

ACCEL: Advancing Cornell's Commitment to Excellence and Leadership

Project Summary for a proposal submitted to the National Science Foundation's ADVANCE Program

PI: Provost Carolyn Martin

Co-PI: Vice Provost for Diversity and Faculty Development Robert Harris

Co-PI: Associate Professor Shelley Correll, Sociology

Co-PI: Associate Professor Sheila Hemami, Electrical & Computer Engineering

Co-PI: Associate Professor Marjolein van der Meulen, Mechanical and Aerospace Engineering

The NSF ADVANCE program was begun in response to MIT's 1999 report "A Study on the Status of Women Faculty in Science at MIT." The program's stated goals are *to increase the recruitment, retention, and promotion into leadership positions of women in engineering and the sciences, and to institutionalize best practices, policies and programs across colleges as they pertain to women faculty*. This award will directly involve and have maximum impact on the areas supported by the NSF: engineering, physical sciences, life sciences, and social sciences. However, because many of the initiatives are indeed institutional, they will impact the university as a whole.

The program solicitation can be found at

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5383

ACCEL: Advancing Cornell's Commitment to Excellence and Leadership

Cornell University is committed to diversity and gender equity and to an institutional environment where all faculty can achieve their greatest potential in research, education, and service. Despite the university's commitment, gender diversity remains a significant problem that affects the quality of our enterprise. The representation of women faculty in science and engineering (S&E) falls below the level of female PhDs produced nationally. Through the NSF ADVANCE program, we have the opportunity to increase the number of women S&E faculty and thereby affect the environment Cornell. As an institution, we have decided to set ambitious goals: over the five year life of the grant, we aim to achieve 20% women faculty in *each S&E department* and to increase the number of senior women S&E faculty. We chose this level to move the representation of women from token status to a critical mass in each department, the environment that most determines faculty daily life. At present 27 of the 51 S&E departments are below this critical mass. Our more ambitious longer-term objective is that a third of our S&E faculty be women by 2015, Cornell University's sesquicentennial.

Our approach to institutional change is based on the following principles: successful implementation of diversity strategies requires genuine support from high levels of an organization; inequalities that result from forces external to the institution can be effectively addressed by institutional policies and strategies; accountability for achieving diversity goals reduces biases against women and minorities; and, representation below 15-20% of a unit heightens the visibility of women, leading to a series of barriers to advancement. Achieving our short- and longer-term goals requires a commitment not only to recruitment, but also to retention, development, and promotion of women faculty, which we will achieve through the efforts detailed in this proposal.

The main thrust of our proposal is to create an integrated campus wide set of initiatives and to ensure their implementation and success through the creation of the CU-ADVANCE Center, that will permanently reside in the Provost's Office. As is common with elite, private universities, decision-making and policy design and implementation are highly decentralized at Cornell. As a result, past efforts to increase the representation of women faculty have been fragmented across colleges and departments, with no easy way for "best practices" to be shared. For this reason, the majority of the budgeted items are for programs and support staff that will connect faculty and decision makers across departments and colleges through the Center in a way that would not be possible otherwise and for a on-going university wide evaluation of progress in each area. Cornell has a rich history of inclusion of women and many women's firsts in higher education. With an ADVANCE grant, Cornell can return to its commitment to leadership by demonstrating that reaching a critical mass of women scientists and engineers at an elite, research-intensive institution is possible, and more generally that the advancement of women scientists and engineers can and should include such institutions.

Intellectual Merit In addition to our proposed direct efforts toward recruitment, retention, promotion, and development, we include two sociological studies as part of our formative and summative evaluation strategies. A longitudinal study of assistant professors will allow us to understand whether and how the experiences of women and men faculty differ and to determine which barriers to advancement are unique to women in S&E, which affect all women faculty, and which are common to all faculty. These results will be helpful to isolate differential contributors to success in men and women. We will also perform a study of the impact of changes in the demographic composition of departments on social relations among faculty members. To date, no research has been conducted on the dynamic aspects of gender composition, though understanding these dynamics clearly is an important outcome of increasing the number of women faculty.

Broader Impact We will include the women faculty in S&E at several neighboring institutions in workshops and seminars throughout the grant period. In addition to affecting the Cornell faculty, this grant will indirectly influence future S&E faculty nationwide. A majority of Cornell's bachelors (60%) and doctoral (80%) degrees are conferred in science and engineering fields. An unusually large number of our female and male undergraduates later receive doctoral degrees, and, in fact, we rank third as the undergraduate institution where women engineering faculty were trained. The presence of greater numbers of female faculty at Cornell will, therefore, have a truly transformational impact nationally.

1. Introduction

Cornell University is committed to diversity and gender equity and to an institutional environment where all faculty can reach their intrinsic potential in research, education, and service. Despite the university's commitment, gender diversity remains a significant problem that affects the quality of our enterprise. At present, only 20% of our science and engineering (S&E) faculty are female, with substantial variation by area, rank and department. Indeed, our in our physical sciences and engineering, women represent only 11% of our total tenure track-faculty. Our S&E departments range from 0% female faculty in Biostatistics to 67% in Textiles & Apparel. The representation of women in S&E falls below the level of female PhDs produced nationally.

Through the NSF ADVANCE program, we plan to increase the number of women S&E faculty and thereby affect the environment Cornell. Our approach to institutional change is based on the following principles: successful implementation of diversity strategies requires genuine support from high levels of an organization [1, 2, 3]; inequalities that result from forces external to the institution can be effectively addressed by institutional policies and strategies [1, 2]; accountability for achieving diversity goals reduces biases against women and minorities [4, 5]; and, representation below 15-20% of a unit heightens the visibility of women, leading to a series of barriers to advancement [6, 7, 8].

We have decided as an institution to set ambitious short- and long- term goals. First, over the five year life of the grant, we aim to achieve 20% women faculty in *each S&E department*. We chose this level because it is imperative that our units move the representation of women from token status to a critical mass in each department, the environment that most determines faculty daily life. At present 27 of the 51 S&E departments are below this critical mass. Based on current faculty levels, the university's S&E units will need to appoint 60 additional female faculty to succeed. If successful, this change would result in an increase to 26% women S&E faculty at Cornell. This short-term goal is critical to a more ambitious longer-term objective: one third of our S&E faculty be women by 2015, Cornell University's sesquicentennial.

Achieving our short- and longer-term goals requires a commitment not only to recruitment, but also to retention, development, and promotion of women faculty, which we will achieve through four initiatives:

- Our *Climate Initiative* addresses both institutional policy and individual attitudes to provide a more inclusive community and environment where all faculty can achieve their maximum potential in research, education, and service.
- Our *Recruiting Initiative* develops a culture of proactive and continuous recruiting and contributes directly to achieving our short-term goal of 20% female representation in each department.
- Our *Women's Power Tools Initiative* provides women faculty in S&E with the knowledge and resources needed for a successful academic career, both pre- and post-tenure, and prepares women for leadership opportunities.
- Our *Monitoring and Evaluation Initiative* will assess our progress in a both formative and summative manner and includes what we believe are some innovative approaches to evaluation.

The main thrust of our proposal is to create an integrated campus wide set of initiatives and to ensure their implementation and success through the creation of the CU-ADVANCE center, that will permanently reside in the Provost's Office. As is common with elite, private universities, decision-making and policy design and implementation are highly decentralized at Cornell. As a result, past efforts to increase the representation of women faculty have been fragmented across colleges and departments, with no easy way for "best practices" to be shared. The proposed efforts support programs and staff that will connect faculty and decision makers across departments and colleges in a way that would not be possible otherwise and for a on-going university wide evaluation of progress in each area. Cornell has a rich history of inclusion of women. With an ADVANCE grant, Cornell can return to its commitment to leadership by demonstrating that reaching a critical mass of women scientists and engineers at an elite, research-intensive institution is possible, and more generally that the advancement of women scientists and engineers can and should include such institutions.

In addition to affecting the Cornell faculty, this grant will indirectly influence future S&E faculty nationwide. A majority of Cornell's bachelors (60%) and doctoral (80%) degrees are conferred in science and engineering fields. An unusually large number of our female and male undergraduates later receive doctoral degrees, and, in fact, we rank third as the undergraduate institution where women engineering faculty were trained. The presence of greater numbers of female faculty at Cornell will, therefore, have a truly transformational impact nationally.

2. Background & Significance

Women and Cornell University: From Founding to Today Cornell University was founded in 1865 as an intentionally diverse educational institution according to the vision of Ezra Cornell and Andrew Dickson White: equal educational access for all individuals [9, 10]. Cornell's establishment was a radical departure from religious and educational conventions at the time: the founding legislation combined public funds from the Morrill Land Grant Act and private financing from Ezra Cornell; the curriculum integrated classical courses with science and engineering; and, the first class in 1868 included students regardless of race, religion or wealth. Women were included in Cornell's founding vision. Cornell was the first of the now-Ivy League institutions to admit (1870) and to graduate (1873) women [11]. In 1884, Cornell became the first institution to designate scholarships for women. The first woman to earn a Doctorate of Science in the US graduated from Cornell in 1895. The class of 1905 contained the first woman to receive a civil engineering degree in the US and the first female engineer at Cornell.

Today Cornell awards approximately 3,500 bachelors and 400 doctoral degrees annually. Of these degrees, nearly 65% of bachelors and 82% of doctoral degrees are conferred in the fields of science and engineering (S&E), compared with 32% and 62%, respectively, nationally [12, 13]. At Cornell women received 48% of bachelor's and 30% of doctoral degrees in S&E, compared to 51% and 37% nationally, respectively [13]. From 1997 to 2001, Cornell produced the second highest number of female (and male) bachelor's degree recipients who later received doctoral degrees in S&E [13]. In addition, Cornell ranked third in number of female undergraduate students who later became engineering faculty [14].

Current Status of S&E Women Faculty at Cornell Cornell encompasses a broad range of S&E disciplines across endowed (private) and contract (public/state-assisted) colleges. Cornell's undergraduate colleges include four endowed colleges (Architecture, Art & Planning; Arts & Sciences; Engineering; and, Hotel Administration) and three New York State contract colleges (Agriculture & Life Sciences; Human Ecology; and, Industrial & Labor Relations). Three graduate and professional colleges are located in Ithaca: Law, Management and Veterinary Medicine. The medical school is located in New York City. These colleges operate with substantial autonomy. The mix of private and state colleges with different management models provides opportunities to implement different program approaches and develop a range of best practices to export from one college to another. To date, however, there has not been a central organization to integrate and share these practices or to implement new practices. Therefore, we propose to create the CU-ADVANCE Center situated at the university (provost) level.

The S&E departments at Cornell in Ithaca are concentrated in five colleges (hereafter, the "ADVANCE colleges"): Agriculture and Life Sciences, Arts and Sciences, Engineering, Human Ecology, and Veterinary Medicine (see Table 1). As can be seen in Figure 1 and Table 1, female representation varies substantially by the four broad S&E areas and academic rank. The limited supply of women receiving S&E Ph.D.s (i.e. the "pipeline") makes hiring female faculty a challenge [15, 16]. We seek to increase the number of female hires so that we move to a critical mass of women in each S&E department at Cornell. In addition to hiring, we seek to increase the number of women at all ranks through our initiatives on retention and promotion. As can be seen in Table 2, while every college has at least one female department chair, women continue to be underrepresented in leadership roles. Our initiatives include leadership training to increase awareness of opportunities and to provide tools for women to embark on these positions. Furthermore, initiatives aimed at increasing the promotion of women to full professor will increase the pool of women eligible for leadership roles.

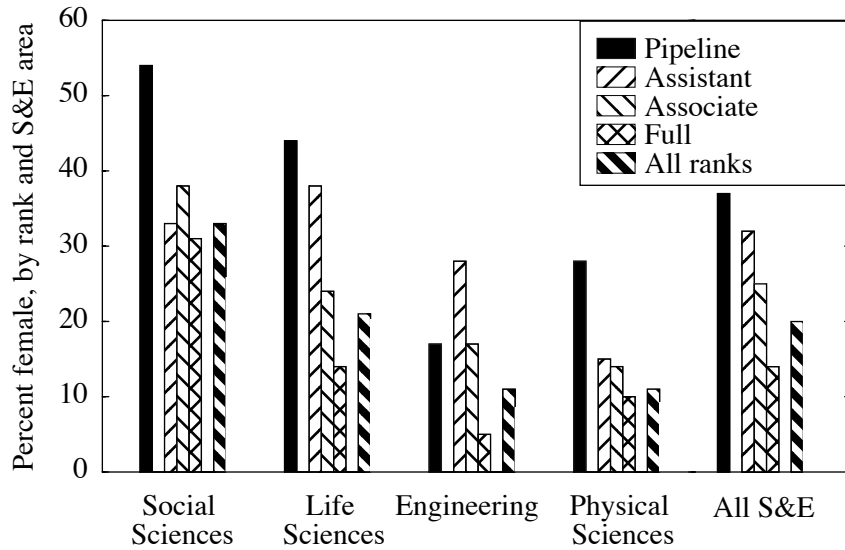


Figure 1 Cornell women faculty percentages by S&E area and rank (2004) compared with doctorates awarded to women (2003, “pipeline” [12]). This figure represents 202 women faculty (1031 total faculty) in in 51 S&E departments. Of these women faculty, 14% (30) are African-American, Hispanic, or Native American.

Table 1 Numbers of women faculty by rank and S&E areas

	Assistant	Associate	Full	Total
Social Sciences	18	18	34	70
Life Sciences	28	25	33	87
Engineering	12	9	7	28
Physical Sciences	4	2	11	17

Table 2 Cornell University S&E departments and leadership positions by college

College	No. of Departments			Academic Leadership				Disciplinary Leadership			
	Below 20% target	Total S&E	Total	Dean		Department Chairs		Endowed/Named Chairs		Center/Program Directors	
				M	F	M	F	M	F	M	F
Agriculture & Life Sciences	12	19	22	–	1	16	3	32	6	9	2
Arts & Sciences	6	12	29	1	–	10	2	38	3	6	1
Engineering	9	10	10	1	–	8	2	46	2	4	0
Human Ecology	0	5	5	–	1	3	2	6	2	3	0
Veterinary Medicine	1	5	5	1	–	4	1	9	3	2	0

3. Transformational Environment at Cornell

The ADVANCE program comes at an opportune time for Cornell, and Cornell also brings unique features to ADVANCE. Since 2000, Carolyn Martin has served as provost at Cornell. During this time, she has made diversity a priority, “The university recognizes the importance of systematic and concerted efforts to increase diversity among faculty, staff, and students and the need to create an environment in which differences are appreciated” [17]. Since 2000, a series of programs to foster institutional diversity has been introduced, which form a base upon which this proposal can now build. The success of current programs will first be assessed so that strategies to improve effectiveness can be implemented in a more integrated fashion university wide. To assess the current climate at Cornell, the provost’s office will administer a broad-based work-life survey of all faculty in Fall 2005. This survey will serve as a baseline from which we will evaluate the progress of the initiatives described below.

Within the ADVANCE program, Cornell brings a broad portfolio of academic programs within a unique context: a combined private and state university. The combination of distributed leadership and strong faculty governance places an unusual amount of authority at the department levels and creates a need to engage all faculty to effect institutional transformation. In addition, hiring in our rural Ithaca setting can be challenging [18]. Our goal is to better integrate our college policies and practices to foster gender diversity while maintaining the college's distinctive characteristics and operating policies. With the proposed initiatives, our colleges will be able to provide each other and the ADVANCE program with opportunities to implement strategies appropriately.

3.1. Institutional-level Transformational Environment

Existing efforts on hiring. The Vice Provost for Diversity and Faculty Development (VP-DFD), CoPI Robert Harris, plays an important role in academic hiring providing bridge and pre-fill funding for outstanding female and minority candidates when no open lines exist and facilitating dual academic offers in the University. The Office of Human Resources (OHR) has initiated an Independent Consultants network [19] to aid in placement of non-academic partners. In response to a proposal from the Women in Science and Engineering (WISE) faculty, Provost Martin instituted an additional \$500,000/year specifically for female hires in the physical sciences and engineering for bridge funding or to supplement startup packages. To apply for these funds, department chairs must demonstrate salary and startup parity with previous hires and provide a detailed mentoring plan to a committee of WISE faculty. Since its inception in 2001, 6 women faculty in engineering have been hired with grants totalling \$1.2M; however, engineering still has the greatest number of departments below our vision of 20% women faculty [20].

Existing efforts on climate and retention. A gender salary equity survey was conducted in 2001 and all salaries are currently analyzed annually by the Office of Institutional Research and Planning (IRP) and reviewed by the Provost with the Deans to identify and correct outlying gender disparities. Cornell's Academic Parental Leave policy [21] provides up to 2 semesters of teaching relief to primary or coequal caregiving parents, extension of the tenure clock for 2 semesters and full time off for all New York State-defined disability periods, including pregnancy. Cornell supports 3 existing daycare centers and is currently addressing infant care.

3.2. College-level Transformational Environment

In addition to progress at institutional level, each of the five ADVANCE colleges have distinct practices to address diversity and climate with varying degrees of success. Agriculture & Life Sciences (ALS) and Engineering each has a designated faculty member who interacts with chairs and advises the Dean directly on diversity for recruitment, promotion, and retention. A range of hiring strategies to attract women are employed across the colleges resulting in gender-balanced hires in Vet Medicine (18 men, 16 women) and a doubling of female faculty numbers in Engineering in the past decade. Two colleges, Human Ecology and ALS, have highly institutionalized mentoring programs. Engineering is developing a formal mentoring program but the other S&E colleges have no formal mentoring programs. Finally, women faculty in several colleges have separately "self-organized" producing college-specific networks. One of our goals with this proposal is to formalize and expand these mentoring and networking opportunities.

Each College also has individual diversity practices. In ALS, strategic departmental leadership changes have affected climate change, particularly in recruiting. Arts & Sciences has recently employed creative strategies that produced female hires in Astronomy and Physics this spring. With NSF sponsorship, CoPI Sheila Hemami has instituted a peer mentoring network for junior faculty in Engineering. Because of its historical faculty gender diversity, human ecology has an emphasis on maintaining and improving ethnic diversity which has produced 25% under-represented minority faculty. They have also had success with dual academic career hiring. All these practices will be documented and compared, and best practices shared and integrated, by the CU-ADVANCE Center.

3.3. Proposal Development Methodology

The proposed initiatives were developed via an iterative process involving faculty and leadership at Cornell University. In Spring 2005, women faculty in S&E departments completed a questionnaire about their local climate and desired programming. A subset participated in follow-up interviews and meetings. We conducted individual interviews with the 5 ADVANCE-college deans and a subset of chairs and former chairs in S&E disciplines to provide an academic leadership perspective and more ideas for addressing ADVANCE goals. We refined our proposed efforts by studying programming and outcomes at all 19 existing ADVANCE IT institutions, followed by discussions between the PIs and ADVANCE PIs at other institutions. Evaluation strategies were designed by CoPI Shelley Correll, Pam Tolbert, and the IRP. Group discussions between the PIs and the deans finalized the proposed initiatives and the management plan.

4. Proposed Institutional Transformation Efforts

The programming proposed in this section adopts and builds on strategies that previous research has shown to reduce the barriers to women's advancement and leadership in academia, in science and engineering and more generally. It takes advantage of Cornell's unique structure, its challenges and opportunities to ensure more significant progress than would be possible without the help of an ADVANCE grant and center. We have formulated four initiatives: Climate, Recruitment, Women's Power Tools, and Monitoring and Evaluation.

Our Climate initiative provides institutional policy change where required and educates faculty and leaders to create a more inclusive community and environment. Our Recruitment initiative encompasses all stages of the hiring process, including efforts designed to increase the number of women applicants and interviewees and efforts designed to increase the number of offers to women. Our Women's Power Tools initiative is focused on Cornell women and contributes to their retention, promotion and assumption of leadership positions by providing them with the knowledge and resources necessary for a successful academic career both pre- and post-tenure. Finally, our Monitoring and Evaluation initiative includes appropriate evaluation for each program, evaluation for the NSF indicators, and three in-depth evaluation projects which will allow us to tailor our programs and policies in later years of the grant based on what we have learned about the experiences of women faculty in S&E.

Following Cornell's history of faculty activism and governance, each of our initiatives engages both faculty and leadership, and accountability is placed in the hands of department chairs, deans and the provost.

4.1. Climate Initiative

Improvements in organizational climate have been shown to benefit both women and men [1]. We will combine two complementary approaches to university climate for all faculty, addressing both institutional policies and individual attitudes. The initiative addresses work-life issues which affect all faculty (although they affect women more than men), and educates faculty and leaders to create a more inclusive community and environment. An ADVANCE center will permit us to identify and change policies that inhibit or fail to promote progress. Attitude change will be effected through education of the leadership and faculty at Cornell.

Assessment. In September 2005 Cornell will administer a Work-Life survey to all faculty. This survey was developed by a faculty committee, appointed by the provost in response to faculty requests. The survey will be administered through the Provost's office. The survey was designed on the basis of faculty focus groups at Cornell and from study of similar surveys at other university. This survey has six sections:

- *Your work load*
- *Satisfaction with your work*

- *Your work environment* (e.g., values held by faculty and departments, opinions of worth and contributions, relationships with leadership, resource allocation, department collegiality and climate)
- *Personal and family responsibilities*
- *Policy accommodations* (e.g., tenure clock options, child care options, part-time appointments)
- *Reflections* (e.g., were you recruited to Cornell, did you negotiate your contract, have you had an outside offer)

The survey will provide a baseline measure of climate and is designed to suggest specific institutional policies to improve climate. Data will be analyzed by gender, college, and rank. For example, preliminary findings from the focus groups suggest that the daily university calendar should be changed so that seminars and meetings are held at the lunch hour, rather than Cornell's traditional time of 4:30 p.m. Several individual departments across the university have already made this change, but this is an example of a policy change that could be made at the university level. We expect that this survey (and the follow up surveys we will conduct as described in section 4.4) will suggest many more institutional policy changes.

Now is an ideal time to examine and evaluate the effectiveness of our family leave policy (described in section 3.1). As part of our Monitoring and Evaluation initiative, we will interview all faculty who have used the policy and identify those who have had children and who have not used the policy. The policy will be modified if a substantial need arises.

Department chair and faculty training. The tone set by the leadership, while always important to effecting institutional change, is especially important at Cornell because much of the decision-making and policy implementation occurs at the college or department level [1, 2]. Department chairs are usually selected from internal candidates and serve 3-5 year terms, with the possibility of renewal. Chairs are especially influential because they appoint or nominate *ad hoc* search and promotion committees. The chair charges the committee and instructs them on their mission and responsibilities. Committee hiring, promotion, and tenure recommendations are voted upon by entire departments or subsets of the appropriate rank(s). Therefore, chairs and faculty must be educated about gender diversity issues.

Currently, the Provost's office offers voluntary chair training sessions once each semester for existing chairs and a new chair training session each fall; these sessions are approximately 2 hours and generally well attended. Example thirty-minute modules include "Potential Strategies for Dealing with 'Problem' Faculty," "Faculty Workload, Productivity, and Performance," and "Recruiting Strategies for 'Landing' New Faculty." The last module was developed and presented by OHR and addresses active vs. passive recruiting strategies, while touching on diversity and dual-career hiring. OHR reports that the chairs who attend generally request additional material and discussion beyond what is offered.

Our chair and faculty training efforts include developing materials for training, approaching respected academic leaders to participate, identifying mechanisms to reach all faculty, and incorporating feedback into our process to refine our approach. This material will be developed by the ADVANCE PIs in conjunction with OHR and will draw on resources available from the existing ADVANCE programs at other universities. During a campus visit in Spring 2005, Professor Valian of Hunter College met with OHR and provided training resources [22]. The development efforts are beginning immediately to ensure that a core subset of materials will be available in the first year of the grant. Brief modules are being developed on gender diversity, recruitment development and "climate and behavior" to include in the chair training this fall. "Climate and behavior" will discuss how faculty behavior and interactions determine the local department climate. Once the grant starts, additional modules will address the importance of diversity; objective evaluation of faculty; effective mentoring relationships; the parental leave policy and tenure clock extensions; and facilitation of dual-career hiring. Simultaneously, the PIs and the Institutional Action Board (Section 5.0) will identify academic leaders with a demonstrated commitment to and success on gender and diversity issues to serve as CU-ADVANCE Advocates to lead the training. Our approach is modeled on the successful STRIDE program in Michigan's ADVANCE.

In the first year of the grant, department chair training will become mandatory and enhanced to allow for additional and longer modules and discussion. During the first year, the CU-ADVANCE Center struc-

ture, Initiatives and College Liaisons will be introduced (see 5.0 Management Plan). As the grant progresses, the results of the workplace environment surveys, the workload balance monitoring effort (described in 4.4 Monitoring Initiative), and the gender and teaching information assembled in the women's teaching workshops (described in 4.3 Women's Power Tools Initiative). To facilitate educating all faculty, chairs can call on the CU-ADVANCE Center for presentations on these topics to faculty meetings and search committees by CU-ADVANCE-associated faculty or the CU-ADVANCE Advocates.

New faculty orientation is currently provided by the Provost's office and covers topics such as undergraduate and graduate teaching, and the role of service and outreach. We will develop a module for inclusion in new faculty orientation on gender bias in evaluation, with a focus on how faculty evaluate graduate students. A presentation by an interactive theater group will be used in this module to stimulate discussion.

The **ADVANCEments in Science Seminar Series** will be created to bring a nationally recognized speaker on gender issues in academia and science to Cornell once each year for a campus-wide lecture and provide opportunities for focused discussions. This provides another mechanism to educate all faculty about issues of diversity and to signal the importance of the topic to the university community. Over the past 4 years, individual colleges at Cornell have hosted William Wulff (President of the National Academy of Sciences, "Why Don't More Women Go Into Engineering?"), John Slaughter (President and CEO National Action Council for Minorities in Engineering, "Engineering Excellence and Equity"), Mae Jemison (Astronaut), and Virginia Valian (Distinguished Professor of Psychology and Linguistics, Hunter College, "Why So Slow? The Advancement of Women"). In the future, the CU-ADVANCE Center will host this series to promote campus-wide participation.

4.2. Recruitment Initiative

Our recruitment initiative encompasses all stages of the hiring process: efforts designed to increase the number of women applicants and interviewees and efforts designed to increase the number of offers to women. Recruitment development ensures that Cornell's pipeline of female candidates grows and is maintained. The provost and deans will guarantee funding for the partners of women in S&E departments in which we have not met our goals, thereby expediting the process by which two offers can be extended. We will establish a university-wide web-based tracking and documentation system for all women invited and interviewed to monitor the recruiting process at Cornell. Finally, we propose two competitive programs to nurture post-doctoral women for Cornell tenure-track positions and to encourage departments to develop a pool of mid-level women candidates.

Recruitment development will take place at three stages prior to extending offers. These stages are: 1) pool development, which identifies potential candidate prior to a search, 2) applicant evaluation, which results in candidates who will interview, and 3) candidate evaluation, which results in potential offers. Recruitment development aims to remove gender biases that occur in each stage [23, 24] by instituting procedures and education which emphasize objective evaluation. Current policies in the ADVANCE colleges address some of these stages with varying success. The CU-ADVANCE Center will research and integrate the best practices from each college and will disseminate this information to the various colleges.

Pool development engages the faculty in establishing and maintaining rich pools of women and minority candidates by tracking potential applicants. For example, applicants admitted to Ph.D. programs at Cornell who matriculated elsewhere can be tracked, both through developing relationships with these students through professional contact at conferences as well as monitoring their progress via publications and the web. The establishment of the new *Carolyn Baldwin Morrison Distinguished Lecture Series* (described below) also provides a mechanism to encourage pool development for established women faculty. Individual departments will be responsible for developing their own pools and will report progress to their deans.

Applicant evaluation results in a list of invitees. Because search committee education has been demonstrated to reduce gender bias in evaluation [3], search committee training on the importance of diversity will be instituted. A search-committee specific module will be developed based on the longer department

chair modules and drawing on materials from other ADVANCE programs such as the Wisconsin bias pamphlet [25]. Search approval by deans will be contingent on completion of search committee training. The diversity of the invitee pool must be justified to the dean in each ADVANCE college prior to making any invitations. Tracking begins when female applicants become invitees.

Candidate evaluation is performed by faculty within a department following an interview. Achieving equity at this stage is crucial in eventually making offers to female candidates. However, research has shown women tend to be judged by harsher performance standards than men [23, 24]. To promote equity in evaluation, the University of Michigan ADVANCE candidate evaluation tool will be adapted for each ADVANCE college at Cornell. Following the interview, tracking includes information about whether an offer was made, as well as the stated reasons for having accepted or declined an offer. Evaluative biases against women are reduced when evaluators know that they will be asked to justify their hiring decisions [5, 24, 26, 27]. Tracking will continue through tenure or departure.

In addition, all female candidates in S&E will meet with a group of women faculty in related areas, and all female underrepresented minority candidates will meet with a group of appropriate women faculty during their interview visit, allowing the candidate the opportunity to explore questions about women's issues at Cornell. This meeting is not part of the evaluation of the candidate, but rather demonstrates an active internal constituency and potential support network.

Dual-career placement challenges affect all faculty, but they have a disproportionate effect on women and on women in S&E in particular [28]. For example, 42% of male S&E doctorate holders have a partner employed full-time, while the corresponding number for females is 82% [13]. Successful recruiting of women scientists is impacted more strongly by successful dual-career strategies, especially in rural settings like Cornell's [29]. Cornell's size is both a help and hindrance in these situations — providing multiple potential hiring departments for partners in disciplines that are covered in multiple colleges, but requiring a detailed understanding of individual departments to identify all appropriate choices.

Currently, the office of the Vice Provost for Diversity and Faculty Development (CoPI Harris) contacts potential departments for the partner and coordinates the brokering of financial requirements for each partner hire to ensure that two offers can be made. The case by case approach to each dual-career opportunity provides flexibility but at the expense of speed. While this individualized approach has worked for some departments, others have lost potential hires due to the inability to quickly produce dual offers. This proposal will formalize his role and procedures.

To support the ADVANCE program, the Provost has pledged to eliminate the necessity of finding funding on a case by case basis in instances when the primary hire is a woman in a targeted S&E department. The Provost and Deans will provide guaranteed funding for partner academic offers for a period of 5-10 years assuming an appropriate intellectual match is made, eliminating the need for departmental involvement in brokering financial agreements and thereby expediting the dual-offering process. In addition, the presence of S&E faculty in the CU-ADVANCE Center with CoPI Harris will help in identifying potential departments for S&E partners in cases where the discipline spans multiple colleges. During the period of the ADVANCE grant, this policy will be evaluated based on both the number of successful hires (compared with the 5 years prior to the grant) as well as ease of use in quickly producing offers as reported by chairs and deans. Based on this feedback and the tracking results, this approach may be modified to ensure that speed is achieved in the recruitment of dual-career couples. The result will be a university-wide dual-career offering policy that is easy to use and maximizes the probability of success. The CU-ADVANCE Center will oversee the evaluation of this program and distribute information to individual departments.

Tracking of dual-career opportunities, for couples with both academic and non-academic partners, will allow us to quantify the numbers of 1) interviewed candidates with partners requiring assistance, 2) successfully arranged partner interviews, 3) offers extended, and to document the reasons for a decision to accept or decline offers. Tracking will continue through tenure or departure of the couple, and will also indicate the extent to which dual-career challenges affect the hiring and retention of women faculty at Cor-

nell. Results will provide an understanding of the gains and losses that the current system for dual-academic careers provides as well as providing statistics on the non-academic placement.

Competitive **Faculty Development Grants** provide a flexible mechanism by which high-potential women scientists can be nurtured for the tenure track at Cornell. We envision a program of innovative personalized solutions which is defined by a goal rather than an a priori approach; that goal is to create a new and highly competitive candidate pool of women for Cornell academic positions. While the spirit is similar to the "Tenure Line Conversion" effort of the Wisconsin ADVANCE program that has had limited success [30], our program is based on two successful examples in the College of Engineering in the last 5 years. Both resulted in hires of women assistant professors and a third woman was recruited for a mentored post-doctoral position at Cornell in Fall 2005. Two successful scenarios include: 1) Female candidates with offers wishing to do external or at-Cornell post-doctoral research prior to starting in a Cornell tenure-track position apply for these grants in conjunction with their departments, 2) Women currently in non-tenure-track positions at Cornell apply in conjunction with a department who both endorses the candidate and has identified a future opening for which she will be groomed. Funds could also be used to provide teaching release for instructors, thereby allowing time for scholarship; for unrestricted funds for a research associate; or for research release to gain teaching experience. In all cases, a mentoring plan for the post-doctoral period developed jointly between the candidate and the hiring department will be required. The grants will be administered by CU-ADVANCE. We envision awarding at least one grant per year on the order of \$100,000 shared by Cornell and the grant.

The **Carolyn Baldwin Morrison Distinguished Lecture Series** will be established, named for the first woman to receive a Ph.D. in science from Cornell and in the U.S. in 1895. Lecturers will be from outside Cornell and distinguished early career women (± 3 years of tenure). This series will bring a pool of talented women faculty to Cornell, serve as a recruiting tool by providing a prestigious invitation, and provide professional networking opportunities for both the visitor as well as for the women (and men) in the area at Cornell. Lecturers will be selected competitively; nominations by departments must include a description of the process by which the nominee was selected and other potential nominees. Special emphasis will be placed on inviting women of color. These lectures will be extensively promoted by the CU ADVANCE Center, and will include a reception, allowing both professional and social networking opportunities for women faculty in the area and a smaller dinner with the lecturer. We will also include a lunch for women graduate students, the speaker, and women faculty in the area with the goal to encourage graduate students to consider academic careers and to provide networking. We expect to fund one of these lectures/year in each of the physical, life, and social sciences, and engineering.

4.3. Women's Power Tools Initiative

Informal social networks that develop among men in S&E departments provide substantial professional benefits for the men involved, but the exclusion of women has documented negative impact on their careers [31]. As the social networks literature clearly shows, when networks form informally, they tend to be same sex [32]. As a consequence, women often lack network connections to those in leadership positions (who are disproportionately men), which means that they also lack access to those who could provide them with the insider knowledge that is helpful for navigating their careers [32, 34]. The goal of this initiative is to create formal structures to provide women with the knowledge and resources necessary for a successful academic career both pre- and post-tenure, and to educate and prepare these women for leadership opportunities. A four-faceted faculty development program is proposed consisting of establishing a formal mentoring program, providing both early- and mid-career power tools for women, and creating networking opportunities for women. The first facet will benefit all faculty in the 5 ADVANCE colleges, while the other three are specifically geared to women.

Establish formal mentoring programs. Research suggests that mentoring is important to the career advancement of women [34]. Mentoring helps women obtain important career information that is often

provided to men via informal networks [33]. Each dean will be responsible for establishing a formal mentoring program in his or her college aimed at both early- and mid-career faculty. Current mentoring programs in the ADVANCE colleges differ and not all colleges currently have a mentoring program. Best practices will be shared among the colleges and disseminated within colleges on effectiveness of current practices. The program will include guidelines on mentor selection and pairing, and the development and execution of mentor training modules for department chairs and mentors based on mentoring literature [35, 36, 37]. A module for the new faculty orientation on the importance of mentoring and how to be a protege will be developed by the CU-ADVANCE Center. This module will include information on protege responsibilities in selection of multiple mentors and how to get maximum benefit from a network of mentors [22]. Self-evaluation material will also be developed for both mentors and proteges. The deans have responsibility to ensure that chairs effectively implement mentoring programs in each department. Peer mentoring activities will also be developed in each college, in an effort to mirror the successful Junior Faculty Lunches begun in the College of Engineering in the 2004-5 academic year.

Early-career power tools. We propose two programs designed for early-career women, which can affect both the teaching and research reviews for promotion.

The first is a *teaching workshop for women*. Studies have indicated that teaching ratings of male professors are unaffected by a student's gender, but that female professors receive lower ratings from male students and higher ratings from female students [38, 39, 40]. Since S&E disciplines tend to have disproportionately high numbers of male students, the evaluations of female professors can be significantly negatively affected. Furthermore, when a female professor has a teaching style that does not conform to gender stereotypes (e.g., she is not seen as nurturing and warm), she is rated more negatively by both female and male students [41]. While societal assumptions about gender appropriate behavior cannot be easily changed, educating women professors about the potential stereotypic expectations of students can help them deal effectively with those expectations. We will develop a workshop which covers gender and teaching, as well as a suite of best practices assembled from teaching-award-winning women S&E faculty on campus. This workshop will also give women an opportunity to discuss their experiences and to share their own best practices with an understanding and informed peer group.

Competitive *Professional Development Grants* to women assistant professors will fund visits to senior, recognized researchers in their area, and will also allow these women to host such researchers at Cornell for a colloquium and visit. Such visits provide visibility for the junior faculty member, allow her to showcase her research, and provide valuable professional networking opportunities in preparation for promotion and tenure. Proposal preparation will require collaboration with the mentors and department chair and encourages women to develop ties with senior researchers who can evaluate their work.

Mid-career power tools. In the spirit of NSF's now-defunct POWRE program, which provided the "opportunity to obtain funding for an activity that represents a significant advance at a critical career stage," the ADVANCE grant will support Competitive *Research Initiation Awards* for mid-career women, especially those nearing promotion from associate to full ranks. These awards might be used to fund a graduate research assistant, develop preliminary results for a grant application, or to provide salary for the second six months of a 12-month sabbatic leave (the university provides up to 12 months of sabbatic leave and benefits, but 6 months of salary). Grants will be based on project feasibility, supporting letters from chairs and others, and a career coaching plan developed jointly with a mentor. We expect to support up to 2 awards per year in the range of \$55,000 each, shared by CU-ADVANCE and Cornell. We will also offer workshops for tenured women faculty on leadership and career development.

Leadership Tools. Women's leadership plays a critical role in ensuring the advancement of women in academia [42]. In addition, substantial institutional benefits have been demonstrated when women are members of the leadership team [43]. The CU-ADVANCE Center will coordinate and sponsor a series of leadership workshops for tenured women faculty offered by Barbara Butterfield and Jane Tucker [44]. Dean Staiano-Coico has also volunteered to coordinate additional workshops at the retreats based on her experience with the American Association of Medical Colleges career seminars and the Hedwig Van

Ameringen Executive Leadership in Academic Medicine fellowship she participated in during 2002-2003. Professor Elizabeth Mannix of the Johnson School of Management at Cornell, currently the Director for the Institute for Social Sciences and founder of the Center for Leadership in the Johnson School, will also serve as a consultant in coordinating leadership training.

Networking opportunities. Based on our planning discussions with women faculty in S&E, networking with other women was the most commonly requested activity. Based on these requests and the success of some of the college-specific programs, we will institute discipline-based women faculty lunches. Engineering and the physical sciences have had a joint female faculty lunch for many years, which became monthly last year with support from CoPI Hemami's NSF grant. Bi-semester lunches in the social sciences and in the life sciences will be created and funded by the CU-ADVANCE Center. Both social and life sciences each span up to 4 colleges, so such an organization will facilitate cross-college networking. In addition, Arts & Sciences is now supporting a lunch for all women in the college once each semester.

The ADVANCE grant will co-support a yearly distinguished lecture series for the Black Professional Women's Network at Cornell. Of the 24 faculty in this group, 16 are in S&E (14 in the social sciences). The grant will also support a Latina Women in Science & Engineering lunch each semester for faculty (11 in the social and life sciences), post-doctoral researchers, and graduate students.

In years 1, 3, and 5, we will hold Career-Stage retreats, for all women S&E faculty at Cornell University, following the lead of Georgia Tech's ADVANCE program. These workshops will serve as a direct link between the CU-ADVANCE Center and women faculty. The early- and mid-career workshops developed above will be provided at these retreats, policy information will be discussed, ADVANCE goals and results will be presented. Because much of this information is rank-specific, three retreats will be held for assistant, associate, and full professors, respected. CU-ADVANCE and Cornell will share the cost of these retreats.

We have invited the women faculty in S&E at Colgate University (16), Syracuse University (43), and SUNY-Binghamton (over 70) to participate in the workshops described above and they will also be invited to events such as the ADVANCEments in Science seminar series. Syracuse and SUNY-Binghamton are within an hour's drive of Ithaca; Colgate is within a 2-hour drive. The grant will cover both travel and childcare expenses for participants. (Supporting letters from these universities are included.)

To promote academic careers among our graduate women in engineering and physical sciences, we will hold a brown-bag lunch discussion group with our own women faculty and women from the universities listed above. To promote academic careers among our undergraduate women, we will establish the annual **Barbara McClintock Lecture** which will bring young women faculty who were Cornell undergraduates to campus. The lecturer will give a technical seminar in the appropriate department and will also give an experiential seminar for undergraduates to discuss graduate school and faculty careers. Barbara McClintock (B.S. 1923 M.A. 1925, Ph.D. 1927, all from Cornell) won the 1983 Nobel Prize in Medicine.

4.4. Monitoring and Evaluation Initiative

Our evaluation strategy includes evaluation for the NSF indicators, evaluation of programming, and three in-depth evaluation projects (see Table 3). Two of these projects will begin in Year 1 of the grant: a longitudinal study of assistant professors and a Workplace Environment Survey in Years 1, 3 and 5 to complement the baseline provided by the Work Life Study. These data will help us to better understand the experiences of women faculty at Cornell and to tailor our programs and policies in later years of the grant. The third project will begin in Years 2-4 (depending on hiring), and comprises a study of the impact of changes in the demographic composition of departments on social relations among faculty members.

Indicator and Programming Evaluation Evaluation on progress according to NSF and ADVANCE indicators [45] will be performed by the IRP at Cornell, which resides in the office of the Vice President for Budget and Finance. Cornell will designate 50% time for an individual in Institutional Research and Planning to devote to ADVANCE evaluation and indicators.

Programming evaluation will be designed and performed jointly by the ADVANCE Evaluation Team and IRP. This evaluation includes immediate feedback from events (workshops, seminars) and collecting information including attendance and participant reactions. The tracking of attempted hires described in 4.2 *Recruitment Initiative* will be supplemented by documentation of whether the hire resulted from an ADVANCE program. Departure interviews will be conducted with all women in S&E who choose to leave Cornell to understand the factors contributing to their decisions. We will also evaluate ease-of-use of the programs by querying the appropriate entities or individuals, and will adjust implementation if necessary. Some programs require specialized evaluation, such as the mentoring program. Graduate students in the social sciences will be hired and trained to assist with evaluation.

Longitudinal Study of Assistant Professors The goals of this study are: 1) to understand whether and how the experiences of women and men faculty differ and how these experiences vary by college, and 2) to determine which barriers to advancement are unique to women in S&E, which affect all women faculty, and which are common to all faculty. Data will be collected from two cohorts of assistant professors as they navigate the early years of their careers on the track to tenure. Data collected from assistant professors will evaluate how promotion and retention experiences differ by gender. This study will be conducted by CoPI Correll, with the assistance of a social science graduate assistant.

Two longitudinal cohorts will be studied beginning in Year 1: one of new assistant professors, and one of assistant professors beginning their fourth year. Both male and female and both S&E and non-S&E faculty will be included. We will conduct in-depth interviews with each cohort member in the first year of the grant, and conduct annual follow-up interviews with each member for the entire grant period (6 years for assistant professors; 5 years for the second cohort). We will also attempt to conduct follow up interviews with any members of the cohort who leave Cornell. Based on hiring data from recent years, we expect the first cohort to contain approximately 12 new assistant professors.

The interviews will take approximately 1.5 hours each and will cover the following topics: resources, social networks, workplace evaluations, social influence, and work-life balance. We focus on these 5 topics because research has shown that women in high status jobs are often disadvantaged on these dimensions [46, 47, 48, 49]. For example, women often have less social influence than men—they are less likely to be listened to when they make task suggestions, they are less likely to be asked for their opinion, etc. [46, 49]. Because men and women tend to have mostly same sex social networks, women are less likely to talk with men about workplace issues. Therefore, women are less likely to learn insider information about how to navigate their workplaces because this information is more frequently known by advanced level men [33]. Women continue to be disproportionately responsible for child and elder care [50], making work-family a more difficult balance for women. Furthermore, in many situations women are subject to harsher performance standards [23, 24]. We will tailor interventions to address issues identified in this study.

Table 3 Evaluation Activities

Year 1	Year 2	Year 3	Year 4	Year 5
W.E. Survey 1		W.E. Survey 2		W.E. Survey 3
D.C.S.R. Study		D.C.S.R. Study		D.C.S.R. Study
Longitudinal Study, Asst. Profs. Post-3-year Review				
Longitudinal Study, Asst. Profs. with Appointments Beginning in Year 1				
	Demographic Composition & Social Relations Study			
NSF Indicator & Program Evaluations				
Interview/Offer/To-tenure-or-departure tracking for Women in S&E				
Interview/Offer/To-tenure-or-departure tracking for Dual Career Couples				
Departure Interviews for Women Leaving S&E				

We will continue to collect data on the members of these cohorts beyond the life of the grant so that we can understand their experiences as associate professors move towards promotion to full professor.

Workplace Environment Survey While the goal of the longitudinal data is to provide a deep understanding of the emerging careers of assistant professors, the Workplace Environment survey will provide a cross-sectional portrait of faculty at all ranks. The survey will cover the same topics as the in-depth interviews, but questions will have closed-ended responses to allow for comparison across respondents. Again, data will be analyzed by gender, college, and rank. A separate section of the survey will be administered to associate professors and will contain items to assess issues such as their committee/service responsibilities and whether they perceive that they are being supported as they move towards promotion to the rank of full professor. A section administered to full professors will include items to assess issues such as leadership opportunities.

The survey will be conducted in years 1, 3 and 5 (Fall 2006, 2008 and 2010) and will be compared with the Work-Life Study in 2005. Data from the survey will be used to assess whether progress is being made in the work environment of women faculty. We expect that the programs and policies we implement, such as the Mentoring program and the chair training on gender bias issues, will reduce factors that work to the disadvantage of women. To evaluate whether these reductions occur, we will compare the responses of men and women in the baseline surveys to those in later years.

Design and analyses of the survey data will be conducted by CoPI Correll; Marin Clarkberg, Ph.D., Senior Research & Planning Associate, IRP; and Pamela Tolbert, Professor of Organizational Behavior. All have extensive experience conducting and analyzing surveys. CoPI Correll was also a consultant for the construction of the Worklife Survey that was part of the ADVANCE program at the University of Wisconsin-Madison.

Demographic Composition and Social Relations in Departments Professor Tolbert will use data from these surveys to examine the impact of changes in the demographic composition of departments on social relations among faculty members. Although a variety of studies of organizational demography support the contention that the gender composition of a work group has a significant effect on women's social environment, studies have reached varying conclusions about the nature of this effect. Theoretical arguments by Kanter [7] and Blau [51] suggest that when women hold token status in a work group, they are more likely to face informal social exclusion, heightened performance pressure, and other negative outcomes. In line with these arguments, a number of studies have found a positive relation between the proportion of women in work groups and various indicators of a supportive social environment for women [52, 53, 54, 55, 56]. Other studies, however, suggest that conflict within a group may rise as the proportion of women increases, and this may produce negative outcomes for women [57, 58, 59, 60, 61]. To date, no research has been conducted on the dynamic aspects of gender composition, though assessing these dynamics clearly is an important component of evaluating the outcome of our recruitment initiative.

Our evaluation will address this issue by examining the impact of both the distribution of women in a department at a given point in time, and changes in the distribution over time on department members' attitudes and behavior. Data on departmental gender composition and changes in composition will be provided by OHR as part of the ADVANCE indicators; these data will be integrated with data from the Work-Life and Workplace Environment Surveys. An initial study will examine the relation between the rate of change that has taken place in the proportion of women in various departments over the last three years, and several measures of departments' social environments at the beginning of the program. Such measures will include indicators of research collaboration by faculty, patterns of collegial advice-seeking on teaching and research issues, overall rates of interaction among department members, levels of individuals' general satisfaction with their work and career, and intentions to seek another job. The relationship between the previous rate of change in the gender composition and measures of research productivity, likelihood of promotion and turnover for both male and female faculty within the first year of the program will also be examined. This research will be replicated in the middle year and at the end of the five-year funding period. A graduate research assistant will participate in this study.

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