Welcome to the inaugural Faculty of Science Annual Report. This is the first time the Faculty has produced a report in this form, and we hope to make it an annual feature, with the purpose of giving an overview of the excellent work that is being done in science disciplines at Durham University, to members, and prospective members, of the Faculty and the University, and to colleagues around the world.

In the two years that have passed since I joined Durham as Pro-Vice-Chancellor for Science, the Higher Education System in the UK has faced an uncertain time. A change of government has resulted in significant changes in the funding regime for Higher Education which will result in local/EU students paying a much higher proportion of the cost of their education directly to the universities. Combined with measures to loosen up controls on the recruitment of high achieving students, this is likely to result in a significant shake-out of the sector.

Durham University is in a fortunate position. Consolidating its place as a top 5 UK university, it has little to lose and everything to gain from the changes. Competition for places on undergraduate courses is very high, despite the demanding entry requirements set. Successful students benefit from a distinctive research-led education, being tutored by world-class researchers in their discipline.

Despite a changing political and financial environment, the Science Faculty has got on with the business of producing internationally leading research and providing our students with an excellent educational experience. There is a vibrant atmosphere of cooperation between the Schools, Departments and Research Institutes making up the Faculty, with departments working together to achieve the maximum benefit for the entire university.

There have been some remarkable research achievements in the Faculty over the last year. Some of them are outlined in this report, but many are not, as it would be impossible to capture them all in a document of readable length! My sincere congratulations go to every member of the Faculty who has received recognition of their research over the last year, whether it be through receiving a prize, being awarded a fellowship, receiving a research grant, or having their work published in a prestigious journal.

The Durham student experience is unique. The college communities allow students from many different disciplinary backgrounds to mix and to participate in a diverse range of social, sporting and academic activities. The departments of the Science Faculty enhance this student experience significantly, not just by providing excellent teaching, but by engaging students in research-led education. In June our inaugural Student Research Symposium, Rising Stars, showcased some excellent examples of what both our undergraduate and postgraduate students can achieve in this environment. Departments also provide significant personal development opportunities, including opportunities for field trips and industry engagement, and this year for the first time we were able to offer the opportunity of an International Summer School in China for 20 of the top students in the Faculty.

A major challenge still facing the Faculty and the University is that of international recognition. Although extremely well-known and well respected within the UK as one of the top 5 universities in the country, this standing is not reflected in recognition worldwide: individual researchers are recognised within their fields, but the overall excellence of the university is often not appreciated, and as a Faculty and a University we are working to correct this.

For those of readers already at Durham, I wish you a successful 2011/12 academic year! For readers not yet at Durham, I look forward to welcoming you to Durham, if not this year, then in the not-too-distant future.

Professor Andrew Deeks
Pro-Vice-Chancellor (Science)
Undergraduate

I took on the role of Deputy Head of the Science Faculty (Undergraduate) in August 2010 to represent the faculty on pan University committees, to work with schools and departments within the faculty to implement the University Education Strategy, and to enhance the experience of undergraduate and integrated masters students.

Central themes of the Education Strategy are research-led education, employability and internationalization of the student experience and major enhancement initiatives have taken place in each of these areas this year and are featured in more detail later in this report. They include the inaugural Rising Stars Research Symposium, which celebrated the excellent research achievements of undergraduate and postgraduate students with presentations of research projects carried out by students from each department in the faculty. The Department of Psychology took all final year students away for an intensive Employability Retreat where students were able to hear first hand from professional psychologists about their work and to discuss career plans, and students from the School of Biological and Biomedical Sciences enjoyed a variety of international experiences this year: altogether more than 100 students benefited from the opportunity of interacting with international scientists at home or abroad, giving them an insight into the global nature of scientific endeavour.

Key to improving the student experience and enhancing education experiences of students is the continued development of teaching staff; several Science Faculty staff have been awarded prestigious University awards for Teaching Excellence and Enhancing the Student Experience this year which will allow them to develop new ideas in teaching. I look forward to seeing these ideas develop and further enhance the educational experience of our students.

Postgraduate

I took over as Deputy Head (Postgraduate) in August 2010, and I hold the post 50% alongside a Readership in the School of Engineering and Computing Sciences.

The role involves administration of various processes affecting taught and research postgraduate programmes, such as approval of examiners and reports on PhD examinations, and contribution to university-level postgraduate matters through Education Committee. The Faculty has a healthy number of postgraduate research students, with thriving communities in most of the Faculty’s seven departments or schools. Taught postgraduate students are in the minority in the Faculty with a relatively small number of MSc courses on offer, which we hope to grow. Low numbers on some existing courses, however, mean that care needs to be taken in developing and approving new courses.

A challenge to the postgraduate activity in the Faculty comes from the changing way that research students are supported by the research councils. The EPSRC have dealt a devastating blow by removing the possibility of studentships from responsive mode grant. Research councils are moving away from block grants to concentrate funding in “Doctoral Training Centres” (DTCs), where typically a year of training is added to a standard 3 year PhD. We already have a DTC ‘Lite’ in Energy, and play a role, via Psychology, in the Durham / Newcastle ESRC DTC. To develop agility to react to future calls for DTCs a small group from a number of Science departments and schools have prepared ideas for future centres that Durham could lead in Science. We have presented these ideas to the EPSRC and other funders and will continue to press Durham’s excellent case in this area. One challenge we face with our relatively small portfolio of MSc courses, is the provision of credit-bearing training courses usually required as part of a DTC.
From the Faculty Officers continued

Research

The Faculty of Science Research Advisory Group (FOSRAG) met six times last year and adopted a new format and increased membership: meetings involve strategic discussions of key issues, along with ‘normal’ business, and in addition to the Departmental Research Directors, we have invited representation from our Research Institutes. We are also rotating the meeting venues around the Faculty, with the hosts providing a short presentation on the research structures and activities in their School or Department. This allows sharing of good practice and discussion of common problems and issues. We have also invited short presentations and discussion from areas of the University that impact our research activities such as the Research Office, Estates and Buildings and the Institute of Advanced Studies. This year the FOSRAG activities were focused in three key areas:

REF preparation: as at most Universities, REF looms large and we need to work together to optimise our performance. Directors of Research have been instrumental in collating and grading outputs. We have identified impact coordinators for each department (in many cases these are also the Directors of Research). Currently we are reviewing outputs and impact case studies and identifying instances where critical support (resource, advice, time) can be provided to enhance performance.

Research Centres: the annual review of University Research Centres was undertaken. This year we welcomed two new Research Centres: the Centre for Materials Physics (which evolved from the Condensed Matter Physics group) and the Centre for Polymer and Soft Matter Research. Following recommendations of a working group this activity will in future involve reviewing Research Centre websites on which appropriate, up to date, information on activities, funding and achievements will be posted. This new approach has the advantage of obviating lengthy paper reports and encouraging continuous update and professional appearance of the websites.

Infrastructure: 12 bids to the University’s infrastructure fund, totalling more than £5.5m were considered. The following were (or will be) funded: Integrated Chemical Process Facility: A Unique World-class Chemical Process Research Laboratory; Precision Atomic, Molecular and Optical Physics using a Frequency Comb: Establishing Durham as a World Leading Centre for Precision Measurement; Investigations into the neural basis of behaviour; and Isotope Microanalysis Facility for Energy, Natural Resources and the Environment.

Natural Sciences

This first year of my tenure has been a steep learning curve involving discovering the structure of the Natural Sciences degree programme and how the Faculty of Science works both internally and within the University. I have also been asked to look after two areas of the Faculty Strategy: Science Outreach and the Athena Swann programme, which recognises and celebrates good employment practice for women working in science, engineering and technology.

Understanding how Natural Sciences works and how it meshes with departments has been interesting to say the least. It is over 20 years since the Natural Sciences programme succeeded the General Degree, and whether you love it or hate it, and while it constrains what departments can do, it gives our students flexibility.

As the admissions officer for Natural Sciences I have instigated meetings of the science departmental admissions officers. This year has seen a modest increase in applications and the recruitment of overseas and home students appears to be in line with the targets set. As I write I am on a mission to the US to get more applications to Durham: given the breadth and depth of the Natural Sciences it should be attractive to the US market. Fingers crossed that the Faculty Internationalisation Strategy will be a success and if it isn’t, it won’t be for lack of effort on the part of many individuals!

In the coming year the implementation of the research-led curriculum strategy will present a challenge for all departments and schools, and a particular one for Natural Sciences as we seek to maintain the breadth and flexibility offered by the programme. I look forward to working with Departments to come up with creative solutions. A Science Faculty Outreach Committee has been formed which oversees the work of the four members of the outreach team as well as departments and schools’ own input into the major activities.

The Athena Swann team has been impressively led by Dr Hui Long. Part of this process has involved group interviews in Departments and the gathering of University statistics to use in our application for the Bronze Award in early November.

What is clear is that more work needs to be done in supporting women scientists in their career progression so that they are not discriminated against. Some departmental representatives will make presentations at their October Board of Studies to outline their findings which it is hoped will result in fruitful discussion.

Professor Jon Davidson
Deputy Head of Faculty (Research)

Dr James Blowey
Deputy Head of Faculty (Natural Sciences)
Carlos Frenk wins 2011 Cosmology Prize

Professor Carlos Frenk, Director of Durham’s internationally-renowned Institute for Computational Cosmology, was one of four scientists to share in the 2011 Cosmology Prize of The Peter and Patricia Gruber Foundation, a $500,000 award regarded as one of the greatest accolades in cosmology.

Professor Frenk shares the award with his collaborators Marc Davis, a Professor in the Departments of Astronomy and Physics at the University of California at Berkeley; George Efstathiou, the Director of the Kavli Institute for Cosmology in Cambridge; and Simon White, a Director of the Max Planck Institute for Astrophysics in Garching, Germany.

The official award citation recognises the scientists (nicknamed the ‘Gang of Four’ by their colleagues) for their “pioneering use of numerical simulations to model and interpret the large-scale distribution of matter in the Universe.”

Professor Frenk said:

I am, of course, immensely pleased to be a recipient of this honour. Progress in figuring out how our Universe works has been amazing, but there is still much to play for - the identity of the dark matter and the dark energy, for starters. The DEFW collaboration came together following a 1981 Harvard-Smithsonian Center for Astrophysics survey, which gave an early hint to what is today called “the cosmic web” (galaxies grouped into lengthy laments, or superclusters, separated by vast voids).

They found that a Universe based on the theory of hot dark matter did not match observations. However, a series of DEFW papers from 1985 to 1988 showed that observations of galaxies, clusters, laments, and voids were consistent with a simulated Universe that had evolved under the influence of cold dark matter.

Cold dark matter is today one of the two key components of the standard cosmological model. The other is the acceleration of the expansion of the universe, a discovery observers made in the late 1990s that DEFW’s simulations had anticipated.

Faculty of Science Strategic Planning Day

Before 2010, the planning process in the Faculty of Science took place in a bottom up manner: Department Plans were written first, and then a broad Faculty Plan was written as an overarching document. Ideally, however, the Faculty Plan should connect the University Strategy to the Department Plans, hence the development of the Department Plans should be informed by the Faculty Plan.

On October 22 2010 the Faculty held its first strategic planning day. Its main purpose was to produce the next iteration of the Science Faculty Plan, and to ensure that it formed an appropriate basis for the next iteration of the Department plans.

The day was attended by the PVC and deputy heads of the Faculty, together with the Head of Department, the Research Director, the Education Director and the International Coordinator of each of the Faculty’s Schools and Departments. The Faculty’s support officers in the professional support services also attended, together with the Director of the Strategic Planning and Change Unit.

The day consisted of four sessions, one relating to each of the first four sections of the University Strategic Plan: Research (chaired by Professor Jon Davidson); Education (chaired by Dr Tony Fawcett); World University (chaired by Dr Charles Augarde); and Community and Place (chaired by Dr James Blowey).

Following the planning day, the Chair of each session produced a draft revision to the appropriate section of the plan based on the documents produced by each of the teams and the discussion in the session. A revised plan was then assembled which (after further feedback and modification) was presented to Faculty Board for final approval. Heads of Departments then worked with their Department teams to modify their Department Plans to map into the Faculty Plan.

While the day was very profitable, the large range of important topics meant that discussion often had to be cut short. In light of this experience, and the major changes which will be happening in the Higher Education in 2012, in 2011 the Faculty will hold a two-day Strategic Planning Retreat on November 3rd and 4th.
Faculty News continued

The Rising Stars Research Symposium

The inaugural faculty-wide student research conference, the Rising Stars Research Symposium, celebrating excellence and originality amongst the university’s undergraduate and postgraduate scientists, took place on 21st June 2011 in the Calman Learning Centre. Seminars were given by outstanding final year undergraduate and postgraduate students from each of the schools and departments within the Faculty, and a reception for all attendees was hosted by the Vice Chancellor, Professor Christopher Higgins.

Over one hundred staff, students, alumni and guests attended the event, and all of the talks were excellently delivered: the speakers are a real credit to themselves, their departments and to the Faculty. Details of the speakers, their talks and slides and a copy of the volume of abstracts are available at www.durham.ac.uk/science.faculty/symposium.

The overall prize for Outstanding Communication of Science was awarded to Iain Smears from the Department of Mathematical Sciences for his seminar Optimal Control Problems and Hamilton-Jacobi-Bellman Equations. He gave an exceptionally clear and accessible example of how mathematics can be used to solve real world problems. Iain completed his MMath this year, and will start researching his DPhil thesis in Oxford in October.

Popular prizes, voted for by the audience, were awarded to Lizzy Midgley of the Department of Earth Sciences for her seminar The Geothermal Potential of the UK, and Simon Cork from the School of Biological and Biomedical Sciences for Hypertension: Is it all in Your Head?

Professor Tony Unsworth Receives Lifetime Achievement Award

Professor Tony Unsworth from the School of Engineering and Computing Sciences was the 2011 recipient of the Lifetime Achievement Award from the International Society for Technology in Arthroplasty, at a special dinner which was part of the 24th Annual Congress of ISTA held in Bruges, Belgium on the 22nd September. The presentation was made in the beautiful medieval ‘Provincial Court’ and the citation was read by Professor Hani Haider, the Program Director of ISTA and Director of Biomedical Engineering Research at the University of Nebraska, USA.
Psychology Employability Retreat

The Department of Psychology piloted Employability Retreats for all 3rd Year students on the two Psychology Programmes at Durham and the Queen’s Campus. These retreats, which were funded by the Faculty of Science, involved an overnight stay at the Old School House in Robin Hood’s Bay for around 25 students and staff per visit.

Over the course of the weekend, students participate in a number of activities. These include small group discussions with staff about career options and hearing from professional service providers (for example clinical or educational psychologists), representatives from our strategic partners (including NeuroPartners and the NHS) and course directors of Durham’s PGT Programmes. In the future we plan to add an academic element by inviting overseas speakers from our international collaborators, including Erasmus partners.

Students give brief presentations, present their CV at a clinic to improve and amend it, practice interviews with staff and observe light-hearted interview demonstrations from staff. In addition, there is also time for lunches and walks around the village and on the beach where staff and students can talk in a relaxed setting. Apart from improving graduate prospects and employability, feedback suggests that the retreat enhances student experience of a number of components of the NSS including academic support, staff availability and overall satisfaction.

Solar Car

A team of seven Durham students and academics are entering the Durham University Solar Car in the biennial World Solar Challenge, to be held in Australia in October.

Durham students have been working for many years on the machine, which can reach speeds of up to 60mph, and which features student research projects such as an in-wheel drive motor and flexible solar panels.

Using only solar power, the car has to travel 3000km from Darwin in northern Australia to Adelaide in the south during the race, which is set to feature a diverse international field.

The team includes Steve Wilson, Ben Derrick, John Wilson, Andrew Thurman, academic advisor Dr David Sims-Williams and drivers Richard Flint and Alexandra Reevey. Dr Sims-Williams explained:

“The World Solar Challenge pushes teams to develop high-efficiency vehicles which is the real key to reducing the emissions of everyday vehicles. These cars have to be able to drive at highway speed all day with less power than an electric kettle.

The students have led the project and it will be a tremendous experience for them to put what they have learned at Durham into practice against some of the best solar cars in development.”

John Wilson described the scientific significance of the Durham University Solar Car:

“In a world where the environment is at the forefront of global debate and vehicle emissions are paramount, Durham University Solar Car is designing a vehicle with not just zero emissions, but an unlimited mileage range.”

The project has produced a number of distinguished engineers, and previous members are now involved in a range of sectors such as aerospace, Formula 1 and the commercial automotive industry, and in 2004, the solar car toured the UK, helping to promote science and engineering in secondary schools.

[Image of solar car and team members]
The rapid emergence of China as a world economic superpower and the high value placed on Science, Engineering and Technology by the Chinese universities, authorities and people means that China will play a key role in the future of these disciplines.

As part of our ambition to be more widely recognised internationally for the excellence of our scientific research and education, the Faculty is strategically increasing its engagement with China.

This process began in March 2010 when PVC Professor Andrew Deeks and Sharne Proctor (Director of the International Office) visited 14 leading Chinese universities to determine those with which there was potential to develop significant collaborative relationships. This was followed-up by the two Science Faculty Heads Delegations to China in June 2010 and June 2011.

In September 2010 Professor Deeks took part in a delegation led by the VC, Professor Chris Higgins, during which Professor Higgins signed Memoranda of Understanding with the Presidents of Peking, Zhejiang and Shandong Universities, Harbin Institute of Technology and Dalian University of Technology. Further discussions concerning joint research projects and education programmes, and student exchanges also took place, leading, among other things to 20 students from the Faculty of Science attending an international summer school in Dalian in August 2011 as detailed elsewhere in this report.

Dr Charles Augarde has also visited China as part of a quality assurance delegation, and high-level incoming delegations have been hosted from Peking University, Shandong University and Dalian University of Technology, for talks regarding ongoing collaboration and joint degree programmes.

All this activity is significantly raising Durham’s profile in China and, indirectly, around the world since many universities are developing links with China. We are developing collaborative programmes which attract the brightest students from some of the best Chinese universities which will both diversify the student cohort at Durham and allow us to attract outstanding PhD students. Our exchange programmes will give opportunities for Durham Science students to be exposed to a different culture and to develop a global perspective.
Faculty of Science PVC and Heads Visit China

The second Science Faculty Heads Delegation visited China from May 27th to June 5th 2011. It was led by PVC Professor Andrew Deeks, consisted of all of the current Science Department Heads: Professor Roger Crouch (SECS), Professor John Evans (Chemistry), Professor Jon Gluyas (ES), Professor Charles Heywood (Psychology), Professor Patrick Hussey (SBBS), Professor Paul Mansfield (Maths) and Professor Martin Ward (Physics), and visited Shanghai, Jinan, Dalian and Beijing.

The delegation met with prospective students at the offices of one of Durham’s agents in China in each city, and also hosted alumni receptions in Beijing and Shanghai.

On Monday 29th May they visited Shandong University, on a day which was named ‘Durham Day’ by the University. A poster display introduced Durham University to the students of Shandong University. Members of the delegation had useful discussions with academic departments in the morning. In the afternoon, the members of the delegation presented an impressive array of talks to a gathering of about 100 students.

A similar day-long visit was made to Dalian University of Technology. The morning was spent looking at the facilities and the campus. In the afternoon Heads visited their corresponding departments and engaged in useful discussions regarding future collaboration, some giving research presentations. Following these Professor Deeks gave an open lecture to about 120 students.

In Beijing Professors Deeks, Evans, Crouch and Hussey visited the Procter and Gamble Technology Centre in Beijing together with a Peking University (PKU) representative to discuss a three-way collaborative degree programme. Professor Gluyas, Professor Crouch and Professor Deeks then visited the Chinese University of Geosciences in Beijing to discuss collaboration programmes in Earth Sciences, while Prof Evans went to PKU to continue discussions.

Professor Ward gave a seminar at the Chinese National Observatory, while Professor Manseld gave a research seminar at the PKU Centre for High Energy Physics. Professor Heywood, Professor Hussey and Professor Ward all gave presentations to prospective students at a new International School. Professor Deeks also met with Director-General Zhang of the Chinese Ministry of Education Department for International Cooperation and Exchanges to brief her on Durham University’s cooperation with Chinese universities.

International Coordinators

In September 2010, as part of its internationalisation initiative, the Faculty of Science appointed International Coordinators in each School and Department. These are senior members of academic staff who act as a focus for internationalisation activities in their Schools and Departments:

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<tr>
<th>School/Department</th>
<th>Coordinator(s)</th>
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<tr>
<td>School of Biological and Biomedical Sciences</td>
<td>Dr Martin Cann &amp; Dr Adam Benham</td>
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<tr>
<td>Department of Chemistry</td>
<td>Dr Ivana Evans</td>
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<td>School Engineering and Computing Sciences</td>
<td>Professor David Toll</td>
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<td>Department of Earth Sciences</td>
<td>Dr Stuart Jones, Dr Ken McCaffrey &amp; Professor Yaoling Niu</td>
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<td>Department of Mathematical Sciences</td>
<td>Dr Martin Cann &amp; Dr Adam Benham</td>
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<td>Natural Sciences</td>
<td>Dr James Blowey</td>
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<td>Department of Physics</td>
<td>Dr Richard Myers</td>
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<td>Department of Psychology</td>
<td>Dr Alex Easton &amp; Dr Harriet Rosenthal</td>
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The International Coordinators’ role includes taking part in overseas missions for recruitment and conversion activities, organised both by the faculty and by the International Office. Over the past year trips have been made to China, Singapore, Malaysia, Hong Kong, the USA and India. It has been particularly beneficial to meet, on a face-to-face basis, applicants from overseas to whom offers of places at Durham have been made, and conversion statistics are improving as a result. The International Coordinators are also happy to provide information and advice to anyone interested in studying at Durham: contact details are available at www.durham.ac.uk/science.faculty/international.
Internationalisation continued

Durham students visit Dalian University of Technology

The Faculty’s Student Exchange Agreement with Dalian University of Technology was signed in September 2010. The ‘outward’ part of this exchange involved twenty penultimate year Durham science students taking part in the DUT international summer school in July and August 2011. Accompanied by two staff members, Helen Vaughan (physics) and David O’Donnell (psychology) they spent three weeks learning Chinese language and culture.

The students all enjoyed a wonderful experience, which included classes in Chinese history, calligraphy and even Kungfu, as well as visits to Dandong and the terracotta warriors at Xi’an.

Lucy Knox, a Natural Sciences student who took part, commented: “I definitely think I got a very rounded experience of China by participating in the course, and the culture classes especially made you really notice the cultural differences, and helped understand the people we met and their attitudes a lot better.”

The reciprocal ‘inward’ part of the exchange involves 5 students spending part of the 2011 / 12 academic year studying in Durham.

Biological and Biomedical Sciences Internationalisation Initiatives

The School of Biological and Biomedical Sciences were successful in obtaining funding to support three different strands of an internationalisation programme.

In the first, three students were awarded bursaries following a competitive application process to undertake a research project at the University of Washington in Seattle (the result of a Leverhulme Trust funded sabbatical awarded to Professor Roy Quinlan in the previous academic year), and the Institute of Biophysics of the Chinese Academy of Sciences in Beijing (resulting from a Royal Society funded travel bursary to Professor Quinlan). All three students were ‘ambassadors extraordinaire’ for Durham and their aspirations and ambitions have been very positively influenced by this experience. This has strengthened the academic links between Durham and both the other institutions that encourage the development of closer partnerships across all the spectrum of academic and research activities.

Sarah Morris, one of the participating students, commented

“Spending the summer at the Institute of Biophysics in Beijing was one of the best experiences I have ever had. It helped to confirm that I want to continue studying, and that I would enjoy research because of the thrill and challenge of discovering something that nobody else yet knows. Having the opportunity to spend a long time in a place with a completely different culture reaffirmed my love of travelling and joy of getting to see different ways of life, and has also made me think seriously about moving and studying abroad in the future.”

In the second strand we established a joint ecology field course with the Goethe Universität, Frankfurt in Main. Two staff members from their Department of Geography (Professors Steven Higgins and Thomas Hickler) joined two members of staff from Durham University (Dr Bob Baxter and Dr Ralf Ohlemüller). Six students from Frankfurt joined 23 from Durham. The field-course was held at Hirschegg in the Kleinwaldstertal (Austria) during July with each staff member supervising projects and giving classes. This was a genuine cultural and academic exchange where learning experiences and approaches have been enriched through this common field course.

The final strand involved the enrichment of Durham-based laboratory field courses in Biological Imaging and Biomolecular Analysis. Two guest speakers, Dr. Siegfried Reipert from the Max F. Perutz labs in Vienna and Professor Christophe Verlinde from the University of Washington, were invited to enhance the student learning experience. Dr Reipert is an expert in Transmission Electron Microscopy methods such as high pressure freezing and tomography, and Prof Verlinde in structure-based drug design and has worked for the last 20 years on the development of new drugs fighting neglected infectious diseases. Again both are from strategically important research centres, but for our students their direct involvement in the learning experience gives a glimpse of the standards and opportunities in research-led environments around the world.
Departmental Reports

**Biological and Biomedical Sciences**

This year has been one of initiating change in our undergraduate degree programmes. Consultations with students and academic staff have resulted in changes that will make our degree programmes much more flexible. The six degree programmes we have been running will be replaced by two exciting and modern new programmes from October 2012. The new Biological Sciences degree programme provides a broad-based degree structure, in which students will enjoy more flexibility in their module choices than previously. Biomedical Sciences, which currently runs from the Queen’s campus, will be delivered from the Durham campus in October 2012 for new entrants. The Biomedical Sciences degree module structure has been modified to integrate with and complement the new Biological Sciences degree, whilst at the same time retaining its distinctiveness.

Research in the School continues to align with University Research Institutes and Centres set up to build relationships between departments and develop multidisciplinary research. In January 2010, Professor Nigel Robinson joined SBBS from Newcastle University as the Chair of Biomolecular Sciences, funded through an initiative from the Biophysical Sciences Institute. Professor Robinson becomes a Director of this Institute. The Durham Centre for Crop Improvement Technology (DCCIT) was initiated to reflect our strength in the molecular plant sciences area, and the Directorship recently changed hands from Professor Toni Slabas to Professor Marc Knight. The DCCIT includes members from the Chemistry Department as well as SBBS. Dr Ari Sadarandom joined DCCIT and SBBS from Warwick University in March 2010, adding to our strengths in molecular plant pathology and biochemistry. These Institutes and Centres are a focus of research excellence and are continually seeking new funding initiatives with many recent successes from government and industrial funding agencies including BBSRC, EPSRC, Procter & Gamble, Harvest Energy and the EU.

Professor Przyborski and Reinnervate Ltd. (a spin-out company developed from the SBBS) recently won one of the Annual R&D top 100 awards for the development of the Alvetex 3D growth scaffold, for use in animal cell culture. SBBS has also set up a close partnership with Cambridge Biochemicals, an SME focused on protein production, and other such collaborative ventures with industry are under discussion.

**Chemistry**

This year the Department of Chemistry marked 50 years in its current building. An alumni reunion was held on 23rd and 24th September 2011 to celebrate the many achievements over that period. We were delighted to welcome around 400 attendees, who had associations with the Department dating back to 1950!

In July it was announced that Durham Chemistry has the highest graduate prospects score of any UK department, in the 2012 Times Good University Guide.

Congratulations to Professor Colin Bain who was awarded the Royal Society of Chemistry and the Society of Chemical Industry inaugural Thomas Graham award on 5th July. The Thomas Graham lectureship is awarded for contributions from mid-career academics in the areas of surface and colloid science. Congratulations also to Dr Phil Dyer on the award of a Royal Society Industry Fellowship to carry out a project entitled Tuned Ligand Delivery for ‘Designer’ Heterogeneous Catalyst Preparation. This fellowship will allow Phil to spend 50% of his time for the next 3 years working with Johnson Matthey Catalysts (JMC) at Billingham.

Many congratulations to Dr Karl Coleman, Professors David Parker and Jeremy Hutson of this department on awards from the Royal Society of Chemistry (RSC). Karl Coleman has been awarded the RSC Chemistry World Entrepreneur of the Year. The award is to recognise Karl’s development of intellectual property around the production of graphene, and for the formation of the spin out company Durham Graphene Science Ltd., which is currently housed in the Department.

David Parker is the recipient of the RSC Ludwig Mond Award for Outstanding Research in any Aspect of Inorganic Chemistry. The citation is for work on the coordination chemistry of the rare earths, leading to an understanding of the action of responsive optical and magnetic probes and the development of lanthanide complexes and conjugates for use in analysis and imaging. Jeremy Hutson has been awarded the RSC Tilden Prize and lectureship, which is awarded simply for “advances in chemistry”. Jeremy’s citation reads “for pioneering studies of the formation and properties of ultracold molecules, particularly the novel molecular collisions that occur in the fully quantum-mechanical regime below 1 millikelvin”.

**Earth Sciences**

The department has attracted considerable success in attracting research funding, from industry as well as funding councils: in the last 18 months, grants totalling more than £10m have been won to support research in areas including Ocean Seismology, Palaeoclimatology, Geodynamics, Volcanology, Energy Research. Jeroen van Hunen won a major ERC award to investigate early earth subduction processes, and Richard Hobbs and Christine Peirce, in partnership with colleagues in Manchester, UCL and the National Oceanography Centre in Southampton have been awarded a £3.7m NERC consortium award, of which £2.8m will come to Durham. The project is a major investigation of the hydrothermal fluid flow and plumbing within the oceanic crust at the Costa Rica Rift on the East Pacific Rise, and how this changes as the crust ages and spreads off-axis. This is an environmentally important research project with implications for climate change.

Recognition has come in the shape of various awards and accolades for staff and students: PhD student Scot Fraser won the Norman Falcon Award of the EAGE; Professor Roger Searle has been awarded the Price Medal of the Royal Astronomical Society; Prof. Jon Davidson has been awarded the Coke Medal of the Geological Society of London; Professor Christine Peirce and Professor Gillian Foulger have been elected to the Committee of the British Geophysical Association; and Professor Jon Glayas has been made chair of the UK’s Carbon Capture and Storage working party. Richard Davies has won a University Award for Excellence in Doctoral Supervision, based on recommendations by his PhD students and his work initiating and developing the successful CeREES Geo-energy Scholarship Programme. Kevin Burton was appointed Professor of Geochemistry after the previous chair Graham Pearson left for a prestigious Canada Research Chair at Edmonton.

A 4th year field seminar entitled “A Lithospheric Transect” went to the western USA, for which Serica Energy donated £5,000 of support funding.

Finally, the department’s Volcanology group was in great demand during the recent eruptions in Iceland, and their expert comment featured in news reports around the world.
Departmental Reports continued

Engineering and Computing Sciences

The School of Engineering and Computing Sciences has undergone three notable developments during the last 12 months.

The first was the establishment of new partnership agreements with two industrial partners: Danish Oil and Natural Gas Energy Company and Ikon Science Ltd. These strategic partnerships have enabled two new academic posts to be funded; the DONG chair in Renewable Energy (Professor Phil Taylor) and the Ikon Science Lectureship in Computational Geomechanics (Dr William Coombs). These collaborations fit very well with the School’s research strengths and interests in Smart Grid technology, deep-water offshore wind energy, hydraulic fracturing and carbon sequestration.

The second comprised the phasing out of the existing package of undergraduate degrees in Computer Science to be replaced by a single high-entry degree offered either as a 3-year BSc or 4-year MEng. The number of CS students applying for the existing programmes had fallen dramatically over the previous 3 years, while the numbers arriving on the (higher entry tariff) engineering degrees had grown. The new MEng CS degree, which starts in 2012 requires an AAA entry including A level (or equivalent) mathematics.

The third development concerned the focussing of the research directions within the School through the arrival of 8 new members of academic staff (two in Computer Science, six in Engineering). This strengthened the Algorithms and Complexity (theoretical computer science) Group, as well as the Energy, Thermo fluids and Computational Mechanics research units. These positions have been made possible through the retirement and movement of staff, however during 2012, the School will recruit additional academics in the areas of High Performance Computing, Wind Energy Systems and Computer Visualisation / Software Engineering.

Throughout 2011, building plans for the modernisation of the Christopherson Building have been devised and refined to allow the School to relocate staff from within the Computer Science Extension building, expand high-quality space for increasing numbers of postgraduate researchers, and to improve the specialist computing laboratories.

Mathematical Sciences

Ian Vernon and Michael Goldstein (along with Richard Bower in Physics) were awarded the Mitchell Prize for 2010, for their paper Galaxy Formation: A Bayesian Uncertainty Analysis. The prize is awarded by the International Society for Bayesian Analysis (ISBA) in recognition of an outstanding paper that describes how a Bayesian analysis has solved an important applied problem. Ian collected the prize in September at the Joint Statistical Meeting in Miami, where it was also announced that Danny Williamson got an “Honourable Mention” for the Savage award (the ISBA award for the best PhD Thesis).

Ruth Gregory was awarded a Royal Society Wolfson Research Merit Award. Paul Heslop was awarded a Most Cited Article 2006-2010 Award by the journal Nuclear Physics B for a paper on string theory written with researchers at Queen Mary College.

Members of the department made 89 overseas research trips to 25 different countries this year. Patrick Dorey lectured at the African Institute for Mathematical Sciences (AIMS) in South Africa and is on the Steering Committee for AIMS-Ghana.

The department has said good-bye to several members of staff: Farid Tariff and Misha Belolipetsky have left for Chairs in Brazil, Adrian Diaconu is returning to Minneapolis and Michael Farber has also left us. Many new permanent appointments have been made: Dzmitry Badziahin (algebraic number theory) has already arrived, Patrick Dondl and Anthony Yeates (computational mathematics), Andrew Lobb (topology) and Olaf Post (geometry) will come in October, while Alexander Stasinski (representation theory) and Pavel Tumarkin (geometry) will in January. Vadim Shcherbakov (probability) and Martin Nikolov (representation theory) have both been appointed to temporary lectureships.
Departmental Reports continued

**Physics**

Over the previous year members of the Physics Department have received a number of prestigious awards, honours and prizes. Carlos Frenk was awarded the Gruber Prize jointly, for his seminal research on Cosmology. Tom McLeish was elected to a fellowship of the Royal Society, and Matt Jones won the Bates Prize, awarded biannually to the most outstanding young researcher in the area of atomic, molecular and optical physics. Our number of staff continues to increase. We succeeded in winning two ERC grants, one at senior level (Carlos Frenk) and one at consolidator level (Suzanne Fielding). In addition we attracted an existing holder of an ERC grant to transfer to Durham, Dr Peder Norbert.

On the grants front we successfully renewed both of our main STFC rolling grants in astronomy, totalling £6m. In the peer review they were the highest ranked grants in this round. The Centre for Advanced Instrumentation was awarded two new grants related to the European Southern Observatory’s next generation telescope programme, the ELT. They also completed the build phase of the KMOS spectrograph, a major new instrument for ESO’s 8m telescopes. The CMP group was awarded several new million pound plus grants, one in an area related to biophysics, and another an ERC grant for the study of materials for fusion applications.

The IPPP researchers have been heavily involved in the interpretation of results from the LHC. In particular the HERWIG++ collaboration (led by Peter Richardson) has developed more accurate simulations associated with the search for the Higgs Boson.

In summer 2011 we hosted the largest ever international conference in Physics at Durham, on the subject of galaxy evolution. Over 400 researchers attended, and amongst other attractions the attendees were shown our latest 3-D movie called “Cosmic Origins” in our new 3-D lecture room facility. This movie was also shown to an integrated audience of about 10,000 visitors, at the Festival of Science and Arts, held at the Royal Festival Hall.

Also in the summer of 2011 we opened the ICC’s 4th generation cosmological computer. This keeps the ICC at the forefront of simulations of galaxy formation and evolution, needed to understand the nature of the Universe.

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**Psychology**

This year the Department is pleased to have consolidated its position in the top ten of the 102 Psychology Departments in the UK, in the Times Good University Guide.

A major £3m initiative of the Department of Psychology came to fruition on the 19th June 2011. The delivery of a 12 ton, 3 Tesla Siemens Tim Trio Brain Scanner to the James Cook University Hospital cemented the partnership between the University and the South Tees Hospitals NHS Foundation Trust. The scanner produces high resolution structural and functional images of the brain using magnetic resonance imaging (MRI). It will be jointly used by the Neurosciences Division of the Hospital and the University for clinical and research purposes, respectively. The scanner will be used by a number of research groups including those which investigate vision and visual cognition, brain mechanisms of visually controlled action, memory, autism and the impact of hormones on the brain. The Director of the facility is Professor David Milner and a highlight of the year was his election to a prestigious Fellowship of the Royal Society for his work on brain mechanisms of vision and visuomotor behaviour.

This year we have introduced several innovations to enhance the student experience. We have significantly increased small group teaching in the 1st Year with the introduction of new, research-led modules, where the teaching is centred around ‘Classic Papers in Psychology.’ Students have been very appreciative of increased contact hours with a number of staff in different disciplines early in their academic career. For those later in their academic career we have introduced ‘employability’ retreat weekends - full details are elsewhere in this report.

In addition, the department has made great strides in establishing our international reputation. We have hosted a number of meetings which have had international attendees and speakers, fostered research links with China and taken steps to attract the very strongest international students with trips to China and Hong Kong. As a result of these initiatives a number of new international research collaborations are being developed within the department. We have also seen a significant increase in the number of international students arriving on our programmes in 2011 and have continued to build and develop staff and student exchanges within Europe through the Erasmus scheme, most notably with our successful MSc programmes.
Congratulations

Royal Society Fellowships

Appointed 2010
Professor Jeremy Hutson
(Department of Chemistry)

Appointed 2011
Professor Tom McLeish
(PVC Research and Professor in the Department of Physics)

Professor Arthur David Milner
(Emeritus Professor of Psychology)

Appointments and promotions

Iain Stewart
(Engineering and Computing Sciences) was invited to serve as a member of the Computer Science and Informatics panel in the 2014 Research Excellence Framework.

Gordon Love
(Physics) was elected to the Council of the Institute of Physics.

Bob Holdsworth
(Earth Sciences) has been appointed a member of the Nuclear Installations Inspectorate panel.

Carlos Frenk
(Physics) has been made a Fellow of the Institute of Physics.

Awards

Carlos Frenk
(Physics) was awarded the Hoyle Medal and Prize of the Institute of Physics for his ground-breaking contributions to the cold dark matter model through cosmological simulations, and developing novel methods for calculating the physics of galaxy formation and analysis of galaxy surveys.

Ruth Gregory
(Mathematical Sciences and Physics) and Todd Marder (Chemistry) were awarded prestigious Royal Society Wolfson Research Merit Awards.

Roger Searle
(Earth Sciences) was awarded the Price Medal of the Royal Astronomical Society for his work on the geological processes on the ocean floor.

Durham University Awards for Teaching and Learning

Teaching Excellence
Andrew Gallant, Shamus Smith and Dagou Zeze
(Engineering and Computing Sciences).

Enhancing the Student Experience:
Grants (up to £7K to invest in new approaches to teaching) were awarded to Jon Trevelyan and colleagues (Engineering and Computing Sciences), Richard Wilson (Physics), Andrew Hughes and colleagues (Chemistry), and Sam Nolan and colleagues (Foundation Programme and Physics).

Excellence in Doctoral Supervision
Richard Davies (Earth Sciences).

Major funding awards

Many members of the faculty were awarded significant research grants in 2010 / 11. Highlights included:

Colin Bain and Lian Hutchings (Chemistry), Gordon Love (Physics) and Buddhapiya Chakrabarti (Mathematics): a £1.1m grant from STFC, leading a consortium with on Optical Control of Emulsion Drops for Nano Fluids and Microfabrication; Carlos Frenk (Physics): £2.1m rolling grant from STFC for The Formation of Cosmic Structures, and 2.26m Euros for computational projects using data from the International Panstarrs Wide-Panorama Telescope in Hawaii; Damien Hampshire (Physics): £1.236m for Fusion for Energy Provision; David Parker (Chemistry): 2.49m Euros for work addressing Critical Problems in the Natural Sciences by Developing the Chemistry of Metal Coordination Complexes; Iain Smail (Physics): £2.75m rolling grant from STFC for Extragalactic Astronomy at Durham.
Statistics

Table 1:
Income, expenditure, share of central division and contribution to the University's operating surplus

<table>
<thead>
<tr>
<th>Year</th>
<th>Income</th>
<th>Expenditure</th>
<th>Share of central division costs</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>07 / 08</td>
<td>71,133,521</td>
<td>49,593,095</td>
<td>20,828,426</td>
<td>1,238,000</td>
</tr>
<tr>
<td>08 / 09</td>
<td>75,386,615</td>
<td>50,653,266</td>
<td>22,504,471</td>
<td>1,742,000</td>
</tr>
<tr>
<td>09 / 10</td>
<td>79,441,165</td>
<td>51,505,923</td>
<td>24,170,000</td>
<td>3,006,000</td>
</tr>
<tr>
<td>10 / 11</td>
<td>79,743,709</td>
<td>50,974,134</td>
<td>23,226,787</td>
<td>4,766,413</td>
</tr>
</tbody>
</table>

Table 2:
Breakdown of students in the Faculty 2010/11

<table>
<thead>
<tr>
<th></th>
<th>UG</th>
<th>PGT</th>
<th>PGR</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home / EU</td>
<td>3809</td>
<td>56</td>
<td>415</td>
<td>4280</td>
</tr>
<tr>
<td>Overseas / Islands</td>
<td>197</td>
<td>60</td>
<td>107</td>
<td>364</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4006</td>
<td>116</td>
<td>522</td>
<td>4644</td>
</tr>
</tbody>
</table>

Table 3:
Breakdown of students by gender in the Faculty 2010/11

<table>
<thead>
<tr>
<th>Gender</th>
<th>UG</th>
<th>PGT</th>
<th>PGR</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>1699</td>
<td>51</td>
<td>169</td>
<td>1919</td>
</tr>
<tr>
<td>Male</td>
<td>2307</td>
<td>65</td>
<td>342</td>
<td>2724</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4006</td>
<td>116</td>
<td>522</td>
<td>4643</td>
</tr>
</tbody>
</table>

Table 4:
Staff

<table>
<thead>
<tr>
<th>Grade</th>
<th>Staff</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic</td>
<td>283</td>
<td>37%</td>
</tr>
<tr>
<td>Research</td>
<td>231</td>
<td>29%</td>
</tr>
<tr>
<td>Teaching</td>
<td>41</td>
<td>5%</td>
</tr>
<tr>
<td>Administrative</td>
<td>79</td>
<td>10%</td>
</tr>
<tr>
<td>Technical / experimental / facilities</td>
<td>146</td>
<td>18%</td>
</tr>
<tr>
<td>Management</td>
<td>14</td>
<td>2%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>794</td>
<td></td>
</tr>
</tbody>
</table>
Table 5:
Applicants and arrivals by school / department (overseas).

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>%</th>
<th>+ / -</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBBS</td>
<td>96</td>
<td>4</td>
<td>4%</td>
<td>128</td>
</tr>
<tr>
<td>Chemistry</td>
<td>76</td>
<td>4</td>
<td>5%</td>
<td>76</td>
</tr>
<tr>
<td>SECS</td>
<td>180</td>
<td>20</td>
<td>11%</td>
<td>193</td>
</tr>
<tr>
<td>Earth Sciences</td>
<td>35</td>
<td>6</td>
<td>17%</td>
<td>27</td>
</tr>
<tr>
<td>Maths</td>
<td>99</td>
<td>7</td>
<td>7%</td>
<td>138</td>
</tr>
<tr>
<td>Physics</td>
<td>100</td>
<td>4</td>
<td>4%</td>
<td>71</td>
</tr>
<tr>
<td>Psychology</td>
<td>34</td>
<td>1</td>
<td>3%</td>
<td>79</td>
</tr>
<tr>
<td>Natural Sciences</td>
<td>67</td>
<td>5</td>
<td>7%</td>
<td>90</td>
</tr>
</tbody>
</table>

Table 6:
Breakdown of academic staff

<table>
<thead>
<tr>
<th>Grade</th>
<th>Staff</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor</td>
<td>87</td>
<td>31%</td>
</tr>
<tr>
<td>Reader</td>
<td>40</td>
<td>14%</td>
</tr>
<tr>
<td>Senior Lecturer</td>
<td>44</td>
<td>16%</td>
</tr>
<tr>
<td>Lecturer</td>
<td>106</td>
<td>37%</td>
</tr>
<tr>
<td>Other Academic</td>
<td>6</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>283</td>
<td></td>
</tr>
</tbody>
</table>

Table 7:
A-Level grades

<table>
<thead>
<tr>
<th>Year of Entry</th>
<th>Average A-Level Tariff</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>534.8</td>
</tr>
<tr>
<td>2009</td>
<td>517.8</td>
</tr>
<tr>
<td>2008</td>
<td>493.2</td>
</tr>
<tr>
<td>2007</td>
<td>476.0</td>
</tr>
<tr>
<td>2006</td>
<td>487.8</td>
</tr>
<tr>
<td>Total</td>
<td>283</td>
</tr>
</tbody>
</table>

Table 8:
Faculty of Science Degree Classifications 2011

<table>
<thead>
<tr>
<th>Degree Classification</th>
<th>1</th>
<th>2.1</th>
<th>2.2</th>
<th>3</th>
<th>Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduates (%)</td>
<td>22</td>
<td>53</td>
<td>21</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total 283</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree Classification</td>
<td>1</td>
<td>2.1</td>
<td>2.2</td>
<td>Pass</td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>---</td>
<td>-----</td>
<td>-----</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Graduates (%)</td>
<td>22</td>
<td>53</td>
<td>21</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>