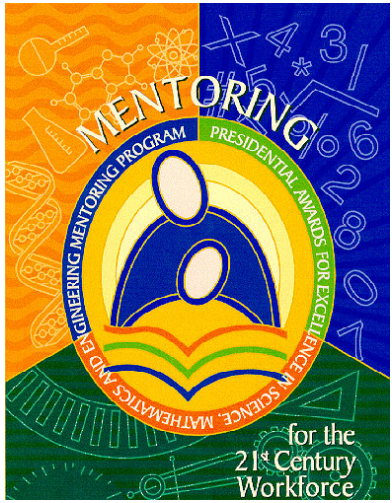

Mentoring for Academic Careers in Engineering:

Proceedings of the PAESMEM/Stanford School of Engineering Workshop

Editors:
Eve Riskin, Mari Ostendorf, Pamela Cosman,
Michelle Effros, Jia Li, Sheila Hemami,
Robert M. Gray

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Preface

In late June 2004 a workshop was held at Stanford University on the subject of mentoring for academic careers in Engineering. For two days (20–22 June) the workshop provided a forum on the needs, goals, methods, and best practices for mentoring engineering students interested in an academic career, for young faculty beginning such a career, and for recently tenured faculty. The emphasis was on mentoring members of underrepresented groups in academic engineering, especially women. The workshop was jointly supported by the Presidential Award for Excellence in Science, Mathematics, and Engineering (PAESMEM) through the National Science Foundation and by the School of Engineering at Stanford University. Workshop funding was largely devoted to providing local housing and sustenance for the workshop. Participation was by invitation and application. There were no registration or other fees.

Participants included experienced mentors along with recent graduates and students who were considering, had begun, or had decided upon academic careers. Faculty in leadership positions were invited along with those emphasizing research and teaching. The workshop consisted of invited presentations, proposed presentations by participants that were accepted by the Orga-

20% of the University of Washington EE Faculty

nizing Committee, panel discussions, and informal discussions. There was an admitted bias towards EE/CS because of the constitution of the Organizing/Program Committee and the initial group of people involved, but it was not official and we welcomed all engineering disciplines (and other related disciplines where there was interest). The participants were primarily from electrical and computer engineering, but a variety of areas was represented from business schools to medicine.

The workshop consisted of three sessions on each of the two days. Each session focused on a specific topic and most began with brief (10 minutes) presentations by members of a panel followed by questions and discussion. Box lunches were provided for lunch on both days, and there were informal discussions and refreshments following the afternoon session. There was a reception following the final session on Monday.

The workshop had two primary goals. The obvious one was to provide an opportunity for mentors, mentees, and mentoring facilitators to educate each other and have fun doing so. Judging from feedback received during and following the workshop, this goal was successfully met. One woman professor observed that it was rare for her not to be the only woman professor at a meeting, and even rarer to be in the majority. Several male graduate students remarked on the educational value of for once being in a minority, of not having almost every one else look just like you. Without risk of overstatement, the workshop was unique in its composition, activity, and enthusiasm and it left a lasting impression on the more than seventy participants. It added connections to several personal networks and it has resulted in the formation of at least one new university organization for women in electrical engineering.

The second goal was a deliverable: to produce proceedings of the workshop, including summaries of the talks and discussions. Most of the presentation slides are posted on the Web at http://paesmem.stanford.edu/, but from the beginning it has been our plan to produce written proceedings of the workshop to make the presentations and discussions available to a wider audience. Our hope was to produce a document distilling the best practices, resources, family issues, and other important issues raised during the two days. This is that document. The workshop organizing committee served as both session chairs and participants in the workshop and together form the editorial committee. The proceedings are a

combination of the material presented in the slides and comments from the session chairs, presenters, and participants. There are also two single author chapters written by workshop participants on the specific issues of the imposter syndrome and on statistical studies of academic families.

Acknowledgements

We thank all of the workshop participants for the contributions and energy. Particular thanks to the panel members and all those who sent written comments to add to the writeup. Particular kudos to Veronica Wadey and Todd Coleman for their extensive comments. Thanks to the Stanford Conference people for their help with housing and catering. Thanks to Natasha Newson and Kelly Yilmaz for their help with local arrangements and their assistance to participants and to Kelly and Deirdre O'Brien for their proofreading help with these proceedings. Thanks to the White House and the PAESMEM program of the National Science foundation under Grant HRD0227685 and to the Stanford School of Engineering for funding the workshop and making it available to graduate students and junior and senior faculty. Thanks in particular to the PAESMEM Program Director, Dr. Marilyn Suitor, who provided enthusiastic support and advice. We would also like to thank Dr. John Cozzens of the NSF who has been a friend and mentor to most of us on the editorial committee and who has supported both our technical research and personal development. He has been a long time supporter of quality and diversity in research. Many thanks, John!

Eve Riskin, Mari Ostendorf, Pamela Cosman,
Michelle Effros, Jia Li, Sheila Hemami,
Robert M. Gray

Chapter 1

Overview

This chapter serves as an Executive Summary, which has been defined as the only part of a book or report that some readers find time to read. While it is possible to compress written material down to a few key points, it does not always yield a good idea of the full contents, especially when the manuscript is peppered with anecdotes and examples. Nevertheless, in a book of this length a detailed summary can help guide busy readers to the portions of most interest, and might entice them to explore other issues on the way. The sections of this chapter mostly correspond to the subsequent chapters, the exception being that the penultimate section corresponds to two chapters.

1.1 Mentoring

Dictionary definitions of "mentor" include "experienced and trusted adviser" and "trusted counselor or guide, tutor, coach." Effective mentoring is important to all persons pursuing an advanced degree in engineering, and especially to those beginning academic careers. Mentors can open doors and provide opportunity even through association rather than through direct contact. This is especially true in academia, where an applicant's graduate institution and adviser are often enough to secure serious consideration by a hiring committee. Studies have shown that women may receive less mentoring and have a more difficult time being selected as mentees than males, especially in male-dominated fields such as engineering. For example, this helps explain why fewer than 8.2% of electrical engineering Ph.D.s

are awarded to women. Partially in response to the underrepresentation of women and ethnic minority engineering Ph.D.s in science, technology, engineering, and mathematics (STEM), the White House established in 1996 the Presidential Awards for Excellence in Science, Mathematics and Engineering Mentoring (PAESMEM), a program administered by the National Science Foundation (NSF). This book is a distillation of the presentations and discussions of a June 2004 workshop on mentoring for academic careers in engineering which was jointly supported by PAESMEM and the Stanford University School of Engineering. This chapter is an overview of the book.

1.2 Best practices

There is no single agreed upon set of best practices to serve as guides for mentors, but the presentations and discussions produced a collection of variations on common themes that provide a good start. The focus of this session was on mentoring students, but many of the principals are valuable for faculty as well. Generally the role of a mentor includes directing and advocating, evaluating and rewarding, celebrating successes and guiding through adversity and disappointment. Mentoring is an ongoing process that continues past graduation into subsequent careers. Mentoring benefits from regular feedback from mentees. Important attributes for a mentor to have (and a mentee to look for) include

Credibility The better we are at what we do, the better mentors we will be.

Integrity It's not enough to talk about integrity, one must live the example. Many students do not take it seriously. Mentors must.

Confidence Many students start with little but can become outstanding when properly encouraged and appreciated.

Cooperation Discourage aggressive competition among students. Encourage cooperative efforts and openness.

Chores and citizenship Engage students in professional responsibilities: reviewing, proposal writing, presentations, mentoring. This does *not* mean handing these tasks off and letting them

sink or swim. It means, for example, having a student write a review and then writing your own. Let them see how it changes. Give them the opportunity to learn all of the skills they will need later in their career.

Communication skills Brilliant research is of little use if not understood. Correct English with good style is critically important. Practice writing and speaking skills constantly.

Professional Activity Send students to conferences to attend and give talks. Rehearse them extensively. Introduce them to colleagues. Get them plugged in. After graduation, recommend them for program committees, technical committees, reviewing chores.

Credit Give credit generously to students. It helps them and makes you look good.

Intolerance of harassment Although many institutions have programs for diminishing sexual harassment, it still exists. Be sensitive to potentially embarrassing or dangerous situations and do not accept inappropriate behavior from colleagues towards your students. Institutions should have a zero tolerance policy towards any mentors who abuse their position.

Other advice to mentors included

- Use a light touch.
- Be patient.
- Be supportive, encourage goodness, and provide direction when off the rails.
- Try not to mess the students up, they came in as good students (a variation on the Hippocratic "do no harm").
- Discuss the skills needed for prospective new faculty members, such as negotiating initial start-up packages and initial teaching responsibilities.
- Try to teach the skills that often confound new junior faculty, such as completing merit reviews, preparing proposals, choosing committees, and selecting good graduate students.

- Some students need little mentoring, but it is not good to ignore them. Everyone can benefit from encouragement.

The many stages of mentoring were considered:

- graduate students, who are essentially apprentice researchers who need to learn research and communication skills and to evolve from coursework to independent creativity,
- junior faculty, who are apprentice professors and need to develop teaching skills, leadership in research, and professional and institutional service,
- mid-career and senior faculty, who can benefit from help in making choices regarding career advancement or changes and nominations for positions of responsibility in academia and professional organizations.

Two special issues arise when mentoring women, some of which pertain more generally to other under-represented groups. Since the number of women faculty members in engineering is still relatively small, women tend to be asked to take on a greater service burden than are men faculty. Although this is driven by the admirable goal of providing diverse opinions on key committees, it can adversely affect the progress of junior faculty members in establishing successful research programs. Women faculty need to be especially careful in not becoming too immersed in such matters before tenure. A mentor can be very useful here in helping junior women faculty members navigate these waters.

A second major issue, and perhaps the most critical issue for women faculty members, is the potential conflict between the biological and tenure clocks. The role of the mentor is not clear here, since this is clearly a very personal issue. However, as with much good mentoring, simply providing information about various options and also providing introductions to others who have been through the same decision-making processes can be of help. The subject is treated in some depth in chapter 8.

1.3 Early and mid-career mentoring

The topic of best practices put the emphasis on the mentors, this topic shifted the emphasis to the mentees. The presentations and

discussion were aimed at graduate students, new faculty, and mid-career faculty seeking mentors. Issues included how to find a mentor, what to expect, and how to evaluate progress and maintain momentum. Obviously the qualities sought in a mentor correlate strongly with those mentioned in the previous topic.

Typically the Ph.D. research adviser plays the key mentoring role during a graduate career. It should be kept in mind, however, that not all mentoring can be accomplished by an adviser — the roles overlap between adviser and mentor, but are different, and at times will conflict

Graduate students should begin the search for an adviser with some self appraisal.

- What are your objectives in graduate school?
- What type of training do you desire?
- What are your strengths?
- What skills do you need to develop?
- What kinds of research or creative projects do you want to work on?
- What type of career do you want to pursue?

Specific attributes for a graduate student to look for in a research adviser include

- An adviser should act as a positive role model for students.
- An adviser should be someone whom you can trust.
- An adviser should have good personal and communication skills.
- An adviser should be encouraging.
- An adviser should be technically strong and possesses a good scholarly reputation in the associated field.
- An adviser should be highly accessible.
- Former students of the adviser should have found good positions after graduation.

- Papers coauthored by the adviser with students should often have students as lead authors.

Explore all possible avenues to find out about research groups in the areas that interest you, including taking classes (especially project courses) and seminars, browsing through research group Web pages, and chatting with students.

As to what to expect or request from a mentor, a good mentor typically

- provides academic advice, both for meeting program requirements and for building a strong background in related areas, such as statistics, mathematics, physics, and biology;
- provides a sounding board for career planning and opinions on possible career tracks;
- provides an opportunity and critiques for technical talks in preparation for oral exams, thesis defenses, job interviews, conference presentations;
- provides an informed source for comparing job offers which can help you reach a sound decision;
- keeps you posted on current literature, meetings, and news;
- helps hone your writing skills, both for technical articles and for important outreach articles that expand the audience for your field;
- provides advice and help on preparing and submitting articles for scholarly publication and, on the other side, for reviewing work by others;
- provides connections into professional networks of colleagues, introduces you to colloquium speakers and other visitors, suggests collaboration opportunities.

Junior faculty have markedly different needs as they must learn the local system for teaching, institutional service, and building a research group and finding research funding. In addition, they can benefit from advice on professional service and advancing their career. Some schools have active mentoring programs in place for new

faculty, but many leave it to chance or make minimal efforts. In both cases, checking out options and finding senior people with whom you feel comfortable is a good strategy. A good mentor for junior faculty can

- provide good advice on the key academic responsibilities of teaching and advising, including negotiating which courses to teach (balancing core and advanced), giving tips for getting good teaching evaluations from students and taking advantage of available resources for improving teaching skills, teaching the basics of students and advising (and where to find all the program and other requirements you will need to have at hand), supervising undergraduate and graduate projects, writing exams, grading strategies, interpreting course evaluations, and preparing for the unpredictable crises you are likely to encounter when advising students.

- help guide you through your department's maze. You need to know how to get things done, whom to see for what, how teaching assistants and research assistants are approved and appointed, and, unfortunately, what to do when you encounter cheating or violations of the university ethics or honor codes.

- provide invaluable advice when you write grant proposals for research funding. They can provide you with successful examples and review your draft grant proposals. They can also be a big help in dealing with the rejection that often comes with a failed proposal.

- help demystify the tenure process, and help in planning ahead for the process. This often means encouraging you to maximize your visibility in your field through publications, talks at conferences, talks in industry and other universities, grant applications, and professional service as reviewer, associate editor, program committee, professional society officer, and other visible positions that enhance your field. Key to a successful tenure process will be having people in the field know and like your work.

- help build relationships with other colleagues both within your department and elsewhere on campus.

- help you to keep things in perspective — they often have a more global and experienced viewpoint that can transcend the daily crises that can beset junior faculty. In particular, mistakes will happen. Get past it. Grants and papers will get rejected, don't take it personally and try again (and make it better).

The acquisition of tenure can result in special mentoring needs that are often not foreseen by junior faculty. Tenure usually brings increased service requests and requirements, and some find it difficult to maintain research momentum and enthusiasm after the clear goal of tenure is achieved. It is important to give these issues careful thought and senior faculty can often provide insight. This is a good time to evaluate your research, administration, and service goals and perhaps to take a sabbatical or look at new areas or projects.

1.4 How to be as bright and capable as everyone seems to think you are

Dr. Valerie Young was invited by the workshop organizing committee to give a presentation on a subject on which she has lectured and written extensively, the imposter syndrome. The syndrome was described by psychologists Pauline Clance and Suzanne Imes, who found that many of their female clients seemed unable to internalize their accomplishments. External proof of intelligence and ability in the form of academic excellence, degrees, recognition, promotions and the like was routinely dismissed. Instead, success was attributed to contacts, luck, timing, perseverance, personality or otherwise having "fooled" others into thinking they were smarter and more capable than these women "knew" themselves to be. Rather than offering assurance, each new achievement and subsequent challenge only served to intensify the ever-present fear of being "found out" as imposters. Dr. Young did her doctoral research on the topic and has since delivered a variety of popular workshops and lectures titled "How to feel as bright and capable as everyone seems to think you are," including suggestions on how to recognize and deal with the syndrome. This chapter, written by Dr. Young, describes the symptoms of the syndrome, some underlying causes, and a variety of measures for dealing with it.

1.5 Mentoring support: National and local resources for mentoring

Many institutions and organizations have developed infrastructures to facilitate finding and working with mentors and for training both mentors and mentees to get full advantage of the relationship. This chapter collects a variety of examples of successful programs, some of which are generally available and some of which provide templates for other institutions to consider. Unlike the other chapters, here the topics closely correspond to specific panel members since these are essentially successful case studies. These include:

- MentorNet, winner of a 2001 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring (PAESMEM). MentorNet provides an infrastructure for e-mentoring on a large scale, working with multiple institutions, connecting industrial, public service, and academic mentors with students and early career faculty, regardless of location, and coaching them toward productive mentoring relationships.

- The Center for Workforce Development at the University of Washington, winner of a 1998 PAESMEM for their development of a mentoring curriculum, available as a book and supporting videotape.

- The Electrical Engineering and Computer Science Department at UC Berkeley. Berkeley has a long history of effective mentoring support for engineering students in general and underrepresented minorities and women in particular. Several of their specific programs are required.

- The Caltech Women's Center provides a variety of services to support women faculty and students.

- The NSF ADVANCE Program promotes institutional change to enhance diversity in the science, technology, engineering, and mathematics workforce.

- The Virginia Tech ADVANCE Program provides a specific example of one of the ADVANCE centers.

Websites for these and other related programs are provided in the chapter.

1.6 Mentoring for academic leadership

The goals of this panel were to encourage younger faculty to consider leadership career paths and to educate more senior faculty about issues in mentoring for leadership. Academic leadership can be divided into the three primary types of research, educational, and administrative, with some positions combining two or all three types.

Assuming a leadership role can diminish time available for other pursuits, but it can result in major rewards in terms of the impact on one's home group, be it a laboratory, department, school, center, or university. Most faculty are familiar with all of the shortcomings of going into leadership roles. Junior faculty in particular are justifiably concerned about the possible negative impact on their long term career of getting bogged down in administration. It is easy to list many of the potential drawbacks, and responses.

- It takes away from research and education.

  This is a genuine drawback, at least for most of us — something has to go. Happily not everything has to go; people typically cut back on some aspects and not others. Department chairs and deans often give up most classroom teaching, but keep on with research and graduate advising.

- It is hard to gear back into research and education later on.

  It is usually not difficult to return to teaching after a break, but it can be difficult to start a new pipeline of grad students and write grant proposals from scratch. It is a good idea to keep some research going no matter what; furthermore, it is often the most fun part.

- Leadership requires too much politics, both within an organization and outside.

  Politics arise where there are people, and to be effective one must deal effectively with people, whether in industry or academia.

- Leadership usually requires fundraising of some kind.

  Indeed chairs (and deans and others) spend much of their time doing fundraising, but fundraising is not in any way inconsistent with our traditional missions of education, research and

service. Indeed, the opposite is true — it provides an opportunity where we must, in a highly effective way, articulate why we do what we do, and this seems to be a wonderful obligation. Conveying the excitement and the value of our people and our ideas is the core of fundraising — and it's fun! However, it frequently means that there are more demands on evenings and weekends to attend dinners and receptions.

- Leadership requires a skill set you may not have including managing staff and central budgets.

  The required skill set for administrative leadership typically involves:

  - Budgeting (how do you control it when others are spending it?)
  - Planning (how do you make a five year strategic plan?)
  - Building consensus and obtaining cooperation (herding cats)
  - Hiring (and startup packages)
  - Supervising (managing staff and professional development)
  - Fundraising (alumni, company, community engagement)

  Few of us receive genuine training in these skills, but then most of us were never trained to be an educator or mentor either. If you have good staff, you can rely on them to do some (much) of this, and you can learn some on-the-fly, too. Many schools provide mentoring and training specifically for academic leadership.

So given all of the shortcomings, why agree to lead? The question is not rhetorical, it has an answer: *to have an impact.* If you have a commitment to the broader community and if you care passionately about it, leadership gives you a chance to have a significant positive and lasting impact on that community.

1.7 Women professors with children

This session was intended to provide some advice, anecdotes, perspectives, and information about combining children with an academic engineering career. The session resulted in two chapters in this

book. The first talk of the session concerned the timing of children–should one have babies during one's graduate student years, during a postdoc, as a faculty member pre-tenure, or should one wait until after tenure? A wealth of data relevant to these questions is presented in chapter 9. The remainder of the session concerned strategies for balancing work and family once a baby has arrived, issues treated in chapter 8. The presentation, discussions, and the chapter collect anecdotes regarding successful balancing of children and career from four women engineering professors.

Obviously children are of concern to both parents and not just women faculty, but equally obviously the workload is different with childbirth and women historically have borne the brunt of childcare. All but one of the panelists in this session were women, but men participated actively in the discussions.

The details of the stories varied widely, but common themes included the necessity for choices and giving up on some things, the benefits of shared responsibilities, the importance of private time for self and spouse, and for developing strategies that work. Specific strategies included setting priorities consistent with family, limiting travel, delegating responsibility, and advance planning and anticipating.

The rewards of an academic life are many: the job is intellectually stimulating, and you work on a problem you love. It's flexible and customizable, and you have the self-determination that comes from having no boss, and from choosing what you work on. You have the satisfaction of knowing that you are contributing to the knowledge of the human race, and you are training the next generation of scientists and inventors.

From the point of view of having children, the rewards of being a professor and parent are also numerous. The work week and work day are flexible, so you can go to school performances and sports events and parent-teacher conferences, without having to punch a time clock, and in fact without having to notify anyone that you are leaving, and without having to account for your time to anyone. The children are exposed to all sorts of fascinating intellectual topics from an early age; they learn to appreciate the questions and the approach to answers that a mind devoted to the pursuit of new knowledge produces. Also the children of women who are engineering faculty do not grow up with some of the stereotypical notions of women that other segments of the population may have, e.g., that girls can't do

math, and that a woman's place is in the home.

1.8 Epilog

The book closes with a final collection of anecdotes received from workshop participants following the workshop. All relate to what the participants learned and how they put their knowledge into action on their return home.

Chapter 2

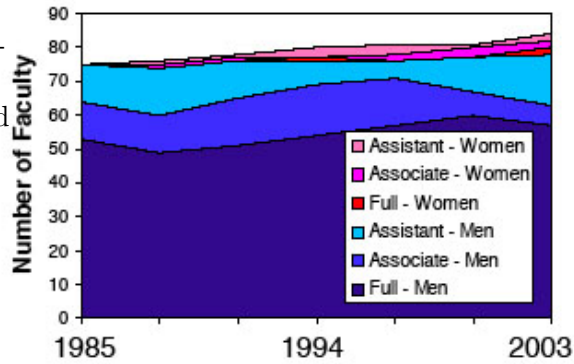
Mentoring

Telemachus and Mentor
by Pablo E. Fabisch
from *Les Adventures de Telemaque*

The Oxford English Dictionary defines *mentor* as "allusively, one who fulfils the office which the supposed Mentor fulfilled towards Telemachus. Hence, as common noun: An experienced and trusted adviser." Merriam-Webster's Collegiate Dictionary provides two definitions, separating the original and acquired meaning: "a friend of Odysseus entrusted with the education of Odysseus' son Telemachus" and "a trusted counselor or guide, tutor, coach." The origins of the modern meaning are often traced back to *The Odyssey* of Homer, when the goddess Pallas Athena assumed the form of the family friend Mentor (one of the many forms she assumed) to support Odysseus' son Telemachus. One might argue that the first "mentor" described in literature was Athena, a goddess and not an old man. In fact, the *Odyssey* provides only

hints of the currently assumed sage and supportive role of Mentor, these attributes were more explicitly spelled out much later in 1699 in *Les Adventures de Telemaque*, by Francois de Salignac de La Mothe-Fenelon (1651-1715). In modern times, mentoring has been recognized as a critical aspect of "the professional and/or personal development of an individual," and it is seen as a lifelong process [4]. Effective mentoring is important to all persons pursuing an advanced degree in engineering, and especially to those beginning academic careers. Mentors can open doors and provide opportunity even through association rather than through direct contact. This is especially true in academia, where an applicant's graduate institution and adviser are often enough to secure serious consideration by a hiring committee. Studies have shown that women receive less mentoring and have a more difficult time being selected as mentees than males, especially in male-dominated fields such as engineering. Women may also have a greater need for mentors due to their low numbers, few role models, and some exclusion from peer networks and socialization. The difficulty that some women encounter in finding Ph.D. advisers attests to this observation. It is due to this fact, in part, that the number of women earning Ph.D.s in electrical engineering is low; from 1985–2001, this percentage was less than 8.2% of the total [6, 7].

As of 1996, there were 124 tenured and tenure-track women EE professors at United States universities [8]. Of the top twenty departments, an informal scanning of their departmental Web pages yielded a total of 75 tenured and tenure-track women in EE. These numbers are not good, they show a wide distance between representation in the population and representation in engineering faculties, and the poor numbers play a major role in the poor numbers in student bodies. A field suffers when it fails



Caltech engineering faculty
distribution among men and women

to attract and encourage diverse talent.

Although many factors affect these statistics and a variety of approaches exist to improve them, arguably the means by which a small number of people can have the maximum impact is by encouraging, assisting, and supporting those who understand the value of diversity and wish to become leaders in academia. The importance of mentoring in science, mathematics, and engineering is known at the national level. In particular, in 1966 the White House established the Presidential Awards for Excellence in Science, Mathematics and Engineering Mentoring (PAESMEM). The program is administered on behalf of the White House by the National Science Foundation (NSF). The Program Director is Dr. Marilyn Suiter, who together with Stanford Dean of Engineering Jim Plummer provided a welcome and introduction to the workshop participants. PAESMEM identifies outstanding mentoring efforts/programs designed to enhance the participation of groups underrepresented in science, mathematics and engineering. The awardees serve as exemplars to their colleagues and are leaders in the national effort to more fully develop the nation's human resources in science, mathematics and engineering. The awards include funds to support the awardees' projects, including workshops, Websites, and developing and expanding mentoring programs. Dr. Suiter and several PAESMEM recipients (Brainard, Wadia-Fasceti, Mecartney, Muller, Denton, Gray) participated in the workshop.

A working definition of mentoring at PAESMEM is *an interaction between a more experienced person and a less experienced person; it provides guidance that motivates the mentored person to take action.* The PAESMEM program supports a research agenda on science and engineering workforce mentoring in cooperation with other programs. This includes the exploration of career mentoring in science, technology, engineering, and mathematics (STEM) Career Mentoring by NSF's Committee on Equal Opportunity in Science and Engineering (CEOSE), in partnership with PAESMEM, and implemented by AAAS/EHR (Yolanda George) with support from AAAS's Committee on Opportunities in Science (COOS). The project also builds on an earlier AGEP-based AAAS study group meeting. The goals are

1. to identify existing research (and gaps therein) in research on STEM career mentoring (a bibliography was researched and developed prior to the meeting and will be available on the project Website);

2. develop and refine standards for career mentoring in STEM; and

3. discuss and develop an initial framework for assessing career mentoring in STEM.

This workshop contributed to the awareness of several of these issues in a core group of enthusiastic participants. It is hoped that these proceedings will add to the promulgation of these ideas and provide supporting material for mentors and mentees, current and future.

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Chapter 3

Best practices in mentoring: teachings from experience

Chair Michelle Effros, Cal Tech
Panel Vincent Poor, Princeton University
Bob Gray, Professor and Vice Chair of EE, Stanford
Jeff Koseff, Professor of Civil and Environmental Engineering, Stanford

While we recognize that mentoring is a two-way process, this session focused primarily on best practices for mentors, leaving questions of how to find good mentors and be "more mentorable" to later sessions. The purpose of these remarks is to provide a brief statement and overview of some talking points that are of interest in the context of mentoring of engineering students and faculty. After a few general observations on the nature of mentoring, some issues arising in connection with various stages of mentoring will be mentioned. Finally, some specific issues that are of particular interest in the mentoring of women engineering students and faculty will be discussed briefly. All of the issues raised here are discussed in greater depth in other sessions of the workshop, and these brief comments are intended only for the purpose of raising issues, and are specifically not intended as the final word on any subject.

3.1 General observations

It should be taken as axiomatic that mentoring, which involves many complexities of personality and inter-personal dynamics, is more of an art than a science. A corollary to this axiom is that there may be as many "best

practices" in mentoring as there are mentor-advisee pairs. However, as with other arts, we can still certainly look for general principles of good mentoring, which of course was the purpose of this workshop. As with other arts, reasonable people can, and will, disagree on what constitutes good mentoring practice. (Not the least of the factors contributing to such disagreements is the fact that the trajectories of successful academic careers are quite varied.) A related issue, sometimes overlooked, is that the personality, aspirations and career stage of the mentor are major factors affecting the mentoring process. So, in looking for good mentoring practices, we should not lose sight of these human dimensions.

Given that good mentoring styles can vary enormously with personality type and that most faculty are not trained to mentor, many faculty learn about mentoring through personal experience and observation. Observing both successful and unsuccessful mentoring styles and then attempting to apply the lessons learned there is a useful part of the process. The role of a mentor includes directing and advocating, evaluating and rewarding, celebrating successes and guiding through adversity and disappointment. Some basic underlying principles to keep in mind in developing one's own approach to mentoring include:

Credibility The better we are at what we do, the better mentors we will be.

Integrity It's not enough to talk about integrity, one must live the example. Many students do not take it seriously. Mentors must.

Confidence Many students start with little but can become outstanding when properly encouraged and appreciated.

Cooperation Discourage aggressive competition among students. Encourage cooperative efforts and openness.

Chores and citizenship Engage students in professional responsibilities: reviewing, proposal writing, presentations, mentoring. This does *not* mean handing these tasks off and letting them sink or swim. It means, for example, having a student write a review and then writing your own. Let them see how it changes. Give them the opportunity to learn all of the skills they will need later in their career.

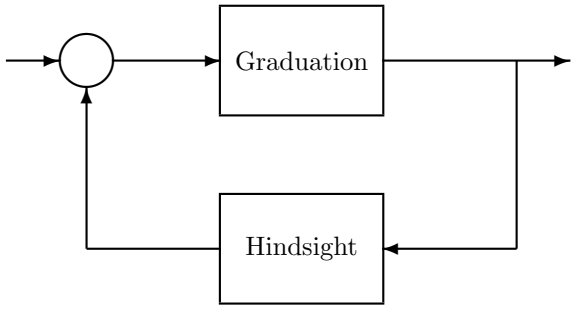
Communication skills Brilliant research is of little use if not understood. Correct English with good style is critically important. Practice writing and speaking skills constantly.

Professional Activity Send students to conferences to attend and give talks. Rehearse them extensively. Introduce them to colleagues. Get them plugged in. After graduation, recommend them for program committees, technical committees, reviewing chores.

Credit Give credit generously to students. It helps them and makes you look good.

Sharks Although many institutions have programs for diminishing sexual harassment, it still exists. Be sensitive to potentially embarrassing or dangerous situations and do not accept inappropriate behavior from colleagues towards your students. Institutions should have a zero tolerance policy towards any mentors who abuse their position.

While many of these points may seem obvious, they are not generally recognized.



Feedback

Learning to mentor is a process of continual learning, rethinking, and revision. *Feedback* is a critical element in developing good techniques for mentoring. One way to measure success is to track the careers of one's former students. Mentoring does not stop with a degree. It is a life-long relationship. Students evolve into colleagues, and staying in touch with these colleagues can be useful to both former students and their former advisers. Remaining accessible to former students allows a mentor to benefit from their hindsight and provides a mechanism for gathering and promulgating successful techniques. Further, since former students often lack mentors at new institutions, maintaining the mentoring relationship can also be of great importance to former student's continuing development. Also, visits from alumni provide wonderful contacts, examples, and sources of information and inspiration for later generations of students. A variety of desirable attributes of mentors were suggested during discussions:

- Use a light touch.
- Be patient.
- Be supportive and encourage goodness and provide direction when off the rails.
- Try not to mess the students up, they came in as good students. A variation on the Hippocratic "do no harm."
- Discuss the skills needed for prospective new faculty members, such as negotiating initial start-up packages and initial teaching responsibilities.

- Try to teach the skills that often confound new junior faculty, such as completing merit reviews, preparing proposals, choosing committees, and selecting good graduate students.
- Some students need little mentoring, but it is not good to ignore them. Everyone can benefit from encouragement.

3.2 Stages of mentoring

The following paragraphs contain some brief remarks on the main mentoring objectives and needs for advisees in various stages of academic careers: graduate school, untenured faculty positions, and senior faculty positions. The objective here is not to be comprehensive, but rather to touch on only the principal issues.

Graduate students

Graduate school is essentially an apprenticeship for learning to do research. The main objectives of graduate students are to learn to do creative, leading-edge research, and to publish it to the research community through conference presentations and journal articles. The main things that graduate students need to do this are the freedom to be creative (a lot of it), encouragement, patience and opportunities for confidence-building through progressively public and formal forums in which to present their work. Obviously, mentoring of graduate students is performed primarily by research advisers (although post-docs and other faculty can of course play roles as well), and the primary objectives of mentors should be to provide an atmosphere that encourages individual creativity, and that offers opportunities for students to develop communication skills.

Untenured tenure-track faculty members

An untenured tenure-track faculty position is essentially an apprenticeship for learning to be a professor. Junior faculty members are in much greater need of mentoring than are graduate students, for several reasons:

- Junior faculty members have much more complex jobs, involving course preparation and development, teaching and evaluation of classroom students, supervision and advising of research students, setting research directions and raising research funds, and participating in departmental and university governance. Most of these jobs are completely new to assistant professors.
- Junior faculty members are typically at an age when they need to begin achieving a balance between work and outside life. Often being

out of school for the first time in life, it is a time when family and other personal obligations and interests begin to increase.

- Unlike the situation in graduate school, there is no well-defined "curriculum" for successfully accomplishing the job of a junior faculty member; i.e., the rules are not formalized.
- Many junior faculty members have no formal mentor or adviser. Although some departments do set up a mentoring system, it is not universal, and there may be conflicts of interest that do not really arise in the professor-student relationship.
- The environment that junior faculty members find themselves in may not be supportive or even benign. Departmental politics often affect even apolitical faculty members.

So, this stage of mentoring is perhaps the most important one, and the one that deserves the most attention.

Untenured faculty members need to focus their efforts on two things: building a visible, independent research program, and being a good classroom teacher. Although there are of course many dimensions to this job, these two are essential for achieving tenure at most universities. Aside from emphasizing the importance of these two objectives, mentors of young faculty members (and such mentors include former professors as well as senior colleagues) can help them in practical ways such as sharing of successful proposals as exemplars, sharing proposal-writing advice, sharing of class notes, providing introductions to senior colleagues and program managers, and extending invitations to participate in workshops, special sessions at conferences, etc.

Senior faculty members

Although sometimes forgotten as targets of mentoring, senior faculty members are still in need of advice and support on issues such as career advancement and recognition. Here, a mentor can help with things like nominations for positions of responsibility in academia or scientific organizations, nominations for awards, and simply providing encouragement and reassurance when needed.

One thing to note about mentoring at this stage is that it is usually a two-way street, as the distinction between mentor and mentee tends to blur with time.

3.3 Issues in mentoring women

While the above comments apply to mentoring generally, there are some specific issues that arise specifically in the mentoring of women faculty

members. (Some of these comments also apply to other under-represented groups. However, they are phrased here in the context of women, primarily because of greater experience with women.)

First, with regard to the mentoring of graduate students, experience shows that differences in personality and ability are much more important than differences in gender, ethnicity or national origin. Thus a good practice in mentoring graduate students of all stripes is to treat all students the same, recognizing differences only in the former two qualities i.e., personality and ability.

As with mentoring in general, untenured faculty status brings perhaps the most sensitive issues for women, namely tokenism and child bearing.

Tokenism

Since the number of women faculty members in engineering is still relatively small, women tend to be asked (even while still untenured) to take on a greater service burden than are men faculty. Although this is driven by the admirable goal of providing diverse opinions on key committees, it can adversely affect the progress of junior faculty members in establishing successful research programs. Some service is of course expected from all junior faculty, but women faculty need to be especially careful in not becoming too immersed in such matters before tenure. As has been noted, this phenomenon can also provide opportunities for young faculty to meet very senior university administrators. But, this often does not help at tenure time, and so some caution is needed. A mentor can be very useful here in helping junior women faculty members navigate these waters. Even when not asked, women usually form a small minority subgroup of whatever faculty group they find themselves in, including faculty meetings and informal discussions. Being in a minority can make all actions more visible and put added stress on individuals.

Child-bearing

A second major issue, and perhaps the most critical issue for women faculty members, is the potential conflict between the biological and tenure clocks. The tenure system that we have today was established in the days when most professors were men, and does not really recognize this issue adequately. Although many universities now extend the tenure window for faculty members who take parental leave, this still does not fully address the issue. The role of the mentor is not clear here, since this is clearly a very personal issue. However, as with much good mentoring, simply providing information about various options and also providing introductions to others who have been through the same decision-making processes can be of help. This issue is treated in some depth in chapter 8.

The "Imposter Syndrome"

Finally, with regard to senior faculty, a significant issue with women faculty is the "imposter syndrome," the subject of chapter 5. While this phenomenon is, of course, not restricted to women faculty, it seems to be voiced more often by women. Here, again, a mentor can help by providing reassurance and help in advancement and recognition, although as considered in chapter 5, recognition does not always relieve the feelings associated with the imposter syndrome. So, again, here is an issue that requires particular attention.

In summary, the above remarks are intended to help frame more in-depth discussion of the general issues arising in the mentoring of academics at various career stages, and also to raise some issues that are of particular concern in the mentoring of women (and other under-represented groups) in engineering academia.

Chapter 4

Early and mid career mentoring and support: Finding mentors and setting priorities, maintaining momentum after tenure

Co-chairs	Jia Li and Sheila Hemami
Panel	D. Richard Brown, Assistant Professor, Worcester Polytechnic Institute
	Lydia Sohn, Assitant Professor, UC Berkeley
	Rebecca Willett, Graduate Student, U. Wisconsin/Rice
	Sheila Hemami, Associate Professor, Cornell Univ.
	Yoonkyung Lee, Assistant Professor, Ohio State

4.1 Introduction

The previous chapter was largely directed at the mentors and potential mentors. Attention now passes to the mentees. How do you find a mentor? What should you look for? How do you evaluate the success of the relationship and how do you maximize your chances of continued productive exchanges? These generic questions echo those in all human relationships, but here the issues are specific to graduate students interested in an academic career, freshly minted PhDs begining an academic career, and mid-career faculty who may feel serious sea changes with the acquisition of tenure. For graduate students, the interaction with their thesis advisers profoundly affects their motivation to pursue research and the extent they can grow as a beginning researcher. Good mentors can bring substantial advantages

to junior faculty members as well. Training in the graduate school mostly focuses on producing independent researchers. A junior professor, however, requires a variety of skills to develop a successful career in academia, including teaching, committee work, professional service, and finding research funding. Mentoring during tenure-track years is highly valuable for a junior professor to master skills in these areas. In this chapter we consider the progression of finding mentors, benefiting from mentors, and in maintaining momentum after tenure.

4.2 Graduate students

How find good mentors?

For graduate students the research supervisor usually plays the role of primary mentor, so for the moment we consider the issues of finding a good reseach supervisor. There is a school of thought, however, that it is best to find a mentor who is *not* your research supervisor. A good compromise is to go for multiple mentors.

It is easy to put together a list of ideal qualities for an adviser. Among the attributes that come to mind are the following.

- An adviser should act as a positive role model for students.
- An adviser should be someone whom you can trust.
- An adviser should have good personal and communication skills.
- An adviser should be encouraging.
- An adviser should be technically strong and possesses a good scholarly reputation in the associated field.
- An adviser should be highly accessible.
- Former students of the adviser should have found good positions after graduation.
- Papers coauthored by the adviser with students should often have students as lead authors.

On the other hand, mentors should not be expected to have godlike qualities or to be able to work miracles. If the professor's research group is productive and happy, it is a very good sign. Note that a perfect technical match between student and adviser is not stressed. With some advisers and students this is necessary, but some of the most interesting research projects develop when the topic is new to both student and adviser.

Finding a mentor should begin with a little homework, beginning with some self appraisal. What are your objectives in graduate school? What type of training do you desire? What are your strengths? What skills do you need to develop? What kinds of research or creative projects do you want to work on? What type of career do you want to pursue? You may not know the answers to all of these questions, but you should give them some thought. They may arise in conversations with peers and potential mentors.

Explore the available research groups in areas that interest you on the Web and in discussions with other students. Go to general seminars where professors and students discuss their work. Take courses from the candidates, especially project courses where you get the opportunity to do initial research and get to know the professor and senior graduate students. Eventually you need to chat with them about doing some research with their group, but it is an enormous help if you already know them when you do this. If you have taken a course from them and done well, it gives you an extra boost. Sometimes you can sign up for a directed reading or individual research course, where you can negotiate with the professor for a custom project. Some professors will want candidate group members to tackle a well defined problem that they provide, others prefer to point a student to a general area and the literature and let them propose a problem.

Mentor age can be a factor. Older advisers are often more famous and established and may be better connected in the professional world. They might also, however, be less accessible and more remote. Young, enthusiastic assistant professors may be less well known, but in building a research group you may find an excitement not matched in a more established group, and you may end up in the front ranks of a brand new field. Sometimes famous

older professors will have research associates who manage most of their research projects, so you might end up spending most of your time with someone who is entirely involved with research and not the other aspects of academia. That can mean insufficient mentoring if you are hoping for an academic career. Retired faculty can be good mentors. They have more time to mentor, but they may have had a very different experience since it was so long ago.

Funding is often an undercurrent in these discussions, some professors have more funding than others and have larger groups, but all are very careful about committing the precious research assistantships they might control. Rarely will they be available for new students, usually students have to work their way up the ladder. Be prepared to discuss your funding or lack thereof. If you really like an underfunded professor, you may have to seek alternative funding to work with the professor— things like teaching assistantships, industrial support, consulting, or possibly an assistantship for another professor as a computer/network administrator.

There is no one-size-fits-all solution, and finding a research supervisor, like finding a research project, is a substantial part of the PhD. It usually requires as much creativity, imagination, persistence, and hard work as does the research itself.

How can a mentor help?

The most obvious contribution of a PhD research supervisor is guiding students to learn how to do, evaluate, and present research. In addition,

typically a mentor

- provides academic advice, both for meeting program requirements and for building a strong background in related areas, such as statistics, mathematics, physics, and biology;
- provides a sounding board for career planning and opinions on possible career tracks;
- provides an opportunity and critiques for technical talks in preparation for oral exams, thesis defenses, job interviews, conference presentations;
- provides an informed source for comparing job offers which can help you reach a sound decision;
- keeps you posted on current literature, meetings, and news;
- helps hone your writing skills, both for technical articles and for important outreach articles that expand the audience for your field;
- provides advice and help on preparing and submitting articles for scholarly publication and, on the other side, for reviewing work by others;
- provides connections into professional networks of colleagues, introduces you to colloquium speakers and other visitors, suggests collaboration opportunities.

Not all mentors consider these opportunities all the time, sometime it takes some prodding on the part of the mentee. But these are all typical and reasonable, so do not be afraid to ask.

And then there is the negative side. You will often get advice, solicited or not, about which potential advisers to avoid. Opinions were voiced against the following character types:

- Absent-minded professors (like Fred MacMurray in the film of that name, the absent-minded professors present likely did not agree with this prohibition)
- Dr. Frankenstein: unapproachable
- Indiana Jones: inaccessible
- De-mentors: suck joy, happiness, and hope – and eventually the soul – from their victims
- Dr. No, Professor Moriarty: evil

You should also be wary of mentors who are only cheerleaders without also being constructive critics — they may ultimately be of little use towards your professional growth. On the other hand, you may notice that often

even those professors with bad reputations may have good and contented students, while the apparent paragons might have divisive and stressed groups. So weigh the gossip you get against your own observations. Some great mentors have reputations for being "difficult," while some self-professed saints can be Hell to work for. Caveat emptor!

Chapter 6 and the following URLs provide resources for finding and profiting from mentors:

- mentoring.org
- gradschool.about.com
- The UCLA Graduate School Survival Guide
  www.gdnet.ucla.edu/asis/infoserv/survival.pdf
- *How to Get the Mentoring You Want,* the University of Michigan
  www.rackham.umich.edu/StudentInfo/

4.3 Junior faculty

How find good mentors?

The needs and methods of junior faculty differ markedly from those of a graduate student. Be prepared by absorbing all you can from your graduate school mentor before you leave the nest, "be prepared" is good advice for more people than Boy Scouts. Many of the desirable attributes and effective strategies still apply, but many are no longer relevant. Perhaps the biggest difference is that you now have an entirely new system to learn. With luck you will know something about such things, but most likely you will not be well equipped to handle them. Most beginning assistant professors have had minimal teaching experience, no experience obtaining research funding no academic (group, department, school, university) committee experience, no advising experience, and little grasp of "how things work" in academia.

Some schools have organized programs for mentoring new faculty, sometimes forming teams based on preferences. Investigate to see if you have such resources available to you. Some departments assign mentors for new faculty, and that gives you someone to talk to and it may be enough. Often, however, it is not sufficient and you may need to seek additional council, possibly even from other institutions. It is particularly important at this stage to find someone with a reputation for both strong teaching and strong research and for a good balance between the two. Unfortunately deans and chairs are not always suitable for this role because they are less active in both teaching and research because of their administrative duties. Two attributes often mentioned for good mentors are that they should have a good sense of humor and that they should be pragmatic.

Probably the best strategy for finding a primary or secondary mentor is to chat with many possible candidates and pursue conversations with people with whom you feel comfortable. Take advantage of any connections you might have, for example local friends of your PhD supervisor or other professors you know and like. It is best to look for someone who is tenured, because learning about the tenure process early can make it far less scary. Every institution operates differently, but all have similar criteria for excellence in research, teaching, and professional service. Finding good advice for allocating your time can be very helpful.

How can a mentor help?

In addition to addressing the skills needed to survive and prosper in academia already mentioned as reasons for seeking a mentor, there follow many other helpful influences a mentor can have on a new faculty member.

- A mentor can provide good advice on the key academic responsibilities of teaching and advising, including negotiating which courses to teach (balancing core and advanced), giving tips for getting good teaching evaluations from students and taking advantage of available resources for improving teaching skills, teaching the basics of students and advising (and where to find all the program and other requirements you will need to have at hand), supervising undergraduate and graduate projects, writing exams, grading strategies, interpreting course evaluations, and preparing for the unpredictable crises you are likely to encounter when advising students. Know your resources!
- A mentor can help guide you through your department's maze. You need to know how to get things done, whom to see for what, how teaching assistants and research assistants are approved and appointed, and, unfortunately, what to do when you encounter cheating or violations of the university ethics or honor codes. These things happen at the best of places. This type of mentoring requires inside knowledge and hence a mentor within your department or school.
- A mentor can be invaluable when you write grant proposals for research funding. They can provide you with successful examples and review your draft proposals. They can also be a big help in dealing with the rejection that often comes with a failed proposal.
- A mentor can be a demystifier of the tenure process, and in planning ahead for the process. This often means encouraging you to maximize your visibility in your field through publications, talks at conferences, talks in industry and other universities, grant applications, and professional service as reviewer, associate editor, program committee, professional society officer, and other visible positions that enhance your field. Key to a succesful tenure process will be having people in the field know and like your work.

- A mentor can help build relationships with other colleagues both within your department and elsewhere on campus.
- A mentor can help you to keep things in perspective — they often have a more global and experienced viewpoint that can transcend the daily crises that can beset junior faculty. In particular, mistakes will happen. Get past it. Grants and papers will get rejected, don't take it personally and try again (and make it better).

These advantages only accrue if you maintain regular contact with your mentor, and regular lunches or walks or coffee provide a good opportunity for doing so.

Mentors at other institutions are less helpful in dealing with the home institution, but they can be a big help in many other aspects of your career. They can provide independent advice on your grant applications and an outside objective perspective on your career advancement. Sometimes they can find out useful information through their own informal networks. They can also nominate you for editorial and program committee service that can provide an excellent means of expanding your knowledge of the field and its members.

4.4 Maintaining momentum after tenure

So you are a success as a junior faculty and to your great relief you are awarded tenure. Now what? It may come as a surprise that this can be a tough time for people who have not thought past this apparent professional black hole. In fact, this can be a depressing time for some and it is not good to let it take you by surprise. Some think the stress will vanish and the most unpleasant aspects of academia will disappear because they can no longer fire you, but as Professor Terry Fine explained to the Chair of the workshop when he received tenure, "there is always another carrot."

The right of passage of tenure effects all major aspects of academic life: research, teaching, service, sabbatical leaves, and the other part of your life (you have one, don't you?). The impact on research is the easiest to predict. Presumably you are doing it because you like it, so momentum on research is usually easy to maintain. Often, however, people consider sabbaticals at about this time to consider new research directions, perhaps far from the PhD work. Paulette Clancy, Chemical Engineering Chair at Cornell, said "I . . . had no problem maintaining research momentum . . . because research is the single most appealing task of my day."

Teaching momentum is also easy to maintain if you're excited about what you're doing. It is a good time to consider designing a new class or redesigning the same-old-class that your department has been teaching for the last 50 years. Be proactive about your teaching assignments and you will enjoy it more. A good balance is to be involved both in advanced

courses for recruiting graduate students and core courses for bringing new undergraduates into the field.

Expect major changes in the service aspect, however, these are likely to rise significantly. Junior faculty are often protected from major committee assignments, like the committees that handle admissions, appointments and promotions, and the academic program. Now that you are famous and tenured, you may also find invitations for major editorial positions in technical journals, chairing conference technical committees and the conferences themselves, and possibly government agency advisery committees and panels. Be proactive, not reactive: identify areas in which you want to contribute and notify the authorities. Take a leadership course if your university offers it.

So what about the sabbatical? Common suggestions are to write proposals in a new area or go elsewhere and learn something new, meet new people, do cool things. This requires careful planning, but can inject a major boost in your career. Another alternative is just to hide out, work on your on research and writing with your graduate students, and hopefully return well rested and ready to go.

Be aware that if you have a family, they may have expectations about a lightened workload after tenure. Think about rebalancing your life commitments with academic progress. Does your kid/dog/plant still recognize you?

This is perhaps a good time to ask yourself if your are happy at what you are doing and adjust accordingly, but please don't retire on the job.

Chapter 5

How to feel as bright and capable as everyone seems to think you are: What every woman (and man) needs to know about competence, the imposter syndrome, and the art of winging it

Valerie Young
ImpostorSyndrome.com, ChangingCourse.com

5.1 What is the Imposter Syndrome?

If you're like most students, you already know a lot about the Imposter Syndrome because you live with it every day. But just to make sure everyone is on the same page, I'd like to begin by sharing what I call my "in a nut-shell" definition of the Imposter Syndrome. Here it is:

> *Despite evidence of their abilities, many bright, capable people do not experience an inner sense of competence or success, believing instead that they have somehow managed to fool others into thinking they are smarter and more competent than they "know" themselves to be. People who feel like Imposters attribute their achievements to luck, charm, computer error, and other external factors. Unable to internalize or feel de-*

serving of their success, they live with a deep sense of inauthenticity and the fear that they will be found out.

Although the Imposter Syndrome has undoubtedly been around for quite some time, the term was first coined in 1978 by psychology professor Pauline Rose Clance and psychotherapist Suzanne Imes in their paper, *The Imposter Phenomenon Among High Achieving Women.* Since then, there have been hundreds of studies, magazine articles, and talk shows dedicated to understanding what the Imposter Syndrome is and what can be done about it.

The Imposter Syndrome is surprisingly common. Early studies by Dr. Gail Matthews[1] suggest that up to 70 percent of all people have experienced these feelings at one time or another, especially when starting a new job or pioneering in a field.

5.2 Who's most at risk for the Imposter Syndrome?

People who experience the Imposter Syndrome come from all walks of life. They're police officers, priests, doctors, nurses, lawyers, sales reps, artists, engineers, teachers, students, therapists, and actors. Clance has identified a number of groups that tend to be more prone to Imposter feelings.

At Risk Group 1: *Anyone for Whom Success Came Quickly*

The writer who publishes a best-seller right out of the gate, the rookie sales rep who lands the major account, or anyone who's experienced rapid success are more likely to experience feelings of fraudulence. The thinking here is, "I don't know how I did it the first time, how could I possibly repeat that success?"

At Risk Group 2: *First Generation Professionals*

Another group considered vulnerable to the Imposter Syndrome consists of those who are the first person in their family to become a "professional." Although first generation professionals can come from all races and nationalities, the pressure may be exacerbated for Black, Latino, Asian American and Native Americans as well as immagrants who often feel the weight of expectations that they be the standard bearer for their family, community, race, or nationality.

At Risk Group 3: *People With High Achieving Parents*

When one or more parents have a history of extraordinary achievement or success, children can feel great pressure to measure up. "And

[1] "Imposter Phenomenon: Attributions for Success and Failure," Dr. Gail Matthews. A paper presented at the meeting of the American Psychology Association, Toronto, 1984.

even when individuals from this type of family do gain recognition or fame or success," says Clance, "they may still have doubts about themselves, asking the question, 'Did I succeed because of my abilities or because my family is so well known?" '

At Risk Group 4: *People Who Are the First, or One of the Few, In Their Field or Workplace*

Everyone knows what it's like to feel under the gun to perform. When you are the only woman, person of color, person with a disability – or you're in a definite minority in your field or job setting – that pressure is more intense because now you're seen as a representative of your entire group. Not having the luxury to be "average" or to fail as an individual unconnected to your social group can lead to intense feelings of self-doubt and fraudulence.

At Risk Group 5: *People Working In Jobs Considered Atypical For Their Sex*

In her research, Dr. Joan Harvey found significantly higher degrees of Imposter feelings in people who were working in occupations considered atypical of their sex. This was true whether the person was male or female.

At Risk Group 6: *People Who Work Alone*

For the person who works alone there's no management, performance reviews, or documented standards to which to aspire. Instead, the measurements of competence and success are all internally driven. This is a problem since Imposter Syndrome sufferers set extraordinarily high standards for themselves.

At Risk Group 7: *People In Creative Fields*

Harvey and others say that some careers are more apt to provoke feelings of fraudulence than others. People in creative fields where each new endeavor calls for a new and different performance are especially prone to the Syndrome. Actor Mike Meyers once confessed that, "I still believe that at any time the no-talent police will come and arrest me."

At Risk Group 8: *Students*

Not surprisingly, being regularly evaluated and graded causes students to score higher on Imposter tests than any other group. "For people with [Imposter Phenomenon] traits," says Clance, "this process of constant evaluation is painful and anxiety-filled. 'Am I good enough?' 'Can I make it?' 'What do I really know?' are questions they repeatedly ask themselves."

For most people, the feelings of fraudulence fade as they get more experience under their belt. The people that I work with – and the

people for whom this chapter is directed – don't necessarily feel more confident with time. In fact, for them, increased levels of achievement often serve to exacerbate their sense of phoniness.

And just to be clear:

> **People who feel like Imposters aren't Imposters at all – they just THINK they are. Without exception – and I do mean, without exception – people who suffer from the Imposter Syndrome really are intelligent, thoughtful, and capable. They just don't believe it . . . yet!**

How do I know Imposter Syndrome sufferers are a pretty smart bunch? Evidence – hard evidence. Proof comes in a variety of forms. If you are a student, proof of your aptitude typically comes in the form of good grades, SAT scores, scholarships, internships, awards, letters of recommendation from faculty, licensing, degrees, and the like.

If you're out in the work world, evidence can take the form of such things as landing a job, receiving good performance evaluations, praise, getting promotions or raises, financial or business success, status, and so on. For both students and workers, proof can sometimes take the form of public recognition like citations or awards.

5.3 If they only knew . . . how Imposters explain away success

Sure, there's all kind of evidence that we actually do know what we're doing . . . that we really are relatively intelligent and capable people . . . that we're not intellectual frauds. The thing about all this evidence, though, is that we can explain all of that. In fact, self-described Imposters have this seemingly unlimited capacity for dismissing, discounting, or otherwise explaining away their successes.

Women are famous for their disclaimers. "I like to think I'm good at such and such," "Anybody could have done it," "It was nothing." A therapist I interviewed insists that such comments are not always indicative of false modesty. Rather, she said, "women's achievements 'frequently don't register very well.' Being able to realistically assess achievement and claim it is a major issue for my clients. There's this underlying sense of 'if I did it, it can't mean much.' "

Let's take a closer look at a few of the more common ways that people with the Imposter Syndrome dismiss, discount, ignore, or otherwise explain away their accomplishments.

Luck

The perennial favorite of Imposter Syndrome sufferers is to chalk achievements up to luck. "It was just the luck of the draw." "I got a lucky break." "It was just dumb luck." "It was a total fluke." "I lucked out." "It was nothing more than a stroke of luck." Achievements are seen as a matter of chance not competence, of destiny instead of effort or ability. And, just because you lucked out this time, doesn't mean you'll be so lucky next time.

Timing

A close cousin of luck is timing. If you subscribe to timing as the source of your success, you can probably hear yourself saying things like, "I was in the right place at the right time," or "The stars were right." To the Imposter, timing isn't an element of success, instead timing truly IS everything!

Personality/humor

Charm and personality top many Imposters' lists of rationalizations for success. This is especially true if you happen to also be blessed with a good sense of humor. As a sales rep explained it, "I figure if I can just keep them laughing, maybe they won't find out I have no idea what I'm doing."

The supposed simplicity of the task

For many Imposters, there's a direct correlation between the difficulty of a task and the amount of credit we're willing and able to accept for its accomplishment. By the Imposter's way of thinking, the fact that I was able to accomplish something is proof that it couldn't have been that difficult. In other words, "If I can do it, anyone can."

Low standards

Groucho Marx once joked that he wouldn't want to belong to any club that would have him as a member. Imposters know just how he feels. A university administrator who had just been accepted into a master's degree program at prestigious Smith College started to question her choice in schools. "After all," she explained, "if they'd let someone like me in, what kind of standards can they have?"

Other people

When it comes to crediting our success to others, there are a number of variations on the "someone helped me" theme. Here are just a few I've heard over the years:

"They felt sorry for me." A lot of women, especially women who have returned to college in mid-life, wonder out loud if perhaps the professors weren't just taking pity on them. A private job resource developer I interviewed shared her own experience: "My husband deserted me, I went to school and jockeyed a high school diploma. I took SATs at age 42 and was accepted into a pre-doctoral program and I thought, 'Oh, they feel sorry for me because I'm older. They thought '[she's] got four kids' . . . I made dean's list [and thought] they wanted to balance the marking system so they put me on the upper end."

"I knew someone." Let's face it, when it comes to getting what you want in life, connections are important. Yet people who feel like Imposters are convinced that the *only* reason they got into school, landed the job, got the promotion, made the big sale, and so on was because, "I knew someone."

"They're just being nice." When it comes to success, there are a lot of self-defined Imposters out there who depend heavily on the "kindness of strangers." The "Blanche Dubois Syndrome" as I like to call it, is so thoroughly ingrained in the minds of the majority of female Imposter sufferers that when I get to this place in my presentation, I need only utter the first three words and the entire class fills in the word "nice" in unison.

"I got a lot of help." If the accomplishment was the result of a team effort or indeed involved any form of support, collaboration, partnership, or cooperation, then that somehow cancels out any individual claim on success.

"Someone has obviously made a big mistake." ' I've heard it all . . . from mixing up college applications, to computer error, to just plain folly. The thinking here is that, "The only reason I got here is that somehow, someway, someone really screwed up when they let me slip through."

And then there are a few explanations that just defy characterization. Like the recent master's degree student who was pretty convinced that her faculty committee couldn't have possibly read her thesis. So she thought and she thought and then she had it! They must have put it on a scale and weighed it. The thing weighed about six pounds so they said, "Oh, what the heck, let's just give her the damned degree!"

Another woman had received the highest grade in her state on the CPA boards. Now if you know anyone who's ever taken the test to become a

certified public accountant, you know that a whole lot of people fail them on the first try. And she got the top grade in Massachusetts!

"It just didn't make sense," she said. Then one day it hit her. "It's a small state. If I had been in California or New York, I would have been way down on the list."

A few other excuses I've heard include:

It was a small candidate pool.

The first choice turned them down.

I just look good on paper.

Now the first thing I think we Imposters need to do is give ourselves a big pat on the back. If nothing else, I think we need to *appreciate* the incredible creativity that goes into thinking this stuff up! You have to agree, it takes an exceptional mind to come up with such ingenious and sometimes convoluted excuses for success.

At the same time though, if you're constantly explaining away your success, you have a serious problem don't you? I say serious because, *if you are unable to claim your accomplishments on a gut, visceral level, then when you're confronted with evidence of your abilities, it's emotionally unclear to you how you got there.*

The program director at a technical training school said it well. "If I experience myself to be this complete failure, and I can't accept the credit for the successes that I don't even see and that I don't recognize as mine, then I can't be here on my own merit because I don't have any successful experiences that I can claim emotionally."

You see, to the Imposter, one success has little to do with the next one. The big account I landed today has little to do with the prospect of my chances of successfully acquiring another sale tomorrow. That's because, for the person who feels like an Imposter, success is not a cumulative event. Instead each accomplishment is its own sum game. So that one success has little to do with the last one or with the next one, never mind being remotely connected with any skills, knowledge, or abilities you might have brought to the table.

5.4 The Phew Factor: fooled them again

Whether it's luck, timing, computer error, or the kindness of others, the result is the same. Any positive feelings about your accomplishments are woefully short-lived. Before the applause has died down, the performance review has ended, the acceptance letter fully read, four familiar words rise up inside to cancel out our glee ... "I fooled them again."

For the Imposter, there's no sense of security. You know that, as a wise president once said, "You can fool some of the people some of the time, but you can't fool all of the people all of the time." Believing that you've somehow managed to slip under the radar screen, sooner or later you *know*

that it is just a matter of time, you believe, before you are FOUND OUT! It's not surprising that instead of offering assurance of our competence, each new accomplishment only serves to intensify the ever-present fear of exposure.

A very competent and credentialed Canadian named Chandreyee wrote to say that despite earning a master's degree in Engineering and an MBA, it wasn't enough to compete with what she called her "nagging self-doubts." "I was on the Dean's list during my MBA program, yet I believed that I'd fail every course. I was a team leader for Engineering consulting and yet I thought that I'd make the biggest mistake ever in the next project."

And this persistent dread has very real consequences. The fear of being discovered, unmasked, and exposed as the incompetent phony you "really" are stunts your greatest aspirations and undermines your potential. But that's not all. For some, the prospect of discovery is accompanied by a deep sense of shame . . . something we'll be looking more closely at here.

The fear of being unmasked is also an incredibly stressful way to live. Betsy used to be the activities director at a nursing home. It was a job she'd slowly worked her way into and one which she genuinely loved. She felt comfortable in her role, well-respected by her coworkers, and received glowing recommendations. The only problem was she barely made enough to pay the bills.

So when a significantly better paying position as admissions director came up at another nursing home, Betsy's friends and coworkers encouraged her to go for it. It was a whole new job with new people, a new staff, and an entirely different system to learn. From the moment they offered her the job, Betsy questioned her ability to "pull it off."

Like any new job, the first few weeks were pretty stressful. But the stress of "knowing" she had fooled the selection committee into hiring her made the stress debilitating. She began each morning with a stomachache and ended each day with a headache.

About two weeks into her new job, Betsy started having chest pains. The pain was so bad one day that her secretary called an ambulance, thinking her boss was having a heart attack. Betsy's chest pain was very real, but it wasn't a heart attack. It was stress caused by the anxiety of having to "fool" all these people into believing she was qualified to be the admissions director.

In her counseling work with gifted and talented adults, Mary Rocamora found many of her clients reluctant to show their creative works to others. A contributing factor to the Imposter Syndrome, says Rocamora, is shame. "The fear of being exposed as a fraud feeds a chronic internal tension about showing creative products to others. Freedom to risk is thereby impaired. There's a pervasive feeling that even if something we've done is well received, it was a fluke, and that the other shoe is sure to fall next time."

According to Rocamora shame "keeps a lid on our level of achievement in life by maintaining an internal climate of fear of recognition. Being

creative in anonymity or as a hobby is safer than being known or praised for our work. The objective assessment of the true merit of our abilities can be very difficult. Looking to others for the objective feedback we don't have means having to bear the expectation of being shamed."

But wait until next time.

Most of us don't end up in the hospital. Instead, after each successful leap through each new hoop, we wipe our brow and think to ourselves, "Whew, that was a close one ... but I won't be so lucky next time."

"Next time" is a dimension of time that Imposters know all too well. Sure you've been successful in the past ... it's ***Next Time*** that you dread. You're utterly convinced that each new endeavor will surely be your undoing. You were lucky last time, but Next Time the whole house of cards will collapse before your eyes – and everyone else's.

And when you are found out, the imagined consequences are dire. Like the attorney who lives in fear of mispronouncing a word in court. On that day of reckoning (which, in her mind, was just a matter of time) she imaged this giant hook emerging from the galley to yank her out of the courtroom like some kind of vaudeville buffoon.

Winning the Academy Award for Best Actress for her role in the Accused was not enough to allay Jodie Foster's fear of being exposed as an Imposter. As Foster explained to Mike Wallace in a 60 Minutes interview, "I thought it was a fluke. The same way [I did] when I walked on the campus at Yale. I thought everybody would find out, and they'd take the Oscar back. They'd come to my house, knocking on the door, 'Excuse me, we meant to give that to someone else. That was going to Meryl Streep." '

Maybe you're one of the many Imposters for whom having the bottom drop out would actually come as a kind of relief. "If everyone finds out," you think, "at least I can finally stop pretending that I know how to be a graduate student, a lawyer, an engineer, a social worker, an artist ..." That's because if the jig really is up, that means you'd have no choice but to return to some less demanding occupation more suitable to your supposed limited abilities.

The constant anxiety for Imposters comes from the belief that any success you've somehow managed to achieve will be short lived. For those imprisoned in the Imposter Syndrome, the resulting fear, depression, and anxiety is real and debilitating.

5.5 Refining competence

The ability to see yourself as competent and capable is essential to unlearning the Imposter Syndrome. What does competence mean to you? And how will you know when you've achieved it? One way to find out is by completing the following sentence: If I were really smart, talented, qualified, competent, I would ...

If you're like 99 percent of the people who completed this exercise, you just learned something important about yourself. What you learned is that you've been walking around the planet operating by this self-definition of competence that is so excessively high and out of whack with reality that not even a certifiable genius could ever hope to attain it. The other thing you may have learned is that you allow other people way more latitude on the competence scale than you do yourself.

If there is one pervasive and unwavering theme to emerge in the Imposter Syndrome workshops it is this:

> *Imposter Syndrome sufferers, and women, as a group, use exceedingly and unnecessarily high standards by which to gauge our personal competence. In fact, I would argue that the core reason so many women identify with the Imposter Syndrome stems from our propensity to measure our competence based on an unrealistic yardstick.*

So let's take a closer look at this inflated view of competency. Over the past twenty years of working with women on their deep-seated feelings of fraudulence, I've come up with six profiles. These profiles are used to describe self-expectations regarding competence.

- The Perfectionist
- The Natural Genius
- The Expert
- The Rugged Individualist
- The Extremist

Most people identify more strongly with one profile over another. Do not be alarmed however, if you identify with more than one. It just means you have to do a little more myth smashing.

The Perfectionist

"Perfection," observed French Romantic poet and playwright Alfred De Musset, "does not exist. To understand this, is the triumph of human intelligence; to expect to possess it, is the most dangerous kind of madness." In the perfectionist's personal rule book, anything short of a flawless performance 100 percent of the time – is unacceptable. She expects each and every aspect of her work to be exemplary. Here, the internal dialogue goes something like this: "If I were really competent, I would do everything perfectly."

There's a difference between a healthy will to excel and perfectionism. Most people want to do a good job. Those who strive to merely excel

however, recognize that while there are areas where perfectionism is highly desirable – for example, while performing surgery or piloting an airplane – not everything requires undue effort.

Contrary to what you tell yourself, perfectionism isn't about doing a superb job. In her book *Work Less, Make More* Jennifer White observes that, "Perfectionism has nothing to do with getting it right. It has nothing to do with having high standards." Instead, she states that, "Perfectionism is a refusal to let yourself move ahead." Think about that line for a minute ... *Perfectionism is a refusal to let yourself move ahead.*

Unlearning perfectionism doesn't mean you have to let go of your need for excellence. Prolific author and consultant Bob Bly makes the distinction this way:

> *Strive to be excellent but not perfect. Customers do not have the time or budget for perfection; for most projects, getting 95 to 98 percent of the way to perfection is good enough. That doesn't mean you deliberately make errors or give less than your best. It means you stop polishing and fiddling with the job when it looks good to you – and you don't agonize over the fact you're not spending another hundred hours on it. Create it, check it, then let it go.*

So as you think about launching your consulting practice, remember, says Cameron Foote "Clients are looking for good, not great."

The Natural Genius

The Natural Genius believes that true competence, ability, intelligence, and achievement are innate and effortless. If your achievement is hard won, it doesn't count. The internal dialog of the Natural Genius sounds something like this: "If I were really competent, I would just know how to do things. If I were really competent, I would get everything automatically. If I were really competent, everything would just naturally bubble up to the surface of my brain on an as needed basis ... a bevy of brilliant ideas, the exact right words at the exact right time, the correct answer ..."

If you identify with the Natural Genius, you are probably of two minds about competence. On the one hand you equate competence with ease. On the other hand though, when something *does* come easily to you, it often gets dismissed as "no big deal." So when you respond to a compliment with, "It was nothing" what you really mean is that your own natural skills, talents, or abilities are nothing. After all, you think, "if I can do it, anybody can." We're not just talking false modesty here. Instead the things that "just come naturally" to you frequently don't register very well on the competence scale.

Clearly, some people do have natural talent. But even the most gifted person will fail if they're unwilling to put in the effort. "We tend to assume,"

wrote human potential pioneer George Leonard, "that mastery requires a special ticket available only to those born with exceptional abilities. But mastery isn't reserved for the super talented or even those who are fortunate enough to have gotten an early start. It's available to anyone who is willing to get on the path and stay on it – regardless of age, sex or previous experience."

If you identify with the Natural Genius, you may take comfort in the words of Michelangelo who said, "If people knew how hard I work to get my mastery, it wouldn't seem wonderful after all."

The Expert

The Expert is someone who erroneously believes that competence and expertise are synonymous. "If I were really competent, intelligent, qualified . . . " thinks the Expert, "I would know this." If you've ever read a job description and disqualified yourself because you didn't have one or two out of the dozen or so competencies listed, you may be suffering from the Expert Trap.

The Expert believes they need to know 150 percent in order to consider themselves even remotely qualified. In the vast majority of fields, however, it's probably okay if you know more like 40 percent. The other 60 percent, you can pick up as you go along.

The problem for people who fall into the Expert trap is that they suffer under the misconception that there's some clear line of demarcation between expert and non-expert – and that they'll actually *know* when they've reached it. "If I can just get enough knowledge, experience, or training," thinks the Expert, "*then* I'll be competent." The reality is though, that you can never know "enough." When it comes to knowledge, there is no end. You can *add* to your understanding of a subject but there is always more to learn.

Certainly there are people – you may well be one of them – who are experts in their respective field. Expertise in and of itself is not a myth. The myth is that being an expert means you know everything there possibly is to know about a subject. The myth is in the belief that you will someday be able to announce triumphantly that you have reached the end of knowledge and are "done." The myth is that if you don't know everything, you must not be competent. The myth is in that little voice inside that says, "If I were really smart, I would know this or know how to do that."

Like perfectionism, striving to be the expert can slow you down or, in some cases, bring your goals to a screeching halt. When you insist on expertise there will always be one more book to read, one more class to take, one more presentation to make, one more book to write, one more degree to earn before you dare pronounce yourself "qualified." This quest for the end of knowledge is an unreachable mirage.

If you're beating yourself up, holding yourself back, or otherwise suffering from the Expert myth it may help to remember the words of the great Will Rogers who said, "Everyone is ignorant, only on different subjects."

The Rugged Individualist

If you are a Rugged Individualist, then you labor – and I do mean *labor* – under the misguided notion that achievement is a purely solo endeavor. Because you think competence means doing everything yourself, in your mind any kind of outside help essentially neutralizes your contribution. In other words, if it was a team or other collaborative effort, if you got the job because someone put in a good word for you, if you received some form of input, advice, or counsel, then somehow that achievement just doesn't count.

The Rugged Individualist's go-it-alone mindset may stem from a certain mystique about competence that Imposter Syndrome sufferers hold. This mystique can lead us to idealize people who occupy so-called "competent positions." "We just embellish these people with all kinds of things that they don't actually have," said one management consultant, "they're smarter than we are, more astute than we are, everything more."

The fact is, competence is not knowing how to do everything yourself. Instead *competence is knowing how to identify the resources required to get the job done.* Resources come in many forms. Time, money, access to decision makers, advice, expertise, information or power, training, support, and technology.

What resources do you need to achieve your goal of becoming a paid consultant? Instead of thinking, "If I were really smart, I could do this myself," try thinking, "I may not know how to do this but I'm smart enough to find something or someone to help me."

History is a great place to find role models offering healthy scripts of competent people who are smart enough to take advantage of the resources around them. For example, Woodrow Wilson once said, "I use not only all the brains I have but all I can borrow." According to Albert Einstein, "The secret to creativity is knowing how to hide your sources." And, Dale Carnegie unabashedly informed the world that, "The ideas I stand for are not mine. I borrowed them from Socrates. I swiped them from Chesterfield. I stole them from Jesus. And I put them in a book."

The Extremist

The Extremist sees himself as constantly teetering on outer extremes of a very skewed competence continuum. In the Extremist's world, there is no middle ground. Competence is a black and white thing. The Extremist views competence from one of two continuums – incredibly bright or enormously dumb. In the Extremist's world, "If I'm not brilliant, I must be

stupid. If I don't know everything then I know nothing. If I'm not totally competent then I'm utterly incompetent."

It's easy to fall into the Extremist trap. After all, you really *do* know what it's like to feel utterly brilliant. Think about it. You've undoubtedly had days – or at least moments – when, despite all the self-doubt – everything just clicked. The great ideas were coming fast and furious. You knew all the answers. The right words seemed to just flow from your lips. Everything you touched turned to gold. When you're "on" like this, a part of you smiles and thinks, "Hey, I'm a hot dog!"

The problem is like every other person on the planet you've also spent a fair amount of time on the flip side of competence when not a single brain cell would fire. You couldn't think to save your life. Everything came out wrong. You were running on intellectual empty.

And herein lays the problem. You *know* what it feels like to be operating on all cylinders. So by your Extremist logic system, if you're not totally brilliant all of the time, then you must be stupid. If it's not perfect, it must be awful.

In reality though most people – even the very intelligent and talented ones – spend most of their waking hours right in the middle of the brilliant-stupid competency scale ... and feel perfectly fine about it. The trick for Extremists is to savor those delightful "I'm a hot dog" highs and forgive those inevitable "Brain closed for the day" lows.

Whether you identify with the Perfectionist, the Natural Genius, the Expert, the Rugged Individualist, or the Extremist, the key is to examine how your misguided notions about competence may be holding you back. Victor Frankl once said, "The last of the human freedoms is to choose one's attitudes." If you're serious about pursing your dream of being a professional consultant you'll need to develop a new realistic definition of competence. Do this and soon you'll see yourself as the bright, capable person you *really* are!

About the author

Dr. Valerie Young is an internationally known workshop leader and public speaker. She specializes in helping individuals achieve their full potential. She has presented her How to Feel As Bright and Capable As Everyone Seems to Think You Are (formerly titled Overcoming the Imposter Syndrome) program at numerous colleges and universities including MIT, Stanford, Cornell, California Institute for Technology, Boston University School of Medicine, Rensselaer Polytechnic Institute, Worcester Polytechnic Institute, Amherst College, Mount Holyoke College, Smith College, University of Wisconsin, University of Texas, University of Iowa, Northern Arizona State University, University of New Hampshire, University of Connecticut, University of Colorado, University of Massachusetts, Radcliffe College, and

Texas A&M. To learn more visit http://www.ImposterSyndrome.com

The complete *Imposters, Fakes, and Frauds: A Workshop for Women Who Doubt Their Competence – But Shouldn't* is available for purchase at http://www.ImposterSyndrome.com and http://www.ChangingCourse.com .

Chapter 6

Mentoring support: National and local resources for mentoring

Chair Eve Riskin, University of Washington
Panel Carol Muller, Founder and CEO of MentorNet
Sheila Humphreys, Academic Coordinator for Student Matters, EECS Department, UC Berkeley
Suzanne Brainard, Executive Director, Center for Workforce Development; Affiliate Professor Technical Communication; Affiliate Professor, Women Studies; University of Washington
Candace Rypisi, Director, Caltech Women's Center
Nancy G. Love, Associate Professor, Virginia Tech ADVANCE professor

6.1 Web resources

We here collect for convenience several URLs providing resources relevant to mentoring.

- Faculty for the Future http://www.engr.psu.edu/fff/
- UW faculty recruitment toolkit http://www.washington.edu/admin/eoo/forms/ftk_01.html
- NSF AGEP schools are producing underrepresented Ph.D. students who are interested in the professoriate. This is a good starting place to find faculty candidates. The directory of project directors is at http://www.ehr.nsf.gov/ehr/hrd/hrddirlist.asp#AGEP.

- The National Science Foundation ADVANCE Program
  http://www.nsf.gov/home/crssprgm/advance/
- MentorNet http://www.MentorNet.net
- Building Engineering and Science Talent (BEST)
  http://bestworkforce.org/
- UC Berkeley Programs for Graduate Women
  http://www.eecs.berkeley.edu/Programs/grad/GradWomen/gradwomen.html
- BGESS – African-American grad students at Berkeley
  http://bgess.eecs.berkeley.edu/
- *White Privilege: Unpacking the invisible knapsack* by Peggy McIntosh
  http://www.utoronto.ca/acc/events/peggy1.htm
- University of Washington Center for Workforce Development
  http://www.engr.washington.edu/cwd
- The Global Alliance for Diversifying the Science and Engineering Workforce
  http://www.globalalliancesmet.org
- The University of Washington's ADVANCE Center for Institutional Change National Leadership Workshop
  http://www.engr.washington.edu/advance/workshops/chair-workshop.html
- The UCLA Graduate School Survival Guide
  www.gdnet.ucla.edu/asis/infoserv/survival.pdf
- *How to Get the Mentoring You Want,* the University of Michigan
  www.rackham.umich.edu/StudentInfo/

6.2 Case studies

Many institutions and organizations have developed infrastructures to facilitate finding and working with mentors and for training both mentors and mentees to get full advantage of the relationship. This chapter collects a variety of examples of successful programs, some of which are generally available and some of which provide templates for other institutions to consider. Unlike the other chapters, here the sections closely correspond to specific panel members since these are essentially successful case studies. These include:

- MentorNet, winner of a 2001 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring (PAESMEM)
- The Center for Workforce Development at the University of Washington, winner of a 1998 PAESMEM

- The Electrical Engineering and Computer Science Department at UC Berkeley
- The Caltech Women's Center
- The NSF ADVANCE Program
- The Virginia Tech ADVANCE Program

6.3 MentorNet

Carol Muller

About MentorNet

MentorNet (http:www.MentorNet.net) is a nonprofit organization dedicated to providing national and local resources for mentoring. Its primary service is an E-mentoring network for women in engineering and science.

MentorNet provides an infrastructure for e-mentoring for higher education, industry, government, and nonprofit organizations, and offers a large-scale, multi-institutional online network with an extensive, diverse pool of participants. MentorNet offers the online programmatic and administrative infrastructure, as well as focused expertise to support a high-quality set of programs in collaboration with its partnering organizations, which provide financial resources and channels of communication to reach prospective program participants students and professionals. MentorNet's programs are research-based and regularly evaluated, drawing up research and experience related to the experiences of women students and faculty in engineering and science fields, to mentoring and mentoring programs, and to the use of electronic communications in building productive professional relationships between individuals who may never meet in person.

E-mentoring

Using email as a medium for building and communicating in mentoring relationships has both obvious advantages and drawbacks. Email is easy, comfortable, and accessible for regular computer users, which includes virtually all students in higher education today and professionals in engineering and science fields. Electronic communications transcend geographical distance, allowing people to meet and communicate at length regardless of their location in the world. Because it is an asynchronous technology, email allows users to communicate when convenient to their own personal schedule, without having to coordinate with anyone else's schedule, and without having to schedule a time in advance. Email is generally less expensive than communicating by telephone, and clearly has significant economic advantages over having to travel to meet with someone face-to-face.

Still, email is a very flat medium for communications. It relies primarily on writing and occasional "emoticons" to convey expression, but does not offer the vast array of communications via facial expression, tone of voice, body language, and shared activities. Relying solely on verbal expression can be limiting.

On the other hand, that written expression provides the opportunity for thoughtful, deliberate communication in a way that the immediacy of face-to-face communications sometimes does not. Providing a written record of communication, email allows those communicating to go back and review a record of past communications rarely captured in face-to-face meetings. Writing, too, offers an opportunity for reflective learning, and when a mentor provides feedback on a protégé's expressed thoughts, questions, ideas, and self-reflections, the mentor helps continue to the cycle of reflective learning.

Email also provides a restrictive channel of communication. Rather than competing for a mentor's time and attention after class or a meeting, a protégé knows that when the mentor is reading email, the mentor is giving undivided attention at that particular point in time to the protégé's interests and concerns. As a result, the medium may be particularly helpful for those who are shy, introverted, or marginalized for whatever reason.

A particular advantage of email for mentoring may be that in electronic communications, status differences are much reduced. Whether the person with whom one is communicating speaks with an accent, or is younger, older, shorter, taller, darker, lighter, physically attractive, well-dressed, or not, is not communicated and thus does not influence perceptions. Research shows that until provided with evidence to the contrary most individuals operating in an electronic communications environment tend to assume the individual with whom they are communicating is similar to themselves. Such assumptions help to build relationships at the outset without prejudice based on appearance. Nor need a protégé, for instance, be concerned with what to wear, or be intimidated by the grandeur, elegance, or entourage of

a mentor's setting. Instead, they can go immediately to the topic of their mentoring communications.

Mentoring programs

Mentoring programs represent attempts on the part of organizations to capture the benefits of mentoring for more of the population than is currently gaining benefits from mentoring relationships that develop without such support. As a result, the organization is attempting to replicate a learning process for individuals and in cases where this kind of learning is not developing on its own. Not surprisingly, researchers have found that some structure and program facilitation increases the likelihood of productive mentoring occurring as a result of structured mentoring programs.

The most effective mentoring programs incorporate eight essential elements: appropriate preparation through research and planning, resource development, attention to how participants will be recruited, determination of the bases and processes for matching participants in mentoring relationships, provision of training to assist both mentors and protégés in building effective mentoring relationships, provision of "coaching" or program facilitation which provides ongoing communication for participants with program staff, processes for ending mentoring relationships at appropriate times, and processes for evaluation of both the individual relationships and of the program as a whole.

Despite careful attention to all these elements, it's important to have realistic expectations for results of mentoring relationships. Like those which develop naturally, not all program-created mentoring relationships will succeed and in fact, a higher proportion of them may fail. Not all matches will be successful. What we do know from the research is that relationships are more likely to be successful when both mentor and protégé can early on in their meeting can easily identify common interests, when communications between mentor and protégé occur regularly and frequently, and when they establish a mutually agreed-upon set of objectives and expectations for the relationship. The single biggest reason that any mentoring relationship fails is due to the inability of mentor and protégé to meet due to constraints of time and location.

Because of the requirements for effective mentoring programs, they can be resource-intensive. Initiating a mentoring program without attention to detail and the real time and other resource costs of implementation is likely to lead to frustration on the part of participants, and/or burn-out on the part of those operating the mentoring program.

MentorNet's one-on-one programs

The objective of MentorNet's One-on-One programs is to pair undergraduate and graduate students, postdocs, and early career faculty with appro-

priate engineering or science professionals for eight-month-long, structured, email-based relationships, and to provide training and coaching to enable productive mentorships to develop. MentorNet provides online information and direction for prospective participants. Those interested complete online profiles providing information about both their backgrounds and their preferences in being matched in one-on-one relationships. Algorithms developed by MentorNet sort through the pool of prospective mentors for each protégé and identify the top five which optimizing both parties' choices. Protégés may then opt to have MentorNet match them with the top choice, or may select from among the anonymous profiles of the top five choices. Online mentor and protégé guides provide training, as do interactive online case study training tutorials. Coaching offers customized discussion suggestions sent every 1-2 weeks to each mentor and protégé, coupled with opportunities to consult on an individual basis with MentorNet program staff. These discussion suggestions also serve as helpful reminders to participants to keep their commitment to exchanging email on a weekly basis, and a direct and easy link back to the program staff should any questions or problems arise.

In almost all cases, MentorNet is pairing protégés with mentors who are external to their organization. It's helpful to note some differences between external and internal mentors. The latter can provide very helpful information and advice concerning the specific practices and mores of the local environment. The former frequently has the advantage for the protégé of having no other vested interest in the protégé's success. Internal mentors frequently play other roles as advisers, supervisors, or teachers, for example. Protégés may feel freer to express doubts, concerns, and fears, and explore nontraditional academic and/or career development paths with mentors who are unlikely to inadvertently or intentionally feed such information back to a protégé's supervisor, colleagues, peers, parents, advisers, teachers, etc. Student participants in MentorNet's programs frequently cite the objectivity of their external mentor as one of the primary benefits of the relationship. These mentorships complement the kinds of mentoring students may receive on campus and in person from academic advisers and others, and represent a good example of how having multiple mentors can be beneficial.

Between early 1998, when MentorNet's web site and One-on-One program first became available, and September 28, 2004, 11,794 pairs of mentors and protégés were matched. Though MentorNet's programs are specifically designed with the interests of advancing women in engineering and science in mind, men are welcome to participate, and a growing number do so (e.g. men were 35% of MentorNet mentors; 10% of protégés in 2002–03).

Recently MentorNet has added mentoring for those interested in academic careers with the development of a new program, Academic Career E-Mentoring, in cooperation with the National Science Foundation and WEPAN. The program promotes one-on-one mentoring for academic ca-

reers, matching graduate students and early career (untenured tenure-track) faculty with tenured faculty mentors. During the first year of this program (2003–04), 49 pairs of graduate students and tenured faculty members were matched. In fall of 2004, the program will be extended to match early career faculty with tenured faculty mentors. In this new program's first year, the biggest challenge has been recruiting sufficient tenured faculty members to serve as mentors for all the graduate students who were interested in having such mentors.

MentorNet's population is increasingly multi-cultural and international; graduate students, African-American students, and Hispanic students have indicated especially high levels of value from the One-on-One program. In evaluation findings, 96% of mentors and 94% of students say they would recommend the program to a colleague or friend. Regular online surveys at the end of the 8-month One-on-One e-mentoring relationships provide feedback for evaluation of the programs from the points of view of both mentors and protégés. Self-reported student outcomes include:

- Ongoing encouragement, reassurance, and moral support; boosting confidence (known to be strongly related to retention) (66% emphasized)
- Career information, alternatives, and inspiration; learning about mentor's workplace (45–75% emphasized)
- Academic advice and support; relating studies to workplace (52% emphasized)
- Advice for women, and female role models in engineering and science fields (not quantified but evident through responses to open-ended questions)
- Options for balancing family and work (46% emphasized)

Based on self-reports, outcomes for mentors include:

- Personal satisfaction in helping develop and advance the next generation (74–81% emphasized)
- Making a positive and important difference in the lives of students (not quantified) Impetus for reflections upon own career (69% emphasized)
- Variations by mentors' racial/ethnic backgrounds on outcomes of skills and self-confidence effects.

MentorNet URLs of interest

Participating colleges and universities:
http://www.mentornet.net/Partners/Campuses/currentcampuses.aspx
MentorNet sponsoring organizations:

http://www.mentornet.net/Partners/Sponsors.aspx
MentorNet News:
http://www.mentornet.net/Documents/About/News/
Evaluation reports:
http://www.mentornet.net/Documents/About/results/evaluation/
First person stories of MentorNet participants:
http://www.mentornet.net/Documents/About/experiences/Contest/

6.4 Mentoring: A Berkeley perspective

Sheila Humphreys

In these reflections on mentoring, the emphasis is placed on the mentoring of students by students through the creation of a strong women's graduate community. In the Electrical Engineering and Computer Science Department at Berkeley, the student group Women in Computer Science and Engineering (WICSE) celebrated in 2004 a quarter century of advocacy and activism. WICSE alumnae joined current students in marking this milestone for women. A viable student group of this kind provides peer support, mentoring of students at earlier stages of study, and an important source of input to faculty.

WICSE offers students a framework which is purposefully supported by the EECS Department, with funding, space for meetings, and acknowledgment in departmental governance at the annual Faculty Retreat. WICSE's core activity is a weekly lunch meeting, held year round; once a month the lunch includes undergraduate women. WICSE actively participates in recruiting new women graduate students, and organizes Big Sister mentoring pairs for entering women. Because of its longevity, WICSE has the benefit of a history, and links to former students. An online database of women Ph.D. graduates in CS and EE forms a virtual community for current students, which forges ties to alumnae. The database, which tracks employment, demonstrates to current students that more than one third of the graduates work in academia. "Today Berkeley graduates make up one fifth of the female faculty in the top 15 computer science departments," states Professor Katherine Yelick.

Helping to formulate policies which respond to the needs of students, WICSE students developed and championed a "Parent Policy" a decade ago; the policy which has since been adopted by the UCB campus, allows graduate student parents to curtail their research and extend academic deadlines at critical times after childbirth. The parent policy is a safety net, and humanizes the departmental "climate."

How does the departmental infrastructure support WICSE? A commitment to diversity is essential. Faculty leaders need to recognize the importance of student communities in helping graduate students to flourish. Official recognition of women students' voice, funding to support refreshments,

some staff assistance for logistics, and a sensitivity to issues facing women graduate students are all important. Department leaders must include gender balance in hiring considerations, visiting professorships, colloquia and outreach programs funded by NSF and other federal grants.

The Department benefits greatly from a strong women's community; WICSE contributes substantially to diversity programs initiated by the EECS Department, such as SUPERB, the Summer Undergraduate Program in Engineering Research at Bekeley. SUPERB brings underserved students from all over to Cal for IT research; 36% of our participants have been female since 1990. WICSE members serve as research mentors for these students.

At Cal, WICSE and the EECS Department have been greatly assisted by synergistic efforts with industry. Industry colleagues often provide the push to recruit and train a diverse graduate student body, to sponsor undergraduate research, to enable students to attend conferences, and to learn the range of opportunities after graduation. For example, a large number of WICSE students have been able to attend conferences like the Grace Hopper Celebration of Women in Computing, and the Richard Tapia Celebration of Diversity in Computing because of industrial scholarships for travel. The Intel Foundation and Microsoft have been very supportive.

The Black Graduate Students in Science and Engineering (BGESS), founded in 1987, serves as a minority cohort in science, engineering, and mathematics. Its efforts at building community and research mentoring resulted in the Chancellor's Outstanding Service Award in 2004. BGESS has supported recruiting efforts in several departments. BGESS helped found and is an active participant in SUPERB.

These web sites provide detailed information on the history and activities of WICSE, the women's graduate program in EECS at Berkeley, and BGESS:
http://www.eecs.berkeley.edu/Programs/grad/GradWomen/gradwomen.html
http://www.eecs.berkeley.edu/Programs/grad/Gradwomen/WICSE/wicse25th.htm
http://bgess.berkeley.edu/

6.5 Mentoring at the Center for Workforce Development

Suzanne Gage Brainard

The Center for Workforce Development (CWD)

http://www.engr.washington.edu/cwd manages several different mentoring programs to introduce students to experienced individuals, who act as advisers and role models in their respective fields of interest.

Faculty and Graduate Student mentoring Program

The Faculty and Graduate Mentoring Program's goals are to increase the recruitment and retention of women graduate students. The program provides information through seminars, panel discussions, and advising; dispels myths about graduate school; and provides role models. Some of the events focus on the development of a supportive community, where other events emphasize development of an intellectual community.

The Faculty Graduate Mentoring Program promotes mentoring relationships between female graduate students and faculty members. The program's goals are to:

- Use faculty expertise for the personal and professional development of students,
- Provide female graduate students with personal and career guidance,
- Increase the retention of female graduate students in ADVANCE departments, and
- Prepare students with a realistic perspective of the faculty career path.

Graduate students are paired to faculty members with similar research interests and career paths. A unique aspect of the mentoring program is the training and support provided to the mentoring pairs. In 1998 the Center for Workforce Development/WISE received the Presidential Award for Excellence in Science, Engineering and Mathematics Mentoring for *The Curriculum for Training Mentors and Mentees in Science and Engineering* and its mentoring programs. The entire curriculum is available for purchase as a book from WEPAN, contact wiep@ecn.purdue.edu for an order form. *The Curriculum for Training Mentors and Mentees in Science and Engineering* includes:

- An administrator's guide with a comprehensive curriculum
- Individual handbooks for students, faculty, professional scientists and engineers
- A stand-alone bibliography of resources
- A stand-alone evaluation module
- A video of scenarios depicting mentoring relationships
- A facilitated guide for group discussion

The content is comprehensive and covers a multitude of topics including:

1. Overview
   (a) Purpose
   (b) Need for Training Mentors and Mentees
   (c) A Working Definition of Mentoring
   (d) Content of A Curriculum for Training Mentors and Mentees
   (e) Strategies for Delivering Training
   (f) Determining Your Needs for Training
   (g) Summary
   (h) References
   (i) Forms
2. Conducting Training Sessions
   (a) Introduction
   (b) Resources: Physical and Human
   (c) Delivering Training
   (d) Summary
   (e) References
   (f) Forms
3. Core
   (a) Introduction
   (b) The Mentor and Mentee Handbooks
   (c) The Goals of Mentoring and Training Mentors and Mentees
   (d) Benefits to the Mentors and Mentees
   (e) Responsibilities of Mentors and Mentees
   (f) Expectations
   (g) Guidelines for Mentoring
   (h) Types of Mentoring Relationships
   (i) Mentoring Challenges: Stereotypes, Biases, and Discrimination
   (j) Navigating a Cross-Gender Mentoring Relationship
   (k) Navigating a Cross-Racial Mentoring Relationship
   (l) Potential Pitfalls and Helpful Hints
   (m) Resources: Where and When to Go for Help

   (n) Periodic Assessment by Mentors and Mentees
   (o) Summary
   (p) References
   (q) Forms

4. Complementary Curriculum

   (a) Faculty Mentoring Graduate Students
   (b) Interpersonal Communication
   (c) How to Set-Up a Mentoring Program

5. Evaluation

   (a) Introduction
   (b) Reasons for Evaluating
   (c) Benefits of Evaluation
   (d) Types of Evaluation
   (e) Selecting an External Evaluator
   (f) Administering the Pre-Designed Evaluation Questionnaires
   (g) Summary
   (h) References
   (i) Forms

6. Bibliography

7. Appendices

   (a) Appendix A: Student Mentee Handbook
   (b) Appendix B: Professional Mentor Handbook
   (c) Appendix C: Faculty Mentor Handbook
   (d) Appendix D: Video Guide
   (e) Appendix E: Overheads

8. Video

The curriculum includes a special section on faculty mentoring graduate students. The curriculum is used to help faculty and students develop clear expectations and goals for the mentoring relationship. In addition to the training, the mentoring pairs are invited to workshops and events on academic, professional and personal development.

The CWD approach to mentoring

Mentoring is broader than advising. Advisers tend to focus more on academic progression and less on personal or professional development of their graduate students. Mentoring consists of advising, teaching, counseling and role modeling. Mentors focus on a mentee's achievements, success in school and preparation for the workforce through a one-on-one relationship that is non-threatening and non-judgmental to both parties. It is a relationship that changes over time as each grows, learns, and gains experiences in the relationship.

Relationships with mentors can be the most formative in student lives. Mentors can provide insight on aspects of academic life that course work does not address, including identifying the key players in the field, understanding the politics in academe, finding and evaluating hot research topics, deciding which conferences to submit work to and to attend, and which journals in which to publish.

Challenges in the mentor/student relationship include cross-gender or cross-racial mentoring, unrealistic expectations or excessive time demands, failure to maintain common and professional courtesies, inappropriate matches, and dependent or romantic relationships. People who are interested in mentoring people from different backgrounds are encouraged to read *White Privilege: Unpacking the invisible knapsack* by Peggy McIntosh http://www.utoronto.ca/acc/events/peggy1.htm. Mentoring is not always forever; there are situations where a mentoring relationship should be terminated or changed. There can be a no-fault termination to avoid hard feelings.

A big factor in graduate student attrition is confidence level. So methods to encourage students are important. Undergraduate research can break large groups into small groups and provide mentoring. See the Building Science and Engineering Talent Website at bestworkforce.org. Encourage multiple mentors.

Chemistry graduate student mentoring program

The Chemistry Graduate Student Mentoring Program is a collaboration between the Chemistry Department and CWD. It builds upon the Faculty Graduate Student Mentoring Program.

The goals of the program are to:

- Use faculty and industry expertise for the personal and professional development of chemistry graduate students
- Provide graduate students with personal and career guidance
- Increase the retention of graduate students in Chemistry
- Prepare students with a realistic viewpoint of the career paths in the field of Chemistry.

Nanotechnology Mentoring Program

The Nanotechnology Mentoring program was developed in the fall of 2001 in cooperation with the Center for Nanotechnology and CWD. Its primary objective is to serve the student population through positive social, professional and academic networking, occupational guidance, student retention, informational programs, and providing students with positive role models. In addition, the mentoring program serves a diverse student population including graduate students from nine interdisciplinary fields. Students are encouraged to participate in the multifaceted aspects of the program, which are comprised of the mentor and mentee relationship, industry speakers and department luncheons.

Examples of program events include:

- Nanotechnology Day which includes a panel discussion from industry and academia with current topics of interest, ethics and research projects
- Lunchtime speakers: In collaboration with the Nanotechnology Student Association, invited leaders from industry and academia are invited to speak on selected topics
- Quarterly "Meet and Greet" between mentor and mentee, which serves as a social function that initiates the relationship between the mentoring program participants.

Undergraduate Professional Mentoring Program

The Women in Science and Engineering (WISE) Professional Mentoring program offers undergraduate students the opportunity to develop relationships with professionals in engineering and science fields. In 1998, the program was the recipient of the Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring and is dedicated to facilitating the personal and career development of women in these fields.

The objectives of the program are:

- Match Students with positive role models
- Expand students' horizons
- Network with professional community
- Assist students to make the transition from school to work
- Offer personal and career guidance
- Reinforce academic and professional skills.

The WISE Professional Mentoring program is geared to students who have already decided on their respective science or engineering area of study. These students are matched with a mentor in their field and participate in program events and training workshops. Students and professionals have an opportunity to evaluate the effectiveness of their mentoring relationship annually.

6.6 The Caltech women's center

Candace Rypisi

The mission of the Caltech Women's Center (www.womenscenter.caltech.edu) is to promote the advancement of women in science and engineering. The Women's Center works to supports the central research and educational mission of Caltech, while providing students, postdoctoral scholars, staff, and faculty with opportunities, programs, and services that address gender issues and promote success, equity, and safety.

Research has shown that mentoring:

- increases student retention
- fosters both professional and personal development
- increases morale
- lowers stress
- fosters organizational change.

For women in science mentoring:

- offers women role models that show a career in science is possible
- encourages women to be competitive and take risks when necessary
- provides focused attention in an atmosphere which is often silent or discouraging
- helps increase self-confidence and esteem.

New ways of looking at mentoring

According to Lois Zachary, *The Mentor's Guide*, the old paradigm for mentoring was that it was based on the assumption that the mentor is an "expert" in a field and that the protégé passively learns through what is passed on by the mentor, and the new paradigm is that mentoring is a partnership based on mutual learning, growth, and satisfaction. In the new model mentoring can take on many roles:

counselor acts as a sounding board to help protégés solve problems or issues

coach gives candid feedback, assistance with career, and advice

role model leads by example

advocate/champion listens, helps protégé gain exposure, opens doors

In many cases the old paradigm assumed that all of your mentoring needs could or would be met by one person. Today, experts suggest that we seek out different mentors for different needs.

Needs assessment with students

Undergraduates believe strongly that mentoring is needed, especially in times of transition. They identify their primary needs as academic progress, negotiating campus culture, and gaining leadership skills. They also identified an interest in gaining access and connection to women faculty and women in industry–role models. The ideal mentors are seen as faculty women; someone who understands Caltech culture, and someone they like

Graduate Students feel mentoring is needed and a key part of their academic and professional development. They identify their primary needs as academic progress, career development, work-life balance, and challenges for women in science. They state that faculty women make the best mentors. Their main concern is confidentiality.

Program development

At the Cal Tech Women's Center an effort is made to think about mentoring in a broader, more holistic way and to develop programs that allow for one-to-one mentoring with a more senior person; peer support and community building; career development opportunities; and access to women role models/leaders in science and engineering.

The center taps into other campus resources to "round out" our programs and struggles with the challenges of not enough women faculty and not enough women in certain disciplines to meet the need. The initial program was begun in a small way with an emphasis on personal connection and on the training of mentors and protégés. Several of the projects initiated by the program follow.

Women Mentoring Women program

The women Mentoring Women (WMW) Program matches women postdoctoral scholars with graduate women for a formal, one-to-one mentoring experience. The purpose of the program is to provide support for women graduate students as they negotiate their academic, professional, and personal development and to provide postdoc mentors an opportunity to develop leadership skills and improve communication skills. This program was initiated by the Caltech Postdoc Association in collaboration with several offices. It provides orientations, monthly face to face mentoring meetings, and monthly workshops. It also provides resources in terms of books, articles, and coffee stipends.

JPL Undergraduate Mentoring Program (JUMP)

This collaborative effort between the Women's Center and the Jet Propulsion Lab brings together Caltech women undergraduates and JPL researchers and scientists in order to build a foundation for future collaboration, mentoring, networking, and research opportunities. It provides lab tours, a fall luncheon, and a spring research talk.

MentorNet

Caltech partners with MentorNet to provide its services to our undergraduate and graduate students.

Graduate women's discussion group

This weekly, drop-in, gathering allows graduate women to explore topics pertinent to their academic, professional and personal lives. By sharing their own stories and hearing those of others, this is a great opportunity to tap into the strengths and supportive network of graduate women at Caltech.

Other programs

Several smaller programs in which the Center is involved include the Big Sister Program of the Society of Women Engineers (SWE), the Career Development Leadership Series, and the Project of Effective Teaching.

6.7 The NSF ADVANCE program

Started in 2001, the National Science Foundation ADVANCE program seeks to promote and advance the participation of women in faculty careers in science, engineering, and mathematics (SEM). As of 2004, nearly 20 universities, such as the Universities of Alabama at Birmingham, Michigan, Wisconsin, Rhode Island, Texas at El Paso, and Washington, held ADVANCE Institutional Transformation Awards, to address issues at the institutions to improve the situation for women faculty there. An important goal of many ADVANCE sites is to increase the number of women academic leaders in SEM. The NSF ADVANCE Web site is http://www.nsf.gov/home/crssprgm/advance/. From this link, all of the Web sites for the Institutional Transformation sites can be obtained.

6.8 Advancing women at Virginia Tech through institutional transformation

Nancy G. Love and Tess Wynn

The Virginia Tech ADVANCE Program mission statement is to *Increase the number of women electing to pursue academic careers through empowerment and skill building programs, and by establishing a supportive climate that eliminates barriers to success.*

The ADVANCE Program has three principal goals:

- to achieve sustainability by collaborating with the Graduate School
- to improve the climate for women at Virginia Tech
- to improve skills to achieve productive and healthy mentoring and networking practices.

Collaboration with the Graduate School

Current activities include programs that complement the "Preparing the Future Professoriate" (PFP) curriculum, work-life grants for graduate students, and focus group activities to define program development issues.

> "The university community assumes all graduate students are single. There is little support or recognition for family life issues as they they pertain to graduate students." — Graduate Student Focus Group Participant, May 2004.

Future activities include day care for graduate students with families; a series of speakers from a broad range of college and university settings to talk about academic careers; a conference in 2006 focused on advancing science, technology, engineering and mathematics (STEM) women into academic careers; and formalized programs during graduate student recruitment weekend.

> "I just don't see good examples of female role models. I wonder if I really want to be a professor." — Graduate Student Focus Group Participant, May 2004

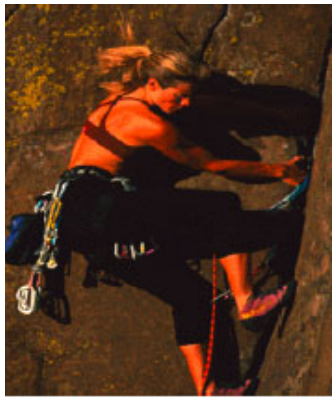
Improving the climate for women at Virginia Tech

Current activities include mentored postdoctoral and graduate student fellowship programs and a grass-roots effort to initiate a post-doctoral Research Associates Network. Future activities include formalization of a Post-Doctoral Research Associates Network and the establishment of a Council on Women that focuses on graduate student/post- doctoral student issues across STEM colleges.

"If you want to inspire postdocs to become faculty members, it would be helpful if some people who are already faculty gave us some insight into the reality of their job and how to succeed."— Postdoctoral Research Associate, April 2004

Improving skills to achieve productive and healthy mentoring and networking practices

Current activities include facilitated networking lunches (peer and across groups). Future activities include skill building workshops for students and post-doctoral research associates and "How to be a mentor" for faculty!



"As a Ph.D. student, I participated in a program attended by women engineering faculty from 13 southeastern universities. It was awesome! That was the day that I first believed that I might actually be capable of succeeding as an engineering faculty member."
— Nancy Love, Associate Professor, Civil and Environmental Engineering, July 30, 2002

Chapter 7

Mentoring for academic leadership

Chair	Mari Ostendorf, University of Washington
Panel	Andrea Lawrence, CS Chair, Spelman University
	David Notkin, CS Chair, University of Washington
	Mark Smith, EE Head, Purdue University
	Kristina Johnson, Dean of Engineering, Duke
	Denice Denton, Dean of Engineering, University of Washington

The goals of this panel were both to encourage younger faculty to consider leadership career paths and to educate more senior faculty about issues in mentoring for leadership, in particular. This chapter thus includes discussion of options for leadership and reasons to consider leadership (or not), as well as mentoring needs and methods, both from the mentor and the mentee perspective. The workshop presentations and discussions fulfilled a dual purpose: first, the speakers were all academic leaders so that the entire workshop received some mentoring on the subject; second, the presentations and discussions provided sound information even for those not themselves interested in leadership roles — they provided good advice to pass on to mentees and colleagues for consideration. It is to everyone's benefit to instill interest in leadership in our best colleagues and students. The future depends on it. Even the older cynics and curmudgeons usually recognize that it is in their interest to lure the most competent, smart, sympathetic, diplomatic, and effective junior and mid-career faculty into paths that will ensure sound and successful future operation of the institution.

7.1 Academic leadership

A small minority of faculty devote significant time to leadership activities in the department, school, and university. Academic leadership can be divided into the three primary types of research, educational, and administrative, with some positions combining two or all three types.

Leadership in research is extremely important and should be on everyone's radar. Three important attributes come to mind: the ability to do good research work; having a vision of what could be accomplished through a strong team effort; and having good interpersonal skills to motivate and bring colleagues together. A research leader seeks out and promotes talent, in addition to facilitating collaboration. Inviting colleagues to work on a proposal can be a good way of stimulating collaboration.

Leadership in education generally receives less attention in our community than it should and in some universities it is not strongly valued in the reward system. Nonetheless, we as faculty have a responsibility for quality education, and education can be scholarly work. Further, there are many opportunities for innovation. The use of high tech classrooms, distance learning, PC simulations and courseware are just a few examples of non-traditional approaches to learning that are currently being explored. Educational symposiums run by professional societies like the ASEE and IEEE provide excellent venues for disseminating innovations in learning. Educational leaders face additional challenges in documentation and assessing performance.

Administrative leadership includes a variety of positions that involve managing groups of various sizes and compositions such as department chairs and associate chairs, academic deans and associate deans, deans of undergraduate and graduate schools, the chair of the faculty senate, directors of research centers, the vice president for research, the provost and associate provosts, and the president. In some cases leadership positions can include multiple universities as with multiuniversity research centers. At most levels, administration typically involves hiring (and sometimes firing), resource allocation, alumni engagement and managing the changing and complex roles of faculty, staff and students. Administrative leadership is critically important because of the impact it has on academic program, faculty, staff, and student body. In many universities, many of these roles are truly full time administrative positions. Thus, when starting down an administrative path, it is worth planning your career stages. It can be difficult to return to a research career if you've been research inactive for 5 or more years.

Irrespective of whether the leadership role is in research, education, administration or some combination, there are responsibilities related to strategic planning, team building, fundraising and budgeting. A key aspect of leadership is vision: seeing and seizing opportunities and planning for long-term growth. A leader identifies and puts in place the foundation

needed for success. People are a vital part of the success of an organization, and hence good leaders must be team builders, both within their organization and with other groups both inside and outside the university. Leaders need to seek recognition for their team, motivate individuals, and get members to take pride in the team. In team building, leaders must also address issues of diversity. Many people think that women and minorities can only be recruited by lowering standards and that there are no women and minorities available to hire. As a leader, you must be prepared to respond to this misperception. For example, consider that Catalyst, a nonprofit organization working to advance women in business, recently found that of 353 Fortune 500 companies, the companies with the highest numbers of women on their top management teams have 35.1% higher return on equity and 34% higher total return to shareholders. Healthy funding is also vital to the success of an organization; hence, all leaders spend a substantial amount of time on fundraising and budgeting.

Two obvious aspects of assuming a leadership role leap to mind when considering a career path that includes administration and leadership. The negative side is the enormous amount of time required, time that must be taken from other professional responsibilities including research and teaching, not to mention family time. Usually the higher the position, the greater the required commitment. Energetic deans sometimes brag how they are actually able to maintain a few students and teach an occasional course in spite of their workload, but presidents are rarely seen in the halls of a department. Another negative is that you often need to be willing to move (change institutions) in order to take on a leadership role. The positive side is precisely the potential for a major impact on many levels, including academic programs, student welfare and success, educational quality and innovation, community and national outreach programs, relations with industry and government, diversity, and quality of life issues.

Often, but not always, participation in leadership begins quite early in a career with the modest responsibilities of leading a small group of peers within a department. A typical path is to move from such initial positions to junior departmental positions such as associate chairs, to chair, to associate dean or dean and so on. But not all paths are so linear. Some faculty find a level they like and stay there; others drop off the leadership path; others move sidewise to directing centers or major university responsibilities; and others get drafted later in their career without low level experience, which can make getting up to steam on budgeting and planning particularly tough. Women, in particular, frequently

take non-traditional routes. For example, none of the first 4 women deans of research universities in the US had previously been department chairs. This multipath entry adds to the difficulty of mentoring for leadership; there is no standard route.

7.2 Choosing Leadership

Leadership is not for everyone, of course. In this section, we explore in more detail various views of both the costs and the rewards of leadership, to help individuals come to a personal decision about whether a leadership role is the right choice for them.

Why refuse to lead?

Most faculty are familiar with all of the shortcomings of going into leadership roles. Junior faculty in particular are justifiably concerned about the possible negative impact on their long term career of getting bogged down in administration. It is easy to list many of the potential drawbacks. Specifically, a list of reasons to refuse leadership positions include:

- It takes away from research and education.
- It is hard to gear back into research and education later on.
- Leadership requires too much politics, both within an organization and outside.
- Leadership usually requires fundraising of some kind.
- Leadership requires a skill set you may not have including managing staff and central budgets.

Research and teaching

The first item is a genuine drawback, at least for most of us — something has to go. Happily not everything has to go; people typically cut back on some aspects and not others. Department chairs and deans often give up most classroom teaching, but keep on with research and graduate advising. Some chairs cut back on research responsibilities and continue teaching. It is usually not difficult to return to teaching after a break, but it can be difficult to start a new pipeline of grad students and write grant proposals from scratch.

Politics

Henry Kissinger was quoted as saying that

> "University politics are vicious precisely because the stakes are so small."

C.P. Snow's *The Masters* provides a fascinating study of just how tortured the politics of a small academic group can be. However, politics arise where there are people, and to be effective one must deal effectively with people, whether in industry or academia. The stakes in academia are not small at all — if one believes that, one shouldn't be an academic.

Raising money

It's a reality that chairs (and deans and others) spend much of their time doing fundraising, but fundraising is not in any way inconsistent with our traditional missions of education, research and service. Indeed, the opposite is true — it provides an opportunity where we must, in a highly effective way, articulate why we do what we do, and this seems to be a wonderful obligation. Universities have a simple pair of goals — produce extraordinary people and fantastic ideas. Our people are students, post-docs, faculty, and staff. We are judged more by the success of the people that leave the university than by those of us who remain here. Our ideas are conveyed in a broad set of ways — by papers, books, company formation, technology transfer, artwork and performances, and many others. Conveying the excitement and the value of our people and our ideas is the core of fundraising — and it's fun! However, it frequently means that there are more demands on evenings and weekends to attend dinners and receptions.

Lack of training

The required skill set for administrative leadership is awesome. It typically involves:

- Budgeting (how do you control it when others are spending it?)
- Planning (how do you make a five year strategic plan?)
- Building consensus and obtaining cooperation (herding cats)
- Hiring (and startup packages)
- Fundraising (alumni, company, community engagement)

Few of us receive genuine training in these skills, but then most of us were never trained to be an educator or mentor either. If you have good staff, you can rely on them to do some (much) of this, and you can learn some on-the-fly, too.

Why lead?

So given all of the shortcomings, why agree to lead? The question is not rhetorical, it has an answer: *to have an impact*. If you have a commitment to the broader community and if you care passionately about it, leadership gives you a chance to have a significant positive and lasting impact on that community.

A leader can make a significant impact on the product of the organization. You can improve the educational and research infrastructure, and thereby improve the products of these efforts. You can foster development of faculty, staff and students to improve the quality of work as well as morale. Improving the quality of education and student mentoring can result in higher student retention and more successful graduates, which is a key factor in how we are judged, as mentioned earlier. Further, the success of their students is a reward in itself for many educators.

As a leader, whether in research or education, there are rewards associated with pioneering a new direction in education and seeing the trend adopted elsewhere. A leader can also be a catalyst for organizational change. If you have something special to bring to your unit including improving diversity, increasing the focus on teaching and learning, developing centers, or increasing interdisciplinary work, leadership provides an opportunity and resources for effecting such changes.

Finally, leadership offers an opportunity for you to grow professionally, providing new experiences and new contacts. In a leadership role, you often see colleagues in a different light, which can lead to adjusting of priorities. Leadership also helps one to develop a greater appreciation for the broader needs of the organization.

Who should lead, and when?

Leadership is not for the faint-hearted. You need lots of energy and passion. You have to be a self-starter and a good juggler. Academic administrators often have multiple roles, as leaders in research or education as well as managers of complex organizations.

It is important to assess impact in making decisions, and a talent for reflection is invaluable. Be responsive and decisive, but don't jump to conclusions. Follow through on commitments. Time management and delegation skills are essential, but choosing what to delegate or give up will depend on the individual.

People skills are a must: people need to know that you care, and you need to establish trust. Forgiveness and acknowledging your own mistakes can go a long way. Good communication skills are also an important part of this, both in terms of keeping people informed, dealing with difficult people, and selling your organization.

In any leadership role, you need to maintain the respect of colleagues

both above and below you. In academia, this means that you need to have a strong track record in teaching and research. It is frequently the case that the best leaders were also excellent teachers.

Other attributes of a good leader include focus, integrity, thick skin (don't take things personally!), and a positive outlook. Leaders need to appreciate that academic roles are changing. For example, more faculty are involved in outside start-up companies or licensing technology, and intellectual property and ethics concerns are now important issues for academic administrators.

Particularly at higher levels, a good leader is usually generous in giving others the credit, understanding that others recognize your leadership contribution. This point is a bit controversial for many women, however, since women don't always get credit for their contributions. For that reason, it is important to make sure that other women, in particular, are promoted and receive credit for their accomplishments.

Other issues to consider relate to timing. Other responsibilities impact the choice to take on a leadership role. In many universities, the department chair is a rotating position, and taking on this role need not mean a career switch away from research. It is relatively easy to move back and forth between some administrative roles and a regular faculty position, but it becomes less so as one moves higher up the ladder in administrative roles. As mentioned earlier, it can be difficult to return to a research career if you've not been active in research for several years.

Is leadership the right career path for you? Prof. Mark's Smith's advice is: "Follow your heart and pursue your dreams." Is the timing right? Prof. Notkin suggests that if you think that someone else could do the job, then maybe now isn't the right time for you to be a leader. You need to feel that you are bringing something special to the organization.

7.3 Mentoring for academic leadership

Finding mentors and training

Many of the skills required for academic administrative leadership must be acquired along the way or on the job. For example, department chairs typically are not trained for things like managing a budget when someone else is spending it; writing a 5-year strategic plan; gaining consensus from a faculty; or fundraising. Leaders need to develop excellent people skills and learn human resources policies and practices. Becoming a good leader is a slow process. Most learn through first serving in assistant or associate positions or by shadowing the person whom they will assist or succeed. Some have the extraordinary good luck to be at an institution which actually has effective leadership programs or workshops for its faculty.

Academic leadership training programs can be very helpful. An example of such a program is the Academic Leadership Program provided

by the Committee on Institutional Cooperation (an academic consortium of the Big Ten universities and the University of Chicago). In the past year, topics in the program agenda included: working with faculty, raises and incentives, sources of funding for higher education, models of university budgeting, budgeting in tough times, facilities planning, demands of changing technology, and the changing role of faculty. Other opportunities are available through professional organizations and some NSF ADVANCE programs. For example, the University of Washington's ADVANCE Center for Institutional Change held a National Leadership Workshop, open to outsiders as well as UW faculty, in July 2004. It covered topics such as "a year in the life of a department chair," leadership skills, leveraging dual career hiring opportunities, family leave and tenure clock extensions, faculty development and recruiting/retention for diversity and excellence.[1] Reading books on leadership can be useful, and mentoring programs also have a role to play here (see below). Other roles may provide opportunities for growth and a broader perspective, for example, Prof. Smith gained valuable administrative experience when serving as special executive to the president at Georgia Tech.

As a leader, particularly if you are a woman or in a minority group, you may find a lack of more senior people to serve as mentors, and we know that having multiple mentors can be quite valuable. Group mentoring programs, described below, provide one mechanism for addressing this problem. Many women in leadership roles also find peer mentoring to be invaluable, i.e. consulting with those in similar positions in other institutions. In addition, you may find yourself in the position of "mentoring up," i.e. educating those above you, such as in issues related to diversity or special needs of your organization. For example, science and engineering education costs are typically higher than liberal arts because of the importance of training students with state-of-the-art software and equipment.

Mentoring others

Mentoring for academic leadership is, in many ways, like other forms of mentoring – the mentor is an adviser, a consultant, a role model and a colleague. At the same time, it is perhaps more difficult than ordinary faculty mentoring. Often the mentor is part of the majority of faculty who have not been an academic leader, and as a result the mentor's view of leadership may differ markedly from the views of those who have had experience with leadership. In mentoring, rewards come when your protégé succeeds, but in leadership roles this can mean that they take on positions of authority over you.

As a mentor, you can help individuals grow into leadership roles by

[1] See http://www.engr.washington.edu/advance/workshops/chair-workshop.html.

identifying service activities that they could be in charge of and providing advice about campus politics. You can also make them aware of any leadership training workshops.

It is generally the case that there are fewer leaders than potential leaders, and leaders can get spread fairly thin serving as mentors. It is sometimes possible to address this problem and have a broader impact on a more diverse group through "group mentoring" activities. Some universities, like the University of Washington, hold workshops specifically aimed at "mass" mentoring for leadership skills in current and future leaders. The workshops bring in internal and national leaders for presentations and lively discussions, and serving lunch adds to the enjoyment and the attendance. These meetings are supplemented by monthly mentoring/networking lunches and lunches specifically for assistant professors. A side benefit of the emphasis on networking is the profound impact it can have on recruiting an excellent faculty. Of course, group mentoring activities should supplement and not be a substitute for individual mentoring, where possible.

While this chapter mostly focuses on mentoring other faculty members, it is important to note that faculty often serve as mentors for undergraduate and graduate students who may be influenced to consider leadership roles outside of academia. There is the potential for impact on society more broadly from this perspective. Government decision making on many issues would benefit from having more engineers and scientists serving in Congress and taking on other leadership roles.

Chapter 8

Women engineering professors with children: some personal perspectives

Chair Pam Cosman, UCSD

Panel Marc Goulden, Principal Analyst, Graduate Division, UC Berkeley
Sangeeta Bhatia, Associate Professor, UCSD Bioengineering
Pamela Cosman, Professor, UCSD Electrical Engineering
Melany Hunt, Professor, Caltech, Mechanical Engineering
Sara Wadia-Fascetti, Associate Professor, Civil and , Environmental Engineering Northeastern University

8.1 Introduction

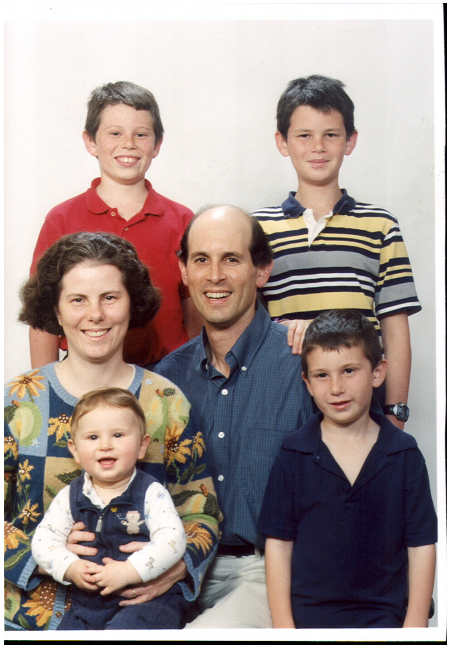
This session was intended to provide some advice, anecdotes, perspectives, and information about combining children with an academic engineering career. Obviously children are of concern to both parents and not just women faculty, but equally obviously the workload is different with childbirth and women historically have borne the brunt of childcare. All but one of the panelists in this session were women, but men participated actively in the discussions.

The first main topic concerns the timing of children– should one have babies during one's graduate student years, during a postdoc, as a faculty member pre-tenure, or should one wait until after tenure? The second main topic concerns strategies for balancing work and family once a baby has arrived.

8.2 Timing of Children

The session began with a presentation by Dr. Marc Goulden, who presented a wealth of data on pipeline issues in academic careers, including how the timing of children impacts academic careers differently for men and for women. Chapter 9 details his presentation. Here, we present the personal anecdotes from the other four speakers in the session.

Personal perspectives on timing babies during an academic career



Prof. Cosman has four children. Benjamin was born in the 4th year of her Ph.D. program, and Rafael was born at the very start of her postdoc year. Technically, Rafael was born when she was still a graduate student; it was the week after she turned in the very final version of her dissertation, and 6 days before she marched in the graduation ceremony. But we can count that as the start of her postdoc. Gilead was born during her years as a faculty member pre-tenure, and Ilan was born after she got tenure.

Having a baby as a graduate student can be a particularly good time to do it, providing that a few things are true. First, your adviser needs to be the type of person who is understanding of the situation, and needs to allow you some flexibility in your work hours for some months, and should be the sort of adviser who will not be upset about a slight dip in your productivity. Of course, this is the sort of adviser you want to work for in any case, regardless of whether you are planning to have a baby or not. For example, there was a case where a male student took a 5-week summer vacation, which had been approved by his adviser. A week after his return, his mother died, and the student took off an additional 5 weeks to spend with his father and siblings. The student therefore had off 10 weeks with pay, and there was a noticeable dip in productivity in the months that followed. The adviser was understanding of the situation, and allowed the time off with pay, and was not upset about the dip in

productivity. So, this sort of adviser is good to have in any case, and not just for pregnant students.

Second, it is hard to have a baby while still taking classes. So if a graduate student wants to have a baby, it might be wise to do it after the required courses are finished. The inflexible hours of lectures and exams can be difficult to reconcile with the unpredictable schedule of a newborn. Even after the baby is a few months old, there may be unpredictable terrible nights of sleep intermingled good nights, as well as health issues that crop up, and other unexpected irregular events. This can often fit in well with doing research (assuming the research is not something that must be done on a fixed daily schedule) but is likely to be harder to fit in with taking classes.

Third, the graduate student mother needs to have the financial resources to pay for child care, which often means having a husband who has a real income, as opposed to a graduate student stipend.

Under these circumstances, having a baby while in grad school can be the best time to do it! The difficulty or ease of having a baby as an untenured faculty member depends largely on the maternity policy of the particular university (see the next section on policies). Having a baby post-tenure can be more stressful than having one during grad school (assuming of course that during grad school one had the right combination of supportive adviser and adequate finances and so forth) but is less stressful than having one pre-tenure. Prof. Cosman's third child was born when she was still untenured, and she had the option of extending the tenure clock by one year. She did not need the extension of time (in fact, she was offered tenure early) but she was pleased to know that the option was there. It was also helpful that the decision to extend or not extend the tenure clock was not one that had to be made when the baby was born. It was possible to wait and see how the research turned out over the next couple of years.

Prof. Bhatia had her daughter after getting tenure. Prof. Wadia-Fascetti also had her two children after she got tenure. For the first one she had a quarter of maternity leave, immediately followed by a quarter of teaching buy-out, immediately followed by summer and a year of planned Sabbatical leave. This was followed by her 2nd child, and therefore another quarter of maternity leave. So this amounted to two full years away from teaching. While it was wonderful to have all that time off, there was some issue of other faculty members being resentful, and it was a little hard to get back into the swing of things. The first quarter back was difficult, but gradually things got better.

Professor Hunt is a professor and Executive Officer for Mechanical Engineering at Caltech; she is married with two children. Caltech is an unusual institution, because it is very small and science-focused with a long history of being an all-male institution. Caltech was founded in 1891 as Throop University, and originally had a grammar and high-school, a business school, a teacher-training program, a college of science and technology, and enrolled female students. In 1907, the trustees decided to narrow the focus of the school to science and technology, eliminating the other programs and the female students, and renaming it Throop Polytechnic Institute (this split plays a role in my story of work-family balance). The school was renamed again in 1920 to California Institute of Technology, which maintained an all-male professorial faculty until 1969. A year later, undergraduate women were admitted to Caltech.

In engineering, the first woman faculty member was hired in 1987; Professor Hunt was the second woman, hired in 1988. At that time, Caltech did not have a maternity program for faculty, and surprisingly she was asked her views on this issue during an early interview. In approximately 1990, the first child was born to a Caltech woman faculty member. Professor Hunt's children were born in 1993 and 1996.

One daughter is a pre-tenure baby, and the other is post-tenure. Both children are happy, healthy, loving and confident, without visible scarring from the tenure process. In comparing the experiences, however, it was much easier to have a child in the post-tenure years, then in the pre-tenure period. Dr. Hunt took an extensive sabbatical plus leave with the second

child, with little break for the first; she was more confident, relaxed, and comfortable with the second child. However, even knowing that it's tough having a child during the pre-tenure process, a woman should not feel discouraged from having a child during this time. The choice of having a child is an extremely personal decision. If you feel that you're at a point in your life when you want to start or expand your family, you should make that decision without putting undue pressure on yourself about tenure. Prof. Hunt found that most of her colleagues either didn't seem to think about her pre-tenure family decision, or else were supportive of her decision to have a child.

University childbearing policies:

There was some discussion during the session on policies for graduate student maternity leaves. On the one hand, there are disadvantages to leaving the matter up to the kindliness of the adviser.

It can be quite a hit to an adviser to require the adviser to pay the stipend of a graduate student during a maternity leave. The adviser pays out the grant support and loses the student's productivity during this time, which might be particularly difficult for the adviser to absorb if he/she is a new assistant professor. There is therefore a strong argument in favor of having a policy which mandates what a graduate student can get (stipend and time off) for a maternity leave, and having some or all of this paid for by the university, rather than having the financial burden fall entirely on the adviser. On the other hand, some advisers are quite generous, and what a graduate student might get unofficially in terms of a maternity leave might be considerably more generous and flexible than a rigid policy would mandate. For example, in one case a student had two weeks off completely, and then came back to work about 3 hours per day, gradually ramping up to 4, 5, 6 and then 8 hours per day over a period of 3 or 4 months. The student received her usual stipend, and this was seen as being in lieu of an annual vacation. The student enjoyed being able to "clear her head" for a few hours a day away from the newborn baby, and she had the advantage of not completely losing touch with her research, which might have happened with a conven-

tional maternity leave. In industry, it is typical for a woman to have 6 or 8 weeks off for maternity leave, and then to come back full time. This type of "step function" is often much harder for the mother to handle physically and emotionally than a "ramp function" and it may mean less overall productivity from the company's point of view also, since the employee can completely lose touch with her prior work, another employee may have to be re-deployed to cover the missing worker, etc. The flexibility of the "ramp function" is something that is often well suited to graduate student life, and to academic life in general. So this is a strong argument for leaving this matter as a gray area, and not imposing a rigid policy formula which might well involve a "step function" approach to the graduate student's work.

At the faculty level, the ease of having a child depends heavily on the maternity policy. As a typical case, one school allowed a one-quarter relief from teaching, as well as a one-year extension on the tenure clock. For many people, the dip in productivity that comes from having a baby does not amount to, say, a reduction by one full year of work over the course of 5 years. So having a baby together with a one-year extension on the tenure clock may actually represent a genuine increase in the hours spent advancing one's case for tenure. A recent change in the policy at the UC schools means that the default position is no longer that the woman faculty member must request the year extension. Rather, the tenure clock will be automatically extended by a year, and the woman faculty member can request that the tenure limit revert back to its original shorter value. This means that the onus is no longer on the woman to request the extension, and the perception has changed of what is the "normal" thing to do.

There was some discussion during the session about a paternity policy. At the UC schools, male faculty as well as female faculty can request the "active service/modified duties" status that can be in the quarter when a child is born or adopted. This means they will get one quarter off from teaching as well. Very few male faculty request this type of paternity leave. It is not known how many male faculty members abuse this policy (for example, by using the quarter off to go to conferences and on a national seminar tour, while their non-university non-working wife takes care of the child) but Dr. Goulden felt the number was quite small.

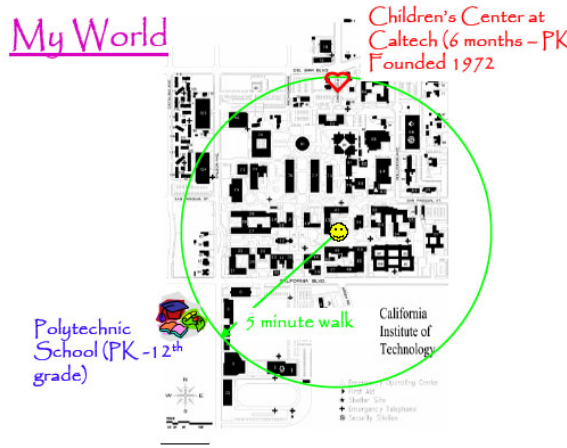
8.3 Strategies for managing work/life after having kids

It was interesting to note the contradictions in perspectives on the work/family balance among the different speakers. There is not one single equation for success in these sorts of situations. What works best for one professor/mother depends on individual factors of personality, family constraints, work constraints and so forth. Here we present an amalgamation of the different points of view and pieces of advice.

Strategies at home

Child care:

Some of the speakers have nannies who come in to the house to take care of the children. Others have relied instead on a day care or pre-school situation during the pre-school years.



Prof. Hunt feels fortunate that her children have been cared for and educated within a five minute walk of her office. Caltech has an on-site day care center (started in 1972 and founded by a group of faculty wives and Caltech staff members), which enrolls children from 6 months to 5 years of age. While her girls were young, she was very active in the Children's Center at Caltech serving on the board for a total 4 years with 3 years as the president. It is a high-quality program; it was a terrific resource during the early years.

Her children now attend Polytechnic School, which is near the southwestern corner of campus. This school was started as the spin-off from the Throop Polytechnic years. It is a private independent school with children from pre-kindergarten through 12th grade. Her children have enjoyed their years at Poly, and she is able to easily run over for the occasional class play, skinned knee, choir performance, student-teacher conference, etc.

Most of the speakers made similar comments about the flexibility of academic life. Academic jobs offer flexibility that you can't find in many other professions. This flexibility is a great asset in child rearing. Certain commitments such as lectures and office hours cannot be switched around freely, but other time during the day is spent doing research, or meeting with individual graduate students, where there is tremendous flexibility in the scheduling. This has the advantage of allowing faculty parents to attend events at their children's school or pre-school relatively easily, more easily than most women in industry would find it.

Prof. Cosman has a nanny/housekeeper who comes in to her home each work day. This has the advantage that the nanny can wash the dishes and

do the laundry while the 1-year-old is sleeping. Prof. Cosman feels it is an enormous benefit to have the housework done, so she can devote her home time to being with the children.

A Typical Teaching Day

Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
Home	Teach	Research	Teach	Research	Home	Home

5:30 - 7:30 am	Wake up, books, play, Bob the Builder
7:30 - 8:30 am	Getting dressed, breakfast
8:30 - 9:00 am	Getting out the door
9:00 - 9:30 am	2 Drop offs
10:15 am	In office
11am - noon	Office hours - sneak in graduate student meetings
noon - 1:15 pm	Course prep, misc
1:35 - 3:30 pm	Class and follow-up questions
3:30 - 5:30 pm	Meetings, misc.
6:00 - 8:00 pm	Play, Dinner
8:00 - 9:00 pm	Bed time
9:00 - 11:00 + pm	Catch up, relax, writing

Prof. Wadia-Fascetti commented on the importance of reliability in child care, and of always having a back-up plan in case the main plan falls through. Part of Prof. Cosman's back-up plan is to never teach a class earlier than 10:00 in the morning. In case one wakes up in the morning to find that the nanny is sick, and can't come to work (happens less than once per year), one needs a bit of time to react, and to activate plan B, and with teaching an 8 AM class there would be no time to react.

Give up on some things:

When people talk about whether it is possible to "do it all" the answer depends on what you mean by "all" . If what you mean by "all" is having an exciting, intellectually stimulating career, and also having a loving family with which one can enjoy plenty of time, then the answer is yes, it is possible to have it all. But the answer is NO if the "all" means the above two items, plus also the following: (a) having a house which is at all times ready to be photographed inside and out for *Architectural Digest*, (b) keeping up with all your pre-children hobbies of bonsai-cultivation, ballroom dancing, rock climbing, and tae kwon do, (c) spending lots of quality time alone with

your spouse, and (d) throwing dinner parties and entertaining your friends regularly with haute cuisine and decorations that would teach Martha a thing or two. In short, having kids and a career will be about all that can be done, and (a),(b),(c), and (d) will largely have to go by the wayside.

In essence, this is a matter of redefining one's priorities at home, after the arrival of a child. As discussed below, the same kind of redefining priorities takes place at work as well, after a child is born. Professor Bhatia commented that before having a baby, her priorities at home (that is, everything not pertaining to work) were her marriage, taking care of herself, her house, extended family, and friends. After having a baby, the baby became the number one priority, while the house and the friends became tremendously reduced in importance.

Professor Cosman concurred with this sentiment, giving examples such as postponing a car wash (car washes are never needed, because it rains in December) and ignoring the spots in the carpet (carpet spots should be literally beneath one's notice).

Shared responsibilities:

Whenever possible, find ways of sharing the jobs that need to be done. Professor Hunt commented that she drives a big mini-van and carries a big purse, neither of which she would do if she didn't have children. They are symbolic of the types of choices that we make. Although she doesn't need the minivan just for her own two kids, she believes in carpooling and is happy to drive other children because she knows that her children may be in need of a ride in the near future. The big purse is the family carry-all.

In a similar vein, Professor Cosman commented that she issues almost all of her dinner invitations as potluck dinners. While this may not be considered the height of elegance by some, it allows her to enjoy lots of social time with friends and family, without having to leave work early to get the cooking done, or having to stay up to midnight the night before. In any case, guests are going to feel bound to bring something, and better that they should bring something useful instead of a box of chocolates or a bottle of wine.

Time for self and spouse:

Everyone agreed that it was important to maintain some time for yourself (for example, having time for exercise) and for your spouse (occasionally going out on dates). As Dr. Goulden's data on faculty divorce rates showed, academic life can put a lot of stress on a marriage, and it is important to go out with one's spouse! Professor Wadia-Fascetti said she tries to have regular Friday nights out with her husband. Professor Cosman wishes she could have regular date nights! But even just putting the toddler in the stroller and walking around the block with her husband can feel like a nice micro-date.

Strategies at work:

A number of topics were discussed about work, including re-ordering one's priorities at work after the arrival of a baby, travel, off-loading responsibilities, and planning.

New prioritization:

After having a child, all the speakers agreed that priorities at work got re-examined. For example, Professor Bhatia had a pre-baby list of priorities that began with Research (funding, managing a lab, publishing), next had Teaching (writing books, classroom teaching, and Web-based materials), and then Service (at the department, university, and national levels). After having a baby, the tasks of managing a lab, as well as all components of teaching and service were reduced in importance. Only publishing and maintaining funding were still considered of prime importance.

Travel:

All the speakers addressed the difficulties of travel. There was huge variation in opinion. Professor Hunt said she traveled extensively, and thought that it was important professionally to do so. Frequently she would cut down on the number of days of travel, however, going to just one or two days of a conference, rather than attending the full conference. The opinion of several people was that professional networking is valuable, and presenting seminars at other universities is a very useful way of building visibility and making connections with people who will write tenure letters. Professor Bhatia said that she made typically one overnight trip per month, usually 3 days with 2 nights. In addition she would make some trips that did not include overnights. At the opposite extreme, Professor Cosman said she made only one professional trip each year, and in fact had no travel at all in some years. She did not think it was particularly important professionally to go to conferences or to present seminars at other universities. Students can be sent to conferences, and in that way the research will still

gain visibility. The students are always happy to go, since that way they can travel a bit, as well as getting some visibility for themselves. One thing most speakers agreed on was the need for planning trips in advance, and the need for careful coordination with one's spouse.

Several speakers commented on the fact that an academic job allows for plenty of family travel. Because the university schedule is well lined up with children's school schedules, most faculty members can take 2–3 weeks of summer travel with the kids, as well as a week during winter break, and various smaller trips at other times.

Delegation:

It's tremendously helpful if one can delegate some jobs to a competent lab manager or administrative assistant. Most faculty members have assistants who do copying for classes, handle travel arrangements and reimbursements, and purchase office supplies at the bookstore. But sometimes assistants are under-used, and with a little thought, one can often find various additional ways in which they can help out: designing the faculty member's Web site, getting books from the library, downloading papers off the Web, making handsome electronic drawings of circuit diagrams for the exams, etc. For those faculty members who maintain laboratories or computers, investing money in competent help such as computer system administrators or lab managers can be a very wise choice.

Planning and anticipating:

Some people commented on the need for advance planning, and never leaving things for the last minute. For example, some male faculty members might prepare their lectures in the few hours before they actually give the lecture. For a woman faculty member with children, that might be a risky thing to do. Suppose the child wakes up sick, and has to be taken to the doctor? Even if one has a nanny, the nanny cannot take the child to the doctor. Or suppose the nanny is sick, and doesn't show up, and some back-up child care plan needs to be activated involving a grandparent or friend. The lecture preparation time vanishes. So, things always need to be done in advance, because the faculty Mom knows she can't count on the hours to be there necessarily on any particular morning, unless of course the father is the first line of defense against unexpected events of this type.

8.4 Conclusions

The rewards of an academic life are many: the job is intellectually stimulating, and you work on a problem you love. It's flexible and customizable, and you have the self-determination that comes from having no boss, and from choosing what you work on. You have the satisfaction of knowing

that you are contributing to the knowledge of the human race, and you are training the next generation of scientists and inventors.

From the point of view of having children, the rewards of being a professor and Mom are also numerous. The work week and work day are flexible, so you can go to school performances and sports events and parent-teacher conferences, without having to punch a time clock, and in fact without having to notify anyone that you are leaving, and without having to account for your time to anyone. The children are exposed to all sorts of fascinating intellectual topics from an early age; they learn to appreciate the questions and the approach to answers that a mind devoted to the pursuit of new knowledge produces. Also the children of engineering faculty Moms do not grow up with some of the stereotypical notions of women that other segments of the population may have, e.g., that girls can't do math, and that a woman's place is in the home.

Prof. Cosman said that her boys love math and science, and they consider it a treat when she teaches them some topic in electrical engineering. When the boys talk about sending secret coded messages to their friends at school, they know whereof they speak (ciphers, error control coding, encryption, etc.) Prof. Wadia-Fascetti gave her opinion on academia as "Let it all bounce off because it's the best job in the world and it's worth it!" And Prof. Hunt's youngest daughter wrote a Mother's Day card in which she described the things her Mom does: "Mom works, reads, swims, makes lasagna, drinks Diet Coke, and loves me and my family."

Chapter 9

Do babies matter: redefining gender equity in the academy

Authors Marc Goulden (speaker), Mary Ann Mason, Nick Wolfinger

In the last four decades, women have made impressive strides in achieving equity in the academy. In 1966 (NCES), women comprised just 43% of baccalaureate degree recipients; 34% of Master's degree recipients; and a mere 12% of doctoral degree recipients (among U.S. citizens). Most recently, women comprised a remarkable 57% of all baccalaureate degree recipients (2001), 59% of master's degree recipients (2001); and 51% of doctoral degree recipients (U.S. citizens only, 2002). Feminists of earlier generations deserve a great deal of credit for ushering in this age of greater access for women. In contrast to this clear pattern of increasing feminization among U.S. degree recipients, the degree to which the professoriate has feminized is less impressive. Women are now well represented among non-tenure-track faculty (perhaps a dubious mark of glory) at 49%, and are fairly well represented among pre-tenure faculty, at 45% of assistant professors on the tenure-track. But women remain a mere 26% of tenured faculty in the United States (NCES 1999).

The realization that women PhDs might be hitting some sort of barrier in their pursuit of tenure or may be leaking out the pipeline at disproportionately higher rates than men led us to the formation of our current research effort, referred to as the "Do Babies Matter?" project (Mason and Goulden 2002).

[1] Much of the text that follows will be included in a revised form in an essay that will be included in an upcoming three volume Jossey-Bass series on Women in Higher Education.

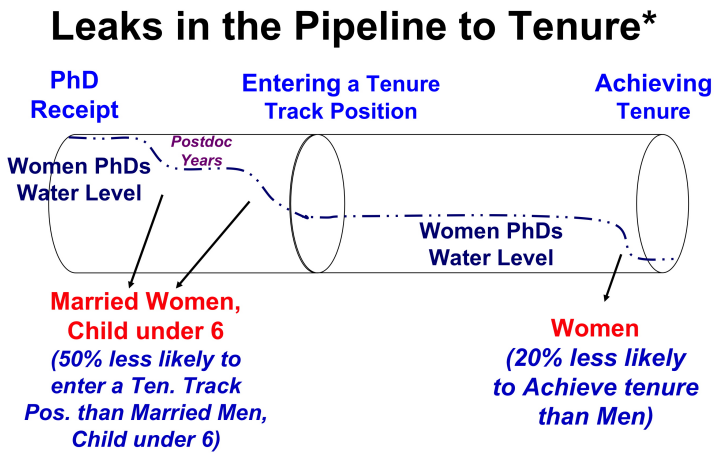
9.1 Survey of doctorate recipients

We knew that we could use data from the Survey of Doctorate Recipients (SDR), arguably one of the best employment datasets in the country, to test whether women and men progressed at different rates to tenure and whether issues of family formation affect these career patterns. Starting in 1973, the National Science Foundation (NSF), National Institute of Health (NIH), and other governmental agencies began to interview roughly a 10% subsample of all U.S. PhD recipients in the sciences and social sciences regarding their post-degree employment experiences (NSF 1995, 1999). The SDR's population is drawn from the Survey of Earned Doctorates (SED), a yearly census of U.S. PhD recipients, and is designed to be representative of all PhDs from U.S. institutions currently residing in the U.S. and under the age of 76. For each two years after the first SDR survey, 1975 to the present, NSF resurveyed all individuals previously included in the SDR and added a new sample of individuals who had received PhDs since the preceding SDR interview. In 1977, the National Endowment of Humanities (NEH) began to survey doctorates in the humanities with a similar instrument and continued to do so until 1995 when they dropped the survey for fiscal reasons. To date, more than 160,000 individuals have participated in this nationally representative survey.

9.2 Leaks in the pipeline to tenure

In the last three years, we have undertaken extensive analysis of SDR data regarding the effect of family formation on men's and women's rates of academic progression and have been able to pinpoint more closely when women leak out of the pipeline to tenure (Mason and Goulden 2002; Wolfinger, Mason, and Goulden 2004). Using discrete-event analysis (Allison 1995) and controlling for broad disciplinary field, age at PhD, prestige of PhD program (National Research Council program rankings), time-to-PhD degree, calendar year of PhD, and ethnicity, we conducted two separate assessments: the effect of gender and family formation on the year-to-year likelihood of (1) men and women PhDs entering a tenure-track position after the PhD and (2) tenure-track men and women achieving tenure. Based on these two analyses, we found that family patterns had a strong effect on the probability of women entering a tenure-track position, but family patterns had no clear independent effect on determining whether tenure-track faculty eventually achieve tenure. Rather, all tenure-track women were less likely eventually to achieve tenure than were tenure-track men.

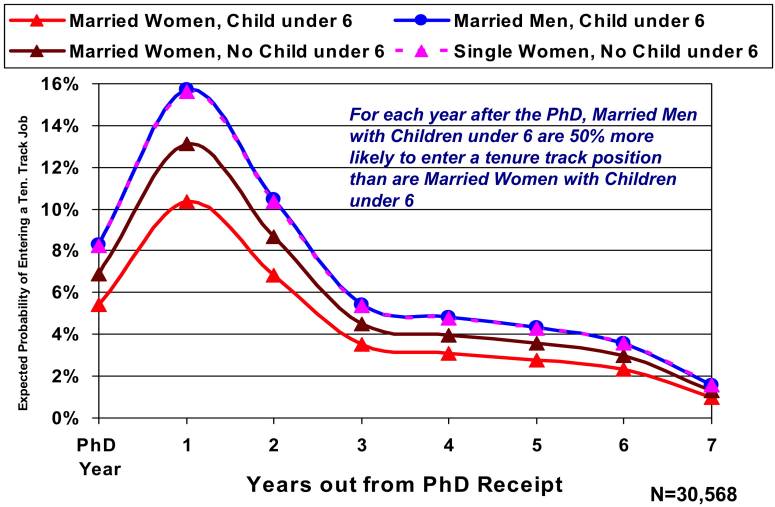
By converting the findings from these two regression models (Wolfinger, Mason, Goulden 2004) to expected probabilities for each of the possible career outcomes, tenure-track entry and the achievement of tenure, the extent of problems in the pipeline to tenure for women, particularly ones with



*Results are based on discrete-time event history analysis of the *Survey of Doctorate Recipients* (a national biennial longitudinal data set funded by the National Science Foundation and others, 1979 to 1995) in the Sciences, Social Sciences, and Humanities. The analysis takes into account broad disciplinary differences, age, ethnicity, PhD calendar year, time-to-PhD degree, and National Research Council academic reputation rankings of PhD program effects. For each event (PhD to TT job procurement, or TT job to Tenure), data is limited to a maximum of 16 years. The waterline is an artistic rendering of the statistical effects of family and gender. Note: The use of NSF Data does not imply the endorsement of research methods or conclusions contained in this report.

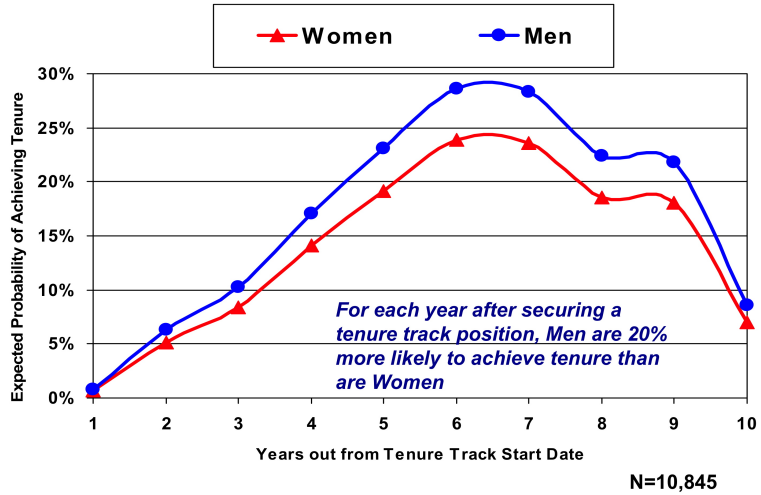
family-related concerns, became clear. The figure shows the year-by-year expected probability of different gender-family groups entering a tenure-track position. In the first year out from the PhD, the high water mark of tenure-track job entry, 16% of married men with children under 6 and 16% of single women without children under 6 are expected to enter a tenure-track position. In contrast, only 13% of married women without children under 6 and a paltry 10% of married women with children under 6 are predicted to do so. Thus, married men with children under 6 are 50% more likely than married women with children under 6 to join the ranks of tenure-track faculty in the first year out from the PhD; this increased likelihood holds steady for all years after receipt of the PhD. Because single women without children under 6 do as well as married men with children under 6, family formation completely explains why women are overall less likely than men to enter tenure-track positions (Wolfinger, Mason, and Goulden 2004). The message is clear: for women, babies and marriage, particularly in combination, dramatically decrease their likelihood of entering a tenure-track faculty position.

Leaks in the Pipeline: PhD to Tenure Track Position



Source: Survey of Doctorate Recipients, Sciences and Humanities, 1981 to 1995.
Note: The use of NSF data does not imply NSF endorsement of research methods or conclusions contained in this report.

Leaks in the Pipeline: Tenure Track to Tenure



Source: Survey of Doctorate Recipients, Sciences and Humanities, 1981 to 1995.
Note: The use of NSF data does not imply NSF endorsement of research methods or conclusions contained in this report.

9.3 Leaks in the pipeline: tenure-track to tenure

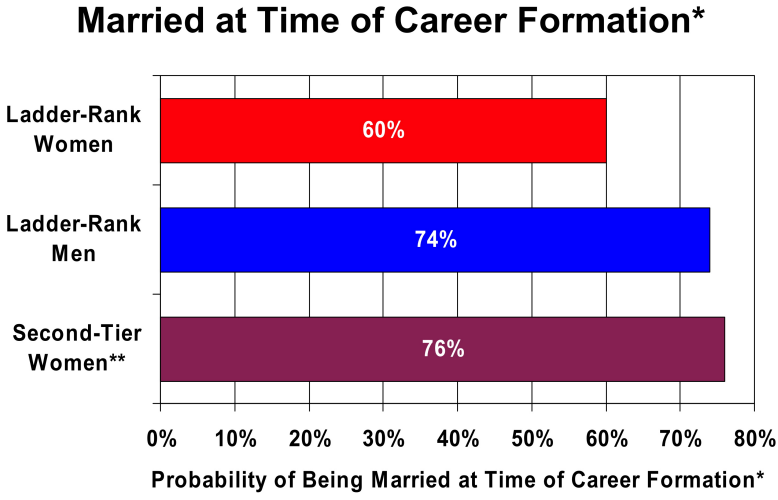
Once women enter a tenure-track position, family effects alone no longer explain their decreased likelihood of continuing on in the pipeline to tenure. Rather, tenure-track women regardless of family status are less likely than tenure-track men to eventually become tenured. On a year to year basis, men are 20% more likely to achieve tenure than are women. We do not know why this is true, but theorize that other factors such as discrimination may be at work (e.g. Valian 1998). From a pipeline/resource related issue, this second leak for women, the tenure-track to tenure leak, is troubling, but the first leak is even more worrisome because it is earlier in the pipeline and thus has a compounding effect. Achieving tenure is obviously preconditioned on entering a tenure-track faculty position and thus married women, particularly ones with young children, are lost to the professoriate within a first few years after the receipt of the PhD.

9.4 Family status at time of career formation and family formation after time of career formation

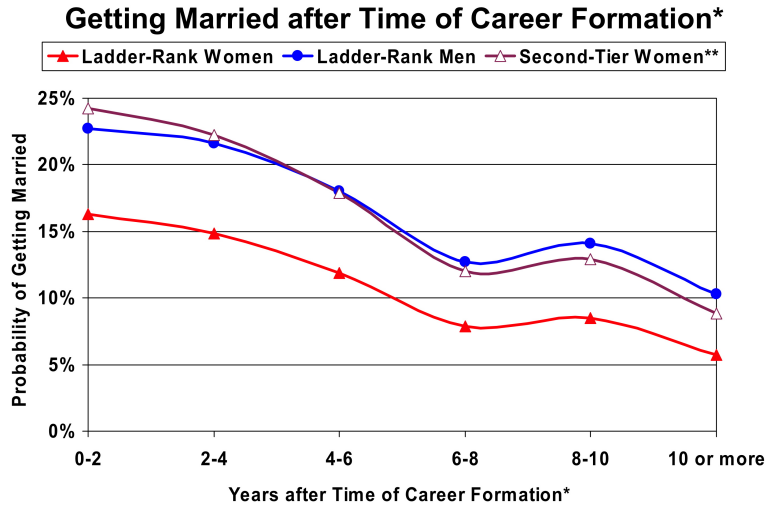
The preceding discussion on the effects of family patterns on the academic careers of men and women PhDs raises an obvious question: Should women PhDs delay marriage and fertility until after they have secured a ladder-rank faculty position so as to maximize their likelihood of enjoying both a robust career and family life? Using data from the SDR and a second data source, the University of California Work and Family survey (Mason, Stacy, and Goulden 2004), we have recently examined precisely this issue.

Our analysis of data from the SDR demonstrates that ladder-rank faculty careers have significantly different effects on the family patterns of men and women PhDs (Mason and Goulden 2004). To begin with, when controlling for major disciplinary field, age at PhD, prestige of doctoral program, time-to-degree, and ethnicity, ladder-rank faculty women are much less likely to be married or to have a child under 6 in the household at time of career formation –within three years post-PhD– than are ladder-rank faculty men or second-tier' women (women working in non-tenure-track faculty positions or part-time positions within or outside academia or not working). Moreover, as their careers progress, single ladder-rank women are significantly less likely than are single ladder-rank men and single second-tier women to get married.

Following the same pattern of lowered rates of family formation, ladder-rank women without children under 6 are much less likely than are ladder-rank men and second-tier women to have child under 6 enter the household

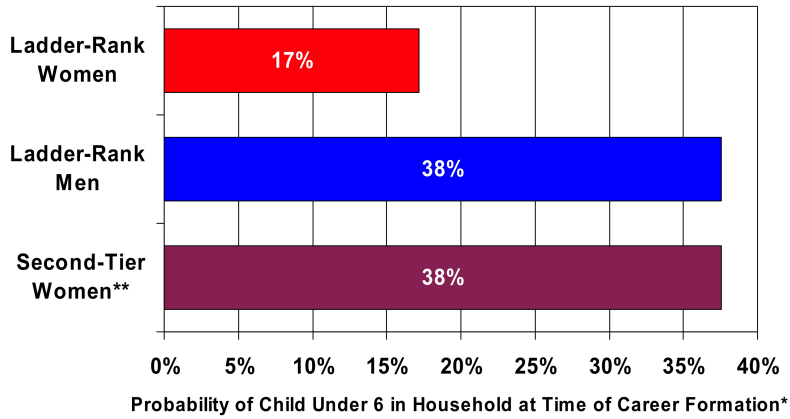


*Time of career formation is defined as 0 to 3 years post-PhD.
**Non-Tenure Track, Part Time, or Not Working.
Source: SDR Science and Humanities Survey, 1981-1995. PhD recipients 1978-1994.



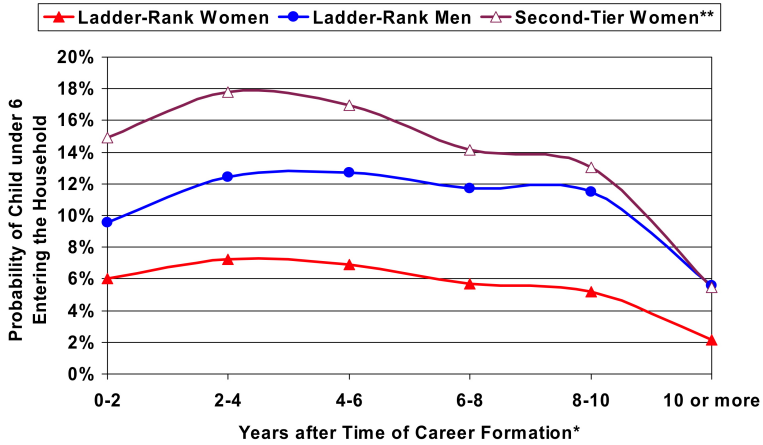
*For individuals who were single at time of career formation, 0-3 years post-PhD.
**Non-Tenure Track, Part Time, or Not Working.
Source: SDR Science and Humanities Survey, 1981-1995. PhD recipients 1978-1992 .

Child under 6 at Time of Career Formation*



*Time of career formation is defined as 0 to 3 years post-PhD.
**Non-Tenure Track, Part Time, or Not Working.
Source: SDR Science and Humanities Survey, 1981-1995. PhD recipients 1978-1994.

Having a Child After Time of Career Formation*



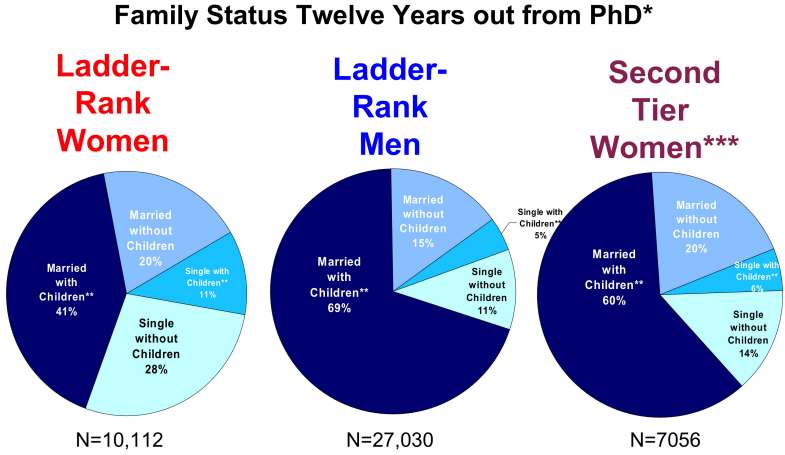
*For individuals who had no child under 6 in household at time of career formation, 0-3 years post-PhD.
**Non-Tenure Track, Part Time, or Not Working.
Source: SDR Science and Humanities Survey, 1981-1995. PhD recipients 1978-1994.

after the time of career formation.

In fact, ladder-rank women are much more likely to be divorced than are ladder-rank men or second-tier women at time of career formation. Lastly, married ladder-rank women are much more likely than are married ladder-rank men and married second-tier women to become divorced as their careers progress, and divorced ladder-rank faculty women are less likely than divorced ladder-rank men and divorced second-tier women to remarry.

9.5 Family status 12 years out from PhD

Not surprisingly, therefore, 12 years out from the PhD, a minority of ladder-rank women are married and have children; in contrast, a substantial majority of ladder-rank men and second tier women are married and have children. So, too, ladder-rank women are much more likely to be single, including never married, divorced or widowed, with or without children.

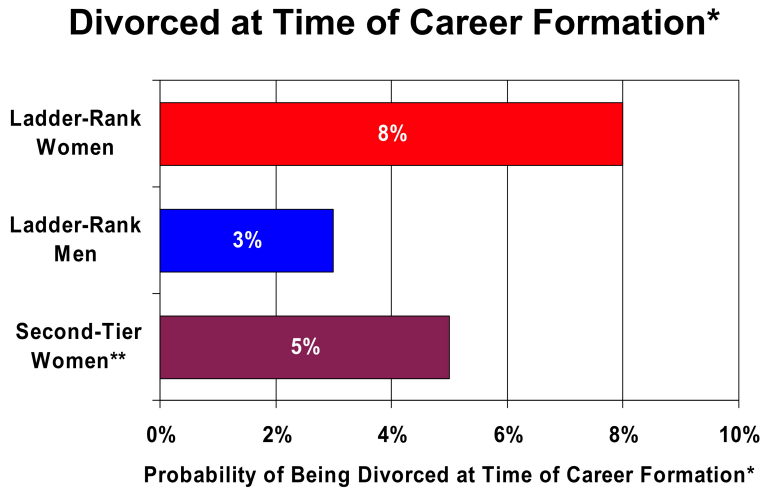


*PhDs from 1978-1984 Who Are Ladder-Rank Faculty 12 Years out from PhD.
**Had a child in the household at any point post PhD to 12 years out.
***Non-Tenure Track, Part Time, or Not Working

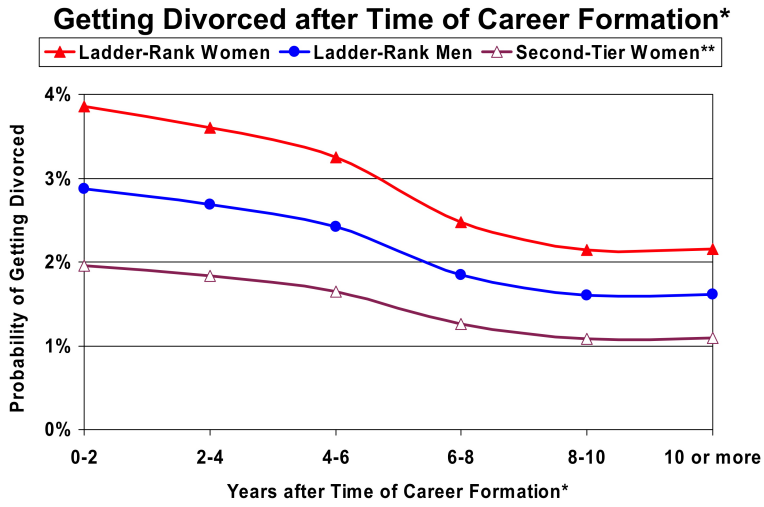
Source: Survey of Doctorate Recipients, Science and Humanities, 1979-1995

9.6 UC work and family survey

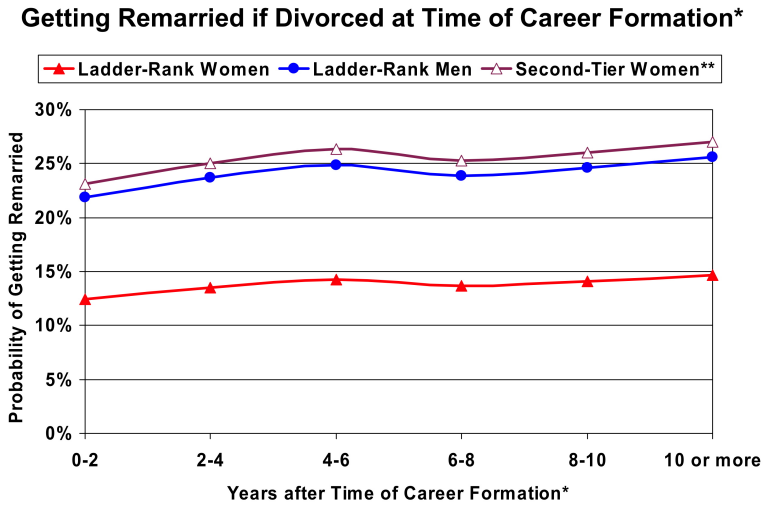
Our second data source, the University of California Work and Family survey, provides additional data on differences in the ways that work and family issues affect men and women faculty parents and in the fertility patterns



*Time of career formation is defined as 0 to 3 years post-PhD.
**Non-Tenure Track, Part Time, or Not Working.
Source: SDR Science and Humanities Survey, 1981-1995. PhD recipients 1978-1994.



*For individuals who were married at time of career formation, 0-3 years post-PhD.
**Non-Tenure Track, Part Time, or Not Working.
Source: SDR Science and Humanities Survey, 1981-1995. PhD recipients 1978-1992 .



*For individuals who were divorced at time of career formation, 0-3 years post-PhD.
**Non-Tenure Track, Part Time, or Not Working.
Source: SDR Science and Humanities Survey, 1981-1995. PhD recipients 1978-1992 .

of men and women ladder-rank faculty. To understand better the importance of work and family issues in the lives of UC ladder-rank faculty and to test the effectiveness of existing family-friendly policies and resources, we designed and conducted the University of California Work and Family Survey, which included all nine active UC campuses (fall–winter 2002–2003 for UC Berkeley and Spring-Summer 2003 for the other eight active UC campuses). A total of 8,705 ladder-rank faculty with valid email addresses were surveyed and we achieved a 51% response rate to the 14-page survey (Mason, Stacy, and Goulden 2003).

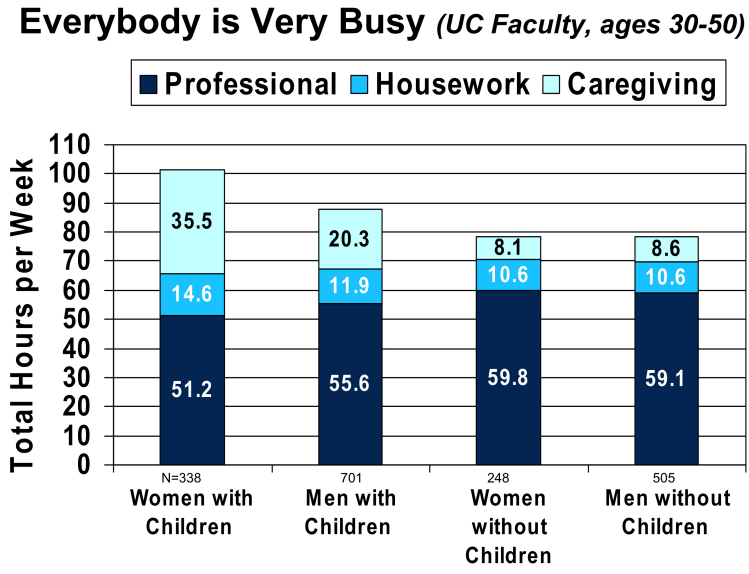
UC Work and Family Survey: History and Response Rates

- **The survey was designed to assess the effectiveness of UC's existing family friendly policies for ladder-rank faculty (implemented in July 1988). It was first conducted at UC Berkeley, Fall 2002, and was rolled-out in Spring-Summer 2003 to the other UC universities (except UCM), with President Atkinson serving as the first contact email signatory.**

University	# of Responses	# of Surveyed	Response Rate
Berkeley	743	1351	55%
Davis	820	1385	59%
Irvine	445	910	49%
Los Angeles	788	1758	45%
Riverside	367	663	55%
San Diego	472	998	47%
San Francisco	188	357	53%
Santa Barbara	374	802	47%
Santa Cruz	262	481	54%
Total	**4459**	**8705**	**51%**

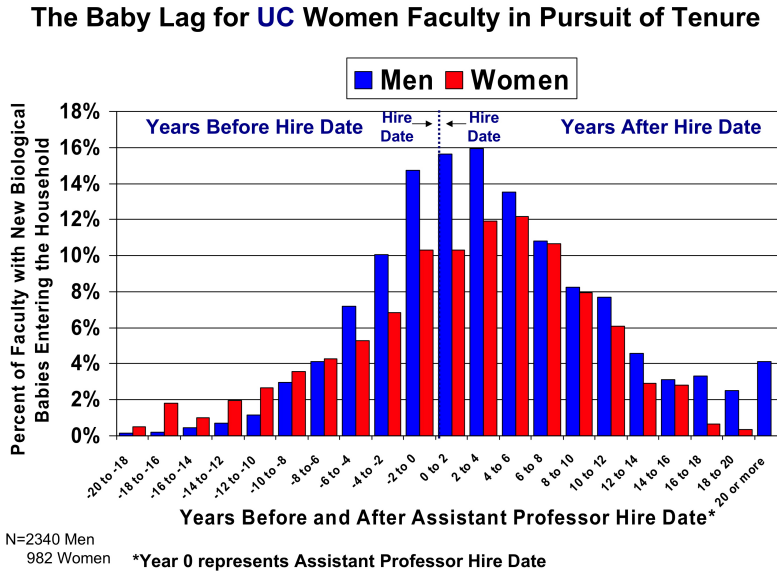
9.7 Everyone is very busy

Data from the UC Work and Family survey on hours worked each week on professional duties, providing care to others, and household activities suggest that women faculty ages 30 to 50, with children, are experiencing a time bind more than are other groups. These mothers log on average more than 100 hours a week on the combined activities, easily outpacing men ages 30 to 50, with children, who nonetheless register an impressive 88 hours a week. UC men and women without children are also very busy but not nearly as busy, topping around 78 hours a week. Given these types of time demands, women doctoral candidates, post-doctoral fellows, and assistant professors without children within the UC system must wonder how easy it would be to reconcile the demands of both career and parenting.



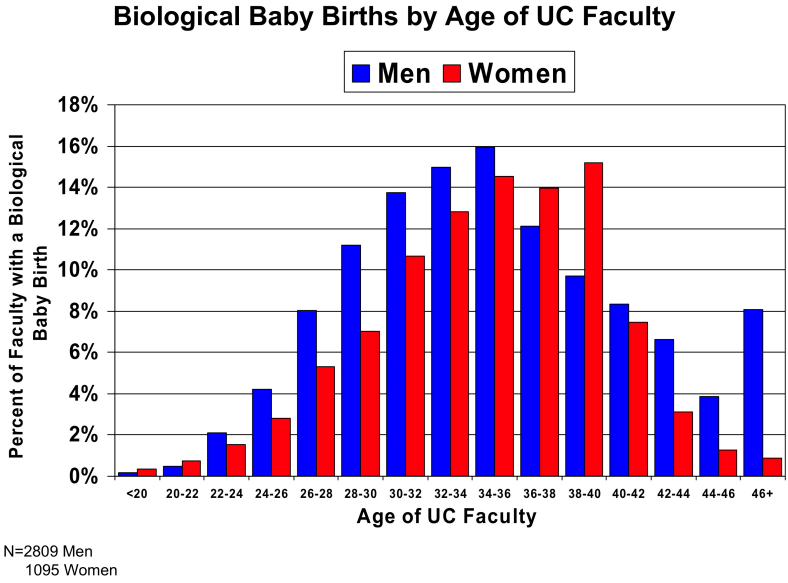
9.8 The baby lag for UC women in pursuit of tenure

Birth history data from the UC Faculty Work and Family Survey provides further evidence that faculty men and faculty women have different family formation patterns. As part of the survey, we asked respondents to provide us with the month and year of up to four children entering their household and their relationship to the child, biological or otherwise. Comparing the timing and rate of birth events in relationship to assistant professor start date for all UC faculty respondents, we observe clear differences in the fertility histories of UC men and women faculty. UC faculty women are more likely to have children prior to entry into graduate school or early on in their years of graduate school. UC faculty men are considerably more likely than UC faculty women to have new babies at the critical time of career formation, from four years before to four years after assistant professor hire date. Moreover, from six years before hire date to twenty or more years after hire date, UC faculty men are more likely to have babies than are UC faculty women (this preceding section is included in Mason and Goulden 2004).



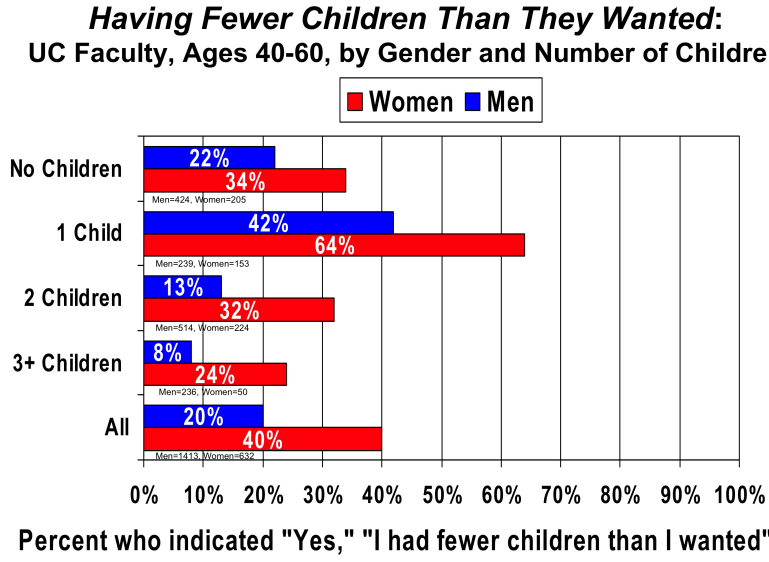
9.9 Biological baby births by age of UC faculty

By taking the same birth history data and fixing it to respondent's age at birth of children, the differences in fertility patterns of UC women and men faculty are even clearer. From age 22 to 36, UC faculty men are more likely than UC faculty women to have babies. Women faculty, however, are more likely to have babies from age 36 to 40. This data suggests that UC faculty women may be delaying child birth until their mid-to-late thirties. After age 40, men faculty are again more likely to have biological babies than are women faculty, no doubt because of biological constraints that disproportionately affect women after the age of 40. (Again, this preceding section is included in: Mason and Goulden 2004).



9.10 Having fewer children than they wanted

But delaying fertility until after tenure, or until some other expected work let-up period, might also hold risks. Among UC faculty after the age of likely fertility, 40 to 60, women were much more likely to indicate that they had fewer children than they wanted. Overall, women were twice as likely as men to state that they had fewer children than they wanted (40% vs. 20%). Among women faculty who had one child, almost two-thirds agreed with the statement that they had wished they had more children. Perhaps they never found a good time to have a second child, or perhaps age-related fertility issues came into play. The overall situation is rather discouraging, however, and suggests that for women ladder-rank faculty the current structures of academia work against family formation and may result in a sense of familial loss over time.



9.11 Sloan Grant, Developing a family friendly package for UC ladder rank faculty

What, then, can institutions of higher education do to reform themselves so as to encourage women PhDs to stay in the pipeline to tenure and feel satisfied with both their career and family lives? Since the late 1980s, the University of California along with many other institutions of higher education have taken some important steps in implementing family-friendly policies designed to level the play field for women and men academics. Perhaps the best known of these family-friendly policies for ladder-rank faculty are active service-modified duties (ASMD) and tenure clock extension/stoppage. The active service-modified duties arrangement typically offers birth mothers (and in some cases substantial caregivers, as is the case with the UC policy) relief from professional duties –typically teaching relief– around the time of the birth or adoption event. Tenure clock extension/stoppage is formulated to allow birth mothers/substantial caregivers who are assistant professors and birth or adopt children up to a year off the tenure clock per child-related event.

As part of the UC Work and Family survey, we asked faculty about their use of family friendly policies. We found that among eligible UC

women and men faculty, individuals who had experienced a birth/adoption event after the policies were in place, the use rates were lower than one might hope. Specifically, 52% of eligible women who already had tenure at the time of the birth/adoption event made use of ASMD and only 45% of pre-tenure women at time of event did so. Among men, the use rates were quite low: only 8% of eligible tenured men made use of ASMD and 7% of pre-tenure men. Tenure-clock extension was used even less, with just 30% of eligible pre-tenure women and 8% of pre-tenure men using the policy. When we asked eligible UC women and men why they did not use the policies, two major issues came up: lack of knowledge about the policies and fear of using them. With a multi-year grant from the Alfred P. Sloan Foundation, we are now seeking to enhance UC's existing family-friendly policies, propose additions to the polices and available family-friendly resources, and encourage a family-friendly culture within the UC. Work is already under way by the University of California Office of the President to make two key changes to the existing policies:

1. To require the campuses to fund active service-modified duties and family leaves centrally so that small departments do not experience an undue burden from the policy and thus discourage its use;

2. To change the default for family friendly policy use from "may request" to a "will be granted" type of language.

Additionally, there is a proposal to allow ladder-rank faculty the option of going part-time for limited periods of service (e.g., up to five years) as life-course needs arise, including birth/adoption events, other parenting issues, personal illness, adult dependent care responsibilities, and phased retirement. We also know from the UC Work and Family survey that high quality, readily available childcare and infant care facilities, regular and emergency, are extremely important to faculty parents. We are suggesting, therefore, that the University of California needs to consider this to be part of the necessary infrastructure of a premier institution. If parking spaces can be considered in all new building plans, perhaps child care and infant care slots should be part of the equation too. Facilities on or near campuses save faculty parents time and help to minimize the time-bind that many faculty parents, particularly mothers, experience.

As part of a larger focus on the institutional culture of the UC community, we also recommend that every campus have in place a work and family advisery committee and host an annual school for new department chairs, which would serve the purpose of ensuring that the front-line administrators who are directly involved with the use of family-friendly policies would fully understand their appropriate use. This is particularly important given the high turn-over rate among chairs and the fact that – as data from the Work and Family Survey show – department chairs play a pivotal role in the interpretation of policies, sometime taking on a gatekeeper role.

Lastly, to assist in the relocation of new faculty hires and to help with recruitment, particularly for married women who are much more likely than married men to have a spouse with a full-time career, we propose that all campuses have in place a relocation specialist who can provide faculty recruits with counsel and resources related to spousal employment, schools, housing, and so forth. No single policy or resource will be a panacea, so we are proposing a package concept that helps to meet faculty's needs as their life and family situation changes over time. With the UC Family Friendly Package in place, we believe that we will be well-positioned to encourage women to stay in the pipeline to tenure and enjoy a satisfied work and family life as a UC professor.

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Chapter 10

Epilog

It seems fitting to close with a few results and comments that followed the workshop.

> I wanted to let you know how much I enjoyed the workshop, and that I learned a great deal from the shared experiences. I have to confess that for me personally, it was a rather bipolar experience. On the one hand, I took away a lot of ideas which I will apply in my own group and with my colleagues. On the other hand, this same information brought to my mind with sharp contrast how as a junior faculty member at my "startup" EE department at Santa Cruz, I received really none of the help that a junior faculty needs. This has motivated me positively to try to make sure that the same does not happen to incoming new faculty or students. Shortly after the workshop, in fact, I contacted my Dean (Steve Kang) and shared my experiences with him and encouraged that the material from the workshop be brought to the attention of the department chairs and faculty – This has since happened. So you could certainly say that this workshop will have a direct effect on mentoring of students and faculty at UCSC's young School of Engineering.
>
> On a personal note, I was very pleased to meet colleagues from around the country, and in particular so many successful women academics, who will serve as role models for my own two young daughters as they grow. It was a unique way for me to gain more perspective on the challenges and experiences ahead.
>
> Peyman Milanfar
> UC Santa Cruz

> The PAESMEM workshop was really a great experience for

me. As a PhD student, I learned a lot from "Early and mid career mentoring and support," especially Lydia and Sheila's talks, as well as the discussions from the audience. They gave me a real idea about what the academic life will be like for female faculty who are working hard for tenure in a male-dominated area. The "Mentoring support" session the second day made me realize that a lot of things could be done at Georgia Tech's College of Computing to improve the opportunities for women students as my department seems to be the one with the lowest female/male student ratio (even worse than physics department) and the department is trying very hard to attract female undergraduate/graduate students and faculties. I have to admit that the "Work/family issues" is the apex of the workshop in my personal view. Every single presentation in this session draws a vivid picture of the success story of a female faculty. I think every CS/EE female PhD student should have an opportunity to watch the video of it if we had recorded it. It conveys the message clearly that life is hard for a female faculty but there is a way out. Choosing an academic life does not mean to sacrifice personal life.

I did not realize the importance of "imposter syndrome" talk by Valerie Young until I got back to Atlanta as I do not much believe in this kind of talk. Just a few months ago I discussed with my MentorNet mentor Elaine Weyuker about how men and women deal with unfair paper rejection differently. Women tend to blame themselves even if they feel the negative feedback is unjust. Elaine told me this to let me know not to be set back by this kind of things. At this workshop Lydia also spoke out from her experience that it is important not to take proposal rejection or other negative feedbacks from others personally. Just go ahead to do what you think is right for you. Valerie Young's presentation pointed out that we can change the way we think and face the challenges more confidently.

Yan Gu
Georgia Tech PhD Student

The PAESMEM workshop was very positive, encouraging and revealing. Among all the topics of presentations and discussions, those regarding mentoring of untenured faculty were extremely helpful to me. They were pertinent to my own situation of feeling uninformed, overwhelmed or sometimes frustrated: being told what needs to be done without a hint of how they can be done. I could project those common problems and difficulties that assistant faculty face in more objective and general perspective. I believe that this apprehension would be

the first step toward finding positive solutions.

Yoonkyung Lee
Ohio State Assistant Professor

I really enjoyed the session on Mentoring Support — because of all the resources mentioned that I was not aware of previously. That in itself made this session very informative. In particular, all the different databases that people can enter themselves into for academic searches really caught my eyes.

I really enjoyed seeing the success stories of these programs and the showcasing of the alumni and their accomplishments in academia. This showed to me that the strategies espoused in these programs surely are effective.

It was great to hear about the ADVANCE programs at different Universities. This was the first time that I found out about their existence and all the different levels of support that they provide.

Todd P. Coleman
MIT Graduate Student

There was little discussion at the workshop about the role that working industrial scientists and engineers can play in mentoring students through the degree process and into employment. Outside of MentorNet, it seems that the Universities don't do much to exploit this resource. The irony of it is that the majority of students will end up in industry, so it would seem highly appropriate to work harder to partner students with industry mentors. Perhaps the university alumni networks could be used as an avenue to partner students with suitable mentors. Note that MentorNet does a great job of this, but is largely aimed at women; it would be just as appropriate for male students!

Liesl Folks
Hitachi

The session that reverberated most with us was "Mentoring support: National and local resources for mentoring." It was encouraging to see how much was being done especially for female graduate students, but it was also a little disappointing in that many of us did not feel such support at Stanford. Because of this, the group of women attending from EE at Stanford has recently formed WEE (Women in Electrical Engineering, wee.stanford.edu).

This year WEE plans to hold a pizza lunch monthly, with an invited speaker to give students insight into various career

paths of women with PhDs in EE and related fields. We're organizing a big sister program for incoming graduate EE women. Also, we're looking at statistics for various milestones for men and women in the department to identify areas that may need more attention.

We're very grateful for the ideas and inspiration we got at the PAESMEM workshop; this has helped shape out new group significantly.

Deirdre O'Brien, Taly Gilat Schmidt, Viola Rieke,
Hrefna Gunnarsdottir, Sarah Harriman
Stanford University, PhD Candidates

Appendix A

Participants

Valeria	Bertacco	University of Michigan
Sangeeta	Bhatia	University of California San Diego
Marina	Bosi	Music Department, Stanford University
Suzanne G.	Brainard	Center for Workforce Development, U. of Washington
Matt	Brennan	U.C. Berkeley
Donald	Brown	Worcester Polytechnic Institute
Jennifer	Chou-Green	MentorNet
Todd	Coleman	MIT
Arlene	Cole-Rhodes	Morgan State University
Pamela	Cosman	University of California at San Diego
Shugang	Cui	Stanford University
Denice	Denton	College of Engineering, Univ Wash
Sheila	Edwards Lange	University of Washington
Michelle	Effros	California Institute of Technology
Alyson	Fletcher	University of California, Berkeley
Liesl	Folks	Hitachi Global Storage Technologies
Taly	Gilat	Stanford University
Chris	Golde	Carnegie Foundation for the Advancement of Teaching
Marc	Goulden	University of California, Berkeley
Vivek	Goyal	MIT
Robert M.	Gray	Stanford University
Hrefna	Gunnarsdottir	Stanford University
Maya	Gupta	University of Washington
Yan	Gu	Georgia Institute of Technology
Sarah	Harriman	Stanford University
Sheila	Hemami	Cornell University
Janet	Hering	California Institute of Technology
Alex	Horner-Devine	Stanford University
Sheila	Humpherys	UC Berkeley
Melany	Hunt	California Institute of Technology
Krisitina	Johnson	Duke University
Jeffrey	Koseff	Stanford University
Kerri	Kusza	Stanford University
Richard	Ladner	University of Washington
Amanda	Lanzone	Texas A&M-Kingsville/National Science Foundation
Suzie	Laurich-McIntyre	Carnegie Mellon University
Andrea	Lawrence	Spelman College

Yoonkyung	Lee	Ohio State University
Albert	Liddicoat	California Polytechnic State University
Sylvia	Liddicoat	Cal Poly
Jia	Li	Penn State
Mingyan	Liu	University of Michigan
Nancy	Love	Virginia Tech
Zhuoqing	Mao	University of Michigan
Michele	Marincovich	Stanford
Yajahira	Martinez	Computer Science
Martha	Mecartney	University of California Irvine
Jessica	Melin	Royal Institute of Technology
Peyman	Milanfar	University of California, Santa Cruz
Karen	Miu	Drexel University
Mahta	Moghaddam	University of Michigan
Carol	Muller	MentorNet
Jill	Nelson	University of Illinois at Urbana-Champaign
David	Notkin	University of Washington
Deirdre	O'Brien	Stanford University
Mari	Ostendorf	University of Washington
Leslie	Pendleton	Virginia Tech
Jim	Plummer	School of Engineering
Vince	Poor	Princeton University
Viola	Rieke	Stanford University
Eve	Riskin	University of Washington
Christopher	Rozell	Rice University
Candace	Rypisi	California Institute of Technology
Serap	Savari	University of Michigan
Erin	Selser	Stanford University
Kamakshi	Sivaramakrishnan	Stanford University
Mark	Smith	Purdue University
Lydia L.	Sohn	University of California Berkeley
Marilyn	Suiter	National Science Foundation
Pantipa	Tachawachira	University of Washington
Claire	Tomlin	Stanford
Cary	Troy	Stanford University
Mihaela	van der Schaar	University of California, Davis
Jelena	Vuckovic	Stanford University
Veronica	Wadey	Stanford University
Sara	Wadia-Fascetti	Northeastern University
Rebecca	Willett	Rice Universty
Tess	Wynn	Virginia Tech
Joyce	Yen	University of Washington