MEETING REPORT

Public communication of science and technology*

As has been rightly said, communicating science for the public means making complex ideas and concepts simpler, and creating tools to interest public without modifying the scientific truth (http://www.unesco.org/science/wcs/abstracts/II_11_communicating.htm). According to P. C. Vyas (Former Chairman, Rajasthan Board of Secondary Education, Jaipur), science communication should ideally enhance the level of awareness about the science behind events and natural phenomena around us, and provide the public with information on latest developments. In India, Jawaharlal Nehru's concern with 'scientific temper' as critical to the nation's culture led to it being enshrined in the Constitution. The United States has no similar formal commitment to science as part of its culture.

Just as the scientific method has 5 Ws and 1 H (what, when, where, why, whose and how), news pieces also have these ingredients that make a complete news. A. K. Sharma (University of Lucknow, Lucknow) pointed out the common mistakes made by a writer when the same thing could be written to the point. For instance, most people mistakenly write 'revert back' for revert, 'cooperate together' for cooperate, 'repeat again' for repeat, and so on.

Artur Matuck (University of São Paulo, Brazil) mentioned the connection between writers and the internet in his talk on e-writing and human–machine co-evolution. He added 'Presently, an individual author is or could be in constant contact with social networks, writing applications and almost infinite resources distributed in the internet'. He also said that in this new writing environment, immediate feedback is received by authors on their work.

What is the role of public relations in science communication? Andrzej Jasinski (University of Warsaw, Poland) in his talk 'Public relations as an important tool of science communication with society: the case of Poland', mentioned that public relations can serve as a professional marketing tool to reach the target groups of, be it journalists, politicians, teachers or public at large.

A. P. J. Abdul Kalam (former President of India) in his inaugural speech 'Powerful science communication is an asset to the transformation of societies', urged experts in science communication to take up three tasks: (i) To make all citizens, particularly those in remote and rural areas to feel the excitement about science. (ii) To make all the citizens know about the advances in science and their role in the society in economic and health development, and to bring more and more fruits of science within the reach of their daily lives, while being sensitive to the sustainability of our planet and our responsibility towards it. (iii) To motivate students and entice them to embrace science as a profession. Kalam added 'There are many young inventors and imaginative citizens (including from remote rural areas), sometimes without a formal training, who can be brought to public attention and encouraged.'

Science communication – a discipline?

Science communication has been accepted as a field of study, but as a discipline is a debated issue. The questions raised are: 'Is science communication a discipline or is it interdisciplinary?' 'Is it applied or theoretical?' The benefits of its recognition as a discipline are in employability and funding. The negative effect is that its discipline status might add boundaries. However, the usefulness of science communication Master's programmes in equipping students with jobs and professionalism is still unclear, as reported in a study conducted by Chao-Ping Hong and

Are you a science communicator, journalist or writer?

Although many of us use the terms science communication, science journalism and science writing interchangeably, Toss Gascoigne† (President, Public Communication of Science and Technology Network) identifies them as different profiles. He says science journalism is where there is a professional journalist who might take an interview with a scientist or scientists, report on an issue, and interpret information to produce a product suitable for the audience. If it involves writing for the *Times of India*, it might be an article of about 250 words with a photograph and if it is a news story for television, it might end in say 70 seconds. That would be the role of a journalist.

Science writing is not necessarily about news. The first thing that distinguishes science writers from journalists is that they are more likely to have a scientific qualification and are likely to have expertise in science because they have either worked or qualified in that area; many journalists will not have that sort of expertise. The second difference is that a science writer is more likely to write an extended piece or a book chapter or a long article, whereas journalists usually write short pieces. If it is a feature article in a major newspaper, it might go up to 600–700 words.

A science journalist is a mediator and would stand between science on the one side and the public on the other, and would look at science and write about it in the form of a product suitable for the audience. Whereas a science communicator would stand back, observe that process and write about it, but not about science. He would talk about the role and function in training of a science journalist and how scientists should approach the process. He will discuss and describe, count and evaluate the sort of coverage in the media, look at the process and comment on it.

†Based on an interview with Toss Gascoigne on 7 December 2010.

*A report on the 11th International Public Communication of Science and Technology Conference on the theme 'Science Communication Without Frontiers', held at the NASC Complex, Pusa, New Delhi, during 6–10 December 2010.

Caroline Wehrmann (Delft University of Technology, The Netherlands).

Challenges facing science communication

Andrew Pleasant (Canyon Ranch Institute, Tucson) identified that the challenge of communicating science is not only due to the scientific illiteracy of the public, but also due to ineffectiveness with which scientists convey information to the public. Specialization in education, funding streams and in the publication process can decrease the ability to communicate across disciplines and with the public due to increasing use of technical jargon. Brian Trench (Dublin City University, Ireland) listed other challenges, including identifying communicators in science communication, the role of social media and strengthening the training of science education. He added that scientists are underrepresented in the blogosphere and possibilities of using this as a forum to interact are yet to be explored.

In The Netherlands, as Maarten van der Sanden (Delft University of Technology) puts it (pers. commun.), there is a gap between society and innovation. Also, there is gap between theory and practice of science communication. How to professionalize science communication and keep the public attached is another challenge. In Brazil, a significant part of the science stories is either a translation of newspapers or press releases from abroad. This is true of India as well! Professionalization of science communication is being done, but there are only few courses offered at present in Brazil. Increasing the opportunities for journalists and exploring the internet and societal networks further are other challenges facing science communication in Brazil, according to journalist Luisa Massarani.

In India, the challenges include lack of training in scientific reporting for journalists and financial constraints to travel for international conferences. There are a few science communicators in India and also concerns of exaggerating scientific findings in the media, according to Arul Aram (Anna University, Chennai). According to Binod C. Agarwal (Taleem Research Foundation, Ahmedabad), there is low appreciation of science in the Indian media and this leads to diversion of journalists from science reporting.

Means of communicating science

Although most of the communication of science occurs in English, which makes it universal, the role of regional languages or mother tongue in communication cannot be undermined. Arts-based approach involving the use of plays, theatre and painting can also help communicate science in an interesting and engaging way, according to Stefan Grünert and Carmen Schmid (Vienna). 'Paint Your Ph D' is one such successful example of a creative approach to science, where the Ph D thesis was condensed into a painting by the researchers. Communication of science is also achieved through science exhibitions. But such activities need to be designed based on the analysis of the objectives of science communication. Public communication of science and technology can be achieved through field visits, science exhibitions, quizzes, stamps, scientoons, etc. Science blogs are another relatively recent addition to the means of communicating science.

Informal learning of science could also be in the form of visits to museums, zoos, sanctuaries, planetariums, etc. According to a report 'Learning science in informal environments: people, places, and pursuits', brought out by the United States National Academies in 2009, 'informal environments can have a significant impact for individuals from non-dominant groups who are historically underrepresented in science', highlighted Bruce Lewenstein (Cornell University, USA). The role of media in communicating about climate change, HIV, energy conservation, and other issues of public interest was also discussed in the conference. The effectiveness of media in the energy conservation awareness campaign was presented by Bimal Krishna Sarma (Guwahati). Sarma revealed that mass media could be counterproductive if the message arouses fear, or is controversial. Parul R. Sheth (National Centre for Science Communicators, Mumbai) emphasized the role of mass media in spreading awareness about HIV.

Public Communication of Science and Technology network and its origin

The International Network on Public Communication of Science and Technology (PCST) is one of the most active international networks. It began in 1989 when the first International Meeting on Public Scientific Communication was held in France (http://www.upf.edu/pcstacademy/_docs/PCSTleaflet.pdf). PCST 2010 was held in India: a pre-conference in Khajuraho, main conference in New Delhi, and post-conference in Jaipur. The next PCST will be held in Italy in 2012.

Bernard Schiele[†], one of the founding members of PCST network, says that the idea behind the network was to bring together two types of experts – researchers and journalists – in the field of science communication and make them interact as much as possible for exchange of ideas, developing projects, and to begin long-term collaboration. So far this has been successful. But as everything evolves over the years, the field is now more structured than it was before. There are formal teachings in science communication and a lot of research is being done. Since the network began, there have been several publications. There is a peer-reviewed journal, *Public Understanding of Science*, that is read around the world. Science journalism has also evolved. It has become more professional. There are many graduate and postgraduate programmes that train people either to become science journalists or to reflect or research upon journalism. Every field has its own set of challenges and so does science communication. It is a challenge because we live in a fast-changing world from the view of scientific development, which brings in new ideas and new technologies every day that we have to cope with and change in the projection of knowledge itself!

[†]Based on an interview with Bernard Schiele on 9 December 2010.

Scientists as communicators

There seems to be a consensus over the view that both scientists and journalists are significant for the communication of science. A strong scientist–media interface can therefore help strengthen the process of science communication. In the UK efforts are being made to train scientists for better communication. One such course is being run by the Royal Society in London (http://royalsociety.org/Communication-and-Media-Training/). Australia also conducts media training workshops for scientists (http://www.scienceinpublic.com.au/).

Though the general perception is that most scientists cannot communicate well, a recent article (http://www.nature.com/news/2011/110126/full/469445a.html) in *Nature* calls it a myth and propounds, 'Of course scientists can communicate'. It also goes on to add that 'scientists are not the only people to blame for a problem in communication'. Here, I cannot agree more with Tim Radford when he writes, 'Those who can think clearly can usually write clearly: thoughts have value only when expressed, and the more clearly they are expressed, the greater their potential value'.

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MEETING REPORT

Solanaceae conference*

To take stock of the understanding of genetics, molecular biology and breeding efforts for solanaceous crops, the Solanaceae Conference (SOL) is being regularly organized every year, starting in 2004, when the first SOL was held at Wageningen, The Netherlands. The 7th SOL held at Dundee, Scotland, was attended by about 250 scientists belonging to as many as 30 countries. This conference was important because significant amount of work has been done in Solanaceae genomics research since the last conference in 2009 and particularly with the near completion of the tomato and potato genome sequencing projects.

The symposium began with a welcome address by Howard Davies (Deputy Director, Scottish Crop Research Institute (SCRI), Dundee) and SOL 2010 organizing committee members mentioning the rationale behind organizing the 7th SOL meeting. David Baulcombe (University of Cambridge, Cambridge) discussed about the genome interactions in hybrid *Solanum* species and RNA silencing. He showed that there are hybrid-specific small RNAs (sRNAs) associated with suppression of gene expression and epigenetic modification of the genic DNA. However, they are absent in the F_1 hybrids and present only in F_2 and introgression lines. These hybrid-specific sRNAs may influence transgressive phenotypes in hybrids, including those affecting agronomic characteristics.

The conference comprised of the following themes: SOL biodiversity and evolution; Plant growth and development; The SOL genomes; Biotic stress; Abiotic stress; Translational genomics and molecular breeding; Informatics and computational biology; Tools and emerging technologies; Tomato; Potato; Other Solanaceae species; Metabolomics and proteomics, and Functional genomics and systems biology and SGN workshop.

As expected in the current post-genomics era, the major emphasis throughout the symposium was on biotechnology/genomics/metabolomics/proteomics/systems biology and their implication on the study of genetics for solanaceous crops improvement. Mario Vallejo-Marin (University of Stirling, Stirling) discussed how the interaction between anther morphology and pollinator behaviour in heterantherous *Solanum* determines the fate of pollen. Andrew R. Leitch (Queen Mary University, London) spoke on the evolution of allopolyploids in the genus *Nicotiana*. In other presentations, emphasis was laid on the study of plant growth and development, and status of SOL genomes sequencing. Mondher Bouzayen (Université de Toulouse, Toulouse) spoke on the tomato Auxin Response Factor (ARF8) which is central to the mechanism controlling fruit-set initiation. One session was devoted to 'The SOL genomes'. Giovanni Giuliano (Casaccia Research Center, Rome) presented the status of tomato genome sequencing and about the large-scale genome duplication and synteny. He reported that 33,926 predicted proteins are in agreement with previous estimates of tomato gene number. An average gene density of ~23.4 kb/gene reflects the occurrence of large 'gene deserts'. C. R. Buell (The Potato Genome Sequencing Consortium, Michigan State University, Michigan) presented an overview of the potato genome sequencing. Buell and his group have annotated the potato genome and are currently analysing the transcriptome and genes critical to potato biology. He emphasized on the timely release of the potato genome sequence data that will provide the entire Solanaceae research community an opportunity to exploit the genome sequence for fundamental and applied biological studies, including plant breeding. N. Ivanov (Philip Morris International, Neuchâtel) talked about the challenges of tobacco genome sequencing and assembly. He concluded by saying that a successful high-quality assembly of such a complex genome requires the use of a physical map to overcome the challenges of polyploidy and high repeat content. Doil Choi (Seoul National University, Seoul) talked about the progress of pepper genome sequencing project. Choi and his group have assembled the 1270 pepper BAC sequences generated by Roche/454 FLX,

*A report on the 7th Solanaceae Conference (SOL) held during 5–9 September 2010 at Dundee, Scotland and jointly organized by the Scottish Crop Research Institute and the UK-SOL.