry are working together to find news ways to develop the talent needed for the jobs and industries of the future.

Pushing educational frontiers

The Bloodhound Project – reaching 1,000 mph and 2,000 schools

Building a car to beat the world's land speed record is inspiring a new generation of young people to become the scientists and engineers of tomorrow

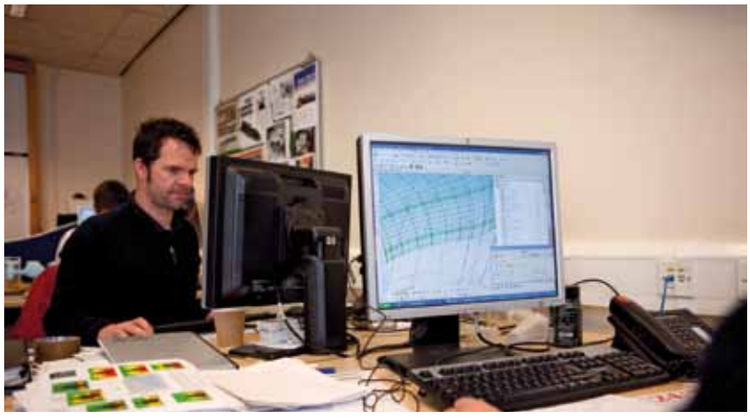
You might think that building a car, powered by a jet engine, to go up to 1,000 mph in an attempt to break the world land speed record is not helping us to face up to today's environmental challenges. Not so, says, Dr. John Lanham of the University of the West of England, who is working on the Bloodhound project which is aiming to do just that.

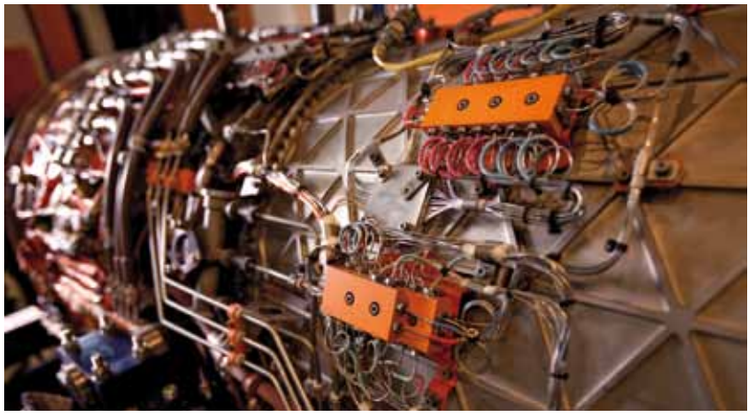
> The Apollo space missions of the 1960s and 70s inspired a generation of engineers. But in recent years, the number of young people becoming engineers has declined sharply. The Bloodhound Project aims to re-create the Apollo effect.

"It's all about engaging youngsters in a group of subjects we call STEM – science, technology, engineering and maths," says John. "It's been a national problem for a number of years that there aren't enough youngsters studying these subjects at school – and we need to increase the participation in STEM so that we can involve young people in solving some of the challenges we face, from the world's energy problems to clean water."

Hywel Vaughn, a student at the university, worked on a project to design the cockpit for Andy Green, the driver. Following that, Hywel was offered a 12 month placement with the Engineering Design Team where he has been responsible for the design of the steering wheel. So he has had the chance to work closely with the top class designers and engineers behind Bloodhound, "My knowledge of engineering has increased dramatically. Every single day you're doing something new, something exciting and something literally ground-breaking."

"These subjects – science, technology, engineering and maths – are vital to the economic performance of our country, and to developing new solutions about how we live and operate in a more sustainable way."





> **“You understand how the world works through engineering. Engineering is all around you; everything has been engineered to work. There’s something about understanding the fundamentals of the way that society works that really appealed to me.”**

For Hywel, the experience has been thrilling. “You understand how the world works through engineering. Engineering is all around you; everything has been engineered to work. There’s something about understanding the fundamentals of the way that society works that really appealed to me. I’m really enthusiastic to be involved with what is cutting-edge technology. Where that will lead me, I’m not sure – the future is completely up for grabs.”

The project seems to be having the desired effect. Over 2,000 schools are signed-up. Already, the evidence is that there’s been an increase in the number of children at schools and colleges engaging with STEM subjects, and the university’s seen a 30-40% rise in the number of students applying to study engineering.

The information and data coming out of the project will be shared at all levels of education from primary through to university, in classrooms, lecture theatres and laboratories up and down the country.

And, whilst Bloodhound focuses on the technologies involved in designing and building the car, the project highlights the many other skills needed to make it happen: logistics management; project management; materials science; geography – with the selection of the site in South Africa; even biology – with the sensors monitoring the performance of the driver.

In its whole life, the car will probably run only about 100 miles. So surprisingly, maybe, the environmental impact of the project itself is low. But for John and the Bloodhound team, the long term win is not in the development of the car itself, but in exciting young people about the skills that will feed through into the engineering and technology solutions of the future.

As John says, “We need young people to come and study – and then work – in these areas because we need people with those skills to help not only this country, but the planet as a whole. We’ve got to find more efficient ways to use nature’s resources. These subjects – science, technology, engineering and maths – are vital to the economic performance of our country, and to developing new solutions about how we live and operate in a more sustainable way.”

John Cabot Academy – preparing students for the opportunities of the future

"Bristol has top-class engineering companies, like Rolls-Royce, and top-class high-tech companies, like Hewlett Packard. And when the students realise what's on their doorstep it's ground-breaking for them. They can actually see there are more opportunities out there than they'd ever thought," says James Hall, Assistant Principal of John Cabot Academy.

James Hall also heads up science teaching in the school and he's clear about how working with industry enthuses students about what they study in the classroom, "Hands on, that's what science and technology is about. It's being able to create things, to touch things, to try and work out how they operate."

> **"Hands on, that's what science and technology is about. It's being able to create things, to touch things, to try and work out how they operate."**

John Cabot recently converted from a City Technology College to an Academy, which has given the school greater flexibility in the way they handle the curriculum. They are focused on bridging the classroom and the world of work. And making the most of the links with local industry and universities which come with their sponsorship status is a good way to do that.

For example, the sponsorship of Rolls-Royce offers a range of practical benefits from visits to their operations in Filton to engineers coming into the classroom. The company donates the kind of equipment a school could not generally hope to lay their hands on, including laser cutters, an electron microscope and even a helicopter engine to 'dissect' to get a better understanding of mechanics. The company offers students a work experience programme of up to 10 weeks, which can be a great asset when applying for a university place or a job, and there's even a sponsorship scheme for sixth formers to encourage them to study engineering.

As part of bringing real world issues into the classroom, an area of the school has been dedicated to exploring environmental challenges. In a project with the University of the West of England, called Go For Set, they have a volunteer from the Environment Agency working with Year 9 students on conserving water in the school, and an expert from the MOD looking at energy provision. There's even a weather station on top of the school and they've set their sights on achieving eco-school status.

The school is serious about increasing the creativity of the teaching it offers and James says that the staff recognise that students are the best people to judge whether or not the lessons they're getting are doing the job. They wanted a process to work out how best to get that feedback. So the University of the West of England volunteered to train some of the students to observe and critique lessons, in a non-confrontational way. Now any time a member of the leadership team sits in to observe lessons, they're accompanied by a trained student – who is focused not so much on the teacher but on the students and how they are actually learning. And now the regular self-evaluation which the staff do has a student voice added in to the process.

The school has developed a more flexible approach to the curriculum overall, mixing up Year Groups and encouraging the skills needed for research and finding information for themselves. James is confident that they can demonstrate that these new techniques make a difference. "We're after a more skills-based, competency-based approach to learning because we believe the better students are at solving problems, the better they will be in the workplace. We've just had the first Year Group which has followed this approach from 11 all the way through to 16 – and they were the highest achieving Year Group in the school's history."

> **"We're trying to prepare students for a world that is changing very fast – and it's important we give the students the skills to access a wide range of jobs that will exist in the future."**

Summing up why the school is putting so much into new approaches to Teaching and Learning, James Hall says, "The world is getting smaller and we're got a global community now. So we're trying to prepare students for a world that is changing very fast – and it's important we give them the skills to access a wide range of jobs that will exist in the future."

Once a year John Cabot runs a Careers Fair with 20 or 30 firms and different types of professionals coming in to the school:

"There's such a diversity of employment opportunities out there, but students tend to see just a sample: they see what's in the media, they know what their parents do or maybe what their friends' parents do. But to give them a chance to see there are other possibilities out there is very valuable. The children have been very receptive and people like to come here and talk about their jobs!" says James Hall, Head of Science at the Academy.

SETsquared – making ideas happen

Four universities came together to back high-tech, high-growth companies and grow them into big players in the knowledge-economy.

Nick Sturge, Director of the SETsquared incubator in Bristol, knows what he's there to do, "The UK needs more knowledge-based companies. With traditional manufacturing industries reducing, we need to create new knowledge-based industries. So we need to support engineers and entrepreneurs, in whatever discipline, who can start a business. And our role is to help them make those businesses succeed."

"We take in very early stage entrepreneurs with innovative technology ideas that have potential for real growth," explains Nick. "The principle of business incubation is that a technology entrepreneur, for example, would otherwise start their business in their shed or their back bedroom on their own. Whereas, if they do it in a community of entrepreneurs, with people around to support them, facilities and networks, they're more likely to succeed."

> **"The principle of business incubation is that a technology entrepreneur would otherwise start their business in their shed or their back bedroom on their own. Whereas, if they do it in a community of entrepreneurs, they're more like to succeed."**

SETsquared is a collaboration between the four universities of Bath, Bristol, Southampton and Surrey, backed by government money, to support new technology businesses in the area. As Nick describes it, universities in the UK have three areas of focus today: research, teaching and – increasingly – enterprise. "In Bristol there's a very strong desire to stimulate the local, regional and national economy through enterprise.

In 2008, the centre won an award for being the best business incubator in the UK. Nick says, "It's all about the people. We work with an entrepreneur who has an idea and help them develop their business. Sometimes they come in with one business proposition, and go out with something different!" Sometimes the idea just isn't going to fly: the challenges are too great and they put the idea back on the shelf. But Nick feels even that is valuable, because they've been given the opportunity to try it.

"Bristol is a hotbed of innovation and enterprise. It always has been," says Nick, who's enthusiastic about the potential in the city, "Bristol is just about the right size; it's big enough that there are a lot of things going on, but small enough to rub shoulders with lots of people. There's a very

> **What's needed with all these new industries is innovation – ideas, some out of the box thinking, and the talent and skill to make it happen.**

diverse and talented population here. And what's needed with all these new industries is innovation – ideas, some out of the box thinking, and the talent and skill to make it happen."

"There are incubators all around the country now – quite a few in Bristol specialising in different sectors and types of business," he continues. That's fantastic because it means we can support a broad spectrum of ideas and people. The challenge is to capture those ideas and make sure they become valuable for society."

How it works

Nick Sturge, Director of Bristol's SETsquared, explains how it works when someone walks through the door with a new idea:

> "We spend time with them to understand how they got to where they are... what they've got... and where they want to go.
>
> We help them to identify their strategy...who their customers are, what their products should look like... and where their funding will come from in order to grow.
>
> We make use of the support of local accountants and consultants who offer their advice free of charge.
>
> We evaluate if they have got potential for growth, what the challenges are – because there always are challenges... and if the challenges they face are surmountable, how to help them do that."

Designated as the UK's first Low Carbon Economic Area, the South West aims to play a leading role in the search for renewable energies and the creation of entrepreneurial green businesses to compete in worldwide markets.

Building a green economy

Growing the green technology sector in Bristol

Over 200 companies are members of BETS, the largest trade association for environmental technologies in the UK

Alan Bailey, Chairman of Bristol Environmental Technology Sector, believes that new firms are being attracted into the South West by three things: the highly skilled engineers and graduates who live in the area, the universities in the region and the environmental organisations, such as the Soil Association and Sustrans. "All of these together make the package very exciting. Every day I'm hearing of new environmental companies re-locating to the South West."

> **"I see the South West as having more off-shore wind power than any other part of the UK over the next decade. And we could really have some world-class examples to show of how to make the most of those opportunities."**

"Bristol has very good access to graduates and engineers because of the aerospace cluster of businesses here, which is the largest in Europe," he explains. The skills developed in aerospace, as well as chemical processing in the region, can be transferred easily to the growing environmental sector.

Some of the firms are being tempted to re-located by one of the biggest projects launched by BETS, the Avonmouth Forum. "There's now £2 billion of proposed investment going into Avonmouth on 14 different projects – and Avonmouth will probably be the largest cluster of environmental tech in Europe. We're actively re-locating businesses to the South West."

BETS drives the Hydrogen Strategy Board, which explores how hydrogen and other renewable energies can be used increasingly to power the region's energy needs. "We're looking at a feasibility study to put in the first industrial heating grid in the UK, which would reuse the excess heat from industrial processes," says Alan.

Alan Bailey is also chairman of two companies with an environmental focus, ABS Renewables and ELS Consulting, both of which aim to improve the processes and energy efficiency of their clients, most of which are FTSE100 and FTSE 250 companies. "The ethos of reducing their carbon footprint – and doing more with less – is embedded in everything we do," he says.

There's a big future for environmental companies in the region, according to Alan, "I see the South West as having more off-shore wind power than any other part of the UK over the next decade. We could really have some world-class examples to show of how to make the most of those opportunities."

"It's a very, very exciting time in the South West. We're in the right place, at the right time, with the right people pushing to make it happen."

> **“Every day I’m hearing of new environmental companies re-locating to the South West.”**

PowerOasis – connecting people sustainably

By combining mobile telecommunications skills with renewable energy expertise, the team at PowerOasis have invented a way for base stations all over the world to run on solar or wind power.

There are 4 billion mobile phone subscribers in the world today, and that's expected to increase by 50% over the next 5 years. That increase is going to require 1 to 2 million new base stations and – because almost all of the new subscribers are going to be in the emerging markets – more than half of the base stations needed will be in areas which don't have access to a reliable electricity grid.

> **"The worldwide 'green telecoms' equipment market will be worth around $300 billion by 2013."**

Ivan Harris, Chief Marketing Officer at PowerOasis, explains how it works, "For companies which run mobile networks all over the world, providing power is one of their top three operational costs. But in developing countries in Africa, it can represent almost 50% of their costs: the No.1 item on the list. The base stations which serve those communities have been using diesel generators – which are very expensive to keep going, with diesel having to be transported to the site, sometimes even by helicopter.

So for our customers – who are the big mobile network companies – our technology allows them to supplement, or even replace, diesel fuel with renewable energy, which has almost zero operational costs. So we can both reduce their costs and reduce their carbon footprint."

Plus the benefit to the environment could be significant. The average base station today emits about 40 tonnes of CO_2 a year – the equivalent of

two homes in the US or running 6 family sized cars for a year. Ivan estimates that, if they manage to get half of the new off-grid base stations powered by renewable energy, the carbon emissions saved would be the size of Sydney's footprint over a year.

> **"Now that there's a critical mass of cutting-edge technology businesses in the South West, there are more and more reasons for people to gravitate to the area."**

That's why they're convinced that their innovative power solutions will benefit everyone: the mobile companies, the consumers and the environment – and, indeed, PowerOasis' own prospects.

Even though they only started in 2007 and have a team of 15 full time people, PowerOasis serves a truly global market. "One hundred percent of our business is done overseas," says Ivan. "Our customers are in places like Sri Lanka to Qatar, or even the beautiful island of Vanuatu in the South Pacific."

Their opportunities lie in places around the world where the infrastructure is poor and the demand for modern communications is high. The worldwide 'green telecoms' equipment market will be worth around $300 billion by 2013 and almost half of that will be in areas where PowerOasis systems can be used.

So the opportunity ahead of them is huge. Peter Bishop, Chief Technology Officer at PowerOasis, credits the Bath Ventures Innovation Centre and SETsquared in Bristol as being instrumental in identifying that opportunity. "They supported us through the incubation period with both advice and funding; helping develop the business plan and introducing us to the right venture capitalists."

This is the second business Ivan has been involved with which has attracted funding from local investors. "We've got great universities and colleges around here, and that means there's a lot talent that can be pooled too" he says. "Now that there's a critical mass of cutting-edge technology businesses in the South West, there are more and more reasons for people to gravitate to the area."

There are already **150 renewable electricity schemes in the region**

The Bristol area has an estimated **300+ companies** in **environmental technologies**

Across the West of England, about **13,600 people** work in **environmental technologies and services**

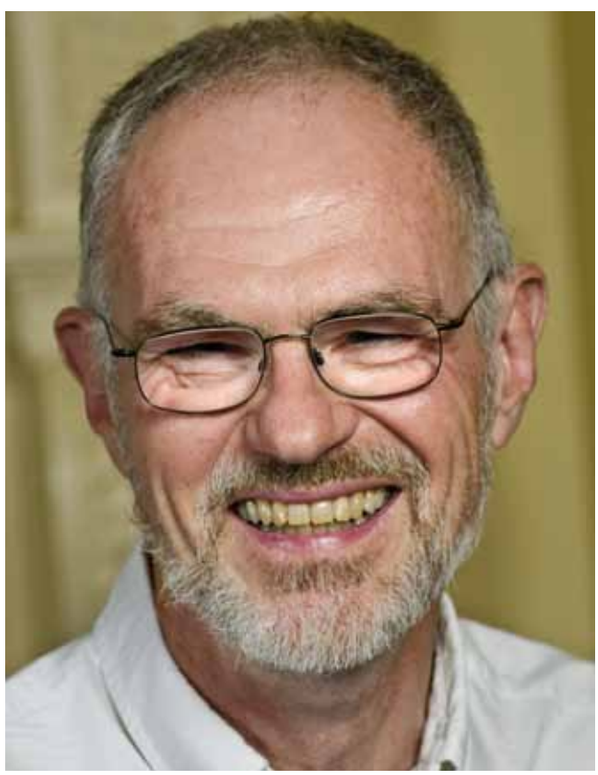
There were almost **900,000 jobs in Low Carbon and Environmental Goods and Services** in 2008 – research commissioned by the Government estimates this could **grow by 45%** over the **next 8 years**

Wind Prospect – starting local and going global

Today's environmental entrepreneurs are harnessing the wind and the waves in the search for solutions to the world's energy challenges.

"In 1997 when we began we were two people, Euan Cameron and myself. Today we have more than 200 people spread around the globe. We started in Bristol. We're now an international company," says Colin Palmer, a director and one of the co-founders of Wind Prospect – a renewable energy developer which has worked on wind farms, from design to operation worldwide.

> **"There's so much going on in renewable energy at the moment. It's just an incredible area to work in."**



He and the team are excited by the momentum in industry, "There's so much going on in renewable energy at the moment. It's just an incredible area to work in. You've got huge offshore wind turbines being developed; massive engineering structures of great beauty and sophistication. You've also got work going on towards a smart grid, to enable us to integrate the various renewables into our grid. Solar energy is coming up very rapidly; that's going to be a very exciting area in the future."

Renewable energy is one of the fastest-growing sectors in the world: wind energy has been growing at 25-30% a year, solar energy even faster. Globally, it's employing hundreds of thousands of people and creating long-term secure jobs.

Wind Prospect covers the whole spectrum from finding the locations in which to develop projects, right the way through development, construction and operation, and then the lifetime servicing of those projects. "We find that because we've actually been out there and done it -- we're the people who put things in the ground -- that banks and other people come to us for advice, to help them do the same thing. So these days, there's an increasing amount of advisory work too."

Right from the start, Wind Prospect's strategy has been to diversify: partly by design and partly by serendipity. Their first diversification took them into Australia by lucky chance. "We had a young guy working with us, who wanted to go back home. He wanted to set up Wind Prospect in Australia, so we found some support for him – and the rest, as they say, is history. He's now the most successful developer in the Southern Hemisphere," says Colin.

As well as expanding their horizons geographically, they also want to diversify their technological base. They're keen to get into solar energy and they came up with an idea for how to begin, "It's early days in that industry for us, and we wanted to learn," explains Colin. "We felt one good way to do that would be to support a Ph.D. student at the university. It gives the student the opportunity to get industrial experience, and gives us access to solar technology and an understanding of the industry."

One reason they like being based in Bristol is they find it an easy city to recruit in – partly, because young people find it an attractive place to live in. The company employs a lot of young graduates and Colin sees that as key to the success of the business in the future, "I think this is an industry that a lot of young people don't understand yet. They look to the more established businesses for their future. But actually, the renewables sector offers them a very secure long-term future – with the added benefit of doing something good for the environment, as well," says Colin.

And the region is committed to the search for new energy solutions. As Colin puts it, "The Southwest is a leading area for renewable energy technologies. They've made some brave decisions to support wave energy and are currently building the Wave Hub,

"This is an industry that a lot of young people don't understand yet. They look to the more established businesses for their future. But actually, the renewables sector offers them a very secure long-term future."

which will become a very important international focus of wave energy development. There is also a lot going to explore biomass as an alternative fuel. I also believe we can see a good future for solar energy here because the south coast is a particularly good solar resource for the UK."

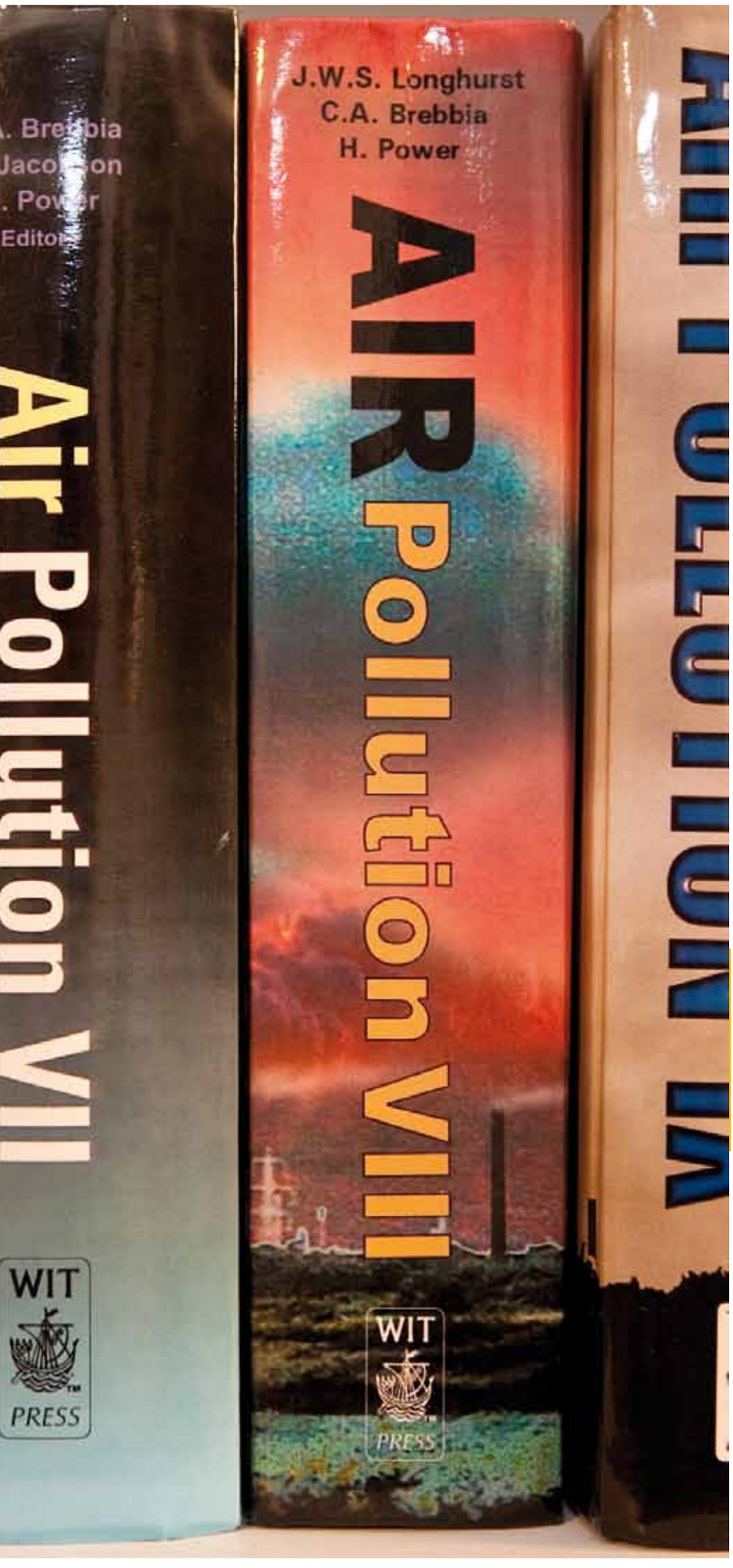
"We want to give people in the company the chance to take the initiative, so they can find opportunities and follow them up," explains Colin. So how does a rapidly growing small company, like Wind Prospect, see the future? "If I look back 10 years, the world has changed a huge amount. It will change even more in the next 10. So I think it's wrong to have a rigid set of ideas about where an organization should go in such a rapidly changing world. I want to keep the company young – and to keep growing by setting up new business areas; going into more countries and more technologies."

Nurturing green talent

Bristol is home to some 200 or more enterprises working in the environmental technology and services sector – and key to the region's competitive edge in the low carbon economy.

"Bristol is one of the great British cities and today it's a city that's committed to developing its sustainability and environmental expertise", says Professor Jim Longhurst, Professor of Environmental Science at the University of the West of England. "It's home to a group of universities that offer world-leading expertise in areas of environmental science, technology and policy. It is also the home of the Environment Agency for England and Wales, the Soil Association and Sustrans."

So why has this happened in Bristol? "Bristol has a long and illustrious history of engineering – which allows today's cutting-edge design and technology companies to capitalise on the wealth of engineering skills and apply them to innovation in the environmental sector. These enterprises have also encouraged the development of environmental consultancy business in the region. We have leading companies in the transport sector operating here, in aerospace and automotive," explains Jim. "Consequently, Bristol now has a competitive advantage in this area – which puts us in a good position to invent new ways of becoming more environmentally sustainable."



> **“As a society, we have a relatively small window of time in which to move from a dependency on fossil fuels into a different energy mix for the future. The urgency of the challenge means that many of our old ways of doing things will be challenged.”**

Professor Longhurst is also Co-Director at the Institute of Sustainability, Health and the Environment at the University. The University offers a wide spectrum of under-graduate and post-graduate degrees in environmental and related subjects, as well as a variety of short courses. Over the past decade, he’s seen considerable growth in students’ interest in these issues. While student demand for dedicated environmental degrees continues to be strong, a significant change is that many students taking different degrees now have the opportunity to supplement their studies with environmental or sustainability courses.

The University is also known for its partnerships with industry, commerce and the professions, providing training to many sectors, from aerospace through to water. New professional development and degree programmes are coming on stream in areas such as energy management, water pollution, flood management, risk assessment and public health, to support private and public sector organisations in their transition to a low carbon future.

An 80% cut in carbon emissions by 2050 is a very challenging target for the UK. Supporting that ambition, the Institute has a project they call Carbon Futures for Bristol. Rose Bailey, the researcher leading this project, is asking a range of experts to take an imaginative leap and envisage Bristol as it needs to be in 40 years time, to achieve that target: what does the city of 2050 look like? How will people move around? What will the lifestyle be like? Then using the innovative technique of

'Backcasting' – which can be thought of as the opposite of 'forecasting' – they aim to plot how to arrive at that vision, starting from today. "If we can do this in Bristol, it will provide a routemap for other UK cities to follow. We're going to try and show how it can be done," says Jim.

"As a society, we have a relatively small window of time in which to move from a dependency on fossil fuels into a different energy mix for the future. The urgency of the challenge means that many of our old ways of doing things will be challenged," he says. "Individuals are going to need to be more entrepreneurial in a green economy sense; businesses are going to need to work more collaboratively in ways they haven't done in the past. We need to innovate our way to this low carbon future."

Jim believes that Bristol is grasping the opportunity and will become one of the cities that pioneers the way in which the UK can shift to a lower carbon economy and society. He applauds the City Council and the private sector for their partnership in developing the Bristol Environmental Technology and Services Partnership, an organisation which brings together the private and the public sector and universities to promote the green technology future in and around Bristol.

The city was short listed for Europe's green capital competition – and a huge amount of effort is going into to ensuring that the local and regional economy will prosper through the green collar jobs of the future.

Thinking about how jobs will emerge in the coming years, Jim sees a range of opportunities, "One urgent task is improving the energy efficiency of our existing housing stock – and, indeed, commercial and public buildings too. There'll be a very large opportunity in terms of draught proofing and insulating the existing stock.

"At the same time, we need to learn how to provide more of the resources a city needs from closer to the city; more localised forms of production and travel from the point of manufacture to the point of sale. And, of course, one of the biggest challenges is transport. We have, as a society at large, a complete dependency on fossil fuels for our transportation systems.

"There are no magic solutions as yet. But a range of small scale initiatives that can change our relationship with fossil fuel must come, and surely will come. And if they're going to come, they're likely to come from somewhere like Bristol."

> **"Initiatives that can change our relationship with fossil fuel must come, and surely will come. And if they're going to come, they're likely to come from somewhere like Bristol."**


Mapping Sustainability, Hea
and Environment across Eng
Institute for Sustainability, He
Principle Findings
Methods
Rationale for the Project

Building blocks for the future

From its early days, Bristol and the South West have been connected into world trade, and many industries and businesses grew up around the shipping routes of the colonial era. Some, like mining, have gone now. Others, like modern aerospace and micro-electronics, are generating wealth today. Through them, the region continues to be plugged into the global market place.

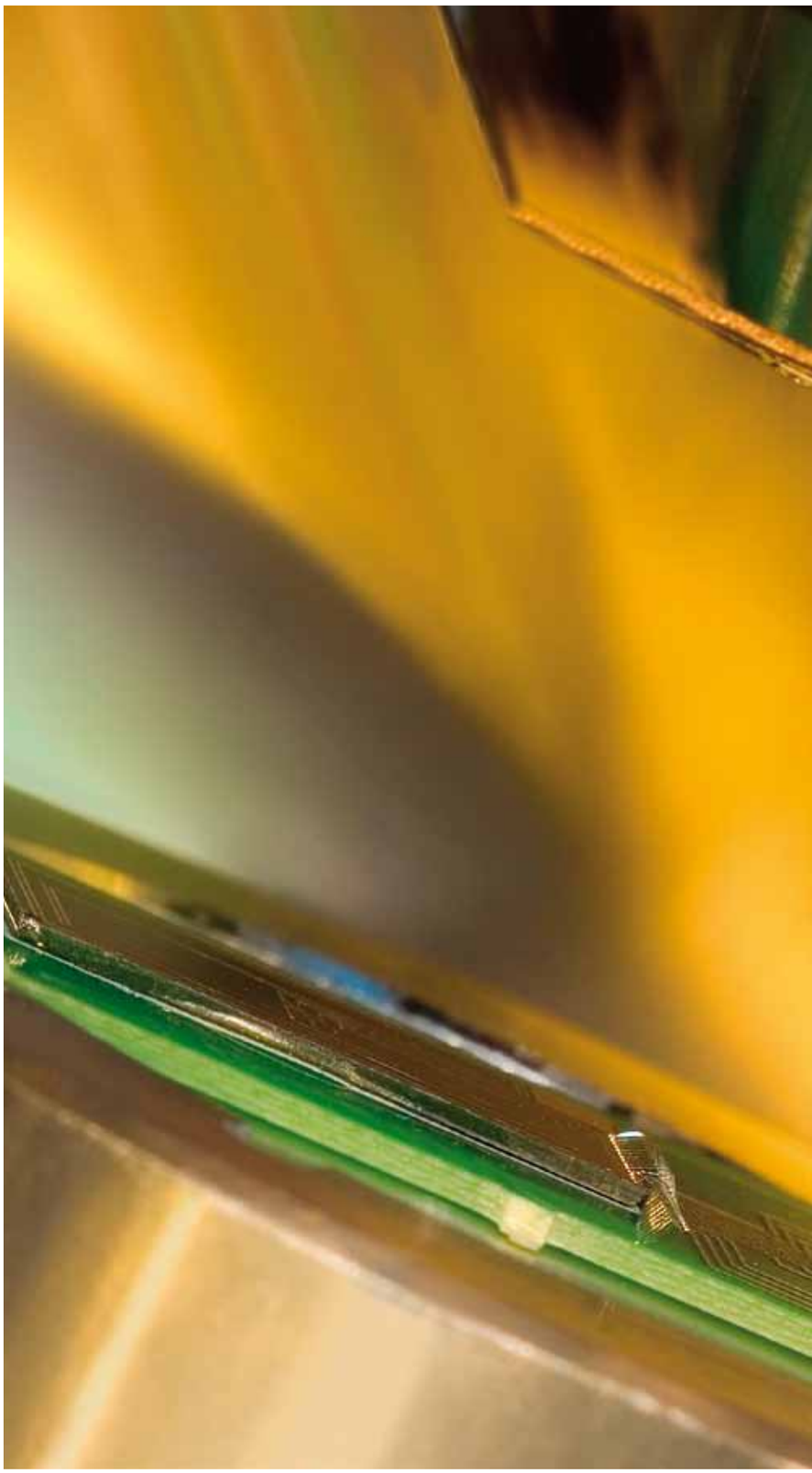
The many high-tech businesses along the Silicon Corridor represent Europe's biggest concentration of skills for the micro-electronics industry. Major global corporates in the sector are investing in ground-breaking research and engineering in the region. New innovative start-ups arrive every year. And a growing cluster of smaller companies are stepping up to fit into global supply chains. The digital revolution is blurring the boundaries between technology and the creative arts to create new content and applications for today's sophisticated consumers.

Backed by the universities, incubators are helping entrepreneurs to attract the investment needed to make ideas happen. Building up home-grown talent will be the surest way to win in a world where the new industries and new opportunities will depend on skills and creativity, technology and innovation.

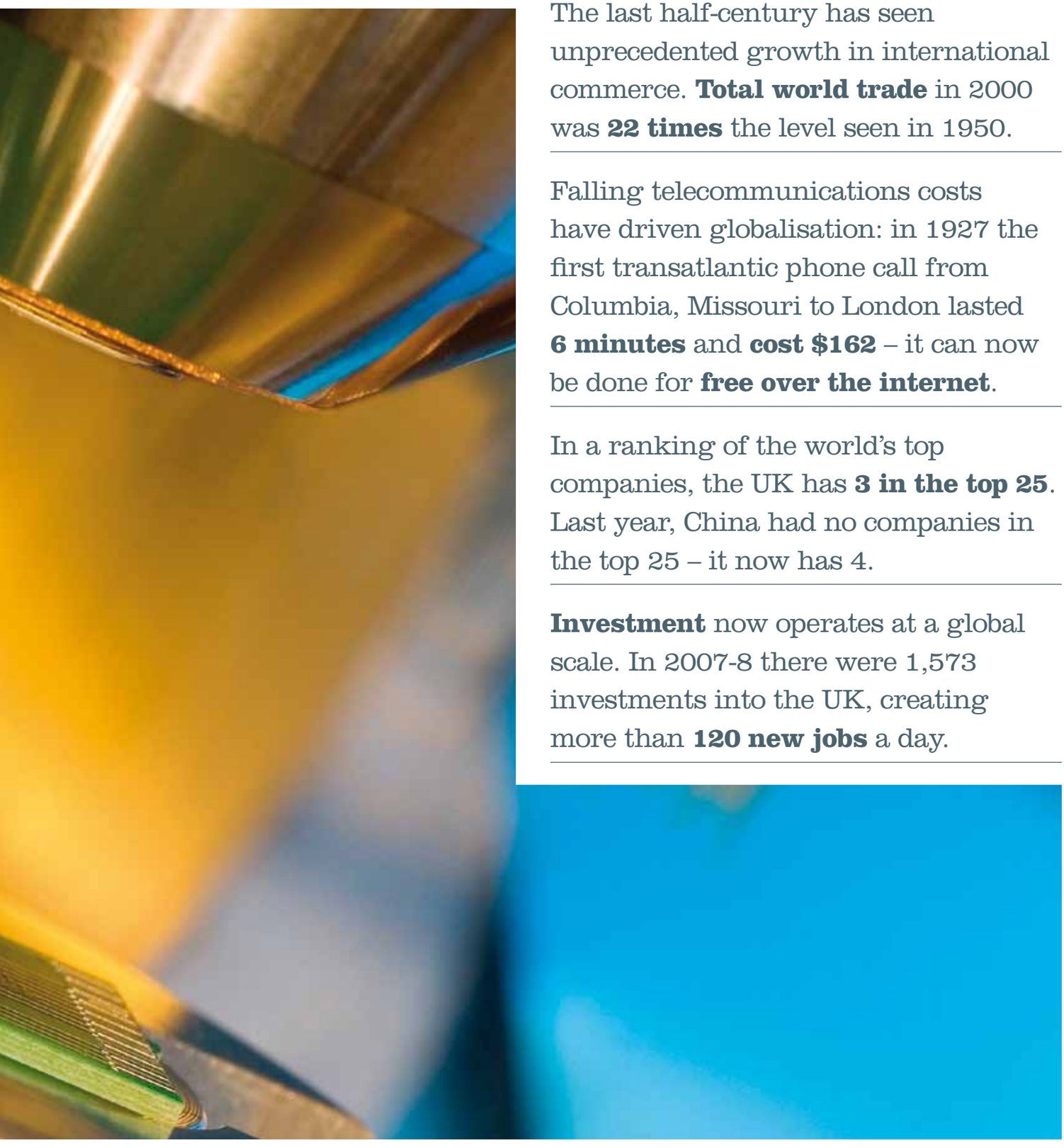
The South West is focused on making the most of its potential in wind, tidal and solar power to develop new energy solutions for the future – while, at the same time, establishing new jobs and businesses that can flourish in the shift to a more sustainable, low carbon economy.

Looking ahead, one thing is clear. The work that we do, the way that we live, and the cities that we live in are all changing.

And, everywhere across the region today, it is already possible to identify what the building blocks of the future will be.



The world is changing



The last half-century has seen unprecedented growth in international commerce. **Total world trade** in 2000 was **22 times** the level seen in 1950.

Falling telecommunications costs have driven globalisation: in 1927 the first transatlantic phone call from Columbia, Missouri to London lasted **6 minutes** and **cost $162** – it can now be done for **free over the internet**.

In a ranking of the world's top companies, the UK has **3 in the top 25**. Last year, China had no companies in the top 25 – it now has 4.

Investment now operates at a global scale. In 2007-8 there were 1,573 investments into the UK, creating more than **120 new jobs** a day.