

excellence in science

news from the Royal Society

June 2002

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Funds needed for new schemes

THE Royal Society is seeking government funding for new initiatives to boost the careers of women scientists and to encourage overseas researchers to pursue their work in the UK, the House of Commons Science and Technology Committee has heard.

In its evidence to the Committee's inquiry into the Government funding of the learned bodies, the Society revealed details of its bid for additional money under the Spending Review, the results of which will be announced in July. Extra funds have been sought for:

- a new relocation fellowship scheme to allow couples of researchers to move together if only one post is available at a new host institution;*
- the Athena project aiming to promote the careers of women scientists in academe;*
- an extension of the Society's fellowship scheme to bring post-doctoral researchers from the USA to the UK;*
- new fellowship schemes to attract post-doctoral researchers to the UK from India and China;*
- the European Academies' Science Advisory Council, the secretariat of which is based at the Society; and a programme of regional events to be held outside London.*

If the spending review bid is successful, the Society's Parliamentary Grant-in-Aid would rise from £28.8m in 2002-3 to £35.9m in 2005-6. The written evidence submitted to the Committee's inquiry is posted on the Society's web site. The inquiry's report will be published later in the year.

Managing radioactive waste

THE management of existing radioactive waste from nuclear power stations and military activities is a serious and urgent problem that must be dealt with. This is the message the Royal Society has given to the government in its recent response to a consultation by the Department of Environment, Food and Rural Affairs.

The response was prepared by a working group chaired by Professor Geoff Boulton. The working group concluded that new institutions are needed in which the public have confidence, to take forward policy for the long-term management of wastes. The response recommends that the government set up two new independent bodies: a Waste Management Commission to consult



The storage of radioactive waste needs to be improved.

with the public and give technical advice for the formation of a waste disposal policy, with a separate executive body to implement the policy.

Fundamental research is required to provide solutions for the treatment

of waste for long-term storage. In the short term, technologies that are already available should be adopted in order to improve management practices. The response notes that the UK's capability in this area of science and technology has dramatically decreased in recent years. The response also urges international collaboration on research on disposal methods and recommends an urgent safety review with respect to possible terrorist threats, following the events of September 11. The full document is available at www.royalsoc.ac.uk/resource.cfm?rs173

For further information contact Marisa Goulden at marisa.goulden@royalsoc.ac.uk

Dancing on pinheads



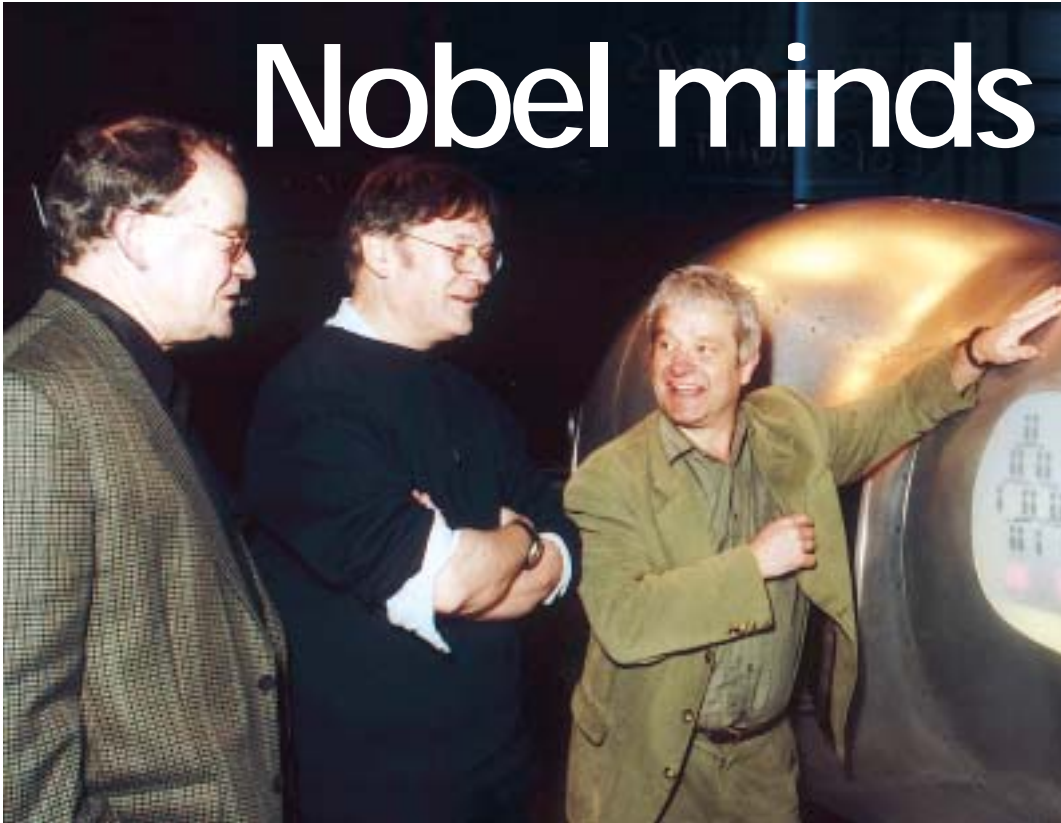
THE Royal Society joined forces with one of London's premier arts organisations, the Institute of Contemporary Arts, to host Dancing on pinheads, a panel discussion on nanotechnology.

The event was held at the ICA on 15 April and addressed the implications of the nanotechnology revolution.

The panel speakers are pictured above from left to right: Professor Harry Kroto, 1996 Nobel Laureate for Chemistry

and winner of the Royal Society's 2001 Faraday Award for communicating science; botanist turned award-winning science fiction novelist Paul J McAuley; Dr Michael Gross, honorary science writer in residence at Birkbeck College, London and author of *Travels to Nanoworld* and microbiologist, Professor Judy Armitage of the University of Oxford.

Nobel minds



The Guardian's science editor Tim Radford (left) interviewed Nobel laureates Sir Paul Nurse (right) and Dr Tim Hunt (centre) about their passion for science and what it was like to receive a Nobel Prize, before an audience at the IMAX Theatre, Science Museum. The event was a Royal Society collaboration with the Science Museum's Naked Science Project.

UK universities attract more leading scientists

MORE UK universities have received a significant boost to their bids to attract the best researchers from abroad and retain them here.

Six outstanding scientists have been selected in the third round of the Royal Society-Wolfson Research Merit Awards scheme, bringing to 26 the total number of senior researchers who have won the award since the programme was first launched last year.

One of them, Professor Peter Buneman, will leave a prominent post at the University of Pennsylvania in the USA to take up a permanent post at the University of Edinburgh's Division of Informatics.

It is anticipated that a further 30 awards will be made this year and around 40 next year when the scheme will be reviewed.

Under the scheme, which aims to help institutions attract to or retain in the UK researchers of outstanding achievement or potential, each recipient receives an award for salary enhancement and research expenses on top of the current wage that they receive from their host UK university. The average award for this round is approximately £40,000.

These awards are jointly funded by the Wolfson Foundation and the Office of Science and Technology and administered by the Royal Society. Initial funding available for the awards totals some £20 million over five years.

For more information, please contact Keith Wylde on keith.wylde@royalsoc.ac.uk

news briefs

Croonian Lecture

PROFESSOR Kim Nasmyth delivered the Croonian Lecture on 1 May at University College London. His lecture focused on the discovery of a multi-subunit complex called cohesin that mediates sister chromatid cohesion. Mistakes in chromosome segregation cause cells to gain or lose chromatids, which may have an important role in the evolution of tumour cells and is the cause of Down's syndrome.

Climate levy or not?

SHOULD the government introduce new economic measures such as a carbon tax to tackle climate change? This is what the Royal Society hopes to answer in an investigation it has launched recently.

The study has been set up because the Society believes the government's current energy policy, including the Climate Change Levy, is failing to reduce adequately carbon dioxide emissions. As part of this study the working group, chaired by Sir Eric Ash, will meet with policy makers from other European countries to discuss the economic measures that have been introduced in their countries.

For further details please contact Richard Heap or Marisa Goulden e-mail: climate@royalsoc.ac.uk

Your views are welcome

If you have any comments about an article or would like to contribute to a future issue of Excellence in Science, please email a 200-word synopsis to excellence@royalsoc.ac.uk

Academic freedom

THE House of Commons are to vote on measures to protect academic freedom following a House of Lords defeat for the government. Voting 150 to 108, peers approved an amendment to the Export Control Bill which prevents the legislation from being used to stop academics communicating information during teaching or research. The government had tried to impose controls over academic research that would limit the ability of dangerous regimes to obtain British technology for military use.

Awards, honours and prizes

Royal Society Prizes

THE following were given medals and awards this year by the Society's Council:

Professor John Pople
Copley Medal

Professor David King
Rumford Medal

Professor Neil Bartlett
Davy Medal

**Professor Peter Grant
and Dr Rosemary Grant**
Darwin Medal

**Professor
Michael Waterfield**
Buchanan Medal

Professor Alex Dalgarno
Hughes Medal

Professor Nicholas Handy
Leverhulme Medal

Dr Julie Macpherson, a Royal Society University Research Fellow, has been named the 'Charles N. Reilly Young Investigator 2003' by the Society of Electroanalytical Chemistry in the USA

Deaths

THE Royal Society very much regrets to record the death of the following Fellows:

Dr Cesar Milstein CH
died 24 March 2002.

Professor Barry Johnson
died 5 May 2002.

A SKILLS SHORTAGE IN SCIENCE AND MATHEMATICS IS LOOMING IN THE UNITED KINGDOM UNLESS SALARIES OF MATHEMATICIANS, SCIENTISTS AND ENGINEERS WORKING IN UNIVERSITIES ARE IMPROVED.

Looming science skills crisis

THIS was the warning aired in a report by Sir Gareth Roberts on the supply of people with science, technology, engineering and mathematics skills.

Welcoming the publication of the Roberts report, Professor Patrick Bateson, Vice-President of the Royal Society, said the crisis in the supply of scientists and engineers had been building up over many years.

"We must reverse the decline in the numbers of young people pursuing chemistry, physics, mathematics and engineering qualifications if the UK is to be economically competitive in the future.

"The Royal Society is already working to tackle this problem by actively



Photo courtesy of Salford Chemistry Campus

Fewer and fewer young people take up careers in science, maths and engineering.

raising the profile of scientists and engineers in schools and funding more than 370 of the country's best post-doctoral researchers...we hope the Treasury will look seriously at the

need for additional government funding to raise PhD grants and the salaries of science teachers, post-doctoral researchers and university lecturers," he said.

Fellows speak out on teaching of evolution

SIXTEEN bishops and scientists, eight of them Fellows, have expressed concern about the teaching of science in the Emmanuel City Technology College in Gateshead.

In a letter sent to the Prime Minister at the end of March, the group said: "Evolution is a scientific theory of great explanatory power, able to account for a wide range of phenomena in a number of

disciplines. It can be refined, confirmed and even radically altered by attention to evidence. It is not, as spokesmen for the college maintain, a 'faith position' in the same category as the biblical account of creation which has a different function and purpose."

The group noted that the curricula in such schools "need to be strictly monitored in order that the respective disciplines of science and

religious studies are properly respected."

The signatories to the letter included Fellows Lord May, the Society's President; Sir David Attenborough and Sir Martin Rees, the Astronomer Royal. The bishops included The Rt Revd Richard Harries, Bishop of Oxford; the Rt Revd Christopher Herbert, Bishop of St Albans and the Rt Revd John Oliver, Bishop of Hereford.



Is science more sympathetic to religion than literature? This was the topic of a panel discussion on 8 May hosted by the Society and the Royal Society of Literature (RSL). Pictured from left to right: Philip Pullman; RSL Chairman Ronald Harwood; broadcaster Joan Bakewell; Professor Richard Dawkins; Professor Jocelyn Bell Burnell and Baroness James of Holland Park. Joan Bakewell's insights on the event can be read on p8.

news briefs

Society receives funding boost

THE Royal Society has recently received two major grants from the Gatsby Charitable Foundation. The grants, totalling over £600,000, will fund the appointment of a University Research Fellow (URF) and support the Society's programme of education policy advice.

Speaking at the announcement of the grants, the Society's President, Lord May of Oxford, said "Grants of this nature are vital to the work of the Society and I am delighted that the Gatsby Charitable Foundation has been able to offer such generous funding. In addition to providing the opportunity for another talented young scientist to benefit from our prestigious URF scheme, the funds will be a tremendous boost for our work in education, allowing us to continue to provide independent advice to government in this most crucial of areas."

21st century science

THE Royal Society has been helping the Qualifications and Curriculum Authority (QCA) develop a pilot for a new GCSE aimed at keeping school science in step with the 21st century. Views were sought from some of the Society's University Research Fellows in developing a proposal for a qualification giving greater emphasis to science for public understanding and concepts such as risk and certainty, linked to contexts relevant for young people.

Senior Research Fellows

SEVEN senior research fellows in fields ranging from evolutionary biology to heteroborane chemistry have been appointed thanks to funding from the Leverhulme Trust.

The fellowships represent a valuable opportunity for mid-career scientists to be relieved of all teaching and administrative duties to do full-time research for a period of between one academic term and one year. The scheme has been recently extended up to 2006. It was launched in 1990 and a total of 88 fellowships have been awarded to date. All take up their post from 1 October except for Professor Matthew Thirlwall who starts on 16 September.

The new Senior Research Fellows are:

Professor I David Abrahams, Department of Mathematics, University of Manchester, to work for one year on elastic, acoustic and electromagnetic wave propagation in inhomogeneous media.

Professor Alison M Gurney, Department of Physiology & Pharmacology, University of Strathclyde, to work for one year on molecular and cellular studies of ion channels in the pulmonary circulation.

Dr Sarah Gurr, Department of Plant Sciences, University of Oxford, to work for one year on gene silencing in an obligate plant pathogenic fungus.

Professor Anne E Magurran, Division of Environmental &

Evolutionary Biology, University of St Andrews, to work for one year on evolution and conservation of biological diversity in freshwater fish.

Professor Andrew M Stuart, Mathematics Institute, University of Warwick, to work for one year on algorithms for extracting effective macroscopic dynamics: analysis and development.

Professor Matthew F Thirlwall, Department of Geology, Royal Holloway University of London, to work for one year on origins of OIB and arc magma sources using Pb-O-Th-Hf isotopes.

Professor Alan J Welch, Department of Chemistry, Heriot-Watt University, to work for one year on new opportunities in heteroborane chemistry.



Science in action

Do you want to see cutting-edge science up close? The Royal Society's Summer Science Exhibition on 2-4 July 2002 offers an excellent opportunity to do just that.

This annual exhibition, the Society's largest public event, showcases some of the best of the UK's science, engineering and technology research. But what makes this event unique is that visitors get the chance to meet and talk to the scientists who are doing the research.

The Exhibition features 20 hands-on, informative and interactive exhibits that have many applications in the real world.

Here's a preview of just three exhibits the visitors will enjoy this year:

WHAT MAKES THIS EVENT UNIQUE IS THAT VISITORS GET THE CHANCE TO MEET AND TALK TO THE SCIENTISTS WHO ARE DOING THE RESEARCH

Universes to order

The make-up of the Universe is one of the great unresolved mysteries in science. Carlos Frenk, Professor of Astronomy at Durham University, heads a team that is using new technology to come up with the answers. "In recent years," he says, "astronomers have come to realise that gravity, the force that holds the universe together, comes primarily from something we can't see. Something called dark matter, but we haven't got a clue what it is."

But if you can't see dark matter, how can you be so sure that it exists? Professor Frenk contends it's merely a matter of arithmetic. "The sums don't add up," he insists. "The amount of gravity that the visible part of a galaxy produces couldn't keep a galaxy in place. So it must come from another source, something that doesn't shine".

Professor Frenk and his team are using computer simulations to work out the characteristics of dark matter. They are constructing different universes containing slightly different dark matter and comparing them to what's around us. In our universe small packets of energy appear and disappear very quickly without

noticeable effects. However, when the universe was young, it expanded very rapidly and bursts of energy did not have time to disappear: instead they became incorporated into the universe as small imperfections. "We set up the simulator with these small imperfections," he explains "and then we programme a number of possibilities for the dark matter. The only rules are the effects of gravity. Then we say to the computer 'Give me a universe!'" Using this approach, Professor Frenk and his colleagues have made a whole array of virtual universes, all with subtly different dark matter.

Taking a jab at malaria

Scientists at the University of Oxford have developed a promising new approach to controlling malaria, the biggest infectious killer of children in the world.

Traditional vaccines tried to fight the disease, with limited success, by increasing the number of antibodies against malaria in the blood. This time, Professor Adrian Hill and his colleagues have used a new approach which stimulates the white blood cell (or killer T cell) response – to attack the parasites while they are inside the liver cells, before they have a chance



to multiply and start causing symptoms in the blood.

So far the team have vaccinated over 100 people in Oxford and West Africa with one of two new vaccines, then deliberately infected them with malaria to see if the vaccine protects them against the disease. Initial results are promising, with one of the vaccines giving some people complete protection against the disease, and the other killing 70-80% of the parasites.

"Malaria isn't just a health care problem, it's an economic problem," says Professor Hill, "it costs a huge amount to control and is a huge burden on economic development. If you could control malaria it would certainly help relieve poverty in Africa. It's ambitious," he admits, "but it's becoming realistic".

Sentinels of the sea

Meteorological records tell us that air temperatures are increasing under global warming, but very little is known about the mean sea temperature, or the movements of the currents beneath the surface. Now scientists from the Southampton Oceanography Centre, Proudman Oceanographic Laboratory and the Met Office are involved in the Argo

Project, an international collaboration aimed at unlocking the secrets of the deep.

They do this by deploying specially designed floats in the world's oceans, which then transmit information by satellite to an onshore base. The data from the floats are used to build computer simulations of the ocean's movements, temperature and salinity. By comparing these temperatures to previous measurements taken from boats, scientists on the Argo project can build up a picture of global sea temperatures, and how they are changing, for example during the weather phenomenon El Niño. Integrating this information with deep-sea currents, and in the future observations of surface currents, the scientists hope to be able to make long-term predictions about the Earth's climate.

The Exhibition is free to attend and open to all. If you would like further information please email Froniga Lambert at froniga.lambert@royalsoc.ac.uk

*Tues 2 July 12.00 to 16.30
Wed 3 July 10.00 to 16.30
Thurs 4 July 10.00 to 16.30*

The other exhibits are:

How to genetically engineer a rainbow

Developing proteins that light up chemical reactions within cells.

Needle in the haystack: cognitive visual search strategies

Measuring the visual knowledge needed to scan images.

Biological invasions and global change

Helping make decisions about threats to biodiversity.

The carbon trap

Exploring how plants and rocks might help deal with global warming.

Chasing the high-flyers: uncovering the ecology of the skies with radar

Revealing the mysteries of insect migration.

What's in a name? Trust on the internet

New ways with cryptography to make e-commerce secure.

Tethered space propulsion

Using a sling-shot to get to Mars.

Magnetic chips with everything

Putting magnetic brains into computer chips using nanotechnology.

Non-toxic toxins

Making use of toxins to understand human cells and disease.

Putting the fizz into chemistry

Leading a green revolution in cleaner chemical reactions.

Optical micro-rotator

The potential of laser beams to probe DNA damage.

Human plumes and optical thermometers

Using physics for sustainable building design.

Make me a molecule

Synthesising valuable chemicals in the cleanest way.

Knights in shining armour: immunity in action

Harnessing the body's natural defences in the fight against HIV and melanoma.

The underground pulse

Unearthing the truth about soil fungi and their strange underground networks.

Out of sight, out of mind: the weird and wonderful life of a mitochondrion

An innovative technique for examining the powerhouse of the cell.

Paul Dirac (1902-1984): a centenary celebration

Celebrating one of the greatest theoretical physicists of all time.

Science, religion literature...



Joan Bakewell (centre) chairing the panel discussion at the Royal Society. The other speakers were, from left: Philip Pullman, Professor Jocelyn Bell Burnell, Baroness James of Holland Park and Professor Richard Dawkins

“PERHAPS, A MEMBER OF THE AUDIENCE SUGGESTED, SCIENCE, LITERATURE AND RELIGION ARE SIMPLY TELLING DIFFERENT STORIES”

“It was a sell-out event and not surprisingly so. Here were four very diverse, intelligent and fluent people coming together to debate what is currently, for all disciplines a hot question – Is science more sympathetic to religion than literature? What is ‘hot’ is not the literature or the science but the matter of religion. There was a time in the late 20th century when religion’s time seemed all but spent. Declining church attendances, the abandonment of daily, religious assemblies, and limp religious teaching in schools, seemed to be marking its demise. But religion has staged a spectacular come-back and in ways we didn’t anticipate. After the events of September 11th, even the most avowed atheist must examine what is the hold, what is the loyalty that religion commands in the lives of so many men and women? We all need to know.

The panel was not lined up for a debate: two scientists versus two writers, nor two believers against two non-believers. The current discourse doesn’t move in that way. Those who wanted a debate and a motion carried would have been disappointed. What happened was far more interesting than that.

P.D. James led with the claim that much of literature is, in itself, religious, citing the *King James Bible* and Cranmer’s *Book of Common Prayer*, the rituals of ancient Greek



drama and the Islamic *Koran*. Richard Dawkins began with a flourishing reading of a text that in fine lyrical writing attacked religion only to reveal it was from one of his own books. He is, incidentally, the only speaker to be a member of both The Royal Society, and The Royal Society of Literature which came together to create the event. Dawkins spelled out the spectrum of belief from fanatical fundamentalists, through to hardened atheists, implicitly inviting us to place ourselves along the scale. But he came into his own when expounding his view that religious belief is like a virus that we pick up from our parents whom evolutionary survival requires us to believe implicitly, and that as adults we don’t need it anymore. Philip Pullman, whose trilogy *‘His Dark Materials’* reads as an allegory of primal struggle, introduced the concept of stories, stories which we tell each other without always being aware of their import. Perhaps, a member of the audience suggested, science, literature and religion are simply telling different stories. Everyone, in their own terms, seemed to feel

comfortable with the idea. Certainly no one banged the table and insisted theirs was the one true story.

Indeed, Professor Jocelyn Bell Burnell, the astronomer who discovered pulsars, who is herself a Quaker, gave an exposition shining with clarity about how being a scientist and a Quaker makes perfect sense. This was an occasion, rare in modern culture, in which scientists talked with artists, not in confrontational mode, but in a genuine spirit of enquiry. But the difference in their imaginative sensibilities was nicely pointed out by Philip Pullman who reckoned it would be hard to write about electrons being in love, or a gang of galaxies getting together to rob a casino. But, I don’t know. I think the panel could make a good attempt.

Joan Bakewell is a well-known broadcaster and writer.

The views expressed here are the author’s and do not necessarily reflect Royal Society policy. If you would like to comment on these views or write an article for a future In my view, please email excellence@royalsoc.ac.uk

We regret that the last issue of Excellence in Science carried an edited version of Rachel Flecker’s article, ‘Improving life for contract researchers’, which did not accurately reflect her views. The correct version, ‘Who speaks for contract researchers?’, is available at www.royalsoc.ac.uk/news/excellence/0402flecker.pdf

UK's science heritage goes online

A TREASURE TROVE OF RARE RECORDS AND HAND-WRITTEN NOTES BELONGING TO SOME OF THE WORLD'S MOST OUTSTANDING SCIENTISTS IS NOW AVAILABLE FOR THE FIRST TIME ON THE INTERNET.

HOWARD FLOREY'S notes on his ground-breaking experiments with penicillin and John Herschel's correspondence relating to pioneering attempts at colour photography are among the collection details now available online documenting the best of the UK's science heritage under the newly-completed *Web of Science History* project.

Led by the Royal Society's Library, the project provides electronic access to 19 of the Society's collections as well as personal papers deposited in eight other national scientific institutions. The project, which is funded by the Heritage Lottery Fund, is available online via the Access to Archives (A2A) website <http://www.a2a.pro.gov.uk>, the English strand of the UK national archives network hosted by the Public Record Office. Among the 19 Royal

Society collections included are those of John Smeaton, the first civil engineer and architect of the Eddystone Lighthouse; Edward Sabine, geophysicist specialising in terrestrial magnetism and Robert Boyle, natural philosopher, chemist and founder member of the Royal Society.

Partnership projects are one of the ways that the Library and Archives of the Royal Society is achieving its primary objective to increase public access to the collections. Open to the public, the Library is used by researchers from all over the world. However, for those unable to visit, the Library catalogue is available online through the Royal Society web site www.royalsoc.ac.uk/library

This year, the Library started a programme to catalogue, in electronic

form, the Society's extensive archives, which date back to 1660. Although this mammoth task is estimated to take a number of years, the collections for Howard Florey, Alfred Egerton, Charles Wilson and Arthur Tansley plus details of all the portraits paintings and sculpture, are already available online. Updated monthly, this catalogue will continue to expand.

Transcription of election certificates from 1731 to 1951 is nearing completion and will be followed by digitised copies of the election certificates being attached to biographical records, which are already available through the Web. The Library is actively exploring funding opportunities to support a digitisation programme for the 6,000 portraits of Fellows that are in the form of paintings, photography and etchings.

The ongoing redevelopment of Carlton House Terrace also offers opportunities to promote and celebrate the Society's unique historical resources. Of international significance, these items include scientific papers, manuscripts, correspondence, portraits and artefacts, which the Library plans to put on display around the building as new dedicated exhibition spaces are created.

An example can be seen at the Summer Science Exhibition on 2-4 July 2002 when the Library display will be dedicated to Paul Dirac, one of the greatest British theoretical physicists of all time and winner of the Nobel Prize for Physics in 1933.

For more information, please contact Karen Peters on karen.peters@royalsoc.ac.uk



Paul Dirac



A sample of the Royal Society's artefacts from left: a bronze maquette for Charles Darwin's statue at Shrewsbury School; Isaac Newton's death mask and a circular cameo glass plate portrait of Lord Kelvin.

Saving Europe's coral reefs



Redfish is a species sought by trawlers.



Dr Hall-Spencer monitoring coral and algae habitat.

DR JASON HALL-SPENCER'S DISCOVERY OF WIDESPREAD DAMAGE IN EUROPE'S ANCIENT CORAL REEFS, WHICH WAS WIDELY REPORTED IN THE MEDIA, HAS FLAGGED UP AN ECOLOGICAL DISASTER.

Dr Jason Hall-Spencer, a researcher at Millport Marine Biological Station in Scotland, is studying fluctuations in the direction and strength of the North Atlantic Drift, the current that profoundly affects climate and coastal ecosystems in northern Europe. Much of his first year as a Royal Society University Research Fellow has been spent on fishing boats collecting the skeletons of obscure sea creatures such as coralline algae and cold-water corals. These skeletons incorporate chemical signatures from the water that they grow in. These signatures can be used to reveal information about the long-term pulse of the Atlantic, just as tree rings tell us about climate change on land. This information will feed into a major international research programme aimed at predicting and planning for climate change.

Initial analyses of the trawled skeletons are providing worrying results. Working with scientists in France and Norway, Dr Hall-Spencer has found that poorly known European coral reefs, radiocarbon dated to more than 4550 years old, are being inadvertently smashed to pieces by bottom-trawl fishing. Deep waters were once thought to be barren and it still surprises many that the grey North-East Atlantic harbours spectacular coral reefs. Most associate corals with warm, well-lit waters off tropical coasts but

research profile

Dr Jason Hall-Spencer

oil surveys over the past five years have located large, diverse coral reefs along the oceanic margin off Europe. These reefs have yet to be studied in detail, yet seabed photographs and an analysis of commercial trawls show that unregulated deep-water fishing is causing wide-scale damage to these ancient coral habitats. The fishers do not deliberately damage coral as it tears their nets and reduces the quality of their catch. Dr Hall-Spencer explains that "collapses in shallow water stocks such as cod have forced the largest trawlers to target ever deeper habitats where wildlife has been virtually undisturbed since the last ice age". The Norwegians estimate that 50% of their coral reefs have been damaged by trawling – the extent of the problem off EU countries has not been assessed. Over the next year the collections of deep-water corals will be used to address fundamental questions regarding the link between climate change and ocean circulation.

Particular attention will be paid to historical changes in the flow of water between the Faroes and

Shetland as this is a critical deep-water gateway between the Arctic and Atlantic Oceans. "In the meantime, these early results point to an urgent need for the Department for Environment Food and Rural Affairs, government conservation agencies and the EC Fisheries Department to work closely with the fishing industry to minimise long-term environmental damage to deep-sea habitats," Dr Hall-Spencer points out. It is widely thought that deep-water habitats occur too far offshore for us to be able to manage their exploitation but Dr Hall-Spencer argues that we now have the technology to protect fragile deep-water corals and ensure sustainable exploitation of the long-lived fish that they attract. "In the wake of hostilities between the fishing fleets of Canada and Spain a satellite-based vessel-monitoring scheme has been introduced throughout the North Atlantic. This scheme now offers an excellent means with which to protect deep-water coral provinces and at the same time help fishermen avoid damage to their nets," he says.

"UNREGULATED DEEP-WATER FISHING IS CAUSING WIDESCALE DAMAGE TO THESE ANCIENT CORAL HABITATS"

Dr Hall-Spencer's research was featured in the 7 March issue of the Society's journal Proceedings B. If you would like to submit research for publication to Proceedings B or any of the Society's journals, please visit www.pubs.royalsoc.ac.uk

DR SUSAN HOWSON, A DOROTHY HODGKIN RESEARCH FELLOW AT NOTTINGHAM UNIVERSITY, HAS BEEN AWARDED THE ADAMS PRIZE, A PRESTIGIOUS AWARD MADE ANNUALLY FOR YOUNG, UK-BASED MATHEMATICIANS.

Blue skies mathematics



Dr Susan Howson is one of the youngest pure mathematicians working in Number Theory, a field that can lay claim to being one of the oldest in mathematics. One of the main motivating problems in the subject is the study of Diophantine equations. "Attempts to solve particular Diophantine problems have led to perhaps some of the deepest and most beautiful mathematics yet created," she says.

Her particular interest is in the class of equations that give so-called elliptic curves. In mathematical language, elliptic curves are 'smooth projective curves of genus 1', which means that the solutions to the equation form a surface the shape of the surface of a doughnut. The 'genus 1' part of the mathematical definition corresponds to the fact that a doughnut has one hole and this is the really important property which makes elliptic curves particularly interesting and rich in structure.

More precisely, her research project aims to extend a range of techniques known as Iwasawa Theory, after the Japanese Mathematician Kenkichi Iwasawa who first introduced these ideas. Iwasawa

Theory has already proven itself an extremely powerful method for studying elliptic curves, and the aim of Dr Howson's research is to strengthen the theory sufficiently so that it applies to a vastly enlarged range of situations.

Many of the most powerful and elegant ideas in pure mathematics come out of discovering, often surprising, relationships between apparently different mathematical objects. Associated to an elliptic curve is a function called the L-function of the curve. Iwasawa Theory constructs a second, algebraically defined, object associated to the curve and conjectures a precise relationship between the two. Through this, one is able to prove deep theorems about the arithmetic of the curve.

So far, the techniques have only been developed to apply these ideas in the commutative setting. An operation is called commutative if it does not matter in what order it is applied. Dr Howson is working on extending this to certain non-commutative situations.

Professor John Coates of Cambridge University, Dr. Howson's former PhD supervisor, principally introduced the idea of generalising Iwasawa Theory

research profile

Dr Susan Howson

"MANY OF THE MOST POWERFUL AND ELEGANT IDEAS IN PURE MATHEMATICS COME OUT OF DISCOVERING OFTEN SURPRISING RELATIONSHIPS BETWEEN APPARENTLY DIFFERENT MATHEMATICAL OBJECTS"

in this manner and there are now about ten mathematicians worldwide, with Dr Howson among them, working collaboratively in this field.

Although it is not the focus of Dr Howson's own work, elliptic curves have very important practical applications in cryptography. For example, when one sends a credit card number over a secure Internet connection the computer may well be using an algorithm based on the arithmetic of elliptic curves.

"At present, it appears that elliptic curves possess just enough structure to allow one to construct the codes, but not enough spare structure left over with which to try and attack (i.e. decode) them, and it is this apparent property which makes them so valuable. But no one has actually proven this to be the case, and one can never predict what applications, to this or other practical problems, apparently pure, blue skies research on elliptic curves may have in the future," she says.

Dr Susan Howson is a Royal Society Dorothy Hodgkin Fellow at Nottingham University.

diary dates

Public Events

Tuesday 2, Wednesday 3
and Thursday 4 July

The Royal Society's Summer Science Exhibition

The Royal Society's annual Summer Science Exhibition is a showcase for scientific innovation. Each year 20 of the UK's top science, engineering and technology research teams are selected by the Royal Society to stage a public demonstration of their work. Admission is free and open to all.

Open:

Tues 12.00 to 16.30

Wed 10.00 to 16.30

Thurs 10.00 to 16.30

Tuesday 3 September at 18.00

Clifford Paterson Lecture: Computer Security?

By Professor Roger Needham FRS

The technical aspects of computer security have fascinated researchers (including the lecturer) for decades. It is, however, beginning to appear that the challenging problems are to do with people, rather than with mathematics or electronics.

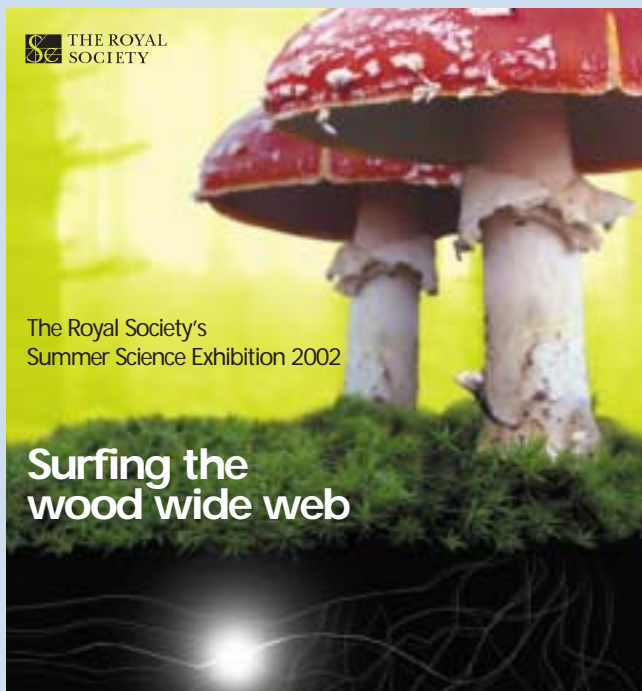
Scientific Meetings and Conferences

Wednesday 26 and Thursday 27 June

Chloroplasts and mitochondria – functional genomics and evolution

Organised by Professor John Allen
and Professor John Raven FRS

Chloroplasts and mitochondria are energy-converting organelles of eukaryotic cells. They also contain small, specialised, functional genomes. While their genetic and energy-converting systems are evidently bacterial in origin, most genes for chloroplast and



mitochondrial components now reside in the cell nucleus. So why did some genes move, while others did not?

Wednesday 25 and

Thursday 26 September

Slow Dynamics in Soft Matter

Organised by Professor Mike Cates,
Professor Julia Higgins CBE FRS,
Professor Tom McLeish and
Dr Peter Olmsted

The meeting will cover a range of related topics in experiment and theory of Soft Condensed Matter (fluids and semi-solids of polymers, liquid crystals, surfactants, colloids). Focussing on slow dynamical processes, potential discussions will cover: transitions from metastable states (eg colloidal crystallisation), flow-induced phase transitions (eg banded states in micellar fluids),

molecular dynamics in biology (eg protein folding), entanglement-dominated systems (eg polymer melts) and dynamics of self-assembly.

Wednesday 16 and

Thursday 17 October

Glycolipids in cell biology and medicine

Organised by Dr Terry Butters,
Professor Timothy Cox, Professor
Raymond Dwek FRS and
Dr Fran Platt

Glycolipids are key cellular components and inherited defects in their metabolism cause disabling diseases. Novel therapies, based on an understanding of cellular biochemistry, have advanced to clinical trials. All aspects of basic and applied glycolipid science will be discussed.



Stephen Cox
Executive Secretary

The election of 42 new Fellows has just taken place, a culmination of over six months hard work by many existing Fellows, but particularly by two Vice-Presidents: Patrick Bateson and John Enderby, who oversee the whole process. The innovations introduced this year into the nominations process to attract more women and more candidates from emerging disciplines or from institutions outside the golden triangle have had an immediate effect with several of the new Fellows being identified in this way. Four of the new Fellows are women: still too few but this reflects the small number of women in science at professorial level in Britain and we are of course addressing this issue in imaginative ways.

Our new Fellows will interest the House of Commons Select Committee who questioned the President, Professor Julia Higgins and myself the day before the elections took place. The Society gave a robust account of itself during the session and I await with interest the select committee report which is due in the summer. In the meantime it will be interesting to see if the committee will also tackle the research councils who receive over 98% of the science budget, compared to our own 1.5%.

Another Summer Science Exhibition is upon us with the usual exciting exhibits and a varied programme aimed at bringing scientists and the public together to talk about cutting edge research. I hope to see many of you at the exhibition which runs from 2 to 4 July here at Carlton House Terrace.

contact information

For further information on any
of the subjects covered in this
issue, please contact the editorial team at

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