

Narratives of the Double Bind: Intersectionality in Life Stories of Women of Color in Physics, Astrophysics and Astronomy

Lily T. Ko^{*}, Rachel R. Kachchaf^{*}, Maria Ong^{*}, and Apriel K. Hodari[†]

^{*}*TERC, 2067 Massachusetts Avenue, Cambridge, MA 02140*

[†]*Council for Opportunity in Education, 1025 Vermont Avenue N.W., Suite 900, Washington D.C. 20005*

Abstract. This paper presents themes on the life stories of women of color in physics, astrophysics and astronomy. Drawing from our NSF-sponsored project, *Beyond the Double Bind: Women of Color in STEM*, we share findings from 10 interviews and 41 extant texts (about 23 women in varied life stages). Employing intersectionality theory and narrative analysis, our study contributes a critical analysis of how the intersection of gender and race affects performance, identity, persistence and overall career and education experiences in the physical sciences. Our findings both support existing literature on women of color in STEM, as well as bring to light two major, emergent issues: the importance of activism, and school/work-life balance. This research will add to the knowledge base about strategies for retaining women of color—widely considered an untapped source of domestic talent that could fill the country’s scientific workforce needs.

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INTRODUCTION

Because of their race and gender, women of color who pursue advancement in the science, technology, engineering, and mathematics (STEM) fields are caught in a “double bind,” and their struggles to be scientists are greater than for white women or men of color [1]. To address these inequities, we need to learn about the factors that support women of color in STEM education and professions. This paper draws from a larger project, *Beyond the Double Bind: Women of Color in STEM*. Here, we analyze the life stories of African American, Asian American, Latina/Hispanic, and Native American women to investigate the strategies that allowed them to persist in physics, astrophysics, and astronomy.

Narratives similar to the one following from Dr. Evelyn Hammonds, Dean of Harvard College at Harvard University, are examined through a framework of *intersectionality theory* to develop an understanding of how salient, multiple identities, such as race and gender, function simultaneously to produce outcomes for individuals and society [2]. Hammonds, who received degrees in physics and later in history of science, said, “[Race and gender] aren’t separate in me. I am always black and female. I can’t say, ‘Well, that was just a sexist remark’ without wondering would he have made the same sexist remark to a white woman. So, does that make it a racist, sexist remark? You know,

I don’t know. And that takes a lot of energy to be constantly trying to figure out which one it is... somebody has some issues about me... being black, female, and wanting to do science and be taken seriously” [3]. Intersectionality theory posits that minority women’s experiences can amount to “greater than the sum of racism and sexism” [2]. Thus, dually occupying undervalued identities of femaleness and non-whiteness—especially undervalued identities in STEM contexts [4][5]—can lead to personal, professional, and societal repercussions to a degree that white women and men of any color do not experience [2][4]. Intersectionality theory, in conjunction with narrative analysis [6], brings into focus consequential individual and programmatic factors that both hinder and empower women of color to persist in STEM.

Many of our findings support the existing empirical literature on women of color in STEM, including, but not limited to: chilly science environments, isolation, not fitting the conventional image of a “scientist,” doubts from authority figures, the importance of support, and learning to navigate their environments [7]. Due to space limitations, we focus on two major, emergent two themes that have received minimal or no attention in literature on women of color in STEM: *activism* and *school/work-life balance*. While existing literature (e.g., [7]) mentions examples of activism, we examine this theme in much greater detail in this paper,

including various meanings it holds for women of color. The theme of school/work-life balance in STEM for women of color has remained largely unexamined; Ong et al.'s [7] synthesis of empirical research on women of color in STEM between 1940 and 2008 found no literature addressing this specific topic. In answer to this identified gap, and to the call made by NSF's Career-life Balance Initiative [8] to learn more about the career-life needs of women of color in STEM, we begin here a brief exploration of this theme.

METHODS & ANALYSIS

We examined 51 narratives—41 extant (written texts¹ and 10 oral interviews conducted by team members—about 23 women of color who have been in physics, astrophysics and astronomy. Narratives may be full life stories created from interviews, observations, and documents; brief stories told in response to a single question; long sections of talk over the course of one or more interviews; or written accounts of varied lengths [6]. We found extant texts via the Internet (in journal databases and online searches), books, magazines and solicitous emails to members of women and minority organizations. We obtained interview participants through our professional networks and solicitous emails to organizations. Our semi-structured, recorded interviews were transcribed.

Narrative analysis requires transparent processes of laying out stories and identifying codes, then creating conceptual groupings and orderings from the data [6]. Thus, we formed a codebook, and to ensure high inter-rater reliability, we assigned each narrative two coders who were responsible for agreement. Monthly meetings required the entire team code a part of a common narrative, and further negotiate implementation of the coding system. After coding, we analyzed the data to create conceptual groupings and elicit emergent themes. Narrative analysis is especially effective for understanding the experiences of those who are traditionally marginalized, such as people of color, women, and gays and lesbians [6]. While narratives are usually dismissed as isolated anecdotes, narrative analysis provides ways of seeing beyond individual stories to broader patterns.

FINDINGS

Activism

Activism—which we defined as “STEM-related volunteer work”—was often motivated by experiences

of race, gender or both. This intersection of two or more marginal identities in STEM environments acted as a catalyst for activism. For instance, Chloe², then a physics graduate student and now a cosmologist, talked about a program she volunteered for, at her school, in which her groups had mostly non-white females. She recalled, “[B]ecause I’m always either one of only two female mentors that they can choose from... I had two students from [where] my family’s from... So for me, it was really, really exciting to have these young women of Caribbean origin in my group.” This section describes motivations, tactics, self-sacrifice, and doubts about activism for these women of color in physics, astrophysics and astronomy.

Several women had a vested interest in increasing diversity in STEM. Recurrently, these women were interested especially in helping under-resourced and underrepresented populations, perhaps because they could personally relate to people in those situations. Laura, a physicist in industry, described her desire to encourage minorities to go into physics, explaining, “We usually come from an economically disadvantaged home.” A few expressed the importance of seeing more scientists with a racial background similar to their own, and worked towards this ideal to encourage, and to improve conditions for, future generations. Activism led to rewarding feelings and experiences, whether it was through results of seeing students advance in STEM, or just having someone look up to them as scientists. Other personal reasons behind activism included feeling at home with fellow activists and reconciling personal and work issues. Apara, a physicist now working in professional development for minorities, explained, “We thought that not only we had found sort of our personal tribe, but we had found a way to bring in personal issues that we cared about into the core of our work.” This sentiment also confirms our finding that women of color in science need a strong connection to their jobs and seeks the potential for their work to impact others.

In order to diversify STEM environments, participants strived to reach two audiences: authority figures—including institutional department heads, academic research communities, national committees, policy makers, and other professionals—and the specific populations they were trying to affect—women, minorities or women of color. Tactics included conducting research, chairing scholarship funds, serving on national committees promoting women, minorities and women of color in physics and STEM, working to have policy reinforced, and working to educate the public (on both minority contributions as well improving educational outreach for the general public). Women also did direct outreach via teaching,

¹ A full reference list of the extant texts can be found at: <http://www.terc.edu/work/1774.html>

² Interviewees are represented by first-name-only pseudonyms.

mentoring, and recruitment and retention efforts. They became role models and mentors. Diana Garcia-Prichard³, a research scientist for Eastman Kodak, encouraged high school girls to explore non-traditional careers and to get hands-on physics experience. Olabisi Boyle, the director of engineering planning and technical cost reduction at Chrysler, advised students on developing leadership skills. Because these women realized the importance of role models and mentorship in STEM, they participated in and founded programs in their communities and institutions to provide these opportunities to students, peers, and colleagues.

Because activism is not usually rewarded with promotion or tenure, all the time and effort spent in improving science environments did not necessarily assist these women in advancing their own careers. A few women shed light on the sacrifices they made to advance their causes. Anna Coble spent an entire summer helping to improve conditions for black graduate students rather than conducting research, and, later in life, forfeited her pursuit of the rank of Full Professor. She proclaimed that being an advocate for students and women was more important. Shirley Ann Jackson passed up two Ivy League schools to stay at her undergraduate institution for her graduate work in order to help recruit and retain African American students there. Hattie Carwell, a retired health physicist and group leader for the U.S. Department of Energy, left a “comfortable” position in Europe because she felt too far removed from the issues of African Americans in science. Despite this, no one expressed any regret. In fact, it was just the opposite for Carwell, who asserts that she “probably would not change a thing.”

Even with the conviction we’ve seen, there was some disconfirming evidence, as two women in our study expressed ambivalence about whether activism was really the right thing to do. Jasmine said, “People will ask me, ‘Oh, you’re an astronomer, your husband’s an astronomer, do you want your kids to be astronomers?’ I... say, ‘I want my kids to be happy. Why would I put my kids through that?’ I would not send my daughters out with a known rapist. I’m not saying it’s always a situation where they rape your soul and crush your spirit, but it is not a pleasant experience, the process of becoming an astronomer.” Despite this reflection, Jasmine still works on committees to promote women and minorities in STEM.

Overall, it appears that activism carries deep and multiple meanings for the many women of color in physics, astrophysics, and astronomy who take part in it, serving as a significant form of motivation, hope and encouragement.

School/Work-life Balance

Here, we discuss the nature of school/work-life balance as it relates to women of color in physics, astrophysics and astronomy. Many school/work-life balance issues discussed below may not seem unique to women of color, and they are indeed mentioned in literature about white women in STEM [9]. Yet, we recognize that women of color may have distinct circumstances that affect their choices and experiences in STEM. For example, family roles, including needing to contribute financially, provide childcare, or uphold culturally traditional female ideals [7], can make it difficult for women of color to prioritize a lengthy, advanced STEM education and career. Also, research suggests a greater propensity for black families to be female-headed and led by single-mothers [10], and there are significant differences in family support involvement between black and white women [11]. The women in our study frequently reported the tension between dedicating oneself to STEM and maintaining a life outside of it and acknowledged the importance of having interests outside of science. In other words, contrary to the master narrative of fully dedicating oneself to STEM [4], they demonstrate that in order to persist in science, they must occasionally leave the field.

Despite the intense demands of achieving success in STEM, many participants repeatedly commented on the importance of maintaining a balance between school/work and life. These women had hobbies and interests outside of physics, astrophysics and astronomy that helped them strike this balance. For instance, Luz Martinez-Miranda played the piano at a mastery level. Frida, a graduate student that left Physics, contrasts how her new, non-STEM department allows her time to enjoy physical fitness. Lola, then a postdoctoral fellow and now an astronomy lecturer, explained, “if I end up with a balanced life, it’s totally all been worth it.”

Achieving balance was a struggle for many women of color. Participants reported concern over being able to have a family and a successful career. They often felt that they would not be able to achieve both, in which case they would need to choose one, and some young participants reported that they would choose family over their career. Meena, a graduate student in astrophysics and astronomy, asserted, “[If] I feel that I won’t be able to have the kind of lifestyle that I want, then I’ll leave... the lifestyle also means being there for people I care about, or being able to travel, and being able to not [be] stressed out 24/7.” Other women of color reported that they purposefully chose their careers to achieve a better balance. Laura explained her choice of industry over academia: “You would have to basically live at the university and do everything...

³ Subjects from extant texts are referred to by their real names.

that's related to your job, and not to your family or... things outside of work... [but] I like to go on vacation... to bird watch. These are activities that I don't want to give up."

Lola explicitly noted how societal expectations benefited men, who were able to dedicate their time to their career over family. She contrasted her need to choose with that of a male minority professor at her school, who said, "My wife does absolutely everything with the kids. And I can barely cope. If I was a woman having kids and also being a professor, it would probably be impossible." It was the first time Lola had ever heard that. Growing up, she thought men and women were equal in terms of being able to have both jobs and families. Lola felt relief from hearing that it is very difficult to maintain a healthy both family and career life. Sometimes, a choice must be made, however, it doesn't always have to women making unfavorable decisions. Employers can play a huge part in making work-life balance easier. Teresa Segura notes about her workplace, "We have daycare on-site... a cafeteria... flexible hours... every other Friday off... a gym. They get the work-life balance thing."

Again, the issues stated may be arguably issues for all women, but the implications of school/work-life balance for women of color are not yet fully known or well studied, and further research needs to be conducted [8].

IMPLICATIONS

Our findings inform a critical analysis of the ways in which the experiences of women of color are shaped by the intersection of race and gender, and how this intersection influences STEM persistence. We highlighted two important themes in the lives of women of color as they navigate STEM: activism and school/work-life balance. These are only two salient themes that have surfaced from the many we have discovered, and we look forward to discussing more in the future. By producing an expanded knowledge base about success factors for retaining women of color, we aim to enhance efforts of the PER community to broaden overall participation rates of women of color in STEM professions and transform understanding of the challenges they face as they work towards their educational and career objectives. From our study, some notable insights into and implications for teaching and learning follow: Support women of color in physics, astrophysics and astronomy in their efforts diversifying those fields. Refer to them as a resource. Incorporate more opportunities to do STEM-related volunteer work without it being a sacrifice to time spent toward furthering their education and careers. Produce more flexible institutions for students and employees.

Ask them what they need to lead both successful personal and school/work lives. Reinforce policies already in place or create new policies to make it easier for students and employees to have families and lives outside of work.

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