



Workshop on Women in Science & Engineering

Maria Goeppert-Mayer

A REPORT ON THE WORKSHOP ON WOMEN IN SCIENCE & ENGINEERING

November 16, 2009

Jefferson Lab

Newport News, Virginia

Marie Curie

Rosalind Franklin

Chien-Shung Wu

Rachel Carson

EDITORS:

Latifa Elouadrhiri

Gail Dodge

Dianne Napier

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Conference Report

Women in Science and Engineering Workshop

Jefferson Lab
November 16, 2009

Background

On November 16, 2009, a Workshop on Women in Science and Engineering (<http://conferences.jlab.org/wsw09/program.html>) was held at Jefferson Lab. Organized by Latifa Elouadrhiri, Dianne Napier and Gail Dodge, the workshop was funded by a grant from the Jefferson Science Associates Initiatives Fund. Jefferson Lab also provided numerous services in support of the workshop, including conference support. One hundred thirty people registered for the workshop, some of whom are pictured below. The workshop grew out of discussions at Jefferson Lab centered on increasing women in the pipeline by sponsoring effective educational, mentorship and research opportunities for young people as well as on retaining women staff and users in these disciplines by improving the working environment whenever possible.



Some of the 130 attendees take a break for a "class" photo at Jefferson Lab

Goals and Objectives

The workshop brought together men and women from academia, national labs and government who are interested in learning more about these issues, sharing their experiences and perspectives, and identifying barriers and implementing suggestions for effective change. The goal of the workshop was to discuss strategies, existing programs, and practical measures to increase participation of women and girls in science and engineering at Jefferson Lab. During the workshop, barriers to the education, recruiting, progression and retention of women in science and engineering as well as strategies and practical measures to improve the current situation were discussed.

WOMEN IN SCIENCE AND ENGINEERING WORKSHOP AGENDA November 16, 2009

7:30	Registration and Continental Breakfast	
8:30	Welcome	Hugh Montgomery (<i>Jefferson Lab</i>)
8:45	Goals of the Workshop	Latifa Elouadrhiri (<i>Jefferson Lab</i>)

Status of Women in Science

9:00	Report from the Gender Equity Conference	Catherine Fiore (<i>MIT</i>)
9:30	Committee on the Status of Women in Physics	Kim Budil (<i>Lawrence Livermore National Lab</i>)
10:00	Women in Engineering	Catherine Didion (<i>National Academy of Eng.</i>)
10:30	Coffee Break	

Recruiting Strategies - Feeding More Women Into the Pipeline

10:45	The Importance of Research Experiences	Beverly Hartline (<i>University of the District of Columbia</i>)
11:15	Outreach at Jefferson Lab	Hari Areti (<i>Jefferson Lab</i>)
11:45	Minority Programs	David Ernst (<i>Vanderbilt</i>)
12:15	Female-Friendly Academic Departments	Howard Georgi (<i>Harvard University</i>)
12:45 – 2:00	Lunch	
2:00	The Perspective of Women in Europe	Silke Zollinger (<i>Max Planck Institute for Physics</i>)
2:30	NSF: Programs and Plans	Kathleen McCloud (<i>NSF</i>)
3:00	Gender Equity Activities in the DOE Office of Science	Linda Blevins (<i>DOE</i>)
3:30	Coffee Break	

Retention – Improving the Environment and the Role of Mentoring

4:00	Graduate Women Leadership Institute: Leaders in Life	Leslie Kolodziejski (<i>MIT</i>)
4:30	The Effect of Peer Instruction on the Retention of Women	Eric Mazur (<i>Harvard</i>)
5:00	Effective Mentoring: Roles and Responsibilities, Expectations and Realities	Stephanie J. Bird (<i>Science and Engineering Ethics</i>)
5:30	The Two-Body Problem	Marc Sher (<i>William & Mary</i>)
6:00 – 8:00	Reception	

Speaker Biographies and Summaries of the Workshop Talks

There were 16 talks, including a welcome from the Director of Jefferson Lab and an overview of the goals of the workshop by Latifa Elouadrhiri. The talks were organized into three sections: Status of Women in Science, Recruiting Strategies – Feeding More Women Into the Pipeline, and Retention – Improving the Environment and Role of Mentoring

Goals of the Workshop

Latifa Elouadrhiri



Latifa Elouadrhiri, Chair – Jefferson Laboratory

Dr. Latifa Elouadrhiri is a staff scientist in Hall B and the Assistant Project Manager for Hall B for WBS 1.4.2 (Hall B). She received her Ph.D. from the University of Clermont-Ferrand (France) in 1992. She came to Jefferson Lab in a joint position with CNU in 1994, and then joined the Hall B staff in 2001. Dr. Elouadrhiri has performed experiments at Saclay (France) and PSI (Switzerland) in addition to Jefferson Lab. She is one of the spokespersons of the Generalized Parton Distributions (GPDs) program with the CLAS detector and the senior team leader for the Hall B 12 GeV Upgrade.

Latifa Elouadrhiri provided a brief overview of the Jefferson Lab science and education programs. Jefferson Lab is a world-leading nuclear physics facility in the Department of Energy's Office of Science exploring the nature of nuclear matter. The science program carried out at Jefferson Lab is collaborative and “large-scale,” requiring broad participation representing different skills, outlooks and insights. Dr. Elouadrhiri also gave a brief overview of the excellent education program already existing at Jefferson Lab, which reaches 10,000 students and 1,000 teachers per year.

She next presented the workshop goals, which were:

- to discuss the barriers to the education, recruiting, progression, and retention of women in science and engineering,
- to identify and implement strategies that can help improve the participation of women in the science and engineering programs at Jefferson Lab and in general.

Status of Women in Science

<i>Report from the Gender Equity Conference</i>	Catherine Fiore (MIT)
<i>Committee on the Status of Women in Physics</i>	Kim Budil (Lawrence Livermore National Lab)
<i>Women in Engineering</i>	Catherine Didion (National Academy of Eng.)

**Catherine Fiore – MIT**

Dr. Catherine Fiore received her Ph.D. in Plasma Physics from Rensselaer Polytechnic Institute in August of 1980 after completing her thesis work developing a heavy ion beam as plasma diagnostic for measurement of the internal electric field in a tokamak plasma. She immediately joined the newly formed Plasma Fusion Center at MIT as a staff research scientist in the Alcator tokamak program, specializing in ion temperature diagnostics. Her work has continued into the third tokamak in the Alcator series, C-Mod where she specializes in nuclear source measurements and plasma transport studies. Fiore has been active in women in science/physics issues for many years. She led the Boston Chapter of AWIS for several years in the early 1980s, and served as co-chair of the national AWIS affirmative action committee until 1992. She has been a member of the APS-DPP Weimer award committee since 2005, serving as vice-chair in 2005 and chair in 2008. She joined CSWP in 2006, and chaired the committee in 2008. She has worked as a steering committee member for the CSWP Gender Equity Project since 2006, and became the project PI in 2008. Dr. Fiore is also active in Girl Scouting in Lexington, MA where she recently coached an FLL Robotics team of area Girl Scouts.

Catherine Fiore first reviewed the statistics on women in physics and their importance in maintaining growth in US productivity, which depends heavily on growth in the STEM fields. She cited a report by the National Academy of Science (2007), *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering*, which concluded that “women in science and engineering are held back from achieving their full potential, not by a lack of drive or talent, but by unintentional biases and by institutional structures that hinder their advancement.” Dr. Fiore went on to summarize the recommendations of the speakers at the Gender Equity Conference, which was held in May 2007. She is now participating in Gender Equity Conversations, in which a team of 2-3 physicists travel to an academic department, at the department's invitation, to work with the department on identifying challenges to women and helping to develop an action plan for addressing these challenges.

**Kim Budil – Lawrence Livermore National Laboratory**

Dr. Kim Budil is a Senior Advisor to the Under Secretary for Science at the Department of Energy. In this role she provides technical assistance on matters related to the National Nuclear Security Administration including its missions, the scientific and technical capabilities of the NNSA laboratories and complex, and the relationship between the NNSA and the broader DOE. Dr. Budil is detailed to this assignment from the Lawrence Livermore National Laboratory where most recently she was the Associate B Program Leader for Science, Technology and Experiments within the Weapons and Complex Integration (WCI) Directorate. She has actively participated in numerous other activities focused on increasing the participation of women in physics. Dr. Budil was a senior member of the U. S. delegation to the 1st International Union of Pure and Applied Physics Conference on Women in Physics in 2002 and co-chaired the U. S. delegation to the 2nd conference in 2005, and has served on a number of site visit teams assessing the climate for women in physics under the auspices of the APS Committee on the Status of Women in Physics.

Kim Budil presented an institutional perspective on women in physics. The Committee on the Status of Women in Physics (CSWP) sponsors a site visit program that has recently been expanded to include national laboratories. The site visit team investigates the climate for women in physics, identifies problems, and offers solutions to help improve the climate at the facility. The process, preparation, and general observations across facilities from these site visits were detailed in her presentation. She noted general observations from past CSWP site visits for climate improvements, including the importance of senior leadership "owning" the problem and setting expectations, the importance of women role models and women in leadership roles, the importance of a commitment by the institution to promote diversity, and the need for the institution to recognize the importance of all employees maintaining a balanced work-life. She stressed that actions taken to improve the climate for women tend to improve the climate for all employees. She also highlighted other positive actions for management, supervision, recruitment, hiring, mentoring and career development.



Catherine Didion – Committee on Women in Science, Engineering, and Medicine (CWSEM) of the National Research Council (NRC)

In addition to her work at the CWSEM and NRC, Dr. Catherine Didion is a Senior Program Officer at the National Academy of Engineering (NAE) where she provides staff leadership to the Academy's efforts to enhance the diversity of the engineering workforce at all levels. She is the Project Director for the Engineering Equity Extension Service Project (EEES) which is working with engineering societies to enhance their gender equity principles within their professional development materials. Before joining the National Academies, Dr. Didion was Vice President of the Didion Group, a public affairs and communications firm, and the director of the International Network of Women in Engineering and Science (INWES). She previously served 14 years as the Executive Director of the Association for Women in Science (AWIS). During her tenure AWIS was awarded the U.S. Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring, and she was the principle investigator for 17 government and foundation grants. Dr. Didion is an internationally recognized expert on issues of equity and gender in science and engineering. She has worked extensively with the European Commission, the South African Ministry of Science and Technology, the Organization of American States, and many other organizations on these issues. She has been an invited speaker on mentoring, networking, and women in science and engineering at over 200 conferences and has authored over fifty publications on women in science and engineering.

Catherine Didion presented an overview of the gender differences report. She noted statistical data for women holding B.S. Degrees and Ph.D.s in various engineering and scientific fields. The Committee on Gender Differences in Careers of Science, Engineering, and Mathematics Faculty conducted two national surveys in 2004 and 2005 of faculty and departments focusing on hiring, tenure, promotion process, and career related information within the disciplines of biology, chemistry, civil engineering, electrical engineering, mathematics, and physics. Each finding from the surveys was presented with recommendations. Some recommendations included: involving current female faculty in faculty searches, initiating mentoring programs, offering paid leaves for pregnancy, family care and emergencies, stopping the Tenure Clock policies, and making tenure and promotion procedures as transparent as possible. Catherine Didion recommended to Jefferson Lab that effective programs have three components: *commitment to take corrective action, collection of data for organizational change, and a framework for monitoring progress.*

Recruiting Strategies - Feeding More Women Into the Pipeline

<i>The Importance of Research Experiences.....</i>	<i>Beverly Hartline (University of the District of Columbia)</i>
<i>Outreach at Jefferson Lab.....</i>	<i>Hari Areti (Jefferson Lab)</i>
<i>Minority Programs.....</i>	<i>David Ernst (Vanderbilt)</i>
<i>Female-Friendly Academic Departments.....</i>	<i>Howard Georgi (Harvard University)</i>
<i>The Perspective of Women in Europe.....</i>	<i>Silke Zollinger (Max Planck Institute for Physics)</i>
<i>NSF: Programs and Plans.....</i>	<i>Kathleen McCloud (NSF)</i>
<i>Gender Equity Activities in the DOE Office of Science.....</i>	<i>Linda Blevins (DOE)</i>

**Beverly Hartline – University of the District of Columbia**

Dr. Beverly Karplus Hartline is Associate Provost for Research and Dean of Graduate Studies at the University of the District of Columbia. Previously she has held teaching, research and leadership positions in universities, in Department of Energy laboratories, at NASA, and worked in policy at the White House Office of Science and Technology Policy from 1996-1998. From 1985 through 1996 she was a member of the leadership team for the Continuous Electron Beam Accelerator Facility, which became Jefferson Lab after completion. As Associate Director for Project Management, she was responsible for ensuring completion of the project within cost, on schedule, and achieving the performance goals. A passionate educator enthusiastic about attracting students to science and engineering, Dr. Hartline organized and led JLab's first education/outreach programs—focused especially on broadening participation to include more women and minorities. As a member of the Committee on Equal Opportunities in Science and Engineering (2003-2009, chairperson in 2007), she became interested in institutional transformation of the science enterprise to take full advantage of the ideas and energy of America's and the world's diverse population. She is a charter member of the International Working Group on Women in Physics of the International Union of Pure and Applied Physics. This working group has organized three international conferences: one in Paris in 2002, one in Rio de Janeiro in 2005, and one in Seoul in 2008. She is the lead editor for the proceedings from those conferences. She has raised substantial funding to support full participation in the conferences. Her Ph.D. is in geophysics from the University of Washington, and she has a bachelor's degree in chemistry and physics from Reed College.

Beverly Hartline pointed out that the underrepresentation of women in physics and related fields in the U.S. remains significant despite an increase in doctoral degrees earned over the past 10 years. An even greater disparity is seen among minority women. Increasing recognition of the contributions of women to discovery and education in physics and related fields has led to government initiatives and other programs to promote broader inclusion, balance, and gender equity. She presented some of the actions that have been taken to support women in physics in the U.S. since the first IUPAP Women in Physics Conference in 2002. She also discussed how early education both at school and at home is critical in encouraging boys and girls to practice thinking like a scientist: questioning, exploring, discovering and verifying.

**Hari Areti – Jefferson Laboratory**

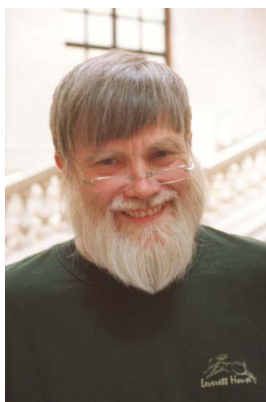
Dr. Hari Areti received his Ph.D. in High Energy Physics from the University of Ottawa. After his post-doctoral work at McGill University, he joined Fermilab's Advanced Computer Program and worked on CDF's data acquisition upgrade. He became a member of the Accelerator Division at Jefferson Lab in the Instrumentation and Controls Department. He then moved on to be the experimental coordinator between the Physics and Accelerator Divisions. At present, he looks after the Graduate Student Affairs and the Accelerator Division's education program at Jefferson Lab.

Hari Areti elaborated on outreach at Jefferson Lab and presented programs on science education, how the JWISE (Jefferson Women In Science and Engineering) Committee formed, retention and the path forward for Jefferson Lab. Science education programs at Jefferson Lab include BEAMS (Becoming Enthusiastic about Math and Science), Virginia Regional Science Bowls, High School Honors Program, and many other workshops and programs for K-12 students and teachers. Undergraduate, graduate programs and internships are also offered. The JWISE committee formed two years ago as an initiative to help foster a family-friendly work place. A lactation facility, research into the feasibility of a day care center, and this workshop have been initiatives of the JWISE committee. Jefferson Lab is creating a path forward for future workshops, pooling of resources, funding sources to aid in child care, collaborations, retention and mentoring.

**David J. Ernst – Vanderbilt University**

Dr. David Ernst is a Professor of Physics in the Department of Physics and Astronomy at Vanderbilt University. Dr. Ernst played a key role in a new agreement designed to encourage minority students to pursue science careers by giving them easier access to top physics journals. He directs the Minority Serving Institutions Project at the Southeastern Universities Research Association (SURA). He is also a co-founder and the current administrative executive officer of the National Society of Hispanic Physicists. He represented the two organizations in the negotiations that led to the current agreement. In the future, SURA plans to expand the program beyond physics into other physical sciences and mathematics.

David Ernst presented a method to recruit minority students into a Ph.D. program and to maximize the number of such students who succeed in obtaining a Ph.D. This is based on several years of experience with the Fisk-Vanderbilt Masters to Ph.D. Bridge Program (see <http://www.vanderbilt.edu/gradschool/bridge>). The program he discussed was developed through trial and error. Moreover, much of what he presented can be used to recruit and retain students in general. His experience is one that had a focus on domestic minority students. He also showed that having a formal program in place provides a great advantage in recruiting and mentoring students.

**Howard Georgi – Harvard University**

Dr. Howard Georgi is a Mallinckrodt Professor of Physics. He was a Senior Fellow in the Society of Fellows for 15 years before he resigned in 1998 to become Master of Leverett House. His work in particle theory has involved many aspects of the standard model, particularly QCD and grand unified theories. The latter were first constructed by Georgi and Sheldon Glashow in 1973. Much of Dr. Georgi's research has been in collaboration with his many graduate students, a group that includes four of the outstanding women in particle theory: Sally Dawson, Ann Nelson, Lisa Randall and Elizabeth Simmons. He is a Fellow of the American Academy of Arts and Sciences and the American Physical Society and a member of the National Academy of Sciences. He received the Sakurai Prize from the APS in 1995, the Dirac Medal from the Abdus Salam International Centre for Theoretical Physics in 2000 and the Pomeranchuk Prize from the Institute for Theoretical and Experimental Physics in Moscow in 2006. In addition to his research interests, Dr. Georgi is active in physics education and in the status of women and minorities in physics. He has served in the Chair line of the Division of Particles and Fields of the APS, the executive committee of the APS Forum for Education, the APS committee on the status of women in physics, as an external advisor to the Hunter College Gender Equity Project, and on the Advisory Board of Boston University Women in Science and Engineering. He co-chaired the NRC committee on women in science and engineering from 1996-99. In 2009 he was elected as a Fellow of the Association for Women in Science.

Howard Georgi discussed his experiences at Harvard over the years as he became more aware of the problems experienced by women studying physics. As chair of the department, he tried to understand why there are so few women studying physics, significantly fewer than in the other sciences. He showed that teaching physics with techniques based on cooperation rather than competition, such as peer instruction, seems to work and makes learning physics fun. He also emphasized the importance of undergraduate research. This is based on his work as director of undergraduate studies and master of Leverett House. The results of his studies showed that women are happier, but their numbers have increased only very slowly. Good communication and supportive attitude can increase effectiveness.



Silke Zollinger - Max Planck Institute for Physics, Munich

Silke Zollinger is a communications specialist with experience in media, writing and science. As Press and Public Relations Officer at the Max Planck Institute for Physics (MPP) in Munich, Germany, she currently manages all press and outreach activities. At MPP, she develops strategies to meet the needs of target audiences by combining the use of communication, didactics and scientific information to share information about the field of particle and astroparticle physics. She is responsible for the institute's popular scientific communication success with the public and the institute's visibility in print and broadcast media. She previously worked with research organizations like CERN in Geneva, Fraunhofer Research Society in Munich, and the Karlsruhe Institute of Technology. She developed her business expertise working in the software development industry with SAP in Germany and Delcam in Great Britain. She obtained her academic qualifications from the Technical Communication program of the University of Applied Sciences in Karlsruhe, Germany. In addition, she is a Certified Engineering Draftswoman (Karlsruhe Institute of Technology).

Silke Zollinger presented the European perspective of women in science and engineering with emphasis on the Max-Planck Institute for Physics and the European Union. The European Union has a goal of 40% female participation in science and engineering, with current statistics at less than 20% as of 2006. She presented data on men and women scientists and engineers across Europe and statistics from the Max-Planck Institutes. In researching her organization, she found that women on the staff have increased from 2001 to 2009, but have hit “glass ceilings.” She also noted women are not reaching higher positions and, on average, they earn less money than their male counterparts.

**Kathleen McCloud – NSF**

Dr. McCloud received her B.S. in Physics from the College of William and Mary in 1988, and her Ph.D. in Physics from the University of Pittsburgh in 1995 under the direction of Dr. James Maher. After a year of a postdoc at the University of Pittsburgh, she began her career at Xavier University of Louisiana, a Historically Black University located in New Orleans, as an Assistant Professor in the Department of Physics and Dual Degree Engineering. In 2001 she was promoted to Associate Professor and was elected Chair of the Department, a position she held until leaving Xavier for the National Science Foundation in 2006. She is currently the Program Officer in charge of the Education and Interdisciplinary Research Program in the Physics Division at the National Science Foundation. Dr. McCloud's primary research focus is pattern selection and interfacial dynamics in fluid systems, and she was able to successfully involve and mentor many undergraduate students at Xavier in her research activities. As a faculty member and as Chair, she also helped build and manage the undergraduate physics program at Xavier, as well as the associated dual degree engineering program. The undergraduate physics program at Xavier is known for consistently graduating the most African-American students with physics degrees in the nation.

Kathleen McCloud reviewed the steps that NSF has taken to broaden participation by underrepresented minorities in science. These include staff training, scrutinizing solicitation language, establishing explicit proposal review criteria (broader impacts), and training panelists on implicit bias. She reviewed evidence that showed that factors other than merit can have a strong influence on our judgments and discussed ways to mitigate evaluation bias. NSF has funded a series of workshops on gender and other underrepresented groups, covering many fields of science, and is monitoring the long-term impact of them. The ADVANCE program provides funding for an institution to transform its culture to enable the participation and advancement of women at all levels in academic science and engineering careers. Finally, the lessons that have been learned from these funded programs were summarized.



Linda Blevins – DOE

Dr. Linda G. Blevins is a Senior Technical Advisor in the Office of the Deputy Director for Science Programs in the DOE Office of Science. Her responsibilities include providing advice on science program management. Her efforts contribute to the normalization of management practices across the science programs, including the use of advisory committees and committees of visitors, the execution of peer review for research and facilities, the use of electronic tools for program management, and the development and execution of staffing plans. She manages the Office of Science Early Career

*Research Program and various other cross-cutting activities, and she assists with coordination of international activities in the science programs. She received a Ph.D. from Purdue University, a M.S. from Virginia Tech, and a B.S. summa cum laude from the University of Alabama. All of her degrees are in mechanical engineering. She testified before a Congressional subcommittee in 2008 on the topic of gender equity in science and engineering. She was a contributor to the book, *Giving Much/Gaining More: Mentoring for Success*, written by Emily M. Wadsworth and published by Purdue University Press in 2002.*

Linda Blevins first reviewed the DOE supported Gender Equity workshops, the recommendations that came out of them, and plans for follow-up. She described the concept of implicit bias and gender schemas, which are “hidden assumptions about a person’s behavior based on gender.” She outlined some of the ways that national labs are both different and similar to academia in their gender equity challenges, and she highlighted the family-friendly policies of Brookhaven National Lab, in particular. Finally she discussed some of the tools that funding agencies can employ to foster diversity.

Retention – Improving the Environment and the Role of Mentoring

- Graduate Women Leadership Institute: Leaders in Life*..... Leslie Kolodziejski (MIT)
- The Effect of Peer Instruction on the Retention of Women*..... Eric Mazur (Harvard)
- Effective Mentoring:
Roles and Responsibilities, Expectations and Realities*.....Stephanie J. Bird (Science and
Engineering Ethics)
- The Two-Body Problem*..... Marc Sher (William & Mary)



Leslie Kolodziejski – MIT

Dr. Leslie A. Kolodziejski is Professor of Electrical Engineering in the Department of Electrical Engineering and Computer Science at MIT. Her research group, Integrated Photonic Devices and Materials Group, implements compound semiconductor materials for photonic devices such as lasers, saturable Bragg reflectors, modulators, and photonic integrated circuits fabricated in her lab, The Nanoprecision Deposition Laboratory. Dr. Kolodziejski is the founder of the graduate women leadership institute Leaders in Life.

Leslie Kolodziejski found that first year graduate women in her engineering program at MIT were experiencing a loss of confidence, a questioning of their technical ability and a feeling of isolation. To address those issues, she developed a retention program, Leaders in Life, which consisted of an intensive week-long summer retreat, as well as a one-day workshop later in the year. The women in the program used a variety of techniques to improve their coping skills, resilience, and communication skills. The participants found the program extremely valuable. The challenge going forward is to find funding for the program and to get more faculty involved.



Eric Mazur – Harvard University

Dr. Eric Mazur is the Balkanski Professor of Physics and Applied Physics at Harvard University. An internationally recognized scientist and researcher, he leads a vigorous research program in optical physics and supervises one of the largest research groups in the Physics Department at Harvard University. Dr. Mazur has made important contributions to spectroscopy, light scattering, the interaction of ultrashort laser pulses with materials, and nanophotonics. In addition to his work in optical physics, Dr. Mazur is interested in education, science policy, outreach, and the public perception of science. He believes that better science education for all -- not just science majors -- is vital for continued scientific progress. To this end, Dr. Mazur devotes part of his research group's effort to education research and finding verifiable ways to improve science education. In 1990 he began developing Peer Instruction, a method for teaching large lecture classes interactively. Dr. Mazur's teaching method has developed a large following, both nationally and internationally, and has been adopted across many science disciplines.

Dr. Mazur has served on numerous committees and councils, including advisory and visiting committees for the National Science Foundation, has chaired and organized national and international scientific conferences, and presented for the Presidential Committee of Advisors on Science and Technology. He serves as consultant to industry in the electronics and telecommunications industry. In 2006 he founded SiOnyx, a company that is commercializing black silicon, a new form of silicon developed in Mazur's laboratory. Mazur is currently Chairman of the Scientific Advisory Board for SiOnyx. Mazur is Chairman of the Instructional Strategy Advisory Group for Turning Technologies, a company developing interactive response systems for the education market. He also serves on the Scientific Advisory Panel for Allied Minds, a pre-seed investment company creating partnerships with key universities to fund corporate spin-outs in early stage technology companies, and on the Scientific Advisory Board for the Lifeboat Foundation, a nonprofit nongovernmental organization dedicated to encouraging scientific advancements.

Eric Mazur presented a study that he performed to investigate if the gender gap in conceptual understanding in an introductory university physics course can be reduced by using interactive engagement methods that promote in-class interaction, reduce competition, foster collaboration, and emphasize conceptual understanding. To this end, he analyzed data from the introductory calculus-based physics course for non-majors at Harvard University both taught traditionally and using different degrees of interactive engagement. The results he presented showed that teaching with certain interactive strategies not only yields significantly increased understanding for both male and female students, but also reduces the gender gap. In the most interactively taught courses, the pre-instruction gender gap was eliminated by the end of the semester.



Stephanie J. Bird - Science and Engineering Ethics

Dr. Stephanie J. Bird is an independent consultant, internationally-known speaker, and co-editor of the journal Science and Engineering Ethics. She is a laboratory-trained neuroscientist whose research interests focus on the ethical, legal and social policy implications of research and technology, especially in the area of neuroscience. Dr. Bird is an active member and Fellow of the American Association for the Advancement of Science (AAAS) and has been Secretary of the Societal Impacts of Science and Engineering Section of the AAAS since 1995.

In 1990 and 1991, Dr. Bird served as President of the Association for Women in Science (AWIS), a national organization with 5000 members and over 80 chapters across the US. She was Director of the first AWIS Mentoring Project, which was designed to encourage and support undergraduate and graduate students in their pursuit of careers in math, science and technology. Dr. Bird gives talks and workshops at professional societies, conferences, medical schools, and research and teaching institutions on teaching research ethics, on various aspects of professional standards and ethical values in science including mentorship, and on neuroethics.

Stephanie Bird reviewed the importance of having one or more mentors to share their experience and expertise. She stressed that a mentor is not the same as a research supervisor or role model, and that not everyone makes a good mentor. She urged institutions and departments to encourage and promote mentorship, provide training for mentors and reward good mentoring.

**Marc Sher – College of William & Mary**

Dr. Marc Sher is Professor of Physics at the College of William and Mary. He received his B.S. from UCLA and his Ph.D. from The University of Colorado in 1980. He did postdoctoral research at UC Santa Cruz and UC Irvine and held a five-year senior research associate position at Washington University before coming to William and Mary. His research interests cover a broad range in theoretical particle physics and cosmology, including electroweak interactions, Higgs phenomenology, cosmological phase transitions, astrophysics, and Supersymmetry. Several years ago, he conducted a survey

concerning dual career couples in physics with Laurie McNeil. The response was overwhelming, and an extensive report was written (which has now been downloaded 40,000 times, and has had a significant impact on policy within federal agencies).

Marc Sher talked about how physicists are increasingly faced with the "two-body" problem, i.e. the difficulty of finding two scientific jobs in the same geographic location. This is a major issue in both academic and industrial hiring. It has a particularly disproportionate impact on women in physics. This is partly because the density of positions in physics is low. In early 1998, Laurie McNeil and Marc Sher conducted a Web-based survey on this problem. They asked about the experiences of physicist (and other scientist) couples in finding employment for both partners in the same location and about solutions that had proved successful. One of the products of the survey is a useful website (www.physics.wm.edu/dualcareer.html). It contains the full 60-page report on the survey, as well as a large number of links that are relevant for dual-career-couples. In addition, readers are encouraged to send in specific suggestions, which will be added to this site.

Participants List

Akers, Evelyn

Jefferson Lab
eakers@jlab.org

Akers, Madelaine

Old Dominion University
maker005@odu.edu

Andrews, Cassandra

Jefferson Lab
candrews@jlab.org

Anthony, Bontia

Old Dominion University
banthony@odu.edu

Areti, Hari

Jefferson Lab
aret@jlab.org

Barbosa, Rhonda

Jefferson Lab
rbarbosa@jlab.org

Battaglieri, Marco

INFN-Genova
battaglieri@ge.infn.it

Benmokhtar, Fatiha

CMU
fatihab@andrew.cmu.edu

Bey, Coletta

Tidewater Community College
beycj@cox.net

Blevins, Linda

DOE
Linda.Blevins@science.doe.gov

Bookwalter, Valerie

Jefferson Lab
bookwalt@jlab.org

Bowring, Daniel

University of Virginia
dbowring@jlab.org

Budil, Kimberly

LLNL
budill@mail.llnl.gov

Burkert, Volker

Jefferson Lab
burkert@jlab.org

Cade, Brandi

Jefferson Lab
bcade@jlab.org

Cardman, Larry

Jefferson Lab
cardman@jlab.org

Careccia, Sharon

Old Dominion University
careccia@jlab.org

Carter, Kandice

Jefferson Lab
kcarter@jlab.org

Comer, Amy

Jefferson Lab
acomer@jlab.org

D'Angelo, Annalisa

Univ. Rome Tor Vergata and INFN Roma
annalisa.dangelo@roma2.infn.it

Dashyan, Natalya

YerPhi
natasha@jlab.org

De Vita, Raffaella

INFN - Genova
devita@ge.infn.it

Didion, Catherine

National Academy of Engineering
CDidion@nas.edu

Dinkler, PE, Stan

ASME
s.dinkler@att.net

Dodge, Gail

Old Dominion University
gdodge@odu.edu

Dowd, Deborah

Jefferson Lab
dowd@jlab.org

El Fassi, Lamiaa
Rutgers University
elfassi@jlab.org

Elouadrhiri, Latifa
Jefferson Lab
latifa@jlab.org

Ernst, David
Vanderbilt University
david.j.ernst@vanderbilt.edu

Fiore, Catherine
MIT
fiore@psfc.mit.edu

Fisk, Sally
Jefferson Lab
fisk@jlab.org

Fomin, Nadia
University of Tennessee
nfomin@utk.edu

Ford, William
Old Dominion University
wpford@jlab.org

Forman, Nichole
SWE
nichole.forman@yahoo.com

Freeman, Jessica
Hampton University
jessica.freeman@pipeline.hamptonu.edu

Gan, Liping
UNCW
ganl@uncw.edu

Georgi, Howard
Harvard U.
hgeorgi@fas.harvard.edu

Gilfoyle, Gerard
University of Richmond
gilfoyle@jlab.org

Gohn, Wes
U. of Connecticut
goth@jlab.org

Greene, Tiffany
ASME Member
tgree015@odu.edu

Grenoble, Christiana
Jefferson Lab
grenoble@jlab.org

Griffioen, Keith
College of William & Mary
griff@jlab.org

Guzey, Vadim
Jefferson Lab
vguzey@jlab.org

Hafidi, Kawtar
Argonne National Laboratory
kawtar@anl.gov

Hageman, Ann
Jefferson Lab
annmarie@jlab.org

Harrell, Martha
Institute of Mathl Physics
imp.harrell@gmail.com

Hartline, Beverly
Delaware State U.
beverly.hartline@earthlink.net

Heffner, Kari
Jefferson Lab
heffner@jlab.org

Higinbotham, Douglas
Jefferson Lab
doug@jlab.org

Hinton, Wendy
NSU
whinton@nsu.edu

Hofler, Alicia
Jefferson Lab
hofler@jlab.org

Horn, Tanja
The Catholic University of America
hornt@cua.edu

Hummel, Christine

Jefferson Lab
chummel@jlab.org

Hutton, Andrew

JLAB
andrew@jlab.org

Ivanco, Marie

ASME Member
marieivanco@yahoo.com

Ivory, Megan

College of William and Mary
mkivory@wm.edu

Jawalkar, Sucheta

College of William and Mary
sxjawa@wm.edu

Jones, Ivy

HAMPTON UNIVERSITY
ivykrystal@gmail.com

Joyce, Michele

Jefferson Lab
erb@jlab.org

Keesee, Marie

Jefferson Lab
keesee@jlab.org

Keller, Maya

JLab
mkeller@jlab.org

Keppe , Cynthia

Hampton U / Jefferson Lab
keppel@jlab.org

Khetarpal, Puneet

RPI
puneetk@jlab.org

Kolodziejski, Leslie

MIT
leskolo@mit.edu

Kuchina, Elena

NHGS
Elena.Kuchina@nhrec.org

Kuhn, Sebastian

Old Dominion Univ
skuhn@odu.edu

Ledbetter, Jessica

Jefferson Lab
jledbett@jlab.org

Leininger, Eileen

Society of Women Engineers - Hampton
Roads Section
eleininger@nngov.com

Lin, Huey-Wen

University of Washington
hwlin@phys.washington.edu

Long, Elena

Kent State University
ellie@jlab.org

Lukaszew, Rosa

College of William and Mary
ralukaszew@wm.edu

Lung, Allison

Jefferson Lab
lung@jlab.org

Madre, Bonnie

Jefferson Lab
madre@jlab.org

Mahfouz, Riham

Thomas Nelson Community College
mahfouzr@tncc.edu

Malace, Simona

University of South Carolina
simona@jlab.org

Martin, LaTaunja

GEORGE WASHINGTON UNIVERSITY
lataunja2002@yahoo.com

Mazur, Eric

Harvard
mazur@physics.harvard.edu

McCloud, Kathleen
NSF
kmcccloud@nsf.gov

Mestayer, Mac
Jefferson lab
mestayer@jlab.org

Mineeva, Taisiya
Jlab/Uconn
mineeva@jlab.org

Montgomery, Hugh
Jefferson Lab
mont@jlab.org

Mooney, Karen
University of Virginia
mooney@virginia.edu

Mosbrucker, Becky
Jefferson LAB
becky@jlab.org

Musch, Bernhard
Jefferson Lab
bmusch@jlab.org

Myers, Katherine
George Washington University
kamyers@jlab.org

Nadel-Turonski, Pawel
Jefferson Lab
turonski@jlab.org

Napier, Dianne
Jefferson Lab
dnapier@jlab.org

Nasseripour, Rakhsha
GWU
rakhsha@jlab.org

Niculescu, Ioana
James Madison University
ioana@jlab.org

Nikolic, Milka
Old Dominion University
mniko004@odu.edu

Olson, Kara
Old Dominion University
kara@cs.odu.edu

Pagola, Silvina
W&M, Applied Science
spagol@wm.edu

Pastore, Saori
old dominion university
pastore@jlab.org

Phillips, Sarah
University of New Hampshire
sarahp@jlab.org

Prok, Yelena
CNU
yprok@jlab.org

Prokudin, Alexey
Jefferson LAB
prokudin@jlab.org

Punjabi, Vina
Norfolk State University
punjabi@jlab.org

Richards, David
Jefferson Lab
dgr@jlab.org

Ripani, Marco
INFN Italy
ripani@jlab.org

Roberts, Winston
Florida State University
wroberts@fsu.edu

Rossi, Patrizia
INFN-LNF
rossi@Inf.infn.it

Rugnetta, Heather
Northrop Grumman
heather2.l.rugnetta@ngc.com

Saha, Arun
Jefferson Lab
saha@jlab.org

Samolov, Ana
Old Dominion University
asamo003@odu.edu

Seraydaryan, Heghine
Old Dominion University
heghines@jlab.org

Shabestari, Mitra
University of Virginia
mhs3u@virginia.edu

Sher, Marc
William and Mary
mtsher@wm.edu

Shinault, Kim
Jefferson Lab
kshinault@jlab.org

Shinn, Michelle
Jefferson Lab
shinn@jlab.org

Skopik, Dennis
Jefferson Lab
skopik@jlab.org

Smith, Erin
Jefferson LAB
esmith@jlab.org

Solvignon, Patricia
Jefferson Lab
solvigno@jlab.org

Stutzman, Marcy
Jefferson Lab
marcy@jlab.org

Surles-Law, Ken
Jefferson Lab
law@jlab.org

Tandogan, Asli
Old Dominion University
atand002@odu.edu

Thomas, Sherry
Jefferson Lab
stthomas@jlab.org

Tian, Hui
Jefferson Lab
huit02@jlab.org

Valente-Feliciano, Anne-Marie
Jefferson Lab
valente@jlab.org

Vegna, Valentina
INFN - Roma for Vergata
Valentina.Vegna@roma2.infn.it

Vuskovic, Lepsha
Old Dominion University
vuskovic@odu.edu

Walford, Natalie
The Catholic University of America
nkwalford@gmail.com

Weygand, Dennis
Jefferson Lab
weygand@jlab.org

Whitlatch, Celia
Jefferson Lab
whitlatc@jlab.org

Williams, LaChelle
Jefferson Lab
lachelles@jlab.org

Wismer, Vikki
NHGS
vikki.wismer@silas.nhgs.tec.va.us

Yamagishi, Masao
Hampton University
yamagish@jlab.org

Young, Glenn
Jefferson Lab
gyoung@jlab.org

Zelitch, Shannon
University of Virginia
szelitch@virginia.edu

Zheng, Xiaochao
Univ. of Virginia
xiaochao@jlab.org

Zollinger, Silke
Max Planck Institute for Physics, Munich,
Germany
silke.zolling@mpp.mpg.de