**Improving Retention and Facilitating Career Reentry for Women Scientists**

**With a Consortium of Universities**

**Project Overview**

Despite years of scholarly attention and institutional concern, women in science, technology, engineering, and mathematics (STEM) fields have failed to gain equality with men. While women in STEM at research universities may be as likely as men to be promoted up the academic ranks when reviewed (NAS 2007), they are disproportionately likely to leave the pipeline at every stage before they are reviewed for renewal and promotion. The result is a persistent shortfall of women in senior academic jobs and leadership roles despite the growing number of young females with ambitions to become scientists.

The specific aims of this five-year project are five-fold: (1) to better understand pipeline leakage and improve retention among women in STEM during the postdoctoral career stage, (2) to develop and test the efficacy of an online community of STEM postdoctoral scientists, including mentoring, professional networking, job postings, and forums among a consortium of nine universities and the National Postdoctoral Association (NPA), (3) to publicize and facilitate career reentry for STEM scientists with a Ph.D. who have left the pipeline using the online community and National Institutes of Health (NIH) reentry grants, and (4) to create a nationwide, sustainable online community of STEM scientists at 4-year research universities who are committed to repairing the leaky pipeline. We will undertake goals (2), (3), and (4) in conjunction with a consortium of nine universities and the NPA. The nine universities are: California Institute of Technology (CalTech), Columbia University, Howard University, Massachusetts Institute of Technology (MIT), Stanford University, University of Michigan, University of Pennsylvania, University of Texas at Austin (UT-Austin), and Yale University. (5) Ultimately, our goal is to make our tried-and-tested mentoring modules and matching platform developed for women and underrepresented minority (URM) postdocs in STEM available to all STEM scientists at 4-year research universities.

**Literature and Motivation**

*Women in STEM Fields*

According to 2012 National Science Board (NSB) data, the proportion of women in science and engineering programs has been increasing, particularly in the life sciences. In 2009, nearly half of the 611,600 science and engineering graduate students in the United States were women (NSB 2012). In the professoriate, women constituted 31 percent of full-time science and engineering faculty in 2008, up from 7 percent in 1973 (NSB 2012).

*Why is the Pipeline “Leaky”?*

Despite these gains, women are disproportionately likely to drop out of the STEM pipeline before receiving tenure in academic jobs (Goulden, Mason, & Frasch 2011; Ceci, Williams, & Barnett 2009; Goulden, Mason, & Frasch 2009; NAS 2007). Although a certain amount of the underrepresentation of women in STEM fields can be explained by time lags, particularly at the tenured level, longitudinal analysis of the STEM pipeline using National Science Foundation (NSF) data over a 28-year period (1979-2006) documents that female attrition is most problematic in (1) completion of STEM undergraduate degrees, and (2) retention in academia after the doctorate (Shaw & Stanton 2012). This later transition is the focus of this proposal.

There are numerous barriers to obtaining a faculty position in STEM, which might be usefully divided into three major categories: (1) Family responsibilities such as child care rest primarily on women’s shoulders, forcing many women to make painful choices between family and career (Williams & Ceci 2012; Hill et al. 2010; Wolfinger, Mason & Goulden 2008; van Anders 2004; Martinez et al. 2007; Preston 2004; Kulis & Sicotte 2002; Office for Research on Women’s Health (ORWH) 1995). Dual career problems also disproportionately affect women (Martinez et al. 2007; van Anders 2004; Kulis & Sicotte, 2002; Mason & Goulden 2002). A recent longitudinal survival analysis using the Survey of Doctorate Recipients (SDR) found that marriage and childbirth reduce the odds of married women with a Ph.D. obtaining a tenure-track position by 35 percent (Goulden et al. 2009). Female postdocs at Berkeley indicated childrearing as their principal reason for leaving academia (Goulden et al. 2009). Lack of high quality, affordable child care also impedes women in science (Martinez et al., 2007). As a result, women who make it through the postdoc gauntlet to tenure track positions are 27 percent less likely to achieve tenure than their married male counterparts with children (Goulden et al. 2011). (2) Scientists, however objective in their scholarship, are not immune from subtle and unconscious bias against females and minorities (Moss-Racusin et al. 2012; Steinpreis et al. 1999; Valian 1999). (3) Female scientists are more likely than their male counterparts to lack self-confidence (Handelsman et al. 2005).

These obstacles are separate phenomena each with its own causal mechanism, but they reinforce one another in identifiable ways: The departure of women from the pipeline creates the actuarial fact that females as a group are less likely to advance to the highest ranks, reducing the incentives of Principal Investigators (PIs) to invest in their scholarly success. This is a widespread and self-reinforcing phenomenon in labor markets known as “statistical discrimination” (Mincer 1958). At the same time, the disappearance of female scientists reduces the number of senior role models who can model the family-career balance and provide practical advice and realistic encouragement for budding scientists. Not surprisingly, young women who observe few hopeful signs of their own prospects lose self-confidence and are at risk of giving up on an academic career in science.

**Prior Projects, Research, and Significance**

Our proposed project builds on enormous stores of knowledge gained from prior programs and past research on postdocs and mentoring but will both generate new information about pressure points for women in the sciences and will provide new ideas about what to do about them. This proposed project is only the second NSF ADVANCE grant focused on women postdocs in STEM to our knowledge. Knowledge about mentoring remains something of a “black box” with numerous components that may be complementary, necessary, or sufficient. Our aim is to unpack the “black box” of mentoring in order to deliver it more effectively and to pair it with an online platform that matches current and prospective postdocs with PIs and mentors who know how to mentor.

Based on years of research and trial-and-error, universities have instituted an array of policies to increase the family friendliness of academia, including paid parental leave, stopping the clock, flex time, and part-time positions. Postdocs, however, are not always eligible for these benefits. Yale University now provides paid leave to postdoctoral fellows to take time off for childcare, but this does not solve the problem that PIs have to cover the work while the postdoc is away, sometimes at considerable expense and inconvenience. As a result, postdocs internalize these costs and worry that stopping the tenure clock would harm their careers (Martinez et al. 2007; Bhattacharjee 2004). Changing these incentives would require that funding agencies such as the NSF and NIH provide additional funds to PIs who employ postdocs who take child care leave and/or for PIs to organize their labs in such a way as to make the temporary absence of one person less costly.

Recognizing that PIs have little incentive to help female scientists at their own expense, in 1992, the NIH’s Office for Research on Women’s Health (ORWH) sought to remedy the problem by establishing Research Supplements to Promote Reentry into Biomedical and Behavioral Research Careers to help scientists reestablish their careers in biomedical or behavioral science after leaving for family reasons (ORWH 1995). Since 1992, this Research Supplements to Promote Reentry into Biomedical and Behavioral Research Careers has been reissued three times, most recently on April 6, 2012 as PA-12-150 with an expiration date of September 30, 2015 (<http://grants.nih.gov/grants/guide/pa-files/PA-12-150.html>). Under the program, Reentry scientists and Program Directors (PDs) or PIs with an active NIH grant with two or more years of funding remaining may apply to one of twenty-five NIH Institutes and Centers for one to three years of supplemental support for a reentry scientist (NIH 2012).

The ORWH program was evaluated in 1995 based on 26 supplements awarded in 1992-1994 (ORWH 1995). The majority of the awardees were female (24 of 26), while the majority of the PIs were male (20 of 26). Awardees were returning from an average of 4.4 years of leave to care for children (23), elderly parents (6), and/or for relocation (6) (ORWH 1995). The program has been deemed to be effective in helping awardees return to scholarly careers (ORWH 1995).

Relatively few women have returned to academic careers after leaving, however, because postdoctoral funding alone does not address the harsh realities of a difficult work environment. Most programs aimed at helping women in STEM have tended to focus instead on mentoring, encouragement, and empowerment of young scientists. This is not of merely symbolic importance; there is overwhelming evidence that mentoring can be extremely effective. The University of Michigan, the University of Wisconsin, and many others have created an impressive array of material about workshops on teaching, research, service, written and oral communication, and work/life balance (Mavriplis et al. 2010; Stewart et al. 2007).

A recent randomized, controlled experiment in face-to-face mentoring was undertaken in the field of economics, a discipline with almost as few senior women as the sciences. Based on a group of 80 junior faculty volunteers, Blau et al. (2010) randomly assigned forty untenured women faculty to attend a two-day mentoring workshop; the control group did not participate in the workshop. The experimental design allowed Blau et al. to avoid the usual flaw in mentoring assessments by eliminating the possibility of selection bias: the kind of person who signs-up for extra mentoring is likely to be more motivated in ways that correlate with outcomes. Since both the treatment and control groups volunteered, they were indistinguishable in this way. The results of the experiment were remarkable: although little impact was seen after one year, publications of the treatment group were significantly higher three years after treatment. Five years later, the treatment group significantly outshone the control group in total publications, top-tier publications, and grant success.

There is much to learn from the Blau et al. (2010) experiment with female economists. The two-day mentoring workshops exposed participants to senior women economists, included discussions about what it takes to get tenure and increased peer networks, all treatments that can reasonably be assumed to be helpful. But the design of the project did not provide further granularity for understanding which of these aspects of mentoring were most helpful and for what reasons. Given the demonstrated effectiveness of mentoring, but also given the varying costliness and feasibility of different ways of providing intellectual feedback and moral support to a large group of people, it is important to develop further the understanding of what works and why.

In 1994, the NSF funded one of the earliest examples of electronic mentoring, also known as e-mentoring (Single & Single 2005). Although e-mentoring, where mentor and protégé communicate electronically is a relatively recent platform, its proliferation has been exponential. Dr. Carol Muller founded MentorNet, our proposed platform for this project, in 1997 after assessing the benefits of four structured e-mentoring programs that existed at the time (Muller 1997). MentorNet was designed to be a *national* program to increase the diversity of mentors and protégés, to increase the sectors of industry represented, and to take advantage of economies of scale (Muller 1997). Our project intends to exploit all these benefits by adapting MentorNet for STEM postdocs while also systematically evaluating the relative benefits of e-mentoring compared to mentoring workshops and face-to-face mentoring using a randomized trial of STEM postdocs at Yale.

**The MentorSTEM Project**

*Overview*

This project aims to refine and advance existing knowledge about mentoring. Building upon an MentorNet’s existing platform, a recipient of NSF funding, we will create and develop MentorSTEM, a web-based e-mentoring platform. MentorNet has been tested using 31,000 students from over 350 college and university campuses with more than 1800 mentors (MentorNet 2012). By tailoring MentorNet for female STEM scientists, first postdocs and then beyond, we can transform the dispersed audience currently active on MentorNET—varying by field, by career stage, by type of university, by type of degree, by occupation—into a more focused, committed community where mentors and protégés are matched by STEM field, by postdoc stage or beyond, by 4-year research-intensive university, and by demographic characteristics. Using a randomized controlled experiment, we intend to develop a more finely gauged understanding about what aspects of mentoring—and in what combinations—have the greatest impact. MentorSTEM will be used in two principal ways: (1) to help female Ph.D. STEM scientists seeking to return to academia find PIs willing to sponsor their NIH reentry grants; and (2) to provide continuous mentoring support for postdocs, PIs, and mentors first within the consortium and eventually nationwide.

*Program Components*

This project has several distinct components, all aimed at learning about the problems that cause female scientists to give up on academic careers ameliorating them.

The **first component** is a self-study of Yale’s 1,300 postdocs in STEM fields and their PIs and mentors. For this component, we build on a vast body of literature and previous surveys to separate the effects of multiple problems for STEM women that are often lumped together: insufficient intellectual support, unsupportive PIs, discouragement, child care concerns, dual career pressures, and bad lab dynamics, among others. By gaining a sharper understanding of what contributes to female STEM scientist leaving academia can we convince universities of the necessary steps to improve retention among women postdocs.

The **second component** is to facilitate career reentry for female STEM scientists who have left the pipeline during or after a postdoc or while a non-tenured faculty member. By publicizing the NIH reentry grants to both PIs and returning scientists, our project will provide the first well-developed, well-supported, well-advertised platform in the United States for reentry scientists. This reentry component will begin in year one with the design and development of the web-platform MentorSTEM and continue through year five with our consortium universities and the NPA as we implement, evaluate, and refine this matching service. Our consortium of nine universities and the NPA can begin to solve the “free-rider” problem that has plagued solutions to the leaky pipeline in the past. This program is designed to use current financial incentives from NIH reentry grants to encourage participation, and it is designed to be sustainable. PIs and PDs and reentry scientists will be asked to participate voluntarily in a web-based database to match scientific job postings and job applicants.

The **third component** is to develop, test, and refine various models of mentoring. As we describe in more detail below, we will assign Yale basic science postdocs in STEM, PIs, and mentors randomly to different mentoring “treatments” as a way to gauge the effectiveness of, for example, (1) intensive mentoring workshops similar to those tested in the Blau et al. (2010) study, (2) face-to-face mentoring, and (3) e-mentoring with online remote pairings and online encouragement similar to MentorNet. MentorSTEM will be the vehicle for testing the effectiveness of remote forms of mentoring, whether connected by Ethernet to real people or to an online protocol providing advice and moral support. By using a randomized controlled experiment to test our mentoring programs among Yale postdocs, we intend to discern which forms of mentoring are most effective and beneficial for women, men, and URM postdocs in basic science STEM fields.

The **fourth component** is dissemination. Beginning in year five, we intend to give access to MentorSTEM to the additional 35 private and 73 public 4-year research-intensive universities in an effort to develop and support a network of STEM scientists committed to equality for women in science. Our goal is to create a project that ultimately will be nationwide and self-sustaining. After it is developed and tested in years one through five, MentorSTEM will have reached the economies of scale in university membership to be able to run without federal assistance. We have already begun discussions with David Porush, President and CEO of MentorNET to map out a self-sustaining model for MentorSTEM. We expect that with demonstrated programmatic success, research universities will have a vested interest in seeing MentorSTEM continue to serve STEM scientists. Although our initial concern is with women postdocs in STEM, we intend to target URM scientists as well and expect much of what we learn will be applicable to helping to advance the cause of scientists who remain in disproportionately small numbers up and down the academic ladder.

Ultimately, this project will benefit the entire STEM community in two profound ways. First, our randomized trials of three different mentoring treatments for STEM postdocs at Yale with a control group will provide conclusive evidence of which types of mentoring impact which outcomes. Second, the development, testing, and sustainability of MentorSTEM will have a profound impact on STEM scientists and on reducing disproportionate leaks in the pipeline.

It is unlikely that female scientists will achieve real professional equality until male scientists play an equal role on the home front. Given what we know about statistical discrimination, only when childcare is no longer a female problem and only when females are no more likely to drop out than their male counterparts will a female scientist no longer be scored lower in randomized, controlled studies only because she is female. MentorSTEM can, we hope, serve as an instrument of the cultural change that has to suffuse the world of science for real change to occur.

**Program Evaluation and Methodology**

A substantial part of this project is to learn what works for mentoring postdocs and why. The value of a multi-year formative evaluation is that we can repeatedly monitor, improve, and test our treatments. In order to separate the multiplicity of causal mechanisms entailed in typical matching and mentoring programs, we intend to incorporate experimental design. While we understand that there may be concerns about the ethics of providing some groups with a mentoring treatment while others are in a control group, we intend to work closely with Yale University’s Human Research Protection Program (HRPP) whose mission is to “adhere to the highest ethical standards in the protection of human research participants” and which “seeks to identify and implement means for ensuring the protection of its research participants” (Yale HRPP, 2012).

*1. Self-Study at Yale University: Understanding and Improving Retention among Women and URM STEM Postdocs (Years 1-5)*

Our program begins with a self-study of Yale postdocs and PIs in year one. (1) First, we will administer a pre-treatment survey to all 1,308 Yale postdocs to determine which of them are in STEM fields in the basic sciences (estimated to be between 750 and 1,200). Table 1 shows all Yale postdocs that we can easily identify as being in basic science by gender, and our initial survey will yield additional basic science postdocs at Yale that cannot easily be identified by which department they are in. In this first survey we will gather demographic information to create a stratified random sample for the experiment and to gauge their own sense of the challenges and opportunities they face. We will increase our response rate by describing the mentoring programs we intend to offer. The bulk of our questions will be evidence-based rather than attitudinal, by asking about actual experiences with PIs, mentors (when they are not their PIs), and with lab mates and other scientists in their departments or units. This self-study will include a survey experiment to gauge the effects of priming: one randomly assigned group of postdocs will get a survey with encouraging language about the University’s commitment to helping women in STEM fields and another randomly assigned group of postdocs will get a survey with statistics about the leaky pipeline. We will see what the effect of this simple priming has on their own expected probability, at the time of the survey, of becoming an academic scientist.

**Table 1: Yale University Basic Science Postdoctoral Fellows, 2012-13**

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| **Yale Central Campus STEM Postdoctoral Fellows**  |
|   | Women | Men | Total | % Women |
| Chemistry | 13 | 41 | 54 | 24% |
| Geology & Geophysics | 10 | 12 | 22 | 45% |
| Engineering | 14 | 38 | 52 | 27% |
| Ecology & Evolutionary Biology | 12 | 22 | 34 | 35% |
| Astronomy | 4 | 5 | 9 | 44% |
| Molecular, Cellular & Developmental Biology | 37 | 32 | 69 | 54% |
| Physics | 18 | 24 | 42 | 43% |
| Applied Physics | 0 | 15 | 15 | 0% |
| Computer Science  | 1 | 6 | 7 | 14% |
| Psychology | 11 | 4 | 15 | 73% |
| Mathematics | 0 | 5 | 5 | 0% |
| **TOTAL** | **120** | **204** | **324** | **37%** |
| **YMS, Low Estimate of STEM Postdocs(restricted to doctoral awarding departments)** |
|   | Women | Men | Total | % Women |
| Cell Biology | 25 | 29 | 54 | 46% |
| Cellular & Molecular Physiology | 13 | 16 | 29 | 45% |
| Genetics | 18 | 26 | 44 | 41% |
| Immunobiology | 21 | 30 | 51 | 41% |
| Microbial Pathogenesis | 14 | 29 | 43 | 33% |
| Molecular Biophysics & Biochemistry | 24 | 47 | 71 | 34% |
| Neurobiology | 7 | 19 | 26 | 27% |
| Pathology | 12 | 19 | 31 | 39% |
| Pharmacology | 25 | 19 | 44 | 57% |
| **TOTAL** | **159** | **234** | **393** | **40%** |
| **Aggregate Total (low estimate)** | **279** | **438** | **717** | **39%** |

Source: Yale University's Office for Postdoctoral Affairs.

Note: Yale University has 1,308 total postdocs. There are 324 STEM basic science postdocs in Yale’s Central Campus. There are estimated to be between 393 and 870 STEM basic science postdocs at Yale Medical School. We plan to determine the exact number in the pre-treatment survey.

(2) Second, we will survey Yale PIs to see how well their experiences and perceptions compare with those of postdocs. Because we will promise confidentiality, we will not be able to match postdocs to PIs in the same lab, but we can get a sense of aggregate similarities and differences. Our questions will also provide another look at the hypothesis from social science research that men with stay-at-home wives are less supportive of female scientists and particularly of working mothers. (3) Third, we will refine and expand the exit survey for postdocs leaving Yale to learn more about their experiences at Yale. We will make our surveys and the results available to our consortium members for their adaptation and adoption in their universities, if they so choose.

*2. Evaluating Aspects of Mentoring*

In year one, with the advice of experts at Yale and at our consortium universities and the NPA, we will begin offering a variety of mentoring treatments to stratified random samples and a control group of STEM basic postdocs at Yale. In our evaluation of mentoring treatments, we propose to include men STEM postdocs in both the treatment and control groups to test the possibility that outcomes vary systematically by gender and to provide a counterfactual for estimating the success of women postdocs. We propose three treatment groups and one control group: (A) The first treatment will offer an intensive two-day workshop similar to the successful mentoring program developed for women in economics and evaluated by Blau et al. (2010). The workshops will include small group, face-to-face advice and conversation with senior scientists about publishing, research, fundraising, how to get tenure, and will include continued one-on-one mentoring with tenured faculty from Yale in the same field. (B) The second treatment provides each postdoc a one-on-one tenured Yale faculty mentor in the same field. We will match mentors and protégés and set up an initial face-to-face but provide very little additional guidance. Here, we intend to replicate the most common form of mentoring. (C) The third treatment trains and encourages postdocs by way of e-mentoring on MentorNet and eventually MentorSTEM. Remote mentors will be available to provide advice and will receive the email prompts and guidance in forming a relationship without being physically present. If successful, the virtual network could save mentor and protége time and on the financial cost of intensive workshops. (D) A control of Yale postdocs will receive none of the mentoring treatments described for treatment groups A, B, and C. Although we will use stratified sampling techniques to capture key population characteristics (e.g., gender, race/ethnicity, field, postdoc stage), the size of the treatment and control groups may vary slightly depending on resources (e.g., tenured faculty recruited for mentoring). We will minimize the size of the control group to increase the numbers of Yale postdocs who receive some form of mentoring treatment since we believe that all three treatments will have some benefit over the status quo. Finally, we are working with cognitive scientists at Yale and elsewhere to develop and pilot online cognitive therapy modules that postdocs can access from their computers. The advantage of this approach is its relatively low cost, but we need first to assess its potential usefulness.

After one year of these treatments, we will survey the entire group again to gauge the effectiveness of these methods as measured by as many concrete measures of success as possible: successful grant submissions and acceptances, stated sense of personal efficacy, stated likelihood of staying in an academic career, and publications. Based on what we learn from this survey and in conjunction with our Internal Advisory Committee (IAC) and our External Advisory Committee (EAC), we will assess the progress of the evaluation to determine whether benchmarks were met, and we will fine tune and adapt the treatments as necessary. In order to be responsive to new knowledge without the incurring the costs of missing longer-term effects, we will keep the treatment and control groups intact for a second year, and in year three, we will survey the postdocs again and reevaluate based on effectiveness and feasibility. We have the option at that time of mixing and matching across the various forms of mentoring. Our comprehensive quantitative and qualitative online annual surveys at the end of each treatment year will form the basis of our summative evaluation and will provide three to five years of longitudinal data to analyze.

*3. Training PIs to Be Mentors*

As a scientific community we already know that mentoring matters to a range of outcomes. We will begin tentatively in year one to train PIs to be better mentors to the postdocs in their labs. We will also train them in group dynamics and lab management. As we learn more about mentoring from our experiments in years one and two, we will improve the content of these training modules. We expect MentorSTEM will become a vehicle for providing PIs with advice and to build a sense of community across the consortium institutions.

*4. Evaluating Reentry STEM Scientists*

In years two through five of the grant, we will collect information from MentorSTEM about STEM scientists re-entering the pipeline, and we will be in a position to evaluate their choice to leave and then to return to an academic track. Our evaluation of reentry STEM scientists is designed to address four overriding questions: (1) What factors contribute to scientists leaving and then re-entering the pipeline? We will design institutional responses to the problems as we learn what they are, basing those responses on what we learn from our separate study of mentoring of Yale STEM postdocs. Childcare availability and affordability is an expensive policy response that universities have been reluctant to make available to postdocs, but it is possible that strong evidence could overcome that reluctance, especially in the context of a consortium of universities and the NPA sharing best practices. Depending on the numbers of cases and the level of reluctance that has to be overcome, it might be more feasible to assign subsidized childcare slots by lottery that would generate additional high-quality data about cause and effect. (2)To what extent does MentorSTEM matching facilitate reentry? (3)What aspects of mentoring are most helpful? We do not expect there will be enough reentry postdocs to randomly assign them to different treatments so our current plan is to encourage them to participate in all of the modules we are creating. This will give us a kind of focus group of reentry postdocs with experience across the range of options that can help us assess the advantages and disadvantages across the varieties of mentoring programs. (4)Finally, we will assess the success of reentry postdocs across relevant scholarly criteria: their placement, grants, and publications. We intend to conduct quantitative and qualitative annual online surveys of reentry scientsits who reenter using MentorSTEM. The data gathered on reentry scientists will be used to evaluate their success over the duration of the project. We will consider the possibility of continuing to survey these reentry STEM scientists to gauge their longer term success as well.

**Capacity of the Proposed Project Team, the Consortium of Universities, & the NPA**

*Institutional Context and Commitment*

Yale is one of the world’s greatest universities, but like all institutions of higher learning, Yale faces the persistent problem of the leaky pipeline for women. While 40 percent of postdoctoral trainees are women at Yale University (see Table 1), only 34 percent of all ladder faculty are women, and 24 percent of all tenured faculty are women (Tait 2012). Only 11 percent of tenured faculty in the physical sciences and 19 percent of the tenured faculty in the biological sciences are women. Recognizing that academic excellence is impaired as much by unintentional hurdles as by intentional neglect, Yale is committed to evaluating and addressing the obstacles that have discouraged female scientists. The Yale administration will provide the financial and personnel resources needed to make this program a success.

The consortium of nine universities in this project are all outstanding 4-year research-intensive universities—7 private and 2 public—committed to supporting women in STEM in academia. The National Postdoctoral Association (NPA) is a member-driven, non-profit organization founded in 2003 that provides a unique, national voice for postdoctoral scholars. NPA’s mission is to advance the U.S. research enterprise by maximizing the effectiveness of the research community and enhancing the quality of the postdoctoral experience for all participants (NPA 2012). All nine universities and the NPA have signed a letter of collaboration confirming their partnership with Yale University, welcoming their input at any stage, and enthusiastically tackling the leaky pipeline problem for women postdocs in STEM.

Our proposed consultant is MentorNet and David Porush, the President and CEO. MentorNet is an award winning web-based, e-mentoring program, and it is the largest and best developed network in the world. MentorNet’s stated mission is to, “further the progress of women and others underrepresented in scientific and technical fields through the use of dynamic , technology-supported mentoring network (MentorNet 2012). MentorNet Targets students, postdocs, and early career researchers in engineering and science, but we intend to adapt MentorNet into MentorSTEM, a nationwide web-based e-mentoring program for STEM scientists at 4-year research intensive universities. We intend that MentorSTEM will be a new pipeline for all STEM scientists, but developed for and targeted to women and URMs, to enter upon receiving their Ph.D.

*Yale University’s Project Team*

The project team from Yale University is led by four highly qualified social scientists—Dr. Frances Rosenbluth, PI, Dr. John Dovidio, Co-PI, Experimental Design Expert and Statistician, Dr. Kelly Mikelson, Co-PI and Project Manager, and Dr. Rebecca Friedkin, Co-PI and Survey Designer. Four STEM scientists on the project team—Dr. Joan Steitz, Dr. Meg Urry, Dr. Jo Handelsman, and Dr. Megan King—will provide expert knowledge of mentoring women in STEM fields and how to improve the balance of men and women progressing through the pipeline. An Internal Advisory Committee (IAC), comprised of Yale’s Postdoc Advisory Committee (PAC), will collaborate with the project team on the self-study of Yale postdocs and the adaptation and implementation of the web-based mentoring for STEM scientists. Finally, an External Advisory Committee (EAC), comprised of nine consortium University leaders and a representative from the NPA, will advise the project team on the adaptation and implementation of the web-based mentoring for STEM scientists and on the eventual dissemination and sustainability of MentorSTEM to additional 4-year research universities.

**Frances McCall Rosenbluth, Ph.D.**, Principal Investigator (PI), is the Damon Wells Professor of International Politics in the Political Science department at Yale and, since 2009, she has been the Deputy Provost for the Social Sciences and for Faculty Development and Diversity. Dr. Rosenbluth is the PI and will head the project team and co-lead all stages of the project evaluation, and, she will devote 1.2 calendar months in Years 1-5 to the project. She has close relationships with seven of the nine consortium universities, has management experience, and has supervised numerous graduate and undergraduate students. In her role as Deputy Provost for Faculty Development, Dr. Rosenbluth leads the University’s diversity initiative and mentoring programs for faculty, and supervises the Office of Faculty Development. Dr. Rosenbluth is a comparative political economist with current research interests in war and constitutions, Japanese politics and political economy, and the political economy of gender. Her research employs a variety of research methods.

**John Dovidio, Ph.D.,** Co-PI**,** is a preeminent Professor of Psychology at Yale with thirty-five years of research experience. With particular expertise in experimental design, Dr. Dovidio will co-lead all stages of the project evaluation and be a statistician on the project team, and, he will devote 0.60 academic months in Years 1-3 to the project. Dr. Dovidio is PI for The Yale Intergroup Relations Lab dedicated to the study of intergroup relations and diversity. Experimental research is central to the Lab’s, however, the Lab also incorporates a range of methodologies and techniques from social psychology, clinical psychology, political psychology, field research, social cognition, and neuroscience. Dr. Dovidio’s research on aversive racism, a contemporary subtle form of prejudice, and on techniques for reducing conscious and unconscious biases will be particularly beneficial in designing and conducting our experimental design and interventions for Yale’s postdocs. Dr. Dovidio has received numerous awards for his stellar scholarship, mentoring, and teaching including the American Psychological Association Presidential Citation 2008, “in recognition of 30 years of stellar research that has demonstrated how contemporary forms of prejudice and discrimination toward Blacks and other disadvantaged groups have become more subtle and less recognizable than traditional racism.”

**Kelly S. Mikelson, Ph.D.**, Co-PI, is currently a Program Manager for Development and Diversity in Yale’s Office of the Provost. Dr. Mikelson will assist with all stages of the project evaluation and will be the Project Manager, handling day-to-day management of this collaborative project which includes key Yale University personnel; the Internal Advisory Committee; the External Advisory Committee; and our subcontractor, MentorNet. Dr. Mikelson will devote 2.4 calendar months in Years 1-5 to the project. With over fifteen years of experience working on federal, state, and foundation funded grants and contracts, Dr. Mikelson conducts qualitative and quantitative data analyses, has worked with Gallup to design and conduct a statewide survey, has supervised numerous research assistants, run focus groups, and written both peer-reviewed articles and final reports. Her past research focused on social policies, child and family policies, child health disparities, and the relationship between public policies and individual behavior. Her publications have appeared in the *Journal of Policy Analysis and Management*, the *American Sociological Review,* and *Journal for Marriage and* Family.

**Rebecca Friedkin, Ph.D.**, Co-PI, is a sociologist and is currently Acting Director of Yale’s Office of Institutional Research (OIR). Dr. Friedkin will be the project’s primary survey designer; and she will devote 0.60 calendar months in Years 1-3 to the project. Dr. Friedkin has eighteen years of experience in quantitative and qualitative survey design and implementation and complex data management and data analysis using SPSS and SAS. In Yale’s OIR, Dr. Friedkin has designed surveys of faculty, undergraduate students, and graduate students. Dr. Friedkin’s expertise will lead the team in developing useful measures using complex data from multiple sources. Her knowledge of online survey implementation and Qualtrics will be particularly useful in our evaluation of STEM scientists re-entering the pipeline and using the consortium’s web-based MentorSTEM. As an active member of the Association of American Universities Data Exchange *(*AAUDE*),* Dr. Friedkin has served on committees on data sharing and confidentiality and in developing core faculty survey questions. Dr. Friedkin’s experience with AAUDE and in working with other universities will be particularly beneficial for developing data measures and sharing data and results with our consortium.

**Four STEM scientists from Yale** on the project team—Drs. Joan Steitz, Meg Urry, Jo Handelsman, and Megan King—will provide expert knowledge for Yale’s self-study of how to improve the balance of female and male postdocs progressing through the STEM pipeline. They will review our experimental design, our proposed treatments, our postdoc surveys, and the MentorSTEM website. Together these four scientists have mentored hundreds of women in STEM, and their expertise will be instrumental in developing MentorSTEM into a valuable online mentoring resource for reentry scientists and, eventually, as a resource for all STEM scientists in 4-year doctoral granting research universities.

**Joan Steitz, Ph.D.** is a Sterling Professor of Molecular Biophysics and Biochemistry at Yale, and she will devote 0.10 calendar months in Years 1-3 to the project.  She is a pioneer among women STEM scientists and is famous for her discoveries involving [RNA](http://en.wikipedia.org/wiki/RNA).  She is a Fellow of the American Academy of Arts and Sciences (AAAS) and the National Academy of Sciences.  She has trained nearly 100 postdoctoral fellows, about half of them women.  Many have gone on to positions in academia; virtually all are still in science or medicine.  Her intense personal involvement with women in science began in earnest in 2005, when joined the NAS Committee that wrote the NRC Report “Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering.”

**Claudia Meg Urry, Ph.D.,** is Chair of the Physics Department at Yale, as well as Israel Munson Professor of Physics and Astronomy and Director of the Yale Center for Astronomy and Astrophysics, and she will devote 0.10 academic months in Years 1-3 to the project.  Dr. Urry was first female tenured faculty member in the history of the Yale Physics Department in 2001. She is a Fellow of the AAAS and the American Physical Society and American Women in Science, and was awarded the American Astronomical Society’s Annie Jump Cannon and George van Biesbroeck prizes. Dr. Urry won the 2010 Women in Space Science Award from the Adler Planetarium for her efforts to increase the number of women and minorities in science. She organized the first national meeting on Women in Astronomy in 1992. She has chaired the Committee on the Status of Women in Astronomy of the American Astronomical Society. She served on the Committee on the Status of Women in Physics of the American Physical Society; helped organize its Gender Equity Conference in, 2007; and led the US delegations to the first and fourth International Conference on Women in Physics in 2002 and 2011, respectively. She serves on the Steering Committee of the Yale Women Faculty Forum.

**Jo Handelsman, Ph.D.**, is a Howard Hughes Medical Institute Professor in the Department of Molecular, Cellular and Developmental Biology at Yale University, and she will devote 0.10 academic months in Years 1-3 to the project.  Dr. Handelsman is nationally known for her efforts increase the participation of women and minorities in science at the university level. She co-founded the Women in Science and Engineering Leadership Institute at UW-Madison, which has designed and evaluated interventions intended to enhance the participation of women in science. She was the first President of the Rosalind Franklin Society, and her service on the National Academies' panel that wrote the 2006 report, “Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering.” Dr. Handelsman received the Presidential Award for Excellence in Science Mentoring in 2011 and is a Fellow of the AAAS and the Association for Women in Science. Dr. Handelsman is co-author of three books including, *Entering Mentoring: A Seminar to Train a New Generation of Scientists*, and recently co-chaired a working group that produced the report to President Obama, “Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics,” about improving STEM education in postsecondary education.

**Megan King, Ph.D.**, is an Assistant Professor of Cell Biology, and she will devote 0.10 calendar months in Years 1-3 to the project.  Her initial idea for this project grew from watching her own outstanding female scientist peers opt out of academic careers.  Dr. King recently received a prestigious NIH New Innovator Award worth $1.5 million for five years and is also a Searle Scholar. She is committed to helping develop solutions to address the leaky pipeline for women in STEM fields focusing on career reentry and access to childcare.

*Yale University’s Internal Advisory Committee*

The **Internal Advisory Committee (IAC)**, comprised of Yale’s Postdoc Advisory Committee (PAC), will collaborate with the project team on the self-study of Yale postdocs and the adaptation and implementation of the web-based mentoring for STEM scientists (see Table 2). Yale’s Advisory Committee for Postdoctoral Affairs was first convened last year. Its primary mission is to improve the postdoctoral experience at Yale through the development and promotion of sound postdoctoral mentoring practices.

**Table 2: Internal Advisory Committee, Yale’s Postdoc Advisory Committee**

|  |  |
| --- | --- |
| Name | Title |
| John Alvaro, Ph.D. | Director of Postdoctoral Affairs |
| Robert Burger, Ph.D | Assistant Provost for Science and Technology |
| Hui Cao, Ph.D. | Professor of Applied Physics |
| Michael Caplan, Ph.D., MD  | C. N. H. Long Professor of Cellular and Molecular Physiology and Professor of Cell Biology; Chair, Cellular and Molecular Physiology |
| Jack Harris, Ph.D.  | Associate Professor of Physics |
| Marina Picciotto, Ph.D. | Charles B. G. Murphy Professor of Psychiatry & Professor of Neurobiology & of Pharmacology; Assistant Chair for Basic Science Research, Dept. of Psychiatry |
| Sara Rockwell, Ph.D. | Professor of Therapeutic Radiology and of Pharmacology; Associate Dean for Scientific Affairs |
| David Stern, Ph.D.  | Professor of Pathology; Associate Director, Shared Resources, Yale Cancer Center; Leader, Signal Transduction Research Program, Yale Cancer Center |
| Meg Urry, Ph.D. | Israel Munson Prof Physics & Astronomy, Director Yale Center Astronomy & Astrophysics; Chair Physics |

We will use the Committee’s monthly meetings to obtain feedback and guidance on (1) the pre- and post-treatment surveys of Yale’s postdocs, (2) the exit surveys of Yale’s postdocs, (3) how consortium universities/NPA can publicize MentorSTEM and the NIH reentry grants, and (4) our development of the mentoring component on the MentorSTEM website and supports offered to ease the transition for reentry scientists. Since this Committee is already meeting monthly as part of Yale’s institutional commitment to supporting postdocs at Yale, we did not budget additional time for these individuals.

*The Consortium of Nine Universities and the National Postdoctoral Association (NPA)*

Our consortium of nine Universities and the NPA comprise our **External Advisory Committee (EAC)** (see Table 3). These nine universities and the NPA were chosen for their: (1) history of working collaboratively, (2) geographic dispersion, and (3) ability to address unique issues facing women in STEM, minority-serving institutions, and disabled STEM postdocs.

First, seven of the nine universities are a group of collaborating universities that have been meeting formally annually and also more frequently sharing information and best practices informally for the past ten years. Second, these nine universities are dispersed throughout the United States. Five are located on the east coast, two are located on the west coast, one in the south, and one in the midwest. Third, in addition to women postdocs in STEM, we are particularly interested in supporting URMs and disabled scientists in the STEM pipeline because these individuals are disproportionately less likely to enter the STEM pipeline and continue to a position in academia (Towns 2010; Martinez et al. 2007; Handelsman et al. 2005; Steinpreis et al. 1999; Valian 1999). We use the gender, racial/ethnic, and disability status of the science and engineering (S&E) doctoral degree awardees as a modest proxy for diversity in the postdoc ranks. Seven of our nine consortium universities are among the top 50 institutions in terms of the number of doctoral degrees granted to women in S&E from 2005-09 (NSF 2012a). Five of our nine consortium universities are among the top 20 institutions in terms of the number of doctoral degrees granted to Asian/Pacific Islanders in S&E from 2005-09 (NSF 2012b). Three of our nine consortium universities are among the top 20 institutions in terms of the number of doctoral degrees granted to African Americans in S&E from 2005-09, including the top two, Howard University and the University of Michigan, Ann Arbor (NSF 2012b). Three of our nine consortium universities are among the top 20 institutions in terms of the number of doctoral degrees granted to Hispanics, and two of our nine consortium universities are among the top 20 institutions in terms of the number of doctoral degrees granted to American Indian/Alaska Natives in S&E from 2005-09 (NSF 2012b). Finally, six of our nine consortium universities are among the top 47 institutions in terms of the number of doctoral degrees granted to individuals with a disability in S&E from 2005-09 (NSF 2012c).

The strategic development of this consortium strengthens this project and increases its likelihood of success by (1) providing diverse perspectives from varied universities in developing MentorSTEM, (2) each of these universities are key players in producing and supporting women STEM scientists in the pipeline, so MentorSTEM will be used by them and their scientists, (3) these premier universities are well-respected by other 4-year research universities who will eventually have use of MentorSTEM, (4) these institutions are firmly committed to reducing the numbers of women who leave the STEM pipeline, and (5) the consortium members have signed a letter confirming their collaboration throughout the implementation of this project and in publicizing this program at their universities.

In sum, the EAC members listed in Table 3, will advise the Yale project team on the development and implementation of MentorSTEM and publicize the program at their own universities. As described in the project timeline, we expect to hold regular conference calls with the EAC in Years 1 and 2 of the project and in Years 3 through 5 as needed.

**Table 3: External Advisory Committee**

|  |  |  |
| --- | --- | --- |
| Name | Title | University/Organization |
| Frances McCall Rosenbluth | PI, Deputy Provost for the Social Sciences and for Faculty Development and Diversity  | Yale University |
| Kathleen Flint Ehm | Project Manager for NPA's grant funded initiatives | National Postdoctoral Association |
| Melany Hunt | Vice Provost and William R. Kenan, Jr. Professor of Mechanical Engineering | CalTech |
| Andrew R. Davidson | Vice Provost for Academic Planning and Professor of Population and Family Health | Columbia University |
| Wayne A.I. Frederick | **Provost and Chief Academic Officer and Professor in Department of Surgery** | Howard University |
| Hazel Sive | Associate Dean for School of Science and Professor of Biology | MIT |
| Karen S. Cook | Vice Provost for Faculty Development and Diversity and Ray Lyman Wilbur Professor of Sociology | Stanford University |
| Jennifer Linderman | Acting Director, ADVANCE Program at the University of Michigan and Professor of Chemical Engineering | University of Michigan, Ann Arbor |
| Abigail J. Stewart  | Director, ADVANCE Program at the University of Michigan and Sandra Schwartz Tangri Distinguished University Professor of Psychology and Women’s Studies  | University of Michigan, Ann Arbor |
| Lynn Hollen Lees | Vice Provost for Faculty and Professor of History | University of Pennsylvania |
| Janet Ellzey | Vice Provost, Gender Equity and Professor, Mechanical Engineering | University of Texas at Austin |

*Our Consultant: Transforming MentorNet into MentorSTEM*

MentorNet is “the premiere and most experienced web-based e-mentoring program in the world” (MentorNet 2012). MentorNet’s mission is “to further the progress of women and others underrepresented in scientific and technical fields through the use of dynamic, technology-supported mentoring network (MentorNet 2012). MentorNet has been recognized with a U.S. Presidential Award for Excellence in Science and Engineering Mentoring, the Cisco Grand Prize for Educational Technology, and grants from the NSF, the Alfred P. Sloan Foundation, The S.D. Bechtel, Jr. Foundation, and the Carnegie Corporation (MentorNet 2012). With fifteen years of experience tested on 31,000 STEM students from over 350 college and univesrities, MentorNet has been continually improving their web-based platform for matching and guiding mentors and protégés based on ongoing research (MentorNet 2012).

MentorSTEM will be a web-based platform designed for, and initially limited to, women and URMs in STEM fields who have attained a Ph.D. We intend to adapt the e-mentoring platform developed by MentorNet for women of color in STEM to our project. While the goals of each are similar, we intend to systematically expand our network over the course of five years. This will allow us to tailor the e-mentoring, publication of the NIH reentry program, and other forums and services to women/URM Ph.D.s in STEM fields within the consortium. After conducting our experiment to evaluate the preliminary efficacy of the e-mentoring using a randomized trial with a treatment and control groups, we intend to systematically expand the network to include all STEM scientists with a Ph.D. that are reentering the pipeline or affiliated with a 4-year research-intensive university.

**Specific Activities and Project Timeline**

|  |  |  |
| --- | --- | --- |
| Milestones | Key Project Staff | Dates |
| YEAR 1: July 1, 2013 – June 30, 2014 |
| Project start date |  | July 1, 2013 |
| Meeting with PI and Co-PIs and Chair of Internal Advisory Committee (IAC) | PI and co-PIs, Alvaro | Within 1 week of start date |
| Teleconference with NSF ADVANCE Project Officer | PI and co-PIs | At start, monthly thereafter |
| Sign contract with David Porush of MentorNet for consultant services | Rosenbluth, Mikelson, Porush, Yale Grants and Contract Office | Within 2 weeks of start date |
| Internal Advisory Committee (IAC) meeting | Rosenbluth, Mikelson, 9 IAC members | July 2013, then bimonthly |
| External Advisory Committee (EAC) teleconference | Consortium members, Rosenbluth, Mikelson | July 2013, then bimonthly |
| Meet with Yale’s Human Research Protection Program to discuss the ethics of randomized experiment for Yale’s postdocs | PI and co-PIs, Alvaro | Within 3 week of start date |
| Pre-treatment Survey of Yale Postdocs |
| Design survey | PI and co-PIs | 7/1-8/ 14/2013 |
| Obtain feedback on pre-treatment survey | IAC, Friedkin, Mikelson, and 4 STEM Scientists | 7/21 – 8/ 7/2013 |
| Conduct pre-treatment survey | Friedkin, RA | 8/15-9/15/2013 |
| Analyze pre-treatment of Yale post-docs | Friedkin, Mikelson, Rosenbluth | 9/16-10/15/2013 |
| Create and Develop MentorSTEM from MentorNet |
| Design MentorSTEM | MentorNet, Rosenbluth, Dovidio, Mikelson | Mid-July 2013, then biweekly |
| Develop plans for publicizing NIH reentry grants with consortium members | MentorNet, Rosenbluth, Mikelson, 4 STEM Scientists, IAC, EAC | Sept. 2013-Mar. 2014 |
| Obtain feedback on MentorSTEM | MentorNet, Rosenbluth, Mikelson, 4 STEM Scientists | Mid-Oct. 2013 |
| Obtain feedback on MentorSTEM | MentorNet, Rosenbluth, Mikelson, IAC | Mid-Oct. 2013 |
| Obtain feedback on MentorSTEM & plans for publicizing NIH reentry grants | MentorNet, Rosenbluth, Mikelson, EAC | Mid-Nov. 2013 |
| Test and finalize MentorSTEM | MentorNet, Rosenbluth, Mikelson, Alvaro | Dec. 2013-Jan. 2014 |
| Introduce MentorNET & MentorSTEM to Treatment group C | MentorNet, Rosenbluth, Mikelson, Alvaro | Feb. 2014 |
| MentorSTEM testing for reentry scientists in consortium | Rosenbluth, Mikelson, MentorNet, IAC, EAC | Apr. –June 2014 |
| Survey of Yale STEM PIs |
| Design survey of Yale STEM PIs | PI and co-PIs | 8/16-9/14/2013 |
| Obtain feedback on survey of Yale STEM PIs | IAC, Friedkin, Mikelson, & 4 STEM Scientists | 8/20- 9/7/2013 |
| Conduct survey of Yale STEM PIs | Friedkin | 9/14-9/30/2013 |
| Analyze Yale STEM PI survey data | Friedkin, Mikelson, Rosenbluth | 10/ 1-10/31/2013 |
| Exit survey of Yale STEM Postdocs |
| Re-design exit survey of STEM postdocs | Mikelson, Alvaro, Friedkin, Rosenbluth | 9/1-9/21/2013 |
| Obtain feedback on exit survey | IAC, Mikelson, and 4 STEM Scientists | 9/14-9/21/2013 |
| Conduct exit survey of Yale STEM postdocs when they leave | Alvaro, Mikelson | ongoing |
| Analyze STEM postdocs exit survey data | Alvaro, Mikelson | ongoing |
| Design Randomized Experiment of Mentoring for Yale STEM Postdocs |
| Devise specific content for Mentoring treatment groups A, B, & C | Rosenbluth, Dovidio, Mikelson, 4 STEM Scientists, IAC, EAC | 10/7 – 10/31/2013 |
| Assess Yale personnel resources needed for Treatments A, B, & C | Rosenbluth, Mikelson | 10/21 –11/15/2013 |
| Obtain feedback on content for Mentoring treatment groups A, B, & C | Rosenbluth, Mikelson, Alvaro, EAC | Mid-Nov. 2013 |
| Stratified sampling of Yale STEM postdocs to create Treatment & Control Groups | Friedkin, Mikelson | Late-Nov. 2013 |
| Notify and enroll Yale STEM postdocs in Groups A, B, C, and D | Rosenbluth, Mikelson, Alvaro | Dec. 2013 |
| Recruit and train tenured Yale faculty for Treatments A and B | Rosenbluth, Dovidio, Mikelson, 4 STEM Scientists, IAC, | Dec. 2013-Jan. 2014 |
| Treatment A: Conduct intensive mentoring workshops | Rosenbluth, Mikelson, tenured Yale faculty, Group A | March 2014 |
| Treatment B: Match one-on-one mentors and protégés | Rosenbluth, Mikelson, tenured Yale faculty, Group B | Feb. 2014 |
| Treatment C: train and introduce postdocs to MentorNet/MentorSTEM | Rosenbluth, Mikelson, Group C | Feb. 2014 |
| Reports |
| Draft Tables for Year 1 Report | Friedkin, Mikelson, RA, Rosenbluth | 10/2013 – 2/2014 |
| Draft/Revise/Final Report for NSF and consortium partners | Rosenbluth, Dovidio, Mikelson, Friedkin, RA | Jan. –June 2014 |
| YEAR 2: July 1, 2014 – June 30, 2015 |
| Meet with NSF ADVANCE Project Officer | Rosenbluth, Mikelson | Monthly |
| Meet with David Porush re: MentorSTEM | Rosenbluth, Mikelson, Porush | Monthly |
| IAC meetings | Rosenbluth, Mikelson, IAC | Monthly |
| EAC teleconference | Rosenbluth, Mikelson, EAC | Bimonthly |
| Publicize MentorSTEM for reentry and STEM scientists within the consortium | Rosenbluth, Mikelson, MentorNet, EAC | All year |
| Design/Revise post-treatment survey of Yale post-docs | Friedkin, Mikelson, Rosenbluth, IAC, 4 STEM scientists, RA | July-Aug. 2014 |
| Post-treatment survey of Yale post-docs | Friedkin, Mikelson, RA | Sept. 2014 |
| Analyze post-treatment of Yale post-docs | Mikelson, Rosenbluth, RA | Oct.-Nov. 2014 |
| Draft Tables for Year 2 Report | Friedkin, Mikelson, RA, Rosenbluth | 11/2014 – 2/2015 |
| Draft/Revise/Final Report for NSF and consortium partners | Rosenbluth, Dovidio, Mikelson, Friedkin, RA | March –June 2015 |
| YEARS 3-5: July 1, 2015 – June 30, 2018 |
| Meet with NSF ADVANCE Project Officer | Rosenbluth, Mikelson | Monthly |
| Meet with David Porush re: MentorSTEM | Rosenbluth, Mikelson, MentorNet | As needed |
| IAC meetings | Rosenbluth, Mikelson, IAC | Monthly |
| EAC teleconference | Rosenbluth, Mikelson, EAC | Bimonthly |
| Expand MentorSTEM to more universities | Rosenbluth, Mikelson, EAC, MentorNet | All year |
| Post-treatment survey of Yale post-docs | Friedkin, Mikelson, RA | Sept. |
| Analyze post-treatment of Yale post-docs | Mikelson, Rosenbluth, RA | Oct.-Nov. |
| Draft Tables for Yearly Report | Friedkin, Mikelson, RA, Rosenbluth | Nov. – Feb. |
| Draft/Revise/Final Report for NSF and consortium partners | Rosenbluth, Dovidio, Mikelson, Friedkin, RA | March –June |
| Develop sustainability plan for MentorSTEM | MentorNet, Rosenbluth, Mikelson, RA | Years 3-5 |

**Project Summary**

Women have not yet achieved equality in the scientific community. Despite advances in the proportion of women in academic science and engineering, a 2008 study by the National Science Foundation confirmed that women continue to make up a much lower percentage of science and engineering full professors than their share of science and engineering doctorates would indicate. A 2007 study by the National Academy of Sciences was more sanguine, finding that “[f]or the most part, men and women faculty in science, engineering, and mathematics have enjoyed comparable opportunities within the university, and gender does not appear to have been a factor in a number of important career transitions and outcomes.” However equitable the promotions process, there will never be equality at the higher ranks of the professoriate if females are choosing to avoid careers that are known for unforgiving hours and promotion schedules.

*Intellectual Merit*

This project proposes a several-pronged approach, focusing on the postdoctoral community where attrition is both substantial and gendered. First, better information about why postdocs drop out will help us target policies more effectively. In most research universities, postdocs do not come under the watchful eyes of deans and provosts because they are neither graduate students nor faculty. Given the importance of postdoctoral training for scientific careers, this neglect has become a structural problem for women who are dropping out at a fast clip. Second, we plan to develop MentorSTEM into an effective and feasible way for universities to provide systematic mentoring to postdocs, beginning with women postdocs. Our experimental design allows us to “learn by doing,” to improve mentoring content and delivery based on regular and repeated evaluation of the scholarly success and morale of those being mentored. Third, MentorSTEM provides a cost-effective way for the scientific community to help women scientists who dropped off the academic track to find a way back on. MentorSTEM is an online vehicle for matching prospective postdocs (including but not restricted to those with NIH reentry grants) with PIs and program directors that are willing to hire someone who has been out of the lab for a period of time. Over the course of this program, we will develop and test a variety of ways to support these postdocs, as well as those who are mentoring them, to achieve scholarly excellence.

*Broader Impact*

In the longer run, we hope the knowledge we gain from this project will help to improve both the quality of life and the quality of scholarship for the entire scientific community. Our commitment to diversity rests on the conviction that knowledge flourishes best when there are no barriers to entry. We are eager to build an environment in which all members of the academic community can grow and flourish as scholars, and in which men and women alike can balance family and career. Failure to remove obstacles to success, now unevenly in the paths of women and minority scholars, places an unacceptable tax on the possibilities for scientific excellence.