



# **Fostering Success for Women in Science and Engineering**

**Advice for Departmental Faculty**

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# Introduction

## Responsibility of faculty

Faculty members are the agents of change in universities. Their values and behavior permeate everything a university does and represents. Consequently, to foster success for women in science and engineering, it is essential that all faculty members consider their own impact on women in these fields. From the subtle to the blatant, faculty behaviors often shape women's careers. Most faculty members want to be a positive influence so it is important to understand the types of behavior that can make a difference.

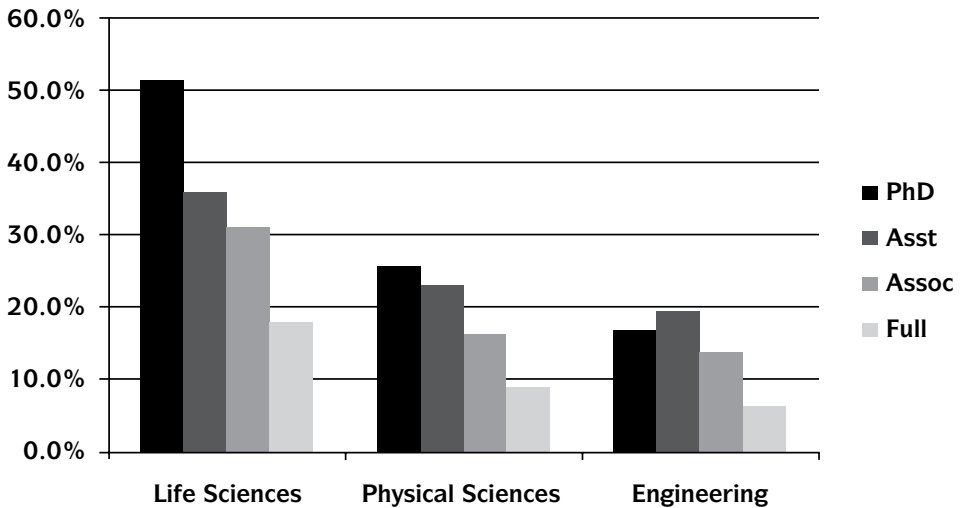
***If you are a new professor (male or female)***, you may soon confront unexpected issues associated with gender—either your own gender or that of your students, staff, or colleagues. You will also experience a dichotomy of authority: you will wield more power over students and staff than you did as a graduate or postdoctoral student, but your status as an untenured faculty member will make you vulnerable to the power of more senior faculty, who will be making both objective and subjective judgments about your performance. If you are a woman, you may find that colleagues take advantage of your professional vulnerability whether they intend to or not. If you are a man, you may find that you need to adjust your interactions with women colleagues or women who work in your department and/or your lab; they are not just your classmates or lab mates anymore. It is important to become aware of the ways in which gender and power can influence the experiences of professional women.

***If you are a senior faculty member***, you have a position of immunity and influence from which to stimulate change in your institution and in members of your scientific community. You can provide support for more junior men and women who would like to see change but are reluctant to initiate it because of their vulnerable status. Your colleagues probably respect your views and opinions and you can rely on this respect to exemplify and encourage behaviors that generate positive climates in which all members of your department and your scientific community feel welcomed, valued, treated fairly, and respected.

## Underrepresentation of women in science

Women are not as well represented in faculty and leadership positions in science as might be expected from their representation among PhD recipients. Even in fields such as the life sciences, in which women have been receiving more than 45% of PhDs granted since 1997, women currently represent only 36% of assistant professors and 18% of full professors.<sup>1</sup>

Percent Female PhDs and Faculty  
Top 50 Departments in Selected Disciplines<sup>2</sup>



This imbalance impairs the vitality of the scientific community by artificially constraining its diversity, failing to fully utilize the talented workforce developed by U.S. universities, and limiting the scale of ideas in proportion to those given the opportunity to express them. Moreover, women are legally and morally entitled to the same opportunities in science as those enjoyed by men. State and Federal laws prohibit discrimination on the basis of sex, and the scientific ideal is a search for knowledge unimpeded by false restrictions such as the personal and demographic characteristics of the scientist.

Similar issues arise for scholars of color, those who are lesbian or gay, and those who have disabilities as well as for faculty who supervise students and staff belonging to a minority group. Though much of the information and advice we present is relevant for other underrepresented groups, our express emphasis here is on women because gender issues are sufficiently complex and influential on their own to warrant spending time thinking about them and periodically examining your own behaviors and those of people around you.

The underrepresentation of women faculty in science and engineering stems from a number of factors that are firmly rooted in our society's traditions and

culture. To accelerate the rate at which women take their earned places as leaders in these fields, it is essential that each of us—men and women alike—reflect on our own values, beliefs, and behavior to ensure that we are not furthering stereotypes, prejudices, policies, practices, or climates that discourage or exclude women.

### **Four main factors are responsible for the relatively low representation of women in leadership positions in academic science and engineering:**

- **Subtle bias**
- **Discrimination and harassment**
- **Lack of role models and encouragement**
- **Work-life balance**

This booklet provides information about these factors and presents guidelines to help you overcome challenges that power, discrimination, and bias may pose to the development of more equitable, inclusive, and welcoming work environments. Decades of research about women in the workplace inform the advice provided. The bibliography provides examples of these studies.

### **Subtle bias and prejudice**

Women who choose careers in science and engineering do so in a society that continues to question their abilities and aptitudes for scientific work. Consequently, they frequently have to contend with proving their competence and their commitment. In addition, beliefs about women's nature and women's roles in society contribute to the development of subtle, unconscious attitudes that can influence our evaluation of and responses to women and their work. Copious research shows, for example, that work performed by women is less valued than the same work performed by men and that people are less comfortable with women in leadership positions in traditionally male-dominated fields. These biases influence the views, decisions, and behavior of both men and women, indicating that simply having women present in the community will not automatically reduce bias against other women. These biases often operate at an unconscious (implicit) level, despite conscious (explicit) commitments to equity.<sup>3</sup>

### **What to do?**

#### ***Educate yourself and your colleagues***

Educate yourself about how implicit biases and assumptions might affect the evaluation, mentoring, advising, coaching, and encouragement your female students and colleagues receive. This advice is relevant for women as well as men, because we all internalize the same gender assumptions.

Discuss the results of research on implicit bias with your lab group and faculty colleagues and think about how these prejudices might affect decisions and evaluations. Consider using the WISELI brochures, *Evaluating Applicants: Research on Bias and Assumptions*<sup>4</sup> and *Benefits and Challenges of Diversity*,<sup>5</sup> to initiate discussions and to begin this learning process.

### ***Reflect, question, and challenge***

When evaluating people for positions in your laboratory or department, scholarships and fellowships, award nominations, or promotions, carefully reflect on your judgments. Ask yourself and your colleagues whether you are holding all candidates to the same standards. Explicitly question whether gender bias has inadvertently influenced the process. As you read papers and grants, ask yourself whether your judgments would differ if the author of the paper or proposal you are evaluating was a person of the other gender.<sup>6</sup>

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***“At the first meeting [of a search committee seeking to fill a major administrative position], the chair announced that there was no need to look for minority or women candidates because no qualified ones were available. No one said anything. Later, when I, the sole black member of the committee [raised concerns], I was told that it was not important.”<sup>7</sup>***

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As you review letters of recommendation, critically analyze them to determine if they incorporate linguistic patterns that may disadvantage women.<sup>8</sup> Challenge your own decisions to ensure that you are being fair and equitable. Make sure that you are consciously evaluating people on their merit as scientists and not inadvertently basing your assessments upon a cultural bias that has nothing to do with quality science.

### ***Examine resource allocation***

Make sure that men and women have equal access to resources. Ensure that you allocate space, salary, and responsibilities fairly within your lab and support efforts to achieve equity in your department. If you find that your male students are asking for and/or receiving more of your time than your female students, encourage your women students to ask you questions and seek your advice, or take the initiative and offer to meet with them.

If you are a woman, make sure you have the resources to do your job. If you find that you are not receiving the same support that men in similar positions receive, ask your department chair or a trusted mentor how to achieve equity.

### ***Understand and be aware of climate***

Try to understand how the local climate affects your women students, staff, and colleagues. Understand that students you supervise and junior colleagues you will evaluate for tenure and promotion may feel constrained about openly sharing their experiences with you—but listen and learn if they do raise concerns. Seek out other sources of information. Review the results of climate surveys

your campus may conduct and read the climate vignettes referenced in this booklet.<sup>6</sup> Consider whether these sources reflect climate issues, behaviors, and/or policies in your environment that might make women feel less safe, valued, or respected than they should.

If you are a woman experiencing an inhospitable climate, seek out women or men who are sensitive to climate issues and discuss how to approach the problem. This can be a difficult topic to raise, but you may find that your colleagues are unaware of the behaviors or situations that make you uncomfortable and they may be eager to change them.

If you are a man, consider what you could do, either by example or by intervention, to prevent or diffuse negative situations and to help improve the climates women often experience. You have an advantage in that you are not asking for a change that directly benefits you, which may make your request for behavioral change more acceptable. For example, it may be easier for a man than for a woman to pull aside a male colleague and say, “I know you don’t realize you are doing it, but the way you stare at Sue when you’re talking with her probably makes her feel uncomfortable—try looking at her eyes instead.”

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***“As a man, I’ve noticed that when a woman approaches a group, some or all of the men do a once-up/once-down, almost as if it’s a requirement for conversation. I don’t know if the men are aware they do it; it seems like it’s an unconscious response. I’m sure the women are aware of it, though.”<sup>7</sup>***

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## **Discrimination and harassment**

In addition to subtle biases, women are sometimes targets of illegal behaviors, including sexual harassment and overt discrimination (which includes withholding a professional position, benefit, or advantage based on a personal characteristic such as gender, race, sexual preference, marital status, or age). Experiencing sexual harassment can profoundly affect a woman’s professional success and psychological health.<sup>9</sup> Likewise, witnessing or being aware of discriminatory events, especially if they are not appropriately addressed, can discourage and demoralize all members of a community—men and women.<sup>10</sup> Even if blatant and egregious examples of discrimination and harassment are absent or rare, an accumulation of less severe incidents can be devastating.

## What to do?

### ***Protect yourself and your colleagues and students***

Every member of an academic community should know about the laws and policies that pertain to discrimination and harassment. Be sure you understand the definition of sexual harassment and your university's policy on romantic/sexual relationships between supervisors and the people they supervise. This knowledge will help you deal with a situation if you are approached for help by someone who feels harassed, or if you are harassed or accused of harassment, or even if you become romantically/sexually involved with a colleague or someone you supervise. Understanding the nature of discrimination and harassment will help you avoid making unlawful mistakes and help you recognize mistakes made by others. Be sure you know which offices/individuals at your university deal with harassment and discrimination complaints and offer education about university policies and procedures.

Keep your lab members physically safe. Develop and discuss recommended practices about working in the lab alone, leaving doors unlocked, and sharing keys to the building or lab. Make sure that women know of campus services that can help them get to their cars or homes safely after a late night in the lab.

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***“I work in a department where sexual harassment is rampant, and many women have shared painful accounts with me. Though they would not officially come forward for fear of retribution, I decided something must be done. I [spoke with an administrator in confidence]. He listened to the stories... believed in their validity in spite of the fact that I could not name names, and vowed to do something about it. I was impressed with his willingness to listen and with the depth of his distress. And, most importantly, he kept his word and made efforts to change the situation.”***<sup>7</sup>

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### ***Speak out and enable others to speak out***

When you see discrimination, harassment, or unsafe working conditions, speak out against them and support others who speak out. Federal law prohibits retaliation against those who make accusations of sexual harassment, but retaliation is common and many victims of sexual harassment do not report it out of fear of retribution.

Discuss sexual harassment with your research group. Make sure your students and employees understand the sorts of behavior proscribed by discrimination laws and provide safe avenues for them to report inappropriate and illegal behavior. Let them know that they can approach you if they are made uncomfortable by others' behavior and provide them with alternatives for reporting their concerns (perhaps a department administrator, a colleague, a designated member of your lab) in case they do not feel comfortable talking to you about an incident.

## **Lack of role models and encouragement**

Success depends heavily on the belief that a goal can be obtained. A number of factors converge to make this belief more difficult for women, in general, than for most men. Women may be less likely than men to receive explicit encouragement to advance in science or engineering or to pursue an academic career. In many scientific fields, women also have fewer role models—fewer examples of successful women like them—to rely upon than do men. Thus, underrepresentation of women in science and engineering can make it more difficult for women to believe that they can succeed as leaders in their fields. There are prominent men in all fields of science, so even if men do not consciously recognize the power of role models, they have always had the privilege of successful examples to follow. The need for role models presents another challenge for women—those who serve as role models often become overloaded by the responsibilities associated with providing guidance and advice to more junior women colleagues and students.

## **What to do?**

### ***Provide encouragement***

Give your graduate students positive feedback as well as constructive criticism to ensure that they know their strengths and develop confidence in their abilities. Do not assume that students or employees know that you appreciate them or their work. Provide support, encouragement, and constructive criticism in group settings—lab meetings, journal clubs, practice seminars—so that everyone in the group can learn from your comments, but save your harshest comments for private settings. Do not humiliate or embarrass students. Respectful practices are important for all students and employees, but are likely to be more important for women, who may have received less encouragement and therefore may be more easily discouraged by negative feedback. Avoid making assumptions about your students' interests that may be based on gender—i.e., that a woman will be more interested in teaching than in research or that a woman's commitment to family will make her unwilling to pursue opportunities that require travel and/or demanding schedules.

### ***Make connections***

Women often feel isolated from informal communication networks in their work environments. Help women students, postdocs, staff, and faculty members to feel included in your lab, department, and university by making sure that women have access to all of the same networks and opportunities to which male students have access. Be especially inviting to women of color, as they are even more isolated than are white women in most institutions. Share important policies, requirements, or opportunities broadly.

If you feel excluded from a network, seek out ways to be included by talking to your chair, serving on key committees, or finding out how your colleagues obtain their information.

### ***Recognize the unique contributions of women***

Women often do quite different work from men. Many women bring unique perspectives to old problems, new interdisciplinary work to a field, and different styles of leadership to a department. Many women—just by their presence—attract new students from diverse backgrounds to a department or a discipline. Women also frequently act as role models for more junior women who are eager for guidance and advice, and they often serve on more committees than men do, especially as committees begin to place greater emphasis on a diverse membership.<sup>11</sup> Even women graduate students may be called on to provide advice and mentoring for junior students.

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***“Women students naturally gravitate to my office and ask me for advice and guidance—perhaps because I am a woman professor. I end up doing significantly more formal and informal advising than my male colleagues but am always willing to give my time. What is troubling is that now my male colleagues are redirecting women students to me even though the students initially approached them.”<sup>7</sup>***

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If you are a woman, you will want to be very careful about protecting your time. Many women face a significant challenge balancing their desires to be a visible role model and to have a voice in governance with their need to accomplish their research and teaching goals. Carefully consider accepting only opportunities that are well worth your time and/or will advance your career. Feel free to say “no” when asked to serve on committees or participate in non-research activities that do not meet these criteria. Have a prepared answer ready, so that when you are asked to serve in some way that you feel taxes your time too much, you can politely explain that you are already overcommitted and need to focus on your own work. Most people will be supportive of your decision if you explain it.

Recognize the additional service burdens women are frequently expected to meet and be understanding when a woman colleague prioritizes her research or teaching and refuses a request. However, do not attempt to “protect” a woman colleague by not offering her the opportunity to serve because you assume she is too busy and overburdened. Make the offer or request and then respect her decision about how to prioritize her time.

Show appreciation for women’s contributions by nominating them for awards and by recognizing their extra work in mentoring and committee assignments during evaluations for tenure, promotion, and salary increases.

### ***Become an ally and an advocate***

Provide support for your female colleagues by making your commitment to gender issues visible and by sharing the workload.

Participate on diversity committees, lobby in faculty meetings for the hiring and promotion of women candidates, advocate for family-friendly policies, encourage your women students, notice instances in which women are ignored or excluded, and become a voice for inclusion.

Reinforce your women colleagues. Women often report that they find little support for their ideas in faculty meetings or committee meetings. If you experience this, talk to your department chair or a colleague and ask them to be aware of this tendency and find ways to show their support. When you agree with something said by a woman, be explicit about it. When you disagree, do so respectfully in a way that acknowledges the validity of alternative viewpoints.

### ***Use inclusive teaching methods***

Make your classroom inclusive of different types of students and learning styles. You can do so by incorporating active and cooperative learning experiences into your classroom. Properly implemented, active learning strategies will not only help engage, retain, and promote the success of women and minority students, but will also contribute to a better learning experience for all students.<sup>12</sup> To learn more about incorporating active learning practices into your teaching, participate in learning institutes and other events your campus offers that aim to improve teaching and educational outcomes.

### ***Provide access to role models***

Make sure that women students have female role models. If you have few women faculty in your department, invite prominent women in your field to visit your department and your lab. Their visits will enrich your career and your research group and can provide women students with examples of the different women who populate academic science.

## Work-life balance

Women in the workforce typically carry a larger share of family responsibilities than do men. This places women in academic science and engineering in a particularly challenging position during their early career years because the most stressful and demanding period of their careers (the pretenure years) coincide with the time they are most likely to be caring for young children. The prospect of combining a demanding career with family life often discourages women from pursuing academic positions in science. Those who do take up the challenge experience more stress and have more time constraints than many of their male colleagues. Men are faced less often with stark choices between parenthood and a high-level career because, on average, they are more likely to have a spouse who shoulders most of the child care responsibilities. If women are to have families and successfully contribute their expertise and insights to the advancement of science, then universities and the people in them need to develop more flexible attitudes, policies, programs, and resources to accommodate both roles.

### What to do?

#### ***Recognize that family responsibilities fall more often to women***

Family commitments have a differential impact on women and men's careers because women more often have primary responsibility for the care of young children or aging parents. If you are a woman, utilize policies designed to alleviate the pressures differentially shouldered by women (e.g., tenure clock extensions, part-time appointments, parental leave, flexible work hours). If you are a man, recognize that these policies are not "special treatment," but create a better workplace for men as well as women. Remind colleagues that having children, extending the tenure clock, and/or taking a parental leave do not indicate a lesser commitment to science, but reflect the desire of scientists to be human beings in the fullest sense of the word. An academic scientist's career lasts more than thirty years, and the time taken early in a career for family responsibilities diminishes in the face of a lifelong commitment to science.

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***“One day a male full professor asked me if my husband and I were planning on having any more children. I said, ‘Probably.’ He then told me that I should wait until I got tenure. What I didn’t tell him was that I had learned that very morning that I was, unexpectedly, pregnant with my second child. I felt his comment was a threat.”<sup>7</sup>***

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### ***Consider family issues, whether you have a family or not***

Avoid scheduling important or mandatory meetings before or after the hours when child care is typically available. Provide support for colleagues with children so they can stay home with a sick child, attend a parent-teacher conference, or take an aging parent to a medical appointment. Offer to fill in for them at meetings or in classes in case they ever have family emergencies and need some help covering their responsibilities. You can be sure that the favor will be returned and you will gain a grateful and loyal colleague. Offer maximum flexibility to members of your lab who have children. If they are good students or employees, you will earn their trust, loyalty, and gratitude by making it easier for them to take parental leave, work odd hours, work part-time, or occasionally work from home. They will probably do better work if they feel at peace about their family commitments. They are certainly likely to remain in your lab longer if you provide flexibility than if you do not. Remember that losing good personnel is far more costly to a lab's productivity than is accommodating a lab member's need to reduce their time commitment for a short period.

### ***Advocate for family-friendly policies***

Be vocal about the need for on-campus child care facilities, lactation rooms, elder care, or sick child care—whether or not you will personally take advantage of these programs or facilities. If you are a man or a woman without children, speak up about the need for family-friendly policies and services so that parents do not have to advocate for themselves. Remember that “family-friendly” does not only mean caring for children; many faculty members care for aging and ill family members as well. Because faculty members tend to live far from their extended families, this care can be quite burdensome when it requires travel and long-distance arrangements, particularly for international faculty members. Over the course of an academic career, family-friendly policies can apply to and benefit everyone.

## **Conclusion**

The slow progress of women through the academic science and engineering leadership ranks is a matter of national concern. Certainly, academic institutions must do their part by enacting the policies, programs, and procedures that will allow women to reach their full potential in science and engineering careers. But individual faculty members—both male and female—also play a role in encouraging and supporting the careers of their women students, staff, and colleagues. Becoming more aware of the many ways, small and large, that your individual actions and advocacy can help to keep women in the academic science and engineering pipeline will not only be a boon to the individuals you affect, but also to the continued scientific and engineering progress of our country.

## References

Complete references, including links to articles, are available online:  
[http://wiseli.engr.wisc.edu/doc/advice\\_faculty.pdf](http://wiseli.engr.wisc.edu/doc/advice_faculty.pdf).

1. Doctorate Recipients from U.S. Universities: Summary Report, 2007–08; Doctorate Recipients from U.S. Universities: Summary Report, 1997; Nelson, 2010.
2. This graph represents the PhD data for 2004–06 for the same “top 50” institutions as faculty positions in each discipline. Faculty data are from 2007. The “Top 50” departments are ranked by NSF according to research expenditures in that discipline. The source of the faculty data is: Nelson and Brammer, 2010. ([http://cheminfo.chem.ou.edu/djn/diversity/Faculty\\_Tables\\_FY07/07Report.pdf](http://cheminfo.chem.ou.edu/djn/diversity/Faculty_Tables_FY07/07Report.pdf).) The source of the PhD data is: NSF Survey of Earned Doctorates/Doctorate Records File. WebCASPAR (<http://webcaspar.nsf.gov>).
3. Much of this research is summarized in the WISELI Brochure, *Reviewing Applicants: Research on Bias and Assumptions* and more is available in our Online Bibliography: Research on Bias (<http://wiseli.engr.wisc.edu/library.php>).
4. WISELI. *Reviewing Applicants: Research on Bias and Assumptions*, University of Wisconsin–Madison, 2006 ([http://wiseli.engr.wisc.edu/docs/BiasBrochure\\_2ndEd.pdf](http://wiseli.engr.wisc.edu/docs/BiasBrochure_2ndEd.pdf)).
5. WISELI, *Benefits and Challenges of Diversity*, University of Wisconsin–Madison, 2010 ([http://wiseli.engr.wisc.edu/docs/Benefits\\_Challenges.pdf](http://wiseli.engr.wisc.edu/docs/Benefits_Challenges.pdf)).
6. Research studies documenting bias in hiring situations are plentiful. One example in an academic setting is Steinpreis et al., 1999. For an example of bias in awards, see: Lincoln et al, 2009. For bias in publication and peer review of journal articles see: Budden et al., 2008.
7. *Climate Vignettes*, University of Wisconsin–Madison, Committee on Women in the University, 2001. (<http://wiseli.engr.wisc.edu/docs/ClimateVignettes.pdf>)
8. Heilman and Okimoto, 2007; Schmader, Whitehead, and Wysocki, 2007; Trix and Psenka, 2003.
9. Fitzgerald et al., 1997; Dey et al., 1996; Fitzgerald, 1993.
10. Miner-Rubino and Cortina, 2007, 2004; van Roosmalen and McDaniel, 1999.
11. DesRoches et al., 2010; Bird et al., 2004; Sheridan and Winchell, 2003; NSF ADVANCE at the University of Michigan, 2002; APA Task Force on Women in Academe, 2000.
12. Prince and Felder, 2006; Handelsman et al., 2004; Prince, 2004; NRC Steering Committee on Criteria and Benchmarks for Increased Learning from Undergraduate STEM Instructions, 2003; NRC Committee on Undergraduate Biology Education to Prepare Research Scientists for the 21st Century, 2003; Cabrera et al., 2002.

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