Authoring identity amidst the treacherous terrain of science: A multiracial feminist examination of the journeys of three women of color in science

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Abstract:

The study of the identity processes of women of color in science-based fields helps us (a) find ways to support similar women, and (b) study the dynamics of inequity, within and beyond science. Participants in this study (a Black woman, a Latina, and an American Indian woman) survived inadequate high schools and discouraging college science departments to win formal recognition (fellowships, publications). Using multiracial feminist theory, including intersectionality, and practice theory, we conceptualize authoring of identity as an ongoing process. Qualitative methods were designed around Black feminist precepts of caring and personal accountability, the use of concrete experience and of dialogue (Collins, 2000a). Participants' opportunities to author legitimate science identities were constrained by their location in the matrix of oppression. They reported conflicts between their identities as women of color and as credible science students, and having racist, sexist identities ascribed to them. All became more adept at fending off negative ascription and all found settings with less identity conflict; their ability to read a situation and quickly adjust, *la facultad* (Anzaldúa, 1999) helped them survive. But the fact that they have needed to do this is unjust.

Keywords: diversity | equity | feminism | gender/equity | social justice | education

Article:

In this paper, we examine the experiences of three women of color (one Black, one Latina, and one American Indian) who have completed advanced degrees in, and now work in, science-based professions. We study them because understanding the pathways successful women have taken through the sometimes-hostile terrain of science lets us illuminate those pathways for the women

who come after. But we also study them as an entry point for the study of power, status, and agency.

Science is a high-status arena. It confers a number of benefits to its members. Scientists are held in high regard in American culture, and work in science tends to pay at minimum a living wage, often a very comfortable wage. The work is often satisfying; it often allows for independence of action and thought, demands rigorous analytical skills, and most important, is, in our view, inherently interesting. To spend one's days looking closely at the way the world works—the way the universe works—is an honor and a privilege. However, it is a privilege that has historically been accorded mostly to one group of people: White men. Thus, this high-status, exclusive arena is a perfect setting for studying power and the dynamics of inequity, shedding light on questions like: How is the status quo perpetuated? How do racism and sexism persist? Also, how do some people—small numbers—manage to survive whatever dynamics keep most people out?

We already know one of the most important reasons why there are so few women of color in science: Relatively few even make it to the starting line. Black, Latino, and American Indian students in the United States graduate from high school at lower rates (about 60% of those who started high school in 2002 graduated in 2006) than White and Asian students (81% and 90% of whom graduated, respectively) (Education Trust, 2009). Although girls in every racial group graduate at higher rates than boys, this does not obviate the between-race differences; in a study using a different definition of graduation, for instance, 59% of African American girls graduated in 2003 versus 48% of African American boys; this was contrasted with 79% of White girls and 74% of White boys (Greene & Winters, 2005). Those Black, Latino, and American Indian students who persist frequently attend schools with fewer resources and, thus, fewer opportunities to develop the solid academic base necessary for a science career. Kozol (2005), in what he calls "a national horror hidden in plain view," documents the funding inequities between predominantly Black and Latino schools and predominantly White schools. Lee and Orfield (2007) point out that "[t]he data coming out of the No Child Left Behind tests and the state accountability systems show clear relationships between segregation and educational outcomes" (p. 8) and then show that most schoolchildren in the United States attend schools which are, de facto, segregated. The Education Trust, using numbers provided by the College Board, show that Black, Latino, and American Indian students are less likely to take, and do well in, AP classes than their White counterparts (Education Trust, 2009). Thus, many of those Black, Latina, and American Indian women who do graduate and enroll in college have not had the same educational opportunities as students who graduated from predominantly White high schools.

Despite this opportunity gap, however, some Black, Latina, and American Indian women make it into college; and after college, they make it into graduate school; and after graduate school, they find work that uses science. The study of their lives can be a rich resource to help us understand power. Some of the women who persist were not trapped in the unjust school system described by Kozol (2005) and by Lee and Orfield (2007), but others managed to thrive even in poorly funded urban or rural schools.

In this study, we examine the experiences of three women like this: A Black public health expert, a Latina toxicology researcher, and an American Indian pharmacist. We note that each of these women had some advantages over other students in their respective high schools. In particular, each had at least one parent with a college degree, though most of their parents earned their degrees by returning to school as adults. However, each of them also attended de facto segregated urban or rural schools, all of their parents struggled economically, and two of them came from single parent homes. Each of these women has persisted and won recognition in science: One received a prestigious fellowship and is currently working at an international women's health organization. Another received a comfortable scholarship from the Indian Health Service to pursue her doctorate of pharmacology and is currently working as a resident at a large research and teaching hospital. The third has authored or co-authored numerous publications in peer-reviewed journals and is now working on her doctorate in applied biomedical science, having received a fellowship from the National Institutes of Health.

We look at their experiences across their lives, beginning in elementary or middle school, through college and graduate school, and now, in the early stages of their careers. One of us, Angela Johnson, has been studying this group of women since they were undergraduates in the early 1990s, and other versions of their stories, as well as the stories of a larger group, have been written about elsewhere (Carlone & Johnson, 2007; Johnson, 2001, 2006, 2007b; Johnson, Anderson, & Norlock, 2009). A careful study of their experiences in science has the potential to help us understand not only how to support intelligent, motivated women to persist in science, but how it is that systems function to reproduce the status quo and also the areas of possibility for challenging it.

Background: Participation of Women of Color in Science

These women have indeed persisted against the statistical odds. To get a better understanding of the extent of the under-representation of women of color graduating in science, we turned to National Science Foundation data (NSF, 2007). Using their raw numbers, we calculated the percent of White, Asian, Black, Hispanic, and American Indian men and women (the categories tracked by NSF and the terms they use) majoring in science, as a representation ratio (Lewis, Menzies, Najera, & Page, 2009; Ong, Wright, Espinosa, & Orfield, in press), in this case as a *percent of the number of people in each of these groups graduating from college overall.*[1] In other words, of all the Black women, say, who graduated from college between 1995 and 2004, we calculated the percent who graduated in science, which turned out to be 9.3%.[2]

In Table 1 we can see that although fewer Black and Hispanic men complete science majors than the male average, men of all races are graduating in science at greater rates than women from the same groups. The good news is that Black, Hispanic, and American Indian women seem to be completing science majors at about the same rate as White women. The bad news is that since women from these groups are under-represented in college compared to their representation in

the overall US population, the sheer number of potential women scientists of color produced each year is still very small.

Table 1. Percent of college graduates in each group, 1995–2004, who majored in science

	White	Asian	Black	Hispanic	American Indian
Male	14.5	24.8	12.3	12.5	14.5
Female	8.9	18.5	9.3	8.2	8.6

The effects of this twofold under-representation (under-represented in college, further under-represented in science) can be seen in Table 2.[3] Note that the percentages in Table 1 are percents within each race and gender; the percentages in Table 2 are within each employment category.[4] Thus, for instance, the value in the first box in Table 2 indicates that of all the practicing scientists with bachelor's degrees, 32.2% are White women.

Table 2. Percent of all employed scientists, by race, gender, and highest degree earned

Degree	White		Asian		Black		Hispanic		American Indian	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Bachelor's	32.2	47.2	5.2	3.7	1.7	2.0	2.5	2.7	0.0[b]	0.0[b]
Master's	28.1	48.7	8.2	6.4	1.9	1.1	1.9	1.1	0.0[b]	0.0[b]
Doctorate	18.5	53.3	6.5	14.9	0.4[a]	1.5[a]	1.1[a]	2.2	0.4[b]	0.4[b]

Note. Row totals do not add to 100% because of rounding and suppression in the original data set.
[a] These values are inaccurate because some of the measures they rely on are estimated to be less than 500 and thus were not included by NSF in calculations.
[b] These values are inaccurate because the numbers are so low that NSF suppressed them "for confidentiality reasons."

In Table 2, we can see several important trends. First, we see that White men are increasingly over-represented at each degree level, and make up about half of the practicing scientists in the US despite constituting only about a third of the US population (NSF, 2008).[5] Second, the higher we look on the scientific career ladder, the fewer women we find. Third, we see how the under-

representation of students of color in the college population leads to very few scientists of color at the highest levels. Black women, for instance, who make up about 6% of the U.S. population, constitute only 0.4% of practicing scientists at the PhD level (NSF, 2008). The actual number of Black women PhD-holding biological, physical, and mathematical scientists in 2006: less than 2,000. Comparable number for White men: 147,000.

In 1976, Shirley Malcolm, Paula Hall, and Janet Brown prepared a report for the American Association for the Advancement of Science entitled *The Double Bind: The Price of Being a Minority Woman in Science* (Malcolm, Hall, & Brown, 1976). Their argument was that women of color experienced more difficulties in science than either White women or men of color. To update this work, Ong et al. (in press) reviewed all the existing empirical research studies on women of color produced between 1970 and 2008 that they were able to locate. They report that "The results from our project suggest that research on women of color in STEM is limited in number: our large-scale, systematic search covering 1970–2008 yielded only 116 empirical works … The research field is further hampered by small sample sizes and lack of longitudinal analysis" (p. 6). Nonetheless, Ong et al. (in press) replicate our finding that women of color continue to be under-represented in science, and that this under-representation increases at each successive educational and career level. Their review indicated consistent findings:

the difficulties of transitions between academic stages (i.e. high school to college, community college to four-year institution, college to graduate school) and transitions from minority serving institutions to predominantly White institutions; the critical role that social climate—including issues of isolation, identity, invisibility, negotiating/navigation, micro-aggressions, sense of belonging, and tokenism—plays in women of color's satisfaction and retention in STEM; and the positive, as well as negative, effects of words and actions by faculty who serve as mentors, role models, teachers, and authorities on the intelligence and abilities of their students. (p. 30)

It is our hope that this study will further contribute to this research base. It is particularly valuable because it reports on over 10 years of longitudinal data; Johnson has been following the three participants since early in their undergraduate education, through graduate school and into the early stages of their careers. This study has the potential to shed light on many of the themes Ong et al. (in press) identified in their review, as well as addressing the under-representation of women of color in science, the pathways by which some women manage to nonetheless persist, and the more general dynamics of inequity.

Theoretical Framework: A Multiracial Feminist Theory of Identity

Feminist Epistemology and Under-Representation

Our motivation for this study arises first and foremost from social justice concerns. These concerns emerge from our epistemological commitments; our theory of knowledge; "the standards used to assess knowledge or *why* we believe what we believe to be true" (Collins, 2000a, p. 252). Those commitments in turn direct research: The questions we ask, the methods

we use to collect and analyze data. In this study, we rely on Patricia Hill Collins's authoritative work on Black feminist epistemology. She argues that this epistemology grew out of the "collective experiences and accompanying worldviews that US Black women sustained based on our particular history" (p. 256). This history "fostered a series of experiences that when shared and passed on become the collective wisdom of a Black woman's standpoint," and, in turn, "a set of principles for assessing knowledge claims" (p. 256). These principles constitute Black feminist epistemology.

Collins (2000a) distills these principles into a set of standards that are "consistent with Black women's criteria for substantiated knowledge and with our criteria for methodological adequacy" (p. 256). These standards consist of: the use of lived experience as a criterion of meaning; the use of dialogue in assessing knowledge claims; the ethics of caring; and the ethic of personal accountability (Collins, 1989, 2000a). We have used these standards to shape our theoretical framework, our data gathering methods, and our analysis of data.

Calls to address the under-representation of women of color in science are often justified in terms of our national need for scientists (for recent examples, see Aschbacher, Li, & Roth, 2010; Hurtado, Cabrera, Lin, Arellano, & Espinosa, 2009; Ong et al., in press). In contrast, given our epistemological commitment, our central concern is for the women with the ability and the desire to succeed in science who, nonetheless, leave science. Our two overarching purposes of this study, searching for effective pathways through science and using the experiences of women of color in science to better understand wider questions about power and about reproducing and resisting the status quo, both emerged from this commitment.

Furthermore, researchers studying under-representation in science often use, critically or uncritically, the metaphor of the "leaky pipeline" (see, for instance, Aschbacher et al., 2010; Blickenstaff, 2005; Hurtado et al., 2009; Russell, 2005; Russell & Atwater, 2005; Young, 2005). While this metaphor has been useful in identifying the transition points where many people of color are lost to science, we find it inadequate when thinking about our particular concerns. The metaphor is passive and undifferentiated. There is nothing special about the water that stays in the pipe and that which leaks. We, however, are interested in the lived experiences of a very particular group: women of color with a strong interest in science. Nor does the metaphor help us to think about the actions that individuals take to stay in science and help others to do so, or to leave science or push others to do so. We needed thinking tools that let us consider the experience of individuals as well as patterns of staying and leaving. The pipeline metaphor is not robust enough to help us do this; for this particular study, it is not, in Eisenhart's (2001) wonderful phrase, a useful idea to think with.

Focusing on women's experiences directs us to look at both the actions they take and the structures by which those actions are constrained or supported. Zinn and Dill (1996), in their overview of theory developed by feminists of color (which they call multiracial feminist theory), report that this body of work is concerned with how "within the constraints of race, class, and

gender oppression, women create viable lives for themselves, their families, and their communities" and, further, with the ways in which "[w]omen of color have resisted and often undermined the forces of power that control them" (p. 328). Thus, this paradigm directs us to make concrete what we mean by structure and by individual action, and to develop theoretical tools to study these.

Structure, Constraints, Opportunity; Intersectionality

Shanahan (2009) defines structure as "the underlying principles that shape the normative patterns within social groups … normative patterns [which] define, guide and constrain the behaviors of individuals" and calls attention to the need for more focus on structure in science education (p. 45). Ong points to the "strictly guarded sociocultural boundaries around membership in the science community" (2005, 612). In this case, because we are studying women of color, the structures we are most interested in are those which emerge from our participants' race, gender, and, since all three of them grew up in families who were struggling to move into the middle class, economic status; these are the structures that differentiate them from other students. Multiracial feminist theories posit that these structures, or "systems of domination," affect everyone, not just those who are on the stigmatized end of the systems (Zinn & Dill, 1996). According to these theories, we all live in what Collins (2000a) calls a "matrix of oppression," and the structures of race, class, and gender that "create disadvantages for women of color" also "provide unacknowledged benefits for those who are at the top of these hierarchies" (Zinn & Dill, 1996, p. 327). Thus, to understand the structural constraints and opportunities experienced by our informants, we needed to locate them in a matrix of oppression. Intersectionality can help us do this.

Advantages of Intersectionality in the Study of Structure

Atwater (2000) pointed out that considerations of gender in science education often ignore issues of race, class, religion, sexuality, or other factors, and called for science educators to "discuss the ways to infuse these ideas in traditional gender science education research" (p. 386). Attempts to do so, however, can go awry by treating race, class and gender as additive, whereby the experience of a Black woman is framed as her experiences as Black, added to her experiences as female. These approaches are predicated on a solipsism that places the White male experience as the norm, and any other status the exception. Second, they eclipse the interdependence and inter-relationship of the multiple factors.

Intersectionality (Collins, 2000a,b) offers a solution to this problem. "As opposed to examining gender, sexuality, race, class, and nation as separate systems of oppression, the construct of intersectionality references how these systems mutually construct one another" (Collins,2000b, 47–48). Intersectionality helps us understand: (1) *all* of the various dimensions related to structures of power, privilege, and oppression (for instance, race, class, gender, sexual orientation, gender expression), (2) the dynamic interplay *between* each of the dimensions, the

meaning behind each permutation of these dimensions, and (3) the *new social space* created by each permutation and its related experience. Intersectionality is a more nuanced, accurate way to consider the experiences of individuals and thus to deduce the tacit institutional structures that shape those experiences.

Agency; Authoring Identity

Besides our interest in structures, we are interested in individual action; in particular, one kind of action: action that resists and undermines structural constraints resulting from a subordinate location in the matrix of oppression. We call this kind of action agency. As Basu, Barton, Clairmont, and Locke (2009) put it, agency is "a process of understanding the effects of oppression and leveraging resources to act against it" (p. 355). To better capture our participants' agency, we needed a theoretical approach that allows us to look at participants' responses at a particular moment in time and also ways in which those processes were stable and/or changed over time. To do this, we used a fluid, process-oriented approach to the concept of identity; identity as the authoring of a self within a context.

Identity has been used by a number of researchers in science education who are concerned about under-representation in science (Aschbacher et al., 2010; Barton, 1998; Brandt, 2008; Brickhouse, Lowery, & Schultz, 2000; Brickhouse & Potter, 2001; Brown, 2004; Brown, Reveles, & Kelly, 2005; Carlone, 2003, 2004; Carlone & Johnson, 2007; Gilbert & Yerrick, 2000; Malone & Barabino, 2009; Rahm, 2007; Reveles, Cordova, & Kelly, 2004; Tonso, 2006). Brotman and Moore (2008), in an overview of this emerging body of literature, argue that it "calls attention to larger, deep-rooted ideas held by culture and society" (p. 992). Quoting Brickhouse et al. (2000), they underscore the need to address these issues "if we want more girls to see themselves as the 'kind of people who would want to understand the world scientifically' (p. 443)" (p. 992). Shanahan (2009) points out, however, that science educators frequently use identity as a way to study communities-in-practice (Lave & Wenger, 1991). Our work, while influenced by social practice theory, is primarily grounded in multiracial feminist theory; we use social practice theory because it meets our feminist aims of studying both how individuals negotiate settings and how they are understood and responded to by more established members of settings; it lets us look at structure, agency and the interplay between the two.

Our approach to identity aligns with what Holland, Lachicotte, Skinner, and Cain (1998) describe as ethnography of personhood. This formulation of identity is fluid, resilient, creative, and both enabled and constrained by intersectionality; by one's location in the matrix of oppression. We drew on Holland et al.'s (1998) practice-based theory of identity to understand the ongoing *processes* by which identity forms and develops. Their formulation evokes fluidity and movement and allows us to examine how the women in our study authored themselves, with an understanding of the ways their locations in the matrix of oppression shaped, but did not cement, their authoring opportunities. The processes of authoring are complex because people act "as social producers *and* as social products" (p. 42, our emphasis). Thus, a woman can author

herself in certain ways, but, as Holland et al. point out, she also can be an instrument of others' (personal, institutional, or societal) positioning and/or an unwitting or unwilling recipient of others' acts.

Malone and Barabino (2009), in their analysis of the science identities expressed by women graduate students of color in STEM programs, make a similar point: "Identity is not totally at the disposal of the subject in the sense that it is lived in relation to layers of social representations. But for all that, identity is not determined. It adumbrates our possibilities as well as marks our location" (pp. 488–489).

When people author identities, they perform combinations of behavior, speech, and artifacts perceived as "appropriate" as they enter new settings, drawing on their histories as resources for these performances. As Brandt (2008) puts it, "Each [person] brings to his or her learning prior knowledge and experiences, personal vocabularies, and a sense of self that they attempt to fit into a new discourse community" (p. 705). Authoring involves identity-related performances of self for others. The "others" (i.e., those in the new discourse community), in turn, legitimate the credibility of the performance by recognizing the person as, at least potentially, one of "their own."

How Structure Impedes Authoring: When Others Ascribe Unwanted Identities

Gee (2000–2001) offers useful vocabulary for talking about how identities are intentionally asserted; he calls them "bids for recognition". And, like Holland et al. (1998), Gee highlights the limits on individuals' agency to make successful bids for recognition. Bids can fail; individuals can simply be ignored. Worse, insiders in the setting may not only reject an individual's bid but can, in Gee's term, ascribe another, unwanted identity onto the hapless bidder, based on elements that are outside her control—indicators of her particular intersection of race, class, gender, sexuality, religion, nationality, age. Malone and Barabino (2009) describe this process as "a particular failure to be recognized or to be positioned as one who possesses certain rights and obligations as a future scientist" (p. 488). Ong (2005), in her study of ten women of color studying undergraduate and graduate physics, reported something similar: "Regardless of their actual abilities as measured by exam performances, grade point averages, and research mentor evaluations, women of color participating in the study said they perceived nearly consistent messages—with some rare exceptions—that because they lack the standard appearance of a scientist, they also lack the intellectual competence associated with such an appearance" (p. 602).

Lorde (1984) describes this ascription process in more political terms: "Within this country where racial differences create a constant, if unspoken, distortion of vision, Black women have on one hand always been highly visible, and so, on the other hand, have been rendered invisible through the depersonalization of racism" (p. 42). Women of color in the sciences run the risk of being highly visible as exemplars of negative stereotypes, with their potential in science invisible, hidden by a veneer of racist, sexist ascribed identities.

Identity Over Time: Authoring as a Pattern, a Process, and a Skill

We assume that there is more to our participants than simply the *moment-by-moment identities* they attempt to author and the moment-to-moment feedback they get from their identity-related performances. The women in this study have been participants in science or school science for years and years. Thus, as they gain increasing access to the professional world of science, it makes sense to assume some consistencies and at least some directionality in the ways they author themselves. We assume that their identities reflect relatively patterned, ongoing conceptions of themselves, borne out of many experiences authoring themselves and getting positioned by others in certain ways. As Holland et al. (1998) explain, the tools one uses to author oneself can be used again and again, and over time and with consistent use, can be tools of self-control and change. On the other hand, those whose bids for recognition consistently fail will likely abandon attempts to author those particular identities. The recursive nature of authoring, recognition, and meaning-making across time and context draws attention to identity *in process*.

The Limits of Agency in Authoring Identity

Finally, we highlight three often-overlooked identity-related processes that influence the likelihood of a woman of color's successful bid for recognition in a new science setting:

(1) The particular behaviors, speech and artifacts she employs in the setting—does she have the science and cultural knowledge and skills necessary to be recognized as credibly authoring that identity? Is she willing to profess the attitudes and values that others in the setting expect from her and espouse themselves? Is the identity she attempts to author attractive enough that she is willing to do whatever it takes to continue to pursue/fight for it?

(2) What others see when they look at her—in this setting, is she subjected to an "unspoken distortion of vision" (Lorde, 1984, p. 42)? Are unwanted identities ascribed to her based on the intersection she occupies in the matrix of oppression?

(3) The normative identities (Cobb, Gresalfi, & Hodge, 2009) that characterize the celebrated "kinds of people" already in the setting—is it even possible for her to assemble a bid that would allow her to be recognized as one of those "kinds of people"?

These three points highlight the paucity of agency available to women of color pursuing science. The first of these dimensions does allow for a woman of color to exercise a decent amount of agency, provided she has access to the material and institutional resources to "get smart" in those particular ways. She has *limited agency* over the second process (i.e., how others perceive her), in choosing how she presents herself, but it is mainly governed by the structures that shape the setting. The only agency she has in the third process is choosing whether to try to enter the setting or not; if she chooses to enter it, she is constrained by its norms. However, if she receives positive recognition in the setting—if her bids for recognition are routinely accepted, and she

somehow manages to, over time, successfully author identities appropriate for the setting—she may some day have some influence over the setting's norms.

This framework addresses the two purposes of this study: to learn, from the experiences of women of color who persist in science, how to support other women of color; and to study their plight as one example of how the matrix of oppression gets perpetuated. To meet these purposes, we need to focus both on the structural constraints our participants faced as a result of their particular intersections in the matrix of oppression, and the identities they have authored in response to those constraints. Thus, the research questions for this study are:

(1) *Authoring identity*: What science identities were our participants able to author? What were the limits on the science identities they were able to author? How did their other identities affect their authoring of science identities? How did the identities others ascribed to them affect their authoring?

(2) *Structures*: What structural constraints and opportunities did our participants experience as they sought to author science identities? How were those constraints and opportunities related to their location within the matrix of oppression?

(3) *Changes over time and space*: How did authoring processes change over time and space? How did structural constraints and opportunities change over time and space?

Despite this tidy list, however, we do not answer these questions separately; the structures within which the women were attempting to author identities are inseparable from the identities they authored, and thus it is impossible to discuss the two individually. Our discussions of these questions are entwined; they are inseparable.

Methods

Our methods were shaped by our epistemological commitment to Black feminist thought. They are, thus, designed around the ethics of caring and of personal accountability, a focus on the lived experiences of our participants, and "the use of dialogue in assessing knowledge claims" (Collins, 1989, 763). Below, we describe how we addressed each of these.

The Ethics of Caring and Personal Accountability

This study begins with the ethics of caring, not simply in the sense of affection, but in the sense of ensuring that our work is careful and grounded in loving action. Our choices of both research topic and methods were motivated by our common drive to fight against injustice; hooks (2000) reminds us that "All the great social movements for freedom and justice in our society have promoted a love ethic" (p. 98). This caring manifested itself in several ways: the long-term relationships among the researchers and participants, our approach to data collection and what counted as data, our standards for validity, and our approach to member-checking. The ethics of personal accountability, in turn, guided the standards to which we held ourselves as researchers;

our work must, we felt, meet not only standards of qualitative research but our personal standards: it must be an accurate account of our informants' experiences, and useful in the fight for social justice.

This study is part of a larger longitudinal study that Angela Johnson has carried out since the late 1990s; that study, however, is an outgrowth of even older relationships between Johnson and the study participants. She first met the women who became her long-term informants while teaching physics in an enrichment program for high-achieving science students of color. Many of these teacher/student relationship evolved over the years into friendships. These caring friendships have included support and advice on academic, career, relationship and parenting issues as well as the pleasure of old ties; of knowing one another from back in the day. These former students/old friends have also been willing to open up their lives to scrutiny every few years, to participate in sometimes gruelingly long interviews and to have emails intended as personal communication be turned into data; their generosity in doing so demands the highest level of care, accountability and reciprocity from us as researchers.

Thus, our first goal in writing about their lives is the faithful representation of their stories and the protection of their interests; we are not striving for some sort of objective account, but, rather, to produce insights and accounts which they recognize as true. This has entailed careful and ongoing member-checking. All the papers that emerged from this study were sent out to all informants before publication; informant response is our most important source for establishing the validity of our work. In the process of this member-checking, two informants, Jaweer Brown and Azita Cuevas, have provided some of the most important insights to emerge from this research project. Their most important role has shifted from informant to co-author; furthermore, Brown, over the course of this research, trained and began working as an ethnographer. Thus, the three informants who participated in this particular paper gave consent for these two women to have access to the confidential data gathered about them over the years. As one of the informants (Conchita) put it in giving this consent: "I'm ok with this as well as whatever [other] process needs to be done for the end goal to be accomplished. Frankly as I continue to trek through science, this data gold mine is crucial to other women out there doing the same thing, or professors who are trying to better understand their students …"

Finally, in the interests of personal accountability, we would like to describe ourselves. We are: all women; mixed in our sexual orientations (including queer, lesbian, and straight), ethnicities (including Black, white, and Latina), parenting status (biological mothers, adoptive mothers, aspiring mothers, and happily childless), racial make-up (including a dizzying array of transracial family combinations) and civil status (including single, partnered but not permitted by law to marry, not interested in legal marriage, and married).

Concrete Experience and the Use of Dialogue

We gathered our data in accordance with Collins's other two precepts, the use of concrete experience and of dialogue. Our goal was to use our informants' stories recounted from their lives as our primary unit of analysis: To use these stories as a way to learn about both the institutional structures which impeded their passage through science and the ways they were able to exercise agency to cope with those structures. Thus, the first step was to pose just one interview question to each participant: "Tell me your life history as it relates to science." One of the participants chose to answer this question in written form; two others preferred to be interviewed. The interviews were lengthy; one phone interview took about an hour and a half; the other took 3 hours. We engaged in dialogue with the woman who chose to do a written response by asking follow-up questions by email and telephone. We engaged in dialogue with the other two women during the course of their interviews. We then extended the dialogue by asking each woman to respond to this article in various drafts, and incorporating their responses.

Data Analysis

Johnson and Brown analyzed the data. We independently coded the interviews into cultural domains, lists of stories which illustrated similar themes (Spradley, 1979). We each allowed our domains to emerge from the data, attempting to set aside pre-conceived ideas of what we would find (Glaser & Strauss, 1967). We then exchanged domains and found that our coding schemes were, given their organic nature, quite similar. We then worked primarily from the other person's domains, to ensure that the themes each of us had seen emerging in our domains were also present in the ways the other researcher organized the data. This proved to be the case. Important themes we each documented included evidence of the participants' strong interest in science; the effects of their participation in special science programs; their sense that in some science settings, their various identities were in competition; the importance of family and friends; and the role of altruism in their academic and career decisions.

Once we had teased out a set of themes, we further tested out those themes through the use of taxonomic analysis (organizing the domains logically among themselves) and componential analysis (comparing the included terms within a domain and between domains along various significant dimensions) (Spradley, 1979). In the end, we found that it made sense to organize informants' stories by whether the stories described science settings where informants could find no attractive identity, science settings where they experienced conflicts among various identities they wanted to pursue, and science settings where they were able to construct comfortable identities for themselves. This organization allowed us to determine the most robust and explanatory themes.

Findings

We begin this section with statements from each informant on their earliest experiences with science and scientific endeavors; their first forays into authoring science identities. First Kathy, the American Indian woman:

> I *enjoy* science; [it] seems to come a little bit easier than something like writing a story or something. It was just very up front for me. And I liked … learning about different things that are like living things, then learning about our own bodies and you know, just, just knowing all these little things that go on in your body … I can't say when that began, but I'm figuring it's probably around middle school. I also got into some science programs, well, a science, a summer school type thing and then they did some more science with us and that seemed to be right around where I started getting interested in it … I really liked it and it like I said, it wasn't hard for me to understand.

Now Alethia, the Black woman:

> I cannot remember science coming into my frames of reference until age 8. Exactly then: third grade. I had a teacher, Ms. S. Ms. S. was big and mean: she had a loud booming voice and she was a die-hard football fan. Ms. S. was an awesome science teacher. She did all kinds of experiments where things were happening. We held hands one day and cranked the generator, all feeling the charge. Man, I was charged up about science then. She always had some experiment where things happened that we could see. To learn about metamorphosis we [had] worms, who made cocoons and then one day hatched. Can you imagine? We walk into class one day and there were butterflies swarming around the room … just as the day started at 7:30 am or whatever there were butterflies everywhere!

And finally Conchita, the Latina woman:

> I had the one best friend, she was my friend from like 3 years [old] because she lived near me. So she was also in all the same programs [as I was, like] MESA, that was cool and that was Minorities in Engineering and Math and Science. So whenever one of us was going [that parent] would tell the other parent, and her mother was our Odyssey of the Mind coach. So that was kind of cool because then it gave you an excuse to go be together somewhere, working on something.

Each of them came to science early through school or a special program, but they did not have to be *persuaded* to like it; they found that the activities and subject matter of science genuinely caught their attention. The stories that follow need to be considered with this in mind: These women, even as young girls, were drawn to science and scientific ways of problem-solving, thought of it as something they were good at, something they enjoyed.

Settings With No Attractive Identity Available, and Science as an Escape

During their middle school and high school years, despite their attraction to science, our participants were sometimes stymied not by having their science identity bids rejected but by not even being able to author identities they found attractive. They were too busy working to avert other ascribed identities. However, in each case, the women found alternative structures—

alternative settings *organized around science*—to which they could escape. In these settings, they could escape the constraints of having unwanted identities ascribed to them, and instead access opportunities to author science identities.

This was particularly true for Kathy, the American Indian woman, who found no attractive identity of any kind, much less a science-related identity, in her middle and high school:

> There's just too much bad that happened after school. I only stayed after if I absolutely had to. Because I mean, even the times that I stayed after, there were fights. And then, you know, I mean, one time I stayed after school, and I almost had to fight like six or seven girls all at once. And I just thought, 'This is not my life, this is not what I want to do.'

Note her ending: "This is not my life." This is what we mean about her not seeing an attractive identity to pursue in this setting. Note also the components of intersectionality that led Kathy to this situation: She was poor, she was American Indian, and thus this was the schooling available to her. Kathy went on to explain why there was so much fighting, and how her only choice was to get out of this setting:

> My school was very hard. I mean, not hard in that, you know, to study hard. It was hard in that we have two different tribes that live close to each other, and they hate each other. And then we have all the Mormon people that live there also. And then there's just all this clashing of … of different cultures, and you know, different ways of life, different religions, and … High school was pretty bad, and middle school. And I figured you know what, I need to get out of school. That's all my focus ever was, really, was to get out of school.

Within these constraints of intercultural violence, Kathy could not see any identity that she wanted to author for the long term. She was too busy just trying to come up with combinations of speech, dress, and behavior that would keep her from having to fight. There was no way that she could author a science identity in that setting; there was just barely room for her to maneuver and protect herself. Even if she already saw herself as a "science person," and would have liked to bid for that identity, there was no one in her school to recognize and legitimate her bid.

There was, however, someone outside the school setting who could recognize Kathy's science bids: Her mother. Kathy's mother helped her escape the structural constraints of her school by locating a science enrichment program that allowed Kathy to take community college science classes. In this program, "We weren't at the high school; we weren't at the middle school. We got to go to the college. Which was nice because it [violence] didn't happen so much at the college." Instead of devoting her time avoiding fighting, Kathy was able to concentrate on "an English composition class, and then I took a time management course, cause I wasn't too good on, like figuring out like when I should start a project and that sort of thing. And study skills, so I took a class in that. And then I also took a biology class and a chemistry class." Kathy did not meet the

criteria for this program, but she was admitted anyway, and she attributes this to the efforts of both her mother ("I think my mom may have talked to the director of the program") and herself ("I actually wasn't supposed to be part of it, I was too young to be part of it, but I wanted to do it so bad that they just let me").

Alethia, the African American woman, was also constrained in the identities she could author. Her constraints, however, were not in school but in her home. With a controlling father (a Vietnam vet), she, like Kathy, did not have the luxury of authoring identities she found attractive; rather, she authored whatever identities she could, given the resources available, to minimize the impact of her father's power. We note here that we do not read this story as an example of the impact of one individual (the father) on another (Alethia) but again as a story about how one's location in the matrix of oppression constrains the identity choices available. Alethia's father had the power to constrain her choices not because of his individual temperament but because, as a male and an adult, he had more power than his young daughter. Here is Alethia's story about authoring an identity (within her family) as a pre-med student not because it was her dream, but because it was a survival strategy:

> Once it was decided that I would become a doctor, I and my parents sought all resources and inroads available for middle and high-school students. Wait, that is a lie; actually my father was an ostentatious megalomaniac. Our major excuse to leave the house was for anything school related. We (mostly via my brother) therefore sought out all kinds of programs and projects that he would potentially allow us to be able to get out of the house … So that was my high school: doing any and every after school program to get me out of the house and into college.

Note her words: "once *it was decided* that I would become a doctor." Alethia does not present this initial condition as her choice. However, she was able to use this "prospective doctor" identity to get away from her constraints; and, in the settings this identity permitted her to enter, she had the opportunity to author an identity she found satisfying and comfortable. For instance:

> All of the network of college-bound-Black folk were in JETS [Junior Engineering Technical Society], and it was actually fun to go. We got out of the house and got to hang out with kids from our neighborhood and from other schools. At the end of every year, JETS hosted a huge fancy banquet at a local hotel (picture Black women in sequins). Awards were given and prizes given out to the top students (one year I got a fancy HP graphing calculator). My senior year, I was in the civil engineering branch. For our final project we did some visual/laser presentation of the sound frequencies from a tweeter, woofer and sub-woofer speaker. Of all of the fields, I *loved* civil.

Just note how enthusiastically she speaks of engineering; note as well how, in this setting, both being a civil engineer and being a Black woman in sequins were possible; the two were not mutually exclusive. We will return to this point further on in the paper, but for now, we note that

for both Kathy and Alethia, the enormous pressure they faced just to keep body and soul together led them to the same escape valve—and this may be the most astounding finding in this study. Each of them managed to escape settings where they were so constrained that all identity bids were about survival, and to escape them by *fleeing to science settings* where they had the opportunity to author satisfying identities and have those authoring attempts recognized and affirmed.

Conchita also found refuge in educational enrichment programs. As with Kathy's mother and Alethia's brother, she found these programs with her mother's assistance.

> My mom had a big, I guess a panic when she realized that I'd be, you know in [her neighborhood high school] and how the statistics weren't that good and she just felt like I had a better chance at college if I was somewhere else. And especially if it was a magnet program. She never really cared which magnet program as long as I found interest in one of them.

Given what we know about the inequitable distribution of resources to schools serving predominantly students of color (Kozol, 2005; Lee & Orfield, 2007), it is clear how Conchita, growing up in a single-parent Latina home with limited economic means, had her opportunities curtailed as a result of both race and class.

These three stories show us that the components of intersectionality, the components that determine an individual's location in the matrix of oppression, can constrain the successful authoring of identities in three ways. We already acknowledged that individuals' identity pursuits are constrained because of the phenomenon of negative recognition, where gatekeepers fail to recognize their bids to take on a particular identity and instead ascribe negative identities to them. But these women's stories highlight two more ways in which oppression and injustice constrain identity: some individuals can be stuck in settings where (1) the authoring of other identities is more urgent, or (2) there is no way for them to author an identity they find attractive. The women's early bids for science recognition occurred amidst a series of other identity-related struggles. For Kathy, the cultural infighting in her community made the authoring of an identity that would deflect violence much more pressing than authoring a science identity. For Alethia, surviving a household with a controlling post Vietnam vet father was the most salient identity. For Conchita, the most important task facing her as the only child of a Latina single mother was to get the best education available, given a range of limited choices. The locations in the matrix of power where many women of color live their lives can demand that they focus their attention on the authoring of other identities, to the point that carving a *science-related* identity is tertiary, quaternary, or simply not attainable. These women, because of their specific locations in the matrix of oppression, found themselves in settings with little access to the resources they needed to author an attractive, reasonable identity congruent with how they saw themselves and who they wanted to be. Without freedom from the threat of violence, freedom of self-expression, or

quality schooling, they could not possibly be recognized as legitimate science people, no matter how much they saw themselves in those terms.

While their stories demonstrate the ways that individuals' locations within the matrix of oppression constrain successful authoring of identities, we also see that, even in less powerful locations in the matrix, there is room for agency, for resisting that oppression. Each woman managed to find someone who recognized the identity she attempted to author (Kathy's and Conchita's mothers, Alethia's brother) and, in recognizing those attempts, could help her escape to a setting where she could receive wider recognition.

These stories temper our feminist understanding of identity. They indicate that people do not always author an identity as a form of self-expression but sometimes as a survival strategy. At many intersections in the matrix of oppression, people express their agency not by trying to take on the identity of their dreams but rather by trying to live the safest life possible under the circumstances. The women in our study were lucky enough to be able to not only survive but, with support from savvy family members, find settings where they could thrive. Not all science-oriented young women of color are so lucky.

Competing Identities

The most challenging thing for these women was coping with settings where there was no attractive science identity available at all; in some cases, no attractive identity of any kind. When they managed, with family support, pluck and sheer good luck, to pick their way around those situations, they faced a new challenge: Settings where the science identities they wanted to author were in competition with other precious identities. In these settings, one of two things happened. Either the women found that the performances they would have to put forth to author a science identity were in conflict with other identities they valued as women of color; or when they made a bid to be recognized as a legitimate science person, people in the setting instead ascribed an undesirable identity onto them.

Science Identities in Competition With Identities as Women of Color

The first example shows that sometimes the conflicts between the participants' status as women of color and their science identities were not obvious; sometimes, in fact, the women experienced the conflicts as their personal choice. What follows is a story of why Conchita did not take any Advanced Placement (AP) science classes:

> High school was basically the computer magnet program [that her mother helped her enter] and accelerated science courses. However I did not do AP classes in science. I opted out of that. I think my senior year I had put too many extra curricular activities and at the time that was so much more important to me, I guess. Like I was, all four years I played softball and I did yearbook staff. And my junior and senior year I did student council. And then my senior year also was filled with other political stuff, like the school

had a walkout. My senior year though they went to the higher heads and talked about trying to get African American literature and Latino American and Latino history and how come we don't have, you know, different types of programs to actually learn about our story, too? … So I know my senior year was more about getting more culturally diverse courses and education, more resources to the school.

In this case, when Conchita embraced her Latina identity in a vigorous and admirable way, trying to make changes in her school, it endangered her opportunities to author a science identity. She found herself in a position of opportunity, of relative voice in the matrix of oppression, from which she was able to contest structures of oppression. The cost, however, was to her science preparation.

In the next example, Alethia tries to preserve an identity as a (hip) Black woman. Alethia is mixed race. Authoring her identity as a Black woman was already more difficult than it might have been for others; doing well in science left her open to being recognized instead as a nerd:

> So I took physics. I was in the class, therefore, with a mix: some nerds, and some folks just coming to class (most notably, those football players). All this to say, that this mix of students presented a conundrum for me: how to excel enough to get a good grade for my "pre-med record" but not seem too smart as to be a nerd. Basically, I had to downplay anything and keep my grades a secret.

Alethia saw her best strategy as trying to fly under the radar, accumulating the skills she knew she would need in future attempts to enter science setting without letting others in her class realize what she was doing. This example illuminates Alethia's awareness while she was in the setting that she was constrained from authoring a completely legitimate science identity. Stepping toward a science identity meant stepping toward a nerd identity. This was not a setting that made it easy for her to be a smart, hip, scientific woman of color.[6]

For Kathy, the competition between identities was even more untenable. As an undergraduate, Kathy was told that, to complete her biology major, she had to dissect a frog while she was pregnant, an action violating her religious beliefs. When she petitioned to be allowed to only observe the frog dissection rather than participate, she was told that if she would not dissect the frog, she would not be permitted to major in microbiology. Here, a requirement for being recognized as a microbiology major was in conflict with a deeply held tenet of her identity as a traditional member of her tribe. We have recounted that story at length elsewhere (Carlone & Johnson, 2007), but want to return to it briefly, as the lens of intersectionality really illuminates it. That experience would not have happened to men from Kathy's tribe, as her pregnancy was the central factor. For people from Kathy's tribe, dissection is never a good thing, but for a pregnant woman, it means putting the pregnancy in peril. Nor would it have happened to women not from her tribe, pregnant or not; it is not a simple example of racism or sexism, but an illustration of how these two factors work together in complex and unpredictable ways.

Each of these women found themselves faced with, as Alethia put it, conundrums: How to resolve conflicts between cherished parts of their identities as women of color and the requirements for authoring identities as credible science students. Each of them managed to exercise agency to solve her particular conundrum: Conchita by taking an extra year of college to cover the material she would have seen in AP science classes; Alethia by going undercover with her science aspirations; and Kathy by taking her dissection fight over the head of the biology department, to her dean. However, these are not fights they should have had to fight. Conchita should not have had to spend a year organizing a walk-out in order to have access to an excellent public education that included people like her in the curriculum; Kathy certainly should not have had to choose between her religious beliefs and her college major over anything as trivial as one frog dissection; and Alethia should not have had to believe that academic excellence means being a nerd. A person's location within the matrix of oppression should have no bearing on their ability to become a scientist. Success in science should depend on ability, interest, and a willingness to do the work; not on race, gender, affluence, or religion.

Science Identities in Competition With Unwanted, Ascribed Identities

In the previous examples, the women experienced a conflict between their science identities and other identities they valued as women of color; in some sense, they took on those conflicts willingly. Conchita could have left someone else to fight her school system; Alethia could have embraced the nerd label; and Kathy could have dissected the frog or, frankly, have done what many undergraduates did before her: simply let her lab partner do all the work and then take the credit. They experienced constraints in authoring identities, but they also experienced opportunities. The next examples, however, describe deeply constrained settings, where our participants were forced to cope with having unwanted identities, identities born out of racist and sexist stereotypes, ascribed to them. The first story comes from Conchita. Early in her undergraduate career, Conchita volunteered for almost a year at the university's athletic department, as a student trainer. She saw this position as a way to strengthen her pre-med identity. The volunteer job was time-consuming–often students worked 40 hours a week, for no pay. What follows is a story about how her racial identity and her status as a woman made authoring an acceptable identity in this internship more difficult for her than it would have been for someone inhabiting a different location in the matrix of oppression. The first story took place at lunch on the first day of the volunteer training; both the trainers and the athletes they worked with were present.

> And I knew a lot of the athletes because: (1) I had been there [at the university] for a year already, and (2) strangely enough, a lot of the athletes are minorities so all of our paths crossed somewhere. And then I was also dating an athlete, so a lot of his friends I had already met. So I remember the director saying, 'How do you know all these people?' And I was like, what kind of answer do you give to that?

And I said, 'Well, I'm a student of color', and he turned to another student and he said, 'Adam, aren't you a student of color?' And he said, 'Yes, I am beige.' And that was it. And they started talking about something else. And I just was sitting there like, uh, do I respond to that and if I do, what do I say, and it's definitely past the point of being witty to even respond because now they're talking about something else.

Here, important others positioned her in a way that not only competed with her increasingly established identity we saw back in the walk-out story as a politicized woman of color, but demanded that she author an impossible identity: that of a color-blind, gender-blind person in a setting characterized by racial and gender dynamics. We see just how impossible this is as Conchita recounts the kinds of identities ascribed to her:

Female trainers didn't get any respect because some of them were dating some of the football players, now what they chose to do on their own time is their own time, but there was a lot of stereotype, 'Oh, you're just a groupie. You just want to be around the athletes.' So then that trickled down to anybody else who was female.

Again, an unwanted identity—this time related to gender—was ascribed to Conchita in such a way that it was very difficult to author her pursued identity as a budding, legitimate pre-med student. In her volunteer job as a student trainer, both race and gender worked against her, though not in the most predictable ways. Her race worked against her when she was in a setting with colorblind norms (as evidenced by the fact that it was a joke for a White person to call himself "beige") but she found herself publicly owning her racial identity.[7] Her gender worked against her because of prevailing beliefs in the setting about why women might want to be student trainers (so that they could date the male athletes). These dynamics had nothing to do with her own motivations (related to her pre-med aspirations); as Lorde (1984) said, Conchita herself was invisible even when, in this case, her gender was highly visible. People in the setting ascribed unwanted identities onto her based on both her race and her gender, so that her ascribed identity as a woman of color not only competed with, but prevented her from authoring the identity she really wanted to pursue—a legitimate pre-med student.

In this next story from Alethia, the racial and gendered dynamics are again complex. It is the story of going to an interview, during high school, arranged through a program to get more students of color to go into business.

I wore to the interview a business suit with flats, stockings, and ugly shoulder pads (I think it was the kind that even has a faux camisole that goes underneath). I flat ironed my hair, printed my resume and went to the interview (I think my mom drove me). I cannot remember much about the interview, like the kinds of questions they asked; only what they talked about and how they looked. But I walked in to see the previous applicant sliding out. He was a taller Latino guy with a nice blue suit; in his swagger and confident

demeanor I think he walked the walk and talked the talk, he played the part. I swallowed my insecurities and strutted ahead.

Note how intentionally Alethia orchestrates her performance, trying to de-emphasize her race (straightening her hair) while dressing like a professional woman (shoulder-padded suit). Note also her account of the interviewee before her, whose performance seems more plausible than her own. The story continues:

I remember having three consecutive interviews, followed by a wrap up with the guy I first met. In short, I was there all day. Person after person explained to me the way civil engineering works; contracts are established and [the company] determines how they will be executed. Finally, interviewer #2 asked me a series of questions about being on site when construction is done; he lingered on the description of wearing a hard hat; he asked me about interacting with contractors, workers and the companies seeking design themselves. I hit back with my unbridled enthusiasm and ability to liaise with all folks. Finally, he asked, "so how does a career in the field of construction sound to you?" I thought, "Construction!? It sounds like blue-collar, over worked underpaid shit! How does it sound to you? I am not here to do construction, I want to be an engineer!" I b.s.'d some response about how this field would open opportunities and crap crap. That was it. Right there: I was done. Even if I got the job (which I didn't) I decided I didn't want it. He had me convinced that to be a civil engineer was to work in construction … From then on, I just wanted to be a doctor.

Here, we see how her interviewer, in her recollection, gradually amped up the suggestion that the identity she was trying to author would be in competition with the constraints of the identity he ascribed to her as a woman, until she finally just gave up. Hers was not an identity bid he was going to accept, nor, after he portrayed it as (highly gendered) construction work, was it an identity she wanted to pursue; even though earlier, as a result of her work in the JETS program, she had found herself strongly pulled to civil engineering.

Effects of Dealing With Competing Identities

Each of the women in this study reported on how trying to mediate competing identities affected them. In the first example, Kathy talks about how it impacted her to know that she was constantly in danger of having an unwanted identity ascribed to her:

I felt very alone [at college]. And that was part of the problem. And being at the university was very hard … If you ever took like American Indian history classes with a bunch of freshmen that are not coming from the same background as you, you just get a lot of, just really stupid comments, and ignorance … Just having to deal with that, and the attitude that came along with that. I just felt like I had to be on the defensive.

Note how she ended—that being on the receiving end of an ascribed identity put her on the defensive. Kathy did not make a connection in this quote between fending off unwanted identity ascription in American Indian Studies classes and her experiences in science classes. However, Kathy told the story as part of her narrative of her science life history. In her own understanding of her life in science, she saw this as relevant: Her awareness of how others viewed her as an American Indian made the work of authoring other identities that much harder. This reminds us again of the power of intersectionality: Kathy's experiences as an American Indian woman in one setting color her interpretation of events in other settings.

Alethia's story comes not from this study but from interviews conducted for an earlier study, in 1999, when she was a senior in college; however, it is a clear example of how being "on the defensive," as Kathy describes it, can impact a student in science. By this time, Alethia had realized what Conchita did not yet know (or at least was not able to circumvent) at the athletic lunch: Acknowledging race interferes with one's bids to be recognized in some settings. But rather than understanding that this resulted from the setting forcing her various identities into competition, Alethia found herself feeling "messed up:"

> I was doing my report on Graves' Disease a couple weeks ago. There's different genes related to Graves' Disease, for different ethnicities, and for a long time, they were like, 'OK, it's just this one gene,' but it was only found with White people. And I thought that was really interesting. But then in my presentation, I was like, 'Should I mention the part about African Americans having a different gene?' And women get affected a lot more. And I thought, 'Damn, that's kind of messed up, that I should re-think presenting—it's as normal to the disease as its symptoms, know what I'm saying?' But still, I sort of felt, 'Damn, should I not mention that?'

In this example, something Alethia needed to do to be recognized as a legitimate science student—give a full report on a particular disease—was in competition with something else she needed to do to be legitimate—downplay her race and gender. Alethia's 2008 interpretation, over 10 years after the incident: "I think the point is that, given the conspicuousness of my race/gender, I felt the need to downplay it when discussing the disease—but that wouldn't be very scientific, as it is a very real part of the disease phenomena, no? So this is a moment where a bid does not necessarily get rejected, but intersectionality emerges: how to be a good scientist, but not overstate the obvious characteristics of my being."

Finally, we include an example from Conchita, who started college getting good grades in science classes. However, her grades declined throughout the athletic department debacle, and Conchita ultimately found herself in a position where, after completing all the classes she needed, her grade point average was too low to graduate. She went to her department and asked if she could receive independent study credit for a research project on Latinas and diabetes in which she was already involved. Here, as she recounted it in an email some time after we interviewed her, is what happened:

Another bad moment was when my kinesiology advisor told me, 'Quite frankly, Conchita, we, the Department, don't believe you have what it takes to graduate. You have many classes under your belt, so just transfer to sociology or communications so you can at the least graduate.' I remember that like yesterday. I still have a pic of that woman for motivational purposes. They made me feel like I squeezed by to "finally" graduate.

We include this example not only as an illustration of the worst experiences these women went through—being explicitly told they were not "science material," even after completing the entire major—but also to illustrate the women's agency. In this case, Conchita not only found a way to graduate in the face of this discouragement; she also used the incident as motivation.

This section highlights the power of ascribed identities. In each of these stories, our participants have a strong sense that they belong in a setting, that it is a desirable place for them and they have the pre-requisite skills to succeed there, be that setting high school physics class, college, or an internship. We see them carefully choosing the elements of themselves to emphasize as they bid to be recognized as belonging in that setting, right down to the way they wear their hair. We see that some science and science-based settings demand that women deemphasize parts of themselves that they value; in some settings, in fact, this proves impossible, because the negative identities which are ascribed to them are impossible to shake. And this is sometimes conveyed directly (e.g., see "beige" story) but other times appears as fears of having negative identities ascribed, or as a sense that certain topics are taboo. We also see the damage that is caused when an unwanted identity is ascribed to them. This damage ranges from discouragement and loneliness (in the case of Kathy in a class on American Indian studies) to being denied a job and in fact deterred from pursuing a career in which she had previously affiliated (in the case of Alethia and the civil engineering program) to losing a year's worth of time and energy (as Conchita did before she finally dropped out of the internship in the athletic department). We note also the power of seemingly little exchanges—a lunch conversation, an overheard comment—in propelling or repelling the women's authoring attempts.

In these stories, negative recognition did not lead in a simple, linear, cause-and-effect way to curtailing these women's opportunities. Alethia got another job, Kathy quit taking American Indian Studies classes but put more energy into her biology classes; even when Conchita was told to switch majors, she found another way to graduate and pursue science further. Each woman was able, again, to pick a path through this minefield of negative ascription; each found a way to exercise some agency. However, the cumulative effect of all this was profoundly discouraging. Other students seeking to author similar identities could do so without this constant work of balancing competing identities and fending off ascribed identities. These stories, these processes, help us understand the minute-by-minute dynamics by which science remains predominantly White and male despite there being room for agency; they help us understand how power continues to reside primarily in certain kinds of people, even when a few particularly lucky or particularly hardy outsiders make their way into high-status places.[8]

Successful Identities

Fortunately, each of these women found settings where they were able to successfully author identities as legitimate science students or professionals; where they were able to put together bids for recognition that did not conflict with other identities they valued or force them into contortions because of having negative identities ascribed to them. For example, Alethia discusses a program that served all three participants (the program through which Angela recruited them to the original study):

> Second semester [of college], I got into [the science enrichment program] and literally my world changed. I started studying with [two other Black women]. We sat together in class and I had a budding support system. I started doing better in biology. On the third exam, for which we pulled several all-nighters, I actually got a score that, with the curve, qualified to be an A. I was so happy because I knew (everyone knew) genetics was a hard class.

Note the recognition she talks about—both recognition of self ("I knew") and recognition by others ("everyone knew") of her as legitimate science student. By receiving an A in a class where exams were graded on a curve, Alethia realized not only that she had performed adequately but that she had *out-performed* most of her classmates. Notice also how she highlighted the importance of studying with other Black women.

Next, a story from Kathy, during graduate school: her pharmacy program not only was more diverse but did not force her religious identity into conflict with her new identity as applied scientist. Recall first what Kathy said earlier about being at a predominantly White research university ("I felt very alone at college … I just felt like I had to be on the defensive"). At the pharmacy school, in contrast,

> The thing with that program that was so different from, of course, [university] was that program was diverse. I mean it truly, truly, truly was. Although I was the only Native American, I wasn't the only brown person. … And so, it wasn't like I was the only one that was different. So, I didn't have to deal with those kinds of issues. And then, as far as like science issues, biology issues, we didn't have that sort of hands-on lab kind of thing. We didn't have to dissect anything, it was more to do with drugs.

Once Kathy found herself in pharmacy school, many structural constraints were gone. She was not only not "the only brown person", but she was in a setting where her authoring attempts to be an avid science student were not compromised by her religious unwillingness to cut apart dead creatures, because that was not a necessary component of the actions associated with being a "real" scientist in pharmacy school.

Now a story about what happened to Conchita when she found herself in a setting with opportunity, where her skills were highly valued and so her bids for recognition were accepted

eagerly. While working on a master's in public health, Conchita got a job as a technician in a physiology lab. However, because of both her kinesiology background and steady hands from many years playing the violin, the principal investigator in the lab trained her to take on a role far beyond that of "just" a technician. She had the dexterity to perform a particular technique that was both difficult and important, and as a result she consistently and successfully authored an identity as an important member of the lab; it was out of this basis that she went on to co-author and author a number of scholarly publications. As she recounted in an email at the time,

> Me and the scientist who trained me are the only ones who know how to do the RNA isolation so it's nice, because everybody will come to me for help. Not just the folks in my lab. That's another reason why I was able to be on so many publications is that they came and asked for my expertise or they came and they asked for my technique, or they came and they gave me tissue.

Note the way that other members of this setting formally recognized Conchita as belonging, by asking for her expertise. She went on to talk about an experience attending a professional conference, at which she ran into one of her professors from her undergraduate institution who had told her she should not graduate in kinesiology:

> I'm standing by my poster, dressed in my little suit at the time that I'm supposed to be presenting my poster. And my little poster has my name on it as primary author, it has my little school seal on it. And the chairman of Kinesiology and [the other professor who told that she should probably go into communications] walked by. So I was like, 'Hi, you remember me? Yes, hi, here I am.' And they're like, 'Oh, what are you doing these days?' And I'm telling them, 'Oh, this is my poster right here.' And they're like, 'Oh my gosh, you're at [well-known medical college]?' And do you know so and so?; And I'm like 'Yes, actually he works right down the hall from me. I actually run his RNA for him.'

Not only that was, of course, a tremendously satisfying experience for Conchita, but note how she describes the performance she orchestrated to indicate that she belonged in this setting: the outfit, the poster, the "little school seal," and of course the name-dropping; her experiences as a lab technician gave her the opportunity to author an identity she was constrained from performing when last she met these professors.

And one last story for this section, from Kathy, who talks about how she found a setting, the Indian Health Service (IHS), where she was able to integrate her values as an American Indian woman with her science identity:

> I'm in it for the long haul, the full 20 years or so. Twenty–thirty years. That's why I got into IHS, because you really don't get into IHS for the money. You have to be there because you want to help people … So, I don't know why I would go with any other health systems, because that's who I am. After my grandmother passed away, I was like, 'Well, ok. What am I there for then?' It finally hit me, it would seem so obvious, "What

is your family? Where does you family go? Where does your uncle go to receive healthcare?" They go to IHS. "Where do your aunts go?" They all go to IHS. So, you know, I have to stick with it, I have to stick with IHS.

She is in the IHS because "that's who I am." Not only does the IHS let her practice her altruistic values, but it is where her own family goes for health care. The IHS provides her with the opportunity to author herself as a credible, legitimate science person, getting recognition from other pharmacists (through working at a large research and teaching hospital) and from her community (by serving the health needs of other American Indians).

The stories in this section tell us about the characteristics of settings where it is easier for women of color to successfully author science identities. Notice that none of these settings focused on stimulating interest in science; on drawing these women into the pipeline. Our participants all already wanted to be in the pipeline; they were fighting to first get in it and then stay in. Instead, the settings worked by providing opportunities for the women to author identities without feeling conflicted; these settings did not force the women to downplay parts of themselves, nor did the settings foster the ascribing of unwanted identities onto them. In these settings, the dynamics of race and gender were either central to the setting ("black women in sequins," "where does your family go?" for healthcare), relatively common ("I wasn't the only Brown person"), or not a central focus (settings where the ability to perform a particular technique was valued). In these settings, the women's scientific ability, rather than their race or gender, could be the central focus of their attempts to author legitimate identities.

Identity Work Is Ongoing But May Get Easier

In the interviews and follow-up emails, the women mostly talked about where they had been before; they were telling stories that they had had years to think over and make meaning of. They also, however, talked a little about the present, and those stories had a different tone, an uncertain tone that lets us see how the authoring of identity is not something once achieved and finalized, but a continual, ongoing process. The bidding for recognition continues, and, these next two quotes suggest, at each new level, even one's self-recognition can be threatened. The first quote is from Conchita, during her first semester pursuing a PhD:

> Now what? PhD dammit and struggling. I see this first semester as a clear reality of having to actually put in the work and the MPH/working in lab has helped me realize how to manage time, how to crack open my books, actually study to retain … improve my writing. The struggle isn't over, just began all over again, because once I get this degree, I still have to prove myself worthy to be a card holder. I want to say it is a stamp of approval … but into what? A male-dominated field? It's also been interesting to see there are like 3 people of color (excluding Asians) in my program. And I think, "Am I 'passing'?"

In this quote, Conchita recognized how her previously successful attempts to author a science identity served as resources for her authoring attempts in this current setting, but she was still not sure she was going to be able to successfully combine her various identities in this new place. Notice, also, that she had a new worry: She had begun to fear that she might be passing as White; that the people in the new setting where she was bidding for recognition might not even recognize that she was a woman of color. She actually changed her last name (because during a job interview, she had been asked, based on her name, if she was Jewish, presumably as a way for her interviewer to make more comfortable sense of her appearance) to another family name (a more traditional Hispanic name). This is another interesting twist revealed by using an intersectionality lens: Conchita was proud of her status as a woman of color; for all the difficulties it may have caused, for all that she may have ruined her chances of building an identity as a student trainer by acknowledging it, she was proud of that identity and sought to have it recognized.

In the next quote, Kathy talks about research she just completed on MRSA [methicillin-resistant *Staphylococcus aureus*]:

> Angela: Are you going to submit it for publication?
>
> Kathy: I don't know. I thought about, I thought about submitting it, and my boss was encouraging me to submit it. But I don't think, I still can't write scientific papers. I just don't know that it's powerful enough to, you know, share with anybody.

So even though Kathy's boss encouraged her to submit her work, she was not sure she could do everything that goes with the identity she had already begun to consistently author, that of big-hospital research pharmacist. Thus, in these two stories, we see the tentativeness of these women each time they entered a new setting, the need to first firmly establish for themselves their belonged in that setting. Identity work is ongoing.

Negative ascription also continues to threaten the women. However, their skills in dealing with it have evolved. In a 2009 conversation with Angela, which started out as a chat between old friends rather than an interview, Conchita talked about her doctoral program. She has found an area of research that appeals to her, one that lets her unite bench research and data analysis with her public health concerns. Because this area also addresses a significant gap in the literature, she has received several attractive offers for research positions and post-doctoral research opportunities. However, she still has to fight off negative ascriptions. For instance, in an encounter with a professor in her department, the woman pulled out Conchita's file, brushed over her accolades from her master's program and instead quizzed her about her undergraduate academic record. She scoffed at Conchita in the presence of other students and asked her "How did you even get into this program with your undergraduate grades?," then finished "Oh, you checked the minority box." For the professor, being Latina was tantamount to low achieving/being admitted on affirmative action and not on merit, even in the face of evidence

that justified Conchita's merit. For Conchita, it was revisiting the "beige" moment; she was back in a setting in which the norm was to espouse color-blindness and not acknowledge the way resources are unequally distributed across the matrix of oppression. However, this time, Conchita's goal was to deny this professor the opportunity to perpetuate negative impressions of her, not only to preserve herself from the unpleasantness of such an encounter but so as to protect and continue to fight for her pursued identity in the setting, of competent, burgeoning scientist. She did so by both seeking out allies and carefully controlling her speech and behavior in the presence of the professor.

Alethia, meanwhile, has found herself again in professional settings that forced her identities into competition, but, like Conchita, reports a growing awareness of how to handle them and also when to walk away. In a 2009 email, she recounts several stories and the relationship she sees among them:

> My first "real job" interview (to be an HIV Counselor/Tester) I remember in the interview wearing my hair down and gelled up so it wasn't too poofy. But at some point, I actually tucked my hair behind my ears (well made the motion, there was no tucking of my hair behind any ears). But in a gesture that I must have seen white girls in my school do for years. In a way to … I don't know … appear more … What? Palatable. But I laughed in that moment because I realized in my interviewer's conversation that she was queer (she talked about her partner. I literally laughed in my head, thinking, 'Oh! She's queer, she doesn't need any of my fakeness, she gets being on the outside.' Really! I said it to myself then … it was when she stood up to get files … and I noticed the complete outfit—boots, pants, polo …).

In this account, Alethia recounts her awareness in the moment that she was posing, trying to downplay her racial status by using gestures common among White women, a process she calls "my fakeness." She also recounts how she suddenly realized that, unlike in the civil engineering interview 6 years prior, in this situation she did not need to do this. She went on to talk about this awareness of identity construction in another incident as well, one which just occurred recently. Alethia was invited to be a paid advisor to a program supporting girls of color in the sciences, similar to the programs where she first found her science identity bids being recognized. However, when she sent in her letter of introduction, where she identified herself as a radical feminist, she was asked first to delete the reference to radical feminism and then eventually to step down from the paid role to a lower-profile position as an informal advisor.

> The radical feminist deletion was, well, expected. I joked with [the PI on the grant], 'I knew it!' as soon as she disclosed what needed to be edited. I *did* know it. Like I know to "tuck" my hair, like I know to up my [western] flat accent, and throw in words like "unequivocally" when I need to. It literally IS what it IS. I therefore KNOW when I need to pull out. But that, that is really the bitch of it. That we all know when to "man up" "straighten up" "butch up" "queen out" or "whiten up" as needed …

I feel less saddened than galvanized. But this is what we do, and deletions like these are WHY we do it. Once we figure this big racist system out, then we won't have to be doing this anymore …

Alethia is still engaged in the same process she used back in high school, of choosing which components of herself to emphasize or de-emphasize in order to gain entry to high-status positions. She has become more self-aware, and has finally reached a point in her career where she feels at liberty to choose not to de-emphasize parts of herself just to gain that entry. But the need to balance, to constantly construct and monitor an identity, is ongoing for all three of these women. This balancing of identity is on top of the work in which everyone in science settings engages; these women's stories teach us how much more difficult it is for them than for others in the same setting to constantly (re)enact and (re)establish their identities. Further, there is some evidence that they may be becoming more conscious of it, more adept at it. Their skills at putting together winning combinations and developing successful responses has grown precisely because they have had to practice it over the years.

Further, intersectionality continues to render these dynamics subtle and nuanced. In the last story, Alethia was invited to be an advisor on a science enrichment program precisely because of her status as a Black woman in science; in this instance, occupying that intersection gave her an opportunity, provided access to power. However, she turned out to be the wrong kind of Black woman in science; the radical feminist kind. Again we see the way that intersectionality leads to unpredictable results. Alethia's experiences as a woman of color in science supported her decision to take on a politicized identity. She then used the insights from authoring that identity successfully over the years to more easily navigate through science terrain; however, this politicized identity, even though it was intricately bound up with her experiences in science, led to her rejection as a resource for other women of color who would follow her path.[9]

Discussion

In this section, we first shed some light on our research questions, and then present a new idea which emerged from our data, the idea that skill at authoring identity can grow and that women of color may, because of their experiences having to fend off ascribed identities, become particularly good at authoring acceptable identities. Throughout the course of this, we explore the twin purposes which drove this research: illuminating pathways taken by women of color through the sometimes-hostile terrain of science, and using insights from that process to better understand how power structures are reproduced and contested. Finally, we present some implications of this study.

Research Question 1: Authoring Identities

What science identities were our participants able to author? What were the limits on the science identities they were able to author? How did participants' other identities affect

their authoring of science identities? How did the identities others ascribed to them affect their authoring?

This analysis cautions us that identity, as a tool for analyzing inequity and power, must be used carefully. Identity must be understood not to imply that all individuals have full choice in the identities they can author, but as something that operates within the matrix of oppression. Not all identities are available to all individuals. When the women were in their most constrained positions in the matrix of power, there were some identities that were simply closed to them, simply not an option. Kathy, for instance, until her mother got her into a special program, could not author the identity of ambitious science student because there was no one to recognize her bid. So many young women of color in the United States are stuck in schools with few resources and much violence, schools where, even if they self-identify as science people, there is nowhere for them to make such a bid, nowhere they can learn the fundamental academic skills necessary to get out of those schools and into college, taking the first step towards a science career. And even if there are some good, caring teachers in those schools, teachers who might be able to recognize initial attempts to author science identities and offer the kinds of academic skills which the young students will need if they want to take their authoring to the next level, it still may not be possible for young, science-oriented women to take advantage of this; they may, like Kathy, be too busy just trying to keep body and soul together. So the first thing that this study tells us is about both why there are so few women of color in science and how we must make sure our uses of identity are not centered too completely on issues of "personal identity." While some people who occupy relatively powerful intersections in the matrix of oppression have the luxury to author identities of their dreams, there are others who can only author identities that will let them survive.

These women's stories underscore the importance of seemingly trivial interactions in sorting out how power gets negotiated in the process of authoring identities. Over and over, they bring up small exchanges through which their status was sorted out: comments overheard in classes, a conversation during lunch, questions in a job interview. In each example, these small incidents were vehicles through which established members of a setting indicated that they were rejecting our participants' bids to be recognized as legitimate science people and were instead ascribing unwanted negative identities onto them, questioning their worth and appropriateness for the setting. Ong (2005), in her study of women of color studying physics, found the same thing: "it is often the 'little things' that make minority women feel that they do not legitimately belong in the physics field" (p. 613). We borrow a phrase from hooks (2000) and call these moments "rituals of disregard." She uses the phrase in a different context, speaking of the failure of love: "Often, our spirits have been broken again and again through rituals of disregard in which we were shamed by others or shamed ourselves" (p. 217). Nonetheless, the phrase—as well as her invocation of shame—seems to fit these moments.

Our participants started with an interest in science, supported in school and after-school programs. In this, they are similar to the under-represented minority science majors in a study by

Hurtado et al. (2009), who expressed both their initial attraction to science and the ways their teachers encouraged it. Our participants all eventually located settings where they were able to author science identities which were recognized and thus legitimated by more-established members of the settings. Doing so, however, involved balancing their science identities with other competing identities they desired to author, while fending off undesirable ascribed identities. They were not always successful in their attempts to do this, and they were not always satisfied by the results. We are reminded of Ong's (2005) finding, that even when her informants were able to gain acceptance in physics settings, the strategies they used "were successful because they helped women of color appear scientifically competent, but they came at the cost of time and effort that could have been invested in learning and doing physics. Moreover, they involve the profound cost of denying or diminishing other facets of their selves" (p. 606). These difficulties arose from structural features, from our participants' locations in the matrix of oppression.

Research Question 2: Structures

> What structural constraints and opportunities did our participants experience as they sought to author science identities? How were those constraints and opportunities related to their location within the matrix of oppression?

This analysis illustrates the power of intersectionality to deepen our understandings of power, structure, and agency. Intersectionality helps us understand how the status quo gets maintained, because we can see how the women in this study, because of their locations in the matrix of oppression, found themselves facing more onerous tasks than other students who attempted to author the same identities. Kathy, Alethia, and Conchita had to first survive long enough to make it to settings where there were attractive identities even available to author and where there was someone to recognize the authoring attempts. In their cases, this happened in their families, educational enrichment programs, a magnet high school, and university. Once in these settings, they frequently had to figure out how to balance competing identities; how to orchestrate a credible bid to author a science identity without compromising components of their precious racial and gender identities. Further, they had to fend off the danger of having unwanted identities ascribed to them based on their position in the matrix of oppression. Similarly, the participants of Hurtado et al.'s (2009) study reported in focus groups "facing obstacles of limited educational access and skepticism regarding their intellectual talents" based on stereotypes about their race (p. 206). The ascription of unwanted identities—and the discouraging after-effects of their ascription, as well as the ensuing fear of further ascription—proved to be one of the major vehicles that maintained the status quo. Their skill at finding locations and orchestrating combinations to avoid the ascription of negative identities was probably the most important factor explaining why these women survived and are now working in science-based fields.

Intersectionality also made it easier to understand the areas that agency (i.e., agency for change in the face of oppression) was available to these women. Their particular intersections as women

of color frequently worked against them, especially in science settings, by making them vulnerable to negative ascription. Sometimes, however, their intersections gave them some relative benefits. Alethia, for instance, was able to interview for internships as a result of participating in a program for students of color; all three of them had access to extra educational enrichment through a college science support program. These vitally important programs, however, while they were preferentially available to these women because of their under-represented status in science, did not give them advantages over White students and male students. Rather, the programs created spaces where, briefly, the women were not in danger of unwanted ascription of negative identities, and where it was possible, even easy, for them to combine their racial and gender identities with their science identities. In these settings, the women were free to concentrate on learning and practicing science. In other words, these programs created spaces where these women were able to participate in science in the way that White men almost always participate; comfortably, without compromising valued parts of themselves, without being seen as outsiders. They were able to author science identities, with the focus on their science skills, knowledge and aptitude, on what they knew and could do, rather than on their race and gender. We must ensure that programs like this continue to receive funding and support; and we would like to take this opportunity to express our gratitude to readers who have worked in and created programs like this.

Research Question 3: Changes Over Time and Space

> How did authoring processes change over time and space? How did structural constraints and opportunities change over time and space?

Finally, this analysis highlights the way that a science identity was not something these women attained once and for all, but, rather, something they worked at continually. This identity work was especially visible at each new stage in their career. Every time they entered a new setting, they had to return to making careful orchestrations and tentative bids for recognition, and warding off unwanted ascriptions, to see if they could find ways to author science identities that were not at the expense of other identities they valued. Malone and Barabino (2009), in their study of 21 women of color in graduate school in science, described their participants navigating "a more densely racialized environment for these women who do not know whether they will be read as a person of color or as a scientist" (p. 501). Identity was not something they achieved. It makes more sense to think of this process as identity *work*; endlessly, exhaustingly ongoing.

This brings up a central question: How did Kathy, Conchita and Alethia manage to persist, to do this work for so long, and to do it so well as to now occupy relatively high-status positions in science-based careers? Reading a new situation, a situation where one is in peril of being seen as an interloper, where one is constantly in danger of being judged through the lens of negative stereotypes, requires skill. Malone and Barabino (2009) describe it as "continued racial vigilance as a student reads ambiguous peer and faculty interactions" (p. 505). And just reading the situation is not enough; the insights must *immediately*, in the moment, be translated into

adjustments to one's performances of self (e.g., one's speech and behavior) so as to assemble a credible identity bid while fending off negative ascription. Conchita talks about her awareness, in the moment, of her failure to do this in the "beige" incident: "And they started talking about something else. And I just was sitting there like, uh, do I respond to that and if I was, what do I say, and it's definitely past the point of being witty to even respond because now they're talking about something else." In a happier account, Alethia remembers her realization, mid-interview, that she could relax an identity bid: "I literally laughed in my head, thinking, oh! She's queer, she doesn't need any of my fakeness, she gets being on the outside," even taking the time to underscore that this is not a realization ten years after the fact but something she was aware of at the time: "Really! I said it to myself then … it was when she stood up to get files and I noticed the complete outfit—boots, pants, polo …"

La Facultad

Anzaldúa (1999) has provided us with a name for this ability to read and respond to a situation. She calls it *la facultad*: "*La facultad* is the capacity to see in surface phenomena the meaning of deeper realities, to see the deep structure below the surface. It is an instant 'sensing,' a quick perception arrived at without conscious reasoning" (p. 60). Although she makes it clear that this ability "is latent in all of us" (p. 61), she specifies that:

> Those who are pushed out of the tribe for being different are likely to become more sensitized (when not brutalized into insensitivity). Those who do not feel psychologically or physically safe in the world are more apt to develop this sense. Those who are pounced on the most have it the strongest—the females, the homosexuals of all races, the darkskinned, the outcast, the persecuted, the marginalized, the foreign … It's a kind of survival tactic that people, caught between the worlds, unknowingly cultivate. (pp. 60–61)

Nor, although it conveys some benefits, is it a good thing, as it is acquired through pain and injustice: "We lose something in this mode of initiation, something is taken from us: our innocence, our unknowing ways, our safe and easy ignorance" (p. 61).

Notice that *la facultad* is the child of both structure and agency. It is born when individuals are knocked up against the cold realities of structure, when, due to their relatively powerless location in the matrix of oppression, they are "pounced on the most." It is, however, a faculty of agency: it is the ability to quickly navigate that structure in the safest way possible, under the circumstances. Moya (2001) calls *la facultad* "a partial manifestation of the latent epistemic privilege that most nonwhite women are situated to possess as a result of being subject to a multitude of oppressions; … a special advantage with respect to possessing or acquiring knowledge about how fundamental aspects of our society (such as race, class, gender, and sexuality) operate to sustain matrices of power" (p. 471). She is careful to note that *la facultad* emerges from experience, but that while some people "are better situated than others to

develop *la facultad*," we must avoid the "essentialist trap of assuming a determinative relationship between social location and consciousness" (p. 472). Not all women of color will develop *la facultad*; however, women of color, in this case women of color making their way through the high-status arena of science, are often well-positioned to have the sorts of experiences that give rise to *la facultad*.

We are not the only authors to document this ability; Ong (2005) seems to be describing something similar in her account of a Black physics undergraduate, Kendra, who gradually began playing the "character" of a loud black girl:

> Kendra increased her visibility through a calculated effort to enhance her blackness; in doing so, she outwardly resisted compliance with the appearance of the standard physicist. Nevertheless, her strategy enabled her to be accepted, not shunned, by others in her department. As she increasingly assumed the features of the 'loud black girl,' she embodied for her faculty and fellow students a recognizable and comprehensible stereotype. (p. 608)

Given this understanding of *la facultad*, we need to return to some of the stories in this article: Conchita, not taking AP science classes because she was involved in political organizing on behalf of Latino students, and her inability to embrace a colorblind stance; Kathy, finding her place in the Indian Health Service precisely because "that's who I am … It finally hit me, it would seem so obvious, what is your family? Where does you family go? Where does your uncle go to receive healthcare? They go to IHS"; Alethia, being asked to step down from a position of helping mentor other young women of color because of her self-identification as a radical feminist. We need to consider whether these overt political and cultural commitments are not just results of these women's individual temperaments but rather are related to the fact that they have been able to stick it out and attain their current positions in science. If Anzaldúa is right about *la facultad*, it seems possible that the more conscious a person is of inequity, the more identified they are with their own cultural background, the more likely they are to develop the very skill that let these women persist. Science settings, by demanding that women of color face additional obstacles in authoring a science identity—by demanding that they not just be competent in science but also be skilled at mediating competing identities and at heading off negative ascription—require facility in *la facultad*. Settings like this may actually be selecting for more politicized, more racially identified women of color. These women have survived because they are particularly good at playing the game; but they are good at playing it because they have had to play a harder game than anyone else.

Implications

So what does this mean? That only women of color with *la facultad* will make it through science? That we should somehow help women develop *la facultad* as a survival strategy while we wait for things to get more fair? In fact, this approach would not be without precedent. There

is a long African American tradition of pursuing education as a form of resistance, and of teaching Black students strategies of resistance as part of the curriculum. "For African Americans, from slavery to the modern Civil Rights movement, … [y]ou pursued learning because this is how you asserted yourself as a free person, how you claimed your humanity. You pursued learning so you could work for the racial uplift, for the liberation of your people. You pursued education so you could prepare yourself to lead your people" (Perry, 2003, p. 11). Delpit (1992, during, in fact, a critique of Gee) recounts African American teachers of African American students in pre-Brown segregated schools:

> These teachers were able to teach the rules for dominant Discourses, helping students to succeed in mainstream America even though those students not only were born outside the realms of power and status but had no access to status institutions. These teachers were not themselves a part of the power elite or members of dominant Discourses. Yet they were able to provide the keys for their students' entry into the larger world, never knowing if the doors would ever swing open to allow them in. (p. 299)

So perhaps a viable strategy for preparing women of color to persist in science includes not only offering them opportunities to engage in particularly challenging math and science (Johnson, 2007a; Murphy, Stafford, & McCreary, 1998), not only explicitly teaching them the rules of scientific discourse, to assist them in putting together credible identity bids, but doing so in an overtly political context, one which will help them sharpen *la facultad*. We cannot expect to make great differences for women of color if we do not draw on collective agency to do so. The approach we call for does not target individuals because that is too tenuous an investment. Collective agency is necessary to make it through the inevitable pain and to see through the hegemony of the system to develop *la facultad*. We envision a setting in which women of color are challenged to do their best in science not only for their own personal satisfaction but for the common good and the good of others like themselves; a setting in which, rather than expecting women to be color- and gender-blind, the obstacles facing women of color in science are explicitly recognized, and women are supported as they work together to brainstorm how to overcome those obstacles.

But this approach assumes that there will continue to be race- and gender-inequities in science and that our best strategy is to find women tough enough, astute enough, to survive them. What if we, perhaps in parallel with this strategy, also tried to create the kinds of settings in science where these women would not have to experience identity competition or negative ascription? Settings where the emphasis was on science skill and ability, and there was room for, for instance, Black women in sequins? This also seems like a fruitful approach, particularly for individual professors and for entire science departments eager to increase their recruitment and retention of women science students of color.

Willingness to embrace either of these strategies, however, is dependent on a different understanding of why there are so few women of color in science—a different explanation than

their absence in the pipeline. Current efforts frequently focus on stimulating the interest of girls and women of color. However, at least for the women in this study, interest in science was never a problem. Far from needing to be persuaded to stay in the science pipeline, they were fighting desperately not to be spewed out of it.

Conclusion

The women in this study managed to build satisfying careers in which they use science every day. We suggest that women of color like them who have made it to this stage may be more talented than their White, male peers in such jobs, given that they have had to engage in more complicated tasks: Not only successfully bidding for recognition, but doing so while avoiding having negative identities ascribed to them and finding places where their racial and gendered identities do indeed intersect with their science identities, so that they do not have to step away from one identity to achieve another. One of Angela's current students talks about this process as always having to convey "I'm not who you think I am." This kind of nimble social skill, the use of *la facultad*, obviously conveys an advantage to people trying to enter the culture of science as outsiders.

But even though these three women were able to do this, this is not justice, and in the end, this is not for the greater good. To borrow the metaphor of Jones (2000), just because these women were able to bloom from dry, rocky soil, and bloom as high as others planted in better soil, does not make it fair. Justice and the greater good let us imagine, given what these women have accomplished in their dry, rocky dirt, if others like them were to be planted in rich, fertile soil, what heights they could attain. How can we look at this system and call it fair?

Notes

[1]The NSF college graduation data included a variable called "science," but which includes students who majored in the social sciences and psychology. Because so many women major in these fields, this variable was not useful for this task. Thus, we used raw data from the NSF to calculate our own measure, which included students graduating with degrees in (to use the NSF terms) agricultural, biological, computer, earth, atmospheric and ocean, mathematical, and physical sciences.

[2]We analyzed both aggregate data from 1995 to 2004 (the most recent years available) as well as 2004 data by itself; the two time slices were so similar that we include only the average data. Note also that there is greater under-representation in some science disciplines (for instance, physics) than in others (biology); however, the near-parity among biology majors between men and women, and across racial groups (except Asians), is not sufficient to cancel out the disparity in other science fields (NSF, 2007). Furthermore, "[b]etween 1990 and 2004, most gains in proportional representation in the biological sciences for non-Asian minorities are made at the undergraduate level. Graduate enrollments, doctorates awarded, and faculty positions continue to

show low representation for Blacks, Hispanics/Latinos, and Native Americans," (Lewis et al., 2009).

[3]We again backed the numbers of psychologists and social scientists out of the total, including only biological/life, computer and information, mathematical, and physical scientists. Note, further, that the NSF chose not to report specific counts on any subgroup whose representation at a particular level was less than 500 and any subgroup whose size was so small that reporting could compromise individuals' confidentiality (presumably this latter group would be considerably smaller than 500 individuals). Because NSF rounded all the numbers off to the nearest 1,000, and because the total number of scientists in question is 4.9 million, the impact on calculations of omitting any group with fewer than 500 members is trivial.

[4]In Table 2, we used NSF data tracking the numbers of employed scientists in 2006 (the most recent data available), and calculated the representation of each racial group tracked by NSF as a percent of the total number of practicing scientists at each degree level (NSF, 2009).

[5]These patterns were fairly consistent even when disaggregated by biological and physical sciences. There are instances in which women are more well-represented than men of the same race; however, Black, Latina, and American Indian women are, at every level, in both the biological and physical scientists, under-represented compared with their representation in the US population; and the degree of under-representation increases as the educational level increases.

[6]Comment from Conchita: "Had there been nerd role models (teachers, counselors) who had bid for that nerd science status but also happened to look like us, who make it cool and hip and accepted to be a nerd, then we (the greater body of minority students) could strive for that. We, now, can be that for others."

[7]Conchita's comment on this section: "However, owning my racial and gender identity meant that I was treated differently and not taken seriously. I was given janitorial jobs instead of learning the science of injury prevention and repair. I wasn't only a joke to them … I was a joke that was like the maid in the telenovela stories."

[8]Conchita commented on this: "It doesn't stop at graduation either. It's a life long commitment to puncture the male/white dominated bubble."

[9]On reading this section, Alethia commented on "the messages of 'you don't belong here, drive home and stay home,' even in the face of evidence to the contrary. None of us are home enough in science to take our shoes off and hang our jackets up—Conchita still getting heckled; Kathy not sure about publishing; me being asked to step down from a program to help girls in science. 'This is not your home' *is* home."

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