With increasing competition for funds and divergent demands from the various funders of research and other university activities, universities throughout the UK are facing a time of challenge and change. In response to these challenges, the University of Bristol has clearly stated its vision for research in its Research Strategy, outlined in the last issue of re:search. An exciting aspect of this vision is the formal recognition that, whilst fundamental research remains the corner stone of the research base, the University will also develop a portfolio of activities deriving from and supporting its fundamental research.

In practical terms this means that enterprise, in the broadest interpretation, will be integrated into our core activities of teaching and discovery so that knowledge exploitation, technology transfer and enterprise are embedded in all University activities. This joint agenda of research and enterprise will be managed strategically by the University Research Committee, whose membership includes recently appointed Faculty Research Directors. It will be fully supported by the division of Research and Enterprise Development. This approach will enhance our fundamental research base and is also a vital component in ensuring that the University of Bristol is a key player in the knowledge-driven economy, producing tangible benefits from its research for both the University and the community at large.

Dr Siân Thomas
Director of Research and Enterprise Development
Body Building in Bristol

As the population ages, the concept of ‘regenerative’ medicine is becoming recognised as an important new approach to solving many of our long-term healthcare needs. Anthony Hollander, Professor of Rheumatology and Tissue Engineering in the Division of Medicine, describes some of the advances being made towards this brave new world.

Bristol has a long tradition of engineering. Brunel led the way in the 19th century with his construction of the Great Western Railway, the Clifton Suspension Bridge and the SS Great Britain. In the 20th century the aerospace industry literally took off in Bristol, with the design and construction of Concorde as its flagship. At the start of the 21st century we have a new engineering goal: the construction of tissues and organs. It is part of a new programme of regenerative medicine that will ultimately revolutionise healthcare.

The aim of regenerative medicine is to restore normal function to organs and tissues that do not function properly as a result of disease, traumatic injury or birth defects. This can be achieved using a range of therapeutic approaches that primarily include stem cells, tissue engineering and gene therapy.

Our rapidly expanding knowledge of the cellular basis of disease, and the genes that might make individuals particularly susceptible, will give us ample opportunity to reverse the processes of tissue destruction. Since the world’s ageing population that help maintain the function of the particular tissue or organ in which they are found, but in order for the body to function normally, these cells must be continuously replaced when they die. Stem cells, on the other hand, have the unique property of almost indefinite self-renewal. They are the ‘stem’ of the cellular world, although they can be persuaded to ‘grow up’ if they are exposed to the right biological signals.

As we get older, mature cells become less good at doing their job and are often rather poor at generating tissue. We can get around this problem by obtaining stem cells and giving them the right signals to grow into the particular kind of mature cell that we need. To grow and use an engineered tissue you need to start with the best available cells, put them onto a scaffold material that will help to guide their growth, switch it off before the engineered product is implanted into the body. Osteoarthritis provides an excellent example of why regenerative medicine must become an essential therapeutic tool and how stem cells, tissue engineering and gene therapy will be used together. Osteoarthritis is predominantly an ageing disease. It develops when cartilage, the shock-absorbing tissue that results from a single gene. However, we can also put new genes into cells that are going to be used for tissue engineering. By using a genetic switching mechanism it is possible to turn on the gene while the tissue is growing in the laboratory and then turn it off before the tissue is implanted into the body.

Gene therapy is the introduction of new genes into the body in place of faulty ones and is likely to be of most benefit for patients with inherited disorders resulting from a single gene. However, we can also put new genes into cells that are going to be used for tissue engineering. By using a genetic switching mechanism it is possible to turn on the gene while the tissue is growing in the laboratory and then turn it off before the engineered product is implanted into the body. Osteoarthritis provides an excellent example of why regenerative medicine must become an essential therapeutic tool and how stem cells, tissue engineering and gene therapy will be used together. Osteoarthritis is predominantly an ageing disease. It

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Tissue cells grown from the cartilage in your nose could be implanted into your knee.

Osteoarthritis is a major cause of disability. In Bristol we are exploring the possibility of using regenerative medicine to help patients with osteoarthritis. We are particularly interested in finding more effective cells for cartilage repair. We are therefore exploring the possibility that using cells from the cartilage in your nose could be used to grow tissue that will be implanted into your knee.

Because cartilage is unusual in having only one single cell type – the chondrocyte – its relative simplicity makes it an ideal target for repair by tissue engineering. For younger people with injury-induced osteoarthritis it is already possible to take a biopsy of normal cartilage from a part of the knee which does not carry much weight and extract the chondrocytes for tissue engineering. In Bristol however, we are particularly interested in finding more effective cells for cartilage repair. We are exploring the possibility that using cells from the cartilage in your nose could be used to grow tissue that will be implanted into your knee.

But for older people with osteoarthritis the mature chondrocytes often do not function well enough for tissue engineering. For these patients, taking adult stem cells and turning them into fresh, young chondrocytes may be the best answer. Consequently, we are developing new ways of extracting the rare stem cells found in bone marrow.

The ageing population will present healthcare organisations with unprecedented demands

people in the UK with osteoarthritic joints, a million of which are severe enough to require joint replacement surgery. Demographic changes suggest that these numbers will double over the next 20 years, presenting a huge challenge to the NHS in meeting an invariable demand for hip and knee replacements.

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Stormy Times Ahead?

Dr Jonathan Bamber, senior lecturer in the School for Geographical Sciences, is the lead investigator on a multi-institute project aimed at investigating how changes to the ice cover in the Arctic may affect the future climate of north-west Europe. Could it be the storehouse for the largest ice cap in the area was growing

We are eternally fascinated by the weather – it is an essential topic of conversation. Huge sums of money are invested in trying to predict what it is going to do tomorrow, the day after or even a week into the future. But what about next year, the next decade or even the next century? What does the climate hold in store for us over these timescales? These are the sorts of questions that the project will try to tackle.

Large and rapid climate shifts would have devastating socio-economic consequences

Fundied by the Natural Environment Research Council under a scheme called RAPID, the multi-institute project aims to investigate potential triggers for abrupt climate change. These abrupt changes have been known to occur in the past, particularly during the last glacial period between about 120,000 and 12,000 years Before Present (BP). The changes then were as much as seven degrees centigrade in just a few decades. Such a large and rapid shift would have devastating socio-economic consequences if it happened today, but during the relatively warm inter-glacial period that we are now in (known as the Holocene and covering the last 12,000 years) there is no evidence for such dramatic climate shifts. Does this mean that the Holocene is more stable than the glacial period that preceded it, or is the climate sensitive to global warming because of a strong positive feedback between snow cover and temperature – as snow and ice absorb more solar radiation it is absorbed by the much darker land and sea surface underneath, further enhancing the warming effect, which results in the disappearance of more snow. Thus most climate models predict that global warming will be substantially amplified in the Arctic. The key question Bamber and his team aim to address is: will the increase in freshwater from the Arctic be sufficient to reduce or shutdown the thermohaline circulation and, paradoxically, cause a cooling in northern Europe?

Could increased melting of the Greenland ice sheet affect the Gulf Stream and result in a regional cooling in north-west Europe?

Although most of the glaciers were shrinking, the predictions of global warming over the next century are accurate, this mass loss looks set to greatly accelerate. The Arctic is particularly sensitive to global warming because of the high albedo (some 90% of the energy is reflected back into space). As more of the ice sheet melts, the water absorbs more of incoming solar radiation, which is then absorbed by the much darker land and sea surface underneath, further enhancing the warming effect, which results in the disappearance of more snow. Thus most climate models predict that global warming will be substantially amplified in the Arctic. The key question Bamber and his team aim to address is: will the increase in freshwater from the Arctic be sufficient to reduce or shutdown the thermohaline circulation and, paradoxically, cause a cooling in northern Europe?

Some surprising results have already been obtained. In 2002, Bamber and a team of NASA scientists carried out an airborne survey of several glaciers and ice caps in the Svalbard Archipelago in the high Arctic (Svalbard lies in this group of islands). They measured changes in the surface elevation of the ice masses over a six-year interval, with centimetre accuracy. To their surprise they found that although most of the glaciers were shrinking as expected, some surprising results have already been obtained. In 2002, Bamber and a team of NASA scientists carried out an airborne survey of several glaciers and ice caps in the Svalbard Archipelago in the high Arctic (Svalbard lies in this group of islands). They measured changes in the surface elevation of the ice masses over a six-year interval, with centimetre accuracy. To their surprise they found that although most of the glaciers were shrinking as expected,Some surprising results have already been obtained. In 2002, Bamber and a team of NASA scientists carried out an airborne survey of several glaciers and ice caps in the Svalbard Archipelago in the high Arctic (Svalbard lies in this group of islands). They measured changes in the surface elevation of the ice masses over a six-year interval, with centimetre accuracy. To their surprise they found that although most of the glaciers were shrinking as expected, some surprising results have already been obtained. In 2002, Bamber and a team of NASA scientists carried out an airborne survey of several glaciers and ice caps in the Svalbard Archipelago in the high Arctic (Svalbard lies in this group of islands). They measured changes in the surface elevation of the ice masses over a six-year interval, with centimetre accuracy. To their surprise they found that although most of the glaciers were shrinking as expected, could be the storehouse for the largest ice cap in the area was growing.
How can we tell how things would have looked to people in the past? It was this simple question that led Kate Devlin, Veronica Sundstedt and Alan Chalmers from the University’s Computer Science Department to become involved in realistic graphics and archaeology.

Seeing the Light

Computer-generated images are becoming a popular way of presenting archaeological information. To date, however, the emphasis has been on using these images for display purposes, with interpretation and research taking second place to the demand for a visually stunning presentation. In realistic computer graphics, the main goal is the creation of an environment that is perceptually equivalent to a real scene. So for computer graphics to benefit the archaeological community, they must offer the archaeologist the chance to extend or enhance their analysis of a site or artefact. Furthermore, the accuracy of the images produced should be quantifiable – the archaeologist must be confident that what they see in the generated image is comparable to what would have been seen originally.

Initial work in this area began in 1994 and in 2001 Dr Alan Chalmers and Duncan Brown (Southampton City Heritage Services) won Bristol University’s first Business Plan Competition with ‘ArchLight’, a system for producing highly realistic, computer-generated environments. Since then the research of the computer graphics group has focused on one area of realistic simulations that is often neglected: original lighting. Light cannot be captured in the archaeological record and consequently its importance is not always considered in interpretations of past environments. The ways in which we view, perceive and understand objects is governed by our current lighting methods – steady, bright electric light or large windows – but in order to understand how an environment and its contents were viewed in the past we must consider how they were illuminated.

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The only trace of light in the archaeological record is the methods used to provide it – hearths, candles, lamps or windows regulating the factor of the working hours. If we compare that to conditions today, sunlight is far less relevant to how we work. The evidence from architecture tells us the most about lighting – a lack of glass and a need for security often meant smaller windows, therefore dimmer interiors. Going further back in time, the unyielding darkness of a deep cave would require some form of artificial light for navigation purposes alone. It seems plausible that objects and environments were affected by the limitations of lighting, and this influence may have extended into their design. By recreating the means of illumination for a given environment and simulating it accurately, the archaeologist may find new ways of viewing things.

The initial step in recreating the light source involves experimental archaeology. In consultation with the Department of Archaeology, various types of light sources were physically recreated. These included tallow candles and reeds, an animal fat lamp, beeswax candles and olive oil lamps. Each of these fuels produces a different colour when burnt. To obtain this unique spectral profile for each fuel, detailed data were gathered using a spectroradiometer, a device that measures the absolute value of the spectral characteristics without making physical contact with the flame. The values obtained from the original light sources can then be used as lighting values for a computer-generated model, so that a scene can be rendered under its appropriate lighting conditions.

One of the most recent projects undertaken was Veronica Sundstedt’s MSc dissertation on the ancient Egyptian temple of Kalabsha. In 1963 the temple, which dates back to 30 BC, was moved to a new site in order to save it from the rising waters of Lake Nasser. Working closely with Egyptologists it has been possible to use computer graphics and information from the archaeological record to recreate the temple, place it back to its original location and orientation, and illuminate it as it may have appeared some 2,000 years ago. An animation was created showing how sunlight would have affected the perception of the temple over a ten-hour period in January 30 BC. A comparison of this animation and the video footage taken at the site in January 2003 enables the Egyptologists to compare just how the new location and orientation of the temple, in addition to the damage, has altered its appearance. The interior of the temple was also modelled in detail. This allows the Egyptologists to see how the hieroglyphics would have been perceived in the past – not as they are seen today, unpainted (the paint having long since faded) and under modern lighting – but brightly painted under the illumination of sesame oil lamps.

Overall, this research into colour and light has shown how easy it is for our own preconceptions to intrude into the ways we view archaeological objects or sites, but a definitive explanation would never be expected in archaeology. Visualising a past environment is fraught with difficulties from the outset, so a means of validating computer-generated representations provides an exciting opportunity to explore and test new ideas, with computer-generated images coming as beneficial to the archaeologist as they are to the public.
I do not imagine that many of us spend much time thinking about what heaven might look like, even supposing we believed such a place to exist at all. But whether it exists or not, Dr Ad Putter, Director of the Centre for Medieval Studies in the English Department, spends his time researching it.

Medieval minds turned readily to the Otherworld, because it mattered more than life itself that people got to heaven or at least to purgatory. Not surprisingly, then, the precise conditions of life after death were the focus of intense speculation and sometimes controversy. One such controversy raged over the question I raised earlier: do celestial beings have bodies or not? On the authority of St Paul, who had spoken unambiguously of ‘celestial bodies’ (I Corinthians, xv), the view that determined each detail, heaven is one of the most impressive medieval ‘cathedrals of the mind’. And as with real cathedrals, the architecture of this mental construct changed with the passing of time. Corresponding roughly to the transition from Romanesque to Gothic is the change from visions of ‘heaven as a garden’ (which is what the word ‘paradise’ originally meant) to visions of heaven as a walled city. Both ideas have precursors in the Bible – the garden in Genesis and the Song of Songs, the city in the Book of Revelation – but the resurgence of these bodies – I can recommend to you the literature of this – does not do with these bodies – I can recommend to you. The literature and art of the Middle Ages. In this period, the reality of heaven was never in serious doubt. Medieval representations of the cosmos duly map heaven beyond the spheres of the planets and the fixed stars. In numerous medieval maps of the world, the earthly paradise is given an exact location (in the Far East).

| Do celestial beings have bodies or not? | What machinery was used to hoist angels up and down? |

Alexander the Great was famously believed to have knocked on the very gates of paradise, and to have been refused entry by an angel who curtly raged over the question I raised earlier: do celestial beings have bodies or not? On the authority of St Paul, who had spoken unambiguously of ‘celestial bodies’ (I Corinthians, xv), the view that would have simplified the work of medieval theologians if things had gone the other way. Bodies bring with them all manner of complications: eventually their age had to be decided on (all early thirty – the perfect age), and likewise their sex (we shall be male or female as we are now, though sex in the other sense will interest us no more) and their physical condition perfected, regardless of any disfigurement of our terrestrial body.

In its scrupulous attention to detail, and the coherence of the logic: that determines each detail, heaven is one of the most impressive medieval ‘cathedrals of the mind’. And as with real cathedrals, the architecture of this mental construct changed with the passing of time. Corresponding roughly with the transition from Romanesque to Gothic is the change from visions of ‘heaven as a garden’ (which is what the word ‘paradise’ originally meant) to visions of heaven as a walled city. Both ideas have precursors in the Bible – the garden in Genesis and the Song of Songs, the city in the Book of

The subject of medieval heaven is a vast one, and serious study of it calls for expertise in a wide range of disciplines, including history and art history, letters, music and theology and others. This is why the Centre for Medieval Studies at Bristol University, which brings together medievalists of all relevant disciplines across the Arts Faculty, has joined forces with leading scholars from other universities to explore heaven as it was envisaged by medieval people in art and literature, and in popular and academic thought.

The Centre has organised a two-year research programme, generously sponsored by the Read-Tuckwell Foundation and the University’s Institute for Advanced Studies. The programme includes several public lectures, delivered by distinguished guest speakers from other universities, and culminates in an international and interdisciplinary conference. The topics of the speakers give some indication of the fascinating issues surrounding medieval heaven.

How was heaven portrayed on stage in medieval mystery plays – what machinery was used to hoist angels up and down, for example? To what extent is it defensible or heretical for a woman mystic to say that she has seen God face to face in this life when that is supposed to happen in the life hereafter? How can writers do justice to the notion that heaven is complete from all relevant disciplines across the arts. Faculty, has joined forces with leading scholars from other universities to explore heaven as it was envisaged by medieval people in art and literature, and in popular and academic thought.

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Behind every successful medical innovation lies years and years of research, usually done in universities. Professor Andrew Dick, Head of the University’s Division of Ophthalmology, reveals some of the exciting research that may result in new treatments for eye disease.

Improvement in future health care relies heavily on translating advances made in the research laboratory into real treatment in the clinic. So above the waiting room of the Bristol Eye Hospital, a purpose-built modern specialty hospital, sit the laboratories of one of the leading eye research centres in the country – Bristol University’s Division of Ophthalmology. Additional research laboratories, housed in the Medical School, opened in July by Prince Michael of Kent, patron of the National Eye Research Centre.

The Bristol Eye Bank, part of the University’s Division of Ophthalmology but funded by the Department of Health, issued its first corneas in March 1986 and is now the country’s largest eye bank. In the UK last year almost 2,300 people had their sight restored through a corneal transplant – two-thirds of which were supplied by the Bristol Eye Hospital. Its Director, Professor John Armitage, was instrumental in establishing this facility. Pertinent to its success was the fact that it was the first eye bank in the UK to use a new method of storage for corneas – organ culture.

When one thinks of organ and tissue storage for transplantation, there is an assumption that they are frozen. In the case of corneas, however, laboratory and clinical studies have demonstrated that the action of freezing can cause significant damage. The one alternative – refrigerated storage – allows corneas to be kept for a few days, but Armitage’s innovative work introduced methods of storing corneas in a nutrient medium at close to normal body temperature, extending their storage time to a month. This not only greatly reduced wastage of valuable corneas, but helped to transform routine corneal transplantation in the UK from an emergency out-of-hours procedure to a scheduled operation that could be planned well in advance, to the benefit of both patients and hospitals. Importantly, doctors also have more time to find the most suitable patient for each cornea, which results in better grafts.

Innovative research extended the storage time of corneas to a month

Regardless, cryopreservation (freezing) of the cornea offers the only truly long-term method of storage for corneas, and Armitage’s group is currently investigating the feasibility of ice-free cryopreservation by vitrification. When a liquid vitrifies (turns to a ‘glass’ without any ice forming), it does not undergo a phase change – such as when water turns into ice – but it acquires the physical properties of a solid owing to an enormous increase in viscosity during cooling. As a result, the mechanisms of injury associated with the formation of ice are avoided. But to attain this state requires exposure of cells and tissues to very high concentrations of solutes so work is ongoing to discover what solutions are most suitable.

But having retrieved a cornea and successfully restored the sight of your patient is by no means the end of the story. While most corneal grafts last for many years, 25% survive less than five years, resulting in the need for a second corneal transplant, which is likely to survive an even shorter time.

The very first evidence of stem cells in the retina

One of the main causes of corneal graft failure, as with other transplants, is rejection of the foreign tissue by the immune system. To understand why this happens, a very large multi-centre study of corneal transplants – over 1,000 grafts – is in progress under Armitage’s supervision. Ultimately it is hoped that it will provide answers to questions such as whether tissue matching is required, the need for immune suppression, and whether it is possible to predict which patients are more likely to reject their transplants.

Another area of research is Professor Dick’s programme that looks at how cells in the retina control inflammatory responses. There is a disease in humans called ‘uveitis’ (pronounced UV-itis), which is an autoimmune disease that can lead to arthritis or multiple sclerosis. Inflammation is caused by the body attacking tissue when the autoimmune response is turned on. In uveitis it attacks the retina, resulting in a 25% chance of losing your sight.

A 70% response rate in patients not responding to conventional drugs

It is well known that in rheumatoid arthritis a small protein called ‘tumour necrosis factor’ (TNF) is released by cells, causing the violent inflammatory response. Using animal models, Dick’s team showed that TNF is also a promoter of inflammatory responses in the eye. In collaboration with colleagues in Oxford who designed what is called a ‘fusión’ protein which binds to the TNF and neutralises it, the team in Bristol then established its effectiveness in clinical models. They have now just finished their first highly successful clinical trial, testing it in patients with uveitis. The outcome was a 70% response rate in patients who were not responding to conventional drugs. As a result, the team is negotiating with biotech companies to develop a drug to inhibit uveitis.

Collaborative work with industry, DNAX Inc in USA, is investigating mechanisms to generate compounds and drugs to facilitate repair of the retina, so that it may be possible to return inflamed tissue to its original state by controlling the macrophage function.

Finally, and perhaps most excitingly, the most recent development in ‘remodelling’ is with neural progenitor cells, or stem cells. In the brain these progenitor cells can be ‘switched on’ to generate a range of cell types required to repair damage to the brain. But although the retina consists of neural (nerve) tissue that is similar to the brain, it has always been understood that it does not contain progenitor cells that would help remodel the system. Dick, however, found this difficult to accept and in a paper published in September’s issue of the British Journal of Ophthalmology he and his team report the very first evidence of progenitor cells in the retina. This is an extremely important landmark that might ultimately lead to a whole new area of treatment for retinal disease.

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The symposium revealed that a large gap exists between the questions being addressed in the lab and the problems faced by clinicians when treating patients who have suffered a stroke. Although research has made great progress, yielding drugs that appear to have huge potential, these drugs have consistently failed during clinical trials.

Optimism was high, however, that ways would be found to overcome this gap. In order to do so, it is essential that research scientists and clinicians work together more closely. Bristol Neuroscience will facilitate this, greatly improving communication between the lab bench and the hospital bedside.

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Collaborative work with industry, DNAX Inc in USA, is investigating mechanisms to generate compounds and drugs to facilitate repair of the retina, so that it may be possible to return inflamed tissue to its original state by controlling the macrophage function.
Imagine being on a desert island – or anywhere else in the world for that matter – and instantaneously being able to call up a piece of film and watch it on a portable device that provided images of unparalleled quality. Turning this into reality is the dream behind 3C Research, a University-based company.

The city of Bristol has long been renowned for its activities in TV production and high-tech electronics. In 3C Research, world-class expertise developed at the University will join forces with a range of industrial partners, including Granada, Toshiba and Origin, to look into the technological future. Recently awarded £7.6m by the Department of Trade and Industry to progress its adventurous research programme, 3C Research will bring together a dynamic mix of academic research excellence, production creativity, and technological know-how. With the industrial partner support, funding available for the programme is over £11m in the first three years.

Increasingly people are looking to be liberated from sitting at a desk in order to access information, but this requires significant advances in equipment portability and access to interactive information, as well as the applications that support them. The dramatic advances in multimedia services and the new, user-friendly devices needed to deliver the dream will build upon five projects that arose out of research originally done in the University’s Electrical and Electronic Engineering and Computer Science departments.

Motion Ripper

Generating realistic animation is an expensive and highly skilled process. Motion Ripper aims to provide animators in the broadcast and games industries with a suite of tools that will enable them to produce complex, realistic animation quickly and easily. Access to Granada’s online video database will provide the project with an extensive range of motions to sample. Ultimately, using the software being developed, animators will be able to extract (rip) motion data from the reference video which can then be used in a computer graphics scene to drive character motion. Unique versions of these motion ‘signatures’ will then be automatically generated, allowing the animators to extend clips or create complex effects. For example, the motion signature of a bird flying can be translated to create a plane that flaps its wings.

The motion signature of a bird flying can be translated to create a plane that flaps its wings

ICBR – Intelligent Content-Based Retrieval

If a producer does not have the funding or time to go to South Africa and film

If a producer does not have the funding or time to go to South Africa and film

a lion chasing zebras, how can he find such a clip amongst all the film footage available? Television and film producers have a real need to be able to organise, store and retrieve vast amounts of media images. Furthermore, their requirements are growing as more and more media becomes available. The ICBR project proposes to solve the problem by combining a large-scale multimedia server and database with intelligent shot-recognition and retrieval software.

When completed, the ICBR demonstrator will include a set of software tools for the automatic recognition of images and audio, and for the shot selection and editing of television programmes. The system will select video and audio material according to pre-set criteria, which will include image-similarity measures and object recognition. The selected media will then be presented in an ordered way ready for incorporation into an editing system in order to construct new sequences or complete programmes.

RoD – Rendering on Demand

The computer graphics industry, and in particular those involved with films, games and virtual reality, continues to demand more and more realistic computer-generated images. Despite the ready availability of modern, high-performance graphics, the complexity of the content being modelled and the high fidelity required of the images means that rendering such images (a technique for producing images from their three-dimensional geometry) is simply not possible in a realistic timeframe on a single computer.

RoD aims to provide a high-performance, high-fidelity rendering system that will be accessible from many locations. This will enable users to submit their content to the system and see the desired images rendered in a reasonable, and ultimately real-time, frame. RoD will achieve this goal of ‘realism in real-time’ by combining parallel processing – a number of computers working in tandem – with visual perception techniques. These utilise the fact that the human eye fails to notice certain aspects of an image.
Since the human eye fails to detect certain aspects of an image, significant time can be saved by not reproducing those parts we will not notice.

By exploiting our understanding of the human visual system, significant time can be saved by simply not rendering those parts we will not notice.

OSIRIS – Open Infotainment Services In Radio Interconnected Systems

With the Government aiming to extend the information age to everyone, a key requirement will be fast, flexible and reliable broadband access if the opportunities and benefits of a knowledge-based economy are to become inclusive, and the promise of ‘access to the internet for everyone who wants it by 2005’ is to be realised. Wireless technology is widely regarded as a means of enabling this revolution, however significant research and development is still necessary before wireless can offer ‘wired quality’ at a reasonable price for the mass market.

OSIRIS aims to address this need with the development of novel technologies that will provide an adaptable and resilient radio infrastructure. This will give everyone, everywhere, at any time, seamless access to top-quality broadband internet facilities via handheld devices that tap into a network of public hotspots.

Wireless can offer ‘wired quality’ at a realistic price for the mass market. When combined in the exciting new ways envisaged by 3C Research, these services will impact on the economy and people’s lives in ways hitherto unimaginable... even on a desert island.

www.3crresearch.co.uk

At the BA Festival of Science in Salford this year, Dr Sotaro Kita of the Department of Experimental Psychology asked a group of English, Japanese and Turkish speakers to watch a cartoon featuring Sylvester the cat and his elusive prey, Tweetie Pie. He then asked them to describe particular scenes and observed any gestures they made while speaking.

Kita found that the speakers of the three different languages used different gestures to depict the same event, and that these gestures appeared to reflect the way in which the structure of their languages expressed that event. For example, the participants described a scene in which Sylvester swings across a street on a rope to catch Tweetie. The English speakers predominantly used arc gestures to depict the swing motion, while the Japanese and Turkish speakers tended to use straight gestures. Kita suggests that this is because Japanese and Turkish have no verb that corresponds to the English intransitive verb ‘to swing’, so they use the straight gestures because they cannot easily express the concept of movement with an arc. English speakers, on the other hand, used the arc gesture because the language can readily express the change of location and the arc-shaped trajectory.

Kita concluded that at the moment of speaking language influences spatial thinking, such that English speakers tend to think about manner and trajectory simultaneously, while Japanese and Turkish speakers may think about them separately.

http://psychology.bps.org.uk

The cataloguing of 57,000 files from the Chinese Maritime Customs Service sounds a dry and dusty business, but Dr Robert Bickers in the Department of Historical Studies believes they will transform our understanding of Chinese history during the late 19th and early 20th centuries. The Chinese Maritime Customs Service (CMCS) was an international bureaucracy under the control of successive Chinese central governments, from its founding in 1853 until its abolition by the communists in 1949. It was the only agency which functioned without interruption for this whole period. Established by foreigners during the Taiping Rebellion to collect taxes on maritime trade when the Chinese were unable to do so, its functions quickly expanded. It became responsible for domestic customs administration, postal administration, harbour and waterway management, weather reporting, and anti-smuggling operations. It mapped, lit and policed the coastline, reviewed and approved foreign trade, collected taxes on goods imported and exported, ran the CMCS Albert Hotel and the CMS Club, handled transit trade, and was involved in loan negotiations, currency reform, and financial and economic management. As a result, the CMCS archives now constitute one of the richest repositories for the study of the history of China during the late Qing and the Republic. Most of this material has never been published.

The CMCS has long been associated with the role of Britain in China in the late 19th century. Its senior staff were predominantly British and Sir Robert Hart, the first Inspector General, guided its development for almost 50 years from 1863 to 1912. Essentially established by Britons who were trained in the Consular Service, they brought British Civil Service expertise to the CMCS but had to marry this with Chinese administrative practices.

With an overwhelming number of Chinese staff, and having to report to Chinese superiors, this middle layer of foreigners introduced western-style practices to the Chinese State, and the service became something of a hybrid. It was always a Chinese agency but was effectively ‘outsourced’ to foreigners. With trade the focus of the relationship between China and other foreign powers, having foreigners running the CMCS enabled the State to develop knowledge about international law, how international treaties were negotiated, and how to do diplomacy — things that China was not experienced at and, as a result, was suffering from politically.

One clear example of the way in which this material will help the rewriting of modern Chinese history is the fact that it includes quarterly returns from each of the dozens of customs stations around the country, regarding the export and import of arms and ammunition, and other materials of war. Militarism and warlord violence was the characteristic feature of China in the 1920s and 30s, but scholars have lacked detailed evidence of the arms trade which underpinned the violence. These quarterly returns reveal information such as which ministry gave permission to which military commander to import, say, 10,000 rifles and 5,000 uniforms through this port, and from that foreign client. These shipments can now be tracked across the provinces to see where they end up and this information then cross-referenced with battle data.

When General Y took control of Z. So the CMCS could track across the provinces to see where these shipments go. In the 1920s and 30s, but scholars have lacked detailed evidence of the arms trade which underpinned the violence. These quarterly returns reveal information such as which ministry gave permission to which military commander to import, say, 10,000 rifles and 5,000 uniforms through this port, and from that foreign client. These shipments can now be tracked across the provinces to see where they end up and this information then cross-referenced with battle data.
But as well as providing historians with information about the politics of China during this period, there are fascinating questions to be asked about the men and their families – from light housekeeper to Inspector General. How did they learn the language; did they learn to adapt; and where did their loyalties lie? A Briton based in a port in the 1920s – was he a servant of the British Empire or the Chinese state? While a strong sense of a highly developed service culture emerges from these documents, there are interesting tensions between absolute loyalty to the CMCS – and men had to be loyal otherwise they did not get the plum postings and instead rotted in obscure places – and national loyalties. And there was a fixed class divide. Although ‘outdoor’ staff – often people with no education – could work their way up through the outdoor hierarchy, they rarely crossed the divide to become ‘indoor’ staff.

Bickers and his colleagues, including four archivists at the Second Historical Archives of China in Nanjing, have been working on cataloguing the CMCS files for three years now. Originally catalogued on paper in an illegible handwritten Chinese, the archives are now being transferred from the original manuscripts in their original language – eighty per cent are in English – onto CDs. The project has been so successful and revealed so much fascinating material that Bickers and his collaborator – Hans van de Ven at Cambridge University – have just been awarded £300,000 from the Arts and Humanities Research Board to continue the work for a further three years. A post-doctoral assistant, Dr Yuehtsen Chung, will take the lead on collecting materials for the UK team and her own projects. Based in Nanjing for the first year, she will then complete the work in Bristol. As well as cataloguing the data, the archivists in China will construct databases on personnel, economic, financial and ecological history, and produce documentary collections on various topics relating to the history of the Customs Service and its significance in modern Chinese history. To assist others use the material, the team will also aims to produce four guidebooks of annotated source materials, on the following themes: an institutional history of CMCS, department by department; the history of a typical customs station; the CMCS in international relations; and the socio-cultural world of the CMCS.

The catalogue will be published on a CD-ROM, and a selection of documents will also be published on microfilm, making them accessible to a wide range of researchers.

www.bris.ac.uk/Depts/History

Robert Bicker’s book 
Empire Made Me: An Englishman Adrift in Shanghai was published in September 2003 by Penguin Books.