

## The Science Communication Conference – Scotland

Our Dynamic Earth, Edinburgh

6-7 April 2006

This report includes details of all plenary sessions and the working lunches held on both days.

This conference was organised by the BA with the support of the Scottish Executive, Careers Scotland, SETPOINT Scotland, SEAs, NESTA and ecsite-UK



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## ***Welcome – Stuart Munro***

Stuart Munro's Welcome set the scene for the conference. He pointed out that Scotland, in some respects, is ahead of its colleagues south of the border and the experiments going on in Scotland are useful exemplars for others to tap into. With science taking the lead in the radical review of the Scottish Curriculum, there are new opportunities to engage with pupils, schools, parents and grandparents. 'Connections' is a keyword that will feature throughout the conference, said Stuart, but they don't just happen naturally "it is about networking, collaborations and making connections happen". He then expressed thanks to the organisations that have supported the conference and been brought together in a collaboration, to get a connected view of what is going on in science.

## ***Keynote Address: David Ingram, Chair, Science & Society, Steering Group, Royal Society of Edinburgh.***

David Ingram started his address by remarking that in communicating science we have a paradox that learning is a wonderful thing and does empower people but at the same time, it requires hard work and of course the taking on of responsibility, the loss of innocence and the loss of bliss.

### ***Why Scotland is a great country for science.***

He then went on to outline why Scotland is a great country for science, as a place with a distinguished scientific tradition and scientific heritage. Understanding the principles of science has long been regarded in Scotland as an essential accomplishment of any learned person, and although the emphasis is maybe not as strong as it once was, it is still the case today. Scottish scientists have made an enormous contribution to the modern world. In his opinion, the hallmark has been linking science and technology together, seeing them as different activities but mutually dependent, with one feeding the other. The other aspect has been collaboration, working together with others.

Ministers are building on this tradition of science in Scotland to revitalise the concept of Scotland as a science nation, explained David. A number of developments have been announced recently, to show how this aspiration – of making or recreating Scotland as a science nation – is evolving. In February, the progress report on the science strategy highlighted key achievements to date - including an additional investment of £10 million over the last three years in school science. In addition, approximately £4 million per year has been given to support science centres and other complimentary science initiatives. Further, there continues to be substantial investment in innovation and R&D grants. Building on this, the Scottish Executive has announced plans to develop a fully revised and widened science and innovation strategy over the next year. The appointment of a new Chief Scientific Adviser should ensure that science enjoys a higher profile in Scotland, with both the public and with the media. In addition, this will help to ensure that Ministers and Members of the Scottish Parliament are better informed on scientific issues than they have ever been in the past.

As part of that process the outcomes from this conference will be carried forward into the Scottish Executive and in time, translated into policy. He added that it is important to see this only as a beginning. Our advice is still the advice of experts; it is still the advice of expert science communicators. Ultimately the Executive needs to be listening to all of the people in Scotland and taking into account all of their views in the formulation of its science policy.

### ***Why Scotland is a great place for science communication and collaboration and co-operation in that science communication.***

David stated that "science communication was once seen as a poor relation, or an 'add-on' to scientific research". He observed that science communication is now being supported and encouraged with direct funding. Furthermore it is becoming embedded in courses, with science communication courses being demanded by students themselves. Greater recognition is being

given to the work done in communicating and promoting science to a wider public and society. Science and technological applications impact on our lives every day of the week. But all too often people see scientific knowledge as the preserve of experts or of those working in scientific research, said David. He is aware that the uncertainty of science and scientific processes makes science difficult to communicate; especially with a public who feel disengaged from the decision-making process and long for certainty, to know where they stand on issues. However, people need to be empowered so that they can take part in an informed way in the great national debates and make decisions in the coming years, on a diversity of issues that require scientific knowledge and literacy, such as climate change.

David pointed out that effective dialogues between scientists, the public, the policy and decision-makers are essential for the future and the country. People need to be enthused about science.

He mentioned that science communicators have to work with the press and revitalise school science. There are opportunities to have a major effect on school science in Scotland, with the review of the science curriculum and the moves to strengthen Continuing Professional Development (CPD) for science teachers. Ministers have already recognised the critical importance of the role of science centres in communicating science with people of all ages, remarked David, by providing sustained support for a Scottish Science Centres Network. Together the science centres network and the Executive have published a four-year strategy, outlining how the centres will collaborate with each other and other delivery bodies in the science communication sector. But collaboration should never be for collaboration's sake. Scottish Ministers have announced that they expect stronger collaboration and less duplication.

The Executive's focus appears to be moving to the wider science in society landscape, said David. New partnerships are beginning to show, such as the Royal Society of Edinburgh and the Scottish Executive, but there are other partnerships that can be forged. Schools, science centres, museums, botanic gardens, science festivals, universities, colleges, research institutes, associations, The National Trust for Scotland, the BA, the press, and so on. All of these bodies are involved in the communication of science and building partnerships. Lasting partnerships, David thinks, will be crucial to the success of science communication in the future. These collaborations must reach out to everyone.

### ***Questions and Discussion***

The question that followed focused on school science and how the curriculum is revitalised - in particular the secondary curriculum. Should we not be thinking about finding ways of inspiring and challenging students, and teaching science as process rather than facts? The biggest issue may not be revising the curriculum, but persuading teachers to change their behaviour. Sufficient time is required for teachers' professional development, to keep both their subject and their pedagogical knowledge and skills up to date, responded Jack Jackson (HMIe).

## ***Plenary Session One - Partnership in Science in Society***

*This session showcased two Science in Society case studies where innovative and effective partnerships have been created or developed to deliver projects with proven impact and outlined activity aimed at building partnerships between the public and policymaking.*

### ***Chair: Roland Jackson, Chief Executive, the BA***

Roland Jackson welcomed everyone on the behalf of the BA and thanked the people who put the programme together. The sessions have been designed to look at the many different but often overlapping purposes for public engagement or for the broad involvement in the science and society field, he explained. Whether it is looking at the flow-through of scientists, improving policymaking or simply at wider public awareness and the democratisation culture in science. This first session aims to pick up on the major message that is coming through loud and clear in Scotland's strategy – looking at effective ways of working together in partnership and with the Science Centres Network as it emerges in Scotland.

- ***An international partnership: Sally Montgomery, W5, Belfast***

Sally Montgomery described an exhibit used to involve people in dialogue and engage their opinions as part of a Rediscover project. Visitors engage in groups with a topic, then their views are challenged, before they are given an opportunity to change their minds and vote again on the same question. She explained that the exhibit is in the early stages but of note is the topics they are choosing, such as Healthy Eating, which needs to be tracked over time. "This was a huge partnership involving scientists working in renewable energy, climate change, health promotion, vaccination and so forth and was great fun.", commented Sally. Developing the science for each topic involved working with an academic or volunteering body.

- ***CitizenScience – community partnerships and learning: Ondia Gillette, At-Bristol***

Ondia Gillette explained that the project, Life In The Frame, was a regional partnership between the CitizenScience project and the Avon Longitudinal Study of Parents and Children (ALSPAC), to create a summer school looking at biomedical issues through the medium of digital photography. The 13-year-old children from the ALSPAC project did not have much interest in science but did have a keen interest in photography. She commented that they came up with some really incredible images that had to express their views on these controversial biomedical issues. An opportunity was also created for the community to feed back on the images, the issues these images raised and the thoughts they provoked.

"In any collaboration each person is coming in with a different agenda" stated Ondia. For ALSPAC it was the children meeting each other in a social context and being engaged with something they saw as being cool. CitizenScience really wanted to encourage them to debate amongst themselves. She explained that they overcame barriers by having mentors from both institutions and the common purpose of wanting to create the best possible time for the children. It ended up being a very valuable partnership that she is very happy with.

- ***Building the partnership between public and policymakers: Elaine Kearney, dti/OST & Steven Hope, MORI Scotland***

Steven Hope from MORI Scotland talked about the problems of engagement. He explained the public are increasingly disorientated. Two of the major pillars – political parties and the church - that provided their world view have significantly declined in influence. The issues are more complex, often global, far into the future and increasingly divorced from their current everyday lives. Participation is passive, primarily surveys and petitions that tend to deal with local issues. He remarked that the public is increasingly mistrustful of institutions - particularly politics and politicians - but also institutions that mediate between politics and society, especially the media.

As the issues involve a mix of science, ethics and politics, scientists are being drawn in to political issues amongst a confused public, commented Steven. Increasingly policy is made as part of a debate, not as the outcome and public views are tapped into to test, rather than inform, opinions. The challenge is to create a political culture that allows the public to engage, develop understanding and participate in a way that is informed by science, he explained. But, since public trust of scientists is very high, will scientists being drawn into public debates risk being contaminated by political views and being seen more as politicians and increasingly politicised.

Next, Elaine Kearney gave a brief overview of the Sciencewise programme (funded by the Office of Science and Innovation, Department of Trade and Industry), designed to feed public views into policymaking. Sciencewise is there to be much more proactive about finding out what the issues are that people and Government want to talk about, she explained. They get involved in policies before decisions are made, so policies are more evidence-based, taking notice of people's concerns and where they see the benefits could be; "So that the country as a whole can develop and make best use of its science and technology".

Elaine mentioned that they are developing really good resources to find out how to do dialogue well. As most of the projects are just starting it's hard for her to know if they have had an influence on policy just yet. She mentioned the Horizon Scanning Centre project, looking at the wider implications of science and technology 30 to 50 years down the line and what the Government needs to do to answer the public's thoughts on these topics, as an example. She outlined their growing partnership with the Department for Constitutional Affairs, who are charged with looking at democratic engagement across Government as a whole, trying to bring together the overlaps with Sciencewise. "Science communicators have a key part to play", said Elaine. "Sciencewise knows what Government thinks. The question is how to join that with what other people know about the public's views".

### ***Open Discussion***

From the wide-ranging discussion that followed three themes emerged: partnerships, Government and the public.

- ***Partnerships***

Looking closely at the word partnership – the expectations and the benefits – partnerships can vary from communicating with each other, co-ordinating something, co-operating or collaborating, working towards the same goal. Examples of many types of partnerships were given, including universities working with the science centres to involve the public in research; companies and science societies reaching new audiences; artists and scientists using imagery that can often get across more than concepts, and proactively putting people in contact. It was pointed out that Research Council grants often now include money for public engagement and partnerships with professional science communicators. The issues of forming bottom-up partnerships and the void of engagement with voluntary groups were raised.

- ***Government***

Two of the big challenges are feeding outcomes into decision making and the Research Assessment Exercise (RAE) acting as a barrier to communication in universities. The Government's position on the RAE can be found in the "Next Steps" document. The formation of a Science and Society Unit for the eight UK Research Councils should create a more strategic and co-ordinated approach, helping to build partnerships and support science communication in Higher Education Institutions (HEI). It was mentioned that to get best value for money, national connectivity is needed within Government and communicators need to know how to get Government to act on information. Isabel Bruce, Head of Science in Society Policy Development for the Scottish Executive, referred to the UK wide forums within the civil service that meet to discuss issues, such as pulling together non-commercial funding. There was general agreement that better funding is needed to produce sustainability and a suggestion that projects be made available to others working in the area, to avoid duplication.

- ***Reaching the Public***

The need to generate a wider community base for science communication was recognised. It was pointed out that there are key differences between parts of the nation. One of the big challenges is that the public are not all the same and people have different priorities. First we need to understand communities, then go in and work with them, making it personal and promoting inclusion. We must make clear the reasons for engaging and engage the public from where they are.

## ***Plenary Session Two – Science Education***

*This session considered how the science communication community can support the emerging new curriculum for science and other lifelong learning initiatives in Scotland.*

***Chair: John Coggins, Vice-Principal, University of Glasgow & Member, Scottish Science Advisory Committee.***

- ***Review of the science curriculum 3-18: Jack Jackson, Assistant Chief Inspector, HMIE***

Jack Jackson set the scene by mentioning there is a lot of very good work going on in Scottish schools, which should be borne in mind when talking about the curriculum change. In terms of popularity, in Scottish schools there is no problem with the sciences. Jack then talked about some of the key messages from the 3-18 curriculum review: a progressive curriculum, from pre-school to the end of secondary education, that begins to address content and assessment overload to free up teacher time. With summative types of outcomes, it gives teachers ownership and flexibility.

Jack explained that the main driver is to try and prepare all young people for the science they will encounter as citizens of the 21<sup>st</sup> century. "To give them the knowledge, the skills, the attitudes they will require to make informed decisions and at the same time to ensure we will have enough specialist scientists coming through the system, who want to pursue further studies of science". Another major drive behind the 3-18 review is to break down primary and secondary barriers. "Continuous Professional Development (CPD) is crucially important", said Jack, "and must be of a quality that applies to everyone across the country". He gave an example of two teachers - one trained in 1964 and the other in training at present. Jack then posed the question "How can we begin to think about what will be in the curriculum in 2048?" Preparing the future teaching force is a major job, which needs everyone in CPD working together to deliver these outcomes.

- ***Enterprise education: Sandra Lawson, National STEM Co-ordinator, Careers Scotland***

Sandra outlined Careers Scotland's three priorities: enterprise and education - investing in the workforce of the future by providing the best possible start for all young people; reducing economic inactivity among young people; and improving productivity through personal career planning. There are a number of national science initiatives aimed at encouraging more young people to study science at school up to and beyond S4. Sandra explained that the reason is the impact that the enormous number of skills gaps within Science, Technology, Engineering and Maths (STEM) has on the Scottish economy. Trying to ensure we have a more scientifically aware population, more likely to make informed decisions, combined with an increased level of support from industry.

Sandra talked about their initiatives, such as Tomorrow's Inventors, the Space School, Science & Technology Matters for Scotland and the Scottish Science and Technology Network. Extending across primary and secondary, they are aimed at pupils, parents and the general public. All of these activities provide the stimulus to engage and enthuse our young people in STEM. The Curriculum for Excellence project is a great step forward for science education and a great opportunity for Careers Scotland to support the new curriculum by introducing activities, business support and CPD initiatives for teachers.

- ***Creativity in science education: Steve Mesure, Creative Science Consultancy***

Before Steve talked about creativity in education, he mentioned the CreScENDO project supported by NESTA. CreScENDO is piloting a new way of improving things within the well-documented plethora of STEM initiatives, schemes and maps. It aims to do this by building lateral networks between projects; putting stakeholders and funders in touch with individual projects; talking to

practitioners, managers and policymakers to encourage shared knowledge and learning; and to avoid re-inventing the wheel. [At this point the audience took part in a quick activity – finding the nearest person they didn't know, introducing themselves before telling them about one thing they are really passionate about in science and one thing they really hate].

Steve then asked “Why creativity in science education?” A creative approach to learning can incorporate matters of personalities, relationships, glamour, risk, adventure, stories and emotions. It is also about confidence, control and self-esteem, making a personal contribution, an expression or a personal interaction with others. When students and teachers are being creative, they are “engaged, excited, asking new questions, making new connections, envisaging what might be, exploring ideas, keeping options open, reflecting critically on ideas and outcomes”.

Steve explained that being a creative teacher or enabling students to be creative isn't easy. It involves taking significant risks with lesson plans and trusting in students when you don't quite know where the discussion is going to go. The theatre company he ran used engaging elements of story, character, relationships, emotions, etc., but the performance was a novelty and didn't really help the routine science lesson - if anything, it undermined the teacher's ability to do the same thing. He commented on the creative techniques he has been developing for teacher training and working directly with students. An approach involving theatre techniques and science teaching labs, where teachers work with academics, scientists and artists on a variety of projects. Science is usually seen as a cold, sterile, arms-length and impersonal world. Creative science education can make it a warm science and that in turn will engage more people, summarised Steve.

- ***The 'Real Science' experience: Katherine Mathieson, Learning Programme Manager (Science), NESTA***

Katherine talked about NESTA's “Real Science” report. The report collects together some of the findings from over 70 NESTA-funded projects in the fields of science education and science communication. The aim was to see what the common themes and the common findings are. Katherine pointed out that the message that comes through very clearly is the key role of what they call ‘science enquiry learning’; which is the kind of learning that asks students to focus on open-ended investigations, on the processes of science and on formulating hypotheses. The potential for these elements to be embedded much more firmly and be the core focus around which science education and informal science learning is delivered is huge.

The Scottish discussion highlighted the barriers to embedding real science enquiry learning, such as resources, time, burden of the assessment framework and confidence among teachers. Despite these very real barriers, the opportunities in Scotland are immense with this conference, the Curriculum for Excellence and the Scottish Executive's commitment to the science centres, said Katherine. She commented on the range of knowledge and expertise that science communicators can offer education to help address some of the barriers. The challenge is how these two communities can work together effectively.

Katherine then outlined the lessons we can learn from the Real Science Report. It is essential to make it clearer to educators the benefits of what science communicators can offer in terms of equipment, resources and also to clarify exactly what is being offered by the experience or the activity. Projects are evaluated to suit the aims of that particular project, but this makes it hard to provide evidence of how that project impacts on the school, or a teacher, or a group of young people. “Firmer evaluation frameworks to provide evidence of impact, I think is crucial in engaging educators”, stated Katherine. During the projects, science communicators often provided a form of CPD for teachers as well - teachers are inspired, they have their knowledge deepened and enhanced. She went on to explain that there are many different models of partnership working. In order to engage more effectively and embed real science into science education, we need to consider what partnerships are effective and who are the people who make it happen.

## ***Discussion***

The discussion that followed focused on engineering, interdisciplinary teaching, evaluation and encouraging people to become scientists.

- ***Engineering***

The discussion on engineering was started by a comment on the number of pupils in schools doing science and what can be done about the dearth of those who want to study engineering and computer science at university. Jack Jackson suggested that engineering faculties need to change their image and work more closely with schools. It was suggested that to get people interested in engineering, there is a need to reclaim the word 'engineering' and get people to understand what it actually means. The example of Walt Disney World coining the term "Imagineers" – combining the word imagination and engineering to change the image - was mentioned. Katherine Mathieson pointed out that forensic science, popular with young people, is about solving mysteries and working together as an interdisciplinary team. These elements are inherent in engineering and other science-based disciplines. Science communicators are well placed to draw out the parallels and reclaim words like 'engineering' in the same way that forensic science has been reclaimed.

- ***Interdisciplinary Teaching***

The requirement for an interdisciplinary education was raised. The 21<sup>st</sup> century will require people who have skills in a number of directions and the concepts of science embedded in them from a very young age. To achieve this we need people to be creative throughout their schooling and on into university – people who are prepared to take interdisciplinary courses. Steve Mesure mentioned the need to get the energy, excitement, emotion and personal ideas that are in soap operas into science. When we categorise everything, we seem to take all the emotion and fun out of it. It was remarked that "learning about science is learning a whole way of thinking about solving problems". What is required are pupils who can solve problems and access data, but this is difficult to examine. Science should be taught as a combination of practicality, theory and creativity.

- ***Evaluation***

The question of evaluation and what really works in science communication was asked. It was pointed out that there is no agreed standard and consistency in evaluating. Everyone has their own unique idea of how to do things, but no one has done any research into what really works. There is a long way to go to get more meaningful evaluation that looks at long-term impact. Katherine Mathieson commented that there is a lot of work going into developing frameworks for evaluating what makes a good informal science experience. The possible tensions between evaluating breadth and depth of informal science learning experiences were mentioned. Steve Mesure remarked that it is hard to get people to do proper evaluation and even harder to get them to disseminate it (in a CreScENDO survey 50% said they were required, by their funder, to do evaluation and 25% to disseminate it). Often the pressure to show the project is successful means that a 'warts and all' evaluation, which is really useful to have, is not done.

The possible tensions between what funders want to see and what you are actually trying to do were also raised. A comment was made that funders need to recognise that it may take years to have an impact, but it is difficult to get long-term funding. There has to be some sort of progression and follow-through. An opinion was expressed that the new revised curriculum will cause more problems to science communicators. How can we make activities relevant and how to evaluate them, when each individual teacher is going to be teaching something differently? Jack Jackson responded. He is not convinced that teachers will be teaching differently – they will still be teaching the same key scientific ideas, but the methodology may be slightly different.

- ***Encouraging People to Become Scientists.***

A question was asked about what work is being done with parents, who are crucial, if more young people are to become scientists. Sandra Lawson explained that a major focus was to involve

parents, especially in the primary stages, by bringing them into schools during activities and organising events for them. Parents influence choices. Careers Scotland would like to make sure these choices are informed and let parents know what is available in the local labour market. The Science and Engineering Ambassadors (SEAs) scheme gives pupils access to positive role models; showing them that they can be anything and giving them an opportunity to meet the people who are 'out there' doing these jobs. A comment was made that we also need to engage more with careers teachers as well as with parents, grandparents, and other adult influencers.

The question was asked whether it is possible to have scientists and engineers, recognised as being good quality, without their having been to university. How much of the loss of children's interest can be put down to having to go to the prospect of having to go to university? John Coggins thought it would be difficult to teach science and engineering without having the right level of expert input. It is about being able to judge bad science, said John. There must be alternative ways of creating good scientists. In Scotland, technical colleges have been abandoned and there are not a lot of sciences in further education colleges. It was suggested that perhaps we need a different concept of what universities are. Universities might have to change, with people picking and choosing their knowledge and understanding from a wide variety of sources. Sandra Lawson explained that Careers Scotland recognises that university is not for everyone and it looks at the different routes. It was pointed out that alternative routes have become rare and maybe there is a need to consider a progression route with more steps.

### ***Plenary Session Three – Partnerships for Effective Science Enterprise Education, Lifelong Learning & Economic Development***

*In this session SETPOINT Scotland and Careers Scotland demonstrated how, by working in partnership, they inspire, engage and educate future scientists by supporting young people's career planning, building on genuine collaboration with industry.*

#### ***Chair: Ken Richardson, Director, KRG Associates***

Ken set the context stating the aim is to inspire, engage and educate. To do this some fundamentals such as communication, perception and image need to be addressed. He outlined three components to good communication – transmitter, receiver and the media through which the signal goes. All three have to work together and be aligned to make it happen. He mentioned some of the problems; such as the people who would be the receivers are not always tuned in, or perhaps there is a lot of interference with other people trying to broadcast. We need to make people want to be there, to give them an element of familiarity and make it as memorable as possible. One of the challenges we face, highlighted in a recent survey, is the image that our careers have is turning youngsters away.

[At this point the audience were asked to answer questions using an interactive voting system. 71% of the audience answered false to the Scottish football team having played in a pink and yellow strip but it turned out to be true. 61% of the audience thought employers felt school leavers lack soft skills and 39% technical skills. The survey reported that employers feel soft skills are lacking. Two-thirds of the audience worked in Scotland and 35% out with Scotland; with 18% working in education, 27% in academia, 13% in Government, 3% in industry and 39% other.]

#### **• *A 360 degree view of 'Make it in Scotland': Nigel Akam, Careers Scotland***

Nigel explained that he worked on a project called 'Science and Technology Matters for Scotland', set up jointly by Scottish Enterprise and Careers Scotland to address a number of well-known problems, such as the decline in the number of young people taking Science, Technology, Engineering and Maths (STEM). He has been involved in an event called Make it in Scotland for the past four years from both the employer side (ie providing a workshops) and with Careers Scotland who organise the event.

[Nigel showed a video clip of Make it in Scotland road show]. Make it in Scotland, originally set up to raise awareness of manufacturing jobs, is a national event aimed at S2 pupils before they make their subject choices for Standard Grade. The number of manufacturing industries has decreased but the scope for the event has widened, said Nigel. Make it in Scotland is a huge logistics exercise, with 250 pupils arriving four times a day and, in 70 minutes, they take part in three 20-minute workshops. The event is designed to improve the public image of industry, including participating technology companies and this year for the first time, parents were invited to attend a special evening event.

Make it in Scotland is a partnership between Careers Scotland who handle the logistics, industry who provide the people and the workshops, and the school education system. Nigel described the workshop 'Chips for Everyone' as a partnership between Glasgow University, Strathclyde University and Freescale (formally Motorola). The workshop is a hands-on demonstration of the process used to make silicon chips, presented by a team of university lecturers, engineers, SEAs and students.

This partnership working has enabled them to run 7-8 activities in a year, each 3-4 days long. Nigel explained that they have good support, particularly from the big companies but would like more diverse industry support, especially from small and medium-sized enterprises (SMEs) who often find it difficult to take time out. He mentioned enlisting the SEAs scheme, which uses practising and recently-retired engineers and scientists to promote STEM.

In Nigel's experience, Make it in Scotland has been a partnership success. It is an ideal way to expose school pupils to a range of technology industries and positive role models. STEM communicators, working together in partnership, reduces duplication and makes better use of the

scarce funding and resources available. He commented that industry partners have used it to develop their own personnel and benefit from raised awareness of their organisation, products and services. For Scotland this is a long-term investment, said Nigel. It will take at least 5/6 years before we would expect to see an improvement in the number of pupils taking STEM subjects and moving into further / higher education and / or training.

***Discussion (with comments from Steve Brindley, SETPOINT Scotland West; Liz Hodge, SETPOINT Scotland North; Sandra Lowson, Careers Scotland)***

[The audience were asked to vote on whether there should be a single national programme to promote / raise awareness of STEM. 59% answered yes. 44% thought the principal target of a national programme should be concentrated on lower secondary, 26% on teachers and parents, 15% on upper secondary and 16% on upper primary.]

In the discussion that followed three topics emerged: effective partnerships and the direction they should be moving in, industry involvement and the image of scientists.

- ***Image of Scientists***

A remark was made that to be a successful scientist requires hard work and putting over any other image is misleading. It was suggested that the Year of Physics had a negative effect on the image of scientists. Although right to choose 2005, the 100<sup>th</sup> anniversary of Einstein's papers, the event became associated with the 'boffin-like' image of Einstein, instead of either real physics or the young man Einstein was when he did the work. Liz Hodge commented that hopefully the SEAs scheme is going some way to address the negative image of scientists.

- ***Effective Partnerships and the Direction They Should Be Moving In***

The panel was asked if they felt there should be one body to oversee science communicators. Nigel Akam responded that they were not suggesting one body but some degree of consistency in having a national programme, that the majority of STEM organisations can buy into, for example bringing everyone together for a major national initiative. It was pointed out that trust needs to develop for collaborations and partnerships to happen, which takes time and can only be fostered through getting together. A national programme could be workable in Scotland and the model developed might apply to other parts of UK on a regional basis. Having a focus is valuable and necessary to get everyone moving in the same direction. This raised the question of which direction should we be moving in collaboratively. The response was to use the Science Strategy for Scotland. John Coggins, a member of the Scottish Science Advisory Committee (SSAC), made the observation that some of the objectives in the SSAC report "Why Science Education Matters" are now taking place. He suggested we should feel our way forward, but the direction is connecting and co-ordinating all the activities in a determined way. It became clear from the discussion that the approach adopted should maintain diversity and not focus down onto a select group. Effective partnerships should take away duplication and overlap but keep different audiences, different age groups and the different circumstances in which we meet these audiences.

- ***Industry Involvement***

The panel were questioned about the role industry may play in a national programme. Ken Richardson commented that industry is moving more towards engaging primary pupils because they go back and talk to their parents. Industry sees engagement with parents and community as equally important. The question of how we can get the larger companies, who are only interested in supporting their particular area, connected so they can play a role in improving science and engineering education across Scotland was raised. Steve Brindley replied that there is an opportunity to open the model of the Make it in Scotland roadshow to all industries with support from SEAs. A comment was made that often due to the big commitment only big industries take part. What support is there for small local companies, not-for-profit organisations and charities? It was recognised that providing support is crucial for more small companies to get involved. Steve Brindley suggested dividing Make it in Scotland into sectors, e.g. electrical engineering,

manufacturing, etc. to allow SMEs to take part without too much commitment. Nigel Akam referred to the work Careers Scotland is doing to get professional institutions involved in supporting small companies. Reference was made to industry providing hands-on work experience for pupils. Nigel Akam outlined the main problem as meeting Health & Safety requirements, but Careers Scotland is looking at partnerships where further education colleges host the pupils and local technology firms provide hands-on projects.

[At the end of the session the audience were asked to vote on the single most effective means of encouraging young people into STEM. 42% answered science relevant to life, 29% able enthusiastic teachers and 13% positive role models. When asked where we should focus our principle efforts to find STEM teachers of tomorrow, 36% answered recruit science graduates and 26% mature students]

## ***Plenary Session Four – Science Communication and the Practising Scientist***

*The barriers, the benefits, the juggling act and the joys. This session provided opportunities for practising scientists to explore how they juggle their research priorities with communicating their science. It also looked at how science communicators and others can support scientists in this balancing act.*

***Chair: Graeme Jones, NESTA Dream Time Fellow, Keele University.***

- ***Running a Research Lab and a Thriving Café Scientifique: Margaret MacLean, University of Glasgow***

Mandy described Café Scientifique's origins. Set up in the 1990's, by Duncan Dallas and the Wellcome Trust, the idea was to place science in a place where the members of the public are in their comfort zone but the scientist maybe isn't. To try and break down some of the misunderstandings, misconceptions and distrust that seemed to be building up between the public and the scientists. She remarked on how successful Café Scientifique has been and they now run without the support of the Wellcome Trust. The Glasgow Café Scientifique, set up by Mandy in March 2004, runs on a monthly basis in the Tron Theatre Bar. The key to the success is that they are held in a bar or restaurant, and with support from the Scottish Executive for the venue, they can keep the event free. The number in the audience depends on the topic, but usually 70-90 people turn up and 80% are from the general public. The secret is in the format of Café Scientifique, said Mandy.

Mandy commented that there are not many challenges running Café Scientifique, which is done in her spare time - though as a research scientist and academic she doesn't really have spare time. She remarked that "if you are passionate about the things you do – you make time to do them". One of the key things to doing this is to play down its being an academic event. Although she has support from Glasgow University, it is advertised as run by the public for the public and presented jointly with Vanessa Collingridge, to reduce public intimidation. She mentioned that the speaker is selected and briefed very carefully to avoid visual aids and scientific jargon. The audience is asked what they want to hear about and the subject matter kept varied on topics of interest to the public. "If you tried to tell someone to run a Café Scientifique as part of their job it wouldn't work," said Mandy. You have to have a lot of passion and enthusiasm. Why does she do it? – "It's fabulous fun" and has strengthened her life in the university.

- ***Benefits of BA Media Fellowship: Aoife O'Mogain, British Geological Survey, Edinburgh***

Aoife explained that as a seismologist at the British Geological Survey (BGS), she performs scientific research and analysis but also spends time dealing with enquiries from the general public, Government offices and the media. In December 2004, through the BA Media Fellowship scheme, she spent six weeks working at the BBC. She decided to apply because she felt it would allow her and the group to provide more relevant and appropriate details to enquiries. Aoife commented that when she arrived, she was thrown in at the deep end but everyone was really happy to have a 'real scientist' coming to work with them. During the placement she developed two ideas and wrote a number of articles that immediately went up on the BBC web pages.

Overall the fellowship made her realise how important it is to be effective at communicating science and to remember who the audience is you are speaking to. We need to examine the positive aspects of publicising our science, said Aoife. How it can educate a wide audience, gain us recognition, bring in business and even help us to gain data. She then gave an example that for her, summed up the benefits of doing the media fellowship and using the media for science communication. Aoife explained that, last December after the Buncefield Oil Depot explosion, the BGS seismology group required information from the general public. She approached her BBC news online contact offering to write a story based on their seismic observations of the explosion

in return for a link to the BGS webpage. Through the link their online questionnaire received over 3500 responses in 48 hours. It was a superb data set to work with and shows the power of the media and how the media can be used to our advantage, said Aoife.

- ***Life as a Science and Engineering Ambassador: Joanne McNamee, formerly Motorola***

The Science and Engineering Ambassadors (SEAs) scheme was set up to use scientists and engineers to promote STEM to children and teachers, explained Joanne. She was involved in a project where P7 pupils from the local secondary school's feeder primaries designed a water pump to supply and clean water for a remote area of Africa. She went to the school once a week for three months to assist the children with their product design. Joanne commented that she found the children only expecting one correct answer to the problem they'd been set as a challenge. It is difficult for them to understand that the process is to find out the advantages/ disadvantages of each area. Another challenge was that SEAs are supposed to assist, but the teacher left her with sole responsibility of the class, she said. She stated that her area of expertise is automotive software and electronics. Initially she was not in her comfort zone designing pumps but spent time investigating and researching. She remarked that on more than one occasion she had to say – "I don't know let's find out".

Motorola her employer was extremely flexible and supportive but ultimately the time is made up anyway, Joanne said, although fitting it in was not always an easy task. Her employer saw the benefits, as she works in an area that not everyone recognises Motorola as being involved in. The benefits for Joanne are how it has changed the way she explains technical things to a non-technical audience, the satisfaction she got and inspiring the pupils. There is not always a right and wrong answer to everything, she said. It's a learning curve, but the education system points people down that direction. She mentioned the need to help teachers move out of their comfort zone and develop them in different aspects of science. It would help if companies / industry provide time, financial assistance, equipment and so on.

### ***Discussion***

Support and incentives for practising scientists, SEAs and industry involvement, the benefits of working with others and the success of Café Scientifique were discussed.

- ***Support and Incentives for Practising Scientists***

The BA was asked to encourage heads of academic departments to support academics doing science communication and to lobby the Scottish Executive to fund university science communications officers. Roland Jackson (Chief Executive of the BA) agreed that goodwill can't be relied on forever and inquired about the type of support people would like to see in a Scottish context. He referred to the recommendation from the London conference, for greater recognition and reward for scientists, and the realisation that it requires institutional and departmental sanction. This is being taken forward in England, Scotland, Ireland and Wales in conjunction with the Wellcome Trust and the Research Councils. A representative from the Office of Science and Innovation remarked that Scotland is further ahead than England, because Scottish Universities and HEIs are required to develop a 'community engagement strategy'. It was pointed out that even though universities have community engagement strategies, they might not be willing to provide the funds to support them. More formal support and funding is required. Graeme Jones inquired about the incentives for practising scientists to communicate their science. John Coggins, Vice-Principal, University of Glasgow, replied that it was disappointing from the university side, with not enough people volunteering, no recognition in the Research Assessment Exercise (RAE), or support from enlightened management. He believes Research Institutes are more enlightened with the Heads of the Research Councils pushing their scientists to engage. The Royal Society was mentioned as having recognised that excellence in science is not just about being a good researcher and now trains its university research fellows in science communication.

- ***SEAs and Industry Involvement***

Joanne was asked if she initiated becoming a SEA or was it an opportunity that came along? She explained that she heard about SEAs through the Women Into Science and Engineering scheme and volunteered. Had she managed to convince any of her colleagues? “Unfortunately, no”, she replied. She did put a team together to do science communication but none of her colleagues applied to be SEAs and mainly worked with universities. When asked her opinion on companies insisting, as part of their graduate recruitment packages, that newly-appointed scientists and engineers had to contribute to the community and sign up as SEAs, as opposed to volunteering. Her response was that we need to work on more inventive ways to encourage people to be involved rather than force them. Steve Brindley agreed, explaining the idea is that SEAs volunteer and are provided with training and a Disclosure Scotland check before working with school pupils. A suggestion was made that engineers and scientists who were uncomfortable working with children, could use their practical skills to help with community and charitable projects. The Royal Society website was mentioned as a useful place to find out about the issues and how to be an effective role model in science, engineering and technology.

- ***Benefits of Working with Others***

**Media Fellowships:** To the enquiry of whether she would have had the idea of writing the article for the BBC without the fellowship, Aoife replied that she probably wouldn't have contacted the BBC and obtained the information she required. The fellowships put scientists in a privileged position. More should be done about promoting the fellowships, together with the advantages and spin-offs from the engagement. Nick Hillier (Science in Society Manager, the BA) explained the background to the scheme and how it has changed over the years. However, more support is required for scientists to do this kind of work, particularly from employers. It was proposed that organisations offering media training schemes to their scientists open them up to other scientists if under-subscribed. Another scheme pairs scientists with MPs, with the benefits of MPs being informed about current science and scientists learning about the policy process.

**Café Scientifique:** When asked about Café Scientifique, Mandy responded that it was successful because it is held in an environment where the public are in control and not in the least bit intimidated. It breaks down the barrier between scientists and the public. The main part is the public asking questions. It usually starts tentatively, then moves into full dialogue as they realise there is no such thing as a silly question.

## **Final Plenary Session**

The aim of this session was to discuss and agree recommendations for policymakers on issues which had arisen during the conference.

After brief feedback on the key points from the Working Lunches, the Chairs of each of the plenary sessions presented a brief synopsis of what they had felt were the issues emerging from their sessions. A similarly short presentation was made by one of the conference delegates, acting as 'the voice of the conference' and discussion followed.

### **A: Working Lunches – key points**

#### **1. Science Education**

##### **Linking formal and informal science education: curriculum enrichment**

As science communicators we:

- welcome the new direction of travel of the proposed changes in the school curriculum (Curriculum for Excellence)
- welcome the opportunity to engage in the process and feel that we can add significant value to both pupils and teachers, providing:
  - access to resources, including people
  - relevance, innovation and creativity
  - continuing professional development (CPD) – developing capacity through increased knowledge and confidence in science subjects and in current research
  - the 'wow' factor

#### **2. Science in Society**

##### **Toolkits for Dialogue**

- Although the Working Lunch offered to provide a toolkit, it was clear that there is no such thing as a 'best fit option'. Successful dialogue requires a combination of approaches specifically chosen to match your needs and the needs of your audience
- It is vital that, before we start any dialogue process, we take time to think clearly about what we want out of it. Why are we running this and what do we want the outcomes to be?

#### **3. Science Communication**

##### **Working with the Media**

- In order to create a partnership with the media, encourage scientists to speak to journalists early on. Comment on other research, so that when the scientist wants to tell their science story, journalists already know them. It's a two-way relationship – if you help the journalist first, then they'll return the favour.
- Trust was the key word that was raised. Trust the journalist to report correctly and the journalist will trust the scientist to provide a quote.

General agreement was signified to these points by the participants, with the additional comment that science communicators could have a huge impact in the curriculum review and should continue to be involved in contributing to it. Further, it was suggested that we are at risk of the science communication community being perceived to only comprise large organisations. It should be remembered that there are also many individuals working the field who form a significant, important and, it was felt, sometimes under-valued part of this community. Indeed, these people often perform crucial roles that go largely unrecognised.

## **B: Plenary Sessions – key points**

### **Partnerships in Science in Society**

- There is a need for clarity in the purposes for engagement, particularly with regard to feeding into policymaking. But at what level should this occur and what are the appropriate mechanisms for channelling outcomes?
- The partnerships that do, or could, exist vary hugely – there is a great need to share best practice between and among them.
- There is a need to understand how engagement can become more ‘bottom up’ – and also ensure greater inclusivity.
- The RAE is still regarded as a major barrier for practising scientists wishing to engage in science communication – because of its lack of provision for recognition and reward – although there are some welcome signs that this may be changing.

### **Science Education**

- Under the Curriculum for Excellence, the acquisition of skills will become more important than rote learning of facts. This will require a new mindset for all in education and there remain challenges to be faced with respect to assessment. Introduction will be phased.
- The place of enterprise and engineering in education need to be better understood.
- There should be scope for greater creativity and innovation in teaching. The use of drama, for example, has been shown to be particularly valuable, enthusing both teachers and pupils.

### **Partnerships in Science Enterprise Education & Economic Development**

- The “Make it in Scotland” partnership programme aims to inspire and engage future scientists.
- It works very closely with industry – industry involvement is crucial to its success. However, a major challenge to the programme is how to get the SME’s engaged with it.
- There is a national focus and framework for the activity, but it embraces some diversity. The size of the programme means that it represents a huge logistics exercise, only manageable by a national agency but dependent on local contributions.
- Strategy needs to become action.

### **Science Communication and the Practising Scientist**

- A culture change is required within companies and universities to encourage/enable more involvement by scientists in communications (it is rewarding in itself, but institutional pressures make it difficult).
- Training is required, especially for dealing with the media.
- The Royal Society of London is trying to change the definition of an ‘excellent’ scientist – to be one who undertakes both research and communication.

### **The Voice of the Conference**

If the overall objective is to make Scotland “Smarter”, we acknowledge that partnerships are the way forward and that we must get on with creating and working in them, but we need:

- Inspiring examples
- Practical guidance on how we can become involved

- Support to ensure that we can include the many groups practising science communication and maintain the diversity and range of audiences reached
- Support for and guidance to ensure that:
  - best practice is shared
  - there is adequate funding
  - initiatives are sustainable
  - outcomes and learning are disseminated

Networking is vital to this, but greater representation/involvement is required from funders and the Scottish Executive.

## Comments & Discussion

It was suggested that there is already considerable duplication of work and activities, and that there is a need to be able to access resources and evaluation from other projects to prevent this happening; we need to learn from others and what has been done before.

It was agreed that there was a need for 'better linking at the top of the ladder' and acknowledged that better connectivity is developing, but slowly. For this connectivity to work well, it needs both a logical, systematic approach and to be driven both bottom-up and top-down. Any attempts to ensure greater connectivity, however, must take account of, and value, the diversity which exists in the broad field of science communication. It is not essential that there only be one model for partnership working. In this respect, it was noted that the Scottish Science Centres Network had agreed ways to work more closely together and in partnership – and they are very diverse organisations.

There was widespread acknowledgement that trust is needed for the development and success of partnerships. There are many individuals and organisations who have, or are perceived to have, vested interests in the success or otherwise of partnership working. It was suggested that some clustering of disparate groups, perhaps on a geographical basis, might be a way of encouraging better partnership working.

There was then some discussion on whether communicating 'science' is an end or a means to an end. While communicating some science topics, climate change for example, are vital for the survival of society, others are perhaps less so. It was suggested that the focus should, perhaps be on the 'redeployment' of science, rather than the science itself. There was general agreement that public attitudes are key to the success of science communication and the suggestion was made that there might be an awareness campaign launched, which did not have an explicit focus on 'science'.

It was felt important that people were made aware of science enquiry and its role in entrepreneurship.

While it was agreed that evaluation of science communication activities should become more 'scientific' and rigorous, with academic studies of their impact being carried out and published, it was noted that it is not always easy to find sufficiently rigorous measures by which to evaluate impact. It was pointed out that HMIe and the Scottish Science Centres Network are proposing to discuss how best to develop some suitable measures. Ways to improve the development of 'thinking skills' among the population at large – as well as among young people – should be found.

In considering specific points which might help to guide the future direction for science communication, it was suggested that a regional strategy might produce some good learning points, but that practical action was needed, not more 'talk'. It was acknowledged that there might not be a simple answer to guiding the direction, because there are many varied and legitimate aims for science communication. The *Progress Report on the Science Strategy for Scotland* and the new *Scottish Science Centres Network Strategy*, however, provide some

guidance, a framework and recognise the value and potential of the 'wider science communication community'.

### **C: Recommendations**

- Greater recognition that the science communication community comprises many diverse components, not all of which are large organisations, and that each has a valid contribution to make. This to be coupled with increased support (financial and other) to facilitate greater partnership working. Any increase in resources should be targeted at facilitating greater partnership working.
- Continued efforts to encourage the culture change required within the corporate and higher education sectors to ensure the removal of the barriers to the appropriate recognition and reward for practising scientists to engage more widely with society. (The efforts of HEFCE, the Research Councils UK, the BA and the Royal Society, among others in this area were noted and acknowledged.) A separate Scottish working party could be formed to look at these issues in the Scottish context and to feed into UK wide work. The Scottish Funding Council is involved in this work already and stronger links should be formed.
- More training in science communication is required – particularly with regard to practising scientists engaging with the media.
- Mechanisms must be found to ensure the sharing of good practice among science communicators.
- Evaluation of science communication activities should become more 'scientific' and rigorous – noted that HMIe and the Scottish Science Centres Network are proposing to discuss how best to develop some suitable impact performance measures.
- If science in society engagement is on issues of general public concern or relevance, then there has to be clear guidance from policymakers and influencers on how the outcomes of these activities can be relevant, timely and appropriately channelled into the policymaking/shaping processes.

## Reports of Working Lunches

### Linking formal and informal education – curriculum enrichment

The workshop sought the views of science communicators as part of SEED's (Scottish Executive Education Department) engagement on proposed curriculum changes in Scotland. It also explored how science communicators can work in partnership with teachers to support and enrich the curriculum.

**SPEAKERS:** Walter Whitelaw, Chair, Science Review Group, Curriculum for Excellence, Scottish Executive Education Department  
Kath Crawford, SAPS Biotechnology Project Scotland

The Working Lunch ran twice over two days and was attended by approximately 35 people each day.

#### Summary

As science communicators we:

- Welcome the new direction of travel of the proposed changes in the school curriculum (*a curriculum for excellence*)
- Welcome the opportunity to engage in the process and feel that we can add significant value to both pupils and teachers, providing:
  - access to resources, including people
  - relevance, innovation and creativity
  - continuing professional development (CPD) – developing capacity through increased knowledge and confidence in science subjects and in current research
  - the 'wow' factor

The Working Lunch began with presentations from Walter and Kath.

**Walter Whitelaw** introduced *A Curriculum for Excellence* (ACfE), describing the present stage of this process of reflection, review and improvement.

In particular, he explained that the aim of ACfE was to give teachers more freedom. The curriculum would become less prescriptive and would contain fewer and less specific outcomes. He said that the most important goal for science education was to "stimulate, nurture and sustain the curiosity, wonder and questioning of young people". The role of science education is "to prepare young people for their future lives and careers by developing them as scientifically literate citizens and by preparing them for later more specialised learning".

He also expressed the importance of the 3-18 curriculum in developing

the **four capacities**:

- successful learners
- confident individuals
- responsible citizens
- effective contributors

alongside which are **seven principles** of curriculum design:

- challenges and enjoyment
- breadth

- progression
- depth
- personalisation and choice
- coherence
- relevance

Walter highlighted the following from the published rational:

“There will be freedom to teach in innovative ways and to make the most of the power of digital learning and expertise outwith the school sector.”

He challenged the attendees to think how their skills as science communicators could contribute to these exciting developments and expressed the view that these changes made links between formal and informal education both vital and feasible.

**Kath Crawford** then described how the “SAPS Scotland” (Science And Plants for Schools) and the “Supporting Scottish Science Education through CPD” projects have been working to enrich the learning and teaching of science. She described their work in developing exciting curriculum-related resources and working with teachers to implement these in the classroom. She expressed the view that ACfE was an exciting opportunity to develop science education from being merely the acquisition of facts, to an opportunity to learn how to think.

There then followed a Q&A session which touched on the following points:

- ACfE is THE agenda for the next 10 years, but it is going to be hard to integrate it into the culture of science education. It requires engagement with Principal Teachers, teachers and Local Authorities. Rather than providing courses and materials, *outcomes* will be prescribed for people to adapt. There won't be reams of materials. Only a few teachers have even read the report!
- The curriculum is moving away from formal assessment at levels S1-S3.
- The aim is to prepare pupils better for S4 onwards i.e. the exams. Need to help pupils to think and to understand the value of evidence, but also “raise the bar” of courses.
- There are issues of CPD costs and time (e.g. cover for those on courses).
- ACfE changes may require using dialogue skills from other subject areas e.g. English, RE
- Development of discursive teaching rather than facts – teachers can think for themselves!
- Kings College, London *Thinking Science* programme produces stand-alone lessons which, although very structured, could be adapted for science lessons.
- RCUK are piloting CPD training and have just published their strategy. They are keen to help their scientists with these kinds of activities.

There then followed **three activities** which addressed the following questions. The responses generated by the participants over the two days are summarised here:

**QUESTION 1:** In the context of the four capacities and the seven principles of curriculum design, what value can science communicators and the informal (science) education sector add for (a) Pupils and (b) Teachers.

*Numerous ideas were generated in response to this question, on each day the small groups of attendees were made to select their top answer, all of which are listed below*

(a) PUPILS?

- Real-life science & scientists
- Access to resources including people
- Real-world relevance
- Positive role models

(b) TEACHERS?

- Access to resources
- Increased confidence, by doing new things/skills
- Added relevance and new ideas
- Knowledge and confidence in subject and about current research

**QUESTION 2:** How might you approach, or refresh, one of the following outcomes, or use a current activity to address the four capacities and the principles?

OUTCOMES at Primary level

- I can carry out research and present ideas on the limitations of my senses
- I can carry out research and present ideas on the conservation of water
- I can carry out research and present ideas on how energy is conserved by good design

OUTCOMES at Secondary level

- I can express an informed view on the use of stem cells
- I can research and present information on the recycling of plastics in my local community
- I can explain the safety features of cars

*This question elicited the following comments:*

- we could use much of what we do already
- relevance and responsible citizenship are very closely linked but pupils won't necessarily like something even if it's relevant, it also needs to be done creatively
- assessment will be very different; huge culture change is required – a time consuming and difficult process, but rewarding to do
- could even let pupils set the agenda; ask, "How shall we approach stem cells?"; let the pupils deconstruct the topic and ask the questions
- potential for cross-curricular subjects e.g. forensics works at different levels; chemistry, biology and even physics – a great lead into the science
- but with forensics, there is the conflict of desire for relevance (e.g. CSI) *versus* the need to teach chemistry (pure science)
- may always be two opposing views, either being pro cross-discipline subjects or pro specialisms

**QUESTION 3:** Recognition of achievement is an important aspect of ACfE. All stakeholders are happy to sign up to this as “a good thing”. However, there are issues to resolve relating to:

- reliability
- credibility and currency
- possible bureaucracy/workload issues for classroom teachers

What contributions can the science communication sector make in this important area?

How would you address the three issues listed above?

*This question elicited the following comments:*

- passport of achievement to link things together e.g. CREST and Nuffield
- another set of qualifications BUT trying to recognise types of learning other than by exams!
- presenting to external people? not sustainable to get people to come and see things
- create some kind of scheme like Duke of Edinburgh Award and Guides – industry like this, also ecsite-uk & Royal Society book prize
- also important to recognise effort
- use CREST & other schemes
- could incorporate the notion of self-assessment?

**Useful web links:**

ACfE: <http://www.acurriculumforexcellencescotland.gov.uk/index.asp>

Science and Plants for Schools (SAPS): [www.saps.org.uk](http://www.saps.org.uk)

[http://www.scienceeducation3-18.com/projects\\_saps.htm](http://www.scienceeducation3-18.com/projects_saps.htm),

Scottish Schools Equipment Research Centre: [www.sserc.org.uk](http://www.sserc.org.uk),

Improving Science Education 5-14: [www.ise5-14.org.uk](http://www.ise5-14.org.uk)

## Toolkit for dialogue

The workshop aimed to explore what we mean by 'effective dialogue' and highlight recent approaches to policy through dialogue and the potential impact on the science communication community. It also aimed to create some consensus as to what we mean by 'doing dialogue'.

**SPEAKER:** Mark Dyball, People, Science & Policy

The Working Lunch ran twice over two days and was attended by approximately 30 people on day one and 20 people on day two.

### Summary

- Although the Working Lunch offered to provide a toolkit, it was clear that there is no such thing as a 'best fit option'. Successful dialogue requires a combination of approaches specifically chosen to match your needs and the needs of your audience
- It is vital that, before we start any dialogue process, we take time to think clearly about what we want out of it. Why are we running this and what do we want the outcomes to be?

The Working Lunch began with an introduction from Mark looking at different definitions of dialogue and participants were asked to identify areas of their programmes that they considered to be dialogue and why they ran them

Examples included

One way – Talks and presentations

Consultation – Visitor feedback or Government consultations

Engagement – Schools projects, discussions resulting from topics introduced

Dialogue – activities that share experiences and knowledge and encourage widespread involvement

Participants were also asked to identify the barriers to greater public involvement in decision making and discussion on science and technology

Responses included

- Time
- Not knowing the issues
- Not knowing how
- Lack of confidence
- Government not listening to or acting on discussions
- No opportunities
- People not wanting to take part
- Lack of understanding
- Lack of relevance
- Language
- Lack of knowledge about the facts of science
- Lack of knowledge about active citizenship
- Being labelled "the general public"

In the discussions that followed the following points were raised:

- Why bother with policy through dialogue?
  - I/we do not do it, things cannot be changed
  - It allows you to influence policy that has been made for you

- Makes you feel a part of society with an ability to respond to the changes going on around you
- You can engage people on topics where views are not yet determined
- Why not?
- Helps you understand what people want
- Make better decisions
- It's a means to an end
- We have a democratic right to be involved
- Because voting is not enough
- To make your voice heard
- Decisions are being made on citizens' behalf, if you are a good citizen you should engage
- Our society has become more complex than the systems we use for decision making, we need to update our methods so that there is more accountability
- Should dialogue be compulsory? Can you force people to take part?
- What incentives can be used to encourage participation? If we have to pay people to engage, are we using the right methods?
- Is there not a duty to be involved?
- Information provision is important. How should people look for information and how should it be provided?
- Even if the public are informed about science, it doesn't mean they will be able to make the 'right choice'. Science doesn't always have yes or no answers. The questions you ask are the most important
- Some people don't want to know, should we bother with them? The challenge is to engage those who don't want to be engaged
- How can we eliminate bias and inappropriate organisational impact? Interested publics can also manipulate the discussions
- What are the toolkits for policy makers to engage? How do we do dialogue with them?
- We need to consider the role of scientific information. Science can be used in political ways too

Discussions then turned to the questions of whether dialogue should 'go somewhere'. Responses included:

- Can any dialogue go somewhere?
- You need to have buy-in from participants, this is often achieved from the potential to impact on decision making
- We need a better understanding of where dialogue fits into the process
- Why bother if nothing happens?
- It depends on whether you consider yourself a citizen or a consumer
- If it doesn't we are being dishonest, have we just re-branded Public Understanding?
- People want to know what they get out of it. I want more than information policy, I want to see an impact on me and my life
- If it does have impact it makes people feel good about themselves

The discussions then turned to focus on different methods for dialogue. Mark shared experiences of 5 different processes; citizen's juries, consensus conferences, Democs games, deliberative mapping and focus groups. Information on which is included below.

**Democs is a conversation game enabling small groups to discuss public policy issues. No speakers or experts are needed, as pre-prepared cards convey the necessary facts. It works best for six people over two hours, but it is flexible.**

**Description:** Democs helps people to absorb information and to make it meaningful. The information on the topic is provided on playing cards which are dealt out in two rounds. Each time, people reflect on their cards and choose one or two that they feel are most important. They take turns to read them out, explaining why they chose them, and then place them on the table. Next they cluster the cards, with each cluster representing a key issue relating to the topic. Once they've voted on a range of responses or policy positions they try to create a response that everyone in the group can live with.

**Origin:** Gaming/Deliberative democracy. Designed by the New Economics Foundation to provide some of the deliberation of Citizens' Juries and Deliberative Polls but for a wider use.

**Used for:** Helping citizens find out about an issue, form and share their opinions with others and establish whether there is a policy position that every member of the group can at least live with.

**Who participates?** Usually anyone who wants to. Sometimes representatives are sought. For instance, the Human Genetics Commission, investigating over-the-counter genetic testing kits, was interested in the views of the general public and in those of members of their consultative panel.

**Cost:** Low. A single kit costs £30 in

a box or is free by email. Developing the kits in the first place costs more (£5-10k), as does a full consultation using Democs.

**Time requirements:** Individual sessions are around two hours.

**When should you use?**

- When you want to give people the chance to participate in their own time and place;
- When you want to increase public understanding of an interest in an issue.

**When should you not use?**

- For a one-off session on a particular topic, as developing the information cards would be too expensive;
- Dangerous to combine citizens and experts in a single game.

**Can it be used to make decisions?**  
No

**Strengths:**

- It encourages people to form an opinion on complex topics and empowers them to believe that they have a right to a say;
- It avoids the passivity that can come with experts lecturing people;
- It provides a safe place that will appeal to inexperienced participants;
- The game format helps people to enjoy themselves while they talk.

**Weaknesses:**

- Works better with a facilitator;
- Establishing common ground is not possible within a single game;
- Representativeness is hard to achieve;
- Can create conflict between participants.
- It is hard to feed the results of a Democs process into decision-making.

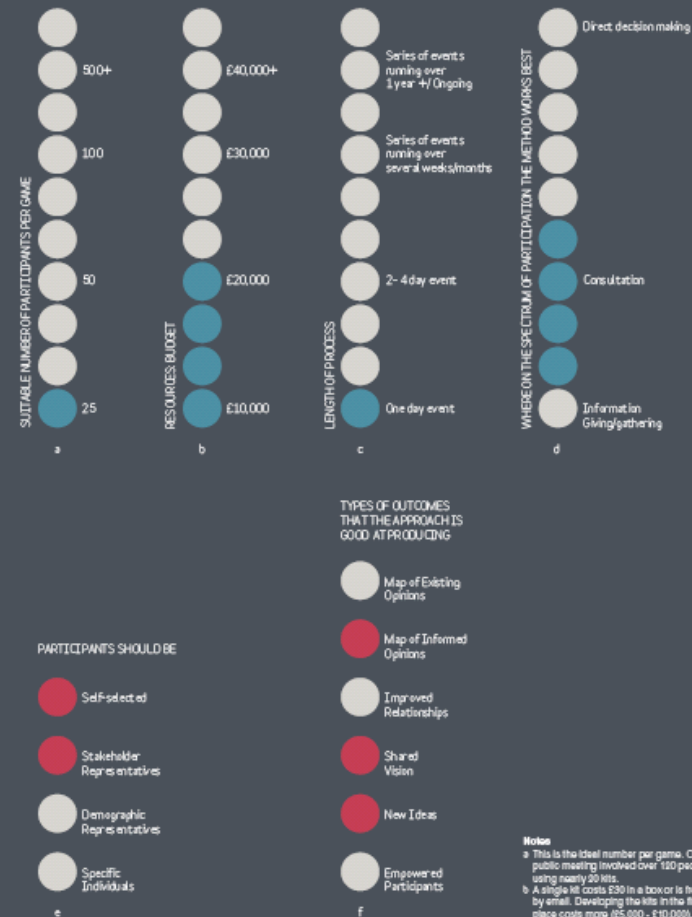
**Can deliver:**

- A citizenry that feels it can have a say and wants to do so;
- Some information about common ground and preferences.

**Won't deliver:**

- Lengthy deliberation;
- In itself, it doesn't deliver follow-up to people who have taken part and want more;
- Tangible outcomes.

## Democs (‘Deliberative Meetings of Citizens’)



Citizens' juries consist of a small panel of non-specialists, modelled to resemble a criminal jury, who carefully examine an issue of public significance and deliver a "verdict".

**Description:** A Citizens' Jury is an independent forum for members of the public to examine and discuss an important issue of public policy. It is deliberative in the sense that the Jury receives information about the issues in question. This information includes a full range of opinions, often in the form of worked up options, on what should be done about the issue. Much of this information is presented through witness presentations followed by question and answer sessions. Juries are not designed to create a consensus amongst the jurors, but there does tend to be a momentum towards consensus. In a four-day process, day one is largely about bringing jurors up to speed on the issue. Days two and three tend to focus on witness presentations about different ways of dealing with the issue. Most of the fourth day is spent by the Jury developing its recommendations.

**Origin:** Social Research – the model used in the UK is a mixture of the US Citizens' Jury developed by the Jefferson Center, and the German Pannungszelle (planning cell) developed by the University of Wuppertal.

**Used for:** Live public policy issues where opinion is sharply divided and policy makers cannot decide how to proceed. This deliberative model creates an informed public opinion about what they feel policy makers should do. Although originally designed for local communities to tackle issues of local concern, Juries are now starting to be used to look at national issues. Juries are decision-advising rather than decision-making

tools. They are about enhancing representative democracy, not direct democracy.

**Who participates?** Most Juries include a 'best fit' (demographic) sample of 12 to 15 members of the public. They are brought together to examine both written and verbal evidence about different perspectives on the issue they are deliberating on.

**Cost:** A Citizens Jury usually costs between £20,000 and £40,000. The difference in the costing usually relates to how long the process is designed to last and the exact nature of the methodology. The original type of Jury introduced into the UK by IPPR and the Kings Fund tends to last for four days and involves much preparation time. This version would be at the higher end of the costing.

**Time requirements:** The set up time for a jury can be anywhere from two to four months.

**When should you use?**

- When you have a 'live' contentious issue where the way forward has not been decided;
- Juries usually work best where feasible policy options have been developed by policy makers about how to respond to a problem.

**When should you not use?**

- When you have already decided how to proceed on an issue;
- When the issue is not of significant interest to the public;
- When you seek consensus.

**Can it be used to make decisions?**  
No

**Strengths:**

- Gives an informed public opinion about how a difficult issue should be tackled;

- Enables decision-makers to understand what informed members of the public might regard as realistic solutions;
- The results can also be used to generate wider public debate about the issues.

**Weaknesses:**

- Only involves a very small number of people, which means that the wider public may still hold a less informed view;
- A challenge for policy makers is how to reconcile these two different public voices to create wider public ownership of the jurors' recommendations;
- It can also be difficult for policy makers to decide how to proceed if they reject the Jury's recommendations.

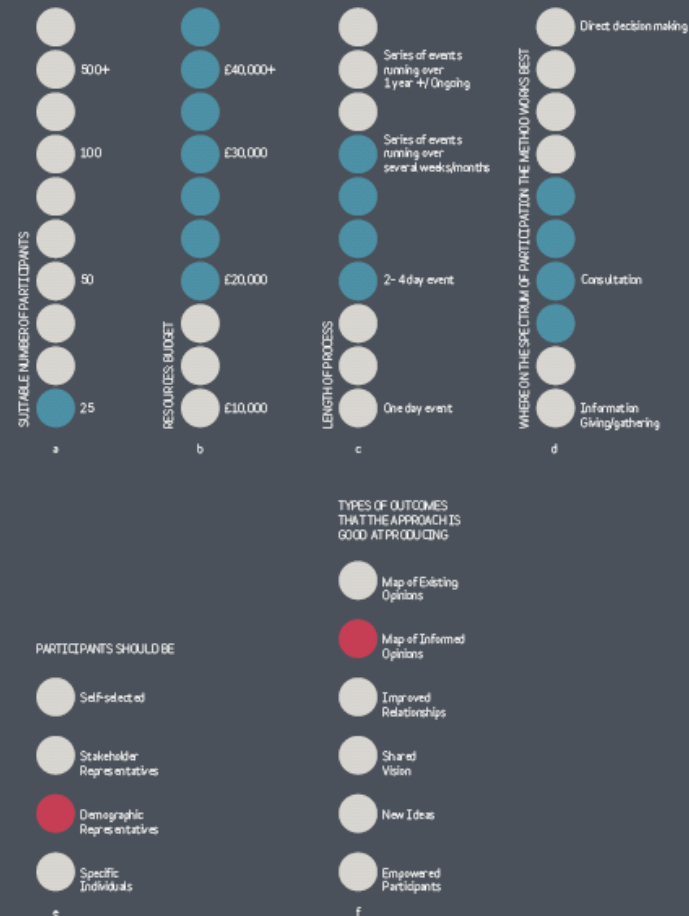
**Can deliver:**

- Decision-making that better reflects the public's views;
- A high profile example of public engagement.

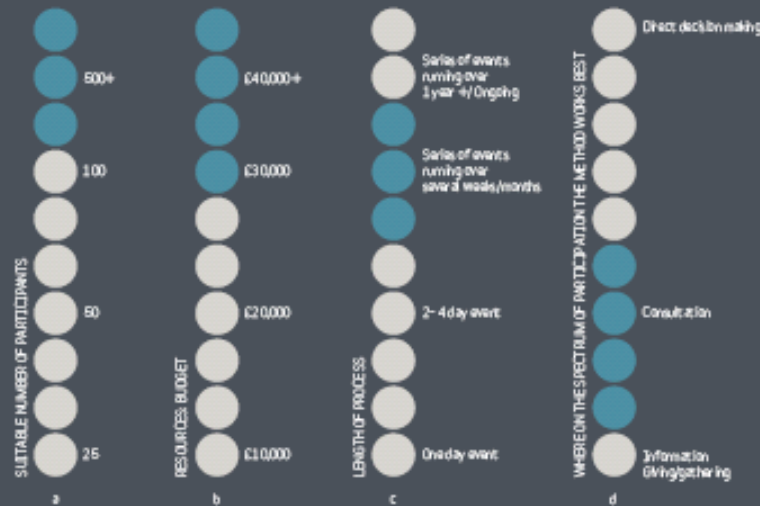
**Won't deliver:**

Wider democratic engagement and empowerment.

## Citizens' Juries



# Deliberative Polling



## PARTICIPANTS SHOULD BE

- Self-selected
- Statistical Representative
- Demographic Representative
- Specific Individuals

## TYPES OF OUTCOMES THAT THE APPROACH IS GOOD AT PRODUCING

- Map of Existing Opinions
- Map of Informed Opinions
- Improved Relationships
- Shared Vision
- New Ideas
- Empowered Participants

**Note**  
 \* Using a statistically representative sample of the public is important

A deliberative poll measures what the public would think about an issue if they had an adequate chance to reflect on the questions at hand by observing the evolution of a test group of citizens' views, as they learn more about a topic. Deliberative polls are more statistically representative than many other approaches due to their large scale.

**Description:** The participating sample is first polled on the targeted issues. After this baseline poll, members of the sample are invited to gather for a few days to discuss the issues. Balanced briefing materials are sent to the participants and made publicly available. The participants engage in dialogue with competing experts based on questions that the participants themselves develop in small group discussions with trained moderators. After this deliberation, the sample is asked the original questions again. The resulting changes in opinion are thought to represent the conclusions the public would reach if people had the opportunity to become more informed about the issues. Deliberative Polling creates dramatic, statistically significant changes in views. Follow up studies, however, tend to show that some of these changes are reversed over time. Deliberative polls are usually run in collaboration with TV companies, which then broadcast parts of the process, allowing the wider public to share the learning of the participants.

**Origin:** Social Research – Developed by US researchers to overcome the often uninformed and fickle nature of opinion poll results.

**Use for:** Deliberative Polls measure informed opinion on an issue. The results of a Deliberative Poll are partly prescriptive – pointing to what an informed and reflective citizenry

might want policy-makers to do.

**Who participatee?** The number of participants in a Deliberative Polling process range from around 200 to 600. It is important that the participants constitute a representative sample of society; if a random selection process might exclude minority groups there is a need for a more affirmative method of selection.

**Cost:** It is hard to estimate what a Deliberative Poll might cost as there haven't been any recently, but we estimate that running one will cost at least £30,000. This excludes expenses for the media and participants.

**Time requirements:** The poll itself is run over several days, a few months before, the participants take part in a number of events (usually over a weekend) where they are polled the first time and where they can familiarise themselves with the issues. Allow at least six months.

**When should you use?**

- Deliberative Polling is especially suitable for issues where the public may have little knowledge or information of the trade-offs applying to public policy

**When should you not use?**

- If issue is non-controversial;
- If issue and its relevant trade-offs are already well understood by the public.

**Can it be used to make decisions?**  
 No

**Strengths:**

- Combines the statistical representativeness of a scientific sample with interaction and deliberation;
- Better demographical representation of population than

Citizens' Juries and Consensus Conferences;

- Increases public understanding of the complexity of issues;
- Includes people that would not normally choose to get involved;
- Demonstrates the large difference between people's uninformed and informed views;
- Good means of measuring the diversity of public opinion.

**Weaknesses:**

- Requires use of television to achieve its wider public awareness raising effects;
- Does not provide qualitative information;
- Expensive;
- Less scope for participants to identify witnesses and question them or determine the scope of the questions than exists for some other approaches (a.g. Citizens' Juries and Consensus Conferences).

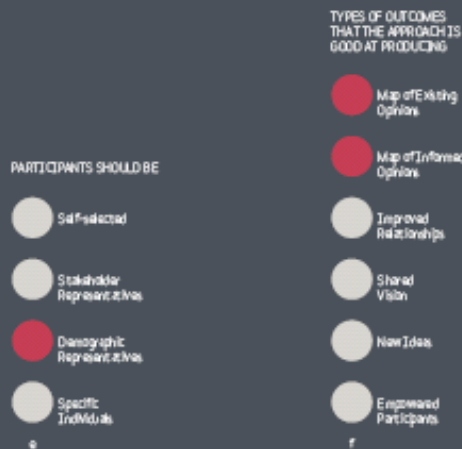
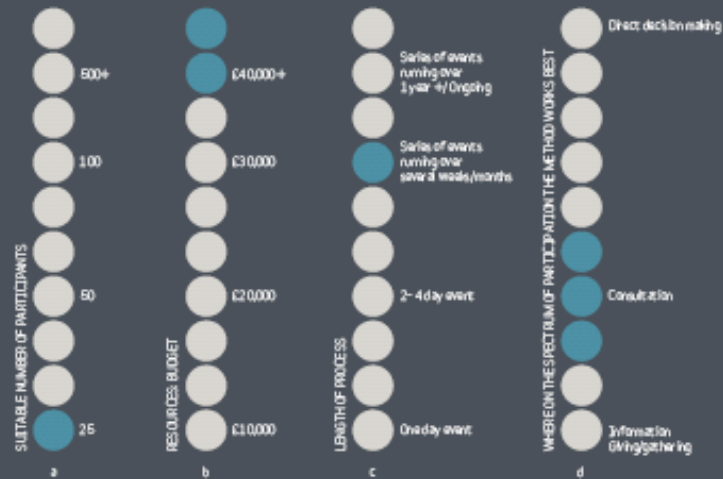
**Can deliver:**

- A statistically representative view of what the public's considered/ deliberated opinion might look like;
- Increased public understanding of an issue through broadcasting of event

**Won't deliver:**

- Improved relationships between groups of participants;
- Shared views/consensus.

## Consensus Conference



**Note**  
 a This number includes those directly involved and does not include those who may be influenced by reports about it or by its results.  
 b The costs of this method usually go well beyond this scale, sometimes amounting to £200,000.

A consensus conference consists of a panel of ordinary citizens who question expert witnesses on a particular topic. Their recommendations are then circulated.

**Description:** At a Consensus Conference a panel of citizens explores a topic through questioning expert witnesses. The panel is given time to prepare before the actual conference in order to fulfil their role as informed citizens. Panel members receive a comprehensive information pack and attend preparatory events (usually two held at weekends). A distinctive feature is that the initiative lies with the citizens. They decide the key aspects of the debate, including the choice of questions and selection of the witnesses, and formulate their own conclusions. The press and public are able to attend the main hearing. At the end of the conference, the panel produces a report outlining conclusions and recommendations that are then circulated to key decision-makers and the media. The process is usually run by an organisation with no stake in the outcome to limit accusations of bias.

**Origin:** Social Research. The Consensus Conference is based on a model of technology assessment originating in the health care sector in the USA during the 1980s and further developed by the Danish Board of Technology.

**Used for:** A Consensus Conference is a way of incorporating the perspectives of ordinary members of society into the assessment of new scientific and technological developments. In common with Citizens' Juries, Consensus Conferences aim to both inform and consult with the citizenry. The difference is that Consensus Conferences take place in open

view of the public. This form of citizen participation is particularly appropriate for involving citizens in decision making on complex and highly technical issues otherwise requiring specialist knowledge.

**Who participates?** A citizens' panel of between 10-20 people is selected to reflect a variety of socio-demographic criteria (note however that due to its size the panel cannot be a statistically representative sample of the population). Panel members should not have any significant prior involvement with the conference topic – they are taking part in their capacity as citizens, not as professionals or specialists.

**Cost:** A trained and independent facilitator is required during the preparatory weekends and during the conference itself. A Consensus Conference is expensive, requiring large facilities to accommodate the media and public during the event. Some claim, however, that Consensus Conferences are cost effective compared to the cost of informing the public through the media. UK examples have ranged in cost from £80,000 to £100,000.

**Time requirements:** The Consensus Conference itself usually lasts for three days; the participants also attend preparatory events. Ensuring that the relevant experts can attend as witnesses usually requires contacting them well in advance of the events.

#### When should you use?

- Useful for dealing with controversial issues at a national level;
- Works well with issues that are seen as controversial, complex or expert dominated.

#### When should you not use?

- When it is important to involve all

- key stakeholders;
- When you want the participants to make actual decisions;
- When the topic is very abstract or uncontroversial;
- When the funding and/or delivering body is seen as biased.

#### Can it be used to make decisions? No

#### Strengths:

- Good public outreach if run well;
- Open and transparent process which encourages increased trust;
- More control over subject matter and witnesses than is common in Citizens' Juries and Deliberative Polling.

#### Weaknesses:

- Expensive;
- The small sample of people might exclude minorities.

#### Can deliver:

- The views of informed citizens and their key issues of concern on a policy area;
- Useful and understandable written material suitable for public use;
- Wider and better informed public debate on an issue through the media.

#### Won't deliver:

- Decisions;
- Detailed technical recommendations;
- Results that are representative of society as a whole.

## Working with the Media

The Working Lunch aimed to incorporate presentations and discussion of case studies which outline successful partnerships between science communicators and the media. It will identify strategies for understanding mutual needs, overcoming barriers and developing effective partnerships.

**SPEAKERS:** Sue Bird, Rowett Research Institute (Chris York on Friday)  
Sue Charles, Northbank Communications  
Stuart Brown, Royal Society of Edinburgh

The Working Lunch ran twice over two days and was attended by approximately 30 people each day.

### Summary

- In order to create a partnership with the media, encourage scientists to speak to journalists early on. Comment on other research, so that when the scientist wants to tell their science story, journalists already know them. It's a two-way relationship – if you help the journalist first, then they'll return the favour.
- Trust was the key word that was raised. Trust the journalist to report correctly and the journalist will trust the scientist to provide a quote.

The Working Lunch began with a brief introduction by the speakers, and then participants were asked to identify why one might want to work with the media.

### Points included:

To get a particular message across

To reach different audiences

To encourage younger scientists to talk about their work

To reach wider than just peer group

To build trust with journalists

To use the media to recruit members of the public for certain research

To use the media to disseminate public views for future research

The 3 speakers then each presented for 15 minutes.

- Sue Charles stressed the importance of scientists to be willing to comment on an area of research (not just their specific area). When acting as a viewpoint for someone else's research, the scientist helps to make up a balanced panel. This prepares them for when they want to use the media for their own research. The Science Media Centre was noted as being a good place to look for such scientists.
- Stuart Brown suggested that when providing a story, graphics, images or a good photo is really useful to the journalist. Giving an exclusive to a particular newspaper can be an attractive offer and a good way to get your research in the news. You must build trust with the journalists and set parameters with

them, so that everyone has the right expectations. Prepare the scientist well, providing good quotes for the journalist.

- Sue Bird highlighted the Science Snaps case study where scientists gave a one-minute explanation of topical science issues, recorded and broadcast on a commercial radio station. Scientists who were able to communicate clearly were chosen to take part and it proved a great experience for the scientists involved.

In the discussion that followed, participants were asked two specific questions –

1. What makes a good partnership?
2. What are the success criteria for creating a good partnership?

### **What makes a good partnership?**

Trust – between journalists and scientists

Respect – scientists should respect the expertise of the journalist and *vice versa*

Care – be careful what you say to journalists; be clear with your message

Understanding – have a realistic understanding of what each party wants; set clear aims and objectives

Plan a clear message that is relevant to readers/listeners

Build a relationship between the scientists and the media

Expectations – make them reasonable

Support – have support from management

### **What are the success criteria for creating a good partnership?**

Good planning

Read the article – what is actually reported, is it a fair report?

Factual, avoid speculation

Whether new collaborations are formed due to the media

Finding new scientists in the same field, or other interested parties such as consumer groups.

Does it bring in new business?

Becoming a future contact that journalists turn to for comments

If a science story turns into a news story

Ongoing news stories published