I

The Graduate School Years

New Demographics, Old Thinking

The graduate student and postdoc years are the proving ground for future academics. Many students enter with clear plans to become professors, but end up changing their minds. There are many reasons to reject an academic career, but family considerations—marriage and children—are most prominent for women and a serious concern for men as well. How concerns about family affect these young scholars' decisions is complex. Some students lack the role models that might otherwise demonstrate that work-family balance is possible in academia. For others, encountering intense professional hostility after having a baby weakens their commitment to an academic career. Sometimes marriage presents a barrier to developing two careers. The scientific disciplines, which foster a nonstop competitive race to the top, offer a particular challenge. The academy has recently focused attention on the work-family concerns of faculty, but it has largely ignored graduate students and postdoctoral fellows. This chapter considers how these young scholars confront family issues, and how a few universities are beginning to remake the academic workplace in order to retain graduate students and postdocs in the career pipeline.

The New Face of Graduate Students

The new generation of doctoral students is different in many ways from that of just thirty or forty years ago. Academia was once composed largely of men in traditional single-earner families. Today, men and women fill the doctoral student ranks in nearly equal numbers, and most will experience both the benefits and the challenges of living in dual-earner households. This generation also has different expectations and values from previous ones; most notably, the desire for flexibility and balance between their careers and their other goals. But changes

to the structure and culture of academia have not kept pace with this major shift in students' priorities. The outdated notion of the "ideal worker" prevails, including in a de facto requirement for sole devotion to the academy and a linear, lockstep career trajectory that permits no interruptions. Senior faculty and administration, still largely men, are not role models for the new generation of scholars when it comes to demonstrating the work-family balance and flexibility that these students desire.[1]

The most significant change in the graduate student body is that women are now as numerous as men. Indeed, gender parity in graduate education is one of the remarkable accomplishments of the past forty years. In 1966, just 12 percent of all American doctorates were awarded to women.[2] By 2008 that number had soared to over 50 percent.[3] There have also been impressive gains for minority students, particularly minority women, but they still are by no means proportionally represented. Moreover, the gender balance remains more uneven in some disciplines than in others. In 2008, women received only 28 percent of the doctorates awarded in the traditionally male-dominated physical sciences, including computer science and math, and just 22 percent of those awarded in engineering.[4] Although these are lower proportions than seen today in the more human-centric disciplines such as biology and psychology, they nonetheless represent extraordinary progress. As figure 1.1 shows, over the past four decades the proportion of women Ph.D. recipients has increased more than a hundredfold in engineering, twelvefold in the geosciences, and sevenfold in the physical sciences. Since these trends appear unabated and women are outperforming men at the baccalaureate and master's levels, it seems reasonable to assume that further gains will occur.[5]

In addition to being notably more female than they were three decades ago, today's doctoral students are a bit older: The median male Ph.D. recipient is now thirty-two and the median female doctorate recipient is now thirty-three.[6] Students in the natural and physical sciences often finish their Ph.D. at a somewhat younger age but are increasingly likely to spend time as postdoctoral fellows.[7] They may hold these positions for years before acquiring a tenure-track job. Most women faculty will therefore be at or near the end of their childbearing years by the time they achieve tenure. Postponing a family until tenure, the old wisdom offered to women graduate students, remains bad advice for purely biological reasons.[8] But what about having children during graduate school, when women are more fertile? As we shall see, few students view this as a good option.

A Bad Reputation

Work-family balance weighs heavily on the minds of graduate students as they ponder their careers; in our landmark 2006–2007 survey of about eight

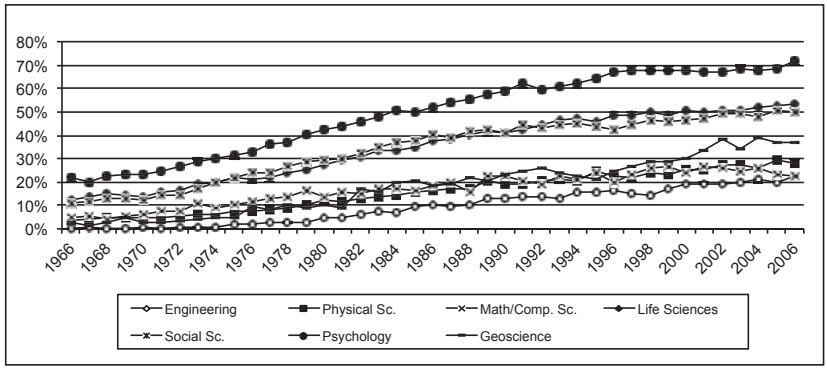

FIGURE 1.1 Women Doctoral Recipients in the United States in the Sciences, 1966–2006

Source: National Science Foundation, Division of Science Resources Statistics "Survey of Earned Doctorates," WebCASPAR, http://webcaspar.nsf.gov/; Marc Goulden, Mary Ann Mason, Karie Frasch, and the Center for American Progress, "Staying Competitive: Patching America's Leaky Pipeline in the Sciences," Berkeley Center on Health, Economic, and Family Security, University of California, Berkeley, 2009, figure 4, http://www.americanprogress.org/issues/2009/11/women_and_sciences.html.

Note: Data are for U.S. citizens only.

thousand doctoral students at the University of California, 84 percent of women and 74 percent of men registered the family friendliness of their future workplace as a concern. Yet more than 70 percent of women and over half of all men doctoral students surveyed consider faculty careers at research universities not friendly to family life.[9]

Most doctoral students begin their careers with the same hopes and dreams as generations before them: they want to become professors. About two-thirds of doctoral students at the University of California said this was their objective when they began graduate school. The majority aspired to faculty positions at major research universities, and most of the others to jobs at four-year teaching colleges. But graduate school frequently causes them to change their minds about careers at research universities. About 30 percent of the women and 20 percent of the men we surveyed turn away from their goal of becoming a professor at a major research university, and instead intend to pursue careers in nonacademic settings.[10]

Men and women offer somewhat different explanations for their apprehensions about academic careers. Both men and women are more likely to report dissatisfaction with the unrelenting work hours. As one male student at the University of California complained, "[I'm] fed up with the narrow-mindedness of supposedly intelligent people who are largely workaholic and expect others to be so as well."[11] Women, however, are especially likely to focus on family concerns. "I could not have come to graduate school more motivated to be a

research-oriented professor," one female student related. "Now I feel that can only be a career possibility if I am willing to sacrifice having children."[12]

Our one-on-one interviews with doctoral students yielded similar findings. Carolyn, a fifth-year Ph.D. student in engineering at a major research university and mother of a three-month-old son, faced a series of challenges when she considered starting a family during her graduate studies.[13]

Carolyn grew up in a working-class neighborhood in Texas. Neither of her parents attended college, but her father worked with engineers at a power plant, and he strongly encouraged Carolyn's interest in an engineering career. She was an outstanding student in both science and the liberal arts and earned a double degree, a BA and a BS, from the University of Texas. Soon after graduation Carolyn married her high school sweetheart. She planned to work for four or five years, then start a family.

But Carolyn was soon drawn back to academia. "I realized I could do much more real research with a Ph.D.," she related. Carolyn's husband, Ken, was already pursuing a doctorate, so she waited her turn and supported his studies. She began her own graduate program at the age of twenty-seven, but realized that the time commitment and work environment probably wouldn't allow for children in the near future. "We were already very ready to have a family, but I didn't see how we could make it work," she said. Only 20 percent of the students in Carolyn's department were women, and none had ever had a baby. The demands of graduate school had upended Carolyn and Ken's plans, and they abandoned their intention to start a family anytime soon.

Doctoral Student Parents

According to our survey of University of California Ph.D. students, only 14 percent of men and 12 percent of women are parents.[14] Yet over two-thirds of the women claim that between twenty-eight and thirty-four would be the optimal age to have a first child.[15] Why do most women avoid having children during graduate school? After all, it's a time of flexible schedules and the possibility of a community with which to share the experience of parenting. The most common reason provided by our University of California respondents is the workload, as table 1.1 shows. Sixty-eight percent of male students and 76 percent of female students cite graduate school work requirements as the most important reason to hold off on children; women are also far more likely than men to believe that graduate school and parenthood are fundamentally incompatible.

It is worth noting that women are more likely than men to put off having children for the same reasons that one of the authors of this book, Mary Ann Mason, did more than thirty years ago: they fear that they will not be taken seriously and that their professors and future employers will disapprove. One

TABLE 1.1.

University of California Ph.D. Students' Reasons for Not Having a Child or Uncertainty about Having One

Reason cited as "very important"	*Total (%)*	*Men (%)*	*Women (%)*
Time demands of current Ph.D. program/ employment	72	68	76
Current level of personal/household income	64	67	61
Anticipated demands of future program/career	54	48	59
Stress of raising a child as a Ph.D. student	53	48	58
Concerns re affordability/availability of quality child care	53	49	56
Concerns re affordability/availability of quality housing	51	51	52
Uncertain future employment situation	50	48	51
Concerns re affordability/availability of health insurance	47	47	48
Worry Ph.D. program and caregiving are incompatible	46	36	54
Concerns regarding degree progress	43	34	51
Concerns about availability of pregnancy leave	43	32	50
Uncertain current employment situation	38	35	40
Concerns re future career advancement/success	36	27	43
Anticipated future level of personal/household income	33	32	33
Uncertainty regarding future spouse/partner (not married)	30	27	33
Limited interest in becoming parent as a Ph.D. student	29	31	28
Spouse/partner does not want child at this time	28	32	24
Time for leisure or social activities	23	23	23
Effects of a(nother) child on my marriage/relationship	17	17	17
Worry advisor would take my work less seriously	15	8	21
Worry possible employers might take my work less seriously	15	6	23
Worry other faculty might take my work less seriously	13	6	19
Medical or health reasons (including age)	13	8	17
Worry peers would take my work less seriously	9	4	14

Note: Boxed items represent statistically significant ($p < .001$) gender differences.

N = 3,880–4,353

Source: University of California Doctoral Student Career and Life Survey, 2006–2007.

student at the University of California commented on her department's attitude toward pregnant students: "There is a pervasive attitude that the female graduate student in question must now prove to the faculty that she is capable of completing her degree, even when prior to the pregnancy there were absolutely no doubts about her capabilities and ambition." According to table 1.1, two to three times more women than men were concerned that having a child would be negatively perceived by their professors or future employers.

The bench sciences offer additional challenges for student parents, particularly mothers. Would-be scientists have far less flexible schedules than do graduate students in the humanities and many of the social sciences. Most of the bench sciences require long hours spent in campus labs. Moreover, the competitive race to achieve scientific breakthroughs and prove oneself offers little respite for childbirth or childrearing.[16] This is reflected in the blog of a postdoc at the Washington University School of Medicine, *Academic Aspirations*: "In science especially, research fields move very quickly. The maternity leave time could be just enough for you to be scooped and lose months or years' worth of work. It's a frustrating thing to think about."[17]

None of this is a secret to female scientists. Jennifer, a neuroscience postdoc, had her first child soon after finishing her Ph.D. "I don't think I'll ever be able to do a tenure-track job, and people were very upfront with me about that when I had my child. Looking around me, I see that people are completely shut out of positions because of family."[18] Not surprisingly, the message is different for men. Men who marry and have children are considered more mature and better able to handle their work, while women are considered less serious.[19] The assumption is that women with children do not get work done—and with limited grant funding available, research positions should go to those who have the most promising futures. Marriage, as we will see in the following chapter, limits a woman's flexibility to seek the best jobs, and pregnancy anytime prior to tenure is seen as evidence that she is not seriously dedicated to her career. And the density of men, as in many professions, reinforces the male status quo. At present, too many students agree with one UC woman student's appraisal: "Don't get a Ph.D.! Just don't do it: there are so many other things in life that you could do for a living that are as intellectually challenging, pay more, and where women having children is not a big deal. Academia is stuck in the 1970s at best on this issue."

Financial Constraints

The graduate student years are typically a period of limited incomes and modest lifestyles—the years of the Ramen noodle diet—and finances are clearly a concern for student couples considering parenthood. Raising a child brings

many new expenses: health care costs, child care, housing, diapers, and clothing. All told, American parents now spend more than eleven thousand dollars a year on expenses for a baby or toddler.[20] In our survey of Ph.D. students at the University of California, the second most cited reason for delaying having children was money: 67 percent of men and 61 percent of female graduate students cited their paltry incomes as a reason for not starting a family (see table 1.1). It's not surprising that men are more likely to invoke financial justifications for waiting on parenthood: they are more likely than women to have partners who aren't working, or are working only part time.[21] As one zoology Ph.D. candidate recounted in an anthology of personal accounts, *Motherhood, the Elephant in the Lab*, child care costs can be a particular challenge for cash-strapped students: "Student life means working long hours and receiving little money for your efforts. Childrearing means working long hours and receiving no money for your efforts. Therefore, if you are busy in the lab and have little money, how can you pay the high costs of child care?"[22]

Would-be parents are unlikely to receive much help from their universities. According to a 2008 survey of over one hundred institutions conducted by *The Chronicle of Higher Education*, annual Ph.D. student stipends ranged from three thousand to twenty-eight thousand dollars.[23] Most students probably receive less than twenty thousand dollars. Only 42 percent have health insurance through their universities, obviously a crucial resource when considering parenthood.[24] Just 13 percent of Association of American Universities schools (sixty-one top-ranked research universities) offer graduate students six weeks of paid maternity leave without notable limitations.[25] Students who wish to take more than six weeks of maternity leave face many barriers. Such was the case for Carolyn, the engineering Ph.D. student from Texas introduced earlier. Toward the end of graduate school, Carolyn finally decided to become a mother. She wanted to take twelve weeks of maternity leave, which she felt would be the minimum necessary to establish a close relationship with her baby. She thought she was entitled to this much time off under the FMLA (Family and Medical Leave Act), which allows all American workers twelve weeks of unpaid parental leave. To her dismay, Carolyn found that as a student she was not covered by the FMLA. Her federal granting agency by law could allow only what the university allowed: six weeks. Only with a great deal of complaining within her university was she granted permission to extend her leave.

Role Models and Mentors

Carolyn's decision to have a child stemmed in part from encouragement she received from a role model, a junior faculty mother. Across all disciplines, a personal mentor is often a key influence in the work and family decisions of today's graduate students. As traditionally conceived, mentors provide academic

support, teach analytic and other technical skills, guide student research, and provide career advice.[26] But faculty mentors also serve as role models on a more personal level: they provide a model for work-family balance.[27] As Carolyn's story illustrates, the presence of a successful faculty mother can be a powerful source of encouragement for students. Conversely, a faculty mentor can discourage graduate students by exhibiting a lifestyle seemingly incompatible with parenthood. Life-changing mentors are not always women. Many senior faculty men provide encouragement and serve as role models for flexibility for family life; sometimes they have wives or daughters in academia or other professions. Some women faculty are neither helpful nor good role models as mothers. Still, the living example of a senior faculty member, especially a woman who successfully balances a demanding career with a satisfying family life, is an important beacon for graduate students.

Apprehension about the ability to balance an academic career with a family often begins in graduate school. Doctoral students cannot help but notice that their advisers are far more likely to have families if they are men. Of tenured women faculty who received their Ph.D.s between 1978 and 1984, 45 percent were childless twelve years after completing graduate school. The comparable figure for men is much lower, on the order of 26 percent. There is a similar difference in marriage rates. Eighty-five percent of the men are married, compared with 63 percent of the women.[28] Tenured academics from this cohort are now senior scholars and the mentors of today's graduate students. According to our nine-campus University of California survey, students frequently observe that women have more difficulty balancing academic careers and families. For some graduate students, the reality seemed painfully clear. "I can recall no female faculty getting tenure in our department while raising children," one women in the STEM (science, technology, engineering, and math) fields pointed out. This sentiment was echoed by a female doctoral student in the physical sciences: "Most importantly, I can't think of an example of a (perceived [to be]) successful female professor at our (or any other) top research university who has a 'normal' family situation. The only time these women appear successful both personally and professionally is if a spouse dedicates his (or her) career to helping his (or her) wife succeed."

For other women graduate students the issue is not so much whether to have children, as when. This dilemma, exacerbated by the absence of role model mothers, plays out at different times in women's professional lives, most commonly when they go on the academic job market or when the tenure clock runs up against the biological clock later in their careers. One female graduate student studying math at the University of California evidently devoted considerable thought to this question:

> My most pressing concern is that I do not have enough information about *when* to have children. There are not enough women (especially

> in math) whom I have encountered to have enough information about when/how having children affected their career. At a recent dinner with other (female) math graduate students, we recognized that we know of no female math grad student who has successfully had a child in grad school (except for one in the 1970s who is now a professor at [another school in the University of California system]). I acknowledge that . . . [because] our program is shorter (than, say, English) it might make more sense to finish one's degree first, but the years of one's post-doc do not seem optimal either, nor the years of a tenure-track position, but who wants to wait until she is 35?

Across all disciplines, graduate student women in particular indicate that having a female role model in their department is critical to whether they perceive academia to be a family-friendly workplace. The fewer faculty mothers they see, the less likely women students are to feel that tenure-track faculty careers at research universities are family friendly—and the less likely they may be to continue on that track. According to our University of California survey, only 12 percent of women doctoral students who said they were in departments devoid of faculty mothers viewed research universities as family friendly, compared with 46 percent of women students in departments where women faculty more commonly had children.[29]

Faculty mentors are not always helpful, and women can be at a disadvantage if they get stuck with a sexist advisor.[30] This was the case for Sue. Just after receiving her Ph.D. in chemical engineering from a prestigious university in four years (near record speed for a doctorate), Sue related to us that her advisor not only failed to offer her help in finding a job, but didn't even ask about her career plans. In the lab, Sue's advisor picked clear favorites and marginalized female graduate students. "I took my qualifying exams early, and his only remark was, 'I'm surprised you passed!'" Sue recounted. "I wasn't sure if he was surprised because I am a woman, or because I am Black." (Sue was born in Ghana and came to the United States at seventeen.) On campus, she was known as the extremely effective and articulate president of her university's graduate student assembly. She seemed self-assured and focused, but clearly her advisor's lack of interest had eroded her confidence. Discouraged, Sue turned away from an academic research career and took a position on the business side of an engineering company.[31]

Scientific Challenges

Concerns about work-life balance are particularly pronounced among doctoral students in the bench sciences. This may help explain why relatively few women obtain Ph.D.s in most scientific fields and ultimately contribute to the

gender imbalance among faculty at research universities. A recent report by the National Research Council of the National Academy of Sciences discusses at length the underrepresentation of women in many of the scientific disciplines at academic institutions across the country, particularly in the faculty ranks.[32] The report confirms that women who receive Ph.D.s in the sciences are less likely than men to seek academic research positions, often the path to cutting-edge scholarship, and they are more likely to drop out before attaining tenure if they do take on a faculty post. Data from both the National Institutes of Health (NIH) and National Science Foundation (NSF), the two agencies providing the bulk of research funding to American universities and colleges, tell a similar story. Women compose a much larger proportion of the total number of predoctoral fellowships awarded by these agencies than they do postdoctoral fellowships and competitive faculty grants. The drop-off in relative proportion is dramatic, with women receiving 63 percent and 54 percent of NIH and NSF's predoctoral awards in 2007, respectively, but just 25 percent and 23 percent of the competitive faculty grants awarded in the same year.[33] This winnowing out of women scientists is depicted in figure 1.2. The recent surge in the number of women Ph.D.s may account for some of this dramatic disparity in federal funding. Equally likely, the rapid decline in funding between graduate school and the professoriate results from women leaving the academy due to concerns about work-family balance.

The fund-raising requirements of a scientific career soon become apparent to graduate students and postdoctoral fellows. As one established woman scientist commented:

> We are required in most cases to produce 65% or more of our salary and benefits from research grants. In addition, we often also pay anywhere from 50–90% institutional overhead from our research grants. In order to do this successfully, we must on the average have at least two active research grants every year. The success rate of a grant application at the NIH is now about 10%. This coupled with the fact that one needs at least 2–3 publications per year to be competitive for a grant and graduate students typically take 4 years to produce one publication, combines for a stressful situation. Lastly, scientists are also required to pay 100% of salary and benefits for technical staff, students and post-docs.[34]

Graduate students are not often fully aware of these fund-raising duties. They represent one more burgeoning challenge for scientists in training who may already be concerned about work-family balance.

And there are continuing concerns about gender bias in science. Often this bias relates to motherhood. Elga Wasserman, author of *The Door in the Dream: Conversations with Eminent Women in Science*, notes that many of the obstacles

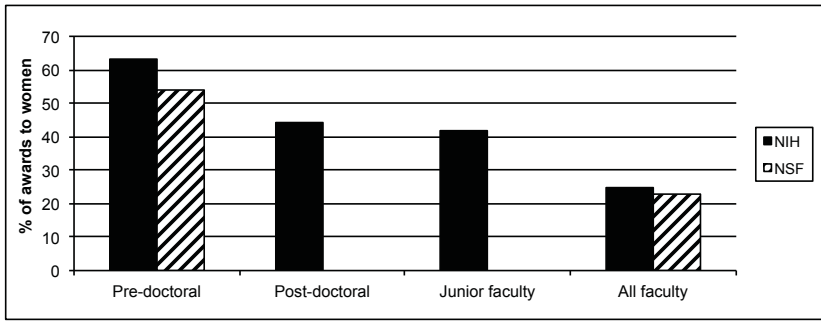

FIGURE 1.2 NIH and NSF Awards Received by Women, by Level of Award Recipient

Source: NIH and NSF Accountability Reports, 2008; Marc Goulden, Mary Ann Mason, Karie Frasch, and the Center for American Progress, "Staying Competitive: Patching America's Leaky Pipeline in the Sciences," Berkeley Center on Health, Economic, and Family Security, University of California, Berkeley, 2009, figure 5, http://www.americanprogress.org/issues/2009/11/women_and_sciences.html.

Note: The postdoctoral award information for NSF is missing significant data (39 percent of awards were to women, 47 percent were to men, and 14 percent of the sample was unknown in 2007). We chose not to include the data point because it is not comparable with the others. Information is from Fae Korsmo, senior advisor, Office of the Director, National Science Foundation.

that contemporary women scientists encounter stem from stereotypes about motherhood and the notion that women can't succeed as professionals while also having a family life.[35] Some scientists may believe that mothers cannot be serious professionals because academic science demands exclusive attention to research. Yet men are not victims of bias against parents and parenthood, even though male scientists are far more likely to have children than are women scientists; two years after earning their Ph.D.s, nearly 50 percent of men have children under age six, compared with just over 30 percent of women.[36] Motherhood, but not fatherhood, is seen as a mark against a young scientist's career. Because of these ingrained stereotypes, the precious few women who do receive their Ph.D. in the physical sciences or engineering may be less likely to be invited to join the teams that perform the cutting-edge research that leads to professional distinction, or like Sue, the chemical engineer from Ghana, they are marginalized within their research group.

Female graduate students may feel pushed in this direction by the unfriendly climate of science departments.[37] Alice Agogino, a mechanical engineering professor at UC Berkeley, believes the male-dominated culture is a deterrent to many prospective female applicants. "There is a perception that mechanical engineering is for 'gear heads.' The field is not set up for women and [even] looks unattractive to women; it needs to look more humanistic to entice further participation from women."[38] This unwelcoming culture creates an environment where women feel ill at ease. Claudia Henrion, author of *Women*

in Mathematics: The Addition of Difference, notes that the women mathematicians she interviewed for her book were accomplished scholars but "still feel like outsiders in the math community."[39] Another female scientist, author of a blog called The *Prodigal Academic*, says that a department's culture and its inclusion or exclusion of women can serve as a powerful recruiting tool—or a deterrent to talented female scholars:

> When I was interviewing for faculty positions, I noted the number of women and underrepresented minorities on the faculty and in the student body. Several departments had just one woman and no visible underrepresented minorities. This was hugely unattractive to me, especially after working in my diverse division at National Lab. My current department has almost 20% women and several underrepresented visible minorities on the faculty. This was an important secondary consideration (after research fit and startup package, and on par with location and salary). . . . The presence of women in positions of leadership in the department and at the university is an important signal, as I learned at my National Lab. As an example, in my department, faculty meetings start at 2, not at 4 or 5 so people who need to be home by 5:30 can see to both work and home obligations.[40]

Making the scientific climate more amenable to women is not easily accomplished. The smallest details matter, as Alice Agogino noted: "I fought for 15 years to take down these photographs of 50 men that were on the walls of the department. I did not make a stink the first year, but those photos really did get to me. I started working with student groups and got $70,000 worth of money to help graduate women and to get the photos taken down; to create an environment and a climate appropriate for women."[41]

Faculty and graduate students aren't the only people who may pick up on atmospheric clues, such as the photographs hanging in Alice Agogino's department. Attracting female students to the sciences early on is important, as grooming for science careers begins in the undergraduate years. Unlike in most other fields, men and women in the physical sciences and engineering must pursue a rigorous, focused curriculum as undergraduates. Young women students may not be interested in a field populated by the hoary white men depicted in Alice Agogino's departmental photos. Women in the physical sciences often take themselves out of the running for doctorates in science early on. Even by 2006, women were a third more likely to pursue a master's degree than a Ph.D.[42]

Robert C. Nicholson, Nobel laureate in physics and chair of the National Science Board panel that investigated why the brightest American students aren't pursuing advanced degrees in science, believes part of the problem is the culture of the laboratory, which requires punishingly long hours in an extremely hierarchical

structure. His conclusion was a nod toward greater family friendliness: "To get more women, we probably need to re-structure work environments in labs and universities so that they're more responsive to them in their childbearing years."[43]

The biological sciences are different, with women receiving about half the Ph.D.s.[44] Still, most do not go on to academic research careers. In addition to the other challenges described here, today's young scientists have to clear yet another hurdle: several more years as postdoctoral fellows. The significant extension of the scientific training period represented by postdocs has clear implications for career paths and family formation.

Postdoctoral Delays

Postdocs are a burgeoning phenomenon in the sciences, particularly in the biological disciplines. According to the National Science Foundation, the number of postdocs in the sciences doubled between 1975 and 2007, and there is no end in sight.[45] Indeed, there are now more postdocs than there are doctorate recipients in any given year.[46] This protracted training period, a kind of limbo between the Ph.D. and a real job, creates a class of highly trained young scientists working for lower salaries and few benefits. This assessment is buttressed by some of the only research on the subject, in which Curtiss Cobb and Jon Krosnick suggest that postdoctoral fellows have more in common with graduate students than with faculty.[47] Yet many are already productive scientists, as judged by the fact that they are first authors on a large share of the research articles published in *Science*.[48]

The postdoctoral period of extended training comes directly during academic women's prime reproductive years, the fertile thirties. A scientist will then be in his or her late thirties or early forties before taking a position at a university or other research venue. Nevertheless, relatively few women postdocs have children. According to a recent survey of over seventy-six hundred postdocs conducted by Sigma XI, a science and engineering research society, 29 percent of the women and 37 percent of men are parents.[49] These numbers are substantially higher than the comparable figures for graduate student parenthood at the University of California, but still reflect a large gender difference. Men, less likely to be the primary caretakers, are more likely to have children.

Parenthood dramatically influences postdoctoral women's (and many men's) decisions to abandon academic research careers. Among University of California postdoctoral scholars with no children and no future plans to have them, we found that women and men are almost equally likely, about one in five, to indicate that they shifted their career goal away from "professor with research emphasis." Plans to have children affect the career goals of women and men postdoctoral scholars differently, with women more likely to reject the goal of a tenure-track professorship (28 percent of women versus 17 percent of men). Actually having

a child or children prior to entering a postdoctoral position at the University of California, or having a new child since entering the position, appears to ratchet up the pressure on women (and some men) to reject the professoriate as a career goal—these parents now realize what combining parenthood and science will entail. Forty-one percent of women and 20 percent of men postdoctoral scholars who had children after becoming a postdoctoral scholar in the University of California system eschew plans of a research professorship.[50] There is a smaller but still noteworthy gender gap for scholars who began their postdoctoral fellowships with children, while men are equally likely to change their career goals whether or not they have children. Notably, women with no plans to have children look like men, with only 20 percent turning away from an academic research career. These results are summarized in figure 1.3. They are corroborated by the Sigma XI postdoc survey, which found that women were more likely than their male colleagues to say that being a postdoc had affected their plans for children.[51]

For some postdocs, the fear that motherhood will derail their careers is instantly realized. Sherry Towers, a particle physicist described in a *Chronicle of Higher Education* story penned by Robin Wilson, was effectively blacklisted by her advisor when she became a mother. During her pregnancy, her advisor warned that he would not write her a letter of recommendation unless she returned to work almost immediately after having her baby. Even though she did return quickly, he still refused, and she received no interviews for any of the positions she applied for.[52]

Postdocs are vulnerable because their careers depend so much on the faculty supervisor who accepts them in his or her laboratory. Jennifer, a neuroscience postdoc, watched her cohort of elite scientists grapple with these issues: "Mine was the first class that was a 50/50 gender balance. I totally believed I

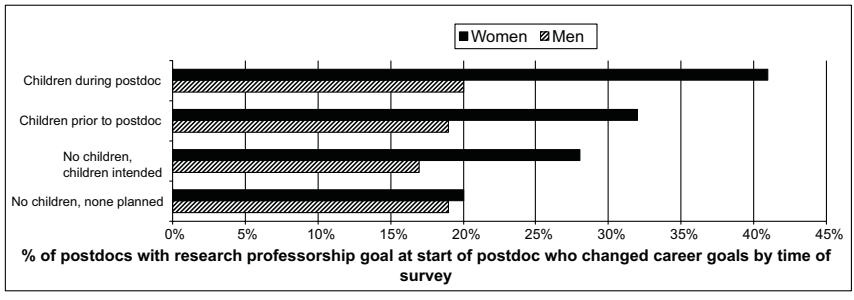

FIGURE 1.3 University of California Postdoctoral Career Goal Shift from Research Professorship, by Gender and Family Status

Source: University of California Postdoctoral Career Life Survey, 2009; Marc Goulden, Mary Ann Mason, Karie Frasch, and the Center for American Progress, "Staying Competitive: Patching America's Leaky Pipeline in the Sciences," Berkeley Center on Health, Economic, and Family Security, University of California, Berkeley, 2009, figure 8, http://www.americanprogress.org/issues/2009/11/women_and_sciences.html.

N = 1,323

could have it all as a female going into the sciences, but that doesn't help you when it comes time for family. Most of the women have to make a decision when they hit their late twenties or early thirties. They either have to quit or take a breather. If you take a breather, it's hard to get back on [track]. Of the female students in my starting class, none . . . became faculty and two dropped out."[53]

A 1999 study of more than eight hundred postdocs at UC Berkeley revealed that postdoc mothers worked many fewer hours in the laboratory, attended fewer conferences, and published fewer papers than their male colleagues, including men with children.[54] Postdoc mothers were relatively dissatisfied with their mentors, whom they often perceived as unlikely to recommend them for university research positions. These women believed they had already lost the race. They spoke of their decision to leave their career track as a choice, but in the rat race of science, the choice was not entirely their own.

Making the Student Years Work for Parents

Are the student and postdoc years fundamentally incompatible with starting a family? They shouldn't be; with the advantages of a flexible schedule and strong community, this period offers many benefits for young parents. So what needs to happen for women to be able to start families during their student years? The experience of Anna Westerstahl Stenport, a Swedish graduate student at UC Berkeley, provides some insight.[55] Anna had a daughter, Courtney, while working on her doctorate in Scandinavian studies. Her decision to start a family was strongly influenced by the benefits available to graduate student researchers at Berkeley, which include subsidized child care and family housing, evening and weekend child care to support study time for parents, free healthcare for graduate student researchers and instructors, and breastfeeding support.

Anna believed that her student schedule worked fairly well with motherhood. She worked forty-five to fifty hours a week, but as a scholar in the humanities these hours were flexible. Having a committed partner willing to share the burden of parenting was crucial for Anna; her husband's work schedule permitted him to take care of Courtney when she couldn't. Anna's experience with her faculty advisor was also very positive. The advisor herself had a five-year-old daughter and completely supported Anna's maternity. We asked if Anna thought her family might be an impediment on the academic job market. She replied that she felt secure at Berkeley, but still worried that other institutions might not be as progressive. "Not right now, right here, but when I went to the job fair for the Modern Language Association [for job interviews] last November I did not wear my wedding band, nor did I bring up my family."

Time passed. We heard from Anna again about a year after her interview at the annual meeting of the Modern Language Association. "You will be happy to

know," she said triumphantly, "that I got a job at [a major research university], and I was pregnant [with my second child] at the time of the interview. Guess what? They offered me my first semester off for parental leave!" This was indeed a happy outcome for this student parent, and a hopeful sign that the culture is inching forward toward family friendliness.

Student life, as Anna relates, can offer a nurturing environment for young mothers, particularly if they are not in the sciences. Moreover, there are signs that the climate is improving. The University of California, like many other universities, stops the time-to-degree clock for student parents. Students are allowed to leave for a semester and return without penalty. The University of California also offers a substantial grant to help student parents with their child-raising expenses. Elsewhere, Yale University has pioneered a five-year medical school plan for student parents who wish to withdraw for a year.[56]

These are positive signs, but there is still a long way to go. Unless the old academic culture, which discourages family formation at all levels but is particularly unfriendly to graduate student parenthood, and especially to women, radically changes to welcome families, we are in danger of losing many of our best and brightest minds. There has been a serious movement to accommodate new faculty parents, but by then it is too late to help disaffected graduate students who have already found careers elsewhere. What might universities do to help? For starters, some of the policies now offered to many faculty could be extended to graduate students and postdoctoral scholars:

- Organized mentoring systems that address work-family balance as well as professional advice
- Affordable child care, including drop-in care
- Family housing
- Paid parental leave for employed graduate students and postdocs
- Health care for dependents
- Stopping the normative time clock for childbirth
- Parent centers and lactation rooms

At best, today's universities offer only one or two of these accommodations, most likely family housing and parent centers.

Title IX

An important argument for offering family accommodations to graduate students and postdoctoral fellows is compliance with the letter and spirit of federal law. Title VII, which outlaws gender discrimination in the workplace, has dramatically changed the work world for employees. Title IX could potentially accomplish the same transformation for graduate students and postdoctoral fellows, who are

usually considered "trainees" rather than employees and are not covered by Title VII. We usually think of Title IX, renamed in 2002 as the Patsy T. Mink Equal Opportunity in Education Act, as helping to level the playing field for women in high school and collegiate sports. Less well known is the fact that Title IX covers all forms of sex discrimination in federally funded educational programs, including discrimination against mothers.[57] Graduate students and postdocs are clearly engaged in educational programs according to the actual language of Title IX: "No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance."

Every major federal granting agency has identical Title IX regulations that include some form of family leave for employees of educational institutions. Most colleges and universities receive federal funds and fall under the jurisdiction of these regulations. The agencies require, for example, that universities and colleges treat pregnancy as a temporary disability, and provide unpaid, job-protected leave to birth mothers "for a reasonable period of time" if the institution does not maintain a leave policy for its employees.

What makes these regulations significant is that if properly enforced they fill gaps in university policies for graduate students and postdoctoral fellows supported by federal grants who are facing pregnancy and caregiving responsibilities. But it is not clear whether these legal requirements are being met at all universities. When asked about the provision of unpaid leave to postdoctoral scholar mothers in our survey of the Association of American University schools, one AAU university indicated that it does not provide it, and six others indicated that they did not know whether or not it was provided.[58] Moreover, only 23 percent of schools offer unrestricted paid maternity leave to postdocs. It is therefore unclear whether all these young scientists are receiving the job-protected, twelve-week unpaid leave stipulated by the Family and Medical Leave Act. Faculty mothers fare much better, but by then many women have decided against academic research careers. All universities and colleges should have in place a clear policy regarding leave for employed graduate student and postdoctoral scholar mothers. Title IX reviewers should consult these policies to ensure that universities are in compliance.

Conclusion

About half of all doctoral students are now women, but a far smaller proportion will become tenure-track faculty members.[59] This chapter has documented some of the challenges women graduate students and postdocs face. Despite their large (and growing) numbers, women students find themselves in a male world. In many disciplines, few of their advisors are women, and even fewer are mothers. The top administrators are likely to be men as well. This leaves women

graduate students with few role models and with profound doubts about how to go about combining families with high-powered research careers. These problems tend to be particularly vexing in the bench sciences, because of both a male research culture and the exigencies of scientific discovery.

At the same time that they are having doubts about an academic career, many women graduate students are getting married or forming lasting relationships, and a small but notable minority are becoming mothers. Men graduate students also marry and become parents, and in somewhat greater numbers than women. Both marriage alone and marriage with children raise serious doubts for both men and women as they ponder academic careers. Some, women more than men, will start turning away from the goal of an academic career. They do not anticipate being able to balance career and family.

Toward the end of their graduate school years, perhaps around age thirty, most women, married or not, consider their career choices in light of present or future family obligations.[60] It may not be the first time they have considered these issues, but now the matter is of some urgency. They know their biological clock has limits. They must make choices that will determine their life's work, and they must evaluate how, and when, having children will fit into the picture, if at all. Many women at this point do not stick to their original career goals.[61] Nor do many men. Sometimes this reflects their concerns about money. Men, more than women, see academia as less likely to provide a family wage than other career choices.[62]

As noted in our survey of University of California graduate students, the great majority of both men and women registered the family friendliness of the future workplace as a serious concern, and as graduation approaches most women and nearly half of all men consider research universities hostile to family life. When our colleague Karie Frasch finished her Ph.D. at Berkeley and started to think about having children, her career plans suddenly looked less appealing: "I went into graduate school thinking a faculty position would be a great way to have kids, that there is flexibility and open summers. Then as I began to see professors who had kids totally strung out and stressed out I began to realize, wait, I am not going to do that!"[63] For many woman graduate students like Karie, thoughts about work and family loom large as graduation approaches. Looking forward, reality sets in as students see the challenging road leading to tenure. What they know about the academic career path is that the next ten years of their lives, the "make or break" years between the ages of thirty and forty, will be the most demanding. The hours are long, perhaps longer than they experienced as a student, and there is often limited flexibility.

How do women respond to these challenges? This will be addressed in the following chapters of this book.