HUBS Spring Meeting, 7 and 8 April 2004
Dartington Hall, near Totnes, Devon

Recruiting Biologists and Supporting Biology Teaching in Schools and Universities

Wednesday 7 April

First Session: Supporting and Promoting Science Education in Schools and Universities

Dr Derek Bell, Chief Executive, The Association for Science Education [talk]

ASE and the New National Centre for Science Learning.

Dr. Keith Elliott, University of Manchester, Chair Biosciences Federation Education Committee

Bioscience Federation plans in the School Sector [talk | slides]

Paul Hartley, Devon and Cornwall SETPoint Manager, and Dr Phil Murray, Science & Engineering Ambassador

SETNet and the SETPoints and the Science and Engineering Ambassadors Scheme [talk | slides]

Professor Kevan Gartland, University of Abertay [talk | slides]

Learning and Teaching Support Network (LTSN) Bioscience and the Biochemical Society's Education Activities

Professor John Coggins, University of Glasgow [talk | slides]

Connecting and Co-ordinating Science Education Activities: Reflections on the Scottish Experience.

Thursday 8 April

Second session: Recruiting Students to Study Biology and Promoting Careers Opportunities in the Biosciences

Dr. Keith Elliott, University of Manchester *Recruitment: A Manchester Perspective* [talk | slides]

Professor John Coggins, University of Glasgow *Recruitment: A Glasgow Perspective* [talk | slides]

Professor David Coates, University of Leeds *Recruitment: A Leeds Perspective* [talk | slides]

Professor Charles Bryce, Napier University Recruitment: *A Napier Perspective* [talk]

Careers Opportunities in the Biosciences

Professor Wendy Purcell, Director, Centre for Research in Biomedicine, [slides]
Faculty of Applied Sciences, University of the West of England

" The Sector Skills Council for Science, Engineering and Manufacturing Technologies – SEMTA"

Professor John Coggins, University of Glasgow. [slides]

Roberts Review on the "The supply of people with science, technology, engineering and mathematics skills".

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Session 1**: Supporting and Promoting Science Education in Schools and Universities**

Dr Derek Bell, Chief Executive, The Association for Science Education
Will cover both ASE and the New National Centre for Science Learning.

Dr Derek Bell, Chief Executive of The Association for Science Education and a former science teacher and vice-principal in secondary education, talked about the Association's current membership, its position in the UK and internationally, its aims, activities and objectives:

The Association for Science Education is the leading education association by subject in the United Kingdom, and is currently the only association for science education in the Great Britain (whereas in other areas, such as mathematics and social sciences, several distinct organizations exist). Due to this, it is in a strong position within the UK, and also has important international contacts and affiliations, among them the National Society of Teachers of America, the Association for Secondary Education and several other international Science Associations in several countries of Europe, as Africa, South America and the Indian subcontinent.

It was founded in January 1901, and its main concern is the excellence in science teaching and learning. It currently has a membership of 18,000, which includes teachers at primary, secondary and higher education levels, as well as science technicians in schools. It is an inclusive association, since both teachers and science technicians form part of its membership. It currently has 19 regional offices in England, Scotland, Wales, and Northern Ireland.

The Association for Science Education provides advice, support and guidance, top class web site and publications, high quality continuous professional development opportunities, discounts on resources, an international network of people in science education and competitive indemnity insurance. They also publish five different journals. ASE working partners include:

- Professional bodies and Learned Societies
- Government Organisations across UK
- Industry and business
- Charitable Trusts
- Universities
- Science Learning Centres
- Specialist Schools Trust

Among its activities, there are Annual general and area meetings, more than 300 local and regional events, regional and national committees, projects and task groups, articles for journals, and discussion groups on web site.

ASE initiatives include “Planet Science”, a series of 5CD ROMs with resources for teachers, as well as “Science UPD8”, a free service for teachers that helps them bring out the science behind the headlines while it's fresh in students' minds, usually within seven days since the story or news has become current or appeared in the spotlight, with some short activity to include in class. There are plans to extend this to have the activity cover the whole class.

Another important initiative is the “Laboratory Design Project”, a software programme that allows schools to design their own laboratories, according to their specific needs.

Another important concern of the ASE is science technicians specifically at a secondary education level, who at present have no clear professional structure and in general do not enjoy of good paying conditions. There are plans with the Royal Society to publish a leaflet with the career structure of technicians shortly, offering NVQ, on the assessment of which the ASE is currently working. At present the ASE does not work at the level of higher education technicians, although there is a plan to extend this concern to science technicians at universities.

ASE is also working on the possibility that science teachers receive status of “Chartered Science Teachers”, from the Science Council, since the Science Council have the designation of “Chartered Scientist”, but such not a specific one for science teachers, and this would be desirable. ASE also looks forward to establishing awards and other incentives.

The “National Network of Science Learning Centres” initiative was also discussed in the talk: its mission is to change the culture and uptake of professional development within the science teaching community. In order to fulfil this mission it currently manages 51 million pounds from several sources, of which 21 million come from the Wellcome Trust, over a period of 10 years. The remaining 26 million comes from the DfES. It runs 9 regional centres in England only.

The National Centre is run by the White Rose University Consortium, and is the source and place for residential programme for teachers. Its target audience is primary teachers and science co coordinators, secondary science teachers and heads of department, further education teachers, science technicians, citizenship teachers and other support staff in the science classroom. Teachers from the devolved nations and the independent sector also attend regular training here.

There is an important problem in continuing professional development for science teachers, since a certain the reluctance of headmasters regarding the concession of leaves for their teachers to attend them has been noticed, mainly due to the costs in getting replacement teachers.

In this particular situation finance is not the main deterrent or obstacle, as there are several grants and other types of financial support both for teachers and schools, but there is an imbedded culture of not taking CPD seriously enough, due to the stresses of

the test-oriented mentality promoted by the current education system in the UK, in which the main interest of schools and teachers, and their main preoccupation, is 'tomorrow's examinations' and not the long-tern updating of the teachers' knowledge. It was discussed that teachers ought to use some of their vacation time for CPD.

Another problem that can be seen coming is the foreseeable massive retirement of science teachers: due to the average age of currently working science teachers (for example, 50% of physics teachers are over age 50), in a short time, due to retirements, there simply will not be enough science teachers to replace them.

Another issue is re-training existing teachers or expanding their teaching base (for example training biology teachers to teach chemistry and physics), and the training of other professionals with valuable non-teaching experience (such as engineers) in order to balance the retirement rate of science teachers. There is a problem with this though, in the sense that several of the people wanting to undergo mid-life career change could be doing so out of necessity (such as unemployment), and this would lead to having 'not exactly the right people' entering the teaching profession: This population of people has a lot to offer to children and young people, but they need to have the right attitude, and want to join the profession for the right reasons.

It is also noticable that most teachers of science do not teach the different branches of science or its specialities, but that up to GCSE level they teach general science. Therefore, teachers of general science should be trained, and not so much emphasis should be placed on training biology, chemistry or physics teachers. It is worth noting that science is more exciting if taught topic-based rather than discipline-based, and it is important that students understand that science is a border-crossing, limit-crossing discipline, and not a compartmented set of techniques and knowledges. This is especially important in this age of multi-disciplinary, where university courses and specially research programmes insist in a cross-disciplinary approach. An example is the Open University Science 1 module, which is taught as an integrated subject, but the problem with this is that even though it is a great way of introducing science to people without previous exposure to it, people that know where they are going in their science education usually have some previous background knowledge, and get bored by this approach, in which inevitably certain aspects that they may have learnt before are repeated to them, therefore generating a lowering of their interest and motivation.

Most students have an image of learning science as a set of laboratory techniques and practices, and science can be much more interesting than this, therefore this prevailing image should be challenged.

Test-oriented teaching is also a great problem: at GCSE level students do three pieces of assessed investigation, which usually only comprise following a recipe (examples are measuring a variable resistance and observing enzyme activity in yeast), but where no enquiry, imagination or creativity to solve problems is exercised. Students are being spoon fed, even at university level. This can be blamed almost entirely on the pressures put on teachers by the excessive demands current testing system, and the prevailing confusion regarding standards and levels of achievement. These problems are being reviewed by the authorities, and there are several plans to reform and change both the testing system and the regulations for teaching (e.g. the KS4 Programme of Study from 2006 onwards, Applied Science GCSE initiative). A move towards the diploma system

is also being proposed, in which there will be a core component of functional maths, literacy and ICT skills, while the rest of topics will be taught as complementary studies. If this reform goes through, it could have major implications on what happens in schools, as students will be expected to do it up to the end of Key Stage 4.

It is important to build up from the pupils' existing knowledge, rather than imposing on them a set of academic theories, the so called 'academic view'. One of the key issues in the discontinuity of the transition between the levels of education (primary, secondary and tertiary) is the perceived discontinuity in the teaching methods, the origin of which is a discontinuity about the way we think about science and the way we teach science.

The proportion of students that finish secondary education and become scientists is relatively small, yet most of them enter a world as adults in which there is science and technology all around them, and they need understanding of science as citizens, instead as of mainly as scientists. Science education at the primary and secondary level should therefore be oriented towards the challenges of living in a world permeated and flooded by science and technology, while it is the job of tertiary education to train and prepare specialized scientists.

Team teaching is another possible approach, in which the diverse abilities and knowledges of several teachers are capitalized upon, instead of pressing a single teacher to know all the different details of a certain specialty. This is a very exciting way to learn, but it is very labour intensive, and therefore also very expensive, and most schools on limited budgets cannot afford it. Most head teachers and school administrators have the image of science as a very expensive subject to teach, due to the prevalent image of the laboratory with its several instruments and chemical reagents, which is of course a limited and not very accurate image of science teaching.

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Session 1**: Supporting and Promoting Science Education in Schools and Universities**

Dr. Keith Elliott, University of Manchester, Chair Biosciences Federation Education Committee
Will cover the Bioscience Federations plans in the School Sector

The Biosciences Federation evolved out of the UKLSC and IoB, and was formally established in December 2002, and launched at the House of Lords in September 2003. It has so far held one meeting, in November 2003, and an upcoming one is planned for April 2004. It currently comprises 30 organisations, representing more than 65,000 members, and therefore being on a par with the societies of chemists, physicist, and engineers. Its membership includes university academics, school teachers, society staff, support and professional organisations such as LTSN, ASE, NSLO, and co-opted members. The Federation represents expertise, but not any particular societies within the field. It is entirely funded by individual and societies fees.

The Federation was set up to promote liaison and dialogue between the biosciences, provide opinion and information to assist the formulation of public policy, and promote debate about practical and ethical implications of developments in the biosciences, involving the wider public where appropriate. The Federation is quite new, but since it has a lot of interaction with government, academia, research institutions and schools, it will have a major role in the future directions of biosciences in these aspects of British society.

In the area of education the Federation has established an Education Committee, which was the first committee to be set up, last year. The terms of reference of the committee are to promote and enhance education in the biosciences, respond to initiative enquires, establish a network of speakers and organise activities such as career conference and colloquia.

Included in the activities of the Committee, are stands and representation at careers fairs, science fairs and other community outreach activities targeted at parents, school teachers and students, to promote interest in science education.

The Federation also published the *Biosciences Supplement* in “The Independent” newspaper. This issue included articles on undergraduate degrees, postgraduate qualifications and careers prospects. It was distributed via societies and fairs

Plans for 2004 include the production of a leaflet aimed at schools, which will show the wide range of occupational, research and employment possibilities in the study of science. Further science and careers fairs are planned, and conferences and talks aimed

at undergraduates and postgraduates. A workshop for the Biological Association will also be held in Exeter later this year.

The Education Committee also hosts the website ww.biology4all.com, which seeks to maintain a database of scientists willing to give talks in schools, in order to promote the interest of children in science. This service is available to science teachers, and is being used extensively by them, and by headmasters. The site also features a question forum by biology teachers, with a weekly digest that summarizes the discussion threads of each week.

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Paul Hartley, Devon and Cornwall SETPoint Manager
Dr Phil Murray, Science & Engineering Ambassador
Will cover the role of SETNet and the SETPoints and the Science and Engineering Ambassadors Scheme

The Science & Engineering Ambassadors Scheme of SETNET (The Science, Engineering, Technology and Mathematics Network) aims to promote interest in the fields it represents by providing enthusiastic and vetted volunteers to work with young people in schools. The idea is to inspire and excite students about science, technology, engineering and maths. The programme is co-ordinated nationally by SETNET and managed locally by the UK-wide network of SETPOINTs. The programme is funded by the BBSRC School coordinators, Science Week Awards, Community Awards and by COPUS and the Royal Society.

This work is very important, as there is a declining proportion of young people taking up science and technology subjects in the later stages of education, and the long term impact of this in developed societies and economies can be very dire, representing a loss in competitivity and technological and scientific leadership.

This decline is due to the current image the students have of science, technology and mathematics: they consider other subjects and career prospects as more interesting, with more public recognition and exposure and with a better level of income.

The ambassadors offer role model, enthusiasm, a story to tell, and a passion for their subject, and they have the ability to identify with young people. They are, above all, real people with real experience and a desire to inspire.

SETPOINTs also help maximise the benefits to pupils and schools as well as providing support and information to the Ambassadors, such as access to resources, management of their activities, interfacing with business, organization of STEM activities and a link with the education community.

Through SETPOINTs or their companies, Ambassadors are getting involved in a wide range of activities, such as working with science clubs to enhance learning through practical demonstrations and experiments, working with teachers to develop curriculum relevant activities and ideas for exciting demonstrations, or working with classes on projects for GCSE applied science or engineering.

These volunteers can add significant value to schools and pupils, and aid for example by providing a better understanding of the richness of today's technologies and the career

options they offer, and a chance of meting real people doing real jobs. The students also get the chance to ask them the questions they may have about their daily activities.

As well as having Ambassadors visit the schools, the programme also aims to take children to tours around scientific institutes and universities, and try to involve parents in science activities such as science fairs and festivals; it must be remembered that parents are still the primary influence in young people's career choices.

SETNET runs other schemes to help science, technology and maths education, among them running science fairs and shows or workshops lasting several days. Special equipment can also be loaned out to schools that don't have them among their resources, and there is an ongoing training programme which primary school teachers attend during a day, learning to perform a simple experiment or any other kind of activity that they can later adopt into their class, and use with their students.

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Professor Kevan Gartland, University of Abertay
will cover the Learning and Teaching Support Network (LTSN) Bioscience and the Biochemical Society's Education Activities

The main aim of The Biochemical Society is to promote the molecular biosciences. This of course includes education and training, and the Society currently runs 19 diverse education support activities, at the primary, secondary and university levels.

The Learning and Teaching Support Network (LTSN) is housed at the University of Leeds, and amongst its activities one of the most important is the "Teaching development grants 2000", which aim to help in the development of innovative teaching materials and methods. It is also currently working on a peer reviewed journal about bioscience education which will see the light soon.

It also organizes events, such as one day events on learning and teaching issues, ethics, work related learning, practical work and assessment. Registration for these events is free for academics, and the details and timetables can be found at the LTSN website. The website also houses an image bank which is provided for the use of the community without copyright restrictions, as the images have been cleared and they can be used freely by anyone that needs them. This image bank also accepts uploads and donations, and new images are being digitized continuously, so it is ever expanding. It currently consists of more than 50,000 records. The site can be searched and browsed in a systematic way, making its records even more available and easily accessible to the interested public.

The website also includes a series of online tried and tested practical exercises, both for lab and field work. Tips advice on the contributors' experiences using the practical information is also available, and again this database is fully searchable. This provides opportunities to discuss and debate issues, methods, and problems with other UK bioscience academics. Special interest groups are continuously being suggested by the academics.

Some of the issues covered include: teaching ethics to bioscience students, practical work in the biosciences, problem based learning, plagiarism, final year project work in the biosciences, formative assessment in science, and widening participation in the fields of biosciences. The website also includes a student feedback project, in order to be in contact with the reactions of students, and is currently commissioning a number of mini projects, as well as providing several opportunities for funding, publishing, jobs related to the field, and other useful resources.

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Professor John Coggins, University of Glasgow

Connecting and Co-ordinating Science Education Activities: Reflections on the Scottish Experience.

The knowledge economy requires a number of scientists and high-profile researchers and other scientific professionals to keep the competitiveness of research in developed countries, as well as to keep the economic level sufficiently high so as to motivate world-leading researchers to come to, and remain, in this country. None the less, there is great concern about the declining number of people interested in pursuing scientific careers, as this may mean that in the short run there will be less qualified individuals to maintain the current and needed number levels of the scientific community.

The importance and urgency of recruitment is to re-balance this situation by attracting young people who are finishing their secondary studies into higher education in scientific disciplines, and thus recruitment strategies is something universities should prioritize.

In Scotland, Professor John Coggins has been able to present these issues to the people in the Scottish government that may have an influence in the determination of government policies on the future of science education. Even though the Scottish scene is relatively small compared to the one in England (Professor Coggins is usually able to have meetings with ministers within two days of booking the appointment, whereas in England this could take several weeks), the Scottish experience may be applied at a regional level in England.

Professor Coggins introduced a section of his presentation to the Scottish policy makers, emphasising that the Knowledge economy is about scientists inventing new products, and developing the existing ones. He also showed statistical data regarding Scottish secondary and higher education, acceptances to which have been steadily increasing since 2001.

None the less, there is a great problem regarding the crowded syllabus: curriculum designers keep adding subjects, but they do not subtract or otherwise balance the ever-increasing syllabus, over-feeding secondary students which a great quantity of separate knowledge that is not flexible enough to allow topicality. This also increases the amount of time dedicated to assessment. There are plans to do a curriculum reform in Scotland, that would include reducing assessment to 25% of what it is now: pupils in the final years of secondary school should know enough science to be informed and critical

citizens in a scientific world, but the specialization into specific topics of science should come during the first years of undergraduate courses.

Another big problem is that the investment plans in schools have systematically avoided the modernizations of the equipment: laboratories look just as they did 80 years ago, so the mental association that the students make is that science is a thing of the past, and not of the present, or the future: this image needs to be changed, by modernizing school laboratories and other science equipment.

Further Education colleges are also distancing themselves from science, since it is so expensive to deliver. Likewise, school careers in Scotland tend to stick to physotechnical and psychometric tests, not knowing enough of science careers to deliver a good service. The idea of a science degree as a step into a management career is not emphasised enough, and yet there are many skills that are acquired during undergraduate courses in science that are extremely relevant to the management professions, such as organizing time, data collection and analysis, report writing, justification of the good use of funding, etc. Since so much of today's industry is either scientific or technologically oriented, managers that have done a first degree in a scientific discipline would be very well suited to lead and administrate many companies, yet neither careers advisers, teachers or parents, nor the public at large, associates science with a management career.

There is also the need of attracting the next generation of science teachers: they need to be given more incentives, and the opportunity to undertake mid-career changes. In Scotland linkages between primary and secondary do not happen, and this has to be challenged.

The informal science education and networks linking several programmes has a lot to offer. Schools cannot afford bus fares to send their students to science centres, and various organizations, such as SETPOINT, are trying to link up with others, taking the expertise and the opportunities to schools.

Public engagement in science is also very important. Unless the government is more prepared to support individuals and organizations that are trying to explain what science is about to the public, the knowledge economy is not going to happen. Since the public has no understanding of the issues, fostering a wide scientific literacy is of prime importance to start changing people's attitudes and preconceptions about science.

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Session 2: **Recruiting Students to Study Biology and Promoting Careers Opportunities in the Biosciences**

Dr. Keith Elliott, University of Manchester

OVERVIEW OF THE DEPARTMENT

The School of Biological Sciences of the University of Manchester offers a full range of undergraduate programmes in the biological sciences, including pharmacology and other bio-medical disciplines, which are taught within the Department. The range includes from Anatomy to Zoology, with emphases in molecular, organismal and cellular biology. In all, around 20 different subjects are taught. There is no Environmental Science degree within the Department as such, but some of the courses of the Environmental Science degree are also taught at the department, since this is a cross-faculty degree, taught by 17 different departments spread out in 4 faculties of the university.

There are also some joint degrees: biology & geology, and also psychology and neuroscience, taught in conjunction with the Department of Psychology. A degree with foundation year is also available, for those students who don't have the required previous scientific background (as in GCSEs or A levels) to enter any of the subjects of the department. Life Sciences is an internal subject, which gives the students an opportunity of getting a general understanding of biological sciences before requesting transfer to any of the other lines of specialization, although a final degree in Life Science is also available to those students that do not wish to make a transfer or a specialization in any of the other subjects.

All degrees come in three formats: A conventional three year degree, a four year degree with and industrial placement in the fourth year, and a four year degree with a modern language, which in the moment can be chosen from Spanish, German, Japanese, French or Portuguese. In this last format, students spend one year studying at a foreign university.

PROBLEMS AND CHALLENGES OF RECRUITMENT

The main challenges are to increase applications, to improve conversion, the efficient handling of the applications, retaining the students within the department, and attracting the right students, that is, those that will succeed in their chosen programme of studies. In order to succeed in these challenges, institutional, regional and national efforts are being exercised.

It must be noted also that some students drop out of their studies because the biological sciences demand much practical work, and in their secondary education, with its ever diminishing load of practical training in sciences, the students have become accustomed to the idea of a theoretical approach to the biological sciences, and so during their first or second year they discover it is not so, and leave their studies in the face of this reality. Again, this points to an important re-structuring and re-thinking of secondary education in the sciences, as discussed earlier in other presentations.

Dr. Elliot showed a series of data showing the current and recent trends in attendance, matriculation and graduation rates. These figures can be found, in all detail, in the copy of his PowerPoint presentation. But since the figures showed a slight decrease in the intake of students, Dr. Elliot proceeded to address the theme of what the Department of Biological Sciences is doing about this:

Firstly, a recruitment officer was engaged by the Department, in order to have a professional lead the efforts in this area: this has lead to series of programmes and policies, among them to be actively liaised with local secondary schools, to have a lot of field trips and informal visits from schools (such as the very popular visit to the electron microscope), and also the more formal university open days, in the last of which 10,000 secondary students attended and toured the university.

Other strategies included visibility (attending careers fairs and other events), and the very flexible foundation year approach, from which students may change their principal study by transferring to a related specialization without having to leave the Department or drop their studies.

Applicants should also be handled remembering they are individuals, and the front desk personnel is critical in this: it must be helpful, polite, professional and well informed about the department, its changes, and what it offers in terms of degrees, career opportunities, industrial placements, and the possibilities of transferring within the different programmes in offer. It must also have enough personnel to be able to speak to the applicants on a one-on-one basis, for the necessary period of time. It is also necessary that the information provided is clear, honest and may be available before, during and after the day of the visit and the interview: A chief reason for students dropping out of their studies is that either the programme, the department, the accommodation service, the university or the city is not what they expected, so they should be informed *before* registering on what they should expect and what will be available and on offer for them.

Experience has demonstrated that those years in which applicant students have not visited the university due to the non-programming of open days or student visits, the number of registrations has only been what could be expected by randomness, while the programming of open days and student visits have increased these numbers considerably.

A very good strategy is to use present undergraduate students as mentors or guides during student visits and open days, since they are the best ambassadors to prospective students: they know what the experience is really like from the point of view of the students, they have been through the process, and they are perceived by the students as being more honest. Talking to parents it also important, as parents are an important influence in the choice of the students' future department or university. This is why more and more parents are being invited to the open days, and prospective students are encouraged to bring their parents to the open sessions. In the last open days at the University of Manchester, about half of the attendants were parents. Nonetheless, since parents have different questions and concerns than students, it is important that they are toured separately from students and shown around on different groups.

After the presentation it was asked what importance does the University give to the interviewing of applicants. Regarding this Dr. Elliot commented that in the experience of the School of Biological Sciences, interviews should be on a one-on-one basis, as this gives the prospective students a sense of commitment and interest both from the university towards them, and also of them towards their studies and future course work, since having to undergo an individual interview to enter the department gives them a sense of importance that makes them take their studies more seriously. This is why group interviews do not give good results.

Regarding this, a member from the audience mentioned that a similar approach was tried at the University of Lancaster, and that for evaluation purposes the results were monitored: it turned out that in those groups which had been interviewed, the conversion rate was higher than in those groups that merely attended the open days, visited or were toured around the university. Also, if the interviews turned out to be well organized and methodical, the conversion rate increased, while the opposite happened if they were improvised or inappropriately organized. Unfortunately this method was so labour intensive that it was not possible to maintain it, and it had to be cancelled.

It was also asked if it this referred to an interview as such, or rather to a meeting with the staff. In reality, it was acknowledged, it is a meeting with the teaching staff, yet the students perceive it as an interview.

A question emerged about the actual weight of the results of the interview in the selection process, but it was clarified that it was quite marginal, and that the interview served the purpose not of leaving students out but rather of making them more committed to the department and their studies, and therefore as a preventive for future drop-outs.

In the past, when students were first offered a place and *afterwards* invited to an interview, many did not show up to the interviews and recruitment and conversion rates dropped significantly. Now, they are first invited to the interview and only after they attend it are they offered a place. This has increased recruitment and conversion rates.

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Professor John Coggins, University of Glasgow
Recruitment: A Glasgow Perspective

The presentation started with some slides being projected, showing some trends at the University of Glasgow. Broadly speaking, there is not a drop in students applying in biology and physical sciences, but there are all kinds of vagaries: for example, this last year there was a significant drop in computing science at the university. The reason for this, it seems, is the most recent tendencies of labour in the computer industry: as most computers are assembled abroad, there is an evident lack of job opportunities in the computer industry in the UK, and since the students and prospective students perceive this, this decreases the university's conversion rate in computer sciences.

This serves to illustrate by specific case the enormous influence that industry has on higher education, especially in the science and technology sectors.

The slides also showed the admittance figures of science-oriented disciplines. Since the flexible system of specializations and transfer in the school of biological sciences in very popular among students, it seems that this attracts mores students to this particular department, as its enrolment numbers is higher than in the rest of the departments of scientific and technological subject areas. None the less, since the understanding of secondary student of what biology is really about is quite inadequate, many students also drop out of the courses, as these do not meet the unreal expectations that they had built during secondary school, especially that peculiar idea of biology as a totally theoretical discipline, with little practical work.

It is interesting to note how recruitment is not matching the research strength of the University, which is biochemistry: a decrease in the number of students interested in coursing biochemistry has been noticed.

The structure of undergraduate degrees in the Department of Biological Sciences is as follows:

After a first year in which students are taught the basics of science and biological sciences at a university level, they go to a second year, which is quite modularised: they may choose to course modules in different combinations. The majority of the students will do more biological subjects, but this is by no means mandatory. This flexibility has brought some inner criticism: it is thought that perhaps the flexibility available to students is excessive, since students tend to chose clusters of subjects which are not

very appropriate for the honours degree they will be finally taking. Due to this, the Department is now moving in the direction of giving students less liberty in the choice of courses during the second year. Finally, during the third year students specialize in whatever pathway they have prepared during the previous year.

Professor Coggings also mentioned that there is a system in some subjects in which students need to have secured complete Bs during the first year in order to have a complete choice of courses in the second year, and furthermore, they need to secure a B in the second year in order to be passed to the third year.

It was also noticed by the audience, which commented on it, that according to the presentation, the School of Biological Sciences of the University of Edinburgh does not have a general biology degree, which seemed quite unusual. To this Professor Coggins replied that, since there is the possibility for the students of getting studying several general biological science courses during their first year, in order to seek a specialization for later, this general degree has not been considered necessary.

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Professor David Coates, University of Leeds:
Recruitment: A Leeds Perspective

The Faculty of Biological Sciences of the University of Leeds is composed of four schools. Some years ago there were six or seven different departments, but in 1997 there was a merger of subjects, and these are the school today: The School of Biology, The School of Biochemistry And Microbiology, The School of Biomedical Sciences, And the School of Sport And Exercise Sciences. Each of these schools recruited students independently. Professor Coates specifically referred to the School of Biology, of which he is the Head of School.

The first years are common for all schools, accepting around 210 students per year, divided at the moment into nine degree subjects. The main entry is for Bachelor of Science in Biology. Other important entries are for the Bachelor of Science in Zoology, Genetics, Human Genetics, Applied Biology and Ecology.

The entrance number in ecology was higher a few years ago than now, and this may be due to the fact that the University now has a Centre for Environmental Studies, that may be concentrating the attention of students in preference to the School of Biological Sciences.

A slide was shown regarding the geographical origin of the students, and it was quite clear that most of them come from around Leeds, and the University indeed has a strong local effect. This data showed that it was worth going out and converting students from schools in the local area, and schools visits are on their way. One of the greatest challenges was to convince secondary students of the importance of the interview, which they fear, since the Department does not make any offers without a previous interview.

A few of the more recent developments include that now the resources of all four departments have been combined in terms of recruitment, and it is the Faculty that recruits students. This combination of resources has led to a standardisation of the informative literature, a revision of selection and acceptance procedures, and a unified targeting of schools within the local area that send applicants to the Faculty. This has enhanced the role for school liaisons, as the local region is the University's main market.

There are plans on extending these developments, through personalised targeted mailings, a wider presence at higher education fairs and UCAS events, and a survey of students who decline offers, in order to establish the reasons for this.

The most important advancement was to employ people whose profession is to do this recruitment and promotion; this has been very effective, since academics are not necessarily good doing the promotion and marketing of the Department, Faculty or University, but the new personnel is experienced, specialized, and dedicated exclusively to this, since they do not have any other professional or academic commitments.

At the end of the presentation a question came from the floor, regarding the manner in which the Department goes out to student fairs: the specific question was if the Department has a separate stand from the University, or how this is done.

The fact is that the University has a stand, and someone from the Faculty is always with the University team, in order to answer the public's questions regarding the Faculty and all of its Departments. Whenever the University does not attend a particular event, the Department takes its own stand.

HUBS Spring Meeting, 7 and 8 April 2004

Dartington Hall, near Totnes, Devon

Recruiting Biologists and Supporting Biology Teaching in Schools and Universities

Thursday 8 April

Session 2: **Recruiting Students to Study Biology and Promoting Careers Opportunities in the Biosciences**

Recruitment: A Napier Perspective

Professor Charles Bryce, Napier University

Professor Bryce showed some slides in which it was clear that, even though in terms of recruitment applications have dropped, the reality was that applications continue to be quite stable.

A worrying trend is that, recently, students have not been progressing as expected: up until a few years ago, if students passed the first year of their studies, it was almost guaranteed they would go on to honours level. Nonetheless, currently there are failures in years two, three and even four. Students could graduate in year 3 in a non-honours degree, but they continue up to honours and fail the course. This was noticed to happen not only in the biosciences, but in other academic areas as well.

It was commented that this also happens at Manchester Metropolitan University, where students choose to course honours degree and fail it, when they would be able to pass a non-honours course. There are first year failures in Manchester, but this does not continue happening in years 2 & 3. The reason for this seems to be that students are not used to university-type examinations: There is a tendency at secondary schools to generalise the use of the multiple-choice questionnaire, and students get the impression that this is the most widely used, if not the universal, way of testing, which of course is not true of Higher Education in the biosciences. It was also mentioned that the biggest single predicted failure for students in Manchester Metropolitan University is in biochemistry.

Again, one of the greatest challenges in this matter is *transition*: from secondary education to higher education, and from the first year, the year of foundations, to the second and third years, the years of specialization: the transitions between these steps of education are not running smoothly, and this is affecting the results of testing and the levels of the students.

Professor Bryce's perception of the problem is that the students that fail are quite able academically, yet they do not match their ability with hard work or sufficient effort: They pass the first year because they have a good basis from secondary education, but as things get newer, more difficult or demanding in the second and third years, they begin failing, as they are not committed to hard study and work: they are therefore beaten by their laziness, to which they have become accustomed. The non-completion of the first year seems to be the biggest problem, and failure in subsequent years is another matter altogether. Students are offered to re-sit their honours degree in the following year, and many take advantage of this opportunity. In other universities they can do this up to four times, and only the best mark goes through,

but it Napier the first mark is the only one that goes through. The system of re-sitting examinations in Napier is different, so there is not much advantage for students in doing so over and over again.

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Session 3: **Careers Opportunities in the Biosciences**

Professor Wendy Purcell, Director, Centre for Research in Biomedicine,
Faculty of Applied Sciences, University of the West of England
*Will cover " **The Sector Skills Council for Science, Engineering and Manufacturing Technologies – SEMTA**"*

At the beginning of the presentation, general information was given about SEMTA. It was mentioned that sector school councils wish to improve the economic force, so that supply and demand can be brought together, and promote activities in order to foster this. It is worrying that higher education is not channelling people into the perceived economic needs of society. This is why curriculum design, to embed within the courses, needs to make enquiries and listen to the needs and perceptions of employers groups and industry.

It is nonetheless unclear how this group will bring to fruition and deliver on the terms of reference, but it has the possibility of having some influence, because of the people and sectors that are involved in it, especially since they are running quite close with government

The meeting in April 2004 wishes to bring diverse sectors together and aims to understand their involvement in this process, and to develop communication links so that employers can communicate.

The terms of reference of the last meeting, held in March, established there were some tensions surrounding the idea that university exists to feed industrial demand. This meeting had a strong representation from the farming, the pharmaceutical and the defence industries, and it was noted how all of them complained of how badly prepared graduates were, in their appreciation. There is also a sense of disquiet of industry with the lack of exposure of graduates to team work, practical skills, and in general poor communication skills. In this meeting Academics got bashed because the representatives from industry complained of the graduates and what they do not know how to do, which they should, given the fact that it is a working necessity. The major complaints came from the pharmaceutical industry: they were very concerned about the lack of interdisciplinary knowledge and practice in graduates. They also mentioned they were expecting graduates who were in general technically competent, but they felt that in general graduates were inadequately trained in laboratory techniques.

The pharmaceutical industry representatives particularly complained that universities keep training their students with outdated equipment, so they do not learn to use the up-to-date, latest equipment which is in use in industry, yet it is personally not committed

to finance or contribute towards new equipment, at least not in the level of undergraduate training.

Yet it seems that Academia is being blamed for the failures of the whole education process, which starts in primary or even in preparatory education. We have literally people coming to undergraduate courses who have never looked down a microscope. In the school they think biology can be a non practical, and this is quite unacceptable. It is something that needs to be fought against.

One of the reasons that schools have few practical training in the sciences -if any at all- is the health and safety issues that surround it, and the cost, both in labour and in insurance and materials. This is why research and practical work is almost exclusively confined to universities, as they have the resources needed to undertake this kind of work. Unfortunately, this discontinuity between secondary and tertiary education is a big problem is the education system, as already discussed in other presentations and interventions during this meeting.

Industry also values the experience of training with animals, which is incredibly expensive to deliver, even at universities. But if industry values such expensive training, they need to help universities by lobbying government in order to get better funding that will improve this kind of training. It is more likely that government will listen an d pay more attention to the requirements of higher education institutions, if the industrial sector insists the needed training is not being provided, but this insistence should rather be directed to government than to academia, which are doing the best they can with their current resources.

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Session 3: **Careers Opportunities in the Biosciences**

Professor John Coggins, University of Glasgow.
"The supply of people with science, technology, engineering and mathematics skills".

Professor Coggins' presentation was, in his own words, a *review* regarding the supply of industry and academia with people with science, technology, engineering and mathematics skills.

Unfortunately though, it seems career paths for researchers tend to get stuck in low pay jobs. This tends to draw recent graduates away from research and academia, into non-research industry, and commerce. The government was advised on this, and it has reacted by introducing the Academic Research Fellowship, which consist on a subsidy to universities in order to help pay the salaries of for new research fellows. It covers £150,000 per person per academic period. Each university can participate in this programme bidding in any areas they choose. This programme will fund around 200 people for 5 years, and the positions have been given open contracts.

Another important reform is salary enhancement for post-doctoral researchers, which was spent in enhancing a number of project grants. In the past, this enhancement (around 200,000 pounds) was used to fund technical support, but this is not happening recently, which is an improvement, since the money can be used in what it was intended to fund in the first place.

More government funding is also being used to support PhD studentships and post doctoral researchers, in order to enhance the employability of new researchers and academics.

But in general, in order to increase the starting salaries of new academics, the university salary scheme at all levels would have to be increased proportionately, and this is a tremendous investment the government will not be so happy to make in the immediate term. Indeed, government expenditure in this respect has gone up, but not enough: if you visit China or Singapore, you can see how they have made the decision that it is worth investing in scientists and academics, and their spending in research and academia is in accordance with this decision. But in this we are in a difficult political situation, because science is expensive to teach. Yet the government must realize that if they move the salaries up, graduates will continue in academia instead of migrating to industry and commerce.

Career opportunities for academicians, and the structure of academic advancement, also need to be revised, as it may help stop the recent higher level graduates from migrating

to industry or the private sector. In Doctor Coggin's Faculty, for example, salaries of professors are around two and half times higher than those of the colleagues in other universities: this is because this is the only way to not loose them to Harvard or Oxford, to keep them as staff in the university.
Whereas it is true that there are less jobs for scientist doing science that for other people working in their trained specialities, there are lots of jobs in many areas were employers want to recruit people with the skills scientists have, such as method, analysis, looking for the underlying causes of things, etc. This is why there are several scientists sitting at the boards of companies, in management positions. In Germany and Japan, for example, you are expected to have a science or engineering background if you want to climb up in the industrial and managerial ladder.

But certainly in the UK a lot of graduates go into industry, and do not continue in Academia. This used to be different, and in the past a very large number of graduates where to be found in schools, universities and research, but this has changed now, with the pressures of globalized economies.

Another problem is that European Union legislation favours short term contracts, but this is not always appropriate for academia. Universities must choose wisely if, and when, to follow general contractual practice in this respect, with their research staff, and when to engage other researchers and teaching faculty in other types of contracts.

Employers also have several misconceptions about scientific training, which need to be challenged in order to have them looking at reality in a more apt way. Some of these misconceptions are:

- That science is difficult
- That there are very few jobs for scientists
- That scientists are not well paid
- That science degrees are not good qualifications for careers in commerce and industry.

These misconceptions have to be challenged, by improving the image of science. This can be done by giving the appropriate emphasis to the relevance of science to the production economy and quality of life agenda. Also, the general knowledge of science in the population at large must be improved. Parents, pupils and teachers must be persuaded of the value of training in science as a pathway to a good job.