

Austrian EU Presidency

Innovative Approaches to Science Education

Science, Technology and Education Counselors

May 9th, 2006, 10 AM to 12 PM
Austrian Embassy, Washington DC

Meeting Agenda

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| 10:00 – 10:10 am | Philipp Steger , <i>Science Attaché, opening remarks</i> |
| 10:10 – 11:00 pm | Presentations |
| | Pat O'Connell Ross , <i>Team Leader for the Mathematics and Science Partnerships, U.S. Department of Education</i> |
| | Robert Kuczkowski , <i>Program Officer, National Science Foundation</i> |
| | Muriel Lederman , <i>Professor Emerita of Biology and Women's Studies at Virginia Tech</i> |
| | John Chelen , <i>President of the Hampshire Research Institute</i> |
| 11:00 – 12:00 pm | Q&A |
| 12:00 pm | Adjourn |



Pat O'Connell Ross
Team Leader
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U.S. Department of Education

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Biography

Ms. Ross is the Team Leader for the Mathematics and Science Partnership program, U.S. Department of Education. In 15 years of federal service, she has also managed the Javits Gifted and Talented Students program, the Eisenhower Math and Science National programs, and the Fund for the Improvement of Education. Prior to joining the Education Department, she served as: associate director of Project 2061, a part of the American Association for the Advancement of Science (AAAS); director of academic programs with the Center for Talented Youth at Johns Hopkins University, a program serving over 5,000 students in programs around the world; and, as an education specialist with the Maine Department of Education. She received her undergraduate degree in anthropology from Beloit College, a Masters of Arts in Teaching in museum education from George Washington University, and a Masters in Education degree in education policy from Harvard University.



Robert L. Kuczkowski
Program Officer
Special Projects and Instrumentation
Division of Chemistry
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Professor Emeritus
University of Michigan – Ann Arbor, MI

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Biography

Robert L. Kuczkowski has been responsible for programs in the Chemistry Division at NSF promoting the integration of research and education such as Research Experiences for Undergraduates and Undergraduate Research Collaboratives. He was chair of the Department of Chemistry at the University of Michigan (1991-97, 2004-05). Kuczkowski is a fellow of the American Physical Society and the American Association for the Advancement of Science. He received his B.S. degree from Canisius College and a PhD. degree in chemistry from Harvard University.



Muriel Lederman
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Biography

Muriel Lederman has retired from the Department of Biological Sciences and the Women's Studies Program at Virginia Tech. She was educated at Barnard College and holds the Ph.D. in Biological Sciences from Columbia University. Her scientific research was in molecular virology and she has done scholarly work in feminist science studies. She is the co-editor of *The Gender and Science Reader* from Roudledge (2001). The National Science Foundation supported her studies on teaching science for equity.



John C. Chelen, Esq.
President
Hampshire Research Institute

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Biography

Mr. John Chelen is an attorney and systems engineer with substantial experience in technology service programs in both the government and private sectors. He currently serves as President of Hampshire Research Institute, a non-profit group providing Internet publication of complex quantitative databases for the United Nations and the U.S. Environmental Protection Agency. In addition, he is a Director and General Counsel of Lightpath Media, Inc., an educational media and software development firm.

He holds degrees from Carnegie-Mellon University and the University of Pittsburgh School of Law and has studied graduate economics at Georgetown University.

Mr. Chelen recently completed an engagement for the Office of Technology of The District of Columbia where he served as Special Counsel, developing a comprehensive privacy and data sharing framework. Prior to that he consulted with several commercial clients on corporate accountability, assisted The World Bank with strategic planning for Internet services, and developed security and privacy protocols for several private clients.

Mr. Chelen has specialized in applying technology for the public interest, supporting numerous educational, environmental, human rights, and “open government” initiatives. In that role Mr. Chelen directed the development of numerous landmark software and communications applications, testified before the US Congress on Internet issues, served as an official U.S. diplomat to the United Nations, and participated in several White House information infrastructure committees.

He has served on numerous American Bar Association committees, was Treasurer of the National Child Research Center, and has co-founded several educational institutions.

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Abstracts

Integrating Research and Education

Robert L. Kuczkowski and Arthur B. Ellis, Chemistry Division, National Science Foundation

The National Science Foundation supports projects that help bring cutting-edge research into the undergraduate college curriculum as well as the K-12 level. A recent example is nanotechnology. Two illustrations will be given: the preparation of silver nanowires and a ferrofluid. Education materials are often developed by NSF - funded centers and collaboratives, such as the University of Wisconsin's Materials Research Science and Engineering Center, as part of their public outreach activities. Nanoscience has developed sufficiently and entered the curriculum broadly enough that examination materials have been developed by the American Chemical Society's Examinations Institute for use across the United States. Undergraduate research experiences are an excellent vehicle for integrating research and education. Research Experiences for Undergraduates (REU) has been a strong program at NSF for approximately 20 years and provides summer research opportunities typically for third-year college students. The Chemistry Division funds 71 sites that promote these experiences, including 3 international sites in Thailand, France and Austria. The NSF Chemistry Division has recently introduced a new undergraduate research model called Undergraduate Research Collaborative (URCs). These are designed to involve large numbers of freshman and sophomore undergraduate students in an authentic research experience. Three sites have been launched in the last two years.

Teaching Science with the Social Studies of Science Equity

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Science education is often promoted as a means to attain a competitive economic advantage and to broaden scientific literacy. Instead, science education can alienate women and minorities from scientific careers; knowing basic facts is not the major factor connecting the general public with scientific debates. To counter these problems, a transformed pedagogy combines insights into the social studies of science (history, philosophy, sociology and feminist analyses of science) along with explicating the research conventions of specific disciplines and analyzing the historical and philosophical bases, strengths, and weaknesses of these conventions. Such linkages can enhance science education by emphasizing that science is a social activity shaped by history, institutions, beliefs, and values. Including these topics when teaching science can be a positive step towards explicating the internal culture of science and promoting the inclusion of those whose race, gender or social status are "other" when compared to the traditional practitioners of science.

TEACHING SCIENCE WITH THE SOCIAL STUDIES OF SCIENCE FOR EQUITY

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Internationally, science education is seen as a means to

- Insure a competitive economic advantage and all competent persons should contribute.
- Insure a scientifically literate public.

These goals are not necessarily being met.

- Women and certain minorities are under-represented in scientific professions.
- Scientific literacy is not attained across the board.

Why are these goals not being met?

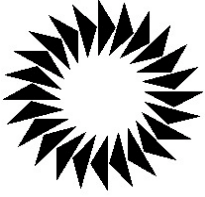
- Science education does not resonate with women.
- Science education assumes women will assimilate into the science that is.
- Science education does not promote scientific literacy.
- Educational philosophies reinforce the science that is.

TEACH THE SOCIAL STUDIES OF SCIENCE ALONG WITH SCIENTIFIC INFORMATION.

- Social studies of science include history, philosophy, sociology of science and feminist analyses.
- These disciplines can make students aware of the norms, attitudes and practices of science that are invisible to scientists.
- These disciplines can make students aware that science is a social activity, whose attributes reflect those of the society in which it is practiced.

Preliminary results of teaching with this transformed pedagogy.

- Students learn standard material.
- Students claim the social studies of science help them learn standard content.
- Students gain an appreciation for the social location of science.
- Students increase their self-confidence as scientists.



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Executive Summary

The World Mathematics Software Initiative (WMSI) is a strategic program designed to increase significantly the use of advanced software and organizational techniques in education. It will stimulate the creation of a comprehensive Internet-based global service, *OurMathTutor*, which will provide comprehensive mathematics training from early childhood to post-graduate levels. Made available in a variety of languages to students of every age and level of mathematics proficiency, *OurMathTutor* will help assure that income and national or cultural identity are not barriers to education in one of the central pillars of intellectual attainment and human productivity.

OurMathTutor will be an on-line software-based tutorial system that stimulates and tracks the individual progress of any registered student or mathematics teacher. Through an innovative logical progression, the system will lead a student through an adaptive course of graphical demonstrations, questions, answers, and related suggestions that will foster a student's thorough and rapid attainment of mathematical competency. Under the auspices of a non-profit educational organization, the World Mathematics Software Trust (WMST), this system will be made available worldwide in a variety of languages through educational and economic development agencies.

Not only will this initiative support global math literacy, the research and development results also will be transferable to other educational domains and stimulate parallel developments in the sciences, the humanities, and the arts.

Financially, the Initiative relies upon early non-profit venture capital support, in due course sustaining a large income stream derived from services. Significant increases in student mathematics proficiency should be demonstrable within 10 years.

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Background Information

Europe

Science and Society Portal of the European Commission
<http://europa.eu.int/comm/research/science-society/>

xplora – European Science Education
<http://www.xplora.org>

USA

U.S. Department of Education
Mathematics and Science Partnership (MSP) program
<http://www.ed.gov/programs/mathsci/index.html>

American Competitiveness Initiative
<http://www.whitehouse.gov/stateoftheunion/2006/aci/index.html>

National Science Foundation
Education and Human Resources
<http://www.nsf.gov/dir/index.jsp?org=EHR>

National Science Resources Center
<http://www.nsrconline.org/>

Report
Science, Technology, Engineering, and Mathematics Trends and the Role of Federal Programs
by the United States Government Accountability Office
<http://www.gao.gov/new.items/d06702t.pdf>

Report
Federal Science, Technology, Engineering, and Mathematics Programs and Related Trends
by the United States Government Accountability Office
<http://www.gao.gov/new.items/d06114.pdf>