Final Report of the Boston University NSF ADVANCE PAID Initiative

WIN: Women in Networks, Building Community and Gaining Voice

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1. Executive Summary

Boston University began its NSF ADVANCE PAID initiative, "WIN: Women in networks, Building Community and Gaining Voice," to strengthen the networks of women scientists and engineers at BU in order to increase the work satisfaction, retention, and advancement of STEM women faculty. The WIN programs included pre-tenure mentoring, networking receptions, sponsored colloquia, and Erskine grants, named in memory of Professor of Biology Mary Erskine. All WIN programs and research efforts included faculty in the College of Arts & Sciences, the College of Engineering, and Sargent College of Health and Rehabilitation Sciences. Several WIN programs were open to men as well as to women faculty members. The WIN initiative benefitted enormously from the synergistic activities undertaken simultaneously by BU WISE under the direction of a rotating chairmanship. WISE also initiated activities designed to enhance women's professional networks and to foster other aspects of professional development.

All of the programs put into place as part of the WIN initiative received very positive reviews from participants. Two of the programs had such impact that we recommend they be continued. First, STEM faculty greatly appreciated the pre–tenure mentoring programs, which introduced them to senior and junior faculty members beyond the bounds of their own departments, fostering some enduring professional relationships and providing multiple perspectives on the critical questions tenure-track faculty face. There was no gender difference in the positive evaluations from participants.

Second, women STEM faculty who received Type I Erskine grants (up to $3,000) to expand or strengthen their networks by bringing potential collaborators to campus, visiting collaborators elsewhere, or networking at professional meetings reported many professional accomplishments that were enabled by the grants. The ability to use these funds in non-traditional ways, such as providing childcare to make professional travel possible, was especially appreciated. Thus, we recommend that the pre-tenure networking programs and the Erskine small grant program be continued by the university in the years to come.

Between AY 2006-2007 and 2010-2011, female representation in tenured and tenure-track positions of STEM departments increased. This expansion was entirely owed, however, to increases in the hiring of females at the Assistant Professor level. Attrition by female scientists and engineers remained disproportionately high, and there was no increase in female representation among Associate and Full Professors. In addition, it is still true of STEM faculty (as it was at the beginning of the WIN grant) that the modal male faculty member is a full professor, while the modal female faculty member is not on the tenure track at all.

Women were generally well represented on college and university level tenure and promotion committees. However, they were better represented as members of these committees than as chairs. In the past five years there has been no female chair of the Appointment, Promotion, and Tenure Committee in Engineering, nor at the University level. Women in CAS and ENG are still underrepresented as department chairs, but the percentage of CAS department chairs who were women increased noticeably, from 0% in 2007 to 12.5% as of 2011.

We recommend continuation of hiring efforts to address under-representation of females, particularly in disciplines where females are well represented in the pool of recent PhD recipients (such as Biology and Biomedical Engineering). These efforts should also not be limited to the junior level. We also recommend that increased attention be paid to faculty members who have been at BU for many years, with respect

to such things as recognition of accomplishments, tenure and promotion, and the potential for contributions through leadership positions. To support senior as well as junior STEM women, we also recommend the renewal of support for BU WISE.

We urge the creation of a systematic program of exit interviews, for insights that may be useful, in part (though not only) for increasing retention. We also recommend that the 2007 Climate Survey be rerun so that the university can quantifiably assess the gains that have been achieved in fostering a positive sense of community and can focus on the remaining challenges.

Within the sciences specifically, women at BU do not appear to be at a salary disadvantage relative to their male counterparts (with the exception of one category, in which the number of women is very small). In some cases (and most dramatically in SAR), female scientists' average salaries are higher than comparable male salaries. Nonetheless, because of larger gender gaps in other divisions, salaries are still more competitive for males than for females at the university overall, especially for Professors. BU still ranks below the median for private doctoral universities in its ratio of female to male faculty salaries at the ranks of Professor and Assistant Professor, according to the latest AAUP salary survey.

Continued vigilance is essential. The university should continue to track closely benchmarks including the following (by gender, ethnicity, tenure status, rank, and discipline): representation: on the faculty, and in specific types of leadership positions; rates and patterns of hiring, attrition, tenure, and promotion; and average salaries as well as non-salary compensation. We urge that a standard set of benchmark data be shared with the BU community on an annual basis.

2. Introduction.

Boston University's WIN initiative was designed to increase the work satisfaction, retention, and advancement of women faculty in the sciences and engineering at Boston University by enhancing women's professional networks, and to analyze the ways in which network-building can contribute to women's satisfaction and success in academic science and engineering. The WIN programs were adapted from successful programs at other ADVANCE schools and included pre-tenure mentoring, networking receptions, sponsored colloquia, and grants to tenured and tenure-track women STEM faculty to enhance their networks and promote new research initiatives. All WIN programs and research efforts included faculty in the College of Arts & Sciences (CAS), the College of Engineering (ENG), and Sargent College of Health and Rehabilitation Sciences (SAR). Several WIN programs were open to men as well as to women faculty members.

3. Context.

Since the arrival of President Robert Brown in 2005, Boston University has been on a course to recapture the University's founding principles of inclusion. Boston University was begun in 1839 by three Methodist abolitionists who believed that higher education should be accessible to all, and Boston University has always admitted students of both sexes and every race and religion. Boston University was also the first university in the country to admit women to graduate education, award a doctorate to a woman, award a doctorate in medicine to a Native American, and graduate a black psychiatrist. Boston University's School of Medicine was the first co-educational medical school in the world.

This legacy of inclusiveness was lost, however, and by the turn of the millennium Boston University had become conspicuous instead for the paucity of women and minority group members in positions of leadership and decision-making power, and, in fact, for the near-absence of minority group faculty on campus. In academic years 2005-2006 and 2006-2007 no woman chaired any of the 24 departments in the College of Arts & Sciences or any of the 4 departments in the College of Engineering. More than half of these departments had not had a female chair in the previous quarter century. At Boston University the representation of African American faculty was only half as high as it was at virtually all of the top-ranked universities and liberal arts colleges in the nation.

At the time of our application for the WIN grant, the modal male faculty member on the Charles River Campus (CRC) of BU was a Full Professor and the modal female faculty member was not on the tenure track at all. The overall percentages of women in natural science and engineering departments had remained flat between 1997 and 2007, and the percentage of female Assistant Professors in the CAS natural science departments (16.2%) was below the average for comparable disciplines in the NSF "top 50" departments (20.5%). Some data suggested differences in the time to tenure and promotion for men vs. women in the natural sciences and engineering, as well as some differences in the rates at which men vs. women on the tenure track ultimately ended up in tenured positions. The rate of attrition from BU's CAS natural science

departments between AY 1997 and 2007 was 70% higher for females than males. Rates of attrition in Engineering were also higher (by about 50%) for females than for males.

Results from the BU faculty climate survey had also revealed that in many areas, women from STEM disciplines were much less satisfied than their male peers. Only 11% of female faculty (compared to 54% of male faculty) from Natural Science departments in the College of Arts & Sciences and from the College of Engineering agreed that the climate and opportunities for female faculty at BU were at least as good as those for male faculty. Over a third (37%) of female faculty in these STEM departments, but only 16% of their male peers, believed that they had to work harder than some of their colleagues to be perceived as legitimate scholars. More male than female STEM faculty members (72 % versus 48%) agreed that the academic leadership within their departments was supportive of improving the climate and opportunities for women faculty, and more female than male faculty (41% versus 16%) disagreed with the statement, "I feel diversity of opinion is valued and respected at BU." A higher percentage of male STEM faculty than of female STEM faculty (62% versus 47%) said that they had a voice in the decision-making that affects the direction of their departments, and a smaller percentage of female STEM faculty than male STEM faculty (41% versus 56%) reported that they had sufficient opportunities to collaborate with departmental colleagues.

Women STEM faculty were more likely than their male colleagues to report having had a mentor formally assigned to them within their own departments (44% versus 17%), and were also more likely to report having had an informal mentor (63% versus 51%). Despite this apparent female advantage in mentoring, only 19% of female faculty reported receiving adequate mentoring at the university, while 45% of male faculty did. Women were less likely than men to agree that there had been clear communication about the criteria for tenure (42% versus 70%) and promotion (15% versus 49%). Women were also more likely than men to report that the formal mentoring they received was actually unhelpful (23% versus 9%).

Boston University began its NSF ADVANCE PAID initiative to strengthen the networks of women scientists and engineers at BU in order to reduce the high attrition rate of STEM women faculty from the university. It was also hoped that strengthening women's professional networks at the university would make BU science and engineering departments more attractive to potential female hires, thus augmenting our hiring efforts as well.

Boston University applied for and received its NSF PAID grant during a period of active efforts to promote the advancement of women faculty in the sciences and engineering and following efforts at self-study by the university administration. In fall, 2004, Prof. Sheryl Grace, later co-PI of the WIN grant, took the lead in founding Boston University Women in Science and Engineering (BU WISE), an organization devoted to the advancement of women science and engineering faculty at Boston University. President Brown augmented the funding available to the organization and supported BU WISE in other ways, including attending and participating in WISE events. In the fall of 2006, President Brown created the Council on Faculty Diversity and Inclusion

(CFDI) to make recommendations to promote the hiring, retention, and advancement of women faculty and those from underrepresented minority groups. Deborah Belle, Sheryl Grace, and Carol Neidle, the leadership team of the NSF PAID grant, served on this committee. On the recommendation of the CFDI, the university carried out a Faculty Climate Survey during the 07-08 academic year and also participated in a COACHE survey of all junior faculty members. The CFDI's final report was published in the fall of 2008 and it called for the creation of two new university positions, an associate provost for faculty diversity and inclusion and an Ombuds, as well as a new family leave policy that would help faculty members balance work and family needs. The university accepted these recommendations. In 2007 newly arrived CAS dean Virginia Sapiro launched a program to ensure that all CAS faculty members had departmental mentors within two years. A timeline synopsis of recent relevant events can be seen in Figure 1.

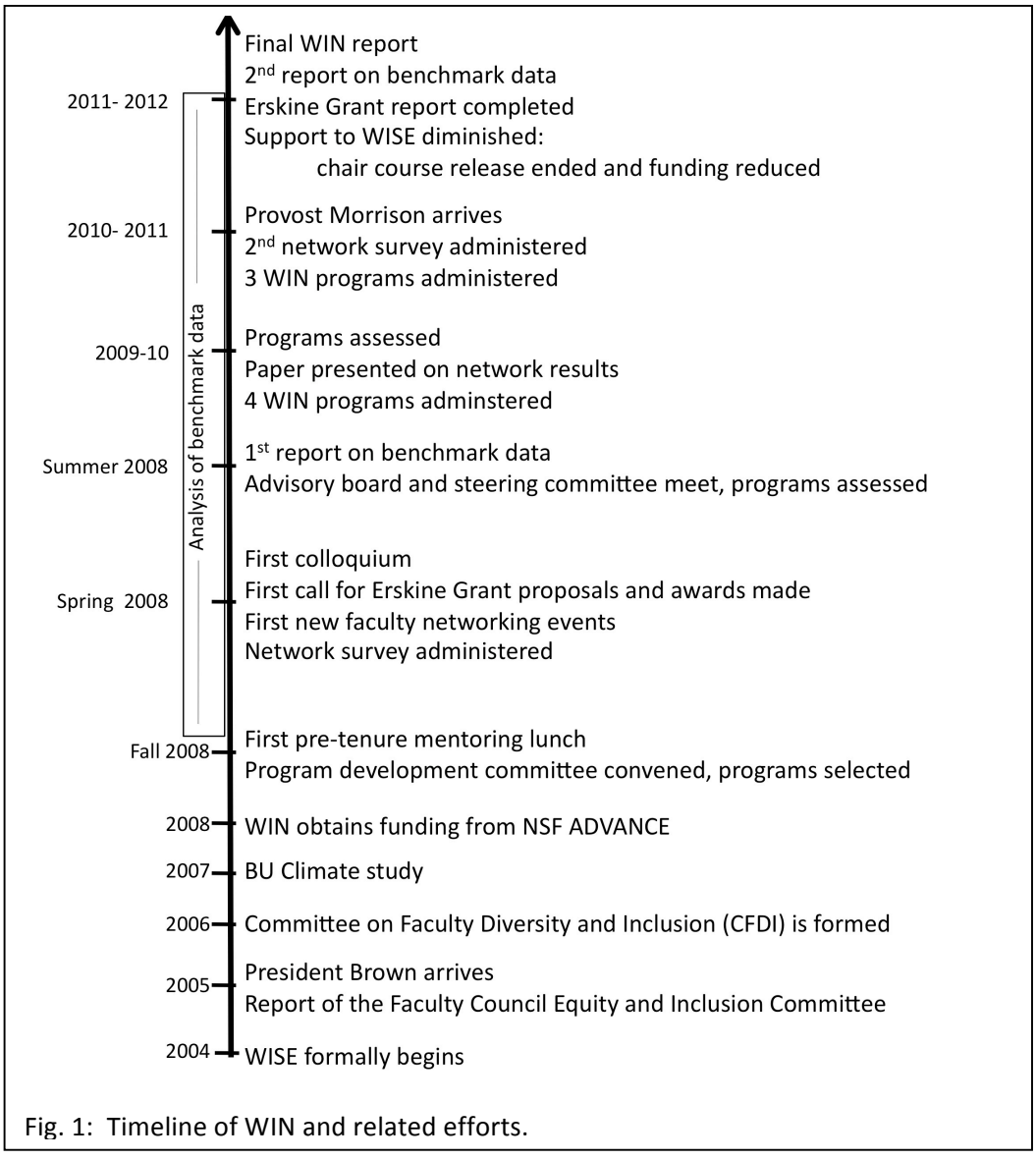


Fig. 1: Timeline of WIN and related efforts.

4. Programs.

WIN established several programs designed to strengthen professional networks. To guide the implementation of WIN programs, the leadership team worked with an program development committee composed of CAS and ENG faculty at all ranks, including both men and women. The WIN leadership team also received valuable ideas from the BU WISE external advisory board (Lotte Bailyn, Howard Georgi, Nancy Hopkins, Susan Metz, Eve Riskin, Debra Rolison, and Abigail Stewart) and from the WIN Steering Committee, which included Provosts David Campbell and Karen Antman and Deans Sapiro (CAS), Lutchen (ENG), and Waters (SAR). A graphical representation of WIN's organization is shown in Figure 2.

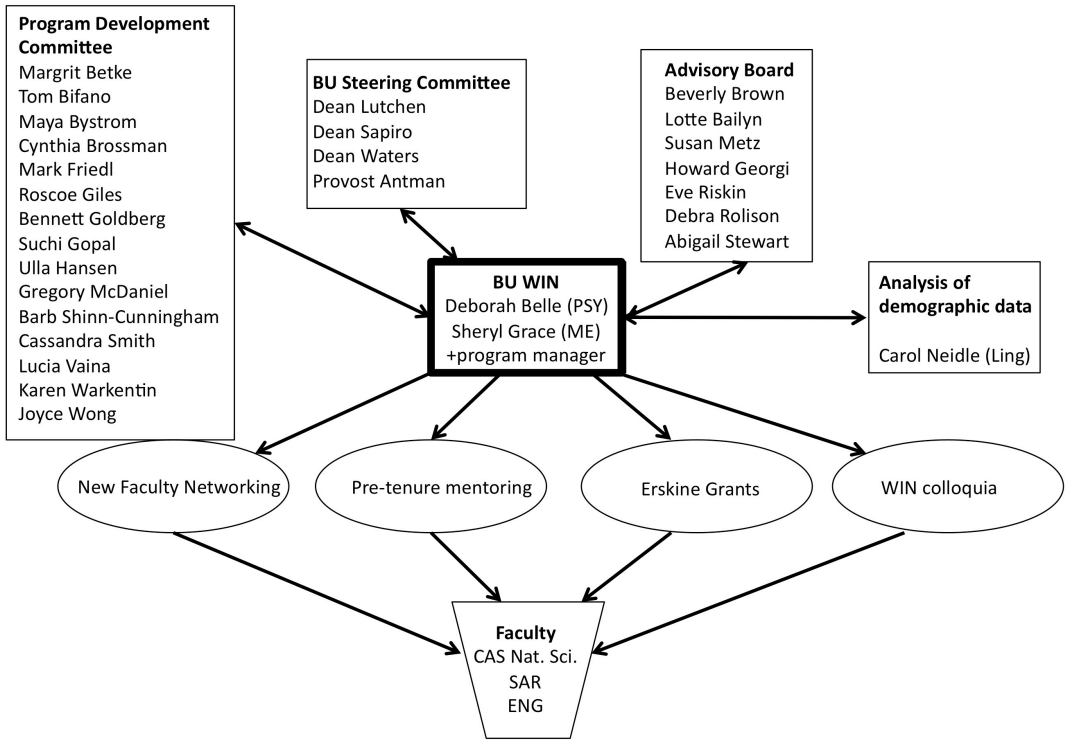


Figure 2. WIN organizational structure.

a) Pre-tenure Mentoring was a two-part program designed to provide career guidance to pre-tenure faculty and to enhance the networks of pre-tenure faculty by connecting them to senior colleagues across the university who could continue to provide guidance, and to other pre-tenure faculty members with whom they could share peer support. In the fall of each year, all junior faculty members in the College of Engineering (ENG), Sargent College of Health and Rehabilitation Sciences (SAR), and STEM departments in the College of Arts & Sciences (CAS) were invited to lunch and a panel discussion with senior faculty members who had recently served on tenure

review committees at the college or university level. In the spring of each year, junior faculty were invited to sign up for one-on-one meetings with such senior faculty members.

At pre-tenure mentoring luncheon panels, table assignments were arranged so that junior faculty members sat with senior faculty members. To stimulate conversations over lunch, a set of discussion topics was suggested. After lunch, four of the senior faculty members at the luncheon gave brief prepared talks, offering career and tenure advice to their junior colleagues. The panelists were chosen to represent a variety of disciplinary backgrounds and colleges and to include both men and women. The talks were followed by a question and answer period and general discussion.

In the first year of the grant, nearly half of all eligible junior STEM faculty members (26 out of a possible 57) participated in the lunch event, including 17 women and 9 men. Thirteen senior faculty members joined the luncheon for informal conversation, and four of these gave prepared talks after lunch. In the second year of the grant, when we chose a new time earlier in the semester that turned out to be less convenient for many faculty members, 14 of the eligible 74 junior STEM faculty members attended the luncheon, including 11 women and 3 men. Eleven senior faculty members participated in the lunch, with four giving prepared talks. In the third and final year of the grant, 21 of 68 eligible STEM faculty members attended, including 12 women and 9 men, and 15 senior faculty members participated as well.

Summaries of the substance of all of these talks are available on the BU WIN website: www.bu.edu/win/programs/pretenure/.

The panelists over the three year period were:

- Irving Bigio, Professor, Biomedical Engineering
- Dan Clemens, Professor, Astronomy
- Lena Lundgren, Professor, School of Social Work
- Melanie Mathies, Professor Sargent College
- Margrit Betke, Associate Professor, Computer Science
- Yannis Paschalidis, Professor, Electrical and Computer Engineering
- Joseph Restuccia, Professor, School of Management
- Mary Shann, Professor, School of Education
- Julie Sandell, Associate Provost for Faculty Development
- Karl Ludwig, Professor, Physics
- Kim McCall, Associate Professor, Biology
- Rick Averitt, Associate Professor, Physics

Evaluations of these mentoring panels showed that they were very well received. In the first year, for instance, 20 out of the 24 junior faculty members who responded to our evaluation survey (2 did not respond) said that they had gotten out of the mentoring panel what they had hoped to get, with several emphasizing the point: "Absolutely," "Yes!," "Yes—more than I ever expected," "Yes—I did. It was extremely helpful." One respondent left the question blank and three respondents gave qualified answers: (1) "Partly. It gave some answers to my questions, but I wish there was more

time to talk to and questions and answers from junior faculty," (2) "More or less," and (3) "In large part—of course, the standards/norms in each field vary, but I got a general feel for what comes into consideration."

All of the respondents said that they had learned at least one thing that they thought would be helpful to them as junior faculty members. The ideas they listed included the need to set limits on service, time management suggestions, and advice on which conferences to attend, keeping the CV up to date, the importance of writing the tenure application with non-experts in mind, and getting "big-wigs" in the field to know you and your work. Several mentioned that simply seeing the tenure application was helpful.

All but four respondents said they had met at least one person at the workshop they could call on in the future if they had questions or concerns, and most of these were senior people, including the panelists.

When asked what were the best things about the meeting, attendees frequently pointed to the multiple perspectives offered. One person said that there was a "very helpful variety of perspectives, with core consistency in message, from the panel." Respondents valued the bringing together of senior and junior level faculty for interaction and gaining perspectives from outside one's own department. Hearing about balancing work and family life was also valued, as was hearing people talk explicitly about the tenure process. Respondents praised the honesty of comments and the well organized panelists.

In subsequent years these positive evaluations continued, with most attendees reporting a great deal of valuable learning and new connections with senior and junior faculty members. One attendee noted that "This is the first time that I heard of/attended such a meeting in 4 years." Another said, "I wish this existed years ago when I, personally, needed it most. Please keep this going into the future. Information is empowering to promote success, lessen fear, and put a plan into place to achieve this goal." Attendees praised in particular the "direct," "frank," "honest," and "informal" conversations and talks by panelists. "It was really nice to see how the (tenure) process works from insiders." One person noted that he or she was seated at lunch with two senior faculty members. "It was nice to get their personal attention." Another attendee listed the excellent panelists with thoughtfully prepared statements," and yet another praised the packet of materials provided. One wrote, "Thank you so much for organizing this lunch last week. It was tremendously useful. I have pages of notes that I will study over the winter break."

The **one-on-one mentoring sessions** facilitated by WIN took place in the spring semester of each year. In the first year, 12 junior faculty members, including 6 men and 6 women, chose to participate in this part of the program. In 2010, 9 women and 2 men attended, and in 2011, 12 women and 6 men participated. Most of these junior faculty members had also participated in the pre-tenure mentoring panel event in the fall. Responses to the evaluation questionnaires and in focus groups were overwhelmingly positive.

When asked to what extent their expectations for their one-to-one meetings with senior mentors were met, virtually all stated that their expectations were met and, in many cases, exceeded. "It was great, all my questions were answered and I learned more than I expected to." "They were absolutely met and I feel comfortable calling on my mentoring partner in the future." "I had a very productive meeting with my mentor!" A mildly negative note was sounded by one junior faculty member who wrote, "I was somewhat disappointed that I was paired up with someone inside (my own) college. At the same time, I was pleasantly surprised at how useful the meeting was."

Junior faculty cited several important things they had gained from their one-on-one sessions, including a better understanding of the level of expectation for receiving tenure, an unbiased opinion of their current status, suggestions on how to make their work better known, ideas on setting priorities and on networking to promote themselves in their fields, learning details of the review process from the perspective of the reviewer, and gaining advice on how to be useful and important in the department "without being completely overburdened." One participant stated that "the piece of advice that most resonated with me was to somehow define myself within my department. I was already aware that I need to define myself as a good teacher and as a top-notch researcher in my field, but I hadn't really thought that I should also fill an important role within my department." Another said, "I have another contact that I can turn to. He is outside the department, can give me an objective opinion, and can give me advice and resources." Another said, "My mentor was able to guide me on making my application cogent without being effusive, and how to present my material well even to those outside my area."

Although the one-on-one pairings were advertised as one-time events, several mentor/mentee pairs have met on subsequent occasions. One mentor/mentee pair brought together by the program decided to pursue a grant together. One of the participants said that she meets for lunch with her mentor at least once a semester to update her progress, "and I can always email quick questions on any questions or difficult academic matter at hand, and I usually will get a response within a few days. Please do continue the mentoring program for others!"

One junior faculty member learned she had similar research interests to her mentor and reported that when they attended the same research working group, her mentor introduced her to his colleagues and "that helped break the ice." She was the only female and the youngest faculty member in a research working group teleconferencing with a group in another country. "It was a bit intimidating at first, but … when there was an opportunity that I could join in the discussion, my mentor turned to me and said 'I think this is your topic of interest, would you like to say something?' I know that I could have stood up for myself but being the new, young, and the female faculty in this working research group, it was difficult for me to say something. But right after my mentor gave me the spotlight to talk, I talked about my ideas and research interests, and my thoughts about a grant opportunity. Shortly after that research group meeting, the leader of that working group contacted me directly to ask for my CV."

Most participants reported no disappointments with their sessions. One did say, "I am a relatively junior person so my application wasn't as full as I would have liked, so it made it somewhat difficult for my mentor to critique it." Another stated that the mentor was "not in the technical sciences, so it limited questions I could ask. At the same time, it was a strength because I was curious as to how a member of the university-wide tenure and promotion committee that was not a member of my college would evaluate my application."

All of the participants said that they would advise a friend to spend the time to attend such a meeting, with many emphasizing they would do so "definitely," "or "absolutely." One said, "I would. As I mentioned, it was surprisingly helpful." Another said, "If nothing else, it's a nice way to meet more people at BU, and most likely it will be a much more valuable experience than that!" One commented, "I know that many of my colleagues always say that they are too busy to attend these personal/professional development workshops, and would rather focus on research. I think that their thinking is short-sighted. I believe that small talk leads to big talk. I think these types of workshops and activities are an essential part of career development."

When asked how we could improve these pairing sessions in the future one person suggested mentoring groups, in which three mentors and their mentees might meet once or twice a year to touch base. "It would widen the network." Another suggested that junior faculty should be encouraged to bring along a CV to the sessions, and to read the tenure application form before meeting with the mentor. A third suggested having such sessions earlier in the career of junior faculty members. We were also encouraged to have a mentor award or mentor certificate by nomination. "This may get more senior faculty involved, and if a mentor has more than one mentee, there is some kind of recognition of their services."

One participant stated that, "overall, the mentoring and networking activities sponsored by WIN were a great help to me in my first year! I don't have many BU colleagues in my specific field, and it's been great to have the opportunity to meet other BU faculty beyond my field and to get assistance in making connections to researchers in my field at nearby universities." Another said, "My meeting with Dr. Dorothy Kelly was really helpful. I was preparing my tenure package at that time. The suggestions and perspectives from Dr. Kelly were invaluable. I am glad that I participated in the one-on-ones."

b) New Faculty Networking Events were held for all newly hired faculty in STEM disciplines to help them make or deepen connections with their STEM colleagues, particularly those in other departments and in other local universities. The first year we invited all departmental faculty from the departments which were welcoming new colleagues and held two separate receptions to accommodate the large crowds we expected. In subsequent years we held only one reception each year with a more restrictive guest list: department chairs as well as the designated departmental mentors of new faculty were invited, but not the entire membership of the department. In the second and third years we held the welcoming receptions at the President's House, with Dr. Beverly Brown, life scientist and wife of the university president, as official host.

New faculty attendees were encouraged to invite to the reception members of their local professional networks or Boston-area individuals they hoped could become members of their professional networks. Not all new faculty members took the opportunity to invite outside guests, however, and many of those who were invited could not attend. In some cases the invitations alone were sufficient to initiate a relationship that was later pursued over coffee or lunch.

A total of 36 STEM faculty members new to Boston University attended one of the three new faculty networking events. Evaluation questionnaires and focus groups showed that many attendees of these events experienced significant gains from these receptions. One man said he invited a professor from Harvard with whom he was acquainted. "It made such an impression on him to be invited to the President's House as my guest that he has assumed the role of mentor for me." Another attendee said that the valuable contacts she made there were crucial to getting her research started and "out there" as soon as possible. One new faculty member had felt the need to meet a particular professor of biomedical engineering at BU whose research in the area of biomechanics and electromyography overlapped her own research interests and who was very well established in the field, but she had not had the opportunity. She invited him as one of her guests and he was able to attend. She communicates with him regularly now. Another new faculty member discovered during at the reception that BU faculty member Mark Friedl shared his research interest in remote sensing. As a result of this meeting, the new faculty member says, "I speak with him often now. I would not have made this connection had it not been for the networking event."

c) Erskine Grants were designed to enhance the research and professional networks of women faculty members in STEM disciplines. Named after the late Mary Erskine, Professor of biology, founding member of Boston University Women in Science and Engineering (BU WISE), and a revered mentor of many young women in the sciences, the grants were available to all female faculty members with tenured or tenure track appointments in science and engineering. We offered larger catalyst grants of $20,000, available through an annual award competition, and smaller grants, available on a rolling basis, for up to $3,000. The larger awards allowed faculty to venture into new areas of research. The smaller awards allowed women to host colleagues at BU, visit colleagues elsewhere, attend conferences and workshops, and kickstart new projects by covering the costs of supplies or undergraduate research stipends. Unlike NSF and other traditional funding, Erskine grants could also be used to cover child care expenses that would allow a scientist to manage her child care responsibilities while pursuing her research.

The larger catalyst grant proposals were reviewed by a panel of senior faculty members in the sciences and engineering using a review procedure modeled on the NSF research proposal reviews. All faculty members who did not receive funding in one round were given feedback about the strengths and weaknesses of their proposals and many were encouraged to revise their proposals and apply again. Three rounds of catalyst grants resulted in 27 proposals, with 10 of these funded. Twenty smaller grants were awarded during the duration of the WIN grant, with only 7 requests turned down.

In a small number of cases a faculty member was awarded a second small grant or awarded a larger catalyst grant after first receiving one of the smaller grants. In all, a third of all eligible female STEM faculty members at BU received one or more Erskine grant.

Winners of the larger catalyst awards were:

- Dana Bauer, Assistant Professor, Department of Geography and Environment
- Tereasa Brainerd, Associate Professor, Department of Astronomy
- Leslie Brody, Professor, Department of Psychology
- Robinson Fulweiler, Assistant Professor, Department of Earth Sciences
- Rosina Georgiadis, Associate Professor, Department of Chemistry
- Sucharita Gopal, Professor, Geography and Environment
- Ulla Hansen, Professor, Department of Biology
- Cheryl Knott, Associate Professor, Department of Anthropology
- Elise Morgan, Associate Professor, Department of Mechanical Engineering
- Emma Previato, Professor, Department of Mathematics and Statistics

Winners of the smaller awards were:

- Rama Bansil, Professor, Department of Physics
- Lorena Barba, Assistant Professor, Department of Mechanical Engineering
- Catherine Caldwell-Harris, Associate Professor, Department of Psychology
- Kee Chan, Assistant Professor, Department of Health Sciences and Epidemiology
- Stacey Doan, Assistant Professor, Department of Psychology
- Linda Doerrer, Assistant Professor, Department of Chemistry
- Simone Gill, Assistant Professor, Department of Physical Therapy and Athletic Training
- Sheryl Grace, Associate Professor, Department of Mechanical Engineering
- Lucy Hutyra, Assistant Professor, Department of Geography and Environment
- Kathleen Malley-Morrison, Professor, Department of Psychology
- Donna Pincus, Assistant Professor, Department of Psychology
- Emma Previato, Professor, Department of Mathematics and Statistics
- Anne Short, Assistant Professor, Department of Geography and Environment
- Karen Warkentin, Associate Professor, Department of Biology
- Joyce Wong, Associate Professor, Department of Biomedical Engineering

Our evaluation efforts suggest that these awards were quite valuable in enriching faculty networks and in enhancing faculty research. Winners of the ten larger awards reported that the research undertaken with Erskine grant funds had already led to four new research proposals, eight conference presentations, and five journal articles under

review. Several recipients of the smaller awards are now writing grants and papers with new collaborators they met at conferences or workshops they attended with the support of Erskine grants. Five have journal articles that have already been published on work jumpstarted by their small grant, and six others have papers either under review or presently being written. Six report that they have presented the findings from their new area of research at conferences. One PI believes her recently received CAREER award grew out of her attendance at a critical conference that was supported by her Erskine grant. Five recipients have mentioned being invited to give lectures at other universities or conferences because of a new connection they made thanks to an Erskine grant. A summary document pertaining to the Erskine Grants is included at the end of this report.

d) Sponsored Colloquia were designed to increase the visibility of women in STEM departments, strengthen networking and career opportunities for women in STEM disciplines, and bring new ideas to BU from industry and from other ADVANCE schools. WIN offered two sponsored colloquium programs. The Women in Industry Colloquia brought women scientists and engineers in non-academic careers to Boston University in order to provide faculty and graduate students with additional female role models and mentors while providing information on industry agendas and networking opportunities for all faculty members. The Women of ADVANCE series sponsored visits from female faculty members who were active with ADVANCE programs at their home institutions. Each visit in the Women of ADVANCE series included both a research seminar and an ADVANCE-related seminar or discussion during which BU faculty members could learn more about the initiatives and outcomes of ADVANCE at the visitor's university. Each colloquium took place as part of an ongoing colloquium series within a college, department, or center. WIN funds were used to provide travel funds, honoraria, reception funds, and additional support in publicizing the events. Men as well as women were eligible to nominate speakers, and many did so. The program brought exceptional women to campus. Yet nominations for these colloquium speakers declined over the years of the grant and, while some departments and individuals continued to nominate new speakers, many other departments never did so.

The speakers who were brought to Boston University through this program were:

- Dorre Grueneberg from Ariad and August Pharmaceuticals, nominated by John Celenza (Biology)
- Beth Marcus, founder of Bedford start-up Zeemote, Inc., nominated by Stan Sclaroff (Computer Science)
- Susie Wee, Director of Hewlett Packard's Mobile Systems Lab, nominated by Janusz Konrad (Electrical Engineering)
- Jennifer Tour Chayes, Distinguished Scientist and the Managing Director of Microsoft Research New England, nominated by Stan Sclaroff (Computer Science)

- Claire Rimnac of Case University, nominated by Glynn Holt (Mechanical Engineering)
- JoAnne Powell-Coffman of Iowa State, nominated by John Celenza (Biology)
- Patricia Davies, Director of Herrick Labs and Professor of Mechanical Engineering at Purdue University and President of INCE, nominated by Allan Peirce (Mechanical Engineering)
- Elizabeth Simmons, Dean of Lyman Briggs College and Professor of Physics in the Michigan State University Department of Physics and Astronomy, nominated by Rama Bansil (Physics)

5. Synergistic Activities.

During the period of the WIN grant BU WISE worked independently and in concert with WIN to promote networking and career development opportunities for STEM faculty women, including lunches with leaders; workshops on effective communication, salary negotiations, NSF CAREER grant writing, effective classical mentoring, and peer mentoring groups; and campus speakers who addressed the remaining barriers to women's progress in STEM fields. BU WISE chairs met with women candidates for STEM positions to let them know about the WISE community and its programs and to answer any questions they might have about being a woman on our STEM faculty. One WISE faculty member, Professor Cassandra Smith of Biomedical Engineering, received funding from Elsevier Publishers to create a weekly yoga group open to STEM faculty women. Another, Assistant Professor Kee Chan of Sargent College, created a monthly book group and then a set of writing groups for STEM faculty women. These networking and professional development opportunities pursued WIN's goals in different and creative ways, and with great success.

6. Faculty Network Research.

The faculty network research sought to answer questions about the professional networks of STEM faculty and also as part of a longitudinal evaluation of the network-building programs put in place by WIN. Previous research had shown that faculty women in the sciences and engineering often had networks ill-suited to professional development, collaboration, productivity, or high morale (Etzkowitz, Kemelgor, & Uzzi, 2000). Beyond their own departments, women faculty tended to have fewer ties than did men of comparable rank, resulting in fewer channels through which they might receive information about new scientific discoveries, funding opportunities, or methods of research or through which they might become known and valued in their fields (Etzkowitz et al., 2000). In attempting to understand and remedy the remaining barriers to women's advancement in academic science and engineering, attention had focused on women's isolation and lack of supportive network ties (Dyer & Montelone, 2007; Etzkowitz, Kemelgor, & Uzzi, 2000; Posey, Reimers, & Andronicos, 2007; Rankin, Nielssen, & Stanley, 2007; Realff, Colatrella, & Fox, 2007). Yet little empirical work had actually examined the professional networks on which women scientists and engineers rely.

In business settings, networks had been shown to function differently for men and women (Higgins & Kram, 2001; Kram & Ragins, 2007), and these differences appeared to reflect the relatively disadvantaged positions of women in organizational networks. Using personal contacts in job searches resulted in jobs of lower status when women did the searching, but jobs of higher status and better pay for male job seekers (Hanson, 2000). In a business environment, news sharing appeared sparser between individuals who differed in gender than between same sex individuals, and men received news from their networks faster than did women (Aral, Brynjolfsson, & Van Alstyne, 2007). Men, on average, were more favorably placed in organizations and were better sources of information, thus women tended to lose out on information flow more often than did men (Aral et al., 2007). In comparison to women, men reaped greater returns on their networks, even after controlling for an individual's centrality in the organizational network (Ibarra, 1992).

Furthermore, the business literature on networks showed that the kinds of network resources available to men and women tended to differ. Women managers were more likely to have network sponsors (Burt,1998), and to receive advice in more formalized ties (Krackhardt & Raider, 2005). Men's networks in management settings were more likely to be with peers rather than with more powerful sponsors (Burt, 1998), and to have informal resources like trust flowing through the ties (Kanter, 1977).

In STEM fields, the most well developed measures for studying research collaboration networks had been co-authorship and co-citation research, sometimes referred to as "scientometrics". The basic assumption is that co-authorship of a published work is evidence of a tie; citation analyses also sometimes assume that co-citation represents a network tie. Baldi (1998) tested whether citations were more likely among co-workers or authors from the same graduate school and failed to find these effects; he did, however, find that women authors were significantly less likely than men to be cited in astrophysics. This body of research has found that the large gender gap in productivity—men having higher rates of authorship and citations--that was discovered in the 1970s (Zuckerman & Cole, 1984; Cole & Cole, 1973) can be made to disappear when controlling for certain variables (e.g., academic rank, institutional prestige, PhD training). Whittington (2009) analyzes co-patenting networks of firms and scientists in the life sciences. She finds structural network evidence that supports previous work (Smith-Doerr, 2004; Whittington & Smith-Doerr, 2008) asserting that different forms of organization—biotechnology as more highly collaborative network organization, and pharmaceutical and academia as more hierarchical organization—have implications for the gender gap in productivity. Women life scientists find greater equity in the network structure of biotechnology for publishing as well as patenting (Whittington, 2009). As yet, very few studies have analyzed gender disparities in scientists' networks using measures other than co-authorship, co-citation, or co-patenting.

During spring of 2009 all full-time faculty in CAS, ENG, and SAR were invited to participate in a web-based survey concerning their professional network ties within their own departments, outside their departments but within Boston University, and

beyond Boston University. Details about the survey can be found in the Appendix. In spring of 2011 a second faculty network survey was attempted in order to study changes in faculty networks over time and especially the impact of WIN and other networking programs on faculty networks. However, despite an email from university provost Jean Morrison encouraging faculty to participate in the survey and generous financial incentives to do so, participation rates remained stubbornly below an acceptable level. Several faculty members contacted the investigators to complain that they had already filled out the survey, when what they had filled out was the survey administered two years earlier. Some insisted that the first survey had only taken place a few months earlier. It is possible that the widespread impression that this was actually the same survey, not a new one, may have contributed to the poor response rate. It is also possible that faculty simply rejected the survey as too time-consuming or annoying. Whatever the cause of the poor response rate, the intended longitudinal analysis and evaluation could not be undertaken.

Hypotheses. Based on the research reviewed earlier and on results from the earlier BU faculty climate survey, we expected that male STEM faculty members would report a greater sense of belonging and connection in their academic departments and in the university than their female colleagues. We also expected that STEM women faculty would have smaller networks than their male colleagues, with fewer individuals who provided each of the resources about which we inquired. We further predicted that this smaller size of women's networks would explain their lower levels of satisfaction with their networks. We predicted that network ties would evidence homophily, with women naming more female network members and men naming more network members who were men. And we predicted that whether or not a woman's department contained a critical mass of women (15% of departmental faculty) would be positively associated with women's satisfaction and with network characteristics. Since men and women in BU STEM departments tend to differ in academic rank, with men much more likely than women to be tenured and Full Professors, we controlled for academic rank in our calculations, as well as for the extent to which the academic department contained a critical mass of women (15% of departmental faculty).

Results. Contrary to our hypotheses, women reported professional support networks as large as those of their male peers. None of the types of network resources we asked about revealed a gender difference, whether or not we controlled for the respondents' rank and departmental critical mass. Yet women were significantly less satisfied with their professional networks than were their male colleagues at the same rank. As we had expected, many network ties were homophilous, with women significantly more likely than men to name women as network members and men more likely than women to name men. To our surprise, male Full Professors reported more dense professional networks beyond the home university than did their female colleagues. For both men and women, the presence of a critical mass of female colleagues in one's department was a predictor of increased satisfaction with opportunities to collaborate and greater numbers of network members who both seek and help with professional advice.

It is possible that women's negative experiences in overcoming barriers in a STEM career may lead to less reported satisfaction at the university, even while their professional networks have provided the resources necessary to survive as STEM faculty. It is also possible that something we did not inquire about, the costs or stresses of network ties, may be heavier for women than for men and account for the lower level of women's network satisfaction, even when women and men have networks that are equally effective in providing positive resources. Our survey questions emphasized the resources available from professional networks, rather than the potential costs of networks. It is also possible that women are more likely to seek a higher level of connection and support and that many women are dissatisfied with networks that would satisfy most men. Further research is needed to test these competing explanations of our findings.

One paper, "Gendered networks: Professional connections of science and engineering faculty," was presented in August, 2010 at the annual meetings of the American Sociological Association in Atlanta, Georgia. Details about survey methods can be found in the appendix to this report.

7. Benchmark Data.

Analysis of benchmark data was conducted by Carol Neidle with data provided in most cases by the Provost's Office and Office of Institutional Research. We very much appreciate the assistance in data collection that has been provided by Suzanne Brown, Liz Avery, Julie Sandell, Nancy Insley, Mike Devitt, and others. Historical limitations in the way records were kept and categorized have in some cases limited the analyses that could be performed, although the last few years have seen major improvements in data gathering and analysis at BU.

The university appears to have made significant progress in **hiring women scientists and engineers**, particularly at the Assistant Professor level and in CAS Natural Science departments. Generally, female applicants were more likely to be chosen for the positions they applied for than were male applicants in recent years, although this was reversed in hiring at the Full Professor level and in the College of Engineering, where male candidates had a greater chance of being hired. Boston University also appears to be doing well in hiring relative to the numbers of doctorates awarded to women in specific science and engineering fields.

However, in Biology and in Biomedical Engineering—fields in which females are relatively well represented among recent Ph.D. recipients—BU's hiring of women has been less than would be expected, given the female representation in these fields. In Biomedical Engineering, for instance, women have comprised well over a third of Ph.D.'s in recent years, but females represented only 16.7% of BU's hires in Biomedical Engineering over the last five years. The percentage of female full-time faculty members in Biomedical Engineering at Boston University has actually declined steadily from 2000 to 2010.

BU's success in hiring women also does not extend to **senior hires** of tenured and Full Professor faculty. Senior hires are far fewer in number than hires into entry-level

positions, but the faculty who take these positions often have considerable power at the university. There is also a long history of gender imbalance in hiring at the senior level, often through "target of opportunity" hires. It is heartening that the senior administration is working to standardize the "target of opportunity" process, which can only increase the likelihood that females will not be overlooked as potential targets for such hires.

The pace at which Boston University has been hiring women scientists and engineers should bode very well for future representation of women at the university. Yet **attrition** remains a formidable problem. Between 1997 and 2007 18.4% of the hires in the Natural Sciences were women, but so were 22.9% of the departures. For women in the Natural Sciences, the total number who left in this period represented 50% of the original number who held such positions in 1997 (for men, this percentage was 26.8%).

Since 2007 female attrition is still disproportionately high in the Natural Sciences, and the over-representation of women in attrition is even greater when attention is restricted to voluntary departures, i.e., those who leave the university for reasons other than death, retirement, program termination, or dismissal. The CAS Natural Sciences lost 6.8% of its tenure-track women each year, on average, whereas only 1.6% of the tenure track males were lost each year to voluntary attrition. Similarly, the Natural Sciences lost 2.7% of its tenured women each year, on average, to voluntary attrition, and only 1.4% of its tenured men. In ENG voluntary attrition from tenured ranks was higher for females than for males. This picture is reversed in Sargent College, where voluntary attrition occurred at a higher rate for men than for women.

Given the countervailing forces of hiring, which has raised women's representation at BU, and attrition, which has lowered it, the net effect (including effects of internal transfers of several individuals between BU colleges) has been to increase **female representation** since 2007 from 12.8% to 15.7% in the CAS Natural Sciences, from 11.4% to 13.5% in Engineering, and from 56.5% to 61.5% in Sargent College. This expansion is entirely owed, however, to increases in the numbers of female Assistant Professors. In the Natural Sciences and in Engineering there has been no increase in female representation among Associate and Full Professors. Since 2007 there has been virtually no change overall in the percentage of female Full Professors in CAS.

Women are also more likely than men to hold positions that are **not on the tenure track** at all. In the CAS Natural Sciences women held 27.7% of the non tenure-track positions, but only 15.7% of positions on the tenure track or with tenure. In the College of Engineering the difference was much smaller, with women holding 14.3% of the non tenure-track positions and 13.5% of tenured or tenure-track positions. In Sargent College, where women predominate at all ranks, the percentage of women was greater in non tenure-track positions (92.1%) than in tenure/tenure-track positions (66.7%).

Considering CAS, ENG, and SAR combined, more men fall into the category of Full Professor than in any other category, whereas there are more women not on the tenure ladder than women in any other category. For men, the number of tenured Full Professors is more than twice as large as the number of tenured Associate Professors. In contrast, female Associate Professors outnumber female Full Professors. These gender

differences point to profound differences in power and in access to institutional resources.

Women were generally well represented on college and university level **tenure and promotion committees** in comparison to their representation on the faculty overall. They were, however, better represented as members of these committees than as chairs. In the past five years there has been no female chair of the Appointment, Promotion, and Tenure Committee in Engineering, nor at the University level.

Tenure and promotion reviews in the CAS Natural Sciences were more likely to reach completion with approval for men (75%) than for women (50%). In Engineering, 90% of the tenure reviews for men ended in approvals, in contrast to only 67% of the reviews for women. This gender disparity contrasts with the picture in other divisions. In none of the divisions other than CAS Natural Sciences and Engineering did women have lower success rates than men in the tenure process.

Considerable progress has been made in recent years with respect both to **salary levels** and **female-to-male salary ratios**, although this is difficult to track closely over more than the last several years, since under the regime of former University President John Silber BU refused to participate in the AAUP annual salary survey. During this period during which salary information was not disclosed to the AAUP, BU salary levels declined relative to those of its peers, and female salaries declined relative to male salaries. There has been, however, a substantial effort—spearheaded by Provost Campbell prior to the arrival of President Brown and then taken up by the new administration—to reduce salary inequities and to make BU salaries more competitive overall. One should not lose sight of the fact, however, that the recent increases in salary equity do not and cannot address the accumulated economic disadvantage to senior faculty of inequitably low salaries (and corresponding contributions to retirement funds, etc.) over long periods of time.

Although there has been real progress toward **salary equity** at BU in the last five years, as of 2011-2012, salaries were more competitive for males than for females, especially at the rank of Professor. The average female Professor at BU earned, on average, 86.1% of what female Professors at other non-public doctoral universities in Massachusetts earned, whereas the average male Professor at BU earned 90.0% of what male Professors earned at these other universities. BU was still below the median female:male average salary ratios for private doctoral institutions in the United States for Professors and Assistant Professors. Only at the Associate Professor rank was BU's ratio of female to male average salaries at the median.

Although women were paid considerably less than men in the Humanities and Social Sciences, they were actually paid more than men at some ranks in Natural Sciences and Engineering. In the Natural Sciences, women had higher salaries than men at the Full Professor and Assistant Professor level and were nearly equal in salary at the rank of Associate Professor. In Sargent College, women's average salaries were higher than those of males at all ranks. In Engineering, female Associate and Assistant Professors had salaries quite close to those of their male peers, although the female Full Professors in engineering (very few in number) had lower salaries than the males.

Women in the College of Arts & Sciences have been underrepresented as **department chairs**, in comparison with the percentage of the tenured faculty and the percentage of Full Professors who are women. However, the percentage of department chairs who are women increased, up from 0% between 2005 and 2007 to 12.5% as of 2011. Women are a much smaller percentage of the tenured faculty in the College of Engineering, and there were no female department chairs in this college. In Sargent College, by contrast, where a majority of the faculty members are women, all department chairs and other administrators were women.

8. Conclusions.

Boston University began its NSF ADVANCE PAID initiative, "WIN: Women in networks, Building Community and Gaining Voice," to strengthen the networks of women scientists and engineers at BU in order to increase the work satisfaction, retention, and advancement of STEM women faculty. The high level of attrition had kept the university from expanding its women STEM faculty, despite hiring considerable numbers of women scientists and engineers. It was also hoped that strengthening women's professional networks at the university would make BU science and engineering departments more attractive to potential female hires, thus augmenting our hiring efforts as well.

All of the programs that were put into place as part of the WIN initiative received very positive reviews from participants. In particular, STEM faculty appreciated the pre–tenure mentoring programs, which introduced them to senior and junior faculty members beyond the bounds of their own departments, fostering some enduring professional relationships and providing multiple perspectives on the critical questions tenure track faculty face about their professional lives as they prepare to be evaluated for tenure. These programs were made available to men as well as women, and there was no gender difference in the positive views attendees had of these programs. Second, women STEM faculty who received Type I Erskine grants (up to $3,000) to expand or strengthen their networks by bringing potential collaborators to campus, visiting collaborators elsewhere, or networking at professional meetings reported many professional accomplishments that were enabled by the grants. The ability to use these funds in non-traditional ways, such as providing childcare to make professional travel possible, was especially appreciated.

The benchmark analysis undertaken as part of the WIN initiative revealed improvement over the past five years in several areas, with other indicators showing disappointingly small change. These findings should be useful in focusing future efforts to advance STEM women at BU.

- Over the years of the WIN initiative the university appears to have made significant progress in **hiring women scientists and engineers**, particularly at the Assistant Professor level and in CAS Natural Science departments.
- However, in **Biology and in Biomedical Engineering**—fields in which females are relatively well represented among recent Ph.D. recipients—BU's hiring of women has been less than would be expected, given the female representation in these fields.

- The percentage of female full-time faculty members in **Biomedical Engineering** at Boston University has actually declined steadily from 2000 to 2010.
- **Senior hires** also continue to be dominated by men.
- Voluntary female **attrition** is still disproportionately high in the CAS Natural Sciences and in ENG. Only in Sargent College is this picture reversed, with higher voluntary attrition by men than by women.
- **Female representation** in STEM departments has increased since 2007 in the CAS Natural Sciences, in Engineering, and in Sargent College.
- This expansion is entirely owed, however, to increases in the numbers of female Assistant Professors. In the Natural Sciences and in Engineering there was no increase in female representation among Associate and Full Professors.
- Between 2007 and 2011 there was virtually no change overall in the percentage of female Full Professors in CAS.
- Women are also more likely than men to hold positions that are **not on the tenure track** at all.
- More men fall into the category of Full Professor than into any other category, whereas there are more women not on the tenure ladder than women in any other category.
- Women were generally well represented on college and university level **tenure and promotion committees** in comparison to their representation on the faculty overall.
- They were, however, better represented as members of these tenure and promotion committees than as **chairs**.
- In the past five years there has been no female chair of the Appointment, Promotion, and Tenure Committee in Engineering, nor at the University level.
- **Tenure and promotion reviews** in the CAS Natural Sciences and in ENG are more likely to reach completion with approval for men than for women. In none of the divisions other than CAS Natural Sciences and Engineering did women have lower success rates than men in the tenure process.
- Women in CAS and ENG were still underrepresented as **department chairs**, but the percentage of CAS department chairs who were women increased noticeably, from 0% in 2007 to 12.5% as of 2011.
- Although there has been real progress toward **salary equity** at BU in the last five years, current salaries are still more competitive for males than for females, especially at the rank of Professor.
- BU still ranks below the median in its **ratio of women's to men's average faculty salaries** at the ranks of Professor and Assistant Professor. Only at the Associate Professor rank is BU's ratio of female to male average salaries at the median with its peer institutions.
- **Gender-based salary disparities** are concentrated in the Humanities and Social Sciences. Women are actually paid more than men at some ranks in the Natural

Sciences and Engineering (the one exceptional case being a category in which the numbers are very small).

These benchmarks tell us about many of the objective realities at Boston University.

9. Recommendations

1. Continuation of pre-tenure networking programs and Erskine small grants. Women STEM faculty who received grants to expand or strengthen their networks by bringing potential collaborators to campus, visiting collaborators elsewhere, or networking at professional meetings were enthusiastic about the value of these grants in furthering their professional objectives. The ability to use these funds in non-traditional ways, such as providing child care to make professional travel possible, was especially appreciated. Faculty also pointed to many specific professional accomplishments they attributed to these small grants. The pre-tenure mentoring programs provided a wealth of information and useful perspectives and made possible new, supportive relationships beyond the home department. These programs were strongly valued by participants as they worked toward tenure. We recommend that the pre-tenure networking programs and the Erskine small grant program be continued by the university in the years to come. We also recommend that the synergistic activities of WISE be continued which will require support from the administration.

2. Attention to female scientists at the senior level. The biggest improvements during the period from 2007 to 2011 have been made with respect to the hiring of female scientists at the level of Assistant Professor. We recommend continuation of hiring efforts to address under-representation of females, but this should not be limited to the junior level. We would also hope to see improvements in the recruitment and hiring of senior women in the Natural Sciences and Engineering.

In the future, particular attention should also be paid to female faculty members (in the sciences and beyond) with many years of service at BU, with respect to such things as recognition of accomplishments, compensation, tenure and promotion, and the potential for contributions through leadership positions.

3. Close monitoring of benchmark data and annual reporting to the BU community. Benchmarks such as the following should be tracked closely, by gender, ethnicity, tenure status, rank, and discipline: [i] representation: on the faculty, in specific types of leadership positions, and as recipients of named professorships; [ii] rates and patterns of hiring, attrition, tenure, and promotion (as well as average length of time to tenure and promotion to Full Professor); and [iii] average salaries, as well as non-salary compensation, perks, and benefits. We would like to see a standard set of benchmark data shared with the BU community on an annual basis.

4. Implementation of regular exit interviews. It would also be extremely helpful to learn more about women's and men's views of the university and their roles within it. People's understandings of their own situations, their sense of connection to their colleagues or exclusion from them, bear heavily on their professional decisions to stay or go. We urge the creation of a systematic program of exit interviews, so that each

faculty member who leaves the university provides a complete picture of the reasons for the departure.

5. Rerunning the 2007 Climate Survey. We also urge that the 2007 Climate Survey be rerun, in keeping with the plan that was announced in 2007, so that the university can quantifiably assess the gains that have been achieved in fostering a positive sense of community and identify the remaining challenges.

10. References

Aral, S., Brynjolfsson, E., & Van Alstyne, A. (2007). Productivity effects of information diffusion in networks. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=987499.

Baldi, S. (1998). Normative versus social constructivist processes in the allocation of citations: A network-analytic model. *American Sociological Review, 63*, 829-846.

Burt, R. (1998). The gender of social capital. *Rationality and Society*, 10(1), 5-46.

Cole, J.R. & Cole, S. (1973). *Social stratification in science*. Chicago: University of Chicago Press.

Dyer, R.A. & Montelone, B.A. (2007). An institutional approach to establishing professional connections (pp. 48-61). In Stewart, A. J., Malley, J. E., LaVaque-Manty, D. (E:ds.) *Transforming science and engineering: Advancing academic women*. Ann Arbor, MI: University of Michigan Press.

Etzkowitz, H., Kemelgor, C., & Uzzi, B. (2000). *Athena unbound: The advancement of women in science and technology*. Cambridge, UK: Cambridge University Press.

Hanson, S. (2000). Networking. *Professional Geographer, 52*, 4, 751-758.

Higgins, M.C., & Kram, K.E. (2001). Reconceptualizing mentoring at work: A developmental network perspective. *Academy of Management Review*, 264-268.

Ibarra, H. (1992). Homophily and differential returns: Sex differences in network structure and access in an advertising firm. *Administrative Science Quarterly, 37* (3), 422-447.

Kanter, (1977). *Men and women of the corporation*. New York: Basic Books.

Krackhardt, D. & Hanson, J.R. (1993). Informal networks: The company behind the chart. *Harvard Business Review, 71*(4), 104-111.

Kram, K.E. & Raggins, B.R. (Eds.) (2007). *Handbook of mentoring at work: Theory, research, and practice*. Beverly Hills: Sage Publications.

Posey, E., Reimers, C., & Andronicos, K. (2007). A faculty mentoring program for women: Building collective responsibility for a highly qualified faculty. In Stewart, A.

J., Malley, J. E., LaVaque-Manty, D. (Eds.) *Transforming science and engineering: Advancing academic women*. Ann Arbor, MI: University of Michigan Press.

Rankin, P., Nielsen, J., & Stanley, D.M. (2007). Weak links, hot networks, and tacit knowledge: Why advancing women requires networking (pp. 31-47). In Stewart, A. J., Malley, J. E., LaVaque-Manty, D. (Eds.) *Transforming science and engineering: Advancing academic women*. Ann Arbor, MI: University of Michigan Press.

Realff, M.L., Colatrella, C., & Fox, M.F. (2007). Interconnected networks for advancement in science and engineering.). In Stewart, A. J., Malley, J. E., LaVaque-Manty, D. (Eds.) *Transforming science and engineering: Advancing academic women*. Ann Arbor, MI: University of Michigan Press.

Smith-Doerr, L. (2004). *Women's work: Gender equality vs. hierarchy in the life sciences*. Boulder, CO: Lynne Rienner.

Whittington, K.B. (2009). Patterns of male and female dissemination in public and private science. In R.B. Freeman & D. F. Goroff (Eds.) *The new market for scientists and engineers: The science and engineering workforce in the era of globalization*. Chicago: University of Chicago Press.

Whittington, K.B. & Smith-Doerr, L. (2008). Women inventors in context: Disparities in patenting across academia and industry. *Gender & Society, 22* (2), 194-218.

Zuckerman, H. & Cole, J.R. (1984). The productivity puzzle: Persistence and change in patterns of publication of men and women scientists. *Advances in Motivation and Achievement, 2*, 217-258.

Appendix: Faculty Networks Research Methods

The survey was designed to take no more than 15-20 minutes. Confidentiality was protected, and all survey procedures and questions were reviewed for the protection of human subjects by the Charles River Campus Institutional Review Board. Before fielding the survey, Deborah Belle met with over half of all department chairs whose faculty would be invited to take the survey, explaining the rationale and procedures of the study, responding to questions and concerns, and urging the chairs to encourage their faculty to participate. Reminders were sent out after the survey was initially fielded, and faculty members were offered a further encouragement to participate in the survey in the form of a raffle for cash prizes. The survey closed with an acceptable overall participation rate among tenured and tenure-track STEM faculty of 52%, although this overall rate concealed a gendered difference: The respondents to the survey included 39 women in STEM fields (participation rate=72 percent) and 102 STEM men (participation rate=36 percent) for a total of 141 STEM respondents. Results of the survey therefore must be interpreted with the caveat that women's participation rate was double that for men.

Survey questions were adapted and expanded from those used by Etzkowitz, Kemelgor, and Uzzi (2000). To assess *departmental networks*;, the survey asked participants to list the initials or nicknames of faculty members within their own departments who: are your collaborators in research, help you with professional advice, serve as models of professional success, help you balance work and personal issues, provide useful information about what is going on in the university, come to you for professional advice, socialize with you on campus (lunch, coffee), and make you feel valued as a colleague. Participants were then asked for information about each of the individuals they had named, including that person's gender, academic rank, and frequency of contact with the survey participant.

University networks beyond the department were assessed with the same questions asked about departmental networks above. *Networks beyond the university* were assessed similarly, except that participants were not asked to list those who provided them with useful information about what was going on in the university, and the question on socializing was not limited to on-campus socializing. To measure network density, participants were asked to indicate on a 4 point scale how many of their network members from outside the home university knew each other. Specifically, participants could state that "None of these people know each other" (0); "Fewer than half of these people know each other" (1); "About half of these people know each other" (2); "Most or all of these people know each other" (3).

To assess satisfaction with networks, participants were asked to indicate on a five point scale (1=strongly disagree; 5=strongly agree) the extent of their agreement or disagreement with a series of statements about their own departments (e.g., "My department is a good fit for me," "I feel excluded from an informal network in my department," "I am satisfied with opportunities to collaborate with faculty in my

department") and university (e.g., "I feel well informed about what goes on at [the university]", I often feel isolated or alienated from colleagues at [the university]", and "[The university] is a good fit for me").

In order to measure whether the kind of resources garnered from networks differed by gender, scales of conceptually related survey items were constructed to distinguish between resources that are primarily formal and those that are primarily informal. Following Krackhardt and Hanson (1993), we separated measures of formal resources like advice and informal resources like trust. The informal resources scale (a=0.85) is comprised of 9 items including "help you balance work and personal issues", "socialize with you", and "make you feel valued as a colleague," measured within department, outside department, and outside university. The formal resources scale (a=0.89) is comprised of 14 items including "help with professional advice", "come to you for professional advice", "serve as a model of professional success", "collaborators in research", and "provide useful information about what is going on in the university".

Four satisfaction subscales were also constructed including the departmental affiliation scale (a=0.86) comprised of 6 items: "My departmental colleagues value my contributions to teaching and advising", "I feel well informed about what goes on in my department", "I have a voice in the decision-making that affects the direction of my department", "My departmental colleagues value my research/scholarship", "My department is a good fit for me", and "I am satisfied with opportunities to collaborate with faculty in my department". The university affiliation scale (a=0.78) included 6 items: "I have a voice in the decision-making that affects the direction of the University", "I feel well informed about what goes on at the University", "My University colleagues value my research/scholarship", "The quality of my scholarship is positively affected by my interactions with University colleagues", "The University is a good fit for me", and "I often feel isolated or alienated from colleagues at the University". The career strategy scale (a=0.79) is comprised of 2 items: "I can navigate the unwritten rules concerning how one is to conduct oneself as a faculty member', and "I believe I have been quite well informed about strategies for maximizing career success". And lastly, the isolation/exclusion scale (a=0.81) includes: "I feel excluded from an informal network in my department", and "I often feel isolated or alienated from colleagues within my department."

As a preliminary analysis of the data, independent samples T-tests were conducted to identify basic differences between men's and women's networks. Additionally, ordinary least squares (OLS) standard regression analysis was conducted to control for participant gender, rank, and the gender composition of the participant's department (specifically the existence of a critical mass of female faculty members in the department), with these independent variables entered into the model simultaneously. Additionally, OLS hierarchical regression analysis was conducted using the network satisfaction subscales as dependent variables. In the first step, participant rank, gender and critical mass in home department were controlled for. In the second step, the influence of resource type subscales (formal versus informal resources) was examined in explaining variance in satisfaction subscales. In the final step for the first set of

hierarchical regressions, potential interactions between respondent gender and resource type were explored. Steps two and three considered both the gender of the partner supplying the resource type, and the interaction of respondent gender and resource type; these steps constituted the second set of hierarchical regressions.

BU Women in Networks

Erskine Awards 2008-2011

Cheryl Knott collects orangutan urine samples beneath a nest. (Credit: Tim Laman)

New collaborations take root in orangutan fieldwork

Fostering community is essential for orangutan expert Cheryl Knott. Her fieldwork investigating these incredible creatures depends on coordination with other researchers in sites as distant as Indonesia. With the help of the Erskine grant program, Knott received vital financial support to enable such distant collaborations.

"What's great about this grant is the recognition of [collaboration] as an important element," Knott explained. "A lot of agencies don't appreciate this component and therefore the Erskine grant was a really good fit for me. This is something that is really needed, but most typical grants do not cover costs associated solely with enabling collaboration."

Orangutans exhibit regional differences at their reserves in Sumatra and Borneo. The critically endangered apes have a longer birth interval in Sumatra despite better food resources. They also have a cultural preference for different food. Coordinated studies that tease out these local differences with the help of other scientists remain critical to understanding the physiology of orangutan reproduction and survival.

Professor Knott's work has been impacted by the Indonesian government which now requires outside researchers to establish ties with local scientists to access experimental samples. The Erskine grant provided critical travel funds for Knott to spend time in Indonesia and then to sponsor an Indonesian master's student to come to the US. This colleague has since become a key collaborator. Through her partnership Knott has helped cultivate local science talent in Indonesia, and this, in turn, has allowed her access to resources critical to her research.

"It is much more important to have strong collaborative relationships than it was 20 years ago. It's something that is good for everybody," Knott said. "If you want to work there long term you have to develop these relationships. It's expensive to do that. You have to really invest to develop that relationship."

Matching funds from Boston University helped Knott tackle other hurdles she faced as a field researcher and mother of two young children. The program allowed Knott to keep her family close as she spent weeks in the rainforest meeting with collaborators.

"This grant is really progressive in recognizing that this is a huge limitation for women who desire to do field work," Knott said. "It really breaks down a barrier which especially limits female academic achievement."

Knott hopes her dual role as a scientist and parent will motivate other researchers to pursue field research regardless of their ambitions for a family. Together with her young children, she is putting together a children's book and Ranger Rick article chronicling their time together in Borneo

"You can be a woman scientist and a mother and bring your kids," she said of her time. "Hopefully that will be inspiring to other young women."

"This grant is really progressive...it really breaks down a barrier which especially limits female academic achievement."

Lensing Galaxy Cluster Abell 383 (Credit: NASA, ESA, J. Richard)

Galaxy survey offers lens into dark matter

Tereasa Brainerd is a space cartographer of the most mysterious material in our universe: dark matter. Revealing this unseen and exotic matter requires clever strategies and a bit of luck. When Brainerd wanted to test a new approach for finding dark matter, she turned to the Erskine grant program for critical funding to prove its potential.

"The difficulty with this research is finding a material that is invisible at all wavelengths of light. You can't take an image of it using any telescope and you never will," Brainerd said of her quest. "You have to find some proxy that will give you information about how gravity is working."

Brainerd measures the amount of dark matter in distant galaxies by studying the way they are distorted by galaxies in the foreground, an approach known as weak gravitational lensing. The leading theory for dark matter predicts these lenses should be football shaped, but past findings provided only modest support. Now Brainerd suggests these surveys require more stringent sampling criteria. Instead of including as many data points as possible, she contends a select set of isolated galaxies is best to eliminate misleading lenses that are distorted by multiple foreground galaxies.

"We are taking an approach that I think is counter to what most people would do at a gut level," Brainerd explained. "You do want a lot of galaxies, but you want the right galaxies so you're going to the extreme opposite end and using fewer objects. But we think we are getting a cleaner and more understandable result because of that."

Using Erskine funds to start the search for appropriate lensing galaxies, Brainerd identified as many as 80,000 candidates in the Sloan Digital Sky Survey. Her initial analysis found red elliptical galaxies, strong support for the cold dark matter theory. She also found blue spiral galaxies that appeared more spherical and the orientation of their dark matter could explain this consistent discrepancy.

These exciting findings give Brainerd hope as she seeks to expand her work through additional funding from the National Science Foundation. Thanks to the preliminary results made possible by the Erskine award, she believes her once controversial tactic shows strong potential as an intriguing and worthwhile investment for further research.

"I am very pleased and surprised that we got as far as we did in only one summer," Brainerd said of her progress. "We had a really good idea, we followed our nose, and it turned out that we were right."

Obesity travel grant fosters inroads in occupational therapy

Just starting her career as an assistant professor, Simone Gill jumped at the opportunity to present her findings on the influence of weight on walking gait at the annual Obesity Society meeting, a new field of inquiry for her. Little did she expect to be pioneering the way for other occupational therapists in the obesity community thanks to the connections she made.

"It was really important for me to share my work with others and to create a network," Gill said of the conference.

Gill's doctoral work had focused on the adaptations babies and adults make to different environmental conditions. She has recently shifted to studying the gait of overweight adults.

She has found that subjects make maladaptive changes in their stride to keep up the pace on a treadmill. They take short fast steps instead of longer strides. These modifications increase their risk for injury. They may also indicate decreased balance and reduced strength that could have protected against falls. The Erskine grant allowed her to present these recent findings to the obesity research community.

While exploring the exhibition halls at the meeting, Gill chanced upon a poster that included familiar language from the field of occupational therapy. There she met Mary Forhan of McMaster University, another occupational therapist in the obesity research community. The two have since collaborated on an important literature review that assesses the status of occupational therapy work in the field. They found occupational therapy has much to offer the interdisciplinary area of obesity research, but is still an underutilized approach. Gill hopes the work will attract others like herself to this growing area.

"Occupational therapy focuses on what is important in people's lives. It brings that perspective," she said. "We hope this publication will encourage others to participate."

Jumpstarting new opportunities for women scientists and engineers

Great discoveries need a push to get started. For participants in the BU Women in Networks Mary Erskine grant program, the jump to a promising new research venture was facilitated by travel funds to meet a potential collaborator, lab resources to take on an experimental research area, or access to crucial personnel to get the job done.

The awards helped women build key networks, removed research barriers and ultimately promoted a diverse science and engineering faculty at BU.

Awards ranged from $200 to $3,000 for type one grants while type two grants were for $20,000.

The program is named in honor of a longtime member of the Boston University Biology department. Mary Erskine was a founding member of Boston University Women in Science and Engineering. She was revered as a mentor for young female scientists and was living proof that female faculty can successfully balance work and family.

Mary Erskine died in 2007 after a long battle with breast cancer.

From bench to bedside, researcher charts new course

After dedicating her life's work to the gene regulator LSF as a basic research scientist, Ulla Hansen chanced upon an exciting new path. LSF showed tantalizing potential as a drug target for liver cancer, a devastating condition that killed 696,000 people worldwide in 2008. She soon found herself navigating the complexities of drug discovery with funds from the Erskine grant program to kickstart the process.

"We had to get into it," Hansen said of the opportunity. "It was really obvious and it's really gratifying in a way to get to the point where your past research could possibly be used to treat a terrible disease."

But the jump from basic to clinical research presented new challenges. Hansen had spent her entire career studying the convoluted pathways that turned LSF on in cells and its effects on cell proliferation. Hers was one of the first labs to tackle this fertile area. One of Hansen's colleagues, Devanand Sarkar, from Virginia Commonwealth University, called her after discovering LSF's strong expression in the metastatic liver cancer, hepatocellular carcinoma. This planted the seed for her current research.

With help from the Erskine grant, Hansen's first task was to find a compound that stopped LSF's activity. A student narrowed the candidates down to an inhibitor that works well inside cells. Her next hurdle was to find a way to synthesize the compound. By knocking on doors at the Life Science and Engineering Building at BU she found chemist Scott Schaus, who volunteered to make the compounds in house. "That started an incredible collaboration, which is really making this feasible," Hansen said.

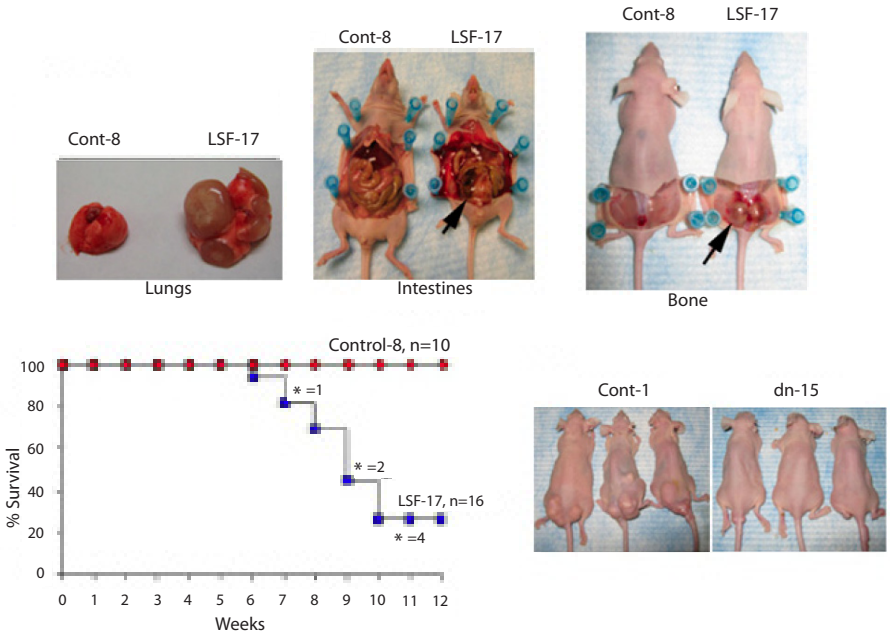


Figure published in: Byoung Kwon Yoo, Luni Emdad, Rachel Gredler, Christine Fuller, Catherine I. Dumur, Kimberly H. Jones, Colleen Jackson-Cook, Zao-zhong Su, Dong Chen, Utsav H. Saxena, Ulla Hansen, Paul B. Fisher, and Devanand Sarkar : Transcription factor Late SV40 Factor (LSF) functions as an oncogene in hepatocellular carcinoma, *Proceedings of the National Academy of Sciences of the the United States of America*, vol. 107 no. 18, 8357-8362, 4 May 2010.

Schaus's group synthesized a variety of compounds, which have since been used in mice to study their effects on tumor growth.

LSF is expressed in all cells at a low level, but it is not always active. When working, the protein seems to turn on genes involved in DNA replication during the cell cycle. Over-expression of this gene in liver cancer could be pushing this copying process forward when it shouldn't be, thereby promoting the growth of errant cancer cells. It could also ease checkpoints during the replication process that ensure chromosomes are divided properly, another factor in oncogenesis. The drug candidate Hansen's team identified may inactivate LSF by blocking part of the DNA near the protein's binding site.

The next step for Hansen's group is to secure a patent for the compound. Then she can begin seeking partnerships with industry. As she continues this new journey, the impetus provided by Erskine remains a crucial step.

"Actually proving the point that it works was quite important," she said. "Without that it might not have gone anywhere for some period of time. It was an absolutely essential step to get the ball rolling."

Mary Erskine Type I Awards 2008-2011

Type I awards were small (up to $3000) and quickly available sums of money designed to cover expenses such as travel, conference fees, child care, and hosting collaborators.

Rama Bansil, Prof.

College of Arts and Sciences, Department of Physics

$1000 to host Dr. Monica Olvera de la Cruz from Northwestern University for a visit to BU to give a colloquium seminar and a WISE lunch.

Lorena Barba, Asst.Prof.

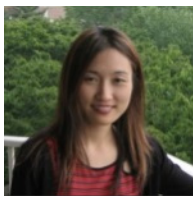
College of Engineering, Dept. of Mechanical Engineering

$500 to host world renowned experts in GPU computing for a dinner while attending Pan-American Advanced Studies Institute organized by the PI.
$1100 to travel to DC to meet with program managers and potential collaborators at funding and other government agencies.

Catherine Caldwell-Harris, Assoc.Prof.

College of Arts and Sciences, Department of Psychology

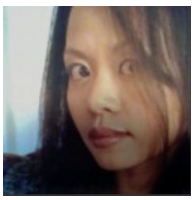
$2000 to support an undergraduate researcher to assist in the collection of pilot data on a new study of special interests in Asperger's disorder.



Kee Chan, Asst. Prof.

Sargent College of Health and Rehablilitation, Department of Health Sciences and Epidemiology

$2000 to attend the Society of Medical Decision Making Conference in Toronto, Canada, and the Summer Institute in public health genomics at Univeristy of Washington.



Stacey Doan, Asst. Prof.

College of Arts and Sciences, Department of Psychology

$2200 to visit the University of Michigan and work with Dr. Twila Tardif for a period of three weeks over the winter break.

Linda Doerrer, Asst. Prof.

College of Arts and Sciences, Department of Chemistry

$2550 to travel to Oxford University to work with Prof. Jennifer Green on the calculation of the electronic structure of molecules, particularly those with transition metals.
$150 to attend conference on "Challenges in Renewable Energy."

Simone Gill, Asst. Prof.

Sargent College of Health and Rehablilitation, Department of Physical Therapy and Athletic Training

$2600 to attend the Obesity Society Conference, give a presentation on new research, and network in a new research community.

Sheryl Grace, Assoc.Prof.

College of Engineering, Dept. of Mechanical Engineering

$200 to host Ken Visser, Director of the Center for Sustainable Energy Systems at Clarkson University.
$1500 to purchase a computer for a new Postdoc who will reside at BU and work with her group but be funded by a colleague at Sherbrooke University.

Lucy Hutyra, Asst. Prof.

College of Arts and Sciences, Department of Geography and Environment

$2540 to travel to the Urbanization and Global Environmental Change Conference and the American Geophysical Union's fall meeting.

Kathleen Malley-Morrison, Prof.

College of Arts and Sciences, Department of Psychology

$2500 to enable a short-term campaign to significantly expand outreach through a blog and newsletter, and to attend the conference of Psychologists for Social Responsibility.

Donna Pincus, Asst. Prof.

College of Arts and Sciences, Department of Psychology

$2750 to attend the Pediatric Sleep Medicine Conference as well as to host Dr. Allison Harvey, an internationally recognized sleep scientist.

Emma Previato, Prof.

College of Arts and Sciences, Department of Mathematics and Statistics

$3000 to travel to a conference on Geometric Methods in Physics in Poland and to the American Mathematical Society's annual meeting which focuses on Inverse Problems, Riemann-Hilbert Problems, and Nonlinear Dispersive Equations.

Anne Short, Asst. Prof.

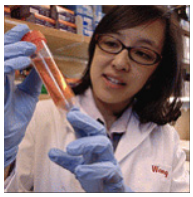
College of Arts and Sciences, Department of Geography and Environment

$250 to host Colin Polsky, Associate Dean for Undergraduate Research & Active Pedagogy and Associate Professor, in the Graduate School of Geography at Clark University. This connection will hopefully lead to fruitful mentoring and collaborations in the future.

Karen Warkentin, Assoc. Prof.

College of Arts and Sciences, Department of Biology

$3000 to support speakers who participated in the symposium on "Environmentally Cued Hatching Across Taxa" at the 2011 meeting of the Society for Integrative and Comparative Biology in Salt Lake City UT for which the PI was a co-organizer. $1000 to support an exchange PhD student to train in her lab.



Joyce Wong, Assoc. Prof.

College of Engineering, Dept. of Biomedical Engineering

$1000 to host Yvette Madrid, a specialist in global health.
$1500 to support the development of a web-based platform to facilitate and enhance collaborative research projects and enable continuity in research.

$33,340

Mary Erskine Type I Awards

Mary Erskine Type II Awards 2008-2011

Type II awards were larger awards of $20,000 intended to seed new areas of research and foster new collaborations. The funds were used for equipment, graduate student support, partial teaching release, summer salary, travel to research sites, specialized child care to enable research activities, etc.

Dana Bauer, Asst. Prof.

College of Arts and Sciences, Department of Geography and Environment

"Effects of Land Use Policies on Land Use Change in Exurban Communities"

The research aims to develop a land use change model that can be used to simulate the effects of various land use policies on land use outcomes which have broader ecological and biogeochemical impacts. The model will impact decisions being made in exurban communities (outside the suburban ring) where zones of conflict as conservation and development compete for the same finite land resources.

Tereasa Brainerd, Assoc. Prof.

College of Arts and Sciences, Department of Astronomy

"Locating Isolated Weak Galaxy Lenses in the Sloan Digital Sky Survey"

This research seeks to determine whether or not the dark matter halos of observed galaxies agree with the predictions of Cold Dark Matter.

Leslie Brody, Prof.

College of Arts and Sciences, Department of Psychology

"Gender Roles in Women with HIV in Relation to Treatment Adherence and Health Outcomes"

This research will provide a basis for developing interventions aimed at changing gender roles to improve treatment adherence and lower morbidity and mortality rates in women with HIV. The proposed project involves networking with researchers who are experienced in studying HIV via a collaboration with investigators at the Chicago and Brooklyn sites of the Women's Interagency HIV Study (WIHS), an NIH funded longitudinal cohort study of over 1,500 women with HIV.

Robinson Fulweiler, Asst. Prof.

College of Arts and Sciences, Department of Earth Sciences

"No More Black Box: Linking the Microbial Community to Biogeochemical Processes in Coastal Wetlands"

The research will link specific wetland biogeochemical processes with the responsible microbial community thus connecting the ecosystem function with the microbial ecosystem. Specifically, microcosms of terrestrial wetland soils will undergo an increase in temperature and CO2 and also be subjected to perturbed nitrogen levels. Biogeochemical measurements and 16s rDNA profiling on every microcosm at a number of points during the perturbations will allow connections to be made.

Rosina Georgiadis, Assoc. Prof.

College of Arts and Sciences, Department of Chemistry

"A new collaborative seed project to investigate nanoparticle protein interactions."

This proposal describes a multidisciplinary research and education program to develop new methods and fundamental understanding of how semiconductor nanocrystals (NCs) interact with proteins in biological systems. This represents a new direction in research for the Principal Investigator (Georgiadis) at Boston University and will serve to "seed" a new collaboration with the Hollingsworth group at Los Alamos National Laboratories (LANL). The goal of the seed project is to obtain preliminary data.

33% of eligible female faculty at Boston University received Erskine Grants

Sucharita Gopal, Prof.

College of Arts and Sciences, Department of Geography and Environment

"M&M's of Estimating Carbon footprint of Boston"

The research developed a methodological framework to comprehensively measure, model and map (M&M's) Boston's carbon footprint. It laid the foundation for measuring, mapping and analyzing socioeconomic drivers, especially related to transportation and energy use in various urban buildings at a parcel spatial scale. The ultimate aim continues to be the reduction of the city's carbon footprint. The PI formed two new collaborations as part of the project.

Ulla Hansen, Prof.

College of Arts and Sciences, Department of Biology

"Relevance of transcription factor LSF to metastatic melanoma: initiation of translational studies."

This research will determine whether or not inhibition of LSF activity can blunt the cell proliferation, transformation, or chemoresistance properties of specific types of cancer cells.

Cheryl Knott, Assoc. Prof.

College of Arts and Sciences, Department of Anthropology

"Establishing networking relationships and family travel support to enable research on wild orangutans in Indonesia."

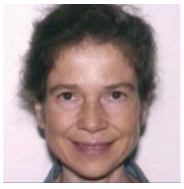
The research enabled by funding family expenses and mandated international collaboration expenses seeks to change the theoretical approach to studying the behavioral and physiological ecology of wild populations of animals. In particular the research addresses the finding that there are significant population-level differences in animal responses which therefore require cross-site comparisons in which hypotheses regarding the influence of environmental circumstances on behavior and physiology of wild populations can be tested.

Elise Morgan, Assoc. Prof.

College of Engineering, Dept. of Mechanical Engineering

"Control of Cell and Tissue Fate through Mechanical Stimulation of Skeletal Healing"

The research will determine the mechanisms by which shear strain and interstitial fluid flow which are stimuli of skeletal healing are sensed by cells and transduced to the chemical signals that ultimately direct healing. The research will be enabled by a new collaboration. Some of the proposed work requires expertise outside of the PI's research areas, and thus this project will serve to initiate a new collaboration. By seeding this collaboration and catalyzing a new research direction, this project will significantly enhance both the PI's professional network and her scholarship.



Emma Previato, Prof.

College of Arts and Sciences, Department of Mathematics and Statistics

"New Applications of Partial Differential Equations"

Partial Differential Equations (PDEs) model every type of motion, in every realm of life. Indeed, thie field is active and rife with challenging problems, highly interdisciplinary and, more subtly, `intermathematical', necessitating sophisticated tools from diverse areas (applied mathematics, analysis on infinite-dimensional spaces, non-commutative algebraic geometry, e.g.), whose practitioners are trained in completely different languages. The proposed research will first analyze the type of equations currently in use, possibly to create couplings or simplifed versions that may bring them to amenable form. Second, the potential for imposing symmetries that may give geometric structure to the class of solutions will be considered. Finally new kinds of asymptotic expansions will be used to study the solutions.

Erskine Awards 2008-2011

TYPE I AWARDS

The Erskine Type I awards supported faculty to host colleagues at BU, to visit colleagues elsewhere, to attend conferences and workshops, and to kick-start new projects by covering the cost of supplies or undergraduate research stipends. The faculty who received these small grants have reported great outcomes. Several awardees are now writing grants and papers with new collaborators they met at conferences or workshops they attended with the support of an Erskine grant. Five have journal articles that have already been published on work jumpstarted by their small grant, and six others have papers either under review or presently being written. Six report that they have presented the findings from their new area at a subsequent conference. One PI considers the foundation of her recently awarded CAREER grant her attendance at a critical conference that was supported by an Erskine grant. Five have mentioned being invited to give lectures at other Universities or conferences because of a new connection they made thanks to an Erskine grant.

"I am very grateful I was able to spend three weeks at the University of Michigan working with Dr. Twila Tardif. It was an extremely productive visit that has lead to tangible outcomes. Dr. Tardif and I gave a joint presentation at an international conference this past summer and we are currently writing two papers together on which I will be first author." – Stacey Doan

"It cannot be emphasized enough how important it is for junior faculty to establish a solid professional network. The Erskine Grants helped me to enrich my relationships with several contacts, and I'm quickly seeing the results. I've been invited to be co-chair at an important conference, to give seminars, and to participate in review panels, thanks in part to these networking activities."
– Lorena Barba

"The week I spent with Prof. Jennifer Green at Oxford, world renowned for calculations on transition metal compounds, right before she retired was amazing. The Erskine grant enabled me to have intense, focused time to improve my skill in the use of these calculations and tap into her expertise. My group now uses such calculations regularly to supplement our synthetic chemistry efforts."
– Linda Doerrer

"As a tenure-track assistant faculty it is important to attend conferences in order to make new connections and subsequently broaden one's research portfolio. The Erskine grant allowed me to attend two such conferences which I would not have been able to attend otherwise. It was at one of these conferences that I solidified the concept that has now led to my NSF CAREER award."
– Lucy Hutyra

"The Erskine award that supported the visit of Monica Olvera de la Cruzhas has had a very nice outcome. She learned about my work in biophysics and that led to an invited talk at a Symposium in the 2011 Annual meeting of the American Physical Society which Monica had organized." – Rama Bansil

"Just the existence of the Erskine grants made me think about inviting to campus a researcher who I wanted to enlist as a collaborator and mentor."
– Joyce Wong

"Getting funded in a new field is difficult. Reviewers claim you do not have the required experience in the new area to make the project successful. But one needs funding to gain that experience. The Erskine Type II grant helped me to overcome this catch-22 by providing the seed funds necessary to obtain the convincing results that we needed."
– Elise Morgan

TYPE II AWARDS

Type II awards were research catalyst awards that allowed faculty to venture into new areas of research. Ten faculty received these awards over the past three years. Three of the earlier awards are highlighted in this brochure.

The grants were used to help fund a total of 6 graduate students at BU (5 female) and 3 undergraduate students. 4 of the PIs note that the research undertaken with the Erskine grant funds already has lead to proposals. 8 conference presentations have already been given related to the grants. 5 journal articles are under review from the various projects.