

Brookhaven Women in Science and State University at Stony Brook Women in Science and Engineering Proposal to the NSF Grant for FORWARD Workshops

INTRODUCTION:

Significance of Science, Technology, Engineering and Mathematics (STEM) fields in sustaining America's economic growth and in the 21st century, is very aptly summarized in the report "Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future" by Committee on Science, Engineering, and Public Policy (COSEPUP) and Policy and Global Affairs (PGA).¹ It clearly states that without high-quality STEM workforce, knowledge-intensive jobs and the innovative enterprises that lead to discovery and new technology, our economy will suffer and our people will face a lower standard of living.

President's recent call for increased investment in STEM fields stands in stark contrast to the under-representation of women in leadership roles in these fields.² Although, women's representation among students in STEM fields is adequate, their proportional representation drops markedly in mid and advanced careers and all but disappear in leadership roles.³ This points to problems along transitional points in women's career paths. Indeed, the gap is perceived to be disadvantageous not just to women but to the advancement and innovation of STEM fields. Several explanations for the low numbers of women at all stages of STEM careers have been proposed ⁴ such as the classroom climate for girls in school classrooms in early stage, ⁵ poor preparation and lack of encouragement in STEM subjects in school, ⁶⁻⁹ bias and discrimination in hiring and advancement of women, ¹⁰⁻¹¹ issues of work-life balance, ¹²⁻¹⁵ and a serious dearth of role models. ¹⁶⁻¹⁷

Brookhaven Women in Science (BWIS) in Brookhaven National Laboratory (BNL) and Women in Science and Engineering (WISE) in Stony Brook University (SBU) are motivated to address these problems in their institutions. BWIS and WISE in collaboration propose training a core group of motivated senior women mentors along with a target group of early career women in STEM fields. The core group will consist of most successful and highly skilled senior women faculty, scientists from STEM fields. We will also include senior level administrators at SBU and BNL. The goal of the core group will be to mentor women STEM candidates on implementation of strategies for improving their early career presence, retention and advancement. Specifically, the core team will conduct mentoring workshops to serve women from main stream and minority STEM backgrounds in skills related to early career success and provide these candidates with opportunities for networking and gathering information to aid in their career advancement. We plan to invite 20-40 early career women from SBU and BNL. The workshop will have three major objectives:

- 1. Offer informal mentoring for tenure track in STEM fields:** The focus will be on training participants to navigate smoothly through the tenure process successfully and equip them with important skills, such as effective communication, grant writing, developing and leading a research group effectively. To meet this objective, the workshop will consist of:
 - Formal lecture given by senior faculty in STEM disciplines on the needs and goals of academic tenure. This will give participants the opportunity to interact with experienced scientist and engineers who can layout a successful plan for gaining tenure, and offer incisive insights on the expectations of administrators and hiring committees. They will share their experiences in research, teaching and gaining tenure, while addressing the individual concerns of participants regarding tenure.
 - Overview talks by recently tenured as well as senior scientists who have had successful research careers and have led innovative research teams for years. These talks will be very influential in equipping

participants with leadership skills, strategies for gaining technical expertise, and in helping them evaluate the latest trends in research.

This formal mentoring session will offer brief awareness sessions focused on gender-based stereotyping in classrooms and labs, and the tools for dealing with differential expectations toward male and female faculty members.

2. Provide an awareness about funding opportunities and research areas of national interest:

The goal is to inform the participants about various sources of research funding, the periodic solicitations advertised, and the procurement strategies.

The participants will be informed about research areas of national need, thereby helping them in aligning their research careers with national scenarios, increasing their chances of successfully competing for federal funding. We will hold focused discussions that will identify and prioritize the research areas.

3. Build a scientific community with culture of informal mentoring:

Finally, we are interested in creating opportunities for senior women scientists to have a meaningful scientific dialogue and create long-term networking. We plan to achieve this via mediated discussion sessions and a networking dinner during the workshop. Again, we will provide role models of success, by showcasing leading female scientists, and facilitate networking among women with academic and scientific backgrounds in STEM disciplines at these institutions. This first-hand exposure to senior colleagues in STEM disciplines will give participants access to researchers who can serve as role models, sponsors, and potentially, collaborators. The Office of Educational Programs at the lab already run such successful partnerships between BNL and community colleges. For our post doctoral fellows/early career scientific staff we would like to work out a teaching appointment with any of the close by universities or community colleges, thereby ensuring they are competitive as teaching staff, when they are applying for faculty positions at universities.

To address the work-life problem, we would invite trained human psychologist to present during dinner, who will outline the social and domestic problems accounting for the dearth of women in the academic workplace, such as motherhood, dual careers, and such, and be available to answer any queries.

TARGET GROUP:

Our targeted group will be from both mainstream and minority background, who are in their early years of research and academic careers in STEM fields; they will encompass postdoctoral researchers, engineers, and young scientists at BNL and SBU. We define STEM for this proposal as including the biological and environmental sciences, computer and information sciences, engineering, sciences, mathematics and statistics, and physical and chemical sciences. We define “minority” as encompassing American Indian, African American, Asian American, and Hispanic/Latino women, all of which are groups wherein women are underrepresented in STEM. For recruitment of minority candidates we have a partnership with the Center for Inclusive Education at SBU, who under NSF-sponsored AGEP (Alliance for Graduate Education and the Professoriate) program, have supported the advancement of more than 100 minority students in academia.

CHALLENGES for WOMEN in STEM:

Although the number of girls and boys in science classes in high school is equal, the numbers change significantly as girls move into higher education. Girl get subtle messages from the media, with little peer encouragement at young ages and it decreases as girls continue into higher education. Teachers and parents do not necessarily know what opportunities and careers are available in STEM fields. As a result girls are not encouraged to pursue

careers in STEM. They think scientist, computer technologist, engineers and physicist are dull and nerdy! Schools tend to reinforce the students who excel at sports more than in science.

Girls want to “help others” and do not think STEM Careers help others. They think that STEM fields are for boys or men and have significantly less role models for success in STEM...which is why these workshops are so important! Girls need to learn what opportunities are available and how to negotiate the system while in college. They need to be educated as to the real opportunities that are available to them if they pursue their talents in STEM. All students benefit from working with role models in their fields. These workshops will help bridge the gap between college and graduate school and onto professional careers. The students in the College WISE program will learn about the opportunities, so that they can make educated choices for their careers. The graduate students who attend the workshops will have the tools needed to move their careers forward to a tenure track and become the role models of the future.

EXPECTATIONS AND OUTCOMES:

After completing the workshop, we expect the participants to have an increased awareness of the tenure track process. We also expect them to have a better understanding of

- Effectively using of their time
- Research areas of national interest
- Strategies to secure research funding
- Ways to apply and negotiate for a faculty position
- Successfully disseminating the concepts of science, and teaching productively
- Networking and being an effective communicator

In order to evaluate the level of understanding (on the above mentioned traits) shown by our participants and effectiveness of the workshop, we will implement the following

1. The workshop participants will fill in a survey at the beginning of the workshop and one at its completion. The latter will ask them about their experiences with their mentor, about how their skills have improved, and their career goals. This survey will provide them with an opportunity to comment on their mentor and the workshop's logistics.
2. The participants will be asked to complete several questionnaires we will send them over time to assess the impact of the workshop in their career path. From their replies we will track their application for, and acceptance into faculty positions

To assess the value of the workshop, the members of the management team will write a report about the effectiveness of the workshop after completion of the workshop. The report will reflect their modified understanding of needs and interests of participants gained from the workshop. In addition, it will include comments on improving the design of the workshop and will act as a guide for mentors that may participate in this program over many future years. In addition, after the success of first workshop we will explore the possibilities of future funding for sustaining the program.

BUDGET:

We will pay for the transportation of the participants from SBU to BNL, and housing, if needed, for the participants. We will also provide breakfast, lunch, and a dinner as a networking reception. The participants will be given supplies such as writing pads, hand-outs of the talks, pens, and folders. Reimburse of travel expenses for team members who are attend the training in Washington, DC are included. We plan to record the presentations of

the workshop on a CD, copies of which we will give to all the participants. An itemized listing of expenses is presented below.

Description	Cost,\$	
Commemorative package for student follow up	500	(30 persons @ \$16/person)
Ground Transportation (SBU to BNL) and housing	3800	
Supplies	2000	
Intern	500	
Meals for Workshop Participants	-	
Breakfast - Continental	300	(30 persons @ \$10/person)
Lunch (Buffet Service)	750	(30 persons @ \$25/person)
Dinner	750	(30 persons @\$25/person)
CD with workshop recording for participants	400	
Invited speaker for dinner session	1,000	
Facilities, Conference and Production Services	Free of Cost	
Total Cost	10,000	

SUPPORT FROM ADMINISTRATION:

BWIS has been assured support from Brookhaven National Lab Director Sam Aronson (letter in annex). This support ensures us access to laboratory resources at no cost, such as the facilities where the workshop will be held. It will also provide access to highly skilled resources of IT personnel at the lab, who will help in the development of a website, where all the activities and assessment of the workshop will be made available. We also have support from BNL's summer intern program; a summer intern will help us plan and organize the workshop. The Laboratory will share the cost of the intern.

MANAGEMENT TEAM:

For this workshop, we have a management team of highly experienced individuals who are very motivated to the cause of mentoring early career women candidates. They are:

Carrie-Ann Miller Director of WISE since 2004 has increased the number of students and breadth of the program. She supervises and trains over 20 undergraduate and 10 graduate mentors each semester. She created the Student Leadership Council that receives leadership training and has significant input into the program. She is the co-director of TechPREP as well as one of the founders of the Coalition for Outreach and Education Programs (COOP). She was instrumental in developing the Brookhaven/SBU WISE Advisory Board. Ms. Miller is an active member of ConnectTo Tech, a group of school representatives and industry leaders who foster career and professional development for students interested in STEM careers.

Simerjeet K Gill is a research associate at BNL at the Energy Sciences and Technology Department. A promising leader in her field Gill is a trained Materials Chemist with a strong research experience in synthesis and characterization of porous nanomaterials. Her current research involves studying carbonation reaction mechanisms for enhanced geothermal systems and investigating radiation damage for advanced nuclear materials. She enjoys teaching; while developing her PhD studies she taught general chemistry and advanced inorganic chemistry laboratory courses. Gill likes to share her knowledge and has mentored and supervised a team of 25 teaching assistants and several undergraduate students in materials research. An accomplished young scientist Gill is concerned with the development of an academic career for her and other young women at a similar stage in

their careers. As such strives to overcome the challenges involved and has become a role model for others who want to follow a career in a STEM field.

Kenneth White is the manager of BNL's Office of Educational Programs (OEP). He has a background in nuclear energy, health physics and water chemistry for military, commercial and research reactors and numerous years of experience in education and training. Under his leadership the Office of Educational Programs has increased undergraduate internships at BNL three-fold, hosting nearly 200 students per summer. The program consistently maintains approximately 47% female participation and 34% underrepresented student participation. OEP also hosts OEP is also a founding partner in the INCREASE Consortium that is focused on advancing minority faculty usership of Department of Energy facilities. Workshops associated with this Consortium have included numerous early female faculty members from Historically Black Colleges and Universities, many of whom are participants in the Laboratory's Faculty and Student Teams. The programs were recently noted as "best in class" by the Department of Energy. Mr. White is a recipient of the Brookhaven Award, a co-recipient of the American Nuclear Society Award for Excellence in Training, and a co-patent holder for developing a computerized systematic approach to training.

David L. Ferguson is a Distinguished Service Professor and Chair of the Department of Technology and Society and Applied Mathematics and Statistics at Stony Brook University. He is a New York State and national leader in programs to enhance the participation of underrepresented minority students in undergraduate and graduate STEM programs. His participation in minority advancement was recognized in the White House by President William J. Clinton who honored him with The Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring (PAESMEM). In 1992, Professor Ferguson received the State University of New York Chancellor's Award for Excellence in Teaching. Currently he is the Director, National Science Foundation (NSF) supported SUNY Alliance for Graduate Education and the Professoriate (AGEP, 1999-2011) and Director, SUNY Alliance for Minority Participation (funded by NSF, 1996-2001), and Director of numerous projects to broaden participation and encourage excellence in undergraduate education in STEM.

Joanna Fowler, Director of the Radiotracer Chemistry, Instrumentation and Biological Imaging Program, who is the recipient of National Academy of Sciences Award in Chemical Sciences. She was awarded the National Medal of Science by President Barack Obama at White House. She is one of nine researchers named by President to receive the nation's highest award for lifetime achievement in science. Fowler's honors include the Society of Nuclear Medicine's Paul Aebersold Award and the Department of Energy's E. O. Lawrence Award, both received in 1997; the American Chemical Society's Francis P. Garvin-John M. Olin Medal in 1998; and the Glen T. Seaborg Award in 2002. She was elected to the National Academy of Sciences in 2004, and earlier this year she was inducted into the Long Island Technology Hall of Fame. Fowler has published about 350 peer-reviewed articles and holds eight patents for radiolabeling procedures.

In addition to the Management team, we have a list of very distinguished scientist interested in participating in the workshop presentations. They are:

Lisa Miller is an Associate Division Director in the Photon Sciences Directorate at BNL. She is also spokesperson for Beamlines U2B, U10B, and X27A at the National Synchrotron Light Source. She has made major contributions to research in bone- and protein-folding diseases and to the development of synchrotron-based biomedical imaging techniques. She is widely recognized for the creativity and originality of her work that has resulted in an extensive record of publications, invited talks, and funded proposals. Other facilities have emulated the very active user program in biomedical imaging that she developed at infrared beamline U10B. Her leadership, educational supervision, and outreach activities are outstanding, and she is truly a valuable member of the NSLS staff. Miller was honored in 2002 with a DOE Outstanding Mentor Award and in 2005 by Brookhaven Town for outstanding contributions to science and the community. She is also an adjunct assistant professor in the Department of Biomedical Engineering at Stony Brook University.

Triveni Rao is a Physicist in the Instrumentation Division at BNL. She has been working on high brightness electron injector for more than two decades and is considered to be an international expert on photo-cathodes. She is a recipient of American Physical Society fellowship, a BNL Science and Technology Award, with membership in professional organizations such as APS, Institute of Electrical and Electronics Engineers (IEEE), and Optical Society of America (OSA). She holds numerous patents, authored more than 150 journal and conference publications, and organized, chaired, and participated in several workshops. She is presently writing a book on Photoinjectors in response to an invitation from a well-recognized publishing house. She is an active participant in the BNL mentoring program. As a scientist and a group leader, she has mentored several students, post-doctoral fellows, and junior scientists and finds great pleasure watching them grow into successful, well recognized scientists.

Monica F Bugallo is Assistant Professor at Department of Electrical and Computer Engineering at SBU. She is recipient of Outstanding Young Engineer Award from IEEE and Hispanic Heritage Month (HHM) Latino Faculty Recognition Award. She has received the award for Best Paper in the IEEE Signal Processing Magazine 2007 as coauthor of a paper entitled "Particle Filtering ". Her research interests are in the field of statistical signal processing, with emphasis on Bayesian analysis, sequential Monte Carlo methods, adaptive filtering, stochastic optimization, and their applications to different disciplines including multiuser communications, smart antenna systems, biomedicine, target tracking, vehicle positioning and navigation. She recently received tenure and is very motivated to help early career candidates for the same.

Mei Bai is a tenured Scientist at Relativistic Heavy Ion Collider Accelerator (RHIC) Group at Brookhaven National Laboratory. She was honored by the Asian Committee for Future Accelerators and the organizing committee of the 2010 First International Particle Accelerator Conference for her significant and original contributions to the field of accelerator research during her early career. She was the recipient of the American Physical Society's Outstanding Doctoral Thesis Research in Beam Physics Award in 2000. She also has experience in teaching as lecturer at US Particle Accelerator School.

Vivian Stojanoff: is a Physicist at National Synchrotron Light Source (NSLS), at BNL and Adjunct Professor at Mount Sinai School of Medicine. Internationally recognized for her work as a crystallographer, Stojanoff is responsible for the National Institute of General Medical Sciences Research Facility at the NSLS and a member of the council of the International Organization for Biological Crystallization. She has mentored over 40 students including high-school, undergraduates, PhD candidates and Post-Doctoral Fellows in subjects encompassing physics, crystallography, biophysics and computer-science. She received the *Mentor Recognition from Smithtown School District* in 2002 and 2003 and the *Office of Science Department of Energy Outstanding Mentor Award* in (2005). Two of her PhD students were honored with the *Margaret C. Etter Student Lecturer Award*, in 2004 and

2006, for their outstanding thesis research. A board member of BWIS Stojanoff believes that a diverse workforce provides for a creative and innovation-driven work environment.

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