Nanoscale Science and Engineering
2008 NSF Grantees Conference
Arlington (VA), December 3-5, 2008

11:15 (Dec 3, 2008) Panel: Informal Science Education
Moderators: Larry Bell (Museum of Science, Boston)
and David Ucko, NSF

Wendy Crone, Univ. Wisconsin
Carl Batt, Cornell Univ.
Akhlesh Lakhtakia, Penn State Univ.
Carol Lynn Alpert, MOS

Remarks by Akhlesh Lakhtakia

Dear Colleagues,

Thank you for inviting me to participate, and thank you for listening to me.

The National Science Foundation has been very successful in having universities and other research institutions devise programs to improve the technoscientific knowledge of schoolteachers and principals. Websites and brochures have been designed. Short-term camps have been and are being conducted by universities to imbue primary and middle-school children with a fascination for science and technology. These are important activities that must continue and even be enhanced.

Incorporation of scientific understanding in everyday life by laypersons is not easy. Let me take the case of the National Science Foundation. Newspapers are full of scientific reports on the obesity epidemic sweeping our country. Yet all breakfast items served today by NSF promote obesity. If scientific personnel working for NSF

cannot translate scientific knowledge into everyday practice, imagine how difficult must it be for laypersons! Informal science education is therefore necessary.

I became formally involved in informal science education as one of three technoscientific faculty members from Penn State in the NSF-funded three-university Center for the Integration of Research, Teaching and Learning centered at the University of Wisconsin-Madison. In devising my activities as part of that five-year project (2003-2008), I interpreted informal science education as community science education.

Community science education is absolutely important in any technologically advanced democracy such as ours. National legislatures and elected executives routinely consult technical and scientific experts before setting the parameters of industrial policies and technoscientific expenditures. Even state legislatures and elected executives have the financial wherewithal and constitutional authority to create and run technoscientific agencies for consultations as well as for the implementation of legislated decisions.

However, the march of technoscience is so relentless, its spread is so pervasive and its scope so widely-encompassing that decision-making by local legislatures such as school boards and municipal councils and elected executives such as mayors needs to be technoscientifically informed as well. This is where community science education is needed.

My activities as part of CIRTL were focused on improving the communication abilities of graduate students. Five batches of 6 graduate students each went through an intensive workshop to develop 20-minute power-point presentations on their own research for presentation to lay audiences. Some of the presentations were put on the web. My department instituted the requirement of a nontechnical abstract in addition to the usual technical abstract. Nontechnical abstracts are put on the web. We beefed up the student FS experience during graduate seminars by adding the

requirement of a reflective element in their seminar reports.

These activities were undertaken with the hope that our graduate students will, in time, not only advise national and state leaders, but also local community leaders. Indeed, some of them would even become local community leaders.

The presentation workshops made me realize that a different type of community science education activity is needed. We technoscientists must not imagine that lay audiences comprise people who can only be passive recipients of technoscientific information. Just because they do not have doctorates in technosciences does not mean that they cannot think. Many of them can think more acutely about technoscientific issues than many technoscientists. What they do not have, as the Wizard of Oz would say, is a proper tool! Scenario planning is that tool.

Technoscientific activities do not occur in isolation. Every one of these activities has societal consequences that may lie far beyond the abilities of many of us to think of. These consequences cannot be viewed through the narrow prism of this or that set of equations. Instead, they must be viewed as possible moves in a game of chess.

Let me give you an example. Suppose that municipal councilors in some city are debating in 2011 the need for refurbishment of IT devices two years later. Some of them have come to know that OLED technology is advancing rapidly could soon overtake LCD technology. If OLED monitors are expected to appear in the market by 2015, should new LCD monitors be installed in schools and the local airport in 2013 as scheduled? Will there be a reduction or increase of power consumption thereby? What hazardous materials and processes are involved in the manufacture of OLEDs as against the manufacture of LCDs? Is it easier to repair OLED monitors than LCD monitors? Is it easier to recycle parts from OLED monitors than from LED monitors? Is it

possible to incinerate OLED monitors safely or not? Where would incineration occur? And, so on.

Technical information needs to be collected and digested in order to answer various questions. Guesses have to be made when hard information is not available. The interrelationships of various factors have to be identified and classified in some order of importance. And then several scenarios must be constructed to project 10 or 20 years into the future.

The creation of a scenario is similar to modeling a physical, biological or engineered system by a technoscientist. But there is an interpretative element to social systems. Different people interpret factual data about the world differently, depending on the context of a situation as well as how a specific person comprehends the world. Different interpretations generally imply different outcomes.

Scenario planning is a method to simplify the complexity and understand why different outcomes are possible. The aim is to learn more about how social, political, economic and technological factors interact to create the current state of our society, and how these factors may create future states of the society. It is a way to describe how the society is and then to develop hypotheses about how the society may be. Investigation of how the society is and consideration of how it may be together enable discussions about how the society ought to be.

Scenario planning may be an effective tool for creating a common language among different stakeholders and thereby bridging two cultures: that of science and technology on the one hand, and that of social studies and the humanities on the other. Scenario planning thus is likely to be an excellent vehicle for community science education, because it will reach out to the intellects of the community leaders and involve them in a grand activity.

I envisage technoscientists and social scientists and liberal arts people at universities and other research organizations to conduct regular workshops for school board members, for municipal councilors, for mayors, for police personnel, for magistrates, for justices of peace, for even the town dog-catchers. In these workshops, the focus should be on involving these community leaders in devising scenarios for the influx of new industry, the impact of emerging technologies, the demographic transformations that could arise with medical advances, etc. The workshops would begin with simulated scenarios to teach the methods of scenario planning, and then move on to the having the community leaders devise scenarios arising from issues that they themselves can foresee in the short, medium, and long terms. Any technoscientific information needed by the community leaders could be supplied by the academics. Science and technology would become relevant to communities in many ways, some of which are perhaps not imaginable yet.

Thank you.

Akhlesh Lakhtakia