Achieving Public Understanding of Research in Developing Countries

A workshop and supporting activities
8-9 December 2002, Cape Town, South Africa

Organizers:

Bruce V. Lewenstein, Cornell University, USA
Marina Joubert, Foundation for Education, Science, and Technology, South Africa

Funded by the U.S. National Science Foundation (NSF INT 0221207) with additional support from South Africa's Foundation for Education, Science and Technology

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The goal of the workshop was to explore differences between how "public understanding of science" is perceived in the developed world and how it might be perceived and defined in the developing world. We were particularly interested in whether theoretical ideas about public understanding emerging from recent work in the developed world would have any relevance in the developing world. The initial proposal contains a full discussion of these issues.

The workshop was held in Cape Town, South Africa, immediately following the 7th International Conference on Public Communication of Science and Technology, "Science Communication in a Diverse World." The workshop brought together more than 50 people from 16 countries on 6 continents. A list of participants is available here, and some of them are pictured below.

Before the workshop, participants were asked to respond to the following challenge:

> Prepare a 2-page "discussion statement" about challenges and opportunities for achieving public understanding of research in developing countries. They will be read in advance of the conference by workshop participants to “prime” the discussions among a group coming from different professional and geographic perspectives.

The original discussion statements prepared in response are posted online.

The agenda for the workshop included some prepared statements, and then a series of breakout discussions.

A preliminary report from the meeting was posted on SciDev.Net in January 2003.

URL: http://www.pcstnetwork.org/PURWorkshop
Maintained by: Bruce V. Lewenstein
Last modified: 17 November 2005

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14 January 2004

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SciDev.Net
Science and Development Network

FEATURES

A developing-world take on science literacy

Bruce Lewenstein
8 January 2003
Source: SciDev.Net

"Science literacy" is generally believed to be a good thing. In a world infused with science and technology, it seems obvious that it is desirable that more people understand scientific research and how it can be used to improve life. In developing countries, modern science and technology offer hope for addressing the pressing needs of improved nutrition, public health, safety, and shelter.

But often when something seems obvious, it's a good idea to look more closely. In December 2002, a two-day workshop in Cape Town, South Africa, found that new definitions of science literacy are needed to ensure that public communication of science and technology addresses the real needs of people and societies in the developing world.

The workshop "Achieving public understanding of research in developing countries" was part of the 7th conference of the International Network on Public Communication of Science and Technology. It brought together more than 50 individuals from 16 countries and six continents — journalists, scientists, museum and science centre staff, policy analysts, community outreach co-ordinators, and academic researchers.

We held a common belief that the "public understanding of research" — understanding the scientific process and the results of cutting edge work — is essential for any modern society, whether in the North or South. What we didn't know was whether our vision of what makes a good public understanding programme in developed countries had any relevance in the developing world.

Discussions in this field often focus on three kinds of science literacy: practical, civic, and cultural. They assume that, once essential human needs have been met, the ability to make personal or policy decisions about science-based issues essentially revolves around being able to use complex information, and is not constrained by political or economic factors.

In the developed world, debates about topics such as nuclear power or genetically modified foods take it for granted that access to energy or nutritious meals is not at stake, and that individuals are free to make meaningful choices. Moreover, developed-world scientists take as a given that science is as fundamental a part of modern culture as music or art. Even the definition of science in the developed world often seems unproblematic: science is the product of cutting-edge research conducted by methods and techniques that have emerged from Europe since the 17th century.

But for much of the developing world, public understanding of research is about much more basic issues: providing clean water for drinking and cooking, learning the essential link between unprotected sexual intercourse and HIV infection, and so on. In this developing-world context, it is not clear that museum exhibits about electricity or magazine articles about in-vitro fertilisation are relevant in addressing the needs of most of the population.

To give just one example, last year during a class on science journalism in Johannesburg, South Africa, a student from a rural district asked me how to talk about HIV infection. "In my community, it is taboo to talk about sex," he said. "In our language, I cannot even use the words for 'penis' and 'vagina'. How can I explain how to avoid HIV infection when I don't even have words for explaining the acts that lead to infection?"

Public understanding of science in his community is not about the latest immunological results, nor about acquiring greater political power, or improved use of scientific instruments; it is about addressing fundamental barriers to scientific information. These barriers are not caused by ignorance or hostility, but by the core conditions of the developing world — local languages, poverty, lack of public health, lack of economic infrastructure and lack of education.

At the workshop in Cape Town, we found that we need to redefine our terms of reference. The developed world has the luxury of detached interest in reliable knowledge about the natural world. In contrast, public understanding in the developing world must focus on knowledge upon which one can act immediately.

Some of our more practical conclusions may be familiar: create databases of successful projects and opportunities for training, improve access to web-based materials (such as those on SciDev.Net), and provide ongoing support to people and projects. Some reinforced the continuing need to evaluate the effectiveness of particular programmes and to recognise that there is no one "best" practice, as all projects need to be adapted and used in particular local contexts.

But our more far-reaching conclusions forced us to redefine science literacy itself. Instead of "practical" science literacy, Nalaka Gunawardene, a veteran science and environment journalist from Sri Lanka, talked about defining public understanding as "the minimum knowledge to make life better". He advocated thinking in terms of survival: of preventing dehydration of babies, of campaigning for better road safety, of promoting the safe use of pesticides.

Similarly, "civic" science literacy looks different in the developing world. Carlos Setti, a Brazilian science writer, reminded us of the gaps between rich and poor in developing countries and urged us to always put public understanding programmes "at the service of overcoming social and regional inequalities" — a reminder that choices about how to allocate scientific and technological resources are not politically neutral.

But in the end we still concluded that research — including open and honest appraisal of the reliable knowledge embodied by indigenous systems — offers tools of great value to the developing world. And we continued to believe in the value of public understanding of research for local culture, and thus in the need to convey the excitement of research, especially to children. After all, recruiting the next generation of scientists is as critical, perhaps more critical, to the culture of the developing world than to the developed world.

Bruce V. Lewenstein is associate professor of science communication at Cornell University, editor of the journal Public Understanding of Science, and webmaster for the International Network on Public Understanding of Science and Technology.

Related links:
International Network on Public Understanding of Science and Technology

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print

Workshop Proposal
submitted to U.S. National Science Foundation, International Programs
Project director: Bruce Lewenstein, Cornell University

Title

Achieving Public Understanding of Research in Developing Countries

Summary

This proposal requests support for a workshop to be held in December 2002 in Cape Town, South Africa, and associated activities to identify issues associated with achieving public understanding of research in developing countries. The workshop will look both at implementation issues for existing and proposed programs, and at longer-term research issues of interest to the scholarly and practitioner communities. Two cross-cutting issues will be explored: (1) the differences between public understanding of *science* and public understanding of *research,* and (2) the differences between a traditional *deficit* model of science communication and newer *contextual, lay knowledge/expertise,* and *participation* models of science communication. The primary funding request is for funds to bring representatives from developing countries to the workshop.

Project description

This proposal requests support for a workshop to explore "the public understanding of research" in developing countries. The workshop will be scheduled for 8-9 December 2002 in Cape Town, South Africa, immediately following the 7th International Conference on Public Communication of Science & Technology, titled "Science Communication in a Diverse World." The workshop will bring together scholars and practitioners from around the world, with special emphasis on participation from the developing world; a substantial fraction of the proposal's request is for funding for participants who would otherwise not be able to participate in an international workshop. The workshop will focus on two inter-related issues: (1) the differences between public understanding of *science* and public understanding of *research,* and (2) the differences between a traditional *deficit* model of science communication and newer *contextual, lay knowledge/expertise,* and *participation* models of science communication.

Conceptual background

In the years after World War II, efforts to address public understanding of science were often motivated by an equation of "understanding" with "appreciation" -- greater public understanding meant greater public appreciation of the benefits that science would provide to society (Lewenstein 1992). That led to many efforts to improve public understanding of science by providing more information about science. These efforts were motivated by a belief that if the public only knew more, it would support science more (both materially through political support and intellectually through more skeptical attitudes to "bad science"). This approach has come to be called the "deficit" or "linear dissemination" model, one in which it is assumed that the public has a deficit of scientific knowledge, which must be filled by more and better dissemination of appropriately written and produced scientific information (Hilgartner 1990; Ziman 1991).

But as a variety of scholars have shown in the last decade, public understanding is a much more complex thing. Several factors are critical:

- <u>The equation of science and technology leads to tension between "good" knowledge and "bad" effects.</u> Science has often been "sold" on the basis of its ability to generate new technologies, including medicines, energy sources, space exploration, materials, and information processing tools (Nelkin 1995). But those technologies are not uniformly perceived as inherently good, and in their implementation many have led to highly publicized events that are perceived as damaging to individuals or the environment -- such as the space shuttle Challenger explosion, the Chernobyl and Three Mile Island nuclear accidents, the Bhopal industrial chemical accident, the Jesse Gelsinger gene therapy death, frequent computer-virus attacks, concerns about privacy of computer-based information, and so on. Members of the public recognize the disjunction between claims that science is inherently good because of its ability to generate technologies, and a reality in which technologies are not necessarily good. It is this disjunction, rather than any perceived dangers of science itself, that lead to public distrust in science even as members of the public recognize the benefits that science can provide (LaFollette 1990; Office of Science and Technology and Wellcome Trust 2000).

- <u>The contexts in which people encounter science often make issues of institutional trust and credibility paramount in how people assess science.</u> "Science," as an abstract concept, does not exist for most members of the public. Rather, they encounter scientific knowledge and science-based institutions (especially industries) in a variety of contexts, ranging from the workplace to schools to doctors' offices to political debates. In those contexts, people's assessments of scientific knowledge cannot be separated from judgments about the previous behavior of the institutions and ideological commitments (for example, rejection of a government role in personal health behavior, or commitment to "green" environmental action). In this conception, public understanding is less about knowledge than about assessments of the institutional place of science (Irwin and Wynne 1996; Yearley 2000).

- <u>The contexts in which people encounter science are often ones in which lay people have relevant knowledge that scientific experts do not have.</u> When families face dread diseases or farmers face uncertainties about new crops, they bring their own knowledge and experience to the situation. A family may know that Aunt Nell's relatives have a long tradition of "giving in" to cancer, and that therefore she will be unlikely to be willing to undertake a particularly aggressive treatment regime, no matter how a physician presents the statistical risks and benefits of the treatment. Or a farmer may know that water runoff collects along one side of his fields, and therefore suspect that airborne contaminants that have dusted his crops are probably more highly concentrated on that edge rather than being evenly spread as scientific models might imply. Sociologists of science have called attention to this "local knowledge," and contrasted it with theoretical knowledge brought to local contexts by scientific experts. In many cases, local knowledge may be as relevant to appropriate decisions as systematic theoretical knowledge (Wynne 1991; Irwin and Wynne 1996).

- <u>In a world committed to democratic action, relinquishing authority to scientific experts runs counter to prevailing values.</u> The essential tension for science in modern democracies is the tension between scientific expertise and public control. Scientists are committed to the belief that properly developed and tested knowledge of the natural world provides the best possible guide for action. Producing that knowledge, and often understanding it fully, requires levels of education and commitment far beyond what most members of the public can achieve. Yet at the same time, science has achieved its many successes precisely because of the freedoms associated with a democratic society in which open debate, meritocratic access to resources, and broad participation are perceived as fundamental criteria for the development of new knowledge (Hollinger 1983). Scientists cannot claim those values for themselves without appearing hypocritical if they do not allow members of the public with the kinds of local knowledge described above full participation in the direction of scientific policy itself, as well as in public policy decisions that are based on scientific knowledge (Sclove 1995).

Together, these issues (supported by a host of more specialized studies) have led to the development of a new models of public understanding of science, ones that stress the need to move beyond "deficit/dissemination" models of scientific information and look at ways of integrating public participation into various levels of scientific debate (Wynne 1991; Ziman 1991; Irwin and Wynne 1996; Gregory and Miller 1998). Some of the activities and ideas associated with these approaches include websites or brochures that distinguish between the "general" public and more specific publics focused on particular issues or encountering science in particular settings (the "contextual model"), such as booklets on the relationship between drugs and brain function targeted at low-literacy adult audiences (who often face challenges associated with drug addiction) {Baker, 1995 #3981}; new approaches to providing "a place at the table" for relevant advocacy groups in the direction of particular areas of research (the "lay expertise model"), as has happened in breast cancer and AIDS research (Epstein 1996); and creating new forums for public engagement in policy issues (the "participation model"), such as public consensus conferences on genetically modified foods, a technique that has been applied in a variety of countries (Einsiedel et al. 2001).

In addition to these new models of science communication, researchers are returning to an issue identified in many definitions of "science literacy" {Miller, 1983

#1214; Project 2061, 1989 #2079; Bybee, 1997 #3865}: the difference between scientific facts and the scientific process. Virtually all commentators, whether coming from the perspective of working scientists {see, for example, Wolpert, 1992 #3159} or sociology of science {Collins, 1993 #3566}, have highlighted the importance of helping nonscientists understand the ways in which scientists work and draw conclusions, the habits of mind and practice that lead to reliable knowledge about nature. To that end, the National Science Foundation has in recent years created a program that focuses on public understanding of *research* rather than public understanding of *science* {Field, 2001 #3978}.

<u>What's missing in the new work</u>

The new models of public understanding have emerged largely in research conducted in highly developed industrial countries, especially the United Kingdom and the United States. They assume that people are making personal or policy decisions in contexts in which essential human needs have been met, and where the choices involve access to information, political or social power, and respect for differing social values. In the developed world, debates about nuclear power or genetically-modified foods take almost for granted that access to energy or nutritious meals is not fundamentally at stake.

But for much of the world, "public understanding of science" is about much more basic issues: producing and protecting clean water for drinking and cooking, access to pharmaceutical treatments for infections, malaria, or tuberculosis, creating infrastructure for public health systems to nurture pregnant women and then their newborn children. Public understanding of science is about learning the essential link between sexual intercourse and HIV infection, or between boiling and filtering water and avoiding cholera or other widespread diseases {Jasanoff, 1996 #3979}. In the developing world context, it is not clear that consensus conferences about genetically-modified foods, or museum exhibits about electrical phenomena, or magazine articles about in-vitro fertilization can address the needs of most members of the population.

To give just two personal examples: In 1996, I visited the newly-opened Indonesian Science and Technology Center in Jakarta, 24,000 sq-meter, 3 story facility. A memo I wrote afterwards reported that "the science museum is open, but still only partially full. It has about 200+ exhibits…. A few of these appear to be designed for interactive science museums, but many appear to be last year's trade show booths, ranging from a BMW exhibit touting its new aluminum drive shaft to a British defense contractor's exhibit on the lethality of its missiles." On that same visit, I walked through slums with open sewers and begging children. A science museum built on the developed-country model, especially a museum in a country ranked as "severely indebted" by the World Bank (www.worldbank.org/data), simply wasn't serving the needs of the citizens who funded it.

In July 2001, during a class on science journalism in Johannesburg, South Africa, a student from one of the rural districts asked me how to talk about HIV infection. "In my community, it is taboo to talk about sex," he said. "In our language, we do not even have words for 'penis' and 'vagina.' How can I explain how to avoid HIV infection when I don't even have words for explaining the acts that lead to infection?" Public understanding of science in his community is not about acquiring greater political power or greater facility with scientific instruments; it is about addressing fundamental barriers to scientific information, barriers not caused by ignorance or hostility, but by the core conditions of the developing world – language, poverty, lack of public health, lack of economic infrastructure.

The need to adapt new models to developing countries

The conceptual developments in the public understanding of science field suggest that attempts to address the needs of the developing world simply by "filling the deficit" of poor knowledge are likely to fail. But it is not clear how "contextual," "lay expertise," or "participation" models can operate in situations where basic literacy, exposure to scientific approaches, or stable democratic structures are not in place. It seems likely that the public understanding of science "problem" is simply not the same in developing countries as in the developed world. How can websites or brochures target specific audiences if huge proportions of the audience are neither literate nor able to access interactive Internet-based media? How can "lay expertise" (for example, community-based knowledge of traditional remedies) be integrated to scientific understandings when most of the population has no access to even basic health care? How can complex mechanisms of public participation in policy debates be built when basic issues of fair voting and democratic representation are hobbled by inefficient, corrupt, or ethnically-based rivalries and leaders? The context in developing countries may be so substantially different than the developed world that the new models may be incorrect or inappropriate. At the very least, they need review to see how they fit into contexts in which core concerns about public health, access to technological resources, and basic literacy are key elements of everyday life.

The scope of questions to be asked is vast if we are trying to adapt the new models of public understanding to the developing world. What levels of knowledge are already there? What attitudes toward modern science and technology exist? What meanings do science and technology have in developing countries? What activities are already in place? What has been the response to those activities? What impact have they had? Which issues are primary: public health issues? environmental pollution issues? access to pharmaceuticals? access to information technologies? Do the concerns with models of science communication fit the needs? What about the distinctions between public understanding of science and public understanding of the research process – do they have meaning in communities without even a semblance of universal education?

Because the scope of questions is so large, it seems inappropriate to begin with a specific research project. Instead, this proposal is to bring together a collection of knowledgeable practitioners (of public communication of science and technology), scholars, and scientists in a workshop setting to explore the issues and to build networks and collaborations that can lead to innovative public understanding projects and research.

Activities

The project will be based on the following activities:

1. Recruitment of individuals. Approximately 25-30 practitioners and researchers in the general field of public communication of science and technology will be recruited from around the world, with heavy emphasis on individuals from developing countries.

2. Pre-circulated "opinion pieces." Each participant will be asked to submit, by 1 October 2002, a 2-page statement about issues s/he believes are important to consider in achieving public understanding of research in developing countries. These statements will be circulated to all participants, via airmail, e-mail, fax, or password-protected website.

3. Panel discussion. A 3-hour panel will be held at the 7th International Conference on Public Communication of Science and Technology, "Science Communication in a Diverse World," 5-7 December 2002, in Cape Town, South Africa. The panel will consist of selected members of the team identifying recurring issues in the opinion statements, or laying out the arguments from particularly compelling statements, with attention to the range of perspectives from practitioners, researchers, developing world, and developed world.

4. Workshop. Immediately following the PCST meeting, a 1.5 day workshop will be held in Cape Town to explore the recurring issues in greater depth. The workshop will consist of both plenary discussions and break-out groups. Potential outcomes include fuller papers on particular issues, proposals for particular public-understanding-of-research activities, and networks for future collaboration. Participants will be encouraged to prepare fuller papers for submission to appropriate outlets, both regional and international.

5. Website. A project website will be established, probably within the structure of the International Network on Public Communication of Science & Technology (www.pcstnetwork.org). The website will contain the texts of the "opinion pieces" (made public after the workshop), any fuller papers that are developed, and a chat or discussion space for continuing interaction. The website and related materials will be publicized through the PCST network's listserv (PCST-L) and other newsletters, websites, mailing lists, etc.

Preliminary list of invitees

To achieve a productive mix of new projects and research collaborations, participants will need to be selected who have a commitment to sustained work in the area of public understanding of research, an ability to engage actively with diverse ideas and perspectives, and a willingness to entertain new and sometimes challenging ideas. At least three existing networks of people provide potential sources for participants:

- The International Science Writers Association (http://www.eurekalert.org/static.php?view=iswa) is a loose network of science journalists and other writers worldwide who specialize in science, technology, and the environment. The 300+ ISWA members are often the major science journalists in their countries, active in national newspapers and broadcasting networks. They have been active in creating a new World Federation of Science Journalists, which will be inaugurated in November 2002 in Brazil, under the auspices of UNESCO.

- The International Network on Public Communication of Science and Technology (www.pcstnetwork.org) is a collaboration of science journalists, museum personnel, scientists, public information officers, scholars of public understanding, scientists, and others working to build worldwide links between practitioners and researchers. It meets biennially and supports both a website and a listserv, as well as various research collaborations.

- SciDev.Net (www.scidev.net) is a new website devoted to "news, views, and information about science, technology, and development." Sponsored by the journals *Nature* and *Science*, and by the Third World Academy of Sciences, SciDev.Net includes a substantial "dossier" on science communication, including online debates, position papers, and news reports.

Through these organizations (I am a member of the first two, and have corresponded with David Dickson, former editor of *Nature* and founder of SciDev.Net), I have identified a wide range of individuals who might participate in the workshop. In discussions with the leaders of the organizations, and with due attention to geographic, professional, ethnic, gender, and religious diversity, we will invite approximately 25 people to participate in the workshop. Some of the individuals who have expressed interest or who might be invited (not all have been contacted yet) include:

- Fabiola de Oliveira. Former public information officer at Brazilian Space Agency, now professor of science journalism at Univ. Vale do Paraíba in Sao Jose dos Campos; host of 3rd World Congress of Science Journalists, scheduled for November 2002, at which a new World Federation of Science Journalists will be announced
- Prakash Khanal. Science journalist in Nepal, founder of science communication outreach program at Royal Society of Nepal in the 1980s, active promoter of Third World Academy of Science Journalism, a training center that might be established under the auspices of the Third World Academy of Sciences.
- Nalaka Gunawardene. Science/environmental journalist in Sri Lanka. Active in many international projects, such as International Television Trust for the Environment (TVE), Sri Lanka Environmental Television Project (SLETP,

funded through the Canadian IRDC), and a former "office manager of sorts" to legendary author Arthur C. Clarke

- David Dickson. Former news editor of *Nature*, founder and editor of SciDev.Net (www.scidev.net), a free-access, Internet-based network devoted to reporting on and discussing those aspects of modern science and technology that are relevant to sustainable development and the social and economic needs of developing countries.
- Bill Nye. Internationally known as "The Science Guy," Nye is a stand-up comic who has turned his talents to science education through his syndicated TV show and related website and books. He has explicitly expressed interest in participating in this workshop.
- Jesús Mendoza-Alvarez. Editor-in-Chief and founder of the monthly magazine *Conversus, where the science becomes culture,* published at the National Polytechnic Institute, Mexico. He previously founded and edited a number of other science outreach publications, including the well-known *Investigacion hoy*, which he edited from 1990 to2000.
- Dhruv Raina. A historian of science in New Delhi, India, with an interest in public communication of science and technology.
- Yuwanuch Tinnaluck. Officer of the National Science and Technology Development Agency, Bangkok, Thailand, with responsibility for public understanding of science and research. Has studied public communication of science and technology in France, and serves on the scientific committee of the PCST network.
- Lisbeth Fog. President of the Colombian Association of Science Journalism, Fog is also a freelance science writer for national newspapers, and Colombian and Latin American magazines. She has a master's degree in science reporting Boston University, earned as a Fulbright scholar. She has organized and attended science communication seminars worldwide.

Additional participants might be recruited from a team of young black scientists who came from South Africa to Washington, DC, in summer 2001 to be trained in radio journalism, from solicitations to members of ISWA, or through discussions on the listserv run by the PCST Network (PCST-L). The PI will consult with leaders of ISWA, the PCST Network, and SciDev.Net, but will make final decisions on invitations himself.

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Public Understanding of Research in Developing Countries
A discussion workshop
Cape Town, South Africa
8-9 December 2002

Agenda
As of: 26 November 2002

Saturday, 7 December
During the PCST7 meeting, one panel will be devoted to "public understanding of research in developing countries." It will take place on Saturday, 7 December, at 14:00 (one of the last sessions of the main meeting) and will feature several participants from the PUR workshop, followed by a general discussion.

Speakers:
Bruce Lewenstein, Cornell University, USA
Manoj Patairiya, Indian Journal of Science Communication, India
Luisa Massarani, Museu da Vida/Fiocruz, Brazil
Lali Ngozi, science journalist, South Africa

Sunday, 8 December
The workshop on this day will meet at the MTN ScienCentre, Century City, Cape Town

	Breakfast at hotels
08:00	Buses to MTN ScienCentre, Century City, Cape Town
08:30	Registration.
09:00	Introductions
09:30	Key themes from the "opinion" pieces Dave Chittenden, US: Museums Kenneth Payle, South Africa: Indigenous knowledge systems Simon John, South Africa: Schools
10:30	Tea, coffee, and biscuits
11:00	Key themes from the "opinion" pieces Jeanette Hewitt, South Africa: Participatory community research Diran Onifade, Nigeria: Research infrastructure Shyama Kuruvilla, Switzerland/India: Systematic assessment
12:00	Discussion

13:00 Lunch
Keynote address from
Bill Nye, “The Science Guy”
Seattle, Washington, USA

14:00 Breakout sessions on:

- Best practices/demonstration projects
- Dealing with indigenous knowledge systems
- Working with national research systems
- Training for public understanding of research

Task: Each group should identify key challenges facing anyone seeking to improve public understanding of research in the context of the group theme (such as the challenges of integrating indigenous knowledge systems, or creating training programs in science communication in developing world contexts). Be concrete: talk about programs that have worked and programs that have not worked. Talk about how to meet the needs and goals of government agencies, international development agencies, NGOs, etc. Identify the goals that can reasonably be met by successful programs. Brainstorm possible projects that you would like to see implemented, either in your own country, regionally, or broadly internationally.

15:30 Tea, coffee, and biscuits

16:00 Reports from breakout sessions. Discussion.

18:00 Reception with delegates to Southern Africa Association of Science and Technology Centers (SAASTEC) conference

19:30 "i Klips! African myths about the moon in the sun"
The play will compare and contrast indigenous and Western interpretations of the eclipse event and use the eclipse as a means of introducing the ancient science of astronomy to the public.

21:00 Buses back to hotels

Monday, 9 December
The workshop today will meet at the Breakwater Lodge, V&A Waterfront, Cape Town

	Breakfast at hotels
09:00	Recap of the previous day
09:15	Breakout groups • Best practices/demonstration projects • Dealing with indigenous knowledge systems • Working with national research systems • Training for public understanding of research Task: Plan specific activities addressing the theme of your group (such as new training programs or new collaborations to improve linkages between public understanding and national research programs), integrating suggestions and links to activities drawn from the reports made by the other breakout groups. Be ready to report back on specific opportunities or collaborations that your group believes should and could be undertaken within the next year.
10:30	Tea, coffee, and biscuits
11:00	Reports from breakout groups and wrap-up discussion
13:00	End of workshop

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Extending the reach of research through community participation

If I may be forgiven for my cynicism, then I'd like to begin by saying that the public that needs to understand research most in India is the select group of politicians and bureaucrats, policy makers who frame policies without much inkling of what's going on inside laboratories and what should be done to promote it. A country that chooses to have a film star as its health minister over a medical doctor (who turned a politician), lends itself to harsh scrutiny over issues like public understanding of health, science and research.

However, a country of over a billion population, 45 per cent of which cannot read or write, addressing the issue of public understanding of research is a Herculean task which requires a multi-pronged approach from as diverse sectors as possible. Recent experiences have shown that extending the reach of science and research through community participation has successfully broken the barrier between laboratory processes/findings and the public.

Relying on the traditional channel, media – print and electronic -- will not suffice as most of the newspapers in the country have folded up science and technology sections and none of the four 24-hour television news channels regularly cover science (not to talk of research); nor do they have any regular slot for science feature. Under such conditions, a fresh look is required at some of the models that have proved effective in enhancing the public understanding of science and research.

Talking of rural and semi-urban India, there is one example worth emulating: Agastya International Foundation (www.agastya.org) , a charitable trust registered in India and USA, is promoting applied research in education through science fairs and mobile science labs in rural areas. So far it has touched the lives of 25000 students and trained 2000 teachers to be more creative in their teaching. Having started from a small town Kuppam in the southern Indian state of Andhra Pradesh, it is now reaching out to the neighboring state of Karnataka.

As for urban India, a brilliant example is the science festival organized early this year in India by the British Council and the British High Commission. With focus on biomedical research, biotechnology, digital communications and environment, scores of Indian and British scientists participated in several public lectures, panel discussions and workshops that were organized across India. The festival turned out to be hugely successful in terms of people's participation and the amount of interest and valid questions that were generated in the areas of research covered by the festival.

Drawing from these two examples it can be argued that:

- New ways of targeting specific audience are required. Given that a large number of high school children gather to meet the renowned defence scientist (and the present President of India) A.P.J. Abdul Kalam when he visits schools (under his meet 100,000 students by 2003 program) to kindle students' interest in science and research, more eminent people from the field should come forward for similar ventures
- Understanding of research varies from region to region and also within regions, so it'd be worthwhile experimenting information dissemination in the vernacular as India has 18 official languages but newspapers are published in about 100 different languages and dialects
- It's research associated with public health that draws most attention (personal example: large number of telephone calls to my newspaper office when I wrote about embryonic stem cell research and how an Indian company was working towards providing treatment for diabetes and cardiovascular diseases)
- The level of understanding on even basic health issues is abysmally low with people even in urban areas not having the vaguest idea about how drugs are developed, how much it costs to develop one drug, what are the banned drugs and why are they available over the counter (a recent example is of banned drug Nimesulide which is widely prescribed in India)
- Institutions like the British Council, American Center, Alliance Francaise along with local educational and research institutions should organize more and more public lectures, workshops, exhibitions, interactive programs on topical issues and subjects

In a country like India where research institutions hardly have a newsletter worth its name, it'd be valuable for such institutions to revamp their public information system and let the media (with whatever little space and time it gives to such news) carry the news from their labs. The quality of science depends a great deal on not just on how well questions are answered but also on the quality of the questions that are asked

Since corporate research budgets are rising much faster than government and charitable foundations, they decidedly have research findings and processes to share with the public. So far the corporate community has done this on its own terms, but time has come when it should play a more responsible role in disseminating corporate research information to the public.

Post Script: There is a class of scientists which believes that both the public and scientific community are better off without worrying too much about public understanding of research. It is argued that while information technology revolution has given enough means to the educated to be informed about research if they choose to do so, taking plain education to the uneducated in rural India will be a great service.

-------Seema Singh

SCIENTIFIC DISSEMINATION
IN TACKLING BRAZILIAN INEQUALITIES

Carlos Augusto Setti(*)

Scientific research and scientific journalism in Brazil have a long tradition and are heavily dense. In 2002, some coincidental facts corroborate this statement.

Ciência Hoje ("Science Today), magazine published by the Brazilian Society for the Progress of Science (SBPC), a non-governmental body founded in 1948, completes 20 years.. The *Conselho Nacional de Desenvolvimento Científico e Tecnológico* (National Council for Scientific Research), a government agency, celebrated its 50th anniversary. Also in 2002, Brazil lost José Reis at 95 years of age, a physician and journalist with almost 50 years of activities in scientific journalism, whose name has been given to the various and most important awards of Science and Technology dissemination in Brazil.

Also in this year, the *Associação Brasileira de Jornalismo Científico* (Brazilian Association of Science Journalism), founded by José Reis, celebrates its 25th anniversary, with 350 associates. The year 2002 also finishes with the creation by the Federal Government of three new research institutes – the Bioamazon, the Semi-arid, and the Nanotecnology; fiscal incentive measures to promote national investments in technological innovation; the complete genetic sequence of *Xylella fastidiosa* bacteria; with the country in the world's 17th position in number of scientific papers accept by the international indexed publications; an active and relevant participation in the International Space Station program and the Human Genome Project; and the organization of electronic general elections with the participation of 115 million voters.

Considered separately, these data could give a wrong idea that Brazil already belongs to the so-called First World, but they confront the reality of an extremely unequal country under social and regional points of view. Approximately 34 per cent of the population are below the poverty line; 11.4 per cent of citizens at 10 years of age or above are illiterate; the minimum wage is just over US$50.00; and the infant mortality rate is 34 infants per thousand born alive, most deaths are caused by infectious and parasitic diseases and perinatal infections.

When observing the country as a whole, it is possible to see greatly developed regions and social groups, which are very rich and sophisticated in science, technology, consumption and information access, and other regions and social groups that are extremely underdeveloped, presenting hunger, ignorance and serious obstacles to the full enjoyment of the main human conquests. Hence, the data above mentioned only corroborate the great differences in the country.

So, the main task of the professionals and institutions dedicated to the dissemination of scientific and technological advances should not be of linguistic nature only, that is, the translation into an accessible and understandable language of what happens in laboratories, research centers and universities.

This challenge is essential, but not enough. The main point of view defended by this paper 1is that <u>the set of activities with the aim of making scientific research public must be at the service of overcoming social and regional inequalities in Brazil</u>.

In this sense, the popularization of scientific research is firstly responsible for leveling deep criticism against economic, political and strategic conditioning factors of scientific investigation activities and the impacts (of economic, social, environmental, cultural, sanitary nature) they may cause to deepen those inequalities or not. The public understanding of scientific research cannot simply promote the "deification" of any discovery or innovation and be useful only to the propaganda of new products and the marketing of the large economic conglomerates, and hence to the increase of the elite's consumption capacity, which occurs quite frequently. It surely has to be attentive to the generation of knowledge that indeed contributes towards the actual sustainable development of the country, such as the discovery of a cure for tropical diseases, the search for alternative fuels, the wise exploitation of biodiversity and the increase in people's nutritional capacity.

Secondly, the popularization of scientific research must join education and communication programs that reach the neediest populations and regions, with the aim of promoting positive changes in them. Dispersed initiatives in this context, which need to be extended and systematized, have been successfully implemented in Brazil in the fields of environmental education, computing democratization, exact science teaching, sanitary education, AIDS prevention etc., for example, whether in schools, museums, universities, the media or through community activities organized by Non-Governmental Organizations.

The popularization of research also needs to value the national capacity of scientific investigation in a country with Brazil's characteristics. In the country, there is a huge gap between the excellence of research carried out in its several types of scientific investigation centers – this excellence is internationally acknowledged – and the absorption by the productive system of the knowledge produced in them. Impediments of economic nature prevent most findings and inventions by Brazilian researchers from being transformed into registered patents and into products and services elaborated within national territory by companies located in the country. Brazil only registers an average of 56 patents a year, while Korea, for example, registers 1.500.

It is also important that the popularization of research be in harmony with the premise that scientific knowledge is society's property and, hence, it must be under public control and be developed in a cooperative and collective way, consequently decreasing the distance between researchers and the members of the public. The acquisition by society of the knowledge of methods and techniques used in research centers and the objectives of ongoing experiments and tests must consist in a target to be achieved on a permanent basis.

The communication model to be implemented here should not be "transmission" of information (or "dissemination of innovations"), but "sharing" a common culture. Within this concept, the following items grow in importance: the opening of research centers and museums to the general public, with scientific education systems; a broader educational use of the media; the permanent scientific update of school curricula; incentives to the qualification of young scientists; and the permanent exchange between modern science and the traditional knowledge of indigenous populations and the people living in rural areas. In that manner, the scientific researcher disseminator is also responsible for showing to the population the actual work conditions of Brazilian researchers and scientific centers, being harmonized with the defense of increased public resources for the sector, which are generally scarce (Brazil invests only approximately 1.5 per cent of the Domestic Gross Product in Research & Development).

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Opinion Piece
Workshop on Achieving Public Understanding of Research in Developing Countries
Cape Town, South Africa, December 08-09, 2002

Public Understanding of Research in India : Challenges and Prospects

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Scientific literacy is necessary for the economic and healthy well being of the social fabric and every person, and for the exercise of participatory democracy. It also implies the ability to respond to the technical issues that pervade and influence our daily lives. It does not mean detailed knowledge of scientific principles, phenomena or technologies, however, it rather points out to the comprehension of what might be called the scientific approach, or the scientific way of conduct or the method of science. Public understanding of research keeps people aware about the latest in the field of research and development and helps them lead a life with better understanding of newer advancements. Developmental change emerges within specific economic, social, and ideological contexts, and in turn reshapes the thinking and working of institutions as well as individuals. The last two decades have been characterized by the rapid development of new scientific and technological advancements across a wide range of fields. Access to these advancements is distributed unevenly within the country. Even people in far flung areas often lack access not only to leading edge technologies, but also modern scientific knowledge. Participatory model of public understanding of research can help in this direction.

India has a rich tradition of communication, especially when it comes to masses. Folk arts, like Nautanki, Ramlila, folk songs and folk dances are immensely effective as the means of mass communication. India has a great tradition and a treasure of scientific heritage. Various classical scientific works were carried out in Indian subcontinent, in the fields of mathematics, astronomy, medicine, material science, etc. during ancient, medieval and modern periods, which still form a huge treasure of our scientific and cultural heritage. However, a remarkable gap between scientific knowledge and the common man remained during the entire span of time. These scientific texts were generally written in technical and classical forms and not in common man's language. With the passage of time, despite many political and social ups and downs, scientific knowledge and more precisely custodians of that knowledge mostly remained centered around the corridors of power. After Independence, science popularization was being taken up at various levels. The Scientific Policy Resolution of March 4, 1958 has been a guiding factor for development of science and technology in the country. With a view to integrate, coordinate, catalyze and support the efforts of science communication and science popularization in the country, the Government of India established the National Council for Science and Technology Communication (NCSTC) in 1982 as an apex body.

We have been using various means and modes for science communication, as follows :

(a) Print Media : Such as newspapers, magazines, wallpapers, books, posters, folders, booklets.

(b) Audio/Visual Media : Mainly radio and TV, besides, films, slide shows, bioscope.

(c) Folk Media : It has been a common observation, that through folk media, it is possible to achieve penetration to the segments where other media have limitations. Puppet shows, street plays skits, stage performances, folk songs and folk dances, nautanki and other traditional means of communication belong to this category. This media is cost effective, entertaining and offers two-way communication.

(d) Interactive Media : Science exhibitions, science fairs, seminars, workshops, lectures, scientific tours, conferences, vigyan jathas, etc. The advantage here being man-to-man and two-way communication.

(e) Digital Media : information technology has given birth to comparatively a new media, known as digital media. It includes Internet, CD-ROM, multimedia, simulations, etc. It has also made science communication simpler to handicapped segments of the society.

That apart, we are popularizing science through our 18 regional languages, to penetrate into local populace effectively. Selection of target audience has greatest significance. Our science communication efforts are aimed at various target groups, such as, common man, children, students, farmers, women, workers or specialists, etc. Various forms for presentation are being used to making science communication more interesting and enjoyable, such as science news, report, article, feature, story, play, poem, interview, discussion, lecture, documentary, docu-drama, scientoon (science +cartoon), satire, etc.

Some of the important modes and means of science communication in India are summarized below :

1. Popular S&T literature (articles/features in daily newspapers, periodicals; newsletters and specialized S&T magazines: comic strips, picture-cum-story books, wall charts etc.)
2. Exhibitions of S&T themes (temporary, permanent and mobile).
3. S&T and Natural History Museums (with permanent galleries on basic topics, on country's heritage and on famous discoveries and inventions, among others).
4. Science Centres and Parks (participatory and interactive activities and demonstrations to learn about S&T principles, applications and to encourage development of a spirit of enquiry among children and adults).
5. Contests (quizzes, essays, scientific models, toy/kit, public speaking, debates, seminars).
6. Popular lectures on S&T subjects (for general public, for children a students at schools, colleges, universities and other institutions).
7. Tours (guided tours around botanical, zoological gardens, museums, planetaria, bird sanctuaries, etc.).
8. Planetaria (including mobile ones; sky watching with naked eyes or telescope to learn about planets, stars and other celestial objects).
9. Radio broadcasts (for general as well as specific audiences).
10. Television telecasts (for general as well as specific audiences).
11. Audio/video-programmes (tapes for special or general audiences; slide shows, bioscope).
12. Digital software, CD-ROMs, etc. (for special or general audiences).
13. Science Films (for general and specific audiences).
14. Folk forms (song and drama, street plays, puppet shows, march, festival, fairs, jathas, etc.).
15. Low cost kit/toys and other hands-on-activities (with specific training modules).
16. Non formal science education.

Following are a few examples, where major achievements were recorded :

a) A 144-part radio serial Human Evolution was jointly produced by NCSTC and All India Radio, which was broadcast weekly simultaneously from nearly 84 radio stations all over the country in 18 Indian languages. Among the listeners there were 1,00,000 children and some 10,000 schools registered as dedicated listeners. They were provided kits, posters, etc. as supplementary material. A 13-part film serial on the history of science and technology in the Indian subcontinent and its impact on the world, titled Bharat Ki Chhaap.
b) Bharat Jan Vigyan Jatha-1987 and Bharat Jan Gyan Vigyan Jatha-1992 were catalyzed by NCSTC, could be considered as the biggest ever science and technology communication experiment attempted anywhere. The main themes included health, water, environment, appropriate technology, superstitions, scientific thinking and literacy. Some 2,500 government/non-government organizations were actively involved. The Jatha covered nearly 40,000 locations in about 400 districts touching almost a third of the country's population. During the course of Jatha, various modes of science communication, especially folk forms, publications, lecture-cum-demonstrations, etc. were employed for science communication among people.
c) The first ever National Children's Science Congress (NCSC), with the focal theme Know your Environment was organized by the NCSTC Network in December, 1993. The children were selected on the basis of their presentations on their scientific projects at the district level Congresses, followed by state level presentations and finally for the National Congress. The main aim of the congress was to provide open laboratory of the nature for learning with joy and to adopt the method of learning-by-doing. Participation was open to children of the age group 10 to 17 years. Till now 10 such congresses have been organized at different places in the country.
d) Scientific explanation of so called miracles is a very popular programme implemented across the country, wherein various tricks and miracles are demonstrated and explained by trained science activists to making gullible people aware about the scientific tricks/facts behind such so called miracles, so that they can be saved from cheating by the self styled god-men. One must remember, when idols started taking milk in 1995, the author demonstrated the phenomenon on television and the hoax was declined as a result.
f) In order to develop trained manpower in the area of science communication, training/ educational programmes are being offered at various levels in our country : i) Short term courses, which are of 3 to 7 day's duration; the participants are science activists and enthusiasts, whether students of science at higher level or not; ii) Medium term courses, which are of two to four month's duration; usually for those who wants to improve their science communication skills; and iii) Long term courses, which are of 1 to 2 year's duration; run at different universities/institutions and offer post graduate degrees or diplomas in science communication. Besides, a correspondence course in science journalism of one-year duration is also available.

In spite of well-planed and well-structured efforts of science communication in India, there are certain challenges before us, to be met. Some of them are listed below :

a) We have yet to make a dent towards wiping out superstitions prevailing for the ages and people are still ignorant about common scientific principles of day-to-day life.
b) Illiteracy and ignorance are major challenges. The level of literacy has increased as compared to earlier times, though it has not reached the desirable level. Scientific literacy is abysmally low in the country.

c) The most significant challenge is our large population and limited resources, due to which most of our efforts come to a standstill, when it comes to masses.
d) As an average, the science coverage in India is around 3%, which we intend to enhance up to 15%, as per a resolution of Indian Science Writers' Association.
e) The science communication has still not succeeded in attracting the media to the extent that it could appear on the front page or become a lead story, like the politics, films or sports. Mass media has its commercial compulsions, which superimpose all the science communication efforts and leave a negative impact in the minds of the audiences. Instead of including scientific information, they prefer to generate more revenue by including non-scientific, meta-scientific or occult information, etc.
f) It is rather disappointing to note that leading science magazines have ceased their publication, like *Science Today, Science Age, Bulletin of Sciences, Research and Industry* etc. and Indian editions of foreign science magazines, like *Vigyan (Scientific American), World Scientist (La Recherche)*, etc. could not survive.
g) India has 18 recognized regional languages. Communication in many languages is yet another great challenge, as research information is generally available in English. The quality of scientific translation could not achieve the level of excellence.
h) The science writing is still dry and boring, and interesting styles of writing, like fiction, poetry, satires, skits, discussions, etc. have not found adequate space and time in the media. Even most of the science writers could not contribute sufficiently such an interesting science material. Merely occasional appearance of something in the name of science fiction cannot serve the purpose.
i) The number of capable science communicators and scientific voluntary organizations is alarmingly low and hardly sufficient to cater to the large population.
j) The diverse social, cultural, geographical, economical set-up of the society is yet another challenge to be faced by science communicators.
k) Misleading scientific information, a continuous decay of creativity in presentation, distortion in translation, inconsistency in organizing the contents, lapses in the use of language, and many more deviations can be seen on media frequently.
l) There has been emerging conflict between scientists and communicators. This can be resolved by way of organizing scientists-journalists meets on regular basis.
j) It has been a common observation that most science communication efforts are centered either on children or teachers and most of the organizations are desirous to involve them in a number of activities. Other target groups may also be given equal opportunities.
k) Generally, "science communication" is considered only as "to communicating science" and no importance is given to "science and art of science communication".
l) Science and engineering are attracting little talent nowadays for pursuing research and higher studies. This is a matter of grave concern that many of the science departments at undergraduate level are left with substantial number of vacant seats for lack of interest by the younger generation in science. This may lead to a crisis in the area of science and technology as well as public understanding of research.

Though challenges are many, we could see some rays of hope. India has been able to take initiatives in a number of newer programmes in the area of science communication, which were not tried out elsewhere and can take lead in these innovative areas to better serve the mankind. Following are some of the prospects :

a) Following the industrial revolution in the western countries, the level of science communication activities was exponentially increased. As such, India is passing through the same stage, in the present time. As the technology advances, the need of scientific information would also increase. Accordingly, the industrial India would soon witness the high time of science communication.
b) As far as science writing and science journalism are concerned, there is ample scope for furthering such efforts in developing countries, especially in South Asian Region. A common science and technology news and features pool can be formed to facilitate writers/journalists to get/exchange information on scientific research.
c) There is a great shortage of properly trained science writers, journalists, communicators, illustrators in various parts of the world, though, a number of training programmes are conducted at various places. Therefore, more training programmes are needed, which may preferably be conducted to give more opportunity to developing countries.
d) The scientific writing in our country today is chiefly limited to describing various aspects of a particular topic, either in a descriptive manner or in praise of it. A large number of our science writers and scientific journals are from the pubic sector and hence it is difficult to expect them to be analytical or self-critical. Further most of the R&D in our country is being carried out in government laboratories and there is hardly any means for the common people to know what scientists are doing. To bring public awareness in our country in the field of research, there is a need for investigative journalism in this field. Whatever is happening in this field, good or bad, proper or improper must be brought before the people, only then science journalism in our country would flourish in its complete form.
e) Despite some encouraging trends in recent years, various ongoing science communication initiatives and programmes at the national level need to be integrated under a single accountable authority to avoid duplication of efforts by multiple agencies.
f) Most of the popular science magazines are depending upon translations, that creates a lot of distortion in the presentation. Generally, science writers tend to prepare a story or a report only siting inside the room, without interacting with scientists or covering on-the–spot reports in the laboratories.
g) Popular science writing in India is still shackled by complacency and over dependence on foreign sources. It is very difficult to get information from a scientific laboratory. The scientists in some organizations are not allowed to talk to the media about the research being carried by them or in their laboratory. This requires a science media centre including a centralized website to facilitate media persons to get research reports well in time.
h) All India Radio has started science news based on the research papers appearing in Indian research journals. Print media can follow similar practice as well.
i) Science communication must not be misunderstood merely as communication of data; it must go beyond data. The logical and rational interpretation must come up to the fore, enabling the target audiences to shape their lives, ideas and thinking, as well.

There is a need of public debates on emerging issues of scientific research which are relevant to the people and are of their immediate concern to enable them to take informed decisions to lead their life in a democratic society. There has been a common belief more recently, that only things having commercial and economic viability will sustain in today's fast advancing world that is governed and influenced by commercial and economic factors. The issue of increasing influence of commerce on research and problems arising thereof has been the focus of science communicators recently. Things have reached the point where money is making fundamental changes in the way research is done and communicated to the public. Hence, the efforts directed towards enhancing and public understanding of research, though important, tend to face the similar fate and therefore cannot be seen in isolation. This is an issue which scientists, communicators and the public have to take seriously.

Challenges and Opportunities for achieving public Understanding of Research in Developing Countries

By Otula Owuor

The greatest challenge facing those directly and indirectly involved promoting public understanding of research and development activities in Africa and other developing nations is the inability to appropriately link these R&D activities with tangible services and products.

Failure to link scientific research to socio-economic, cultural and even political development has a negative impact on public understanding of science especially in developing nations. Research in these regions should have a " human face."

The greatest challenge to science communicators in Africa is how to make the public and even policy makers appreciate or realize that Japan, United States, Germany, France, Britain and even Russia are global powers because of their scientific and technological prowess.

The need to make the public in poor nations to understand that scientific research and development (R&D) activities generate products and services used to "compete in the global arena. or market place.

Still the levels of understanding of research activities is linked to the levels of education among the public. This means that public understanding of research is, for example, higher in nations where the majority has at least high school education when compared to regions where half of the population are illiterate or never completed primary education.

South Korea and Japan, for example, are more developed than Saudi Arabia or Nigeria with vast oil resources but a relatively less educated public.

In Africa there is some variation when one closely examines what goes on in terms of research and development in South Africa that is considered the technological and economic powerhouse or giant in the region. Because of past years of apartheid and other factors, the level of appreciation, and hence understanding of science vary among various groups in South Africa. However, the country generally allocates more resources for R&D despite having political leaders who the global mass media seem to have associated with unscientific utterances.

The importance of communicating science to the public, especially in Africa is compounded by minimal expertise in science communication. This is notable in the mass media where science reporters or writers are hardly there. Still the few who excel are rapidly given jobs elsewhere including international organizations. Institutions involved in mass communication education have yet to streamline and expand their training activities to meet local challenges.

For Africa ineffective communication and limited understanding of science may be linked to the rapid spread of HIV/AIDS especially failure to appreciate the germ theory of diseases.

Public understanding of research activities remains low in countries with minimal research and development activities. Secondly in some research activities do not end up with products and services apart from probably getting published in some journals. There is also the case of research activities and results not being communicated to the public or fail to reach the public domain due to ineffective communication or lack of expertise in science communication.

However, the challenges also present opportunities for those keen on science communication. In Africa it is still major "professional niche" that may in some cases make a major difference or matter of life and death. For example should people in Southern Africa starve because of the "fear of GM corn" which is eaten by Americans? This is at a national level. But for many families and individuals appropriately packaged information on certain , tools, agricultural techniques can be directly linked to improvement in health, reduction of poverty and quality of life. Finally the poor allocation for R&D in Africa may easily be linked to ineffective science communication

PUBLIC UNDERSTANDING OF RESEARCH IN THE DEVELOPING WORLD: A Nigerian Health Reporter's Perspective.

By Diran Onifade

There is no health research going on in Nigeria!
Of course this is not true. It is a frustrated writer's cynical way of simplifying a much complex situation.
Covering health research is a very unattractive experience for Health Reporters due largely to the haphazard state of research in the country.

There are two health research institutions in Nigeria both of which are parastatals of the Federal Ministry if Health. The Nigerian Institute of Pharmaceutical Research and Development located in the federal capital, Abuja does research in the areas of prophylactic and curative drugs while the Nigerian Institute of Medical Research, Lagos studies diseases and their epidemiology.
Over 30 Universities, federal, state or private also run medical and/ or pharmaceutical faculties or colleges where research of one form or the other takes place.

But there is no National Health Research Policy or a superintending body to keep the field tidy, Consequently, there is hardly any co-operation and certainly no coordination even among the faculty of science and the college of medicine of the same university not to talk of different institutions.

Research aims in almost all cases only to generate data for the purpose churning out academic papers upon which the careers of researchers and academicians depend.

Research findings are not translated into interventions. Since research promises little of interest to the journalist's audience, it becomes difficult for the media to present from the point of view of what is in it for the public. Researchers and research institutions are therefore not seen as good sources of news and programs. Research is consequently infrequently featured in the media.

Research efforts therefore need to be coordinated and the results capable of popular interpretation and application.

Achieving Public Understanding of Research in Developing Countries: Whose Research and Whose Understanding? Opinion piece prepared for the Public Understanding of Research Workshop as part of the PCST 7 Conference , UCT, South Africa, 8-9 December 2002

MG Mvalo, Technology Promotion, Cape Technikon

The South African Science & Technology Landscape

Historical barriers have prevented access to science and technology for the vast majority of the South African population. With the advent of a democratic government in 1994 laudable attempts have been made by the government to address the deficiencies within the South African S&T system including a White Paper on Science & Technology policy, 1996 which had the system of national innovation as an overarching framework, Draft Strategy on Maths and Science, 2001 whose objectives is to increase uptake in maths and science of learners at secondary school level, the Human Resource Development Strategy, 2001 and National Research and Development Strategy released in 2002 concerned with the inadequate renewal of S&T workforce, inadequate intellectual property legislation and infrastructure as well as fragmented governance structures (2002:15).

The white paper on science and technology policy has public awareness of science and technology as one of the key drivers in developing a diverse science, engineering and technology workforce. One of the initiatives in this regard was the introduction of a national year of science engineering and technology in 1998 which set to enthuse and raise public awareness of the role and importance of science and technology in the lives of ordinary South Africans. Subsequent to this every year three provinces host science, engineering and technology weeks as part of maintaining the momentum created in 1998. What remains to be done is a systematic study that will examine the extent of the impact of such initiatives in meeting the goals of public understanding of science.

SA context

South Africa is a developing country that stills grapples with many issues affecting countries of the South i.e. poverty, unemployment, housing, access to water and energy, inequalities, illiteracy, health, urban-rural divide and so on.

Key issues around public understanding of research

Dealing with public understanding of research could be quite a challenge compared with initiatives around public understanding of science. Some of the critical issues that needs to be considered involve the following:

Communicating research

What will be communicated and to whom? Is it sufficient to communicate the process of research ? Which is more important the process or the benefits of research? It can only be possible to address some of these questions by unpacking the two fundamental questions around public understanding of research viz, whose research and whose understanding?. Any research (strategic) that does not begin to address the fundamental challenges faced by the majority of the urban/rural poor will not have much chance to succeed in achieving the necessary "buy- in" and legitimation of communities. It will require a lot of convincing in informing an HIV infected person leaving in a rural area that chances of developing an HIV vaccine can happen in the next 5-10 years whist other drugs are readily available to treat other ailments. This also calls for a revisit of the social contract of science between the scientists/researchers and society (bearing in mind the skewed levels of societal understanding of science/research).

It is quite clear that a combination of various strategies will be required in ensuring an attainment of the goals of public understanding of research. But this can only be realized when initiatives of all stakeholders, encompassing schools, research councils, higher education institutions, science centers, government and non-governmental organizations and community are in sync with the ultimate objectives.

Another critical issue necessary for effective understanding of research will revolve around the communication skills of researchers and/or representatives of various communities where the direct benefits of research to social and developmental needs of society can be readily demonstrated. Strategies around integrating indigenous knowledge forms/systems into main stream could ease the manner in which research is not only understood but its benefits are appreciated by the public.

Indigenous knowledge

Unlike many developed countries where schooling was conducted in the vernacular in all subjects, the majority of South Africans continue to be taught in second or third language at school and higher education. This creates a barrier where other languages are as a result underdeveloped especially in teaching and understanding of scientific and technological concepts. Let alone the very low base of integrating alternative perspectives in education in general and knowledge generation and dissemination in particular.

In conclusion, the complexity of public understanding of research will need careful navigation of the mine field that is littered with intellectual property rights, perception of "bad research', public funding of research and the attendant accountability, legitimation of research, relevance of higher education institutions to national needs, graduate unemployment and various models of promoting understanding of research by the public. Developing countries certainly should strive to develop own strategies and approaches in their attempts towards promotion of public understanding of research. Government funding of research will be key to ensuring the review of the social contract of science research with society as well as to facilitate an environment conducive to mass participation of the majority of the population in such initiatives.

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Science communication in Developing Countries – an Australian perspective

By Jenni Metcalfe, Econnect Communication Pty Ltd, jenni@econnect.com.au

Australia's position in the Asia-Pacific regions means that as a "developed" country we have close economic and social links with developing neighbouring countries. This provides an insight into some of the challenges facing these countries with regard to the communication of science in its various guises. However, Australia is also a very multicultural society with a large proportion of our population having immigrated from Asia and Europe. Australia also has an indigenous population, and has been attacked by the UN for the state of its Aboriginal communities. In many cases, such communities face living conditions that are far worse than in many developing countries.

The challenges in communicating science are not dissimilar for developing countries, indigenous groups and multicultural communities. The key challenges include:

- Cultural diversity between various groups – meaning there are issues with language, meaning and social traditions, values and mores
- Coming to terms with positions of power – scientists are generally seen as having the power in relationships with communities; and journalists and "professional" communicators are also seen as more powerful than individuals within communities
- Establishing the role that science communication can and should play with such communities ("science communication" is used here to cover the gamut of roles including science writing, science journalism, science promotion, science consultation, science engagement, science information exchange, etc)
- Access issues – including access to information, access to electronic means of communication etc

However, there are a number of opportunities for more effective science communication (in all its various forms) within developing communities. These opportunities recognise a more participatory model for science communication, and for the conduct of research. One of the issues facing researchers in northern Australia is liaison with Aboriginal communities about doing research on their lands. Such liaison requires skilled and experienced communicators who are a part of, or at least recognise the needs and social structures of, such Aboriginal communities. For participation to be truly effective, it is important that a mutual understanding and respect is formed between the various parties. This may take days, months, years or even decades to achieve. As such, there needs to be clear objectives set about what the participatory communication seeks to achieve so that there is ongoing monitoring of relationship building processes.

Some of the opportunities for participatory science communication in developing countries include:

- Identifying "best practices" for participatory science communication
- Providing training for those engaged in science communication activities (using "best practices" as guidelines), perhaps using international expertise (e.g. in Australia, a group from the Australian Science Communicators is looking to set up a national centre of excellence in science communication – one of the objectives of such a centre would be to assist developing countries in the region through training programs)
- Emphasising the process of knowledge exchange where everyone is a "partner" (rather than a "stakeholder", "audience", "Publics", "Client" etc) in the communication process (see Communication Strategy Guide developed for the Murray-Darling Basin Commission - http://www.mdbc.gov.au/publications/publications.htm)
- Using innovative methods of science communication - for example it is my belief that one of the best forms of science communication is the use of shared "stories"; some organisations in northern Australia (CSIRO Sustainable Ecosystems, Cooperative Research Centre for Aboriginal Health) have successfully used videos and "story books" to communicate with Aboriginal groups or leaders

For such participatory communication to be effective, I believe it is vitally important to establish what role science communication needs to play. This decision should be reached by all the actors/partners engaged in the communication process. For example, in communicating with an indigenous community about research to be conducted on their lands, the first role will likely need to be in establishing relationships. This will be far more important initially than trying to increase their understanding of science or their understanding of western research processes. However, if a community is at risk from a specific disease threat, then the immediate role of science communication will be to raise their awareness of this threat and to promote the behaviours to preventing such a threat. To be effective, this will require a good understanding of what sort of communication best suits these people, and how they like to be communicated with.

In conclusion, all good communication requires a fundamental understanding and appreciation of the perceptions, values and needs of those we are communicating with. This is no trivial or easy task, but there are opportunities for science communication professionals and others to share their knowledge and ideas.

PUS and PUR: What is the meaning of those issues in the two Brazils?

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Although same common aspects can be identified, in my point of view, the developing countries are not homogenous and, as consequence, they don't face exactly the same problems and challenges. It is why I decided to start my statement with a brief description of what happens in my country, Brazil. Because of that, a side effect of my statement is that it is longer that 2 pages.

The Brazilian people are also far from being homogenous. Our population amounts about 170 millions people, being around 60 millions of them below the poverty level. Roughly, we can distribute our population in two main groups. The first group, which we can call here 'Brazil 1', pools half of the population. 'Brazil 1' is an underdeveloped country and its population hardly has access to the basic health and has a very low level in educational terms. In this scenario, science information could de considered in a certain sense a luxury product. 'Brazil 2' has a much higher economical level similar to several European countries.

Both 'Brazil 1' and 'Brazil 2' had origin in the same and complex historical process. Being a Portuguese colony based on the exploration of natural resources, in the course of 300 years, Brazil conquered its political independence in the beginning of the century 19 Before that, press, factories, universities and publication of books were forbidden in the country; education was provided by a monolithic Jesuit system and only at the elementary level. During the century 19, Brazil developed an economy based on agriculture and slavery, and remained a country with no universities and with a big population of illiterate people. Only in the century 20, it is possible to say that there was a proper industrial development. The first universities with science faculties were created in the 1930s and only in the last decades a scientific research system has been developed in Brazil. In this scenario, it is not difficult to imagine that the science communication field, in a more professional and institutional sense, is a very young area.

Since the beginning of the century 19, science is present in the Brazilian newspapers, but not in a systematic way and only reaching basically the members of 'Brazil 2'. In the century 19 the first science books were published and popular lectures on science were provided to the general audience, specially in Rio de Janeiro, the capital city in that moment. The first decades of the century 20 witnessed a growing activity in science popularization, with the active participation of the incipient scientific community. For instance, the first radio was created by a group of scientists with cultural and educational purposes and as a science communication tool. Since the 1980s, a new increase in public understanding activities leaded to the creation of several scientific magazines and science centers; nowadays, there are about a hundred of science museums (small and medium size) and science centers. Science is also present in a few of TV programs.[1]

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[1] Massarani, Luisa (1998). A divulgação científica no Rio de Janeiro: Algumas reflexões sobre a década de 20. Rio de Janeiro: IBICT-ECO/UFRJ. Master thesis. Moreira I. e Massarani L. (2001) A divulgação

However, the activities have been done in general within the framework of 'Brazil 2' (medium class and local elite) and also in a fragmented way, without an effective integration among the different actors, tools or institutions (scientific institutions, universities and schools). The audience of science popularization activities is in general very small. For instance, only 0.5% of the population visit the science centers per year; the main newspapers including science sections has also a limited impact, specially in 'Brazil 1'.[2] About 1/3 of the science centers were built in São Paulo, the richest state of the country, in a clear reflex of the inequality in the distribution of wealth, universities and scientific institutions in the country.

There are some activities aimed to excluded people, but they are the exceptions that confirm the rule. Examples of that are: a project, *Projeto Clicar*, created in 1996 by Estação Ciência (Science Station), a science museum supported by São Paulo University, aimed to homeless teenagers; and several programs aimed to the slums' population promoted by Museu da Vida (Museum of Life), a science popularization unit of Fiocruz, a scientific institution.

Although there are indeed some creative and high level initiatives, in general, science communication in Brazil has as its conceptual background the 'deficit model' stressing scientific content in a unidirectional mode of transmission, giving emphasis only to positive aspects of science and do not touching important points such as the real scientific process with its tortuous paths and the presence of controversies and risks aspects in science. For example, the press also rarely considers ethical problems, as can be illustrated by a study on five of the main Brazilian newspapers, from June 2000 to May 2001, analyzing news related to biotechnology conduce to the following result: only about 10% of the total of 751 stories mentioned ethical, moral and risk aspects involved in biotechnological applications.[3] Furthermore, there is no clear separation between science communication and science propaganda, specially when the activity is undertaken by research groups or press officers of scientific institutions or universities.

Very few surveys were conducted aiming to map out what Brazilians think about science. The main one was done in 1987.[4] According to the research, about 20% of the adult population were interested in issues related to science. The great majority of population respected both science and scientists. Science was seen as being of great importance and usefulness, both for the humanity progress and the well being of the population or even for a better understanding of the human role in the universe. About half of the interviewees affirmed that science brings more benefits than curses, 31% of them believe benefits and curses are equivalent in science. The scientists were considered by the 58% of the interviewees as intelligent people working for the humanity's progress without looking for a financial compensation of its work.

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científica no Rio de Janeiro: Algumas reflexões sobre a década de 20. História, Ciências, Saúde – Manguinhos 7(3): 627-651.

[2] *Folha de São Paulo*, which is the Brazilian newspaper with the best coverage on science news, for example, reaches 0.5% of the Brazilian population; 20% of its readers read the science section (information provided by the science editor, Marcelo Leite, in personal conversation).

[3] Massarani, L., Magalhães, I. e Moreira, I. (2001). A ética, a moral e os riscos das novas tecnologias da genética: uma análise dos jornais brasileiros. Paper presented in VII Reunión RED-POP, Santiago, Chile.

[4] Alves, Isidoro e Tolmasquim, Alfredo (1987) O que o brasileiro pensa da ciência e da tecnologia? (2a ed.) Rio de Janeiro e Brasília: Museu de Astronomia e Ciências Afins, Ministério da Ciência e da Tecnologia/CNPq.

This positive attitude toward science can be changing, as a more recent study case showed, particularly between young people.[5] Although this second study is much more restrictive, it points out that risk and ethical aspects are nowadays a concern by the lay population, at least when we consider the biotechnology field. Science and scientists still have a positive image, but the influence of economical and private interests in this kind of research activity is stressed.

Having mapping out the science communication activities and the public perception toward science in Brazil, some additional questions are elicited. I will focus on two of them in the following, trying to provide some thoughts as a contribution to the debate.

What is the role of science in a country as Brazil?

Obviously science is related to economical progress. But science is also related to strong economical interests that created and maintains a great inequality of the developing countries toward the developed countries, and of 'Brazil 2' toward the richer 'Brazil 2'.

Coherently with the strong authoritarian Brazilian tradition, there is a tendency of not considering the public participation in scientific issues. In a paternalist way of thinking, it is said that the Brazilian people have no capacity for giving an 'informed' opinion on science issues. As consequence of this way of thinking two interesting historical events can be remembered: a riot against the vaccination, *Revolta da Vacina*, in the beginning of the century 20, in which the population was constrained with violence and reacted in the same way; and another popular rebellion, *Revolta dos Quebra-Quilos*, in the 1870s, against the introduction of the metrical system. Nowadays, the discussion on the adoption and production of GMOs in agriculture follows the same lines, without an informed and democratic debate.

It is also a paternalist perspective to think that developing country people are not able to understand science, its development process and other issues related to science; or even to think that science could be a luxury product for those people. It is why I was somewhat worried about the document "Achieving Public Understanding of Research in Developing Countries"[6], because it seems to me that it can expresses, at least in some level, this point of view, for example when it is asked if in the developing world context the consensus conferences (about genetically-modified foods, for example) are appropriate – or museum exhibits about electrical phenomena, or magazine articles about in-vitro fertilization –, as they don't address the needs of most members of the population. I think this is a hill-posed question. Besides, the same could be said about the developed countries.

Is it fair to adapted different mechanisms of PUR and PUS specific to developing countries?

Of course, creating huge science museums, sophisticated magazines and books, etc., without a clear and efficient target can be a waste of money for Third World countries. To import close-packets of science communication activities are indeed, in several cases, useless. On other hand, the mere adaptation of specific science communication activities to developing countries can increase the gap between developing countries and developed

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[5] Massarani, Luisa (2001). Admirável mundo novo – A ciência, os cientistas e a dupla hélice sob o olhar de estudantes. PhD thesis, Medical Biochemistry Department/Federal University of Rio de Janeiro.

[6] URL: http://www.pcstnetwork.org/PURWorkshop

countries. It is indeed important to create new models in which local and specific scientific and cultural issues and needs of the country are included.

As the case of Brazil, the Third World country population is in general not homogeneous. Several of these countries have a reasonable level of science, a growing scientific community and an important amount of money of public funds being target to science issues. If is correct to design science communication activities aimed to provide specific science information or attitudes, for example, basic issues related to clean water and diseases, specially for the poor people, this cannot be the only way for popularization of science activities. Limiting science communication activities to only basic issues is a way of increasing the gap between developing countries and developed countries.

Let's think about an example. Biodiversity is a very important area in the Thirld World, specially in tropical countries, and we should give people much more than some superficial information about specific scientific contents. Issues such as biopiracy, patent legislation, local knowledge are complex but indeed crucial to preserve the Third World interests. They must be discussed also in science popularization activities. Another example is the already mentioned genetically modified crops, a big issue in Brazil nowadays and that must be deeply discussed with and by the lay population. In the present moment, Brazil is one of the most important producers of non-GM crops. Starting to grow GM crops is not only a "scientific issue"; instead, it is a very important economical issue that could totally change the economy of our country.

We should indeed design mechanisms addressed to the developing countries context. But there is still is a long and complex way before we reach a reasonable framework in which we in fact improve the public engagement in science instead of increasing the gap between developing countries and developed countries.

PUBLIC UNDERSTANDING OF RESEARCH WORKSHOP
Opinion Piece

Judy Mann-Lang, Sea World Education Centre, South African Association for Marine Biological Research, Durban South Africa

The challenge of communicating marine science to rural fisherfolk.

Background
Over the past 100 years of marine science in South Africa, research emphasis has shifted from theoretical and descriptive research to applied and management orientated research. Marine science now focuses increasingly on resources that are harvested by people and on determining levels of exploitation and stock levels. Research has shown that, although the major resources are currently sustainably harvested, many resources harvested along the coast of South Africa are overexploited. Most current levels of exploitation are unsustainable and management techniques need to be employed to ensure future sustainability.

The task facing marine scientists and resource managers is to communicate the results of their research to the resource users in a manner that will encourage a more sustainable approach to resource exploitation. In South Africa, resource users are divided into three categories, commercial fishers – who catch fish for commercial gain, recreational fishers – who fish for pleasure and subsistence fishers – who personally harvest marine resources as a source of food or to sell them to meet the basic needs of food security. Communication with all three groups needs to be addressed, however, subsistence communities will be the focus of this discussion.

Subsistence harvesters are usually from impoverished, rural communities. Almost all studies on the management of subsistence resource use have stressed an urgent need for capacity building amongst local subsistence communities. This training should be aimed at encouraging participation in the management process through improving people's understanding of both ecological and biological processes, harvesting rates and fisheries management techniques.

Challenges
How can complex marine science be communicated to rural communities in such a way that the science has relevance to people? Is it possible to involve communities in the management of their own resources in the form of co-management structures?, bearing in mind that for effective co-management both the management agency and the local community should operate off an equal knowledge base to enable both groups to participate equally in the decision making

Poverty
The most important challenge probably relates to poverty and associated pressures on the environment. Regardless of how aware a community is of the implications of overexploiting a resource, in the absence of alternatives, environmental care is a luxury that few can afford. Any attempts to improve patterns of resource use need to look at the entire community milieu. Alternatives for income generation and food supply are as important as providing good training in biological and scientific principles.

Logistical Challenges
In many developed countries the approach to reaching fishermen has been to produce eye-catching and informative brochures, write magazine articles or screen television adverts. However, in rural Africa such options are simply not feasible. Electrification has not yet reached many communities, many rural community members are illiterate and do not speak English. Although an effective tool for mass communication is mother tongue radio, face to face communication is usually essential, although the logistics of working in rural areas are difficult.

Cultural Challenges

In many rural areas there remains a powerful tribal authority system and cultural ties are strong. Work with a community needs to take this into account. An understanding of traditional or indigenous knowledge is important, as this knowledge has shaped many current harvesting practices. Cultural and spiritual beliefs are strong and should be sensitively incorporated into training approaches.

Political and social problems
In some areas political instability, a breakdown of community structure and violence have made attempts at community involvement meaningless. Unless the community is reasonably stable, little progress will be made.

Solutions
In 1997, in an attempt to improve communication between scientists and local communities, the Sea World Education Centre pioneered the development of capacity building courses on the sustainable utilisation of marine resources for coastal communities. The courses assist people involved in subsistence resource use in their understanding of the marine environment, basic biology, sustainable utilisation and marine resource management. The courses help to empower local communities to take an active role in the co-management of their own resources.

Experience whilst running these training courses has shown that there are many factors that will influence the success or failure of the process. Amongst others, these include:

- Simplicity
- Use of traditional communication techniques
- Games and models work
- Group work is vital
- Timing – things take a long time.
- Communication is a two way process
- Sensitivity to local circumstances is necessary
- No preconceived ideas

I would suggest that to be effective science communicators in Africa we should challenge our approaches to science communication. We have to look at communication that will help people. I have had the privilege to run educational courses with communities along much of the east coast of South Africa. In all cases I have found that first world attitudes to science and conservation are simply not relevant to most people. I have had to challenge many of my strong beliefs in order to understand and work effectively with people. In Africa, science communication should be about people and about teaching people to live more sustainably for their own future survival.

Understanding Research - Key Issues

By Prakash Khanal

The vision

Communication is the essence of the scientific method. Hypothesis and experiment together form a type of dialogue between human knowledge and the natural world.

Scientific discoveries and innovations give birth to technology. Those who possess technology gain mastery over the natural world. Humanity has come to recognize the destructive powers as well as creative potential of science. In the public mind, this duality has led to a respect for and a distrust of science.

Science communication is therefore playing an ever-larger role. The objectives of popular science writing are to raise public awareness of science as well as to broaden the perspective of scientists. Science journalism helps to establish the common ground between the layman and the researcher in assessing the social impact of scientific discoveries and their technological applications. Such discussion is necessary to formulate public policies that advance science while trying to bring its benefits to society.

Scientific research should not be solely a means to quench the intellectual thirst of scientists; it must emerge from the confines of the laboratory into societies in need of modernization. The importance of extracting meaning from research thus becomes one of the prime responsibilities of the science communicators and science journalists.

The need to communicate scientific knowledge to a larger audience is also important for the continuity and longevity of spirit of science.

Scientific competition has meant benefits for a few and misery for majority. Intellectual property rights are not simply a natural right of the lucky inventor, if the millions in need of the social benefits of his or her invention cannot afford to license that technology or purchase the product, as shown by the controversy over anti-HIV drugs.

There exists a need to train science communicator from diverse social backgrounds who are able to either integrate or accommodate the latest international developments in science and technology with local knowledge and traditional practices. Local science writers can open avenues for change without threatening the local cultural identity.

A possible strategy is to create training and educational opportunities for a select number of committed enthusiasts with the support of the persons with connections and decisive powers within their organizations or from the PCST Network and transform them as epicenters of change in their local communities. This approach would avoid the current practice of haphazard training of all participants despite their differing levels of commitment and preparation. Training should be given to select committed individuals from given communities to make our goal achievable.

Innovation in the teaching of science

Although education does not directly relate to our topic of discussion, we must not forget that the level of education in general and science education in particular is the starting point in understanding research results. Understanding research is not easy, especially when the researchers tend to use scientific language to discuss their conclusions as well as to present their methodology. Many people consider science to be a boring, difficult and dry subject, mainly because the scientists make it so. There is need to teach science in a different way by making it exciting to study science.

This calls for greater investment and innovation in the area of science education. There is need to bring innovation to the teaching of science. The inherent fear among young learners that "science is a difficult subject" restricts their learning behavior and stifles their curiosity. In contrast, "science is fun" has been a concept introduced by science centers with their interactive exhibits.

Science News Service

There is also need to make science more humane and down to earth by regularly writing about simple scientific achievements that are applicable to everyday life, rather than always portraying the esoteric side of science. One possibility is to initiate a SCIENCE NEWS SERVICE, which would combine the information needs of all our societies. The news service could run simple information relating to avoiding falling sick with malaria, typhoid, Japanese encephalitis, phileria, hepatitis, tsetse, diarrhea, HIV/AIDS and other sexually transmitted diseases, as well as natural disasters. It could also provide information on the discovery of new galaxies, space science, the development of weapons systems that some nations feel so proud to display.

The larger objective of the news service would be to make alternative information available for everyone to chose as their levels of needs and understanding permit. This could be an exclusive outlet to dwell on the issues relating to the politics of science and economic aspects of science, so as not to allow any single nation or multinational corporation to monopolize the public forum to advance their narrow political and financial interests in the name of philanthropy.

As a group of individuals committed to the greater transfer of knowledge for the public good, we have to remain alert for any untoward move to take advantage of our commitment to science/research understanding by those for whom discoveries and innovations merely create another opportunity to amass wealth.

Communication-friendly scientists

Researchers are often portrayed as self-centered, ambitious, secretive and not interested in talking to the general public. This image of scientists needs to be changed and only scientists themselves can do it. Perhaps our fellows teaching science communication can help them a bit to come out of their mind set, which arises from the conventions of peer reviews, papers and scientific conventions to disclose and defend their findings.

Scientists should realize that the lay public also need to know about their research not only because their findings could be useful but also because understanding by taxpayers could pave the way for future research support from the society.

Research for recess

In many countries with a long history of public funding for research laboratories are increasingly cutting back their financial support or diverting research to projects that are harmful to human welfare. Meanwhile, an increasing amount of funding is available for scientific research in the private sector. Multinational companies willing to put vast funds into research, but the spending is motivated by potential profits rather than benefits for humanity. Research has become a means for corporations to gain profits through royalties and licensing fees.

It may not be the scientists and their sponsors who have hidden agendas. Science communicators must be alert so as not to be used by these profit-seekers.

Understanding research

Although it may seem logical that scientists should be interested in informing the public about their research, but the question remains: "Are they willing to do so?"

Many specialists find it difficult to simplify their findings to the level of the general public. They face the dual challenge of having to maintain their privileged status as a scientist while also performing the task of a communicator. This is where the understanding of each other's difficulties emerges. Without adequately addressing this question, our efforts to understand research and write about it for the general public will merely remain a futile exercise and lip service benefiting no one.

As in the scientific method, communication begins with the process of trial and error. Error in science is not a mistake; it is the beginning of knowledge. We science communicators should adopt the same spirit. (END)

Making a difference between Research, Education and Innovation : In Support of Participatory Community Research

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Preparatory position statement for forthcoming workshop ***Achieving Public Understanding of Research in Developing Countries,*** Cape Town, December 2002

The recent World Summit on Sustainable Development in Johannesburg highlighted the urgent focus on sustainable development - now a daunting challenge for humanity - and the fact that existing Science and Technology systems must urgently be redirected to address fundamental issues at local, regional and global levels. These sustainable development issues include the fight against disease, population growth and urbanization, climate change, water and soil crises, and the preservation of forests, fisheries, and bio-diversity.

One of the key Science & Technology issues to be addressed is proactively bridging the development divide between North and South. To achieve this in a meaningful way, innovative approaches must be implemented to incorporate new and existing Scientific and Technological knowledge.

Stronger partnerships between the Science and Technology community and civil society, the private sector and government are called for. More importantly, improving Science and Technology's contribution to social and economic advancement in developing countries requires a full-on commitment to the development of participatory community research, which can be actively supported by the traditional tenements of science, whether academic, private sector or government-based.

Research in the developing context should be community instigated and driven, and closely involving those in need of the scientific information. To achieve this, a new contract between the scientific community and society is required.

Improving education and capacity building is a vital component of this process and here academic institutions can and do play a leading role. Science teaching at secondary and tertiary level builds capacity and increases public understanding of the role of Science and Technology and the issues surrounding sustainable development. The International Council for Science (ICSU) has identified three critical components in enhancing capacity, namely skilled individuals, innovative and efficient institutions, and active networks.

Participatory community research can be established and effectively supported by academic institutions. This is a positive and growing scenario at a number of higher educational sites in South Africa, including Rhodes University where initiatives such as RUMEP (Rhodes University Mathematics Education Project) and CASRA (Centre for Applied Social Research) are but two examples of industry funded, community driven participatory projects. Equipping individuals with the skills required to conduct basic and applied research of benefit to the community is an integral part of the process. But a stronger partnership, encompassing comprehensive and financial support, is called for in ensuring the sustainability of community-based research.

New mechanisms of assistance must be developed, and larger financial investments in Science & Technology are required, with activities focused on sustainable development goals significantly increased. At institutional level, research expenditures need to be pro-actively sourced and channelled in support of community-based research. New partnerships must be forged between public and private S& T sectors at national and regional levels.

Collating reliable scientific and socio-economic data will also become a priority, integrating all relevant data for addressing crucial sustainability issues. Full and open access to this information must be ensured.

What then are the immediate indicators for academic institutions in making the difference between Research, Education and Innovation?

- Applied research that results in real world outcomes for the communities in which they operate;
- An engaged and partnered educational research approach, delivering benefits to students, researchers and their communities;
- A new vision that will involve new ways of working across internal and external boundaries;
- Imparting skills that are highly relevant to the community and to industry in a wide range of Science & Technology, and Engineering disciplines;
- Dissolving the boundaries between new emerging areas and traditional disciplines and developing new programs and research opportunities;
- New mechanisms of support between academic and community-based research centres;
- Channelling of funding and investment to community-based research;
- Full and open access to scientific information;
- Developing interdisciplinary science programs addressing key sustainable development issues in a participatory process;
- Engaging dialogue with partners from the Science and Technology and Engineering Communities;
- Prioritising training and education in mathematics and science;
- High level of commitment for human health research from the S&T community;
- Promoting a blending of scientific and indigenous information for sustainable use of natural resources;
- Promoting gender equality in science through education and active engagement with women's organisations.

Background Reading:

Science and Technology as a Foundation for Sustainable Development. International Council for Science (ICSU). Dialogue paper by S&T Community for the Fourth Meeting of WSSD Preparatory Committee, 28-29 May 2002, Bali, Indonesia.

Mobilising Scientists for Development : A Precious Mission in a Changing Context. International Foundation for Science (IFS).

Innovation and Community-based Participatory Research in Africa. American Association for the Advancement of Science (AAAS) Africa Program.

Ends

Footnote:
I am keen to develop this initial premise on academic institutional support for participatory community research into concretisations for discussion at your workshop. Please let me know if you think this valid.
Thank-you
Jeanette Hewitt

The journalist and the research

The journalism in Latin America persists on the tendency to show only the results of the scientific investigation and, at same time, to the scientist like an uncommon and a different person, as an unusual person. For the journalism the scientist seems to be out of the common, like somebody able to get developments by himself as a result of his exclusive inspiration.

This tendency of the journalism to show only the scientist and his results and to not recognize or to hide the research process, takes journalism to the trite belief that science and the scientific things are exclusive matter for persons who decide to get inside of a special kind of scientific´s monastery and that the result of this special kind of monks has a magic halo.

There are many causes for such a situation. One of these is the difficulty of journalists for understanding the research process, since they the academic training into the scientific areas. In Latin American, those who study social sciences, including journalism, do not take have contact with the natural and exact sciences nor with technological studies. As a consequence of that, journalists are at trouble when interviewing scientists or reading theirs papers.

Of course, journalists can fill this gap trough their ability to deal with these scientific matters every day. But there is another situation: in Latin American, they are usually removed from their specific tasks every day, so they cannot accumulate this experience and get an acceptable expertise.

There is, even, a third situation. Our journalists are always going after very important persons, people who the think their reader want to see on the front pages of news papers or on the screen of their t.v. When not doing so, they have to build a very important person out of a very common one, usually by taking the opportunity of any unusual situation. Because of that servitude, scientists only apply to be shown when they make the *great discovery*. Then, journalists present the scientific as a hero, not as somebody who has been working every day in a process.

One way to overcome this situation is to include scientific classes into the undergraduate curriculum of journalism. More specifically, there would be at least a class addressed to make students familiar with scientific research so they can understand where the results come from. If they have such training, we can expect from them a coverage of the systematic and continuos scientific work.

Such training would be stronger at the graduate level. There, students should take courses on science divulgation. But here we need, in addition, the cooperation of the media, which have to commit themselves to allow journalists to have time enough to study. There must be, also, programs for permanent improvement at the work place.

Meanwhile, checked In order to try to minimize these undesirable effects for the science divulgation through mass media, the *Agencia Universitaria de Periodismo Científico y Cultural - AUPEC*, born in 1993, as one dependence of the *Universidad del Valle* (Colombia) decided to publish its own production in a web page in which puts constantly articles reviews of researches done investigations in basic sciences, engineering and health, written in an easy and journalistic language.

The web page -http://aupec.univalle.edu.co - has a data base of 750 articles that are consulted weekly for more than 200 persons from several Latin American countries, and approximately 30 of these ask for the enlargement of the information, and send questions, trough the electronic mail.

The production of AUPEC is directed, essentially, to the written mass media and to the readers who can access directly the Internet, although the radio and tv. use our free material frequently.

Our Agency has helped to generate a gradual change among the journalists of the mass media who have began to see the scientific journalism like a new option; this alternative has not been yet fully realized, like it would be, but we continue working in this goal

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Public Understanding of Science Research
An Issue on Western S&T and Local Wisdom in Thailand
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Globalization has made Thailand open to imported concepts and cultures as well as technologies which are products of science. Development is also equated with modernization by imported science and technology from the West. Though Western science and technology make the Thais feel alienated, there are no apparent conflicts between Thai cultural tradition and science. However, there are more incongruity between our culture and Western culture and philosophy.

For centuries, Local Wisdom (LW) practices had played a major role in Thai society for creation, enrichment and dissemination of knowledge. LW reflects traditional Thai way of life which emphasized knowledge for living and blending with nature, for example, rice farming, irrigation, traditional medicine and art and crafts. LW had a system and process of observation, trial-and-error selection of best and relevant practices, and then being adopted in the community. LW has a "process" within "Social Laboratories" whereas Western S&T has it in science laboratories. LW has a unique and inseparable element in its spiritual and cultural dimension. This dimension show respect of human to nature and its Gods, creators of all things in nature and human as a part of the whole society.

The changing of time and modernization made old age knowledge and traditional practices of LW almost disappear and some have disappeared. Fortunately, in these recent years, the resurgence of LW has been widely embraced as national and cultural heritage that hold both cultural values and economic viability. The government has promoted the use of LW, for example, in herbal/ traditional medicine, and natural products for cosmetic and food to create new products for domestic use and export. The government , then, has explored the possibility to use modern S&T (which has its root from the West) to make LW suitable for contemporary uses and exportable. Nevertheless, in some cases of environmental and governmental policy there are clashes in ideology between authority and local community in the management of local natural resources. And it has been witnessed in many governmental projects that ignoring LW would not only led to failure of the projects but also to environmental damage, losing of self-confidence among the villagers and social disintegration. In most cases, people from the cities when working with local communities usually think that they are superior, authorized to do the work, more educated, can do better and know how to solve problems of the communities. Such attitudes have brought in development from outside to the communities without considering existing LW, their knowledge, beliefs and skills. And at the same time, for the villagers' past experience may lead to negative attitude, and sometimes resistance toward new knowledge from "outside". Considering this condition, could and how modern S&T knowledge/research join force with LW for a sustainable development of the local communities?

It would need mutual awareness ,respect and understanding in each other's knowledge and expertise (between scientists/researchers and local communities). This will complement each other and generate synergistic relationships among them. It is a reasonable way, on one hand, to help nonscientists understand the way in which scientists work and draw conclusions, the habits of mind and practice that lead to reliable knowledge about nature. And on the other hand it would help scientist experts work with respect and understanding to local knowledge which have accumulated through time for thousands of years. It is the way to use our diversity and our uniqueness more creatively. And the realisation of this humanistic potential to work together for the best result is called "co-intelligence" (www.co-intelligence.org) which I would like to borrow this term to use in this approach as " Co-intelligence Model". Through this approach, the relevance of PUR is clear and could be possible and create a win-win situation. .

Story of Ecosystem and the Pak Moon Dam :
In 1994 the Pak Moon electricity-generating Dam was constructed in Ubon Ratchathani Province. Ever since it has posed an adverse effetcs on the villagers and ecosystem.. Consistent protests against the Dam finally forced the Cabinet's decision to open up eight doors (out of 12) to the Dam in 2001 for a period of one year. An official task force was establihsed to study the impact of Pak Moon Dam on the ecosystem and fish population in Moon River. At the same time, a local group- drawn from the Pak Moon Assembly of the Poor, comprising 200 locals directly affected by the Dam organized its own research. Respectable local fishermen were in charge with the technical assistance of an NGO ,the South-east Asia Rivers Network (Thailand). The communities selected an expert panel of 20 fishermen.

One of the fishermen said, " We have the problem. We have been affected directly . Our natural resources and our livelihood were destroyed. When the Dam was open, the fish came back, nature came back and also our lives. I want to find a way to make other people see this truth and believe in what we want to tell. So, I think we should make a record of this as our evidence. If we use others to do it (the research) I'm afraid they might not do it completely and correctly. Because people from the city don't understand our way of life, don't know about fishes, rapids, tributaries and river like we do. They will have to come to us and ask us anyway. So, I think we'd better do it by ourselves... Major findings revealed positive impacts of the opening of the Dam to ecosystem, local economy and peacefulness in the communities after long period of conflicts within the communities over decreased resources and between the local communities and state authority. This actual field research makes a strong case to solution. It sets an example for local communities elsewhere to enter a dialogue with knowledge. And that "research" in this path-breaking manner is the tool to success.
