From Ph.D. to Professoriate

The Role of the Institution in Fostering the Advancement of Postdoc Women

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NATIONAL POSTDOCTORAL ASSOCIATION
WASHINGTON, DC

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From Ph.D. to Professoriate: The Role of the Institution in Fostering the Advancement of Postdoc Women is a product of the NPA ADVANCE project, a three-year project of the National Postdoctoral Association (NPA) to foster the transition of women postdoctoral scholars (postdocs) into the professoriate.

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About NPA ADVANCE

This resource is a product of the NPA ADVANCE project, a three-year project of the National Postdoctoral Association to foster the transition of women postdoctoral scholars (postdocs) into the professoriate. The project has been supported by the National Science Foundation (NSF) ADVANCE program, which seeks to increase the representation and advancement of women in academic science, technology, engineering and math (STEM) careers. NPA ADVANCE has sought to adapt and disseminate promising institutional practices for assisting women scientists and engineers to make this transition. The project has drawn on successful models from past ADVANCE programs and the broader postdoctoral community in order to identify promising models and approaches that could effectively be replicated at research institutions.

Project activities have included:

- A review of the literature on gender differences among postdocs;
- Development and dissemination of a fact sheet on Postdoctoral Scholars, Gender, and the Academic Career Pipeline and an accompanying informational Web site;
- A survey and review of institutional efforts made by ADVANCE recipients and by leaders in the postdoctoral community to address these issues;
- Development of resources for individual postdocs on issues related to pregnancy and family leave;
- Focus groups with current and former postdoc women regarding factors involved in their career decisions;
- Technical assistance to institutions seeking to implement programs for their postdocs; and
- A series of workshops held at the NPA Annual Meetings on these issues.

The main deliverables of this project were a National Summit on Gender and the Postdoctorate; an online clearinghouse of promising institutional practices with examples of potentially adaptable models;[1] and this resource book. The 2010 Summit brought together postdocs, faculty, administrators with oversight of postdoctoral affairs and other advocates with an interest in postdoc gender issues. It provided a forum for examining what we know about postdoc women and their career

trajectories, as well as an initial platform for sharing of promising practices to help advance postdoc women's careers.[2]

The NPA hopes that the information found in this resource book will assist institutions in their efforts to reduce the obstacles faced by postdoc women as they seek to advance their careers as academic professionals. In reducing these obstacles for women we anticipate that postdoc men, who also need policies and programs that support their careers and foster family formation, will benefit as well.

The successful completion of this project would not have been possible without the participation of many persons from across the country. The NPA wishes to express its deep appreciation and gratitude to the Project Advisory Committee, those who participated in the surveys and focus groups, the Project Evaluator Laura Kramer, Ph.D., ADVANCE Program Director Kelly Mack, Ph.D., the contributing authors, ADVANCE recipients, NPA leaders, and many more.

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1 http://www.nationalpostdoc.org/advance/clearinghouse

2 For more information, including presentations, visit http://www.nationalpostdoc.org/programs-resources-25/npa-advance/advance-summit

About the National Postdoctoral Association

The mission of the National Postdoctoral Association (NPA), a 501(c)3 non-profit educational organization headquartered in Washington D.C., is to improve the postdoctoral experience by supporting enhanced research training and a culture of enhanced professional growth to benefit scholarship and innovation. Since its founding in 2003, the NPA has assumed a leadership role in addressing issues confronting the postdoctoral community that are national in scope and require action beyond the local level.

The NPA supports postdoctoral scholars and the greater postdoctoral community mainly through resource development, building community, and education of the public. Each spring the NPA hosts its Annual Meeting, where many topics pertinent to the education and training of the U.S. research workforce are discussed and debated on a national level. One of the NPA's strategic priorities is to promote and support diversity throughout the U.S. postdoctoral community, and the NPA ADVANCE project is part of this effort.

The NPA membership includes some 2,500 individuals and nearly 190 institutions, whose research is supported by more than 60,000 postdocs. Of the 108 research universities classified as "very high activity" research institutions by the Carnegie Foundation for the Advancement of Teaching, nearly two-thirds are members of the NPA. Of the 62 members of the Association of American Universities, 52 are NPA members. As a member-driven organization, the NPA's work is largely done by standing committees.

For more information on the NPA, visit www.nationalpostdoc.org

Acknowledgements

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Introduction

From 2009 through 2012, the National Postdoctoral Association conducted a review of the challenges facing postdoc women and the collected practices that have shown promise for aiding these women in overcoming these challenges. This resource book provides an overview of this meta-analysis and an introduction to these recommended practices. The goal is to help focus institutions' efforts to support postdoc women to foster career advancement. As a companion to this book, an expanded compendium is available as an online clearinghouse at www.nationalpostdoc.org/advance/clearinghouse which includes more detailed examples of adaptable models from the community.

A continuing challenge in serving the postdoc population is a dearth of robust data. Although datasets on postdocs have substantially expanded in recent years, they are still incomplete, resulting in uncertainty in even the total number of postdocs working in the United States.[1] The supporting data discussed in this resource represent the best available. Several of the most significant limitations are a lack of data on postdocs who are not U.S. citizens (often referred to as international postdocs, who the data suggest outnumber domestic postdocs), data on postdocs who are from underrepresented racial and ethnic groups, and data on postdocs with disabilities. With little information on the factors influencing the career paths of these important sub-populations, we are severely limited in our understanding of how best to serve them.

Given the limited data and the complexities of the scientific workforce, there are no definitive answers about which practices are the best for retaining postdoc women in academic careers. There are few studies that measure the impact of specific interventions on postdoc career outcomes, since long-term tracking of postdocs' careers after they leave an institution is challenging and rarely practiced. For example, among the 72 research institutions surveyed by NPA ADVANCE in fall 2009, only three institutions responded that they formally track their postdocs' subsequent career steps.[2] Moreover, understanding postdoc outcomes and retention within academia can be difficult when some postdocs may not be able to get the academic job they want for a variety of reasons whereas others may have opted against an academic job for any number of conscious or unconscious reasons. Therefore, the practices discussed in this resource and included in the online

clearinghouse are primarily based on success stories and a growing understanding of the factors that differentially impact postdoc women's career choices. Despite the absence of research regarding these impacts, the recurrence of patterns in the insights of people experienced in the field give us a strong sense of the validity of this overview.

What is a promising practice?

As a result of the lack of data on postdoc outcomes, the practices discussed in this volume often have only limited objective evidence upon which their past effectiveness has been assessed. Criteria adapted from *Identifying and Promoting Promising Practices* from the Compassion Capital Fund National Resource Center[5] were used as a general guideline for inclusion of a practice:

1. Suggested effectiveness for fostering postdoc women's career advancement.
2. Successful use in one institution and context.
3. Potential for replicability and/or adaptability.
4. *When possible,* limited supporting data from comparison to objective benchmarks with positive results.
5. Limited supporting data from internal assessment.

Because so many success stories do not have objective benchmarks for comparison, the majority of the practices noted in this resource book do not meet the fourth criteria. Also, in a few cases practices have been included that have not been utilized specifically with postdoc women, but may show promise for adaptation from their use with similar groups, for example, faculty women or postdocs in general.

Ultimately, leaving or continuing on the academic career path is the result of a complex combination of factors. Rather than imagining that any one intervention would be able to ensure that all factors work in favor of success, the goal of this resource book is to present interventions that help women avoid or overcome one or more of the common obstacles in that path. Although attention to the obstacles may have originated in concern about women's relative lack of persistence in academia, the interventions that have been developed will be helpful to men as well, who will benefit from general professional development as well as supportive postdoctoral policies that foster family formation and career advancement.

Who should use this resource?

The goal of this resource book is to summarize the available data about postdocs and gender and to bring forward success stories for aiding institutions in their efforts to advance postdoc women's careers into the professoriate. It is primarily intended **for individuals at research institutions who**

have a role in postdoctoral training or oversight at the institutional level, for example, those working in:

- An office of postdoctoral affairs;
- Graduate schools that include postdocs in their purview;
- Career centers that serve postdocs;
- Training offices or programs that offer programming for postdocs;
- NSF-funded ADVANCE programs that include postdocs in their activities;
- Offices of international services; and
- Postdoctoral associations or similar groups that provide information or programming for postdocs.

Other stakeholders at research institutions who might find this resource useful include **faculty** or other researchers who supervise and mentor postdocs and **institutional leaders** who would like an overview of the key gender issues for postdoctoral scholars.

Beyond institutions, there are a number of other important stakeholders in the postdoctoral community who may find this resource useful. These include the **federal funding agencies** that provide the primary source of funding for postdoctoral scholars, both through research grants and individual fellowships. Various federal policies managing these funds often frame the local institutional policies on postdoctoral appointments, such as employment classification, and therefore, conditions of employment and benefits. In particular, federal policy and guidelines can often set a template for these institutional policies, such as the National Institutes of Health (NIH) National Research Service Award (NRSA) stipend scale that is used as the salary scale for postdocs by many institutions.

Another important group of stakeholders are the **professional societies.** These organizations not only provide an important source of professional development and support for the individual postdoc, they also can play important leadership and dissemination roles within the communities they serve. Moreover, disciplinary societies can be an important venue for sharing of promising practices that are more discipline appropriate.

Finally, **individual postdocs** may find this resource informative where it is pertinent to their own career decisions. Postdocs need to be proactive and take control of their own careers. The information in this guide, and in particular, the appendices, may provide a starting point for postdocs developing a career plan.

Above all, this book has been designed to allow readers to take away some promising ideas for institutional programs and policies that can promote postdoc women's career advancement. A number of these ideas will need to be creatively adapted for different institutional types, cultures and needs. Ideally, the suggestions in this resource book will also provide a framework for new

initiatives and ideas. Additional examples can be found at the NPA ADVANCE online clearinghouse at www.nationalpostdoc.org/advance/clearinghouse. This clearinghouse will provide an on-going source of ideas, success stories, and lessons learned beyond the scope of this publication.

[1] For a discussion of the incomplete nature of the National Science Foundation's postdoc data in the context of estimating the number of U.S. postdocs, see National Science Board. 2012. *Science and Engineering Indicators 2012.* Arlington: National Science Foundation (NSB 12-01), and references therein.

[2] In contrast, at 42 institutions (58% of responding institutions) postdocs are informally tracked by their supervising researchers or "PIs" who tend to know where their postdocs go.

[3] Compassion Capital Fund National Resource Center. 2010. *Intermediary Development Series: Identifying and Promoting Promising Practices.* p. 5 The definition of promising practice is based on the Department of Health and Human Services: "A 'promising model' is defined as one with at least preliminary evidence of effectiveness in small-scale interventions or for which there is potential for generating data that will be useful for making decisions about taking the intervention to scale and generalizing the results to diverse populations and settings."

CHAPTER ONE

The Challenges Faced by Postdoc Women

This chapter focuses on the challenges that impact the career decisions of postdoc women. Understanding these challenges provides motivation for institutional change and helps to maximize the effectiveness of programs, policies, and practices designed to increase retention of women as academic career professionals.

Postdoc Women and the Leaky Pipeline

The number of women in academic science has grown steadily over the years, but the relative fraction of women compared to men in most scientific disciplines has yet to reach parity.[1] Moreover, this fraction decreases at every successive step in the academic career path. Often called the "leaky pipeline," the typical academic career path from graduate school to postdoctoral scholar to tenure-track faculty tends to "leak" both men and women along the way, but these losses are most significant for women.

The point at which the greatest losses occur is between receipt of the Ph.D. and the first tenure-track position.[2] The 2007 National Research Council report, *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering,* points out that this decrease appears to be particularly acute in those fields where the postdoc position is most common.[3] A more recent National Academies study, *Gender Differences at Critical Transitions in the Careers of Science, Engineering, and Mathematics Faculty,*[4] examined the faculty hiring and promotion practices at the top U.S. research universities and found that the fraction of women dropped between the Ph.D. recipient pool and the faculty applicant pool. Moreover, these drops were greatest in those fields that employ large numbers of postdocs, namely chemistry and the biological sciences.

While the underrepresentation of women in the sciences, particularly in the faculty ranks, has been the subject of numerous studies, papers and reports,[5] there are fewer definitive answers regarding the reasons for this imbalance.

The Reasons that Postdoc Women Leave Science

Market pressure is likely one of the most significant factors in the departure of postdoc women—and men—from academic science. The number of tenure-track faculty positions has not kept pace with the growth in the number of postdoc positions, and overall less than a third of postdocs continue into the tenure track[6] (for an overview of the postdoc career life cycle and current data on the postdoc population, see Appendix A). Yet postdoc women are more likely than men to leave science, suggesting that there are additional factors at play.

The general types of reasons cited by the women themselves for leaving science are nicely described by Anne Preston in her book *Leaving Science: Occupational Exit from Scientific Careers.*[7] In a study of the reasons stated by women for leaving academic science, utilizing surveys and targeted interviews, Preston found three general factors: (1) Difficulty combining family with a scientific career; (2) Lack of mentoring; and (3) Mismatch of respondents' interests and the requirements of a scientific job. The first echoes many findings that the institutional environment in academia makes starting and maintaining a family difficult. The second reflects Preston's finding that mentors played an important role in her respondents' occupational exit, most often due to a lack of mentorship, encouragement, and role models. Preston's third factor encompasses the range of issues involved in women potentially choosing so-called "alternate careers" or career paths outside academic science that have not been traditionally taken by Ph.D.-trained researchers. This factor may involve market pressure as well as a loss of interest in the academic science career path.

Recent studies on the factors that influence postdoc women's decisions to leave science find that those factors fit into Preston's general framework. For postdoc women, the top factors appear to be: (1) Issues related to family formation; (2) Feelings of isolation; (3) Low self-confidence; and (4) Lack of mentoring and encouragement.

Family Formation

One leading factor in women's departure from the STEM career pipeline appears to be challenges women face in juggling career and family.[8] Recent studies, such as Mason and Goulden, [9] Goulden, Frasch and Mason,[10] and Ginther and Kahn,[11] find that women who have small children have a decreased likelihood of obtaining their first tenure-track faculty job, in contrast to men with children or women without children. In fact, Ginther and Kahn[12] find that the effect is actually the opposite for men, that getting married and having children actually advantages their careers.

Demographically, postdoc women are on average at a life stage where they are partnering and having children, and these changes in family situation in turn influence their career paths. The postdoc has long been considered a type of "itinerant journeyman," where Ph.D. recipients are encouraged to move from institution to institution for short-term, low-paying temporary training positions

with a string of new supervisors. The transience of this lifestyle, however, can create significant obstacles for postdocs trying to start families and "put down roots." This transience has been cited by graduate student women in chemistry in the United Kingdom, for example, as a reason they lose interest in becoming a postdoc.[13]

Partnering and Dual-Career Concerns

For postdoc women partnered with other professionals, often called "dual-career" couples, finding positions together is challenging, especially when both partners are in academia.[14] Academic women tend to partner with other academics, and academic women in the natural sciences tend to partner with other natural scientists.[15] Same sex couples tend to have similar partnering patterns.[16] With the majority of postdocs being partnered, dual-career issues loom large for these researchers.

NPA ADVANCE Focus Groups

In September and October 2010, NPA ADVANCE staff held a series of four focus groups with current and former postdoc women.[i] The goal was to examine the factors influencing the career choices of female postdoctoral scholars (postdocs) in order to learn more about potential strategies that could help them continue an academic research career. Selected participants' covered a range of disciplines, consistent with the distribution nationally, and, among former postdocs, a range of nationalities and career sectors from academia to science policy to homemaker.

The discussions focused on aspects of postdoctoral training that could be beneficial for their careers as well as other aspects of "life" as a postdoc, such as family and visa requirements, that are significant factors in their career decisions. Participants shared success stories, highlighting institutional and individual practices they felt were beneficial, and illustrated a number of challenges they face in continuing their academic careers, many of which follow from structural aspects of the postdoctoral position. These structural aspects, many of which are interrelated, included: the temporary nature of postdoctoral positions; the duration of postdoctoral training; the relative isolation and lack of status of postdocs who have closer ties to their research group or supervisor than to the institution at large; and the typically low salaries. Another distinct challenge for postdoc women is the fact that most are international and so face additional constraints on their work-family balance, and on the dual-career issue in particular, due to extreme geographical constraints and immigration issues.

Participants had already experienced a number of practices that had helped them advance their careers. These came from their institutions, professional societies, supervisors, mentors and colleagues. A continuing challenge will be encouraging participation in these promising practices, such as training-related programs and mentoring, that for many are still viewed as taking time away from core research activities.

i NPA ADVANCE Focus Groups http://www.nationalpostdoc.org/advance-focus-groups (accessed December 1, 2012)

In 2010, NPA ADVANCE conducted a series of focus groups with current and former postdoc women to examine the factors involved in their career decisions.[17] During the screening survey, the vast majority of respondents indicated that family concerns influenced their career decisions. Most of these concerns could be characterized as geographic constraints on career mobility, where respondents wanted positions in relative proximity to their partner's job or to other family and were concerned about strategies for accommodating these constraints. Other studies have found that postdoc women are more likely than men to cite family considerations as important in their career planning and decisions[18] and can be more likely to choose a postdoc position for the purpose of being near their partner's job.[19] A study of National Institutes of Health (NIH) intramural postdocs in 2007 found that, while married postdoc men were more likely than women to expect career concessions from their spouse on behalf of the family, postdoc women indicated they were more likely to make such career concessions themselves.[20] As for anyone in a dual-career couple, the logistical challenges of finding jobs together are significant, and for postdoc women these family concerns also influence their career choices and outcomes.

While dual-career assistance from institutions grows in availability, there are few incentives for institutions to extend special recruitment efforts for contingent hires like postdocs, and special dual-hire initiatives at institutions are usually focused at the faculty level. The flip side of this is that, at least for postdocs partnered with other postdocs, finding temporary postdoc funding is often easier than finding a permanent faculty position for a partner. For some, the flexibility of the postdoc position may make it easier to find two jobs together,[21] whereas for others the postdoc's temporary nature may make certain tradeoffs, such as living apart, seem more feasible.

NPA ADVANCE focus group participants also brought up the challenge of partners who are professionals but not in academia. Among faculty, approximately a third of both men and women are partnered with someone employed outside of academia.[22] In this case, there are even fewer incentives for either employer to help the partner get a job. In one participant's case, she pointed out:

> *But if you have two spouses with these kind[s] of professional jobs like my husband [a surgeon] and myself, my institution can't get him a job, and his group doesn't care whether or not I have a job. So, you know, there's not a lot of recourse in terms of infrastructure.*

Other considerations in career planning for dual-career postdocs are related to the nature of the postdoc position itself. Participants in the NPA ADVANCE focus groups expressed concern about moving their whole family for a postdoc position which was temporary and low paying. For example, one participant said of her own decision process when choosing a postdoc,

> *My husband was making a lot more money than I was making as a postdoc, and we had a young child while I was doing my postdoc. And so it just didn't make any sense for me, for practical reasons and financial reasons, to kind of venture out. …and with the postdoc current NIH pay*

scales it's just impossible for a female postdoc to take a stand saying that, no, I want to run the family and let's move and do what I want to do.

These types of financial tradeoffs, where a female postdoc chooses not to prioritize her own career over her partner's, may be common for postdoc women partnered with male academics given that for the average academic couple, men tend to be older and more advanced in their careers than their partners, and men are more likely than women to prioritize their own career, particularly when they are the higher earners.[23]

Children

Another dimension of family formation is the introduction of children, which appears to play an even larger role than partnering in the careers of postdoc women. In order to look at the reasons cited by postdoc women for changing their career goal away from academia, a 2009 study by Goulden, Frasch and Mason[24] surveyed postdocs in the University of California system. Consistent with other studies,[25] most postdocs initially had the goal of becoming a professor with a research emphasis—typically the tenure-track faculty position—upon starting their postdoc position. The study found however that the fraction of both men and women who had this career goal dropped over the course of their postdoc, with the drop being more pronounced for women. An examination of the factors influencing this decision revealed some strong trends with gender. Both men and women were concerned about the career advancement aspects (e.g. salary, security, promotion) in academia, but the top factor for women was issues related to children while for men it was concern about compensation. Additional disaggregation revealed that postdoc women with children were more likely to change their goal away from professor with a research emphasis than postdoc men with children or postdoc men and women without children. Of significance, women who had had children since starting their postdoc were twice as likely to make this change of career goal as men who had had children during their postdoc and as women who had no children or plans to have children. Overall, these studies suggest that issues related to children play an important role in postdoc women's choices to leave academia and that actual experience with having children during the postdoc may have an even greater impact.

Given the coincidence of childbearing years with the postdoc, the timing of these events is a considerable source of stress for postdoc women. While there is no set number for the years one should be a postdoc, the National Postdoctoral Association (NPA) has long recommended a maximum term limit of five years on postdoctoral positions—not counting family leave time—in order to encourage postdocs' transition to independence,[26] and many institutions have adopted this recommendation. Nevertheless, the actual total length of the postdoctoral experience varies widely, with the typical individual appointment lasting two years.[27] Family planning therefore can be a challenge on such short timescales.

The conundrum of the "ideal" duration of the postdoc is that it should be long enough for a postdoc to accomplish enough to obtain the next position but short enough so that there are no

concerns about the postdoc's lack of advancement to the next position. Many NPA ADVANCE focus group participants had a sense of what was "too long" and commented on how they had been postdocs for longer than they had intended, in some cases explicitly because of their children. Other participants expressed anxiety over aligning their family planning with their postdoc timing. One participant captured this by saying,

> *You know having a baby during grad school, maybe not the best idea. Having your baby while you're tenure track, maybe not the best idea. So does that mean that I have to get pregnant right now because my postdoc is 24 months long and that's it?*

Being a postdoc for too long or experiencing career delays can have far reaching effects for the early-career researcher. Postdocs funded on grants and fellowships have a certain time-limited period of funding that typically has no guarantee of an extension. Moreover, a perception of lack of research productivity during a grant-funded project can influence future funding prospects. Delays can also affect a postdoc's eligibility for funding designated as early-career and can be difficult to explain on a curriculum vitae.

Limited Access to Family-Friendly Benefits

The Goulden study[28] results suggest that actual experience with having children and balancing family and career plays an important role in the career decisions for these women. The limited family-friendly benefits available to postdocs may be a contributing factor. For example, a minority of research institutions offers guaranteed paid maternity leave to postdoc women. The Goulden study also found that of the Association of American Universities (AAU) universities, which include the 62 leading research universities in the United States and Canada, only 23% offered postdocs baseline, guaranteed paid maternity leave without restrictions.[29] An even smaller fraction offers more general parental leave for either parent.[30]

A recent 2011 survey of NPA member institutions[31] found that while a majority of the 74 responding institutions offered all their postdocs family health insurance (76%), paid time off (68%), and unpaid maternity leave (55%), fewer than half of institutions offered all postdocs paid maternity leave (outside of sick/vacation leave or disability insurance; 40%), paid paternity leave (28%), unpaid paternity leave (49%) or subsidized child-care costs (12%). Moreover, in all cases, postdocs who were not classified as employees were less likely to have each of these benefits and were less likely to have benefits that were comparable to those provided to non-postdoc, non-supervisory employees at the same institution. These discrepancies across postdoc classifications were also highlighted by the Federal Demonstration Partnership (FDP) in its report from the taskforce on trainee family benefits.[32] Even federal laws like the Family Medical Leave Act, which provides for unpaid leave for the purpose of dependent care such as child birth, adoption or family illness, has eligibility limitations that disadvantage short-term workers like postdocs, requiring participants to be employees and to have worked at the institution for at least a year.

Postdoc access to family-friendly benefits varies widely across and within institutions, since that access typically depends upon a postdoc's source of funding and institutionally-based employment classification. In addition, those without formal benefits like parental leave will have to negotiate any leave on a case-by-case basis, which leaves significant room for unequal treatment.

Low Salaries and Childcare

For a working postdoc, an important dimension of having small children is the affordability of childcare. Throughout the NPA ADVANCE focus groups, participants mentioned salary and finances as important secondary issues, primarily when discussing the affordability of childcare and other family expenses like mortgages as well as when assigning value to the postdoc over other family career choices. Virtually every time that childcare came up during the discussion, the expense of it was also mentioned. These comments are unsurprising when looking at the average monthly cost of childcare, which for postdocs in the Sigma Xi Postdoc Survey was higher than their monthly housing cost.[33] Moreover, compared to postdoc men, postdoc women on average pay almost twice as much each month in childcare[34] and are less likely to have family-based childcare or aftercare available to them.[35] Focus group participants' concerns about salary contrast with the finding from the Sigma Xi Postdoc Survey that low salaries showed no correlation with lower satisfaction or success for postdocs.[36]

Isolation

Another characteristic of the postdoc position is its isolation compared to students and faculty at research institutions. As trainees primarily hired to work on a specific, time-delineated project, postdocs typically are more closely affiliated with their postdoctoral supervisor (often the principal investigator, or PI, on the grant funding their project) than with their department or institution. This strong reliance upon the workgroup, lab or supervisor often results in isolating postdocs from the rest of the institutional community, especially given that the number of postdocs in a given workgroup is usually small. This relative isolation is one of the reasons postdocs long have been termed the "invisible university."[37] These feelings of isolation or alienation are experienced by both postdoc men and women and have been cited by both as reasons for changing their career goal away from research-focused professor, but this factor was more significant for women.[38]

When discussing the isolation of the postdoctoral appointment, NPA ADVANCE focus group participants described it as being "in limbo" or a "grey area," primarily stemming from a perceived lack of status at their institution. One participant described it like so:

> *I [was] starting a little bit in nobody's land, right? I mean I was nobody's responsibility any longer really. I was sufficiently grown up, and all the practical attention is given mainly to the students and to the faculty members. It seems that postdocs are like these temporary people in the university and nobody really cares how they feel, right?*

Being neither student nor faculty, some participants felt less supported by the institution, as well as uncertain about how they were perceived or even how they should perceive themselves. Another participant wondered, "Should we be acting more like graduate students or are we closer to faculty members ... sort of, which lunch table to sit at when you walk into the cafeteria?" A complementary dimension to this isolation was felt by some focus group participants who had children and felt that they couldn't commit the same number of hours to work as those without children, so felt they couldn't be as "visible" or "aggressive." As one participant described her experience, "I felt abandoned during my postdoctoral years, especially when raising kids . . . I was feeling very, very isolated."

Lack of Confidence

Postdoc women may also suffer from a lack of confidence in their abilities. Some NPA ADVANCE focus group participants felt that their uncertainties in their status at their institutions engendered confidence issues, for example, being concerned about how their work was perceived by senior colleagues or being uncertain even how to introduce one's self in a meeting. These fears of not being "good enough" despite appropriate preparation may reflect a case of the imposter syndrome,[39] which for example has been found among both men and women graduate students in astronomy, but with greater prevalence in women.[40]

A key finding of the Martinez study [41] of biomedical postdocs was that women lacked confidence in their abilities to a greater degree than men. For example, the study found that biomedical postdoc women had less confidence in their ability to obtain a principal investigator position than postdoc men, despite each group indicating that they felt they were qualified for such a position. Compared with male respondents, postdoc women were also less likely to apply again if their first application did not succeed and were less confident that, upon obtaining such a tenure-track position, they would achieve tenure.

The Role of Mentoring

Mentoring is a key part of the structured oversight that was found by the Sigma Xi Postdoc Survey to correlate with postdoc success and satisfaction,[42] underscoring its importance in the postdoctoral experience. For postdoc women, however, mentoring is often inadequate. NPA ADVANCE focus group participants reported that, while mentoring was one of the most beneficial aspects of their postdoctoral training, it was often lacking in their own experience. A study of chemistry postdocs found that postdoc women are more likely than postdoc men to perceive a lack of mentoring.[43] Furthermore, postdoc women have noted that lack of mentorship has played a part in their decisions to leave the academic pipeline.[44]

A limited mentoring model may contribute to the perception of a lack of mentoring. A postdoc's

supervisor is commonly her primary, and sometimes only, mentor.[45] NPA ADVANCE focus group participants typically used the words *PI, supervisor,* and *mentor* almost interchangeably when discussing their postdoctoral supervisor, independent of the amount of mentoring that was actually taking place, suggesting that postdoctoral supervisors essentially become the de facto mentor. This role has long been considered fundamental for the supervisor as he or she shepherds a postdoc's research and helps her prepare for her next career steps. There may be some areas, however, where a postdoc could benefit from complementary perspectives and information. Best practices today in mentoring recommend multiple mentors that can provide the variety of professional and psychosocial advice needed by the mentee and note that this is particularly important for women.[46] With the growing diversity of the postdocs and their career needs, a circle of mentors can provide broader support as well as minimize possible conflicts of interest in certain arenas. While mentoring from a postdoctoral supervisor is an important part of the postdoctoral experience, postdoc women need to be encouraged to expand their network of mentors. (See the chapter on mentoring for more information.)

Regardless of access to effective mentors, postdocs can be reluctant to participate in designated mentoring activities. Like most academics, postdocs report working long hours, and most of this time is dedicated to research.[47] Based on the NPA's experience, postdocs can be reluctant to spend work time on activities outside of the lab or office, even training activities, because the unspoken expectation is that they should focus their efforts on research to the exclusion of other activities, despite the potential career benefits. This expectation has been a particular concern for postdocs funded on NIH R01 grants, since their grant effort reporting often requires 100% of their time assigned to research. This concern has eased in recent years, since the NIH acknowledged in 2007 that mentoring, for example, is often indistinguishable from research and therefore allowable as part of research effort reporting.[48] Nevertheless, for most postdocs, mentoring and other professional development are not considered core research activities and therefore continue to take low priority. For example, some NPA ADVANCE focus group participants indicated they were less likely to participate in mentoring or grant writing programs because they took time away from research, in spite of the fact that they highly valued such programs.

Other Factors

Deficiencies in Professional Record

In addition to family formation, isolation, and mentoring concerns, which may impact both women's ability to persist in their current academic position as well as their choice to apply for the next academic position, there is also evidence that some postdoc women face additional obstacles in obtaining that next position. The Sigma Xi Postdoc Survey findings include evidence that women have lower levels of subjective success and fewer publications than men,[49] consistent with other studies.[50] Findings about unconscious bias in the writing and evaluation of letters of

recommendation[51] may also hinder these women's career prospects given the importance of such recommendations in the job selection process. Another important part of a researcher's marketability stems from their visibility within their community, often leveraged by giving talks at meetings. Mason and Goulden, however, found that postdoc women who were married with children tended to spend less time in the lab or office and to attend fewer conferences.[52]

Implicit Gender Bias

Another leading factor in women's persistence in academic science discussed in the literature is implicit gender bias in the workplace that disadvantages women's advancement. These biases arise when people unconsciously use assumptions about sex differences in their evaluation of the world (called gender schemas by Virginia Valian's widely-cited work on this subject[53]). In academia, these gender biases have been shown to influence hiring,[54] promotion, resource allocation, and other peer reviewed processes, such as journal and grant review,[55] as well as influence institutional policymaking, for example, with a bias against caregiving for both women and men.[56] An important aspect of these biases is that they are typically unconscious, but unexamined, ways of viewing the world as opposed to overt or intentional discrimination. Their influence, however, can be far-reaching and creates an institutional environment that does not provide equal opportunity for women to succeed, often called a "chilly climate."

It has been argued that institutions have made considerable strides on these issues in recent years, with the advent of federally funded interventions such as NSF's ADVANCE institutional transformation awards[57] in addition to local institutional efforts such as that at Massachusetts Institute of Technology (MIT).[58] The National Academies' Gender Differences study[59] found no evidence of bias against women once they were in the applicant pool for faculty positions at the top research institutions. Another recent meta-analysis of the evidence for unconscious bias suggests that the situation has so greatly improved that institutions should focus their attentions instead on promoting a family-friendly work environment,[60] although another more recent study in 2012 demonstrates that gender bias is still a factor in the evaluation, hiring and mentoring of early-career women in academic science.[61] These studies suggest that things have improved but that there is still considerable work left to do, particularly at the early-career stages.

Additional Concerns for International and URM Postdocs

International postdocs and postdocs who are underrepresented minorities (URM) face these same challenges and in some cases, to a greater degree. For example, postdoc women from underrepresented groups will experience an additional degree of isolation due to their small numbers, creating a greater need for mentorship and role models.

While there are no empirical studies of postdoc women of color,[62] there are some trends from studies of students and early-career women that may inform thinking about the postdoc stage.

Maria Ong and collaborators, in a review of the empirical literature on women of color in science, technology, engineering, and mathematics (STEM), find several factors that influence these women's advancement.[63] For students, these include the difficulties of transitioning between academic stages, such as from college to graduate school, and transitioning from minority serving institutions to primarily white institutions. Another critical factor is the social climate of an institution such as issues with isolation and tokenism, difficulty navigating informal processes, and learning institutional culture, all of which influence a woman's retention in STEM. In addition to these features of the training environment, women of color still face issues of racial stereotypes and cultural or racial discrimination in hiring and promotional decisions. All of these may play a role in the transition of postdoc women of color into the professoriate. For additional discussion, see the commentary by Anderson-Thompkins and Stroman.

International postdoc women also experience additional challenges. In contrast to the small numbers of URM postdocs, international postdocs are the largest group in the U.S. postdoc population, and yet these individuals can be isolated from their cohort in terms of their cultural background and experience. International postdoc women may face heightened family-related geographical constraints relative to domestic postdocs, since international women's partners or extended family may be abroad, possibly requiring a return to their home country. As one participant commented, the primary career constraint she had experienced was whether or not "family demands (old parents, sick parents etc.) will interrupt or influence your decision to stay in the [United States]." Foreign postdoc women therefore face the same concerns as domestic women, but, in some cases, these concerns are amplified.

International postdocs also encounter visa-related issues. The short-term nature of the visa can make long-term career and family planning a challenge, as can lengthy and unpredictable visa processing procedures. These vagaries can create additional constraints on postdoc career mobility, for example, needing to stay in place during permanent residency processing, being limited to certain types of jobs on a given visa, or having a job search cut short due to visa expiration. Such restrictions can compound the mobility limitations on partnered postdocs who may already have geographic constraints due to their partner's job. One participant said:

> *Why I took the job was basically, I am married with a husband and he has a very good job. And this was the only postdoctoral position here at the time, and I was bound to having an H1 visa somewhere in this area. And that was the main reason I took the job, because nobody else would hire me as a foreigner.*

An additional complication for some partnered postdocs is that the associated visas for spouses may not permit their holders to work in the United States. The two most common types of visas among postdocs are the H1-B and the J-1, and each have an associated dependent visa that allows the postdoc to sponsor eligible spouses and dependents to enter the country, the H-4 and J-2, respectively. The H-4, however, does not allow its holder to work, whereas the J-2 does in most cases.

These visa-based work restrictions are important considerations for postdocs considering bringing their families to the United States, since supporting a family on a single postdoc salary can be a challenge.

Summary

Overall, postdoc women face a range of challenges as they navigate the academic career pipeline. Chief among these are challenges related to family formation and having children, as well as isolation, low self-confidence, and a lack of mentoring and encouragement. Many of these are common challenges for professional women while some are unique to the postdoctoral appointment. The structure of the postdoctoral position adds its own complications, such as the short tenure of the postdoc that makes family planning difficult, dual-career job constraints with little assistance from institutions, limited family-friendly benefits, low salaries, a reluctance to participate in non-research activities, and a limited mentoring model. The following chapters will look at the ways in which robust postdoctoral policies and practices can help ameliorate some of these challenges.

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A Perspective from Leadership: Critical Considerations in Retaining Postdoctoral Women of Color in Academia

By Sibby Anderson-Thompkins, Ph.D., and Deborah Stroman, Ph.D.

Facing similar obstacles of majority females, women of color postdoctoral scholars have challenges that limit their educational and career attainment in the fields of science, technology, engineering, and mathematics (STEM). These difficulties include the absence of mentoring or support, encountering isolation, gender bias, low salaries, and a lack of work-life balance. More disturbingly, there are several structural features specific to the postdoctoral scholar position at research universities with very high research activity (RU/VHs, i.e., Carnegie Foundation's updated categorization of Research I institutions) that make these challenges even more difficult to navigate for women of color such as the lack of positional status within the institution, duration of postdoctoral scholar training, temporary nature of postdoctoral scholar positions, and racial bias and discrimination in the postdoctoral hiring process. It is imperative that major research universities continue to support and promote women of color postdoctoral scholars through innovative strategies and the execution of best practices in postdoctoral education.

Various public and private sector reports, policymakers, and national business, education, political, and science leaders have expressed the importance of the United States increasing its production of researchers and workers skilled in STEM to remain competitive in the global economy. According to the CIA World Factbook, America is currently ranked 7th in literacy, 27th in math, and 22nd in science. It is evident that now is the time for intervention and reform in our educational strategies to compete and offer solutions to the world's problems. The STEM fields are critical to America's stability and additionally often offer prestige and very attractive remuneration.

Before the Postdoc

Not surprisingly, many racial and ethnic underrepresented students matriculate to college with a genuine interest and intention to pursue STEM majors and biomedical research. They are filled with hope and dreams as undergraduates ready to learn and apply the necessary competencies and skills to change the world. The fact that many of their classmates at RU/VHs do not look like

them or share the same cultural experiences is not a significant obstacle to overcome. Most underrepresented minorities readily adapt to their environment and even increase their desire to succeed in the STEM courses. Students of color have prior experiences that have prepared them to accept challenges and to be prepared for situations where they face being the "only one" in the classroom. However, by their senior year (similar to their majority peers) most have changed their majors to a non-STEM curriculum. What happened to the students of color who were so excited about a STEM career? Did they find the curriculum too difficult? No. In fact, research clearly states that in most cases there are intervening factors that deter outstanding students of color from academic success at predominately white institutions. These dynamics include a lack of faculty of color, academic support systems, access to resources, and mentoring.

When one considers the journey of women of color students interested in STEM, this plight can be even more overwhelming. Far too many of these students, during their first and second year of taking STEM courses, encounter unnecessary challenges whereby they lose confidence in their abilities. Few faculty or administrators are there to identify their struggle and offer another plan of action to achieve success. (Quite possibly, there is a need for more empirical research and assessment of the pedagogical models used to instruct minorities and underrepresented ethnicities in STEM.) This woeful situation is far too common at our major research institutions. According to Palmer, Maramba and Gasman,[1] Minority Serving Institutions (MSIs) have shown efficacy in facilitating the success of racial and ethnic minority students in STEM and are collectively responsible for producing nearly one-third of the nation's minority STEM graduates. In *Fostering Success of Racial and Ethnic Minorities in STEM*,[2] the authors share salient institutional characteristics and unique aspects of climate, pedagogy, and programmatic initiatives at MSIs that are instrumental in enhancing the success of racial and ethnic minority students in STEM education. Can the nation afford to rely solely on the MSIs to support and nurture the STEM pipeline of students of color? Given the rapidly increasing underrepresented minority population in the United States, it is critical that higher education policies, pedagogies, climates, and initiatives are efficient and effective in promoting racial and ethnic minority scholars' educational and career attainment in STEM. Otherwise, the very limited current pool of women of color STEM graduates at RU/VHs will shrink further and lessen the country's ability to be competitive.

The Juncture of the Postdoc

It is laudable that women of color do rise above the undergraduate challenges as STEM graduates and continue on to achieve their master's and doctorate STEM degrees. Choosing to stay in academia, these determined women are again full of hope as they consider postdoctoral positions at RU/VHs. However, it is critical that women of color choose and approve their postdoctoral appointments, their mentors, and their research projects wisely. The hope is that there will be resources and significant advantages to completing additional research, demonstrating competence

and collegiality, and making contacts within their departments and disciplines that will ultimately lead to a potential job. Still, the complex challenges associated with race, ethnicity, and gender are made even more clear and magnified at this critical juncture. The isolation is extreme and can become an overpowering barrier that derails a promising career. Malcolm, Hall & Brown[3] refer to this phenomena as "the double bind," the intersectionality of gender, race and ethnicity which interact on multiple and often simultaneous levels, contributing to systematic social inequality.[4] The scholars and the institutions both suffer from this disturbing cycle of engagement and discouragement.

Typically, the interest in women of color postdoctoral scholar rests solely with the postdoctoral office on campus. To address the sense of isolation and lack of support, it is strongly suggested that the postdoctoral scholar maintain consistent communication with this dedicated staff. The postdoctoral office can also serve to complement or initiate the necessary training women of color need to navigate the demands and rigor of the academy. As a "guest" in a faculty member's lab or an academic department dominated by white males, there is a strong probability that the woman of color postdoctoral scholar will not receive all the attention and support that her male counterparts would garner. To avoid and reduce unnecessary stress, the postdoctoral office should offer seminars and programs for women of color to facilitate mentoring, research strategies, and special topics of interest such as work-life balance, getting the mentoring you need, cultivating relationships with potential sponsors and collaborators, or navigating the academy as the "only one." It is important that the scholar stays committed to her career goals and actively participates in professional development seminars and programs when possible. The postdoctoral office can be instrumental in establishing unique and customized support for women of color to ensure their professional and research success. This office has both structural and program design to assist the postdoctoral scholar in all stages of her development. Recognizing the importance of partnership, the committed staff will make connections with the offices of equal opportunity, human resources, multicultural and diversity affairs, student affairs, international center, and women's center to gain insight, feedback, and opportunities to share best practices.

Regardless of the resources available though, postdoctoral scholar women of color may have a more difficult time finding role models and mentors, especially at RU/VHs. There are fewer faculty of color to possibly network with and share interests. Also, the duration of the postdoctoral appointment does not lend itself to the participation in many activities outside of research to meet majority or underrepresented minority faculty. However, the importance of cultivating relationships with several faculty mentors, especially connecting with senior faculty, cannot be understated for women of color postdoctoral scholars. Further, cross-disciplinary or inter-disciplinary relationships may prove to be instrumental in collaborative research and the identification of possible mentors and sponsors. Though many institutions understand and articulate the benefits of diversity, clearly there is a need for greater support and mentoring at RH/VUs to encourage both participation and achievement by racial and ethnic minority postdoctoral women in STEM. Having multiple

mentors and sponsors can assist the postdoctoral scholar in the understanding of the nuances of success and the best timeline for the completion of the necessary milestones.

Progress in retaining women of color has been easier to accomplish in certain academic fields, yet the STEM areas lag behind. There have been a few positive changes in diversifying the pipeline of students into the STEM fields at RU/VHs; however, this advancement has not translated into satisfactory diversification at the postdoctoral or faculty level, which is imperative to increase the diversity of the STEM workforce. In order to achieve this significant feat, exacting steps need to be taken to ensure that an attractive and supportive pathway is created for women of color to progress through undergraduate programs into graduate programs through a postdoctoral scholar appointment and into a tenured faculty position. Still, "the postdoc" is a tenuous bridge between graduate education and faculty, whereby we lose talented women of color. Major research universities need to reexamine their postdoctoral hiring policies and practices. Unlike formal admission policies that promote and foster student diversity, the institutional reliance on informal networks or relaxed procedures that bypass equal opportunity employment requirements often leads to racial bias and discrimination and the exclusion of women of color at this critical period. Ong's recommendations[5] provide a foundation to support the promotion and retention of women of color in STEM:

Promote undergraduate research opportunities for women of color in STEM. Many undergraduate research programs are available to nurture and motivate young students to explore STEM without a major commitment. Many institutions implement these research opportunities within their senior honors curriculum or formal institutes. In addition, these offices and programs are wonderful resources for postdoctoral scholars to mentor young people and obtain their own research assistants.

Identify graduate and postdoctoral scholar fellowships in STEM where women of color are most underrepresented such as physics, astronomy, computer science, and some areas of engineering.

Attend workshops and conferences for critical stakeholders (i.e., professional societies, university deans and department chairs in STEM, honor societies) to discuss preparation of underrepresented women in STEM.

Offer professional development programs for women of color on their writing and publishing, as well as grant money and protected time for faculty to work on scholarship. The doctoral experience varies for each scholar. Many are fortunate to work with dissertation advisors who are extremely gifted at writing. Others may have an advisor that is a better researcher or presenter. It is important that postdoctoral scholars assess their strengths and align themselves with the necessary persons and resources to overcome areas of weakness.

Offer skill-building seminars on interviewing, salary negotiation, and proposal submission. These skills would help women successfully navigate the financial puzzle and instill confidence in their performance review meetings.

Offer leadership and career development workshops for women of color in STEM. We find that these seminars are most effective when facilitated by women of color in STEM at RU/VH institutions.

In addition to these recommendations, women of color postdoctoral scholars should adopt an entrepreneurial mindset of responsibility. The postdoctoral scholar must fully grasp the importance of developing a roadmap of success, identifying and contacting research partners, networking, and communication early and often with mentors and the postdoctoral office. This entrepreneurial attitude may be the difference in their exposure on campus to potential mentors and sponsors and their receiving a faculty appointment offer.

Institutions must also be mindful of abstract or ambiguous meanings when articulating affirmative action strategies to assist the postdoctoral office. Undoubtedly, a university can best achieve its mission if the student, faculty, and staff community is diverse. Historically, this effort on college campuses focused on American diversity and domestic-minority underrepresented groups. It is apparent that the diversity definition has since been redefined and expanded to include many types of people such as religion, language, and international affiliation. Senior administrators must be clear on their characterization and support of those who continue to receive little support in their attempt to become postdoctoral scholars and faculty members. In addition, their positional power requires them to take the lead in directing a collective reinforcement of those STEM postdoctoral scholars and anyone (formal or informal) working towards their success. With this clarity of nomenclature and mandate from senior administrators, the women of color (and their unique and remarkable journey) will not be overlooked in this noble quest to fulfill the diversity objective.

In summary, research universities must enhance the understanding of the impact of intersectionality on the STEM careers of women of color through program evaluation and empirical research on their experiences. Women of color face daunting challenges such as isolation, unconscious bias, absence of underrepresented faculty as mentors and role models, and inadequate academic or insufficient social support at each stage of their academic careers. Thus, it is imperative that institutions examine closely the transition points between each stage of transition and dedicate resources to "seal the gaps"— those critical points where underrepresented STEM researchers often leave the career path or job. At each stage, the importance of oversight, early intervention, mentoring, sponsorship, and academic and social support must be reinforced.

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[1] Palmer, R.T., Maramba, D.C., & Gasman, M. (Eds.) 2012. *Fostering Success of Racial and Ethnic Minorities in STEM.* New York: Routledge

[2] Ibid.

[3] Malcom, S. M., Hall, P. Q., & Brown, J. W. 1976. *The double bind: The price of being a minority woman in science* (No. 76-R-3). Washington: American Association for the Advancement of Science

[4] http://en.wikipedia.org/wiki/Social_inequality (accessed December 1, 2012)

[5] Ong, M. 2009. *Women of color in science, technology, engineering and mathematics (STEM): a summary of events, findings and suggestions.* http://www.terc.edu/downloads/TERC_mini_symp_rprt_hires.pdf (accessed December 1, 2012)

CHAPTER TWO

Postdoctoral Benefits and Policies

This chapter discusses institutional practices and policies that promote the academic career advancement of postdoc women.

Research institutions play a vital role in the postdoctoral experience. While an individual postdoc may feel closer ties to an individual project, lab or group, it is the institution that provides the critical infrastructure to facilitate both their research and their conditions of appointment. Moreover, since postdocs are supported by a wide variety of funding sources, including both federal and private, U.S. and non-U.S. based, there are few broad national policies governing postdocs, leaving authority over their appointments primarily with the institutions. As a result there is wide variety in how postdoctoral services and policies are implemented in practice.

There are, however, some trends in postdoctoral practices that cut across institutions. The Sigma Xi Postdoc Survey sought to identify these trends and found that postdocs with the greatest structured administrative oversight showed the highest levels of subjective success and satisfaction.[1] The components of this structured oversight are some combination of recommended institutional practices, such as the existence of an office of postdoctoral affairs, postdoctoral policies, letters of appointment, performance evaluations, grievance procedures, and research plans. Changing practices and policies to increase structured oversight has the potential to increase postdoc success overall as well as to address many of the specific shortcomings discussed in the previous chapter.

Impact of Federal Agencies in Setting Postdoctoral Policies

The majority (61%) of academic postdoctoral research is funded by federal agencies.[i] One of the strengths of the federal role in postdoctoral funding is that the agencies can provide standards for postdoctoral training and compensation. For example, although only a limited number of National Institutes of Health (NIH) National Research Service Award (NRSA) individual fellowships are awarded each year, the NRSA stipend scale has been widely adopted by institutions as a salary guideline for all postdocs, in all disciplines.[ii] Many institutions set a minimum stipend based on the NRSA minimum, and some institutions even adopt the experience-based stipend tiers of the NRSA scale as well. In this way, NIH has had enormous influence on the postdoctoral training experience, even for those outside the biomedical sciences.

In recent years, a new wave of family-friendly policies has been championed by NIH and the National Science Foundation (NSF), the primary funders of postdocs. The NIH has established expanded family leave policy for NRSA fellows, providing clarifications about dependent care benefits on grants, supplements to support technical assistance during the absence of key personnel, and no-cost extensions for reasons such as family-related absences of key personnel. The NSF established the Career-Life Balance initiative, announced in 2011, that has many of the same policies.[iii]

The June 2012 report by the NIH Advisory Committee to the Director Biomedical Research Workforce Working Group may further impact family-friendly policies. One of the recommendations was that the "NIH should require and adjust its own policies so that all NIH-supported postdoctoral researchers on any form of support (training grants, fellowships or research project grants) receive benefits that are comparable to other employees at the institution. Such benefits include paid time off, health insurance, retirement plans, maternity leave etc."[iv] This report was followed by the development of implementation plans for many of the recommendations, including specific steps towards policies that support comparable benefits.[v] The impact of the working group's report remains to be seen. Hopefully, this NIH effort will foster increased establishment of institutional family-friendly policies as well as other policies that will benefit not only NIH-funded postdocs but all postdocs across all sources of funding.

According to a survey conducted by Marc Goulden, Karie Frasch, and Mary Ann Mason,[vi] other federal agencies that support postdocs are significantly more limited in their explicit family-friendly benefits than the NIH and NSF and, in most cases only offer no-cost extensions. It is possible that those agencies will follow the lead of the NIH and the NSF. Administrators and staff should closely follow the development of new governmental policies and initiatives that impact postdocs.

See the accompanying commentary by Mary Ann Mason for additional discussion.

i National Science Foundation, National Center for Science and Engineering Statistics. 2011. Graduate Students and Postdoctorates in Science and Engineering: Fall 2009. Detailed Statistical Tables NSF 12-300. Arlington, VA. See Table 70, available at http://www.nsf.gov/statistics/nsf12300/ (accessed December 1, 2012)

ii 2011 NPA Institutional Survey Pilot http://www.nationalpostdoc.org/images/stories/Documents/Other/npa-survey-report-april-2012.pdf (accessed December 1, 2012)

iii http://www.nsf.gov/career-life-balance/ (accessed December 1, 2012)

iv National Institutes of Health. 2012. *Biomedical Research Workforce Working Group Report.* http://acd.od.nih.gov/bmw_report.pdf

v http://acd.od.nih.gov/Biomedical-Workforce-Implementation-Plan.pdf (accessed January 8, 2013)

vi Goulden et al. 2009

NPA Recommended Practices

Acknowledging the key role of institutions, the NPA has long promoted a series of recommended institutional practices[2] that correlate with the Sigma Xi study's structured oversight measures in many ways. These recommendations include:

1. Establish a postdoctoral office that actively engages postdoctoral scholars and provides:
   a. Oversight and accountability for postdoctoral training and
   b. An open line of communication with the administration that gives postdocs an independent and accessible avenue to provide input to the administration.
2. Establish postdoctoral policies including:
   a. Administrative policies, such as grievance procedures, entrance/exit interviews, central appointment process, an annual survey of postdocs, a postdoc handbook, and postdoc access to institutional facilities and resources.
   b. Training policies, such as a timeline for transition to independence, career planning with annual review, career development services, and postdoc training resources and/or curriculum.
   c. Benefits policies, such as a minimum salary or stipend and a pay scale based on years of experience, matched retirement contributions, and family-friendly benefits for all postdocs.
3. Maintain an office for international scholar services that provides processing and tracking of postdoc visas as well as informational services on immigration issues for international scholars.
4. Address diversity concerns, seeking to promote diversity and ensure equal opportunity and inclusion for all postdocs in the membership, leadership and activities of the institution regardless of race, ethnicity, sex, disability, country of origin, field of research, socio-economic status, religion, age, marital status, sexual orientation, or gender identity.

NPA Postdoc Office Toolkit

The NPA has distilled years of guidance on establishing and maintaining offices of postdoctoral affairs (postdoc offices or PDOs) into an online toolkit. Available as a member benefit, the toolkit provides an overview of a range of critical topics for newly forming PDOs as well as more established PDOs looking to expand or change their operations. Among these are:

- Hiring Staff Members
- Financing a Postdoc Office
- Developing a Postdoc Database
- Strategies for Conducting a Postdoc Survey
- Creating a Postdoc Advisory Committee with Faculty and Postdoc Representation
- Creating a Standardized Appointment Process
- Providing Benefits to Postdocs
- Creating an Orientation Package
- Addressing Diversity and Minority Issues
- Evaluating Postdocs
- Providing Career Development Resources.

The articles include practical "How To" advice as well as concrete examples from the broader postdoctoral community. The online-only toolkit is available at http://www.nationalpostdoc.org/pdo-toolkit.

Institutions establishing postdoctoral programs and services for the first time may want to consult the NPA Postdoc Office Toolkit (see sidebar).

Family-Friendly Policies and Benefits

Postdocs who are starting families are often at a career stage when they are unlikely to have robust family-friendly benefits. **Where possible, institutions should establish family-friendly benefits for all of their postdocs, ensuring that postdocs with different sources of funding have equitable benefits.** Some challenges for establishing uniform benefits are the variety of funding sources that will have multiple guidelines and policies. Institutions are encouraged to seek out creative solutions within their own personnel structure to standardize benefits across these classes, which in some cases may require additional funding to supplement non-employee benefits. A similar recommendation comes from the recent report on research trainee family benefits from the Federal Demonstration Partnership.[3] *Some institutions have designated separate postdoctoral classifications for both employee and non-employee postdocs in order to standardize their benefits, for example, the University of Pennsylvania has three payroll classes of postdoctoral trainees that depend upon funding source.*[4] An advantage of this standardization is that postdocs may seek out prestigious individual fellowships to support their research without fear of losing benefits by switching between classifications.

NPA ADVANCE expanded recommendations for family-friendly policies are:

Provide clear guidance on family-friendly policies and practices in order to avoid case-by-case implementation, especially where there are differences by postdoc funding source. This guidance should include basic policies such as sick or annual leave, as well as paid and unpaid parental leave and flexible work schedules. A particular advantage of written policies and guidelines on these topics, particularly for family-related leave, is that it provides a formal framework for discussions between postdocs and their supervisors.

Provide baseline paid parental leave provisions for all postdocs for the birth or adoption of a child. The policy for maternity leave should ideally provide for a guaranteed minimum of six weeks, independent of leave accruals or time in service to the institution.

Provide a provision for unpaid family leave for those postdocs who may not be covered by FMLA and may require leave beyond that provided by available paid benefits. In particular, institutions receiving federal funding should ensure their compliance with Title IX's provisions on pregnancy discrimination, which requires that students and employees, at a minimum, be allowed an unpaid, job-protected leave of absence for a "reasonable period" if no other pregnancy-leave benefit is available.[5]

Work pro-actively with the institution's Title IX office to ensure compliance regarding pregnancy protections for postdocs. In particular, examine maternity leave offerings, pregnancy safety protocols, and accountability for equal treatment of pregnant postdocs.

Title IX of the Education Amendments of 1972

Title IX of the Education Amendments of 1972 is a law that has long been applied primarily to women's sports but also has provisions protecting against pregnancy discrimination for students and employees of federally-funded institutions. The law says that pregnancy must be treated as any other temporary disability and requires that institutions allow unpaid pregnancy leave for those students and employees without an applicable leave policy and for employees without sufficient leave accrued. The duration of such leave, however, is not specified for either group, calling for "a reasonable period of time" for employees and for "as long as is deemed medically necessary" for students.[i]

While discussions continue regarding whether postdocs are more like students or employees under the law,[ii] both groups are protected from pregnancy discrimination under Title IX. According to an analysis by Marc Goulden, Karie Frasch, and Mary Ann Mason, this therefore suggests that postdocs should also be protected by Title IX,[iii] although this has yet to be tested in court. Nevertheless, federal agencies have begun to conduct compliance audits for the various issues covered by the law. For example, the National Aeronautics and Space Administration (NASA) has begun periodic compliance reviews of its grantees in accordance with the agency's Title IX regulations as well as advice from the General Accounting Office.[iv] The compliance checks have yielded a number of promising practices the agency has shared[v] but also underscore the need to ensure postdocs are included, both in the audit process and in an institution's efforts to become compliant.

i The section on students for the agencies DOE, NASA, NSF and NIH, for example, can be found in 10 CFR 1040.43, 14 CFR 1253.445, 45 CFR 618.445, and 45 CFR 86.40, respectively. The section for employees for the same agencies can be found in 10 CFR 1040.53, 14 CFR 1253.530, 45 CFR 618.530, 45 CFR 86.57, respectively.

ii AAAS (American Association for the Advancement of Science), with participation by AAU (Association of American Universities). 2010. *Handbook on Diversity and the Law: Navigating a Complex Landscape to Foster Greater Faculty and Student Diversity in Higher Education* (Washington: AAAS). http://php.aaas.org/programs/centers/capacity/publications/complexlandscape/ (accessed December 1, 2012)

iii Goulden, M., Frasch, K.,& Mason, M.A.,. 2009. *Staying Competitive: Patching America's Leaky Pipeline in the Sciences.* Berkeley: Berkeley Center on Health, Economic & Family Security and the Center for American Progress. http://www.americanprogress.org/issues/2009/11/women_and_sciences.html (accessed December 1, 2012)

iv See the NASA Title IX Compliance Program Website and references therein. http://odeo.hq.nasa.gov/compliance_program.html (accessed December 1, 2012)

v National Aeronautics and Space Administration. 2009. *Title IX and STEM: Promising Practices for Science, Technology, Engineering, and Mathematics* (Washington: NASA) http://odeo.hq.nasa.gov/documents/71900_HI-RES.8-4-09.pdf (accessed December 1, 2012)

Ensure that extended family leave or leaves of absence qualify a postdoc for an extension of her postdoc clock at the institution. As included in the NPA's recommended institutional practices, a postdoc's tenure at an institution should allow for extensions for appropriate circumstances, such as family-related leaves of absence. Inevitably, any extension of the postdoctoral appointment is also dependent upon a postdoc's funding; therefore institutions should aid postdocs and principal investigators to obtain the necessary no-cost extensions on their funding.

Providing Universal Postdoc Health Insurance

An ongoing challenge is providing universal health coverage for all classes of postdocs that is independent of source of funding. Several institutions, working together with insurance broker Garnett-Powers & Associates (GPA), have overcome this challenge by establishing all postdocs as a single, separate class for the purposes of insurance. GPA, an insurance broker specializing in the design, implementation and administration of postdoc benefit programs, has partnered with recognized insurance companies committed to offering comprehensive benefits to this unique population. In addition to promoting equity among postdocs at an institution, treating all postdocs as a separate class can lower plan costs since the postdoc group demographic tends to be younger and healthier than most employee populations. The University of California system and the University of Pennsylvania have successfully used this approach for providing health benefits to their postdocs .

Ensure any health insurance benefit includes an affordable option for dependent care for all postdocs. The most common benefit available to postdocs is health insurance and typically includes dependent care. Nevertheless, the availability is still not universal, particularly for postdocs on individual fellowships who may not be eligible for the institution's group plan or for postdocs on student health plans that may not have an affordable dependent care option.

Consider establishing formal flexible work arrangements or part-time appointments. Establishing a guideline or policy on flexible work arrangements, such as teleworking, or part-time appointments for postdocs can formalize the terms for such arrangements. Such policies can provide safeguards for the postdoc, the postdoctoral supervisor and the institution against potential misunderstandings or abuses. *For example, at Washington University in St Louis, a postdoc can apply for a temporarily reduced schedule for a period not to exceed a year for personal or medical reasons or extenuating circumstances.*

Offer flexible spending accounts or other pre-tax savings options for dependent care expenses to postdocs. Dependent care expenses can be particularly burdensome on a postdoc salary. Pre-tax savings options would allow eligible postdocs to set aside part of their salary pre-tax and use it for qualified expenses, such as childcare or elder care. Because the deduction is pre-tax it reduces a postdoc's taxable income and for some postdocs, may offer greater federal tax benefit than the childcare tax credit. *For example, the J. David Gladstone Institutes offers flexible spending accounts for all its postdocs for both health and dependent care expenses.*[6]

Family-Friendly Assistance

Besides establishing family-friendly policies and benefits, institutions can expand assistance offered to faculty or students to include postdocs.

Offer postdocs access to affordable on-site childcare services and portable childcare subsidies usable at any eligible childcare service. The convenience of having on-site childcare can be considerable for working parents, particularly for some nursing mothers. Moreover, a facility that is

affiliated with the institution may also be a mechanism for providing childcare tuition assistance for eligible postdocs. Additional flexibility can be gained by offering portable childcare tuition assistance that is usable at any qualified facility. Such flexibility allows postdocs to find a service that fits their budget and geographical needs if, for example, it is more convenient for commuters to have a service nearer to home than to work. *In 2012, the Fred Hutchinson Cancer Research Center, for example, offered eligible students and postdocs a childcare subsidy of 25% of childcare costs up to a maximum of $300 per month per child.*[7] *Similarly, the University of North Carolina at Chapel Hill has offered the Childcare Financial Assistance Program for all eligible employees and students.*[8]

Offer postdoc recruits any job relocation assistance available for "dual-career" academic couples. "Dual-career" assistance takes an array of forms, from informal networking assistance to more formal programs such as a dedicated dual-career office. An emphasis for many of these programs is on assisting tenured or tenure track faculty partners, with a minority of programs offering assistance to non-academic partners.[9] At present, dual-career assistance for postdocs is not widely available[10] but *most commonly involves access to a local Higher Education Research Consortium (HERC)*[11], *which shares networks of local employers and their available jobs.*

Provide comprehensive coverage of benefits during orientation or via other tools. Postdoc orientation programs and information hubs like Web sites and handbooks should include a special emphasis on family-friendly benefits and institutional practices. Additional attention to these areas can ensure that both prospective and current postdocs are aware of these benefits, which is often not the case.[12] Such venues can also provide information on services available to postdoc partners, such as any dual-career job assistance, visa information or resources for international postdoc partners *(see for example, information for Berkeley Spouses and Partners provided by University of California, Berkeley Visiting Scholar and Postdoc Affairs office*[13]*).*

Services for Postdoctoral Supervisors

Postdoctoral supervisors provide the primary support to the postdoc while playing a variety of critical roles, from boss to advisor and mentor to collaborator. Institutions can support their postdocs by providing services to supervisors in managing these roles.

Provide professional development training opportunities to postdoctoral supervisors. Mentorship and evaluation of postdocs are done on an ad hoc basis at most institutions, with the format and delivery primarily left to the discretion of individual supervisors. Institutions can assist their faculty and research supervisors by providing training and assistance in these activities. *Mentor training, such as the approaches detailed in the Howard Hughes Medical Institute-supported* Entering Mentoring,[14] *can provide mentors with a toolset for optimizing their mentoring approach and for managing challenging relationships.* Similarly, with so few institutions requiring performance evaluations for postdocs, postdoc supervisors often have little guidance in these procedures, particularly with regard to being aware of unexamined biases in the evaluation process.

Enhance communication about postdoc policies and procedures. Postdoc supervisors should have readily available information on postdoctoral policy that affects the day to day work environment. For example, raising awareness of sick leave or parental leave policies with supervisors can standardize discussion and approval of such requests.

Foster mechanisms for limiting the impact on research of a postdoc's pregnancy or leave period. Postdocs and their supervisors alike want to limit any potential research delays due to leaves of absence for family or other reasons. Institutions should work with supervisors to develop productive mechanisms for facilitating postdocs' return to work following a period of leave and if needed, for maintaining a project in the interim. They should endorse and support the development of a maternity leave plan that defines expectations for supervisor and postdocs. *The NPA resource, "A Postdoc's Guide to Pregnancy and Maternity Leave," provides guidance for the development of such a plan.*[15]

Leadership from deans and department chairs on this issue could provide critical support for supervisors and postdocs seeking out creative solutions. Some strategies are:

- Encourage flexible work schedules or offer telework resources that can allow for gradual return to work.
- Standardize accommodation strategies and discussions during pregnancy and leave so that postdocs, supervisors and labs do not have to reinvent the wheel. For example, standard pregnancy safety accommodation procedures could establish timelines, expectations and attributions for anyone helping keep a project going.
- Consider mini-grants or supplements that could support technical assistance during a postdoctoral researcher's leave. *Some institutions have developed in-house transitional funding for such interruptions,*[16] *while federal agencies like NSF*[17] *and NIH*[18] *allow grant supplements for this type of assistance.*

Other Institution-wide Considerations

Include information on postdoctoral oversight and mentoring issues in leadership training. Dean and department chair training often includes gender issues and is generally faculty-focused. Expanding the focus to include postdocs could increase awareness of the issues surrounding the transition from postdoc to faculty.

Include postdocs in any institution-wide assessment of climate for women. Recent years have seen a number of such assessments that have provided important data for evidence-based decision-making on gender equity at many institutions. Often focusing on faculty and students, such assessments should make a special effort to include postdocs as well *(as did the seminal report at Massachusetts Institute of Technology in 1999*[19]*).*

Proactively examine and seek clarification of governmental policies and practices at the institution-agency interface for postdocs. Federal agencies, as the primary funders of postdocs, are critical partners for research institutions, particularly since each play a role in setting policies that affect postdoc working conditions. For postdocs funded on federal grants, approximately half of postdocs,[20] the Office of Management and Budget (OMB) Circular A-21 provides some uniform guidelines for institutions, but the necessarily general nature of these guidelines often leave much open to the interpretation and local implementation of the institution. In addition to these requirements on grantee institutions, there are postdocs funded off of individual fellowships that respond to different guidelines altogether since often the postdoc him or herself typically is the grantee organization in this case. The institution carries the responsibility to set local personnel policy that simultaneously adheres to these multiple guidelines.

Consider "permanently" hiring the institution's postdocs. The predominant model of the postdoc position continues to encourage postdocs to move from institution to institution in order to gain scholarly breadth and visibility. Research institutions typically do not hire their own postdocs into permanent jobs; it is slightly more common at government-funded national labs than universities. Hiring these newly trained postdocs would mean that the institution is hiring a "known quantity," individuals who are already familiar with the organizational culture. Moreover, postdocs with families or dual-career concerns are already settled, so require no dual-career considerations or moving costs, and enjoy limited personal disruptions.

Summary

Recent advancements in postdoctoral policies and services, largely spearheaded by the rapid increase in the number of postdoctoral offices, have greatly improved the postdoctoral experiences at many institutions. **These successes underscore the importance of the institution in further enhancing the conditions of appointment for postdoc women.** Institutions should consult the NPA's recommended practices as a baseline for their postdoctoral services. Additional consideration should be given to family-friendly policies for postdocs, such as parental leave, Title IX compliance on pregnancy discrimination, flexible work schedules, dependent health coverage and pre-tax flexible spending accounts that can be used for health or dependent care. In addition, institutions should consider offering assistance such as childcare subsidies and dual-career accommodation assistance. Postdoctoral supervisors can also benefit from support in their mentoring activities (a topic discussed further in Chapter 3), performance evaluations, and clear guidance on postdoctoral policies and procedures for accommodating their postdocs' pregnancy and family leave. Finally, the institution as a whole can support postdocs by explicitly including them in any assessments of climate and federal compliance, as well as in leadership training for institutional management. Institutions set local personnel policy and so would benefit from additional attention to the ways in which postdocs can be treated equitably as a class and yet still comply with the panoply of regula-

tions on postdoc funding sources. Expanding postdoctoral policies and services, particularly those that foster a family-friendly work environment, will promote not only the career advancement of postdoc women but that of all postdocs.

[1] Davis, G. 2005. "Doctors Without Orders." *American Scientist.* 93(3, supplement). http://postdoc.sigmaxi.org/results/(accessed December 1, 2012) These findings did not find any overall patterns in success and satisfaction related to gender.

[2] http://www.nationalpostdoc.org/policy-22/institutional-policies/recommended-practices-for-institutions (accessed December 1, 2012)

[3] Federal Demonstration Partnership Task Force on Parental and Family Leave for Research Trainees. 2012. *A Forgotten Class of Scientists: Examining the Parental and Family Benefits Available to Research Trainees.* http://sites.nationalacademies.org/PGA/fdp/index.htm (accessed December 1, 2012)

[4] http://www.upenn.edu/almanac/volumes/v57/n01/postdocpolicy.html (accessed December 1, 2012)

[5] For example, see 45 CFR 86.57 and 45 CFR 86.40 for regulations for NIH awardees regarding employees and students, respectively. For additional discussion of Title IX with regard to postdoc pregnancy discrimination, see Goulden, M., Frasch, K., Mason, M.A. 2009. *Staying Competitive: Patching America's Leaky Pipeline in the Sciences.* Berkeley: Berkeley Center on Health, Economic & Family Security and the Center for American Progress. p. 26 http://www.americanprogress.org/issues/2009/11/women_and_sciences.html (accessed December 1, 2012)

[6] http://gladstonepostdoc.ucsf.edu/experience/benefitsummary.pdf (accessed December 1, 2012)

[7] https://www.fhcrc.org/en/education-training/spac/childcare.html (accessed December 1, 2012)

[8] http://hr.unc.edu/benefits/work-life-and-wellness/child-care-programs/CCM1_018382 (accessed December 1, 2012)

[9] Schiebinger, L., Henderson, A., & Gilmartin, S. 2008. *Dual-Career Academic Couples: What Universities Need to Know.* Stanford: Clayman Institute.

[10] NPA ADVANCE Fall 2009 Institutional Survey of 72 research institutions.

[11] http://www.hercjobs.com (accessed December 1, 2012)

[12] For example, many postdocs responding to the Sigma Xi Postdoc Survey answered "I don't know" when asked about the availability of some family-friendly benefits, such as 44% on child care and 48% on family leave (maternity/paternity).

[13] http://vspa.berkeley.edu/berkeley-spouses-and-partners (accessed December 1, 2012)

[14] Handelsman, J., Pfund, C., Lauffer, S.M., & Pribbenow, C.M. 2005. *Entering Mentoring. A Seminar to Train a New Generation of Scientists.* Madison: The Board of Regents of the University of Wisconsin System. http://www.hhmi.org/grants/pdf/labmanagement/entering_mentoring.pdf
See also: http://www.researchmentortraining.org/(accessed December 1, 2012)

[15] For suggestions on developing a maternity research plan, see the Appendix for the NPA's *A Postdoc's Guide to Maternity Leave,* by K. Flint Ehm and A. Linnemann.

[16] c.f. the University of Washington's Transition Support Program. Riskin, E.A., Lange, S.E., Quinn, K., Yen, J.W., & Brainard, S.G. 2007. "Supporting Faculty during Life Transitions." In A.J. Stewart, J. E. Malley, & D. LeVaque-Manty (Eds.). *Transforming Science and Engineering: Advancing Academic Women.* Ann Arbor: University of Michigan Press. 116.

[17] http://www.nsf.gov/pubs/policydocs/clb/clbfaqs.jsp (accessed December 1, 2012)

[18] http://grants.nih.gov/grants/family_friendly.htm (accessed December 1, 2012)

[19] c.f. Massachusetts Institute of Technology. 1999. "A study on the status of women faculty in science at MIT." *The MIT Faculty Newsletter.* 11(4):14. http://web.mit.edu/fnl/women/women.html (accessed December 1, 2012)

[20] 61% of all postdocs in 2009 were funded from federal sources, which is comprised of the 51% of all postdocs who were funded off of federal grants and 10% on fellowships and traineeships. National Science Foundation, National Center for Science and Engineering Statistics. 2011. Graduate Students and Postdoctorates in Science and Engineering: Fall 2009. Detailed Statistical Tables NSF 12-300. Arlington, VA. See Table 70, available at http://www.nsf.gov/statistics/nsf12300/ (accessed December 1, 2012)

Achieving Cooperation between Universities and Federal Granting Agencies to Create a Flexible Family-Friendly Workplace

By Mary Ann Mason, Ph.D., J.D.

Women now represent a large part of the talent pool for research science, but many data sources indicate that they are more likely than men to "leak" out of the pipeline in the sciences before obtaining tenure at a college or university.[1]

Here at the University of California at Berkeley, our national study of the dropout rates of women in the sciences, based on NSF's Survey of Doctorate recipients, shows that family formation—most importantly marriage and childbirth—account for the largest leaks in the pipeline between Ph.D. receipt and the acquisition of tenure for women in the sciences. Specifically, women who are married with children in the sciences are 35 percent less likely to enter a tenure track position after receipt of their Ph.D. than married men with children, and they are 27 percent less likely than their male counterparts to achieve tenure upon entering a tenure-track job. Most of this dropout occurs before attaining a tenure track job. It is the young women scholars, the graduate students and particularly postdoctoral fellows who decide to change their career direction based on family concerns.[2]

It is imperative that we keep our talented young scholars in the pipeline. It is a great loss of talent and investment when a young scholar diverts from his or her career path. A mass of bureaucratic and regulatory blockages must be pushed through in order to achieve a flexible workplace in which having both a family and a career is possible. A critical block is that while federal agencies largely finance the graduate students, postdocs, and faculty members who create new scientific breakthroughs, it is universities that determine personnel issues.

For instance, the National Institutes of Health offers a generous eight weeks of paid leave to postdoctoral fellows who receive the National Research Service Award. However, recipients may take that paid leave only "when those in comparable training positions at the grantee organization have access to this level of paid leave." In other words, every postdoc at that university must also be eligible for eight weeks of paid leave—an unlikely circumstance for postdocs who are supported by a wide variety of sources.

Childbirth takes a high toll on the career aspirations of female scientists. In our survey of all University of California postdocs we found that of those who had children while they were postdocs at the University of California, 41 percent indicated that they had shifted their career goals away from becoming a research professor at a university.

Focusing on the dropout rates of women in the sciences our Berkeley researchers looked at the 61 members of the Association of American Universities (the top research institutions in the country). We found that only 23 percent of them guaranteed a minimum of six weeks' paid leave for postdocs, and only 13 percent promised the same to graduate students.[3]

Postdocs in particular have grant money from many sources and therefore often receive different benefits. At one university, a postdoc may receive paid parental leave because he or she is considered an employee, while someone else in the same lab may receive nothing at all, including the right to unpaid leave, if his or her work is paid for from an outside source. Postdocs may not qualify for the national Family Medical Leave Act, which guarantees up to 12 weeks of unpaid leave for childbirth but requires that the employee have been employed for at least a year at the institution.

And there are yet different rules dealing with international students. According to the Federal Demonstration Partnership report, of the 48,000 postdoctoral researchers in the United States in 2005, 55 percent were non-U.S. citizens. Their status and access to parental and family benefits are generally handled differently from those of U.S. citizens, and with an alternate cast of officials and regulations. Those foreign postdocs, if treated well, would be more likely to remain in the United States and become major contributors to our pre-eminence as innovators in science and technology.

Then there are the big discrepancies in providing any kind of family support across the more than a dozen federal agencies that award grants to scientists. The NIH and the NSF give the most money and have gone further than other agencies in offering a variety of family accommodations. Among the top 10 agencies, however, we found that most offer recipients only a no-cost extension of a grant to accommodate childbirth. Two offer nothing at all.

In its newly issued report, "A Forgotten Class of Scientists," the Federal Demonstration Partnership[4] and its Task Force on Parental and Family Leave for Research Trainees focus on graduate students and postdocs, the most vulnerable class of scientists, with the fewest benefits. These are the young female trainees, in their peak childbearing years, who are most likely to abandon a career in research science when they have a child.

The partnership, sponsored by the National Academies, is a cooperative project among 10 federal agencies and 119 academic institutions that receive federal research money. Its study looked closely at the different policies pursued by leading granting agencies and at the laws and regulations that bind the organizations. It also examined how several universities interpreted those laws and regulation. What it found was a tangle of rules and policies at different universities.

"There appears to be little collaboration across academic institutions or with federal agencies to make active efforts to improve the process," the report said, "although many institutions are independently addressing these issues. At the least, this is a case of wasted resources. It creates confusion and multiple interpretations of already complicated policies. For example, although Title IX requires that institutions provide unpaid, job-protected leave to birth mothers 'for a reasonable period of time,' the absence of a formal policy could lead to the institution being in violation of Title IX if a postdoctoral scholar was informally granted less than what could be considered reasonable."

According to findings from our AAU survey, some universities may not be complying with Title IX, which requires that research universities receiving federal funds (1) treat pregnancy as a temporary disability for purposes of calculating job-related benefits, including any employer-provided leave, and (2) provide unpaid, job-protected leave for "a reasonable period of time" if the institution does not maintain a leave policy for employees.[5]

Early Steps at Family-Responsive Policies, Benefits, and Resources

Although much remains to be done, some AAU institutions have put in place family responsive policies, benefits, and resources, including time-based policies and benefits such as stopping the clock (i.e., tenure-clock extension), various child care supports such as on- and off-campus centers, monetary supplements such as tuition remissions, and other resources such as lactation rooms.

Federal agencies have made similar efforts, with some agencies—particularly NIH and NSF—standing above the rest. Efforts include the provision of no-cost extensions for caregiving purposes (typically providing an additional year to complete the project, with no additional funds), grant supplements to support family responsive policies or needs, gender equity workshops, formalized agency policies or statements supporting women in the academic pipeline, allowing part-time effort on fellowships or grants, and extending the fellowship period for caregiving.[6]

However, the lack of coordination between research universities and federal agencies creates inconsistent and inadequate coverage.

Recommendations for Federal Agencies and Universities

Promote clear, well-communicated, baseline family responsive policies for all classes of researchers. As described in this article and our earlier report,[7] America's researchers do not receive enough family responsive benefits, particularly the more junior researchers. Together, federal agencies and universities can make headway in solving this systemic problem.

Federal agencies, particularly NIH, NSF, and the nonprofit organization The American Association for the Advancement of Science (AAAS), which oversees federally funded research fellows for many of the federal granting agencies, can help by setting equitable, clearly communicated baseline

family responsive policies for their fellows. At the same time, universities need to adopt baseline family responsive policies for all of their classes of researchers—not just faculty. Graduate student researchers and postdoctoral scholars receive the most limited benefits and are arguably the most important in affecting the future of U.S. science.

Provide federal agency or university supplements to offset family event productivity loss.
Without providing additional financial supplements in association with family responsive policies, faculty principal investigators, or PIs—those with primary responsibility for the design, execution, and management of a research project—will continue to bear the brunt of supporting family-related absences from their research dollars. This dynamic is unfair to PIs and may create a situation where they will find it to their advantage to avoid hiring researchers who might eventually need family responsive policies. This becomes an unintended form of discrimination against women. To avoid this structural difficulty, supplementary funding needs to be provided when researchers paid off of grants take necessary leaves/modifications.

Collaboratively move toward a full package of family friendly policies that take into account the career-family life course.
All major research universities should look to build a family-friendly package of policies and resources, and federal agencies can provide much more than they already do. Sharing and wide-scale adoption of proven practices are necessary.

Remove time-based criteria for fellowships and productivity assessments that do not acknowledge family events and their impact on career timing.
The lock-step timing of academia needs to be more flexible. Time caps and barriers to entry—such as those that require a postdoctoral scholar position to begin within a certain number of years following receipt of the Ph.D.—that set rigid sequential deadlines should be removed. Universities and federal agencies need to examine all of their policies in this regard and look for ways to encourage reentry into the pipeline for academic researchers who take time off for giving birth or caring for children and promote a more holistic concept of career patterns that honors the larger needs of individuals.

Collect and analyze the necessary data to make sure existing and future policy initiatives are effective in meeting researchers' needs and comply with Title IX.
The lack of necessary data and multiyear commitments to these efforts continues to hamper our delivery of truly effective initiatives. Decisions about family responsive policies, programs, and benefits will continue to be made on intuition and anecdote if they are not tracked by systematic longitudinal data. Both federal agencies and universities need to build and maintain the necessary datasets to assess whether our efforts are yielding positive results and whether Title IX requirements are being met. Federal agencies can provide more grant programs to help determine whether our efforts are working, and Title IX compliance reviews should include questions on family responsive policies.

Our current inadequate family responsive benefits for America's researchers makes no economic sense. In the world of federal grants individuals who drop out of science after years of training represent a huge economic loss and are a detriment to our nation's future excellence. Given the nation's interest in maintaining America's competitive advantage, future federal investments should be focused on patching the leaky pipeline in the sciences. Doing so will help us preserve our competitive edge.

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[1] National Research Council. 2001. *From Scarcity to Visibility: Gender Differences in the Careers of Doctoral Scientists and Engineers.* Washington, D.C.: National Academies Press; Mason, M.A., & Goulden M. 2002. "Do babies matter? The effect of family formation on the lifelong careers of academic men and women." *Academe.* 88:21; Mason, M.A., & Goulden M. 2004a. "Do babies matter (part II)? Closing the baby gap." *Academe. 90:3;* American Council on Education, Office of Women in Higher Education. 2005. *An agenda for excellence: Creating flexibility in tenure-track faculty careers.* Washington: American Council on Education. Available from www.acenet.edu.; Nelson, D. [2004] 2007 "National Analysis of Diversity in Science & Engineering Faculties at Research Universities," available at http://faculty-staff.ou.edu/N/Donna.J.Nelson-1/diversity/Faculty_Tables_FY07/FinalReport07.html (accessed December 1, 2012); National Research Council Committee on Science, Engineering, and Public Policy. 2007. *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering.* Washington, DC: The National Academies Press. http://www.nap.edu/catalog.php?record_id=11741 (accessed December 1, 2012); Ceci, S., Williams, W., & Barnett, S. 2009. "The underrepresentation of women in science: Sociocultural and biological considerations." *Psychological Bulletin.* 135:172; Goulden, M., Frasch, K., & Mason, M.A. 2009. *Staying competitive: Patching America's leaky pipeline in the sciences.* Berkeley: Berkeley Center on Health, Economic, & Family Security and The Center for American Progress. Available from http://www.americanprogress.org.

[2] Goulden et al. 2009.

[3] Ibid.

[4] http://sites.nationalacademies.org/PGA/fdp/index.htm (accessed December 1, 2012)

[5] Goulden et al. 2009.

[6] Ibid.

[7] Ibid.

CHAPTER THREE

The Role of Mentoring in Postdoc Women's Career Advancement

This chapter examines mentoring in the framework of the postdoctoral experience and emphasizes the need for institutions to provide multiple avenues for mentoring in order to assist postdoc women in their transition to the professoriate.

Mentoring has been highlighted in recent years as an important component of the trainee experience and features in the NIH/NSF definition of a postdoctoral scholar (emphasis added)[1]:

> *An individual who has received a doctoral degree (or equivalent) and is engaged in a temporary and defined period of* ***mentored*** *advanced training to enhance the professional skills and research independence needed to pursue his or her chosen career path.*

Built into the apprenticeship model, mentoring can have significant benefits for the mentee's success in his or her current position as well as future career. The career benefits of mentoring have been widely catalogued in the literature. For scientists, guidance and good mentoring are associated with increased career satisfaction and success.[2] Mentoring can foster professional development, such as improved grant writing success[3] and expanding a mentee's network.[4] In addition to these career building functions, mentoring has a psychosocial function in providing role modeling, personal support and encouragement,[5] which in turn influence career choice and decision making.[6] For postdocs, who often feel isolated from the rest of their institution, mentoring can help mitigate these feelings and foster increased engagement. In fact, postdocs often point to mentoring as one of the most useful aspects of the postdoctoral training experience.

Mentoring is particularly important for women, who often lack the early-career support and organizational knowledge of their male peers.[7] Yet, trainee women are often less satisfied than men with the mentoring they receive,[8] and a lack of mentoring has been noted as a factor in decisions to leave science.[9] As noted earlier, evidence suggests similar trends for postdoc women of color: Strong mentors and role models are lacking, but when available they play an important role in the retention of these women in the science career pipeline.[10] Early-career women and underrepresented minorities are often interested in mentors and role models who are like them[11] but typically have few available among more senior scientists and have limited informal networks through which to find other potential mentors.[12] Women may also benefit more from mentor-initiated or

mutually-initiated mentoring relationships[13] over self-initiated ones, suggesting that mentors may need to play an active role in fostering these relationships.

Mentoring postdocs

The postdoc position should be the first step toward independence for the newly minted Ph.D. researcher and usually requires less direct oversight than graduate work. For this reason, some postdocs may have difficulty recognizing the need for continued mentorship. This attitude, when combined with the previously mentioned concerns about mentoring not being a core research activity, can make postdocs reticent to commit time to mentoring. Despite the burgeoning independence of the postdoc, mentoring remains, however, a foundation of postdoctoral training.

Postdocs' primary mentoring relationships tend to be with their postdoctoral supervisor, with a majority of postdocs considering their supervisor to be a mentor.[14] In fact, during the NPA ADVANCE focus groups, the term *mentor* was often used interchangeably with the terms *PI, boss,* or *supervisor.* The postdoctoral community has struggled with what to call the postdoctoral supervisor, most often using the term *PI* which is widely used in the numerically dominant biomedical fields for the principal investigator on the postdoc's project, whereas the Sigma Xi Postdoc survey elected to use the more discipline-neutral term *advisor.* The variation in terminology reflects the multiple hats worn by postdoctoral supervisors, which include supervisory functions, like hiring, firing, and performance evaluation, as well as advisory functions, like research training, mentorship, and career development. In some cases these functions can come into conflict, as discussed in the commentary by Donna Dean and Cynthia Simpson, when the best interests of the research do not coincide with the best interests of the postdoc's career. This situation can be particularly thorny for international postdocs whose visa status also can depend upon their relationship with their supervisor, creating additional conflicts of interest when postdocs become overly dependent upon the goodwill of one individual. Thus, while postdoctoral supervisors fulfill many important roles, including that of mentor, postdocs may also need to seek out multiple mentors to ensure all their mentoring needs are met.

International postdocs can have distinct mentoring needs from domestic postdocs as they come to the United States from a range of training backgrounds and research cultures. International postdocs may need guidance on U.S. research norms, funding agencies, and procedures, as well as assistance building up their professional networks in the United States and navigating the immigration process. Mentors, particularly postdoctoral supervisors, can be instrumental in providing these types of support but need not be the only source of information, especially for complicated legal issues like visas. Many institutional resources, such as those provided by an office of international affairs, can provide complementary support to international postdocs, and mentors should be made cognizant of these available support structures.

Like international postdocs, those from underrepresented groups will often work with mentors from a different background or gender. According to some thirty postdocs in the social, behavioral, and economic (SBE) sciences attending an NPA-organized workshop,[15] that is not always a negative option. Having an effective mentor of the same cultural identity is beneficial but there are at least two other factors to consider:

- A mentor of the same cultural identity may have little resources or power within an institution; if so, the postdoc should seek an additional mentor with those resources and power.
- A mentor who understands and respects a postdoc's personal or social background and the ways in which that background informs the postdoc's research is not always someone who shares the postdoc's ethnic background, as discussed in the commentary by Anderson-Thompkins and Stroman. For example, for a postdoc married or with children, it may be as beneficial to have a mentor who is married or with children (or who understands the challenges of balancing career and family needs) as having a mentor from the same ethnic background.

Such factors show the value of building a network of multiple mentors.

NPA ADVANCE Recommendations

Institutions can support postdocs and their supervisors by nurturing their communication and mentorship strategies with diverse mentees, while also offering resources that broaden a postdoc's access to mentors and role models beyond the supervisor.

Treat, and reward, mentoring as a "core" part of research.
An important part of creating a culture of mentoring is establishing meaningful mentoring expectations and incentives at the departmental level. As an integral part of research, effective mentoring is often overlooked as an achievement in itself. Institutions can recognize the value of mentoring by taking it into consideration during promotion and tenure considerations alongside research, teaching, and service. *Similarly, some institutions have established awards for outstanding postdoctoral mentors, in some cases offered by the institution (for example, the University of Southern California) and in others organized by the postdoc association (for example, Harvard School of Public Health).* Another way to encourage and formalize mentoring is the use of a compact between postdoctoral appointees and their mentors that can lay out some of the responsibilities of both the postdoc and the mentor for their working relationship. *A template for this compact was developed by the Association of American Medical Colleges' Group on Graduate Research, Education, and Training (GREAT)*[16] *and has since been adapted by institutions like University of Michigan Medical School, as a non-binding pledge agreed to by postdocs and their supervisors upon the start of any appointment.*

Develop structured mentoring programs to encourage multiple mentors for postdocs. The mentoring literature has long recommended the use of multiple mentors to meet the varied needs of the mentee.[17] Postdocs should be encouraged to look beyond their supervisor for additional mentoring and to consider potential mentors outside the research group, department, discipline and even institution. Women in particular are less likely to have mentors outside of their home department.[18] While there is evidence that informal mentoring relationships may provide greater benefit than more structured mentorship, particularly for women,[19] women also benefit more from mentor-initiated or mutually-initiated mentoring relationships,[20] suggesting that mentoring programs can play a role in fostering these relationships.

One-on-one mentoring. Formal mentoring programs can expose postdocs to new mentors outside of their postdoctoral supervisor through a variety of mechanisms, as well as promote peer mentoring within the program's mentee cohort. For example, a one-on-one mentoring program that matches up interested mentors and mentees can reproduce some of the mechanics of more informally developed mentoring relationships. The matching process can be done thoughtfully to ensure that matches are suitable and the goals of the program are met,[21] but for large numbers of mentees algorithms have been successful, such as the 34-variable algorithm used by MentorNet for matching up e-mentoring pairs.[22] In all cases, the matching process should have some process through which it is uniformly applied.

Mentoring orientation activities. One way that formal mentoring relationships are different from informal ones, according to mentoring consultant Stacy Blake-Beard, is that formal programs need an orientation phase to help a new mentoring pair connect.[23] Therefore, programs should consider organized activities to catalyze mentoring. For example, reviewing papers or grant writing can create opportunities for giving and receiving feedback. *A pilot mentoring program for assistant professors in Economics, CeMENT, has had success with matching up a small group of mentees with a more senior mentor on the basis of their similar research for the purpose of sharing feedback on an in-progress paper or grant proposal.*[24] *A similar approach has been used for teaching postdocs to write grants as well as establish mentoring expectation.*[25]

Group-based mentoring. One approach to limiting the time commitments of busy mentors and mentees is to utilize group-based mentoring, either with one mentor and a group of mentees or a mentoring committee for an individual mentee. This type of "collective mentoring" can provide a diversity of perspectives to mentees as well as potentially reduce the individual time burden for everyone involved. An important aspect of this model is that the team is established by the department or institution instead of leaving that challenge to the mentee.[26] Mentoring committees have been little used for postdocs to date. *Woods Hole Oceanographic Institute has piloted their use at the department level, allowing each department to design the postdoctoral committee of mentors to best suit their departmental culture.*

Peer mentoring. Another type of group-based mentoring is peer mentoring. Peer mentoring has the advantage of providing psychosocial support on topics of mutual interest amongst peers while potentially having greater flexibility than more formal junior-senior mentoring models. Peer mentoring also has its limitations, since participants lack career experience and may be concerned about competition or differing rates of career advancement.[27] *Peer mentoring has been used successfully for senior faculty women in chemistry, who are often the sole women at their institution, by forming small horizontal mentoring "alliances" with other women across the nation.*[28] These alliances meet for a series of in-person retreats of the group for both social and professional development activities, modeled on the approach described in the book *Every Other Thursday: Stories and Strategies from Successful Women Scientists* by Ellen Daniell.[29] *An example of how this could be adapted for postdoctoral scholars is the peer group of postdoc women with small children who successfully mentored each other as they transitioned into their first independent positions (see sidebar).*[30]

GPS Groups: Goals and Problem-solving for Scientists

A Goals and Problem-solving for Scientists (GPS) Group is "a confidential peer-mentoring group for discussing professional concerns, engaging in analytical problem-solving techniques, and developing individualized plans of action. The private and close-knit nature of the GPS group ensures that members can thoroughly explore concerns in an atmosphere that is both supportive and exacting."[i] Adapted from a group problem-solving model described in *Every Other Thursday: Stories and Strategies from Successful Women Scientists* by Ellen Daniell,[ii] GPS groups were reinvented by a group of postdoc women in the life and physical sciences who all had small children. The women have since successfully moved forward in their scientific careers and credit their GPS group with fostering these transitions.

The group has shared some recommendations for starting a GPS group:[iii]

1. When selecting members, develop criteria for desirable peer similarities, such as family status or career stage, and recruit four to six people.
2. Make a commitment to meet every other week and try to make the meetings a top priority.
3. Make a commitment to complete confidentiality.
4. Allocate restricted time blocks during each two-hour meeting to each member based on the requested amount of time to discuss his or her issue(s).
5. Keep discussion topics focused on resolution instead of just "venting."
6. Each member should be prepared to give and receive honest feedback.
7. Develop protocols for the beginning and end of each meeting to address any lingering issues or conflicts in a timely manner.

The authors of this promising practice speculate that this peer mentoring model could benefit the careers of both women and underrepresented minorities and potentially foster their retention in the academic pipeline.

i http://evgenyashkolnik.com/gpsgroups/Welcome.html (accessed January 31, 2013)

ii Daniell, E. 2006. *Every Other Thursday: Stories and Strategies from Successful Women Scientists.* New Haven: Yale University Press.

iii Shkolnik, E.L., Surcel, A., Shahar, A., & Jang-Condell, H. 2011. "GPS Groups: A Peer Problem-Solving Approach to Mentorship." Proceedings of University of New Mexico's 2011 "Learning Across Disciplines" Mentoring Conference. http://evgenyashkolnik.com/gpsgroups/Welcome_files/GPSgroups.pdf (accessed December 1, 2012)

Increase exposure to potential mentors through networking. Such efforts can increase a postdoc's access to potential mentors but let the relationship then develop more organically and informally. A common approach is the use of networking receptions and luncheons to expose postdocs to additional mentors. Similarly, greater integration of postdocs into the department by ensuring their inclusion on e-mail distribution lists can expose them to other research groups and other potential mentors. *Adaptation of a model like speed mentoring developed by the Georgia Tech University ADVANCE program could provide additional external mentoring for postdocs on their potential for career advancement.*[31] *Whereas the Georgia Tech model provided a series of short consultations on the CVs of faculty who were going up for tenure, a postdoc model could provide feedback on postdoc CVs and their preparedness for the job market. The University of Kentucky has developed a toolkit that could be adapted for use with postdocs.*[32]

Provide training in mentorship for mentors and mentees.
A common characteristic of formal mentoring programs is training in mentorship for both mentors and mentees, but such training can also benefit postdocs and their supervisors independent of a formal program. Important components of such programs highlight the reciprocal nature of the mentoring relationship and the roles and responsibilities of both parties as well as provide a toolkit for mentoring challenges, such as conflict resolution and communication. *The Research Mentor Training Web site at the University of Wisconsin-Madison provides a number of curriculum resources for mentoring training, including discipline-specific materials.*[33] Such training programs can also provide a platform for discussion of diversity and multi-cultural competency for those supervising an increasingly diverse postdoctoral population.[34]

Encourage the development of mentoring plans.
In recent years the National Science Foundation has catalyzed the development of mentoring plans for postdoctoral scholars with its congressionally-mandated requirement of such plans in all grant proposals that include support for postdocs.[35] Institutions can aid NSF PIs and others in developing such plans by establishing postdoctoral training programs and raising awareness of institutional resources available to complement a supervisor's mentoring activities. The NPA has developed a toolkit on postdoctoral mentoring plans with tips for writing a plan as well as other resources for postdoctoral training. [36] For example, the NPA's core competencies [37] can provide a basis both for a postdoctoral training curriculum and assessment of postdoctoral training goals.

Another successful mentoring tool is the individual development plan (IDP). A workhorse instrument for corporate career development, the IDP was adapted for use with postdocs by the Federation of American Societies for Experimental Biology (FASEB).[38] The IDP is a tool for postdocs to conduct a self-assessment, establish consequent research and career goals, create a plan for achieving those goals, and then discuss these with their supervisor. IDPs, therefore, also serve as a mentoring tool by fostering communication between a postdoc and his or her supervisor on topics related to professional and career development. The FASEB IDP template has been widely

adapted by institutions for use as a resource, and in some cases, a requirement. *Vanderbilt Medical School, for example, has adapted the FASEB IDP and requires that postdocs maintain their IDP as a condition for reappointment each year. The IDP has also been adapted into an online, interactive career-planning tool for early-career scientists at Science Careers, myidp.sciencecareers.org.*[39]

Summary

Mentoring is the cornerstone of the postdoctoral experience and as such should not be the sole responsibility of the postdoctoral supervisor. Effective postdoctoral mentors should take advantage of any institutional resources available for postdocs as well as foster other avenues for postdocs to identify complementary sources of mentorship and role modeling. Formal mentoring programs and tools can catalyze some of these relationships as well as broaden the circle of mentoring for postdocs. A number of models for these programs exist, from one-on-one mentoring and mentoring orientation activities to group-based mentoring with a committee of mentees or of mentors and peer mentoring. Other tools and resources can help provide structure for mentoring, such as mentoring plans. Importantly, institutions should also support the needs of the mentors through training in effective mentoring techniques, particularly where mentors are overseeing a diverse group of postdocs. Above all institutions must treat and reward mentoring as a core part of research.

[1] http://grants.nih.gov/training/Reed_Letter.pdf (accessed December 1, 2012)

[2] c.f. Russo, G. 2010. "For Love and Money." *Nature.* 465:1104; Davis, G. 2009. "Improving the Postdoctoral Experience: An Empirical Approach." In R. Freeman & D. Goroff (Eds.). *Science and Engineering Careers in the United States.* Chicago: NBER/University of Chicago Press, 100

[3] National Research Council's Gender Differences report found that mentoring increased the grant success rate for faculty at top research institutions. National Research Council. 2009. *Gender Differences at Critical Transitions in the Careers of Science, Engineering and Mathematics Faculty.* Washington: The National Academies Press.

[4] c.f. Ragins, B.R. 1999. "Gender and Mentoring Relationships: A Review and Research Agenda for the Next Decade." In G. Powell (Ed.), *Handbook of Gender and Work.* 347. Thousand Oaks: Sage Publications, Inc.

[5] Kram, K. E. 1985. *Mentoring at work: Developmental relationships in organizational life.* Glenview: Scott Foresman; Ragins 1999

[6] c.f. Lent, R. W., Brown, S. D., & Hackett, G. 1994. "Toward a unifying social cognitive theory of career and academic interest, choice, and performance." *Journal of Vocational Behavior.* 45:79

[7] Ragins 1999

[8] c.f. Nolan, S.A., Buckner, J.P., Marzabadi, C.H., & Kuck, V.J. 2008. *Sex Roles.* 58:235; Mason, M.A., & Goulden, M. 2002. *Academe.* 88(6): 21

[9] c.f. Preston, A.E. 2004. *Leaving Science: Occupational Exit from Scientific Careers.* New York: Russell Sage Foundation

[10] Ong, M., Wright, C., Espinosa, L.L., Orfield, G., Bang, M., Hodari, A., Bath, C., & DeCarvalho, W. 2010. *Inside the Double Bind: A Synthesis of Empirical Research on Women of Color in Science, Technology, Engineering, and Mathematics.* White paper presented to the National Science Foundation. http://www.terc.edu/work/1513.html (accessed December 1, 2012)

[11] Packard, B. 1999. "A 'Composite Mentor' Intervention for Women in Science." American Educational Research Association Annual meeting, Montreal, QC.

[12] Cleveland, J.N., Stockdale, M., & Murphy, K.R. (Eds). 2000. *Women and Men in Organizations: Gender Issues at Work.* Mahwah: Lawrence Erlbaum Associates

[13] Scandura, T. A., & Williams, E. A. 2001. "An investigation of the moderating effects of gender on the relationships between mentorship initiation and protégé perceptions of mentoring functions." *Journal of Vocational Behavior.* 59: 342.

[14] Sigma Xi survey data results, all respondents: http://www.sigmaxi.org/postdoc/all/your_advisor_short.html (accessed December 1, 2012)

[15] http://www.nationalpostdoc.org/images/stories/Documents/Other/sbe-postdocs.pdf (accessed December 1, 2012)

[16] http://www.aamc.org/initiatives/postdoccompact/ (accessed December 1, 2012)

[17] c.f. Kram 1985

[18] Etzkowitz, H., Uzzi, B., & Kemelgor, C. 2000. *Athena Unbound: The Advancement of Women in Science and Technology.* Cambridge: Cambridge University Press.

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Mentoring Postdoc Women from an Institutional Perspective

By Donna J. Dean, Ph.D., and Cynthia L. Simpson, CAE, M.Ed.

The numbers of women and under-represented minorities in science, technology, engineering, mathematics, and medical (STEMM) disciplines have greatly improved over the past several decades, but institutional efforts to recruit, train, retain, and promote their participation and advancement in these fields are still inadequate. Being successfully mentored is particularly important for this group, and institutions must step forward to take a leadership role in this regard. The emergence of frameworks and formal structures for postdoctoral career support and advancement in institutions is a very encouraging sign. In today's STEMM enterprise, the postdoctoral period is an essential platform for expanding one's knowledge base and skill sets, as a springboard to a fully independent career pathway.

As mentoring frameworks, approaches, and strategies are developed, it is essential to keep in mind what women scientists at the early stages of their careers have indicated that which they do NOT want from their mentors:[1]

- Advice based on the mentor's interests that is not necessarily of interest to the protégé;
- Inability to help with considering all options when protégé is making a major decision;
- Lack of interest in the areas the protégé chooses to study or pursue;
- No support of major accomplishments;
- No availability to provide assistance;
- Determent of protégé from life-long goals;
- Negative impact on protégé's life;
- Mentoring that does not bring out protégé's full potential; and
- Bias toward (or against) women.

But what women scientists DO want are mentors who: [2]

- Encourage consideration of ALL opportunities based on the protégé's life goals;
- Can help with career as well as life issues;
- Are supportive of academic, career, and personal achievements;
- Are available in a timely manner;
- Encourage "thinking outside the box";

- Will introduce protégés to professionals in industry, academia, and other work sectors to further the protégé's career or knowledge about the specific area of concentration;
- Will help protégés to become great mentors themselves;
- Are positive role models; and
- Are consistent, honest, and trustworthy.

We start from the premise that postdoctoral supervisors assure that their postdocs are mastering the core intellectual and professional skills within their chosen discipline. Most importantly, institutions and postdoc women themselves should not assume that the postdoctoral supervisor should, or will, meet all the mentoring needs of any given individual. In fact, a postdoctoral supervisor's own scientific career productivity is directly impacted by the postdoc's work performance, and therefore this interdependence has the potential for conflict of interest.

Those who have devoted their careers to studying the principles and practices of effective mentoring strongly recommend that mentors are not the direct boss or manager of the person being mentored, regardless of the work sector.[3] Yet, in this context, it is important to note that some postdoctoral supervisors are mentors in the best sense of the word. The most prudent course is to acknowledge that not all postdoctoral supervisors can fulfill these high expectations, as their own experience, temperament, and perspectives will not likely map to every mentoring need of a postdoc. Hence, it is essential that institutions affirm the importance, and acceptability, of multiple mentors who can adapt to the needs of a specific individual. A postdoc woman at this relatively vulnerable career stage is seeking her own "best fit" for a career that melds her intellectual interests with her own life values. The experts who study the theory and practice of effective mentoring approaches recommend a "network of mentors," as no one person is likely to meet all of an individual's mentoring needs.[4] It is not likely that formalized institutional frameworks can be developed or adapted to meet all the needs of every postdoc, but institutions can clearly convey the message that the norm should be a panoply of mentors.

Effective mentoring from a number of mentors can lead postdoc women to take active steps to assess their needs and interests; develop, enhance, and sustain productive interactions with their mentors; and maintain a meaningful life and career in the context of family, culture, and workplace change.[5] Because few will have a perfect pathway to a career or a seamless meshing of career with away-from-work life, the perspectives of others can be particularly helpful in minimizing the inevitable times of discouragement that occur during the postdoctoral period. With honest, respectful, and sensitive guidance gleaned from their own experience, mentors should provide perspectives to help these protégés: (1) acquire the appropriate professional credentials, (2) recognize when a rich opportunity arises; (3) learn from mistakes or missteps; (4) deal with biases and misconceptions; (5) develop a sense of their career directions and timing; (6) select appropriate role models; (7) mesh their values and interests with the right workplace; (8) obtain a healthy balance in their lives; (9) create opportunities for others; (10) know when it is time to move on; and (11) stretch

beyond their normal comfort zone in taking strategic risks.

The young scientist, in particular, can learn to balance the different roles that lie ahead in both career and life. These changing needs will influence the types of mentoring sought in the framework of long-term strategies for career planning. Mentors can be people who influence facets of life and career during interactions that can last a lifetime or just a minute. Organizations should encourage their postdocs to look for mentors who are savvy, consistent, honest, and patient and who can help with personalized mentoring needs.

Each element in a successful mentor-protégé relationship is a reflection of the temperament, interests, experience, and perspectives of the individuals involved. Not every encounter with mentors will be uniformly positive. Sometimes a mentor may be distracted by concerns about her/his own life/career and not able to focus on what an individual needs at that particular moment. Institutions can help facilitate an environment in which both mentors and their protégés are expected to recognize some basic premises of good mentoring relationships:

- Being honest with one another;
- Not putting one another in an awkward position;
- Looking for patterns in life and in career;
- Having a sense of humor;
- Recognizing that one's actions, whether good or bad, will often have consequences; and
- Seeking the hidden, unwritten, and inside rules that operate in organizational cultures.

Good mentors will ask hard questions of their protégés. In turn, protégés should recognize that dedicated mentors will help them uncover critical truths. The roles of organizational culture and workplace will also exert an important influence on the postdoc's mentoring needs. In some fields, and many workplaces, it is likely that females have different expectations about mentoring than males. Of particular note, it is imperative to ensure that careers are not sidetracked when scientists interrupt their careers in order to fulfill family obligations. Hence, it becomes critical to seek out and identify mentors who meet the needs of particular circumstances and times and who have knowledge of career tracks that may not be part of the postdoctoral environment.

Organizations should remain cognizant that, as with all human relationships, mentoring relationships are not likely to be perfect. Having this awareness can be of great help when it may be time to terminate a specific mentoring relationship. Keeping in mind some critical points may make this process easier. On one hand, not all mentor/protégé relationships start out positive, or remain a positive interaction. On the other hand, it takes time to develop a strong mentoring relationship between two individuals. Too often, mentors try to set the tone for the mentoring relationship rather than approaching it as a partnership that depends upon effective and timely two-way communication. Some general concepts that can work here include being honest, forthrightly confronting the sometimes painful realities; not trying to redesign the past; and following through and closing the loop.

Whether a mentoring relationship is part of an institutional program or one that arises independently, establishing expectations early on is essential. Not only will this make the interactions more productive but also will serve to minimize possible misunderstandings. Both the program and individual mentors should mutually set goals with the protégés for the desired outcomes of the mentoring relationship(s). It is also important to set guidelines for the mentoring process that include, for example, modes of interaction and topics that may be "off bounds" during the mentoring experiences. Such guidelines do not have to be rigid but provide a straightforward way to articulate realistic expectations about what is to be encompassed and accomplished. Finally, mentors and protégés should determine an interval and mode for contact and interaction that responds to issues of concern and of the mentoring support that is needed.

A Final Word

Many experienced practitioners in the STEMM disciplines will acknowledge that, in the research or development laboratory, greater learning comes from the experiment or design that did not work the first time (or the second, or the third). While frustration or abandonment of the project may be the immediate reaction, a more thoughtful and reasoned analysis can lead to a better experimental approach, an adjustment of incorrect design parameters, or a total rethinking of the concepts. This analysis is easy to do in the laboratory or design studio, but it can be very difficult to apply the same principles when it is our own thinking, actions, or frameworks that are "not working." As well-motivated institutions implement efforts to support the advancement of women postdocs, they will inevitably encounter such difficulties. Institutions can make a difference in the short-term by conducting an aggressive and intensive analysis at each institutional level of the reasons that its programs, approaches, or tactics are not meeting the needs of today's women postdocs. Only then will sustainable and long-term system changes guarantee that a more significant number of our female postdocs are making a successful transition from the postdoctoral level to faculty status or other independent career tracks of their choice.

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CHAPTER FOUR

Professional and Career Development for Postdocs

This chapter gives an overview of promising practices for providing professional and career development opportunities for postdoc women.

Enhanced professional and career development is beneficial for all postdocs. For postdoc women in general, effective professional development can help bolster areas where they, as a group, have lagged behind their male peers, such as in publication rates[1] and conference attendance.[2] Other areas thought to have great benefit for women are strengthening skills in negotiating,[3] networking, and fostering tacit knowledge of the institution and the academic career track.[4] While postdocs receive considerable on-the-job training in research skills, these other professional skills, like negotiation, are little taught either informally or formally.[5] Institutions can fill such gaps with formal training programs.

Professional development is increasingly available at research institutions, although it is not always directed at postdocs, especially in the case of career development services. While often available for students, career services can be difficult to offer to postdocs who do not pay the fees that typically support these services. Moreover, postdocs can be reluctant to participate in training activities that take time away from research, and, on average, only a minority of postdoc supervisors actively encourages participation in training beyond the research group.[6] Therefore, even when programs already exist, whether they are targeted for postdocs or even for a complementary group like faculty or graduate students, postdocs may need additional encouragement and incentives to participate.

NPA ADVANCE Recommendations

Establish a coherent postdoctoral training program or curriculum.

By establishing resources or a curriculum for postdoctoral training, an institution provides a framework for the provision of professional development. A coherent program or curriculum establishes standards and guidance for postdocs seeking ways to broaden their professional skills in preparation for the varied needs of the global workforce. For example, while some postdocs may have the opportunity for on-the-job experience writing grant proposals (a little less than half according to Sigma Xi) a formal program on grant writing can broaden their familiarity with a variety of

The NPA Postdoctoral Core Competencies

The National Postdoctoral Association (NPA) has established six core competencies to offer guidance to institutions and individual postdoctoral scholars on relevant areas for continuing training opportunities. A "competency" is defined as "an acquired personal skill that is demonstrated in [one's] ability to provide a consistently adequate or high level of performance in a specific job function."[i] Based on a life-long learning model, the competencies provide a framework for seeking out relevant training opportunities for skills that have already been developed through graduate training as well as other skills that may be new or expanded. These competencies are meant to serve primarily as: (1) a basis for self-evaluation by postdoctoral scholars and (2) a basis for developing training opportunities that can be evaluated by mentors, supervisors, institutions, and other advisors.

The six core competencies are:

1. Discipline-specific conceptual knowledge
2. Research skill development
3. Communication skills
4. Professionalism
5. Leadership and management skills
6. Responsible conduct of research

The NPA's online toolkit[ii] provides a more detailed description of each competency and some initial resources for developing relevant skills and training programs.

i BNET Business dictionary

ii http://www.nationalpostdoc.org/competencies (accessed December 1, 2012)

funding sources.[7] A formal curriculum can be cited in a postdoc's CV, in some cases offering a formal certificate of completion, as well as formalizing the supervisor's approval of participation. *For example, the University of Texas Health Science Center at Houston offers a Postdoctoral Certificate Training Program,*[8] *which is an elective, two-year series of short courses on various professional and career development topics. Postdoc participants must provide a letter of support from their supervisor to participate, and, upon completion of 15 hours of coursework, receive a certificate.*

Use the NPA core competencies as a guide for postdoctoral training, at the institutional, departmental or individual level.

The NPA core competencies[9] can provide a framework for an institutional or departmental program as well as provide individual guidance to postdocs and postdoctoral supervisors on fruitful avenues for further training. Based on a life-long learning model, the core competencies identify six key areas for continuing skill development for researchers (see sidebar). Formal development opportunities in some lesser taught skills, such as leadership and management, can be important complements to more informal skill training in the lab or office. Individual postdocs can use the competencies as tools for self-assessment as well as a guide for seeking out relevant training opportunities. *A self-assessment process based on competencies can enhance career development planning with tools like the individual development plan to develop a robust training plan for postdocs, an approach that has been successful in training postdoc women at the University of Wisconsin at Madison.*[10]

Encourage networking activities for postdocs.

Despite the importance of networking for a professional career, academics are often reluctant to develop this skill. Moreover, studies suggest that women's professional networks may not be as strong as those of men and therefore, may not be as effective in furthering their professional careers.[11] Fostering postdoctoral networking not only exposes postdocs to new potential mentors but builds up a constellation of professional relationships[12] and contacts that can foster knowledge sharing, stimulate collaborative research, and provide more psychosocial forms of support. The former postdocs participating in the NPA ADVANCE focus groups cited networking as one of the most useful aspects of postdoctoral training but also the aspect that could be most improved, along with mentoring. For this reason, postdocs can benefit from training in the process of networking, which can help them build professional relationships as well as take optimal advantage of opportunities like conference attendance. Some institutions offer such workshops as part of their postdoctoral professional development offerings, *for example, Stanford University offers "Networking for Ph.D.s & Postdocs: Networking for those who don't want to."*

Another important network for postdocs to build is with other postdocs at their institution. Given the relative isolation of most postdocs, with only a handful in most research groups, they may need to reach out deliberately to foster these local connections. Postdoc offices or postdoc associations can be instrumental in building community for postdocs through both professional and social activities. National Postdoc Appreciation Week, which was established by the NPA in 2009 and was recognized by the U.S. House of Representatives in 2010, has seen a remarkable series of activities dedicated to celebrating postdocs across the United States. These events are archived on the NPA Web site and can provide examples of many different ways to bring postdocs together. Other types of networks can be established virtually via online communication for postdocs in far flung departments. *For example, the Emerging Scholars Interdisciplinary Network connects early-career scholars nationwide whose work relates to social inequalities and health disparities among minority populations and provides professional development resources and networking for participants.*[13] Such networks can be particularly beneficial to postdocs in the social and behavior sciences who are often even more isolated than other postdocs due to the small numbers of postdocs in these fields.

Provide access to career development resources.

Encourage the use of career plans.

There are a number of tools that can assist postdocs to become more deliberate about their careers. Encouraging the development of a career plan can start postdocs thinking early about their career goals as well as the variety of career options available to them. *The University of Pittsburgh's Center for Postdoctoral Affairs in the Health Sciences has developed an online Postdoctoral Career Development and Progress Assessment Tool that combines career planning with performance evaluation in a mandatory tool for both postdocs and their supervisors.*[14] *As mentioned in the previous chapter, FASEB has developed a widely-used template for the postdoc individual development plan (IDP).* Institutions can adapt the IDP for their own internal uses, whether as

a required step for reappointment or a recommended activity for postdocs, and can consider providing training in effective use of the IDP. Institutional adoption of the IDP has been encouraged by the NIH in its implementation plan for the 2012 recommendations by the Advisory Committee to the Director Biomedical Research Workforce Working Group. *Individual postdocs will also be able to take advantage of the online tool, myIDP, hosted at Science Careers.org.*[15]

Establish or make available institutional career services for postdocs.
IDPs and other career development tools can be offered through an office dedicated to postdoctoral services or by an office of career services. *For example, the Medical College of Wisconsin's Office of Postdoctoral Education has developed a Virtual Career Center*[16] *with individual career counseling in addition to a library of career resources for its postdocs.* Other institutions have expanded student career services to postdocs, *such as the University of Chicago's Career Advising and Planning Services which serves alumni and postdocs in addition to its students.* Synergies could also be found by including postdocs in early-career faculty development.

Offer insight into the faculty search process.
Since postdoc women can sometimes lack the "inside" knowledge of how academic institutions work, they can benefit from frank sharing of information about the faculty search process, negotiating and interviewing, and advancing to tenure. *One successful model for early-career scientist women is the FORWARD to Professorship workshops,*[17] *which were jointly developed at George Washington and Gallaudet Universities with support from the National Science Foundation's ADVANCE program and have been replicated at a number of other institutions. The two-day program demystifies the process of obtaining a tenure-track position and then succeeding in it by providing "inside" knowledge and strategies. Rice University's ADVANCE program offers a similar program, Future Faculty Workshop,*[18] *which brings in underrepresented postdocs and senior graduate students from across the country for a workshop on becoming faculty.* There are also some programs that can bring these activities to an institution for a fee. *For example, the COACh program at University of Oregon*[19] *offers a series of portable workshops on these topics, particularly negotiation skills, for women scientists.*

Offer workshops and resources on career-life balance.
Issues surrounding career-life balance are important for all professionals, not just women starting families, and at many career stages.[20] Resources can be offered on a number of topics, such as stress management, retirement planning, eldercare planning, and family-friendly benefits. Offering venues for discussion of these issues can help raise awareness as well as foster the development of mentoring relationships regarding these personal issues that have been a successful strategy for STEM women to advance in their academic careers.[21] *The Association for Women in Science (AWIS) has recently developed a traveling, interactive workshop*[22] *on work-life satisfaction that helps women identify personalized strategies for finding work-life balance.*

Summary

Postdocs receive considerable professional development through the course of their postdoctoral research, but every individual postdoc will need to conduct a self-assessment to understand their areas for potential improvement. Institutions can help postdocs, and postdoc women in particular, build their professional record through the provision of resources and programming that strengthens their skills and broadens their career potential. Institutions can establish a framework for further professional training through the use of postdoctoral training curricula and tools like the NPA core competencies. Postdocs may benefit from other development sources such as networking within the postdoctoral community, which can mitigate postdoc isolation as well as further their professional careers. Postdocs can also benefit from access to career development tools, such as thoughtful career planning, access to institutional career counseling and other services, as well as programs that provide insight into the faculty search process. The postdoctoral position is a career stage that allows opportunity for incredible scientific discovery while also maximizing an individual's preparation for the next career step.

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[2] Mason, M.A., & Goulden, M. (2002). "Do babies matter? The effect of family formation on the lifelong careers of academic men and women." *Academe.* 88(6):21

[3] Babcock, L., & Laschever, S. 2003. *Women Don't Ask: Negotiation and the Gender Divide.* Princeton: Princeton University Press

[4] Rankin, P. Nielsen, J., & Stanley, D.M. 2007. "Weak Links, Hot Networks, and Tacit Knowledge: Why advancing women requires networking." In A.J. Stewart, J. E. Malley, & D. LeVaque-Manty (Eds.). *Transforming Science and Engineering: Advancing Academic Women.* Ann Arbor: University of Michigan Press. 31.

[5] For example, 67% of Sigma Xi respondents had received no training in negotiating skills. http://www.sigmaxi.org/postdoc/all/inst_environment_short.html (accessed December 1, 2012)

[6] In the Sigma Xi Postdoc Survey, 38% of respondents said their advisor somewhat or strongly encouraged their participation in training, while 42% said their advisor neither discouraged or encouraged their participation and 7% somewhat or strongly discouraged them. http://www.sigmaxi.org/postdoc/all/inst_environment_short.html (accessed December 1, 2012)

[7] Among Sigma Xi Postdoc Survey respondents, 46% had on-the-job training in proposal writing, 17% had received formal training, and 37% had received no training. Grant or proposal writing was also the top choice for formal training desired by respondents. http://www.sigmaxi.org/postdoc/all/inst_environment_short.html (accessed December 1, 2012)

[8] http://www.uth.tmc.edu/postdocs/content/postdoctoral-certificate-program.html (accessed December 1, 2012)

[9] http://nationalpostdoc.org/competencies (accessed December 1, 2012)

[10] Carnes, M., Schuler, L., Sarto, G.E., Lent, S.J., & Bakken, L. 2006. "Increasing Sex and Ethnic/Racial Diversity of Researchers in Aging: Some Promising Strategies at the Postdoctoral Level." *Journal of the American Geriatrics Society.* 54:980

[11] c.f. Hitchcock, M.A., Bland, C.J., Hekelman, F.P., & Blumenthal, M.G. 1995. "Professional networks: The influence colleagues on the academic success of faculty." *Academic Medicine.* 70(12):1108

[12] Kram, K. E. 1985. *Mentoring at work: Developmental relationships in organizational life.* Glenview, IL: Scott Foresman

[13] http://emergingscholars.net (accessed December 1, 2012)

[14] http://www.oacd.health.pitt.edu/postdocprogress/ (accessed December 1, 2012)

[15] http://myidp.sciencecareers.org (accessed December 1, 2012)

[16] http://www.mcw.edu/VirtualCareerCenter.htm (accessed December 1, 2012)

[17] http://www.student.seas.gwu.edu/~forward/ (accessed December 1, 2012)

[18] http://www.advance.rice.edu/NIFP.aspx?id=72 (accessed December 1, 2012)

[19] http://coach.uoregon.edu/coach/index.php (accessed December 1, 2012)

[20] c.f. Slaughter, A.-M. 2012. "Why women still can't have it all." *The Atlantic.* (July/August 2012) http://www.theatlantic.com/magazine/archive/2012/07/why-women-still-cant-have-it-all/309020/ (accessed December 1, 2012); and Monosson, E. 2008. *Motherhood, the Elephant in the Laboratory: Women Scientists Speak Out*. Ithaca: Cornell University Press.

[21] c.f. Pritchard, P.A. 2006. *Success Strategies for Women in Science: A Portable Mentor.* Burlington: Elsevier Academic Press

[22] http://awis.org/displaycommon.cfm?an=1&subarticlenbr=342 (accessed December 1, 2012)

CHAPTER FIVE

Summary of Recommendations

The recommendations and examples in this resource are chiefly designed to provide an overview for institutions and their postdoctoral administrators of a range of interventions expected to reduce obstacles for postdoc women building their academic science careers. While all postdocs will benefit from enhanced postdoctoral oversight, postdoc women face additional challenges that impact their retention in the academic career pipeline. These challenges are primarily related to family formation during the postdoc, including dual-career and childrearing issues, and to feelings of isolation, lack of encouragement, and a lack of mentoring. There are a number of interventions that can mitigate these challenges, from developing robust postdoctoral policies and services, particularly family-friendly policies, to fostering postdoctoral mentoring and offering career and professional development.

Acknowledging the key role of institutions, the National Postdoctoral Association (NPA) has long promoted a series of recommended institutional practices[1] that correlate with the Sigma Xi postdoc survey's[2] structured oversight measures in many ways. These recommendations include:

1. Establish a postdoctoral office that actively engages postdoctoral scholars and provides:
   a. Oversight and accountability for postdoctoral training and
   b. An open line of communication with the administration that gives postdocs an independent and accessible avenue to provide input to the administration.
2. Establish postdoctoral policies including:
   a. Administrative policies, such as grievance procedures, entrance/exit interviews, central appointment process, an annual survey of postdocs, a postdoc handbook, and postdoc access to institutional facilities and resources.
   b. Training policies, such as a timeline for transition to independence, career planning with annual review, career development services, and postdoc training resources and/or curriculum.
   c. Benefits policies, such as a minimum salary or stipend and a pay scale based on years of experience, matched retirement contributions, and family-friendly benefits for all postdocs.
3. Maintain an office for international scholar services that provides processing and tracking of postdoc visas as well as informational services on immigration issues for international scholars.

4. Address diversity concerns, seeking to promote diversity and ensure equal opportunity and inclusion for all postdocs in the membership, leadership and activities of the institution regardless of race, ethnicity, sex, disability, country of origin, field of research, socio-economic status, religion, age, marital status, sexual orientation, or gender identity.

As a result of the NPA ADVANCE work, the NPA has made additional recommendations for postdoctoral polices and services, mentoring, and career and professional development, which follow here.

Postdoctoral Policies and Services

Family-Friendly Policies and Services

Establish family-friendly benefits for all postdocs at an institution, ensuring that postdocs with different sources of funding have equitable benefits.

- Provide clear guidance on family-friendly policies and practices in order to avoid case-by-case implementation, especially where there are differences by postdoc funding source.
- Provide baseline paid parental leave provisions for all postdocs for the birth or adoption of a child, ideally with a guaranteed minimum of six weeks for maternity leave.
- Provide a provision for unpaid family leave for those postdocs who may not be covered by FMLA and may require leave beyond that provided by available paid benefits.
- Work pro-actively with the institution's Title IX office to ensure compliance regarding pregnancy protections for postdocs, such as maternity leave offerings, pregnancy safety protocols, and accountability for equal treatment of pregnant postdocs.
- Ensure that extended family leave or leaves of absence qualify a postdoc for an extension of her postdoc clock at the institution. Where possible, support postdoc and PI efforts to secure any needed no-cost extensions on applicable funding.
- Ensure any health insurance benefit includes an affordable option for dependent healthcare for all postdocs, independent of funding source.
- Consider establishing formal flexible work arrangements or part-time appointments.
- Offer flexible spending accounts or other pre-tax savings options for dependent care expenses to postdocs.

Family-Friendly Assistance

- Offer postdocs access to affordable on-site childcare services and portable childcare subsidies usable at any eligible childcare service.
- Offer postdoc recruits any job relocation assistance available for "dual-career" academic couples.
- Provide comprehensive coverage of benefits during orientation or via other tools.

Services for Postdoctoral Supervisors

- Enhance communication about postdoc policies and procedures.
- Provide resources to postdoctoral supervisors on postdoc policy, particularly family-friendly policies and guidelines.
- Foster mechanisms for limiting the impact on research of a postdoc's pregnancy or leave period. Some strategies for institutional leaders to help foster these mechanisms are:
  1. Encourage flexible work schedules or offer telework resources that can allow for gradual return to work.
  2. Standardize accommodation strategies and discussions during pregnancy and leave so that postdocs, supervisors and labs do not have to reinvent the wheel.
  3. Consider mini-grants or supplements that could support technical assistance during a postdoctoral researcher's leave.

Other Institution-wide Considerations

- Include information on postdoctoral oversight and mentoring issues in leadership training.
- Include postdocs in any institution-wide assessment of climate for women.
- Proactively examine and seek clarification of governmental policies and practices at the institution-agency interface for postdocs.
- Consider "permanently" hiring the institution's postdocs.

Mentoring

- Treat, and reward, mentoring as a "core" part of research.
- Develop structured mentoring programs to encourage multiple mentors for postdocs, which could encompass one or more of the following:
  - One-on-one mentoring.
  - Mentoring orientation activities.
  - Group-based mentoring.
  - Peer mentoring.
  - Increased exposure to potential mentors through networking.
- Provide training in mentorship for mentors and mentees.
- Encourage the development of mentoring plans, and the use of other mentoring tools like the Individual Development Plan (IDP).

Career and Professional Development

- Establish a coherent postdoctoral training program or curriculum.
- Use the NPA core competencies as a guide for postdoctoral training, at the institutional, departmental or individual level.
- Encourage networking activities for postdocs, which can include networking training and formal events as well as other networking venues such as postdoctoral associations.
- Provide access to career development resources, including but not limited to:
  - Encourage the use of tools for career planning.
  - Establish or make available institutional career services for postdocs.
  - Offer insight into the faculty search process.
  - Offer workshops and resources on career-life balance.

Whether institutions are establishing postdoctoral services for the first time or have a well-established postdoctoral program, the practices identified in this resource book and the supporting overview of the literature offer a starting point for creating, enhancing and motivating institutional practices that benefit women. Institutions seeking additional guidance on building up general postdoctoral services are encouraged to contact the NPA or consult other resources such as the NPA's Postdoc Office Toolkit.[3] Additional examples of practices and programs in the postdoctoral community are available at the NPA ADVANCE online clearinghouse of promising practices.[4]

[1] http://www.nationalpostdoc.org/policy-22/institutional-policies/recommended-practices-for-institutions (accessed December 1, 2012)

[2] Davis, G. 2005. "Doctors Without Orders." *American Scientist.* 93(3, supplement). http://postdoc.sigmaxi.org/results/ (accessed December 1, 2012)

[3] http://www.nationalpostdoc.org/pdo-toolkit (accessed December 1, 2012)

[4] http://www.nationalpostdoc.org/advance/clearinghouse (accessed December 1, 2012)

APPENDIX A

The Postdoctorate: A Review of the Data

This chapter provides a quick primer on the available data and informs the discussion about impacts of the current workforce environment on postdoc women.

Postdoctoral scholars are a critical component of the research enterprise in the United States. They contribute a significant proportion of the research produced by research institutions, including a substantial fraction of first authors on published papers[1] and grant proposals.[2] In the life and physical sciences, the postdoctoral research position has become the *de facto* next career step following receipt of the Ph.D.[3] and thus the gateway for many to the tenure-track faculty job.

Definition of a "postdoc"

An individual who has received a doctoral degree (or equivalent) and is engaged in a temporary and defined period of mentored advanced training to enhance the professional skills and research independence needed to pursue his or her chosen career path.

— The official definition adopted by the National Institutes of Health and the National Science Foundation in collaboration with the National Postdoctoral Association.

According to NSF's 2009 statistics on the science and engineering postdoctoral population, the majority of postdocs are in the biomedical sciences (67%), with the next largest group in the physical sciences with 15%, followed by engineering 11%[4] (see Table 1). These ratios have not changed dramatically over the past fifteen years.[5] One change during this period, however, has been the hiring of postdocs in other fields outside of the sciences. While the numbers in these other fields are small, they demonstrate another recent trend: the number of postdocs has been steadily increasing across all disciplines.[6]

Table 1: **Basic characteristics of the U.S. postdoc population**	
	Percent of Total
Female[i]	38%
Underrepresented minorities[i]	8.3%
With disabilities[ii]	<1%
Temporary residents[iii]	54%
Academic discipline[i]	
Biomedical sciences	67%
Physical sciences	15%
Engineering	11%
Mathematics and computer sciences	2%
Psychology	2%
Social sciences	1%

Sources: (*i*) WebCASPAR. 2009 NSF-NIH Survey of Graduate Students and Postdoctorates in Science and Engineering. (accessed October 25, 2011) Biomedical sciences include biological sciences and medical sciences. Physical sciences include physics, chemistry, astronomy, earth, atmospheric and ocean sciences; (*ii*) 2005 Sigma Xi Postdoc Survey by all results, all institutions: http://www.sigmaxi.org/postdoc/all/about_you_short.html (accessed December 1, 2012); (*iii*) Kang, K. 2012. "Graduate Enrollment in Science and Engineering Grew Substantially in the Past Decade but Slowed in 2010." National Science Foundation/National Center for Science and Engineering Statistics InfoBrief [NSF 12-317] http://www.nsf.gov/statistics/infbrief/nsf12317/ (accessed December 1, 2012)

The Postdoc Population

The NSF estimates that 38% of postdocs in 2009 were women, a number that has been growing slowly since 1993 when it was 29%.[7] Disaggregating by discipline shows that, while some fields were approaching gender parity among their postdocs in 2009, such as psychology with 50% and biomedical sciences at 44%, engineering and physical sciences were still down at 22% and 24%, respectively (see Table 2).

For a snapshot of the social demographics of the postdoctoral population we turn to the Sigma Xi Postdoctoral Survey from 2005.[8] That survey found that the majority of postdocs surveyed were aged between 30 and 35 (58%) and married or partnered (69%). Approximately a third had children, and this fraction was slightly higher for men than for women (for breakdown within sex, see Table 3). These data underscore the fact that for many postdocs, their postdoctoral years coincide with the years of family formation. Moreover, for postdoc women this period corresponds to the typical childbearing years for college-educated women in the United States.[9]

Another important characteristic for postdocs is citizenship status, especially those who are working in the United States on non-immigrant visas. Since the early nineties, such international

Table 2: **Female postdocs, by academic discipline**	
	Percent of Total
Female within academic discipline[i]	
Psychology	50%
Social sciences	45%
Biomedical sciences	44%
Physical sciences	24%
Engineering	22%
Mathematics and computer sciences	20%

Sources: (*i*) WebCASPAR. 2009 NSF-NIH Survey of Graduate Students and Postdoctorates in Science and Engineering. (accessed October 25, 2011) Biomedical sciences include biological sciences and medical sciences. Physical sciences include physics, chemistry, astronomy, earth, atmospheric and ocean sciences.

postdocs have comprised a majority of the science and engineering postdocs working in the United States.[10] In 2010, 54% of postdocs were visa holders.[11] The representation of women among U.S. citizens and permanent residents was higher than among temporary residents.[12]

Perhaps one of the biggest limitations in available postdoc data concerns postdocs who are members of underrepresented groups. NSF found that among science and engineering postdocs who received their doctorate in the United States, the percentage of underrepresented minorities increased from 2.4% in 1973 to 8.3% in 2008.[13] Postdocs with disabilities are estimated at between 1% and 3% of the postdoc population.[14]

Table 3: **Postdoc characteristics, within sex**		
	Females	Males
Age (mean and s.d.)[i]	34.5 (4.8)	34.7 (4.6)
Temporary resident[ii]	33%	67%
Married or partnered[iii]	65%	70%
With dependent children[iii]	29%	37%

Sources: (*i*) 2005 Sigma Xi Postdoc Survey results by gender: http://www.sigmaxi.org/postdoc/by_gender/about_you_short.html (accessed December 1, 2012) Age calculated from respondents' reported year of birth and survey start year of 2005. (*ii*) WebCASPAR. 2009 NSF-NIH Survey of Graduate Students and Postdoctorates in Science and Engineering. (accessed October 25, 2011); (*iii*) 2005 Sigma Xi Postdoc Survey by all results, all institutions: http://www.sigmaxi.org/postdoc/all/about_you_short.html (accessed December 1, 2012).

The Postdoc Career Life Cycle

Career prospects for postdocs have become increasingly uncertain in today's job market. The growth in the number of postdocs in the United States has not been accompanied by similar growth in the number of faculty positions. In fact, comparing the type of employment of recent doctorate holders at academic institutions over time, the fraction of those in full-time faculty positions has fallen while the fraction in postdoc positions has grown. In 1973, 74% of doctorates within three years of receiving their Ph.D. were in faculty positions compared to 13% in postdocs, but in 2008, only 42% of recent doctorates were in faculty positions compared to 36% in postdocs.[15] At the start of their postdoc positions, the majority of postdocs have an interest in becoming faculty or principal investigators,[16] but, across all disciplines, less than a third of them obtain tenure-track positions.[17]

Not only is the likelihood of starting a postdoc position increasing in most fields, many postdocs complete more than one postdoc. Almost a third of the postdocs responding to the 2005 Sigma Xi survey had already completed one or two postdoc positions prior to their current position.[18] Until a few years ago, the best available data showed that the length of the postdoc was also increasing;[19] most recently, it seems to be decreasing. Postdocs responding to the 2005 Sigma Xi Survey reported a median number of 29 months in total as a postdoc, with more than half of them expecting their current postdoc position to last more than 24 months.[20]

The ideal length of the postdoc is still an open question. The purpose of the postdoc, according to a recent NSF survey of current postdocs[21] and the NSF/NIH definition of the postdoc,[22] is to obtain additional advanced, mentored training. As a result, the postdoc applying for faculty jobs typically has more experience than newly minted Ph.D.s applying right out of graduate school, potentially making faculty job searches increasingly competitive. While there is no consensus on the ideal length of the postdoc, there seems to be a general sense that it should be long enough to help a postdoc get that next job but not so long that questions are raised about why that postdoc hasn't gotten the next job yet. Postdoc advocates support a limit to the total time spent as a postdoc,[23] arguing that it is important to establish a time scale for transition to independence. Often institutions will place a limit on the total time spent as a postdoc,[24] after which postdocs must leave the institution or transition into another job title. Unfortunately, this uncertainty in how long one *should* be a postdoc can create challenges for those who may need to take a bit longer for reasons like childbearing or other family responsibilities as well as those making plans for starting families.

Because the postdoc is considered a training position, often that position does not enjoy the full range of compensation commensurate with the level of education attained by these researchers. As of 2008, the most recent year for which we have data, the median salary for a postdoc working in academia was $42,000, compared to $75,000 for Ph.D. scientists not working as a postdoc.[25] By another measure, the FY2009 stipend scale mandated for NIH-supported Ruth L. Kirschstein

National Research Service Awards (NRSA) postdoctoral fellows, which many institutions have adopted as the salary minimum for all postdocs,[26] started at $37,368 for a new postdoc and reached a maximum of $51,552 for the most senior postdocs with seven years or more experience (for FY2012, these have increased to $39,264 and $54,180, respectively). In comparison, in 2009 the overall U.S. median salary of those aged 25 to 34 with only a bachelor's degree was $46,437 and for those with a doctorate degree it was $70,990.[27] International postdocs often face lower salaries on average than domestic postdocs, U.S. citizens, and permanent residents.[28]

In addition to having relatively low salaries, postdocs tend to lack robust employment benefits. For example, while the vast majority has employer-provided health insurance, only a minority has retirement benefits[29] or guaranteed baseline paid maternity leave.[30] Moreover, provision of some benefits, for example, eligibility for the Family Medical Leave Act (FMLA), which provides eligible employees with unpaid, job-protected family leave, depends upon an individual institution's treatment of postdoc employment classification or limitations such as being employed for more than 12 months.

Based on a preliminary inquiry conducted by the National Postdoctoral Association (NPA) in 2011, the wide variety of funding mechanisms and employment classification of postdocs at the institutional level can often lead to widely disparate benefits for postdocs within the same institution or even in the same lab, doing the same work.[31] While postdocs funded by research grants may receive full employee benefits at many institutions, postdocs with private funding or fellowships often fall into a special category that may or may not receive equivalent benefits. The continuing conflict between employee and trainee status for postdocs results in a wide variety of employment conditions and increased instability for these burgeoning professionals.

Additional Uncertainty for Postdoc Women

Female postdoctoral scholars face additional uncertainties in their career prospects. The relative fraction of women among scientists has been growing steadily in most fields, with the share of women doctoral degree recipients across all science and engineering, and especially in the disaggregated life and social sciences, beginning to reach parity or more.[32] Many studies have shown, however, that the relative fraction of women compared to men in the sciences decreases at every successive step in the academic career path.[33] The 2007 National Research Council report, *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering,* points out that this decrease appears to be particularly acute in those fields where the postdoc position is most common,[34] and many other reports point to the greatest losses occurring between receipt of the Ph.D. and the first tenure-track position.[35] A 2009 study of postdocs' career choices found that while many postdocs of both sexes change their career goal during the postdoc away from "professor with a research emphasis," this change is more common for women and especially women with children.[36] Therefore, while the job market itself limits the number of postdocs who successfully

transition into the professoriate, there appear to be additional concerns for women (see Chapter 1 for a discussion of these factors).

Summary

The postdoc is an important career juncture for retention of women as academic career professionals. It becomes increasingly common for recent Ph.D.s to do at least one postdoc, and the total number of postdocs working in the United States at any given time is also increasing, while the number of tenure-track faculty positions has not increased correspondently. The coincidence of the postdoc years with the years of family formation for many postdocs means that postdocs are taking steps like partnering, having children, and buying houses with little financial or career stability and limited employment benefits. These factors play a significant role in the continuation of postdoc women in this career path.

[1] For example, in 2010 at least 42% of first authors on *Science* publications were postdoctoral scholars. Black, G.C., & Stephan, P.E. 2010. "The Economics of University Science and the Role of Foreign Graduate Students and Postdoctoral Scholars." In C.T. Clotfelder (Ed.). *American Universities in a Global Market.* Chicago: University of Chicago Press. 129.

[2] National Research Council Committee on Science, Engineering, and Public Policy. 2000. *Enhancing the Postdoctoral Experience for Scientists and Engineers: A Guide for Postdoctoral Scholars, Advisers, Institutions, Funding Organizations, and Disciplinary Societies.* Washington: The National Academies Press. http://www.nap.edu/catalog.php?record_id=9831 (accessed December 1, 2012)

[3] In 2006, about 60% of recent Ph.D.s in the life and physical sciences had done at least one postdoc. National Science Board. 2010. *Science and Engineering Indicators 2010.* Arlington VA: National Science Foundation (NSB 10-01). See Chapter 3, Figure 3-46; SOURCE: National Science Foundation, Division of Science Resources Statistics, Survey of Doctorate Recipients, 2006.

[4] National Science Foundation/National Center for Science and Engineering Statistics 2009 NSF-NIH Survey of Graduate Students and Postdoctorates in Science and Engineering, Integrated Science and Engineering Resources Data System (WebCASPAR), http://webcaspar.nsf.gov. (accessed October 25, 2011) Biomedical sciences include biological sciences and medical sciences. Physical sciences include physics, chemistry, astronomy, earth, atmospheric and ocean sciences.

[5] NSF WebCASPAR. In 1993, the relative fractions among the science and engineering postdocs were 70%, 19% and 7%, in the life sciences, physical sciences and engineering, respectively. 1993 NSF-NIH Survey of Graduate Students and Postdoctorates in Science and Engineering. (accessed October 25, 2011)

[6] c.f. The Humanities Indicators from the Humanities Resource Center Online. Indicator III-6 http://www.humanitiesindicators.org/content/hrcoIIIC.aspx#topIII6 (accessed December 1, 2012)

[7] NSF WebCASPAR. 1993 & 2009 NSF-NIH Survey of Graduate Students and Postdoctorates in Science and Engineering. (accessed October 25, 2011)

[8] Davis, G. 2005. "Doctors Without Orders." *American Scientist.* 93(3, supplement). http://postdoc.sigmaxi.org/results/ (accessed December 1, 2012)

[9] Marcus, J. 2007. "Helping Academics Have Families and Tenure Too." *Change.* 39(2):27; Martinez, G., Daniels, K., & Chandra, A. 2012. "Fertility of Men and Women Aged 15–44 Years in the United States: National Survey of Family Growth, 2006–2010." *National Health Statistics Reports.* Number 51. April 12, 2012 http://www.cdc.gov/nchs/data/nhsr/nhsr051.pdf (accessed December 1, 2012)

[10] NSF WebCASPAR. 1993–2009 NSF-NIH Survey of Graduate Students and Postdoctorates in Science and Engineering. (accessed October 25, 2011)

[11] Kang, K. 2012. "Graduate Enrollment in Science and Engineering Grew Substantially in the Past Decade but Slowed in 2010." National Science Foundation/National Center for Science and Engineering Statistics InfoBrief [NSF 12-317] http://www.nsf.gov/statistics/infbrief/nsf12317/ (accessed December 1, 2012)

[12] NSF WebCASPAR. 2009 NSF-NIH Survey of Graduate Students and Postdoctorates in Science and Engineering. (accessed October 25, 2011) Seen also in Sigma Xi postdoctoral survey results from 2005.

[13] National Science Board. 2012. *Science and Engineering Indicators 2012*. Arlington: National Science Foundation (NSB 12-01), Table 5-9

[14] Sigma Xi respondents reported <1% with disabilities. 2005 Sigma Xi Postdoc Survey by all results, all institutions: http://www.sigmaxi.org/postdoc/all/about_you_short.html (accessed December 1, 2012); This also is roughly consistent with the National Science Foundation's data from the Survey of Earned Doctorates (2010) which describes the disability status of doctoral degree holders who indicated their definite postgraduate degree plan was postdoctoral study; About 3% of these individuals planning on postdoctoral study reported they had a disability. See Table 8-4 from National Science Foundation, Women, Minorities, and Persons with Disabilities, July 2012.

[15] Science and Engineering Indicators 2012. Figure 5-20. SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, special tabulations (2011) of 1973–2008 Surveys of Doctorate Recipients.

[16] Davis 2005; Association of American Universities Postdoctoral Education Survey Summary of Results. 2005. http://www.aau.edu/WorkArea/DownloadAsset.aspx?id=1944 (accessed February 7, 2012); Goulden, M., Frasch, K., & Mason, M.A. 2009. *Staying Competitive: Patching America's Leaky Pipeline in the Sciences.* Berkeley: Berkeley Center on Health, Economic & Family Security and the Center for American Progress. http://www.americanprogress.org/issues/2009/11/women_and_sciences.html (accessed December 1, 2012); Bonetta, L. 2010. "The postdoc experience: Taking a long term view." *Science*Careers.org http://sciencecareers.sciencemag.org/career_magazine/previous_issues/articles/2010_08_27/science.opms.r1000093 (accessed December 1, 2012). 61% reported expected tenure track academic position

[17] National Science Board. 2008. *Science and Engineering Indicators 2008.* Arlington: National Science Foundation (NSB 08-01). See Chapter 3, Figure 3-41.

[18] Sigma Xi Postdoc Survey results, all respondents: http://www.sigmaxi.org/postdoc/all/about_you_short.html (accessed December 1, 2012)

[19] Science and Engineering Indicators 2008, Figure 3-36, showed that across all S&E fields the median duration of the postdoc had been steady for twenty years at 23 months; however, in the life and physical sciences it had steadily increased to 46 months and 30 months, respectively, for the 1992-1996 graduating Ph.D. cohort.

[20] Sigma Xi Postdoc Survey results, all respondents: http://www.sigmaxi.org/postdoc/all/your_postdoc_short.html/ (accessed December 1, 2012)

[21] Science and Engineering Indicators 2012.

[22] NIH-NSF Definition of a Postdoctoral Scholar http://grants.nih.gov/training/Reed_Letter.pdf (accessed December 1, 2012)

[23] c.f. NPA Recommended Policies for Institutions. 2011. http://www.nationalpostdoc.org/policy-22/institutional-policies/recommended-practices-for-institutions (accessed December 1, 2012); NRC 2000. *Enhancing the Postdoctoral Experience.*

[24] For example, the University of California system limits the total time as a postdoc at any institution to five years, with a sixth year granted at the University's discretion. University of California UAW Contract Article II. Section B.6.

[25] Science and Engineering Indicators 2012, Table 3-23.

[26] In a recent (December 2011) pilot survey of 175 research institutions, NPA found that almost half of the 73 responding institutions that have a minimum salary use the NRSA 0 years' experience stipend amount. Moreover, a majority of respondents use this minimum for all postdocs at the institution. http://www.nationalpostdoc.org/images/stories/Documents/Other/npa-survey-report-april-2012.pdf (accessed December 1, 2012)

[27] U.S. Census Bureau Current Population Survey. 2009. http://www.census.gov/hhes/www/cpstables/032010/perinc/new03_046.htm (accessed December 1, 2012)

[28] United States Government Accountability Office. 2011. *H-1B Visa Program: Reforms Are Needed to Minimize the Risks and Costs of Current Program* (GAO 11-26). http://www.gao.gov/products/GAO-11-26 (accessed December 1, 2012) This is also suggested by the Sigma Xi Postdoc Survey data, which found that temporary visa holders had a slightly lower mean annual salary of about $38,000 compared to $40,700 for domestic postdocs, although the standard errors on these numbers are large. http://www.sigmaxi.org/postdoc/by_citizenship/benefits_services_short.html (accessed December 1, 2012)

[29] Science and Engineering Indicators 2010.

[30] Goulden et al. 2009. They find that only 23% of AAU universities offer postdocs an entitlement of six weeks paid maternity leave without limitations.

[31] 2011 NPA Institutional Survey Pilot

[32] National Science Foundation. 2011. *Women, Minorities, and Persons with Disabilities in Science & Engineering.* Table 7-2: Science and Engineering doctoral degrees awarded to women, by field: 2000-08. http://www.nsf.gov/statistics/wmpd/ (accessed December 1, 2012)

[33] c.f. National Research Council. 2001. *From Scarcity to Visibility: Gender Differences in the Careers of Doctoral Scientists and Engineers.* Washington: National Academies Press; National Research Council Committee on Science, Engineering, and Public Policy. 2007. *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering.* Washington: The National Academies Press. http://www.nap.edu/catalog.php?record_id=11741 (accessed December 1, 2012); Nelson, D. 2007. "National Analysis of Minorities in Science & Engineering Faculties at Research Universities," http://faculty-staff.ou.edu/N/Donna.J.Nelson-1/diversity/Faculty_Tables_FY07/FinalReport07.html (accessed December 1, 2012)

[34] NRC 2007. *Beyond Bias and Barriers.*

[35] Mason, M.A. & Goulden, M. 2004. "Do Babies Matter (Part II)? Closing the Baby Gap," *Academe.* 90:3; Mason, M.A. & Goulden, M. 2002. "Do Babies Matter?" *Academe.* 88:21; American Council on Education, Office of Women in Higher Education. 2005. *An Agenda for Excellence: Creating Flexibility in Tenure-Track Faculty Careers.* Washington: American Council on Education); National Research Council. 2001. *From Scarcity to Visibility: Gender Differences in the Careers of Doctoral Scientists and Engineers.* Washington: National Academies Press; and Nelson 2007.

[36] Goulden et al. 2009

A Postdoc's Guide to Pregnancy and Maternity Leave

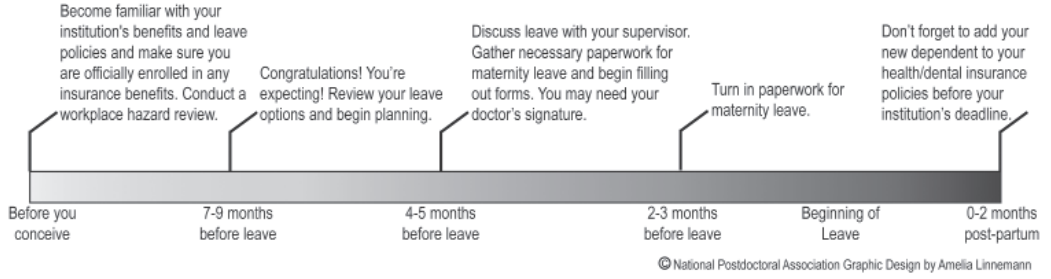
By Kathleen Flint Ehm, National Postdoctoral Association, and Amelia Linnemann, University of Wisconsin–Madison

Developed as part of the National Postdoctoral Association's NPA ADVANCE project

This guide provides general information on pregnancy and maternity leave for postdocs, including tips for keeping your research going and talking with your supervisor. This guide is intended primarily for postdoc women who are pregnant or are planning for pregnancy; expectant postdoc fathers or adopting postdoc parents may want to consult our forthcoming companion guides on paternity and adoption leave.

These are general recommendations only and may not apply to your specific situation; they do not constitute legal advice. Please consult your institution regarding its leave policies and other benefits. For legal advice, please consult a qualified attorney.

Suggested Timeline



The appropriate timeline for your own planning may deviate from this due to variations in institutional practice.

Research Concerns for Your Pregnancy

Day-to-day concerns. First, there are the simple considerations for a pregnant postdoc. For example, morning sickness, fatigue and other physical limitations might interfere with your daily work and could make it harder to maintain long research hours.

Research safety. Concerns may arise if your research presents safety hazards to you or your baby, such as: anesthesia, radiation, chemicals and solvents, extended exposure to extreme loud noises or vibrations, or some physical activities (like scuba diving, strenuous hiking and climbing, or extended periods of standing and typing). Outside of radiation hazards, there are few national regulations for pregnancy safety, so **be your own advocate and do your homework!** Consult with your doctor as soon as possible about the potential risks of your work environment since some hazards may be most acute during the first trimester. Also talk with your institution's safety officials, who may be able to consult with you confidentially before you declare your pregnancy. **You may want to request an evaluation of hazards to women of child-bearing age prior to conception.** If you plan to breast-feed, include a review of any future hazards for breast milk. If modifications to your research regimen are necessary, try to work out some accommodations with your postdoctoral supervisor and safety office. There are a number of resources on occupational safety for pregnant women that can provide more information; visit http://www.nationalpostdoc.org/policy-22/institutional-policies/recommended-practices-for-institutions.

Travel. If you must travel to meetings or remote research sites, keep in mind that typically your doctor will recommend against travel past the seventh month, and many airlines have policies prohibiting air travel after this time. Your doctor may also restrict travel to some countries.

Your Basic Right to Maternity Leave

Family Medical Leave Act. Some employees are covered by the Family Medical Leave Act (FMLA), which provides for up to 12 work weeks of unpaid, job-protected maternity leave. FMLA often has eligibility limitations (such as having been employed for 12 months before it applies), and **many postdocs may not qualify.** *Talk to your institution.*

Title VII. Title VII of the Civil Rights Act of 1964 protects employees against sex discrimination, including pregnancy-related discrimination. Under Title VII, employers must treat pregnancy like any other temporary disability and cannot discriminate on the basis of pregnancy during hiring/firing decisions. **Not all postdocs, however, will qualify as "employees" for the purposes of this law.**

Title IX. Title IX is another provision of this law that protects against sex discrimination at institutions that receive federal funding. It explicitly protects against pregnancy discrimination for *students and employees,*[1] requiring that pregnancy be treated as any other disability and, in the case where no maternity leave program is available, provides for unpaid, job-protected leave for a "reasonable" period of time. **Under Title IX all postdocs, regardless of institutional employment**

classification, should be entitled to job-protected, unpaid maternity leave.

Some states also have parental leave policies which can complement these laws, such as California's Paid Family Leave program (see: http://www.paidfamilyleave.org/).

For more information on laws pertaining to pregnancy and maternity leave, consult the resources at http://www.nationalpostdoc.org/publications-5/family-friendly.

Maternity Leave and Federal Funding Guidelines

Paid maternity leave. Postdocs supported on investigator grants from agencies such as the Department of Energy (DOE), the National Institutes of Health (NIH), and the National Science Foundation (NSF) can receive paid maternity leave via fringe or indirect costs. The institution and its leave policies for comparable employees typically determine how this benefit is offered. Postdocs supported on individual fellowships, such as NIH's National Research Service Award (NRSA) program and NASA's postdoctoral program, sometimes will have fellowship-specific maternity leave guidelines, while others, like most NSF postdoctoral fellowships, may encourage fellows to follow their institution's typical practice.

Grant extensions. Most federal agencies will allow at least one no-cost extension of the grant budget period for reasonable cause, such as absence by key research personnel for maternity or care giving. Individual fellowships often have specific policies on funding extensions and leaves of absence.

Supplemental technical assistance. DOE, NIH, and NSF typically allow grant supplements and re-budgeting to provide technical support to keep a project going while key personnel are on maternity leave. NIH's National Institute of Allergy and Infectious Diseases (NIAID) has an explicit program for this (see: http://www.niaid.nih.gov/researchfunding/traincareer/pages/pctas.aspx).

For more information, NIH and NSF offer specific guidance on these topics:

- NIH Family-Friendly Initiatives: http://grants.nih.gov/grants/family_friendly.htm
- NSF Career-Life Balance Initiative: http://www.nsf.gov/career-life-balance/
- NSF's FAQ Related to Dependent Care: http://www.nsf.gov/pubs/2010/nsf10032/nsf10032.jsp

Consult your funding documentation or talk to your program officer for more detailed guidance.

Maternity Leave and Salary

Research your options. Your options for being paid during maternity leave will vary based on your institution's usual practice, your source of funding, and your appointment classification. You'll have to do some research for your particular situation; below are some common options for leave you

may have available. For any of these options, find out if you must cover your own health insurance premiums during leave. *Talk to your postdoctoral or human resources representative for more information.*

- ***Sick and/or vacation leave.*** Find out how much you will have accrued by your due date, keeping in mind that you may use some up in the interim.
- ***Short-term disability leave.*** If you are eligible for short-term disability (STD) insurance, pregnancy can usually be treated as a disability. Typically, STD will pay you a fraction of your salary for a certain period of time (often six weeks following a vaginal birth and longer with a doctor's approval) and may require a waiting period before it starts. It may be possible to supplement your STD benefit with other paid leave options. *Be sure you are officially enrolled for STD insurance before you become pregnant, otherwise you may not qualify for benefits or receive reduced benefits.*
- ***Institutional paid maternity leave benefit.*** Some institutions may have an explicit program or leave benefit allowing a certain period of paid maternity leave independent of standard leave accruals or disability benefits.
- ***Specific leave provisions dictated by your funding source.*** Some grants and fellowships may have their own guidelines for maternity or family leave. Consult your paperwork.
- ***Unpaid, job-protected leave, guaranteed by FMLA and/or Title IX.***

Make a maternity-leave salary plan. Do you want to maximize your salary during leave by supplementing disability benefits with sick leave? Do you want to maximize the duration of your leave by taking a fraction of your salary over a longer period with a combination of disability and sick days? Could you also extend this period by you, your partner or both of you working part-time? Decide what you want to do, then make sure you have all the paperwork and instructions in hand. Also, consider having a contingency plan in the case of complications. For example, if you go on bed rest three weeks before the birth, this may shave three weeks off the paid time you spend with your baby after the birth.

Parental/spousal leave. Find out if your spouse/partner has a parental leave policy and if there are any limitations. For example, if you both work at the same institution, there may be a cap to the total, combined time you can each take for extended family or child care leave. If you and your spouse or partner work at the same institution and you take 8 weeks of unpaid leave under FMLA, your spouse/partner may only take up to four weeks of FMLA leave, for a combined total of 12 work weeks between the two of you.

Make a Maternity Research Plan

Try to make a general plan for how your research will continue through your pregnancy and maternity leave and write it down. Such a plan can help keep your research on track and address concerns your supervisor or collaborators might have. Some general considerations for that plan are:

How much can you get done before your delivery? Try to identify some milestones you can reasonably reach before you go on leave, especially ones that require you to physically be at work. Allow yourself some flexibility here.

Is there anyone who can continue some of your work while you are on leave?

- Collaborators or members of your lab or group might be able to continue some aspects of your project during your leave, so talk to them in advance.
- A specially hired technician might also be able to continue some of your research. Funds for this temporary hire could be available through grants, grant supplements or even from your institution, which might offer transitional support to faculty for career interruptions. Find out if your maternity leave might qualify for such institutional support for your supervisor's project where you are the primary supported researcher.
- In all cases, be sure to discuss *in advance* how credit for this work will be assigned (e.g. acknowledgement or authorship?) and what will happen upon your return (e.g. who now leads the project? who will continue to work on it?). Consider having these understandings in writing.

Are you willing to do any work from home? Being on leave means you **are entitled** to spend all your time recovering and caring for your newborn, instead of working. When considering how much you might *want* to do during leave, be mindful of committing yourself to doing work before you know how feasible it might be. Some tasks you might consider are: paper writing; grant writing; literature review; and conference calls.

Make a backup plan for pregnancy complications. Despite your best-laid plans, complications can arise. Try to think through some of these in advance. For example: you are put on bed rest before the delivery; the baby comes much earlier than expected; or you need a longer recovery time after the delivery.

Make a Plan for Returning to Work

Gradual return to work. You might be able to extend your formal leave by returning to work from home, or working part time and gradually working up to a full workday. This type of flexibility may be useful as you balance work with your new responsibilities at home and could help you maintain productivity when you are sleep-deprived. Find out if your institution has any type of part-time or flexible time arrangement available to postdocs. If not, talk with your supervisor about your plans and options.

Breastfeeding. There is significant federal and state support for a woman's right to express breast milk at work.[2] Although recent 2010 changes to the Fair Labor Standards Act typically do not apply to postdocs, some state laws will. If you will be breastfeeding, find out about available facilities for pumping at work. Does your institution have lactation rooms? Do you have access to other closed-door space for pumping? Is there a refrigerator available for milk storage? A microwave for sterilization of pump accessories? Also, identifying a support group for working and breastfeeding moms may be helpful.

Childcare. Find out about childcare options at your institution (and whether they are available to you as a postdoc). Some institutions offer subsidies, flexible spending accounts, or other financial assistance for childcare costs. They may also have special programs, such as on-call childcare for emergencies and sick children or networks for parents. Identifying a back-up caregiver such as a relative or friend might be useful if your workday or deadlines are inflexible or you occasionally require after-hours care for your child.

Travel. Make a plan for when it is feasible to resume work-related travel. Can your child travel with you, and are there funds to support bringing a caregiver along? Breastfeeding mothers should also consider how pumping will fit in with your remote work plans.

Tips on Talking with your Postdoctoral Supervisor

First, consider your supervisor's perspective. Regardless of how generally supportive a supervisor may be of your new life change, he or she is likely to experience some concern over the potential research delays that could be caused by your pregnancy and maternity leave. Although granting periods can be extended, lack of research progress can jeopardize grant renewals or new funding requests. Your collective goal will be to limit these risks for all involved.

Know your basic rights. Keep in mind that pregnancy discrimination is illegal. Your pregnancy should be treated as any other temporary disability, and you should be able to take, at the minimum, job-protected, unpaid maternity leave. The details of how your pregnancy might be accommodated or how to take leave will depend on your funding source and your institution's policies and "typical" practices.

Choose a time to talk. Deciding when to tell your supervisor about your pregnancy is a personal decision that depends upon your specific circumstances and the impact your pregnancy and maternity leave might have on your work. For example, many expectant parents wait until after the first trimester, when the risk of miscarriage decreases significantly. In some cases, first trimester safety or health concerns (like workplace hazards or extreme "morning" sickness) may warrant an earlier declaration. Ideally, you would like the timing of your declaration to allow sufficient time for any advance preparations needed for your maternity leave or other work accommodations. Once you

choose a time to talk to your supervisor, try to schedule a private, in-person meeting (i.e., where you can close the door) that is unlikely to be interrupted.

Share your written maternity research plan. Showing that you have thought through the various research implications of your pregnancy and leave may help assuage some concerns. Your supervisor may also have helpful suggestions. After you discuss your plan, draft a final version that incorporates the outcomes and expectations from your discussion and then give each of you a copy. You might also consider having each of you sign it to confirm your mutual understanding.

When problems arise. If you are concerned that you might have difficulty coming to an understanding with your supervisor, look around for other allies who might be able to assist you. Many institutions offer advice on conflict resolution through the graduate or postdoctoral affairs office, human resources, or ombudsman.

Where to Find More Information at Your Institution

For more information on developing a maternity research plan and talking to your supervisor, visit the NPA Web site and read the article "Advice for Postdocs from a PI: A 7-Step Plan for Family Leave" by Dwayne W. Godwin, Ph.D., Interim Dean, Graduate School of Arts and Sciences, Wake Forest University.

When looking for information at your institution, keep in mind that there may be no one definitive source for answers. Below are some suggestions for places that may be helpful.

- Office of postdoctoral affairs or other office that has oversight responsibility for postdocs.
- Office of human resources
- Employee assistance program
- Ombudsman
- Department chair
- Your postdoctoral supervisor or PI
- Postdoc handbook
- Women's resource center
- Title IX officer
- Environmental and health safety office
- Postdoc union representative

Visit the NPA ADVANCE Web site, http://www.nationalpostdoc.org/advance for additional resources and articles.

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[1] For legal purposes, postdocs can be classified as students for some actions and employees for others; this is independent of a postdoc's institutional title or employment classification. Since Title IX covers both students and employees, it should apply to postdocs, although this has yet to be tested in court. For a discussion, see Goulden, G., Frasch, K., & Mason, M.A. 2009. *Staying Competitive: Patching America's Leaky Pipeline in the Sciences.* Berkeley: Berkeley Center on Health, Economic & Family Security and the Center for American Progress. http://www.americanprogress.org/issues/2009/11/women_and_sciences.html (accessed December 1, 2012) For additional information on postdoc legal classification, see the AAU/AAAS handbook: "Navigating a Complex Landscape to Foster Greater Faculty and Student Diversity in Higher Education." http://php.aaas.org/programs/centers/capacity/publications/complexlandscape/PDFs/LawDiversityBook.pdf (accessed December 1, 2012)

[2] For more information, visit the National Conference of State Legislatures' summary of state breastfeeding laws and recent federal changes: http://www.ncsl.org/default.aspx?tabid=14389 (accessed December 1, 2012)

Adaptable Models for Fostering the Advancement of Postdoc Women

Chapter 2: Postdoctoral Benefits and Policies

Chapter 3: The Role of Mentoring in Postdoc Women's Career Advancement

University of Michigan Medical School†, *AAMC Postdoc Compact adapted as pledge signed by postdocs and supervisors upon start of each appointment,* 51

University of Southern California†, *Awards recognizing outstanding mentors,* 51

University of Wisconsin at Madison†, *Research Mentor Training Web site with discipline-specific curricular resources,* 54

Vanderbilt University School of Medicine†, *IDP institutionalized as part of the postdoc reappointment process,* 55

Vassar College*, *Senior chemistry faculty participated in horizontal mentoring program,* 53

Woods Hole Oceanographic Institute†, *Department-based postdoc mentoring committees,* 52

Chapter 4: Professional and Career Development for Postdoc Women

Association for Women in Science, *Portable workshops on how to achieve work-life satisfaction,* 66

Federation of American Societies for Experimental Biology (FASEB)†, *IDP template for postdocs,* 65

Gallaudet University*, *FORWARD to Professorship workshops demystifies the process of obtaining and succeeding in a tenure-track position,* 66

George Washington University*, *FORWARD to Professorship workshops demystifies the process of obtaining and succeeding in a tenure-track position,* 66

Medical College of Wisconsin†, *Virtual Career Center offers career services to postdocs,* 66

Rice University* †, *Future Faculty Workshop on becoming faculty for underrepresented postdocs and graduate students,* 66

Stanford University†, *Seminars for academics on how to network,* 65

University of Chicago†, *Career Advising and Planning Services also serves students and postdocs,* 66

University of Michigan, *Emerging Scholars Interdisciplinary Network connects early-career researchers nationwide,* 65

University of Oregon*, *Portable workshops on topics like negotiation,* 66

University of Pittsburgh†, *Career Development and Progress Assessment Tool combines career planning with performance assessment,* 65

University of Texas Health Science Center at Houston†, *Postdoctoral Certificate Training Program offering professional development courses for postdocs*, 64

University of Wisconsin at Madison†, *Competency-based IDPs for postdoctoral fellows,* 64

* Supported by the NSF-ADVANCE program.
† NPA Sustaining Member at time of publication.

For more information on efforts and models used by other organizations, be sure to visit the online clearinghouse at www.nationalpostdoc.org/ADVANCE. Also, please contact the NPA with examples of efforts to foster the advancement of postdoc women not included here or in the online clearinghouse.

About the Authors

Kathleen Flint Ehm, Ph.D., is Project Manager at the National Postdoctoral Association (NPA), where she manages the NPA's grant funded initiatives. She serves as project manager for NPA ADVANCE, the NPA's National Science Foundation-funded ADVANCE program to foster the transition of women postdocs into faculty positions.

Dr. Flint Ehm came to the NPA from Stony Brook University where she taught astronomy as an adjunct in the Department of Physics and Astronomy and served as Assistant Director of the Reinvention Center, a national center focused on enhancing undergraduate education at research universities. In 2004, she spent a year in residence at the National Science Foundation (NSF) where she was a Science and Technology Policy Fellow sponsored by the American Association for the Advancement of Science. There she specialized in issues concerning early-career scientists and helped manage one of NSF's newest postdoctoral fellowship programs. Previous to that, Dr. Flint Ehm was a Postdoctoral Fellow at Gemini Observatory North and a Carnegie Fellow at the Carnegie Institution of Washington's Department of Terrestrial Magnetism. Her research interests focused on understanding the lowest mass galaxies in the nearby Universe. During her graduate studies at University of California, Santa Cruz, she was also very active in graduate student issues and spearheaded the establishment of a new graduate student center, the Graduate Student Commons, which opened in 2001. She has a Ph.D. and M.S. in Astronomy and Astrophysics from the University of California, Santa Cruz and a B.S. in Math and Astronomy from the University of Arizona.

Cathee Johnson Phillips, M.A., serves as the Executive Director of the National Postdoctoral Association (NPA), headquartered in Washington, D.C. She manages operations of the 501(c)3 nonprofit association, which works to develop and promote national policies and programming that benefit the postdoctoral community and thereby the entire U.S. research community. She facilitates the adoption of NPA's recommended policies for postdoctoral scholars at research institutions across the country as well as at federal agencies, including the National Institutes of Health (NIH), the National Science Foundation (NSF), and the White House Office of Science

and Technology Policy (OSTP). Among her duties, she serves as the principal investigator for the NPA ADVANCE project, "From Postdoc to Faculty: Transition Issues for Women Scientists," funded by the NSF ADVANCE program.

Ms. Johnson Phillips regularly facilitates sessions or presents at universities and conferences across the country regarding the postdoc situation, including gender and diversity issues, the NPA itself, the NPA Core Competencies, and other topics. She holds an M.A. in Leadership from Bellevue University and a B.A. from Morningside College. Her background is in higher education and non-profit organizational management, including but not limited to strategic planning, grant development, and project management.

From Ph.D. to Professoriate

The Role of the Institution in Fostering the Advancement of Postdoc Women

Kathleen Flint Ehm, Ph.D.
Cathee Johnson Phillips, M.A.

The typical academic career path from graduate school to postdoctoral scholar to tenure-track faculty tends to lose both men and women along the way, but these losses are most significant for women. The point at which the greatest losses occur is between receipt of the Ph.D. and the first tenure-track position.

From 2009 through 2012, the National Postdoctoral Association (NPA) conducted a review of the challenges facing postdoc women and the collected practices that have shown promise for assisting these women in overcoming these challenges. This resource book provides an overview of this meta-analysis and an introduction to these recommended practices.

Who will find this resource useful?

- Offices of postdoctoral affairs;
- Graduate schools that include postdocs in their purview;
- Career centers that serve postdocs;
- Training offices or programs that offer programming for postdocs;
- NSF-funded ADVANCE programs that include postdocs in their activities;
- Offices of international services;
- Postdoctoral associations;
- Researchers who supervise and mentor postdocs;
- Institutional leaders seeking an overview of the key gender issues for postdocs;
- Federal funding agencies;
- Professional societies; and
- Individual postdocs.

About the NPA

The mission of the NPA, a 501(c)3 non-profit educational organization, is to improve the postdoctoral experience by supporting enhanced research training and a culture of enhanced professional growth to benefit scholarship and innovation. For more information on the NPA, visit www.nationalpostdoc.org.

About NPA ADVANCE

This resource is a product of the NPA ADVANCE project, a three-year project of the National Postdoctoral Association to foster the transition of women postdoctoral scholars (postdocs) into the professoriate. The project has been supported by the National Science Foundation (NSF) ADVANCE program, under Grant No. 0819994. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the NSF.

As a companion to this book, an expanded compendium is available as an online clearinghouse at www.nationalpostdoc.org/advance.

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