

# Motherhood, the Elephant in the Laboratory

Women Scientists Speak Out

EDITED BY

**Emily Monosson**

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and to those who choose to follow in ours

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# Introduction

## Initiating the Discussion

“Most of us thought we would work and have kids, at least that was what we were brought up thinking we would do—no problem. But really we were kind of duped. None of us realized how hard it is.”<sup>1</sup>

This quote hit home. I am a split personality, the product of my mother—whose job it was to keep the house, raise the kids, and support my father—and my father, who loved his work and held in highest esteem the university faculty who taught him about science, math, and business. Although I strive to be like my mother, I aspired to become a scientist ever since the day my father, with boyish glee tempered by parental caution, dumped a mixture of chemicals from his old chemistry set into a hole in the ground and we watched them hiss, bubble, and fade into the earth.

When I received my doctorate in toxicology from Cornell University, my father tacked up the framed photo of me shaking hands with Frank Rhodes, then president of the college, on his office wall. It was the only

1. Cathie Watson-Short, *New York Times* Quote of the Day, in Eduardo Porter, “Stretched to the Limit, Women Stall March to Work,” *New York Times*, March 2, 2006.

photo he'd kept in his office of any one of his four grown girls. So on the day I announced that I was moving from my research position in Rhode Island to an uncertain future in North Carolina, accompanying my soon-to-be fiancé as he pursued his PhD, my father called. "Lemme ask you a question," he said. "What about your research?" His fear that I might throw it all away, for a man he'd not yet met, was evident. Yet several years after that, while happily married and working as a research associate, when I announced my first pregnancy, he expressed nothing but joy. Perhaps by then he believed his youngest could do it all. But as I transformed from a full-time laboratory researcher to a homebound scientist surrounded by piles of reprints, half-eaten finger foods, and balled-up diapers, I found myself presenting two not entirely realistic selves to my father: one, the fully dedicated scientist and ideal worker; the other, the ideal mother whose first priority was her babies.

For years I'd wondered what was wrong with me. Since I'd decided that I would work only during school hours while the kids were young, was I not a dedicated scientist? Guiltily I wondered if I'd set a poor example for young women in science. I grew up in the 1970s when women fought for equal rights. When my father, who constantly encouraged us to pursue our passions in life, dared one evening to acknowledge to his wife and girls (four sisters) that he was reluctant to hire a young woman for a high-level position with his company (a company that one of my sisters now heads) for fear that she might get pregnant and leave, the five of us pounced. It wasn't pretty.

Thirty years later, had I become one of those women? After reading Watson-Short's quote I realized I wasn't alone in making such difficult choices. Empowered by that knowledge, I sat down in my home office and typed a short note to the Listserv for former American Association for the Advancement of Science Fellows, or AAAS Fellows, one of my links to scientists from around the country, attached the *New York Times* article along with the quote, closed my eyes, and hit Send. Outing myself by broadcasting the article was an act of desperation. I was admitting to an elite group of scientists that I am a mother who struggles to succeed as a scientist and a scientist who finds it difficult to be an ideal mother. I wanted to know I was not alone.

Responses were immediate, enthusiastic, and emotional. For many women, this was the first time anyone had asked that they share their experiences without being judged for their choices. Though these women responded with passion, many wished to keep their responses anonymous.

Some were uncomfortable discussing family and work practices on a forum for science professionals. On the Internet it is easy to assume the persona of a full-time ideal worker. Some respondents were afraid that if they discussed difficulties of combining career and family, they'd be charged with whining. Many, however, felt that by posting their comments to the list, they might encourage others to come forward, initiating a broader discussion about combining motherhood and a career in science:

The push to get more women in science and engineering has ignored the elephant in the room—motherhood. (Denise DeLuca, PE, Outreach Director, The Biomimicry Institute)

I really appreciate your raising this issue, despite everyone's reluctance to discuss it openly. (Rachel S., PhD)

In the final analysis, every woman finds her own way. It's just good to know that none of us is alone. (Frieda S., PhD)

Scientists with families, particularly women with young children, find it difficult to achieve a balance between work and family in these highly competitive, often male-dominated fields. And it is not just the sciences. The media, academic journals, and libraries abound with articles and books detailing the struggles and difficult decisions faced by working parents (though primarily women) in a range of professions from engineering to law to academics.<sup>2</sup>

Although about half of the undergraduate and over 40 percent of graduate degree recipients in science and engineering are women, in 2003 they represented only 27 percent of all employed doctoral-level scientists, reaching parity with men in just a handful of science occupations such as psychology (as psychologists) and postsecondary teaching for health and

2. Peter Meiksins and Peter Whalley, *Putting Work in Its Place* (Ithaca: Cornell University Press, 2002); Leslie Perlow, *Finding Time: How Corporations, Individuals, and Families Can Benefit from New Work Practices* (Ithaca: Cornell University Press, 1997); C. Taylor, "Scientists as Parents," *ScienceCareers: The American Association for the Advancement of Science* (January 2004), [http://sciencecareers.sciencemag.org/career\\_development/previous\\_issues/articles/2800/scientists\\_as\\_parents\\_feature\\_index](http://sciencecareers.sciencemag.org/career_development/previous_issues/articles/2800/scientists_as_parents_feature_index); Lucille Louis, "The X-gals Alliance," *ChronicleCareers: The Chronicle of Higher Education* (October 2006), <http://chronicle.com/jobs/news/2006/10/2006100201c/careers.html>; Robert Drago, "Harvard and the Academic Glass Ceiling," *ChronicleCareers: The Chronicle of Higher Education* (March 2007), <http://chronicle.com/jobs/news/2007/03/2007032701c/careers.html>.

related sciences.<sup>3</sup> In the category of “contingent” faculty members, those who work part-time or full-time as non-tenure-track faculty, the proportion of women working as contingent faculty exceeds the proportion of men.<sup>4</sup> These data have not gone unnoticed, and one needn’t look far to find programs, studies, and books aimed at solving the case of the vanishing woman scientist, a phenomenon sometimes referred to as “the leaky pipeline,”<sup>5</sup> particularly in what has been traditionally considered the pinnacle of scientific success, academia.<sup>6</sup>

But if women really are leaving the sciences, where are they going? We’re talking about thousands of women. Do they seek alternative paths? If so, do they continue to contribute to the scientific community or to science in some way? If they leave, what impact does this have on science and society? Though these critical questions have been addressed by two recent National Academy of Science publications they provide few answers to the question, “Where are they going?”<sup>7</sup>

This book contains essays written by thirty-four mother-scientists whose stories provide insight into the choices they have made to create balance in their lives. Contributors to this book work part-time or full-time, opt out, and opt back in. They’ve become entrepreneurs, they job-share, and they volunteer. They work in academia, industry, consulting, state and federal government, and on their own. Some of these women who have chosen to stray from the straight and narrow road paved by mentors, ad-

3. National Science Foundation, Division of Science Resources Statistics, *Characteristics of Doctoral Scientists and Engineers in the United States Survey of Doctoral Recipients* (Arlington, Va.: National Science Foundation, 2003), table 14, <http://www.nsf.gov/statistics/nsf06320/tables.htm>.

4. E. Ivey, C. Weng, and C. Vahadji, *Gender Differences among Contingent Faculty: A Literature Review*, Final Report, The Association for Women in Science, 2005, <http://www.awis.org/pubs/sloanreport.pdf>.

5. Yu Xie and Kimberlee Shauman, *Women in Science: Career Processes and Outcomes* (Cambridge, Mass.: Harvard University Press, 2003). The term “leaky pipeline” is discussed by Xie and Shauman in the introduction to their book, pages 6–9.

6. Xie and Shauman, *Women in Science*; National Academy of Sciences, National Academy of Engineering, Institute of Medicine of the National Academies, *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Sciences and Engineering* (Washington, DC: National Academies Press, 2006); National Science Foundation, Division of Science Resource Statistics, *Gender Differences in the Careers of Academics, Scientists and Engineers* (Washington, DC: National Science Foundation, 2004); *ADVANCE: Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers* (Arlington, VA: National Science Foundation), [http://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=5383](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5383).

7. National Academy of Sciences, *Beyond Bias and Barriers*; and *Rising above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (Washington, DC: National Academies Press, 2007).

visors, and scientists before them by working part-time, or who no longer coax data from the bench or the field, have a sense that they have become an invisible, underutilized, and misunderstood workforce. They often feel marginalized when they attempt to return or interact with the more traditional workforce. Their feelings are summed up by M. T., who has worked as an editor, research associate, and volunteer:

I find myself constantly rehearsing and drafting what I will say to people I meet at meetings and in professional settings about my unpaid research situation and all the volunteer work I do to promote programs for government agencies, professional societies, and education. (M. T., PhD)

M. T. is not alone. There are others, women in particular, who seek alternatives and who contribute to the sciences in nontraditional ways, their choices driven in large part by a desire for an acceptable work-life balance; they could use support and encouragement from the larger scientific community. As one graduate advisor responded to the original e-mail:

The graduate students in our department frequently complain about not being educated about career options outside of traditional academic careers. When, as graduate studies chair, I talked one-on-one with female students trying to figure out how to make life work (this happened a lot—I always wondered whether the male graduate studies chairs were approached about this as well), I tell them about women who are tenured, or who teach high school or who work part-time as examples of different ways to have successful lives when children arrive after PhDs. . . . I also talk to students about not letting themselves define their goals and success by their advisor's (or their perception of their advisor's) ideas of success. (Libby Marschall, PhD, Department of Evolution, Ecology, and Organismal Biology, Ohio State University)

My motivation for compiling this book was to highlight the accomplishments, challenges, and choices made by women scientists as they combine motherhood and career. I've included essays written by women who have chosen routes outside the mainstream as well as those who have followed traditional career tracks in academia or as government researchers. Essays are organized chronologically by date of last degree conferred, and contributors range from women who received their PhDs in the 1970s to those still in graduate school. Because of the variety of experiences reported by these women, organizing essays by work sector (academia, industry, gov-

ernment) or by time spent in the workforce (full-time, part-time, opting out, and opting in) was too limiting. In the end, a chronological organization, tracking the interaction of science and motherhood across a span of time in which drastic changes in both science and women's rights have occurred, made the most sense.

In all cases, when there is family involved, there is a story to tell. Sharing these stories serves others by reassuring, encouraging, or cautioning them as they seek the balance that works for them. My goals for this book are twofold: to initiate discussion on redefining the concept of "career" scientist and to examine the many different ways in which women have managed to combine motherhood with their science careers. Writes Rachel, another early e-mail respondent:

I can only hope that by continuing to have the discussion, that ultimately policies and society will change to become more egalitarian and family friendly. (Rachel S., PhD)

### Defining the Boundaries

The first time I talked to a group about this book, I was asked how I had defined "scientist." It was a good question, and I did not have a satisfactory answer. While gathering essays, I'd inadvertently narrowed my definition of a scientist to someone who had earned a PhD in the natural and physical sciences (though I had let a few engineers and social scientists slip in as well). I thought this would provide a clear demarcation. Then one woman asked if a master's degree with ten years of experience qualified. Another, who has a PhD but now teaches high school science, wondered if she still counted.

"Of course," I'd answered to both, based on my (perhaps self-serving) belief that the definition of a scientist includes much more than the traditional sum of her degrees, grants, and publications. When I think about the many scientists I know, science is not only their profession but a way of thinking about the world, a way of life. Scientists find joy in science. We ask questions, seek answers, are curious. If we did not love our work, the four, five, six, or more years of graduate school (often during prime child-bearing years) would be a far too painful sacrifice. I've yet to hear a scientist describe her (or his) work as "just a job."

Many of us mothers who leave the mainstream, or leak from the pipeline, will do whatever it takes to nurture and grow our scientist selves.

But are the women who have pursued alternatives to careers in academia or as primary investigators of a research laboratory, seeking work-life balance, still considered scientists by the larger scientific community? Some would say no. Once again I turned to the AAAS Listserv this time asking (1) how would you define scientist? and (2) how would you characterize success in science? In response to the former, I received the following e-mail from Ravi Sawhney, an orthodontist and cell biologist, now working on science policy at the National Institutes of Health, which despite my own broad definition, resonated with the more traditional part of me. Wrote Ravi:

- 1) A scientist is someone who spends a significant portion of their time,
- 2) using the scientific method,
- 3) to answer questions, test hypotheses, or build models that lead to predictions,
- 4) in order to further the human understanding of the workings of nature.

Point 1 is because everyone dabbles in science whether trying to figure out how to lure a mate, raise kids, or just how much Weed & Feed you need to kill the damned dandelions. "Everyone" isn't a scientist though.

Point 2 is because I think you actually have to be practicing science. Teaching science is extremely important to the scientific enterprise, and teachers are a valuable return on our investment in research, but teaching science doesn't make one a scientist . . . any more than someone teaching art makes someone an artist in itself. An art teacher may have a much more significant impact on the world than an individual artist. It isn't a value judgment, just my definition. It also implies that just observing and describing, or using high tech gadgetry, or thinking a lot, etc., doesn't make one a scientist.

Point 3 is what science is. Everyone has a different definition.

Point 4 is because I think you have to actually put your data out there to call yourself a scientist. I think a scientist actually has to be advancing scientific understanding.

Ravi concluded by adding,

I was trained as a scientist. As a Health Science Policy Analyst at the NIH, I think about science all the time; I try to advance it; I try to help the world understand how important it is. I field tough questions at dinner parties. But, as much as I hate to admit it . . . gulp . . . I am no longer a scientist.

Thanks for making me face that brutal reality. Dear God, when did I go astray?<sup>8</sup>

Ravi's definition was both thorough and, given my current status, somewhat depressing. Although some part of me agreed with Ravi, my inner scientist, fully aware of her own bias, begged me to keep searching.

I discovered that Merriam-Webster provides a more liberal definition, describing a scientist as one who is "learned in science and especially natural science," and defines science as "knowledge or a system of knowledge covering general truths or the operation of general laws especially as obtained and tested through scientific method."

On the basis of my own experiences and those of friends, colleagues, and those who have contributed to this book, either by writing essays or by participating in the first few rounds of e-mail, I would suggest a combination of the two definitions. I'm not sure "being learned," which these days may imply a PhD (or in some cases an MS followed by independent research), is enough. I believe that part of being a scientist, as Ravi describes, is advancing scientific information, using the knowledge and the scientific method, whether by designing experiments in a research laboratory, developing an ecology field trip for high school seniors, preparing an analysis based on literature review, or educating communities about groundwater issues.

I think it is important to add here a brief note about the term "career," which also has several connotations. In her analysis of women and work, discussed in next section, Claudia Goldin acknowledges that "career" is difficult to define and that "in common parlance, it means a success that is not ephemeral." In need of a technical definition for her analysis, however, she then more narrowly defines a woman with a career as "earning more than a college graduate man whose income is well below that of the median man (but about equal to the median of the female earnings distribution) for several consecutive years."<sup>9</sup> Such a definition would likely exclude several contributors to this volume of essays (present company included).

8. Ravi later wrote back that after he shared his definition, it was "roundly rejected—by artists who felt it cruel to say that an actress having to wait tables to make ends meet is no longer an actress, and by researchers who felt it unfair to say that someone who lost their NIH grant and thus their lab is no longer a scientist. Perhaps," added Ravi, "the intention to do science may be more important than the actual doing of science in defining a scientist."

9. Claudia Goldin, "The Long Road to the Fast Track: Career and Family," *ANNALS AAPSS* 596 (2004): 20–35, at 31.

Yet, as Peter Meiksins and Peter Whalley, authors of *Putting Work in Its Place*, write in reference to careers:

[B]eing serious about one's work is supposed to mean a full-time, indeed an extended time commitment. . . . This is what is traditionally meant by having a career. . . . Careers not jobs, are what help shape identities, give form to a work life, and gain public recognition. . . . Professional women with children [referring to those who choose flexible and part-time work options], in particular, have to resist the assumption that they have settled for the mommy track, a less demanding form of work, not really a career, just a job (although the man or woman in the next cubicle or office may be doing similar work but be on the fast track to the top).<sup>10</sup>

In one form or another, the contributors to this book have chosen to dedicate their lives to a career in science, whether it is teaching, research, or policy.

The second issue, once we decide who still belongs to the science club, is success. I've added success, because "success in science" is a concept that appears in reports about the leaky pipeline or the vanishing woman scientist. The perception is that not only are women leaving the sciences but also that many women are not achieving a certain standard of success.

Because in certain disciplines academia remains the ultimate and most desirable outcome for scientists, some scientists who leave express guilt and a sense that they have failed their advisors, or that they are letting other women down, perhaps even setting a poor example. Additionally, those who choose careers they consider more amenable to raising children or who take time from their full-time positions fear that discussing the impact of motherhood on their careers will weaken their professional standing and future career options.

Reading the contributed essays and observing the careers of scientists both inside and outside academia, I would suggest that a broader and more inclusive definition of success (beyond attainment of tenure) in science might lead to a more inclusive and perhaps more welcoming scientific community, one that does not discourage but encourages the participation of all kinds of scientists in all kinds of roles. To do otherwise would be to label as failures those scientists who leave the academic pipeline; who are lecturers, adjuncts, or high school teachers; who choose the position of re-

10. Meiksins and Whalley, *Putting Work in Its Place*, 35–36.

search associate rather than primary investigator; or who choose policy or writing. Should success in science be measured purely by the type and size of a grant, the number of publications, and the number of graduate students trained? Or is there a place for a broader definition of success that values contributions to science that cannot be measured with dollar signs or quantities of goods?

The following e-mails about success suggest there is room for more than one definition:

Some weeks ago, a colleague and I talked about how we were all brainwashed with the “publish or perish” rule, and we were warned that we must have grants in highly competitive settings in order to succeed in science careers. Now, she and I and many others have found very productive and interesting careers by ignoring that “old school” advice. (Alexandra S. Fairfield, PhD, National Institutes of Health, retired)

We consider a trainee a success even if they are in a policy or administrative position that deals with Science. Our thought is that, like the AAAS fellowship acknowledges, we need scientists in administration and policy to help translate scientific discovery into informed policy decisions. . . . [W]e use a very broad definition of success. (L. K., PhD, former AAAS Science and Diplomacy Fellow, Fogarty International Center, NIH)

Yet another way to think about [success] is to consider what defines a successful scientific community, rather than what defines a successful individual scientist. In my own opinion, a successful scientific community requires talented researchers, science teachers, science writers, science advocates, and people in many other science-related areas. (Rebecca Farkas, PhD, AAAS Science Policy Fellow)

I believe there is room for a definition of success that is not limited to appointments at respected universities and laboratories or prestigious grants that support large laboratories. In my own field of environmental sciences, at least two large movements were initiated by inspiring women who worked outside academia and who did not run large laboratories—Rachel Carson, credited with initiating the environmental movement, and Theo Colborn, who helped draw attention to the consequences of endocrine-disrupting chemicals in the environment. These women observed and synthesized the work of many others and drew insightful conclusions.

As Rebecca noted in her quote above, a successful scientific community requires a diversity of members. Scientific advances require those who discover the impact of ocean currents on global temperature and novel applications for nanomaterials and those who educate and inspire the next generation of scientists. Scientific advances also require those who inform politicians and lobby for the funds to support these scientists. Application of scientific advances requires those who inform policymakers and the public about the importance of the risks and benefits of new technologies. And women with children populate all these niches—some choosing one over another to accommodate family.

## The Elephant

Women are an integral part of the larger scientific community. According to the National Science Foundation (NSF), there are approximately one hundred thousand women doctoral degree holders in the United States employed in the sciences,<sup>11</sup> but employment figures, particularly in academia, suggest women are leaving the sciences in droves.

In the fall of 2006, the National Academy of Sciences released its highly quoted report *Beyond Bias and Barriers*, the goal of which was to “develop specific recommendations on how to make the fullest possible use of a large source of our nation’s talent: women in academic science and engineering.”<sup>12</sup> That they were compelled to state up front not only that women “have the ability and the drive to succeed” but that the lower representation of women in the highest reaches of academic math and sciences can’t be accounted for by any “significant biological differences between men and women in performing science and mathematics” would have been laughable to the hundred thousand women scientists had it not been for the comments made in a speech the previous winter by the now former president of Harvard University, Lawrence Summers. Addressing the National Bureau of Economic Research, Summers suggested that the underrepresentation of women in science had both a biological and social basis.<sup>13</sup>

11. National Science Foundation, Division of Science Resources Statistics, *Characteristics of Doctoral Scientists and Engineers*, tables 26–29, <http://www.nsf.gov/statistics/nsf06320/tables.htm>

12. National Academy of Sciences, *Beyond Bias and Barriers*.

13. Lawrence H. Summers, “Remarks at NBER Conference on Diversifying the Science and Engineering Workforce,” Cambridge, Mass., January 14, 2005, <http://www.president.harvard.edu/speeches/2005/nber.html>.

His comments created a major backlash,<sup>14</sup> leading to his eventual resignation and prompting social scientists Stephen Ceci and Wendy Williams to solicit “evidence-based” essays debating gender differences in cognition.<sup>15</sup> Writing about Summers’s comment, Ceci and Williams remark:

Coming as it did from the gatekeeper of one of the world’s great institutions of higher learning, the insinuation of biologically based differences in cognition, coupled with an accusation that advocates of greater equity for females in science were grasping at weak socialization explanations, was radioactive. . . .<sup>16</sup>

Although Ceci and Willams invite readers to decide for themselves why more women aren’t in science, they write in their conclusion, “Sex differences appear to be neither as unambiguous as earlier researchers suggested nor as insubstantial as some current critics claim. Sex differences in career choices are definitely not inevitable as the past 30 years have documented a sea change in the gender makeup of various fields.”<sup>17</sup>

These days, almost 45 percent of all science and engineering PhD recipients are women.<sup>18</sup> There is no doubt that women are attracted to and can succeed in the sciences. Yet many leave, while others favor certain less visible and lower-paying sectors, including educational institutions other than four-year colleges and universities, private not-for profit organizations, and self-employment.<sup>19</sup> In academia, compared with male faculty, a greater proportion of women faculty work in non-tenure-track positions as lecturers and adjuncts.<sup>20</sup> More female than male PhD recipients report

14. Marcella Bombardieri, “Summers’ Remarks on Women Draw Fire,” *Boston Globe*, January 17, 2005, [http://www.boston.com/news/local/articles/2005/01/17/summers\\_remarks\\_on\\_women\\_draw\\_fire](http://www.boston.com/news/local/articles/2005/01/17/summers_remarks_on_women_draw_fire); Letter from President Summers on women and science, January 19, 2005, <http://www.president.harvard.edu/speeches/2005/womensci.html>; Women in Science and Education Leadership Institute (WISELI), University of Wisconsin, Madison, has a website devoted to his comments and responses to his comments: Responses to Lawrence Summers on Women in Science, <http://wiseli.engr.wisc.edu/news/Summers.htm>.

15. Stephen Ceci and Wendy M. Williams, eds., *Why Aren’t More Women in Science?* (Washington, DC: American Psychological Association, 2007).

16. *Ibid.*, 8.

17. *Ibid.*, 223–24.

18. National Science Foundation, Division of Science Resources Statistics, *Characteristics of Doctoral Scientists and Engineers* (2005), figure F-1, <http://www.nsf.gov/statistics/wmpd/figf-1.htm>.

19. National Science Foundation, Division of Science Resources Statistics, *Characteristics of Doctoral Scientists and Engineers* (2003), table H-11, table H-12, table H-33, <http://www.nsf.gov/statistics/nsf06320/tables.htm>.

20. Ivey, Weng, and Vahadji, *Gender Differences*, 14.

that they are either employed part-time or not employed and not seeking work.<sup>21</sup> Why?

One answer is family. Of those working part-time, half indicated that they chose part-time work to accommodate family.<sup>22</sup> Although numbers aren't available for full-time workers who chose nonacademic careers because of family responsibilities, evidence suggests that for women family considerations weigh heavily. For those who are tenured or in tenure-track positions, the National Academy of Sciences found that women "consistently ranked working conditions, family, and job location higher than men among their reasons for changing jobs." Further, the study found that "women are 40% more likely than men to exit the tenure track for an adjunct position,"<sup>23</sup> and although reasons for such changes were not explicit, a growing number of journal articles and news stories suggest that women who have invested a great deal in climbing the career ladder (in science and a variety of other occupations) are choosing to step off the career track, at least for a period of time.<sup>24</sup>

It should not be surprising, in a society where women are the primary caregivers, that many women exit, cut back, or find alternative careers that allow more time with family. Though many of us have no doubt that we have what it takes to succeed in the sciences, children exert a powerful force upon us as well, and we will seek a career that allows for balance. In an article published in *Scientific American* on the effect of pregnancy and motherhood on the female brain, Craig Kinsley and Kelly Lambert write:

What was once a largely self-directed organism devoted to its own needs and survival becomes one focused on the care and well-being of its offspring. . . . New research indicates that the dramatic hormonal fluctuations that occur during pregnancy, birth and lactation may remodel the female brain, increasing the size of neurons in some regions and producing structural changes in others. . . . Although studies of this phenomenon have so far fo-

21. National Science Foundation, Division of Science Resources Statistics, *Characteristics of Doctoral Scientists and Engineers* (2003), table H-12, <http://www.nsf.gov/statistics/nsf06320/tables.htm>.

22. *Ibid.*, table H-11.

23. National Academy of Sciences, *Beyond Bias and Barriers*, 3, 36.

24. P. Stone and M. Lovejoy, "Fast-Track Women and the 'Choice' to Stay Home," *Annals American Academy of Political and Social Sciences* 596 (2004): 62-83; Eduardo Porter, "Stretched to the Limit, Women Stall March to Work," *New York Times*, March 2, 2006; also see *First Hidden Brain Drain Summit a Success, The Hidden Brain Drain*, Task Force, Media Notes, Center for Work Life Policy, New York, New York, <http://www.worklifepolicy.org/documents/October%202006%20News%20Flash.pdf>; Lisa Belkin, "After Baby, Boss Comes Calling," May 17, 2007, *New York Times*.

cused on rodents, it is likely that human females also gain long-lasting mental benefits from motherhood. Most mammals share similar maternal behaviors, which are probably controlled by the same brain regions in both humans and rats. In fact, some researchers have suggested that the development of maternal behavior was one of the main drivers for the evolution of the mammalian brain.<sup>25</sup>

The changes discussed by Kinsley and Lambert include not only the typical behaviors associated with motherhood—such as nestbuilding, grooming, and offspring protection—but also such changes as improved memory, ability to forage for food, and (not surprisingly for those of us who juggle work, carpooling, doctors' appointments, rehearsal schedules, and grocery shopping) multitasking. Some of these behaviors are long-lasting, benefiting rats, at least, well into their senior-citizen years.

For some women in the sciences and other professions, the pull of family versus career can be overwhelming, as documented by Pamela Stone and Meg Lovejoy, authors of an article entitled "Fast-Track Women and the 'Choice' to Stay Home," who note that "[p]rofessional women are caught in a double bind between the competing models of the ideal worker and the ideal parent."<sup>26</sup> They further observe that "[a]lthough the vast majority of women with professional degrees are working, they are out of the labor force at a rate roughly three times that of their male counterparts and overwhelmingly cite 'family responsibilities' as the reason."<sup>27</sup>

Many of the forty-three women included in Stone's and Lovejoy's study (women formerly employed in professional and managerial jobs) agonized over their decision to leave their jobs, in part because many women are proud of their accomplishments, enjoy their work, and gain a sense of identity through their work.

But seeking balance between career and family shouldn't hobble a career. For example, in the sciences there is a widely held belief that once one leaves the main road, depending on the discipline, the on-ramp can be difficult if not impossible to find.<sup>28</sup> In 1970 Kathleen Lonsdale, an X-ray crystallographer and one of the first women elected to the Royal Society in London, posed the question, "Is it Utopian to suggest that any country that

25. Craig Kinsley and Kelly Lambert, "The Maternal Brain," *Scientific American* 294 (2006): 72–79.

26. Stone and Lovejoy, "Fast-Track Women," 62.

27. *Ibid.*, 63.

28. Xie and Shauman, *Women in Science*, 8.

really wants married women to return to a scientific career when her children no longer need her physical presence should make special arrangements that encourage her to do so?"<sup>29</sup> Thirty-seven years later, women are still seeking a scientific community that will not disadvantage them if they interrupt their careers in favor of family responsibilities but will instead appreciate the breadth of experience that comes with raising children:

What we all need—parents and non-parents of both sexes—are work places and a scientific community that will accept our bouncing back and forth from periods of work intensity to periods of part-time work. Yes—we as a scientific community will have to be accepting of people needing time to get back to speed. In return we will get mature, balanced people with a wisdom and knowledge of life that would very likely otherwise be missing. (Francesca T. Grifo, PhD, Senior Scientist and Director, Scientific Integrity Program, Union of Concerned Scientists)

Even for those who find balance with a full-time career track, raising a family while maintaining a scientific career is difficult, partly because of biological limitations. What may set science and academics apart from other professions when it comes to having children is the requirement for many PhD graduates to complete at least one postdoctoral position before moving into a more permanent job, particularly for those in research, delaying the timing of career stability. When a woman is striving for tenure or career stability (typically in her early to mid-thirties), the biological clock is winding down. The timing of children and the impact of children on scientific careers (primarily academic) are well documented.

Writing about the conflict between science career and family, Yu Xie and Kimberlee Shauman, authors of *Women in Science: Career Processes and Outcomes*, note that when the primary responsibility for household labor falls on women, some women will forgo their potential science and engineering careers for family, while others who are already on the career track will forgo family for their scientific careers. Xie and Shauman observe that "fewer women than men combine a family life with an active S/E [science and engineering] career."<sup>30</sup>

In his report *Faculty Careers and Flexible Employment*, David W. Leslie presents some striking figures illustrating that as the number of depen-

29. Kathleen Lonsdale, "Women in Science: Reminiscences and Reflections," *Impact of Science on Society* 20 (1979): 45–59.

30. Xie and Shauman, *Women in Science*, 141.

dents increases, the mean number of hours worked by women (presumably work related to academia and not to home and family) and the number of hours dedicated to research decline; by contrast, the hours worked by men tend to increase slightly with increasing numbers of dependents.<sup>31</sup>

Another analysis of tenured and tenure-track faculty at the University of California, Berkeley, by Mary Ann Mason and Marc Goulden in 2002, concluded that women who have “early babies,” born within five years of their mothers’ attaining their PhDs, tended “not [to] get as far as ladder-rank jobs. They make choices that may force them to leave the academy or put them into the second tier of faculty: the lecturers, adjuncts, and part-time faculty.”<sup>32</sup> These findings are supported by the report *Gender Differences among Contingent Faculty* by Elizabeth Ivey and others.<sup>33</sup> In contrast, write Mason and Goulden, those “with late babies and women without children demonstrate about the same rate of achieving tenure, a rate higher than women with early babies. Presumably, women who have babies later in their career life have already achieved job security. They are also more likely to have only one child.”<sup>34</sup>

Finally, a survey of approximately one thousand American Fisheries Society members representing a range of work sectors found that “twice as many women as men think having children will adversely affect their careers. For those with dependents (and the study found that women were both less likely to be married and less likely to have dependents), when asked what effects dependents had on their career, more than twice as many women as men said they had put their career ‘on hold’ because of their dependents.”<sup>35</sup>

The experiences of having children and child rearing are different for each one of us. Before I had children, I was clueless about the strength of the mother-child bond. I just assumed that postbaby I’d continue with business as usual while my husband finished his PhD. Two colleagues and I secured funding to investigate the impacts of reproductive contaminants on fish, which meant moving and setting up a laboratory in time for our

31. David Leslie, *Faculty Careers and Flexible Employment*, TIAA-CREF Institute, Policy Brief, 1-06, <http://www.tiaa-crefinstitute.org/research/policy/docs/pol010106.pdf>.

32. Mary Ann Mason and Marc Goulden, “Do Babies Matter? The Effect of Family Formation on the Lifelong Careers of Academic Men and Women.” *Academe* 88 (2002), <http://www.aaup.org/pubsres/Academe/2002/nd/feat/maso.htm>.

33. Ivey, Weng, and Vahadji, *Gender Differences*, 14–16.

34. Mason and Goulden, “Do Babies Matter?”

35. Nancy Connelly, Tommy L. Brown, and Jill M. Hardiman, “AFS Men and Women Differ Most in Their Lifestyle Choices,” *Fisheries* 31 (2006): 503–6.

first field season. For practical reasons, and not necessarily in anticipation of any powerful hormonal pull, I'd written in my salary as half-time for two years. My advisor smiled knowingly when I told him of my plans. "My wife thought she'd stay home after kids, while my sister-in-law knew she wanted to go right back to work," he'd told me as I waddled down the hallway beside him on my last day of work. "Well, my wife went back to work, and my sister-in-law stayed home—so you just don't know how you'll feel." I fell smack between the two, eventually becoming a stay-at-home scientist, determined to have both family and career yet uncertain of my ability to maintain both.

I am not alone in wanting it all. Many women who have devoted a significant portion of their young lives to education and training to become a professional want both family and a career. In her article "The Long Road to the Fast Track: Career and Family," Claudia Goldin explores the evolution of college women's attitudes toward family and work throughout the past century by identifying five cohorts of college women whose experiences reflected the times in which they lived and the groundwork laid by the women college students who preceded them.<sup>36</sup>

The women in the first cohort Goldin identifies graduated from four-year colleges between 1900 and 1919 and are characterized as desiring (or achieving) "family or career"; those graduating between 1920 and 1945 who pursued "job, then family" composed the second cohort; followed by the third cohort, graduates between 1946 and 1965, who tended toward "family, then job." For this post-World War II group, whose members married young and created the boomer generation with their high rates of childbirth, family typically came first, and teaching was the dominant occupation. Goldin writes:

[This cohort] became the frustrated group described by Betty Friedan. . . .

[I]ts members became increasingly discontent with a labor market that offered college women little in the way of career advancement and with employment officers who often asked them just one question: "Can you type?"<sup>37</sup>

Although few contributors to this book belong to this demographic, those that do, do not fit the cohort model of "family, then job"—since they pursued a career in addition to raising a family.

36. Goldin, "The Long Road," 25.

37. *Ibid.*