

# BREAKING IN

**WOMEN'S ACCOUNTS OF HOW CHOICES  
SHAPE STEM CAREERS**

Ann Wolverton, Lisa Nagaoka, and  
Mimi Wolverton

Foreword by *Donna J. Dean*



STERLING, VIRGINIA



COPYRIGHT © 2015 BY STYLUS PUBLISHING, LLC.

Published by Stylus Publishing, LLC  
22883 Quicksilver Drive  
Sterling, Virginia 20166-2102

All rights reserved. No part of this book may be reprinted or reproduced in any form or by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying, recording, and information storage and retrieval, without permission in writing from the publisher.

**Library of Congress Cataloging-in-Publication Data**

The CIP data for this book has been applied for.

13-digit ISBN: 978-1-57922-428-8 (cloth)  
13-digit ISBN: 978-1-57922-429-5 (paper)  
13-digit ISBN: 978-1-62036-245-7 ((library networkable e-edition)  
13-digit ISBN: 978-1-62036-246-4 (consumer e-edition)

Printed in the United States of America

All first editions printed on acid-free paper  
that meets the American National Standards Institute  
Z39-48 Standard.

**Bulk Purchases**

Quantity discounts are available for use in workshops and for  
staff development.  
Call 1-800-232-0223

First Edition, 2015

10 9 8 7 6 5 4 3 2 1

*To the eight women who graciously shared their stories of careers, challenges, and choices, and to the countless others whose untold stories echo those featured in this book*



# Contents

FOREWORD	ix
<i>Donna J. Dean</i>	
PREFACE	xi
ACKNOWLEDGMENTS	xiii
1 THE REALITIES OF <i>BREAKING IN</i>	1
2 FASCINATION, FUN, AND FLEXIBILITY	13
<i>Cynthia Barnhart</i>	
3 A CURIOUS MIND	31
<i>Linda S. Birnbaum</i>	
4 THE CONSUMMATE PROFESSOR	45
<i>Susan Blessing</i>	
5 ACADEMIA, A GOOD FIT	65
<i>Teresa D. Golden</i>	
6 A LIFE FULL OF SERENDIPITOUS OPTIONS	83
<i>Sharon Hays</i>	
7 ENJOYING A LIFE THAT FITS	101
<i>Angela Hessler</i>	

*Contents*

<b>8</b>	<b>AN ARDENT ADVENTURER</b> <i>Bonnie F. Jacobs</i>	<b>119</b>
<b>9</b>	<b>JUST HAPPENED TO BE IN THE RIGHT PLACE AT THE RIGHT TIME, AND INCREDIBLY BRIGHT</b> <i>Radia Perlman</i>	<b>135</b>
<b>10</b>	<b>THE REALITIES OF CHOICE</b>	<b>153</b>
<b>11</b>	<b>IS THE PAST THE PRESENT?</b>	<b>161</b>
<b>12</b>	<b>HIDDEN CHOICES</b>	<b>167</b>
<b>13</b>	<b>CHOICES: IS THE PAST THE FUTURE?</b>	<b>179</b>
	<b>APPENDIX: WEB-BASED STEM-RELATED RESOURCES FOR GIRLS AND WOMEN</b>	<b>201</b>
	<b>INDEX</b>	<b>223</b>

## twelve

### HIDDEN CHOICES

CONSCIOUS BIAS PURPOSEFULLY demeans the individual who is targeted. It's disrespectful. It's nasty. And we usually know it when we see it. In October 2013, when a post-doctoral biologist at Oklahoma State University, Danielle Lee, declined a request to donate her time and expertise as a contributor to Biology-Online, a forum affiliated with *Scientific American*, the editor's question in response—"Are you an urban scientist or an urban whore?"—clearly exemplifies conscious bias. The journal fired the blog editor in response to public outcry. When it removed the ensuing blog posts that discussed the incident in an attempt to sweep it under the proverbial rug, the journal reinforced the bias by belittling its importance to the blog's readers. *Scientific American's* actions reflected a much more subtle form of bias—unintentional and unconscious.

Unconscious bias refers to implicit preferences informed by our socialization, experiences, and exposure to others' opinions about a particular group. Teresa Golden noted that men often prefer to work and talk with other men. Such actions constitute unconscious bias that reduces women's access to information essential to their careers, not because men are consciously keeping information from women, but because they leave women out of the networking that organically occurs among male colleagues. The men in this example may be entirely unaware of these behaviors, which seem natural and normal to them. And women may harbor only vague notions of how such preferential

inclinations shape their choices. More often than not, these hidden choices bubble unconsciously to the surface.

Unlike conscious bias, which results in the prejudicial treatment of or beliefs about individuals or groups of individuals based on faulty perceptions and a refusal to revise our opinions, hidden choices are made instinctively. The impact unconscious biases have on the choices we make, however, can be just as influential.

Unconscious biases permeate society at three fundamental levels—individual, institutional, and societal. Each of the women we interviewed experienced bias at one or more of these levels. However, because of the very nature of unconscious bias, its impact on women’s career choices often goes unacknowledged and undiscussed.

Individual or person-specific bias refers to attitudes and actions we engage in as individuals that are based on “unintentional categorization-related judgment errors” (Krieger, 1995). Because information collection is often a costly endeavor, we sometimes rely on heuristics or already established relationships (as in the previous example, men tend to interact with other men) based on prior experience to lower these costs.

If a manager interviews several job candidates for a highly technical position and needs to quickly assess which candidates are most qualified, he or she might base the assessment on the attributes of those who have been successful in a similar position or on their personal past experiences. Radia Perlman mentions a hiring manager who asks during interviews about childhood hobbies and suggests that if he doesn’t hear that you built computers out of spare parts when you were twelve that you are not a real engineer. If very few women have occupied a particular position or if those who apply have never been interested in building machines, the manager tends to confuse skill or similarity in experience with gender and hires the male job candidate, even when the candidates have similar qualifications (see, e.g., Moss-Racusina, Dovidio, Brescoll, Graham, & Handelsman, 2012; Steinpreis, Anders, & Ritzke, 1999). (Moss-Racusina et al. found that faculty ranked male applicants with identical characteristics and qualifications to their female counterparts as substantially more qualified, offered them higher starting salaries, and gave them more career mentoring opportunities. Interestingly, the gender of the faculty member evaluating the candidates made no difference in the magnitude of the bias.) Because prior experience does not include relevant examples, the heuristic used

by the manager results in choices that reinforce stereotypes: we predominantly hire men for these technical positions; therefore, they must be better at them.

Barnhart, Blessing, Golden, and Jacobs all mention job search issues in their academic units that suggest gender-based selection bias. For instance, Susan Blessing recalls,

We interviewed a woman in high-energy physics several years ago. We didn't offer her the job because two members of the group claimed they couldn't work with her. One of the two was a young guy, and I really regret not saying, "Well, then I guess you'll have to leave."

Early in Linda Birnbaum's career, she encountered a similar situation.

When I first enrolled at the University of Illinois, I wanted to work in a specific lab, but I was quickly informed that the lab's director didn't like women in his lab because if they weren't married, they might get married, and if they were married, they might have children.

Here, stereotypical assumptions were clearly voiced by the lab director.

Angela Hessler notes unconscious bias at play in how women are recognized for their achievements.

I do see instances where women have to work harder to get noticed professionally. . . . Women get overlooked for technical awards or consultation, in hiring, or just presenting a good idea. It's hard to put a finger on because it's not a fixed glass ceiling but more about subtle dismissiveness.

The Association for Women in Science (2012a) describes this as a more general phenomenon: "Women receive fewer scholarly awards than would be expected based on the proportion of female PhDs and full professors in [STEM] fields."

Even in relating her college experiences, which she categorized as good, Hessler recounts unconscious bias on the part of a professor who described one of her papers as "cute." Ironically, his reaction irritated her but at the time passed by her as normal and perhaps expected behavior. In contrast, one of the women we interviewed who

withdrew from the book clearly recognized similar biased behavior on the part of her adviser when she spoke about his ignoring an idea she suggested but later giving credit to a male colleague for essentially the same idea.

Institutional bias surfaces when policies and procedures at academic institutions and in the workplace sustain practices that put women at a disadvantage. Institutional biases can affect men as well, but in many instances these practices disproportionately affect women. Even policies designed to alleviate bias and rectify a prejudicial situation can have unexpected consequences. The same holds true for ingrained the-way-we've-always-done-it procedures. Linda Birnbaum observes, "The woman still has to be better than the man, at least at the higher levels. But the glass ceiling now has holes in it. We have broken through; nonetheless, the career advancement system in place continues to hamper our progress."

Universities seem particularly susceptible to institutional bias, perhaps because policies tend to be arbitrary rather than universally practiced, and although procedures bear a resemblance to those of other universities, they are quite often institution specific. Two of the more common university policies (parental leave and the tenure clock) and two policy-procedure permutations (the manner in which we define faculty and spousal accommodation) illustrate the impact of institutional bias on women as they strive to establish their careers.

Birnbaum contends that many women delay having children until they've finished their education and started their careers. This delay poses a dilemma. It superimposes some of the most time-consuming years of child rearing into the period in their careers when they should be intensely engaged in the research and publishing demanded by tenure requirements.

In the past two decades, numerous universities, businesses, and government agencies have instituted maternal leave policies intended to provide time for new mothers to nurture their newborns and recuperate any lost strength incurred during birth or in the first few months of a baby's life without jeopardizing their careers. But as Hessler mentions, not every university provides such accommodations. Friends of hers who had babies before gaining tenure often went back to the classroom (and their research agendas) the same semester. Even when universities

offer leave benefits, they can have unintended consequences. As Jacobs notes, there is a need for an environment that “makes life more tolerable for people who want to choose both family and work.” She continues, “Institutional policies and culture often work against creating [such an] environment.”

Maternity leave policies, because of protests about the preferential treatment of women, have morphed into parental leave policies similar to the one in place at the Massachusetts Institute of Technology, which applies to a newborn or adopted child’s primary caregiver (male or female). It releases the caregiver for one semester from teaching and service obligations. The intent is good. But rather than leveling the playing field for new mothers, the outcome digs the furrows to career advancement deeper because the majority of faculty taking advantage of the policy (at least initially) are men, some of whom are not primary caregivers. When women take the leave, they care for the baby. When men take it, they often use the time to further their research agendas, which gives them a competitive advantage that exacerbates existing inequities between men and women on faculty. As Cynthia Barnhart commented, “Now we have to figure out how to change the policy or the way in which it is implemented.”

Lengthening the tenure clock, another well-intended policy designed to help parents (in particular, mothers of young children), also has an unanticipated and subsequently unaddressed consequence—the potential loss of credibility concerning field-specific research because productivity and publishing slows among university members who do not necessarily take child rearing into account when they make decisions about whether to grant tenure. Birnbaum, Blessing, and Jacobs all note this possibility. Seeking to reduce the number of hours worked by going part-time or stopping the tenure clock completely during child-rearing years often brings about similar unforeseen results. In an effort to ease their workload, Birnbaum suggests that new mothers she employs work part-time. But she notes, “Many of them are afraid to go part-time because they believe doing so will hurt them [careerwise].”

Along these same lines, the manner in which we define tenure worthiness can also bode poorly for women. It’s what Birnbaum’s young mothers fear. Barnhart states bluntly, “We cling to the notion that if you are not full-time, you’re not a real faculty member. . . . You

aren't serious about your career." And even if a faculty member works full-time on contract or as an adjunct, her (or his) value as a department member and credibility as a researcher (with or without an active research agenda) diminishes. If you are a newborn's primary caregiver and you've slowed or stopped the tenure clock, you might have reason to worry.

The way we define the appropriateness of work further complicates the issue. Higher education institutions apportion expected faculty responsibilities in concert with their missions. The mission of a research university is threefold—research, teaching, and service—with the least emphasis placed on service, particularly in tenure-granting decisions. Yet, women seem drawn toward service, whether by virtue of a natural affinity for it or an externally driven expectation. Barnhart is quite frank about why she's an administrator: "When I'm given a task, I follow through, and I'm willing to be a good citizen."

Bonnie Jacobs and Teresa Golden took on the very time-consuming job of developing a new program. Golden, in particular, is quite open about the price she paid. Setting up the forensic program is "one reason it took me so long to get promoted to full rank." She explains, "Program development hurt my annual evaluations. Although I'd started a nationally recognized forensic program . . . my external evaluations also suffered. . . . I couldn't publish or bring in [grant] monies at the expected rate." She concludes, "Quite honestly, sometimes I wonder why I did it." The real crux of the matter reveals itself when she justifies her continued involvement: "No one else wants to do it because it won't help with getting promoted."

Finally, spousal accommodation, or what is more commonly referred to in the vernacular as the *trailing spouse handicap*, illustrates how institutional bias toward business-as-usual policies and procedures can hamstring careers. As previously mentioned, female scientists interested in academic positions often marry fellow scientists, but as Blessing observes, because there are so few women in STEM disciplines, "the dual-career issue is more problematic for women." Jacobs and Hessler married fellow geoscientists they met when enrolled in the same PhD programs. Spouses in the same discipline understand its demands, which in their case involved extensive fieldwork requirements.

Several of the women we interviewed point out the difficulties faced by dual-career academics who have overlapping expertise. Usually only

one position exists for a given specialization in an academic department, which can mean that a couple may have to live apart so they can both pursue tenure-track positions in academia, one person takes a non-tenure-track or part-time position, or one person does not go into academia at all. Hessler and Jacobs understood the need to establish themselves as researchers in their own right, choosing to do little, if any, collaborative work with their spouses. Even so, the career of the woman in the couple often takes a backseat.

Jacobs, perhaps, presents the most illustrative example of the detrimental impact a reliance on ignore-it-and-it-will-go-away procedures and nonexistent policies can have on academic careers. She spent seventeen years in a part-time position and was not offered a full-time position until the department discovered that her husband was serious about leaving so that she too could find a full-time tenure-track position.

While her discipline is different from her husband's, Birnbaum faced similar struggles balancing two careers. After graduate school, her husband was employed at Hamilton College in upstate New York. She states, "The Hamilton faculty could not accept the idea that a Hamilton wife—me—could also be a Hamilton faculty member. They wouldn't even consider me for a regular faculty appointment. So after that first year, I was on the job market again."

The dual-career challenge is not unique to academia for highly specialized individuals. Hessler admits that although Chevron had no qualms about hiring her and her husband, even though their areas of expertise overlap, eventually either her career or that of her husband will advance at the expense of the other because "it will be difficult for both of us to land international assignments, which can be big career boosters."

Although person-specific and institutional biases explain a great deal about why the number of women in STEM disciplines remains small, societal bias often underlies both of these biases. The Association for Women in Science (2012b) mentions four reasons women drop out of the STEM fields, which echo what we heard from the women we interviewed. Two are person specific, and the others surface at the institution level: "stereotypes of women as scientists; an 'old boys' club' culture in science and engineering departments . . . ; unequal promotion, salaries, grants and benefits packages for women; [and] under-recognition of women for research and scholarship" (p. 1).

Societal bias has to do with ingrained beliefs and assumptions about preferences and abilities (those based on gender in this instance) that govern a society's norms and help shape its culture. They are systemic in nature and as such can have a powerful influence on behavior. For instance, Thoman, White, Yamawaki, and Koishi (2008) found that undergraduate women performed worse on a standardized mathematics exam when informed before the exam that men score better because they have more natural ability. When they were told nothing or that men score better because they work harder, the women in the study fared better. This study points out that simply conveying a commonly held stereotype can significantly affect performance.

We contend that social norms affect the interaction of the women we interviewed with male counterparts and their views about what they can accomplish. Sheryl Sandberg (2013) suggests that these tendencies are the product of ingrained cultural norms, which presuppose particular gender-based roles and abilities. She advises women to “lean out,” to not limit options by deciding before trying that they are not capable.

Jacobs notes that when she was hired as the director of the environmental science program, she was told she was getting a course release for taking on the extra burden. “I found out later that my teaching load was identical to everyone else's in the department. . . . I thought, ‘This is just another one of those things women do. We don't negotiate.’” Blessing describes dressing a certain way to fit in with the men at Fermilab. “I definitely did not want to look like a secretary. I dressed less femininely—the jeans and shirts.”

Bias also affects confidence. Golden and Hessler mention that women were pretty quiet in graduate school classes for fear of being seen as stupid or less competent. Sharon Hays recalls confiding her trepidation in taking a high-level government position to a female colleague and her colleague's response.

She looked at me and said, “Do you think [a male colleague of ours who was in a very similar role to the one I'd be taking on] worried about whether he was ready for it? He just went for it. You are absolutely prepared. . . . Why do we agonize over this stuff? Guys don't, or if they do, they hide it well.” This ingrained lack of confidence and

## *Hidden Choices*

fear of failure (which I still sometimes have) . . . contributes to my reticence when it comes to risk taking.

Radia Perlman recalls feeling panicked and intimidated when she entered her first computer programming class, wondering if she was cut out for it. Bonnie Jacobs expresses similar feelings.

Blessing also observes that the culture of science may not match up well with the ways women tend to communicate.

As physicists, we're expected to work independently, without a significant amount of direction, and at the same time function within a group. We're expected to compete on the one hand and cooperate on the other. People attack you, and you must be able to stand there, defend your work, and not collapse. Guys tend to be much more challenging, and their communication style differs. It's not so much meanness as it is about socialization into the culture of being in science. It's an odd combination that school does not prepare us for.

Unlike personal or institutional biases, which remain somewhat localized and concentrated around an individual or unit, the systemic nature of societal bias pushes it into everyday living and infiltrates our broader and generally accepted knowledge base. "We have failed miserably in marketing," contends Cynthia Barnhart. "When I talk with my daughters' friends about engineering, most of them don't know what it is."

Hays and Blessing provide striking examples suggesting not only that information is missing but that what's out there is misconstrued and inaccurate. Hays observes, "Think about what's on television. How many programs are there about doctors and lawyers? Many, and the professions are glamorized. They make these professions exciting. You rarely see glamorized depictions of research scientists."

Blessing adds,

We, as a society, also send messages about "proper" women's roles. [My graduate assistant] mentioned a study about the depiction of women in TV shows. The study concluded that women today are represented by behavioral models that harken to the 1950s and 1960s—Harriet Nelson [on *The Adventures of Ozzie and Harriet*] and Jane Wyatt's Margaret Anderson on *Father Knows Best*. In contrast, TV shows in the 1970s and early 1980s portrayed women in traditional

male roles, strong and more independent—*Cagney and Lacy*, *Laverne and Shirley*. Today? Take *The Big Bang Theory*. We've attracted more male physics majors since its first airing but not women. I think it's because girls and young women look at these nerdy guys and think, "I'm not like that." . . . And, of course, the neighbor is this beautiful blonde woman who is a waitress/actress. One female character, a neurobiologist, is so nerdy, she's not "normal."

Women have made gains. The workplace has changed. Ironically, however, most of the gains women have made appear to have occurred at the personal level, which in turn should bring about change at the professional level. Women have much more freedom in who they choose as partners (individuals often in the same or a related discipline). Doing so likely provides some familiarity with, and thus understanding of, the rigors of being a researcher. But it also might mean women are selecting men who will treat them as partners and equals.

Ideally, these same ideals should translate into a professional setting. However, what works in a personal relationship is not as easy to implement in a professional one. Equitable treatment is much harder to negotiate with colleagues than with a significant other. Even though a department is a unit, it is in reality a collection of individuals rather than a partnership. Each individual has his or her own goals and perspectives on what the workplace environment should entail.

Institutional policies, such as family leave and spousal accommodation, attempt to mitigate some of the issues women face by providing a forum for dialogue, specifically about work-life issues. In academic departments, the chair is a particularly important agent of change, since he or she has the power to set the tone and lead by example. However, the degree to which a department is women-friendly depends on individual faculty members' personal perspectives, and a faculty member's history of interactions with women, which emanate from culturally acceptable norms and expected behaviors, plays a role in how he or she relates to women colleagues.

In many ways, relationships with colleagues are more akin to arranged marriages. Some colleagues are like-minded, more similar to a partner, while others are more comfortable with traditional, societally determined gender roles. It is much easier to discuss concerns with the former than the latter. For these reasons, negotiating and navigating

professional relationships is often challenging, particularly if women have little power to open up a dialogue for change. So, where do we go from here?

#### REFERENCES

- Association for Women in Science. (2012a). *AWIS in Action! August 2012 Awards*. Retrieved from <http://www.awis.org/?page=620>
- Association for Women in Science. (2012b). *Underrepresented groups in STEM [Factsheet]*. Retrieved from [http://c.ymcdn.com/sites/www.awis.org/resource/resmgr/imported/Underrepresented\\_Facsheet.pdf](http://c.ymcdn.com/sites/www.awis.org/resource/resmgr/imported/Underrepresented_Facsheet.pdf)
- Krieger, L. (1995). The content of our categories: A cognitive bias approach to discrimination and equal employment opportunity. *Stanford Law Review*, 47(6), 1161–1248.
- Moss-Racusina, C., Dovidio, J., Brescoll, V., Graham, M., and Handelsman, J. (2012). Science faculty's subtle gender biases favor male students. *Proceedings of the National Academy of Sciences*, 109(41), 16474–16479.
- Sandberg, S. (with Scovell, N.). (2013). *Lean in: Women, work, and the will to lead*. New York, NY: Knopf.
- Steinpreis, R. E., Anders, K. A., & Ritzke, D. (1999). The impact of gender on the review of the curricula vitae of job applicants and tenure candidates: A national empirical study. *Sex Roles*, 41(7/8), 509–528.
- Thoman, D. B., White, P. H., Yamawaki, N., & Koishi, H. (2008). Variations of gender-math stereotype content affect women's vulnerability to stereotype threat. *Sex Roles*, 58(9–10), 702–712.

