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## ‘AN INCREDIBLY STEEP HILL:’ HOW GENDER, RACE, AND CLASS SHAPE PERSPECTIVES ON ACADEMIC CAREERS AMONG BEGINNING BIOMEDICAL PHD STUDENTS

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### Abstract

This paper analyzes perspectives on academic careers among 60 beginning PhD students in the biomedical sciences. It presents seven perspectives on academic careers articulated by the students in the sample and explains the way that race/ethnicity, gender, and students’ family education backgrounds are tied to those perspectives. The findings show that traditionally underrepresented students find the academic career path less navigable than students from well-represented groups. Among underrepresented students, even those from higher family education backgrounds, experiences related to race/ethnicity and gender often inform perceptions of the academic career even before they start their graduate research training. As the composition of the graduate population changes to include more women and underrepresented racial and ethnic minority men, it is important to note that not all graduate students enter with the same perspectives and views of the academic career and that there are meaningful differences in perspectives across demographic lines. Graduate programs can play a critical role in providing information and support for graduate students as they navigate their career choices, particularly at the earliest stages of training. By becoming sensitive to students’ perspectives on career options, and understanding how differences in perspectives arise, mentors and others can align advising strategies with the experiences and views of students.

### Keywords

biomedical science education; social class; gender; race/ethnicity; career decision-making; biomedical research training

## 1. INTRODUCTION

“Some young people who might have considered careers in biomedical research are just going to see this incredibly steep hill, and decide to do other things.” Peter Slavin, President, Massachusetts General Hospital

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The road to an academic career in the life sciences is increasingly challenging for aspiring faculty. Many students grow disillusioned with the prospect of a career in academic research as they progress through their graduate training, and increasing numbers of PhDs pursue jobs outside of academia as opportunities in industry and other areas become more available and attractive (Fuhrmann et al. 2011; Gibbs and Griffin, 2013). For students who begin graduate school with an interest in academic careers, most will face stiff challenges along the trajectory leading to the career and during the career itself. This is particularly true for White and Asian women and all racial and ethnic minorities aspiring to careers in academic science, where they remain underrepresented relative to White and Asian men.

There is little research on the *processes* in graduate school that encourage or discourage students from the academic career pipeline in the biomedical sciences (see, e.g., Ong, et al. 2011). However, current research on the STEM fields indicates that students previously socialized with a view of how to navigate the scientific career track are better able to orient their actions and develop expectations in ways that are appropriate for shaping success as an academic scientist (Ovink and Veazey, 2011). Students who have not had opportunities to develop such a view may feel out of place in the science world in terms of its norms, habits, or tacit “rules of the game” (see, e.g., Bourdieu and Passeron, 1977; Bourdieu, 1984; Bourdieu, 1986). More research is necessary to understand how students’ backgrounds and social status may be tied not only to their understanding of the culture of science, but also to their perspectives on and attitudes towards academic science. This paper examines students’ attitudes towards academic careers, with particular attention to the experiences of racial and ethnic minority students and White and Asian women, and discusses the factors that influence students’ attitudes and understanding of academic careers. In particular, this research focused on students’ perceptions of academic careers at the beginning of their PhD studies when they have yet to be impacted by their graduate school experience. It is at this stage, that that their perceptions, misperceptions and ideas can be of most value to those seeking to encourage students to remain in academic research. In general, this research aims to understand how students’ gender, race/ethnicity, and status as first generation or continuing generation college graduates is tied to their perceptions and understanding of academic research careers in the biomedical sciences.

This paper presents perspectives on academic careers among beginning biomedical PhD students from diverse racial and ethnic backgrounds. It examines the information that students have about academic careers in the biomedical sciences, and explores how students from diverse racial and education backgrounds are weighing career options differently. The paper puts students’ attitudes towards academic careers in the context of their social experiences, with specific focus on women and racial and ethnic minorities, whose interest in academic careers, research has found, becomes increasingly negative after one year of research experience in graduate school (Fuhrmann et al. 2011; Gibbs and Griffin, 2013). This paper explores how perspectives on academic careers vary and the degree to which experiences based on gender, race/ethnicity, and parent education level, or the intersection of those factors, are tied to career perspectives. Understanding students’ perspectives on prospective careers in academic science early in graduate training is useful for administrators and those involved in intervention programs, especially as students from

different gender, racial/ethnic, and family education backgrounds tend to enter graduate school with different ideas and attitudes towards academic careers.

## 2. SOCIAL INEQUALITY AND TRAINING TOWARDS ACADEMIC CAREERS

Recent research shows that heterogeneous working groups may produce more frequently cited scientific work (Campbell et al. 2013) and that, arguably, diversity is critical to forwarding scientific discovery. Interventions exist to promote the entrance of underrepresented minority students (URM, which in this study refers to African-American and Black students, Hispanic students, and Native American students) and non-URM women into graduate programs in the biomedical sciences. In recent years, interventions researchers have shifted their focus beyond emphasizing support and resources for underrepresented students, and towards styles of mentoring and advising that are attentive to differences in students' cultural and educational backgrounds (see, e.g., DePass and Chubin, 2014). Despite ongoing efforts, URM students remain underrepresented at all levels of the educational and career trajectory, while White and Asian women are still underrepresented among tenured and tenure-track faculty (National Science Foundation, 2015).

The numbers of female and male URMs earning PhDs in the STEM fields are low compared to their overall representation in the US population. Within the biomedical sciences, URMs earn only 7%–8% of all doctoral degrees (National Science Foundation, 2010). Rates of degree and faculty position attainment are even starker for African-American and Hispanic women across STEM fields. Data released in 2006 indicated that African-American women earned only 2.61% of all doctoral degrees in STEM (while representing 6.01% of the US population) and Hispanic women earned only 2.53% (while representing 6.86% of the US population) (Ong et al. 2011). While White and Asian women are earning advanced degrees in STEM at increasingly higher rates, increases in degree attainment have not coincided with the number of tenure-track faculty appointments occupied by women. Across all science, engineering, and health fields, women make up just 33% of research faculty. Within the biomedical sciences women make up about 32% of tenured and tenure-track faculty, even though they earn more than 50% of doctoral degrees (National Science Foundation, 2010).

In addition to gender and race/ethnicity, this paper compares the experiences of students who are “first generation” college graduates, in which no parent has completed college, and “continuing generation” students, where one or both parents has obtained at least a baccalaureate degree. Considered as one indicator of social class, analysis of students' family education background gives insights into the importance of childhood socialization and cultural resources on perceptions of academic careers. Prior research not limited to the sciences also considers how socioeconomic status structures graduate students' experiences and persistence towards academic careers. Social class shapes students' sense of belonging and their academic “self-concept,” measured through students' attitudes and perceptions about their academic skills and abilities. Students from lower socioeconomic backgrounds are more likely to experience a lower “academic self-concept,” or, perception of one's academic ability and competence, than students with ample financial resources or who come from educated families (Curtin et al. 2011). While socioeconomic origins have not been found to have a direct effect on students' career aspirations, class does affect students' sense

of belonging and self-concept, which in turn affects their interest in pursuing an academic research career. Furthermore, possessing an undergraduate degree does not ensure that all students will be able to navigate the graduate training process successfully; many first generation college graduates lack the specialized knowledge and skills required for graduate school at the time of entrance (Holley and Gardner, 2012).

Studies of doctoral education across scientific disciplines have directly addressed racial inequalities and their relation to persistence in graduate school. The current research also has implications for students' perceptions and views of the academic culture and for their selection of academic careers. Additional research on underrepresented minority women in STEM disciplines highlights the social isolation and racial prejudice faced by some minority students in laboratory environments, citing interpersonal relationships within labs as a major deterrent to persistence among underrepresented women, much more so than structural factors like funding support (see, e.g., Ong et al. 2011). Even though instances of discrimination may not be overt, women and students from underrepresented racial and ethnic backgrounds often report "microaggressions" - everyday exchanges where they receive denigrating or discouraging messages based on their group membership (Sue, 2010). These may include remarks questioning a person's belonging in the scientific community based on their background, for instance by suggesting that racial/ethnic minority students benefit from diversity initiatives or affirmative action or that women are less committed to science when they decide to or expect that they will form families. Experiences with social isolation, prejudice, and microaggressions contribute to retention problems as well as students' negative perceptions of the academic culture (Margolis and Romero, 1998).

Studies of graduate education have pointed to a "hidden curriculum" perpetuating social inequalities based on gender and race in academic science. The hidden curriculum refers to the unwritten and often unintended values and perspectives that students are exposed to in education environments, which often appear differently and have differential effects on students from different racial and social class backgrounds (Anyon, 1980). Scholars have observed that while STEM education appears neutral and meritocratic in its stated purpose, women and underrepresented male students receive messages along the way that they do not belong to the dominant group and that their perceived ways of working as scientists are incompetent or mismatched with the institution and its norms (Bejerano and Bartosh, 2015). This paper considers how students' educational and social experiences might relate to their preparation for careers in biomedical research and their sense of how desirable and achievable those careers are.

This study seeks to examine the extent to which gender, race/ethnicity, and parental educational level are tied to students' understanding of and attitudes towards academic science careers. The primary research question is as follows: How do differences in race/ethnicity, gender, and family education background inform the academic career perceptions of beginning graduate students? In answering this question, it is important to consider gender, race/ethnicity, and family education background as potentially important influences on graduate educational experiences in biomedicine, and consider these identities as intersecting and not as singly predictive (see, e.g., Crenshaw, 1989).

### 3. DATA AND METHODS

This study draws on in-depth interviews with 60 students who are beginning PhD programs in the biomedical sciences. The sample of 60 is drawn from a population of 263 PhD students enrolled in the National Longitudinal Study of Young Life Scientists (NLSYLS), housed at the Feinberg School of Medicine at Northwestern University. Through the NLSYLS, in-depth interviews are conducted annually to follow how students experience PhD training and make career decisions.

When selecting respondents to include in this paper, the first step was to select all non-Asian racial and ethnic minorities that entered our longitudinal study as first year PhD students, and match those students with a non-URM student of the same gender. To obtain a desired sample size of 60, we randomly selected the additional non-URM students, stratified by gender. Of the students included in this paper, 22 are members of underrepresented racial and ethnic groups (including Black/African-American and Latino/Hispanic-origin) and 16 are first generation college graduates. Nine students are both URM and first-generation college graduates. Within the sample 34 students are women, and 13 of the women are from underrepresented racial and ethnic backgrounds. Twenty-nine students, 14 women and 15 men, reported plans to enter academia, while other students were unsure (20 students) or reported plans to enter industry (11 students). Interview subjects in the sample for this study are enrolled in PhD programs at 18 universities, including eight private research universities, seven public research universities, and three free-standing medical schools. Table 1 describes the sample by gender, race/ethnicity, family education background, and career plans at the start of the PhD program.

Students were interviewed at the start of the first year of the PhD program or in the spring before the first year of the PhD program, after committing to a particular program. Those interviewed during the spring were initially enrolled in the study as juniors in college. Thus, this interview is the second interview with the student and the one closest to the start of the PhD. Interviews were conducted in-person and lasted from 35 to 90 minutes. Interviewers used a semi-structured interview protocol that covered experiences in research, courses, and science support programs; self-reflection on independence, creativity, and life balance; the roles that gender, race/ethnicity, and social class played in students' educational trajectories and choices; perspectives on careers; and interactions with research mentors, role models, and teachers.

Interviews were transcribed and checked for accuracy with the audio recordings. Two authors independently coded transcripts and conferred to agree on coding. The researchers analyzed node reports on students' perspectives on academic careers to create the thematic perspectives presented in this paper. Authors not involved with coding reviewed selected quotations for consistency with node definitions to assess their thematic clarity and consistency.

## 4. FINDINGS

### 4.1 Perspectives on Academic Careers

The authors categorized seven types of perspectives that beginning PhD students articulate in their discussions of academic careers. The expression of a “perspective” on science is different from the manifestation of a “science identity,” demonstrated by competence in a discipline, performance of scientific practices, and recognition by others as a scientist (Carlone and Johnson, 2007). So too is the articulation of a perspective different from the statement of a concrete action plan or set of goals related to science, as these plans very often change during graduate training. In this paper, a perspective encapsulates a student’s outlook or point of view on what an academic career entails and the steps necessary to achieve that career. Table 2 describes the perspectives that emerged during the analysis and that are introduced in this paper. Students tended to articulate a dominant perspective, though there was some overlap. We discuss intersecting and overlapping perspectives in a later section.

Two perspectives, the “work-family balance perspective” and the “otherness perspective,” emerged based on how students felt their identities and personal interests would influence their career trajectories. Students holding these perspectives construct career narratives based on their perceptions of how gender, family and life plans, and race/ethnicity influence their view of the academic career. Four perspectives – the researcher idealist perspective, the tempered idealist perspective, the teacher idealist perspective, and the politicized perspective – reflect students’ assessments of the structure of the academic career and reflect less explicitly on identity. In these perspectives, students assess aspects of the academic career, like research, teaching, and academic hierarchies and bureaucracies, in constructing their views. The final category, the undeveloped perspective, includes those students with little or inaccurate knowledge of the academic career path, where correlation emerged among students’ lack of professional knowledge and their gender, race, and family education background.

**4.1.1 Identity and the Occupational Field**—Some students grounded their perspectives of the academic career in their social identities, describing how their personal experiences and values would intersect with their career plans. In many cases, for both women and men, students narrate their experiences in terms of their concerns about future work-family balance, and wonder openly whether an academic career in the sciences is a realistic option given their plans to have a family. These points of view are referred to as work-family balance perspectives. In other instances, students reflect on their experiences in the sciences as people with marginalized gender and racial/ethnic identities. These points of view are referred to as otherness perspectives, as the students recognize themselves as being outside of the norm of the historically well-represented scientific practitioner, specifically in terms of race/ethnicity and, to a lesser extent, gender. Otherness narratives appear as both race- and gender-conscious narratives, where students, in sophisticated ways, consider their own positions as persons of color and as men and women in the occupational landscape.

**4.1.2 Work-Family Balance Perspectives**—Both women and men articulate work-family balance perspectives, with 10 of the 60 students, six women and four men, narrating their career perspectives based on their anticipation of having to balance an academic science career with a family. Students with these perspectives are disproportionately White or Asian, and only one is a first-generation college graduate. The students with work-family balance perspectives demonstrate an ample understanding of the scientific career trajectory and the steps necessary to succeed in academic research. Women respondents especially demonstrate this understanding through their awareness of the complications posed by the cultural expectations of motherhood in shaping the career timeline.

Women who articulate work-family balance perspectives tend to assume, though not necessarily as a core belief or conviction, that childrearing duties are predominantly a woman's responsibility. Projecting the timing of work and family is something that happens very early on for some female graduate students, even though the plans may be hypothetical and the act of balancing work and family has yet to become a reality. For example, Cassie, a White, female student, said:

I don't think it is the same for everyone, but, I mean, I think if I was to plan out what I would do, it would be to get married, or to be engaged probably sometime during the end of my grad school, get married between grad school and postdoc or while [I am in my postdoc] I guess, and consider having a family towards the end of [my postdoc].

Before Cassie begins discussing the postdoctoral fellowship as a next step in the academic career path, she discusses her hypothetical plans for marriage and family. She foregrounds her discussion of the timing of postdoctoral plans in terms of the potential strain of balancing work and family.

Other women express more explicit fears around the issue of work-family balance, and in expressing these fears stress a lack of visibility of female role models who have successfully balanced science with family. Johanna, another White, female student, noted:

What the problem is with women in science is to try to find a woman PI who manages to like research, teach, and maybe possibly have a family 'cause that's like, the main conundrum of trying to be a woman in science of like, 'Well, do I go for like, a lab and tenure and such or do I get a family or can I somehow magically do both?' ... I see that as a potential, like, obstacle later of making a decision...

Johanna identifies work-family balance as a women's problem in science. She also identifies it as a personal barrier for making her own plans around deciding on a tenure track position. She describes a paucity of female research scientists who have wielded the "magic" required to manage a full-time career and a family life, in a culture that places the majority of parenting demands on women.

Other women articulate concerns about the potential for career interruption when deciding to start a family. Corinne, a White, female, first-generation college graduate, offered this insight:

What happens if you decide to get married and start a family while you're still in grad school, or, you know, you're in your post doc or whatever? I pretty much live and breathe science and definitely would not have time to start a family right now, so, but I know that people have done it...I've kind of been interested in working with women in the field, talking with them about their experiences, how you're able to balance your life with a career in academia and research.

Corrine also identified a search for mentors who are willing to openly discuss work-family balance.

When male students discuss work-family balance, some focus less on career interruption or differential expectations due to gender. In fact, male respondents are much more likely to speak in terms that reflect a sense of shared responsibility between spouses. Interestingly, the small number of men in our sample that do express "egalitarian" perspectives on the balance of labor in the household between spouses already have the support of a female partner or spouse who spends the majority of time at home. As an example, Samuel, a White, male student, expressed that:

Raising children takes time and being a graduate student takes a long time. You know, to have both of those as goals for [my wife and me] as a team is going to stretch us in a lot of ways that we have not been stretched yet, but I am excited about it, you know. I think that my undergraduate research advisor is a little influential here. He and his wife are both faculty at [large research university] and they have a child. He is on the tenure track, which, I'm sure you know, especially in engineering disciplines at a [research intensive] school like that, it's really hard. He is probably working 80 hours a week or something like that. He is thankful for [his family], because it keeps him grounded and it forces him to be more efficient with his time and increases his quality of life.

Samuel sees marriage and family as emotional resources that can support a better sense of work-family balance, and ultimately as things that can sustain a professor through the process of becoming tenured. The role model that he references provided the source of his career optimism.

Articulating a work-family balance perspective generally corresponds with a high degree of knowledge about the academic career. Moreover, the women and men articulating work-family balance perspectives are White or Asian and more likely to come from families in which one or both parents holds a bachelor's degree or higher. The students concerned with work-family balance do not doubt their abilities to succeed in academia, and they are savvy about the standard steps leading to a career as an academic researcher. But for women especially, gender-based concerns interact with the benefits and knowledge afforded by high family education background or strong undergraduate science training. The women in the sub-sample articulate more negative views of the academic career, and struggle with the prospective demands posed by work-family balance and the absence of other female scientists who have achieved their vision of balance. Their concerns are supported in the literature as well. For example, Etzkowitz, et al. (2000) found that marriage and children negatively impact women's careers in academic science at three key times: having a child



during graduate school, marriage at the point of seeking a job, and pregnancy prior to tenure. They also noted that women, but not men, are sometimes thought to be less than serious about their science if they do not stay single while in graduate school.

**4.1.3 Otherness Perspectives**—Some students from historically underrepresented racial/ethnic backgrounds construct narratives in response to their observations that there are fewer numbers of underrepresented minority students in science. Three African-American students in our sample reference racial representation as a strong element of their vision of an academic career. One of these three students also discusses the intersection of her gender identity with her racial identity. The strong “race-conscious” view is absent among students from other racial/ethnic groups in the study, including Latino/Hispanic students.

All of the students who narrated their perspectives through a racial prism attended PhD programs at private research universities with high levels of research funding. Two of the three students have at least one parent with an advanced degree beyond the bachelor’s, and the one first-generation college graduate in this group received his bachelor’s degree from a private liberal arts college with very selective admissions criteria. Each of these students demonstrates a keen understanding of the traditional structure of the academic career in proceeding from doctoral training to post-doctoral training towards a role as a principal investigator. But the racial obstacles that students describe sometimes overshadow the power of good training and career knowledge in creating a straightforward path to success. These students also feel that the trajectory into an academic career will involve seeking out support, making specific kinds of choices about which institutions to choose, or defying prejudices. Two students also identify a desire to mentor and be a role model to other minority students.

The first kind of race-conscious perspective reflects the view that the scientific landscape is filled with challenges for URM students, even those students from highly educated families. One female African-American student, Angie, reflects this view by looking ahead to challenges related to prejudice that she feels she might face in the workforce:

I know it’s going to be hard because there’s going to be some support, but...I think some people doubt me...So I know it’s not going to be easy. I know it’s going to be a lot of, um, a lot of stuff that I’m going to get caught up in, but I feel like these connections that I’m making now will help in the future.

Angie stated elsewhere in her interview that she believes that others may doubt her abilities as an academic researcher *specifically* because she is African-American. Built into Angie’s perspective is the belief that she must carefully pursue the right connections to navigate a workforce where racial/ethnic minorities remain underrepresented. Angie expects that she may encounter doubt in her abilities along the way, and so her statement about finding connections suggests that she needs to establish contacts that will steer her in the direction of colleagues that will not display these attitudes. Angie’s perspective is consistent with previous research that argues that URMs frequently experience social stigma and isolation in classrooms, labs, or academic environments in which they are one of a few, which can affect self-confidence (Hurtado et al., 2008).

Another perspective held by students of color has to do with changing the composition of the scientific field to include more underrepresented minority students. Two African-American students in the sample see diversity service work as an important part of the career of the PhD researcher. Tyrone, a Male, first-generation, African-American student, points out:

And so as a PI, right, a scientist of color, I will be in a position, right, whether it's having students in work in my lab, whether it's being involved in programs, whether it's, you know, heading the committee of the program, et cetera, I will be in a position to really change that landscape.

Built into Tyrone's vision of the scientific research career is the goal of altering the landscape of the occupational field, in terms of its racial composition and the opportunities available to other underrepresented students. Tyrone is exemplar of what Margaret Shih (2004) has labeled the "empowerment" strategy of coping with social stigma.

One student, Kathleen, draws a connection to her experiences as being both African-American and female, and finds purpose in mentoring young women of color and encouraging them to pursue science. She notes that:

It's very important to sort of look for opportunity for up and coming females, minority females, or even any science student, but I am definitely more interested in -- because I'm an African American woman, myself, and a woman of color, coming into science -- I just want to be able to be the person who says, 'Look at where I am. You can do it, too. So don't hinder your interests now.'

Kathleen perceives research science as a particularly discouraging sphere for women of color and aspires to become a role model to change that situation.

Kathleen also describes the pressures that some women feel in their labs, in terms of their gender, display in a traditionally male-dominated sphere. Specifically:

I think being a woman is something you live with your whole life, but I feel like it's almost harder because there are things, like, I want to do. Like I want to change my hair, or wear earrings, or just dress up one day. And that is immediately, uh, dealt with, when I come into a room. As in people are immediately, like, "Oh, nice earrings." Or, "Oh, you got your hair and nails." And those things, to me, are just innately woman. I mean, not every woman is like that. But some women just want to. I just would like to dress up and -- or, if I constantly wear, to lab, jeans and T-shirts, and then we go out. And I'm wearing something nicer, and they're like, "Oh, wow. I didn't know you could dress differently." So I feel like, in science, you're sort of forced into this role of either a neutral, or a, like, sort of more masculine, even...And that is really frustrating. Gosh -- I do get exhausted from that.

Kathleen describes the gender strategies she felt she had to enact in her lab, by feeling as though she had to toe a line between femininity and masculinity to avoid commentary from lab mates on her appearance. The commentary she describes, though likely not intended to harm her, is an example of a microaggression based on her status and appearance as a woman in an area traditionally composed of non-URM men. Prior research on minority

women's gender performance in science labs has demonstrated that women often have to adopt clothing styles and speech patterns so as to "pass" seamlessly as members of scientific work groups, which are historically made up of White men (Ong, 2005).

Students with otherness perspectives are likely to be very sensitive to environmental factors when making decisions about laboratories and mentors. For some students, locating a mentor from an underrepresented minority population may be a priority. Similarly, those students concerned about their gender presentation of self in the laboratory and the reactions from others will likely choose a lab where they feel less scrutinized – making a choice based on environment as much as or perhaps more so than on the science itself. The implication here is that environmental factors within a lab matter enormously for student retention and persistence in academic environments.

**4.1.4 Idealist Perspectives**—Many students focus on the ideals of an academic career, and narrate their views of the career based on their understanding of how the career is structured and its rewards and risks. A small group of students idealizes the career of the academic researcher. Many more students envision a productive career that is tempered by the realities of a constrained labor market. Other students idealize the teaching aspects of the academic career.

Within the sample only three students express strong researcher idealist views. The students that idealize academic research all have parents with post-college degrees. They are male and White or Asian, and each attends a private university with high levels of research funding. Their views and idealizations about research are highly uniform and drawn from similar roots: an influential parent or scientific role model. The prevalence of role models and mentors in these students' perspectives suggests that role models and mentors play an important role in helping students to develop their ideas about the steps required to become an academic researcher. These students are well versed in the "hidden curriculum;" they demonstrate a tacit understanding of academic research drawn from their experiences with family members or mentors.

Students who idealized biomedical research focus on the pursuit of interests above all else. The research-focused perspective reflects the belief that an academic scientist's goal should be to pursue "good science" and significant and original findings. The researcher idealist may be aware of the difficulty of getting to that point, but is currently unwilling to compromise on the value of that scientific ideal, all but framing science as a "calling" (Anderson et al., 2010). The following statements by Bill, a White, male student, reflect idealist perspectives on academic research careers:

If I want to go the academic route, I want to go big. What I mean by going big is, you know, have sort of the luxury that the much more established, basically the better labs have... Yes, they have to write all sorts of grants to keep the lab running and there are all sorts of administrative issues that they have to deal with, but ultimately they are in a position where they have the resources and the authority to pursue the questions they want to pursue. That is what I want to do... I really enjoy doing good science. Not just doing science, doing good science.

Bill recognizes that resources are required to “do good science.” Still, his vision for an academic career is “to go big:” he is fully invested in the norm of devoting his energies to research and to pursuing the questions that interest him first and foremost. He follows his previous thoughts:

The PI really taught me, he is the one who really tried to ingrain within me that what ultimately matters in terms of having the job you want, having the career you want in science, is doing excellent science to start with. And then once you have done excellent science, then you can worry about all the politics, all the intrigue with publication and hiring and those things, but the first thing you need to do is do excellent science and he ingrained within me that excellent science is defined as significant and original and that originality trumps significance. That is what he taught me.

Bill’s experience with his scientific role model convinced him that by pursuing original and important questions, one can follow the science to success. Geoffrey, another White, male student echoes these views:

Well, it seems – you can make the argument that [the academic career is] more free – you know, your research isn’t necessarily guided by accountants. Your research is guided by ideas...And, you know, it seems from my understanding – right or wrong – that, um, you know, if you can convince somebody else that it’s a good idea, that it’s important or has important applications somewhere down the road, then you can get money to essentially chase whatever you want.

Geoffrey believes that money, which is required to maintain and run a successful lab, is awaiting the academic researcher who has “a good idea.”

For Bill and Geoffrey academic research remains, at its core, about the pursuit of novel ideas, with the principal investigator role tailored to that pursuit. The researcher idealists are rare in the sample. They represent a narrow demographic of White or Asian men enrolled in private research universities with high levels of research funding. Yet, they represent a traditional model of scientific practice, which expects total commitment to research, and they are members of those groups most well represented in the sciences. Their views on biomedical research and academia in general reflect knowledge and acceptance of the academic culture of science.

Much more common than the researcher idealist view is a tempered view that mixes an idealist’s perspective with a realist’s view of the occupational contingencies involved in pursuing academic science. In our sample, 25 students from various racial/ethnic and family education backgrounds have this perspective as their primary view of the academic career. Students with tempered idealist perspectives perform cost-benefit analyses of the challenges and benefits of taking on an academic career, mixing the concrete information they have about the difficult labor market and funding structure with their ideal vision of a scientific career. One White, female student describes the “upside” and “downside” of academia as opposed to industry, noting, “I think you get more freedom in terms of what you want to research in academia, but you also get more responsibility in terms of getting your own money and, you know, keeping your own project alive.” The ideal of academic freedom

comes at the cost of responsibility for maintaining grants and funding, concerns that these students take seriously. Other students elaborate on the view that science entails personal and intellectual rewards, but at a cost. For example, Travis, a White male, stated:

I don't think [an academic career] is like an easy thing at all but I feel like the sort of rewards that you get from it, in terms of, rather, the fulfillment, might be worth the long hours and the difficult job of, what really being a PI is you have to like wear all of these different hats. Because you have to be a researcher. You have to be a recruiter in terms of like getting people to come to your labs. You have to be a grant writer to get funding. You have to teach probably to be a professor. And so juggling all of those responsibilities is kind of crazy but kind of a neat challenge.

Travis's response mixes a view of the utilitarian aspects of the research career, which factors in the strains of working one's way up the career ladder, with an idealization of life as an independent researcher.

Like the researcher idealists, some students with tempered views also derive their vision of the academic career from an influential role model. Kent, a male Asian student, stated:

From watching my dad there is this need to get tenured and to publish and I think really the backbreaking work that you see some assistant professors do. I think to me it almost seems like an endless ladder that you need to climb because after your assistant professorship then you are an associate and you really need to work toward becoming a full professor. It seems like a lot of agony along the way and the payoffs may not be what you imagine them to be. I guess there is no guarantee but at the same time from watching my father do it once he got the full professorship it seemed he was almost on vacation, like his lifestyle was very relaxed, though he still continued to write and go to conferences.

Kent crafts his vision of the life of the researcher after the image of his father, which is a marker of cultural capital and his early acculturation into science. Much like the student quoted before him, Kent also idealizes aspects of the academic career. Because the tempered idealists best represent "rational actors" in terms of their decision making processes and attitudes, these students would benefit from information and guidance on best practices of pursuing academic research careers. Though tempered idealists are often doubtful of the feasibility of achieving an academic position, mentors and program directors should be aware that they are likely to respond to concrete evidence and information that shows how the career is attainable.

In our sample, 11 students discuss the importance of teaching, and a smaller proportion of students referred to teaching as the main priority of their careers. Students who discuss teaching see a large part of the career of a scientist as that of a teacher, and sometimes see research as informing the craft of teaching. All students who discussed the importance of teaching recognize the potential challenges of a teaching career, in terms of potential difficulties with students or research productivity; these students are more forthcoming about the potential contingencies that face professors than the researcher idealists. Students who discussed the importance of teaching come from various racial/ethnic backgrounds, and

include students from various family education backgrounds. A good example is Abby, a Black/African-American student. Abby stated:

Dealing with students, [they're] very disgruntled. Like, if [they] got a C, like, 'Why did I get a C? What did you give me a C for?' I definitely think it would be difficult. But at the same time, I think it would be rewarding just to see students develop over a period of time, see their thinking develop... Faculty really enjoy when students, like, get it, when the light bulb turns on, when it clicks. I know that's what my PI told me. She initially asked me to join her lab based off of an answer that I gave on a test, because I had her for biochemistry. And she said the way I wrote down the question, it was just like I was – she thought I would do well in research because of the way I approached the question on the test.

Abby focuses on the teaching aspects of being a scientist, over the research aspects, and narrates the career perspective through the lens of mentoring students. Before settling on some of the ideals of the teaching career – like watching a “light bulb” turn on for a student – she narrates some of the difficulties of teaching. But Abby clearly sees many of the rewards of the professorial career in teaching, drawing inspiration from a former mentor.

Other students weigh the costs and benefits of a research career against a teaching career, and idealize teaching in that assessment. In one spin on this perspective offered by Brandon, a White, male, first-generation college graduate, the research experience even facilitates becoming a better teacher:

I think right now I'm more interested in research as a pedagogical tool than sort of the main focus of my career. Sort of using it as a tool to teach particularly to undergraduates what science is all about and exactly is worth doing as opposed to more classroom-oriented sort of things. And so if there was some balance that I could find to have a moderately productive lab that published but that the focus of the work was more to train undergraduates. And I think that is sort of the vision of what my mentor had at the college that I went to.

Lawrence, a male Asian student, outlines a similar perspective:

The reason why I would really enjoy going to a research institution rather than, like, solely just a place for research, such as industry, it's because I think it's necessary to teach. The reason why I say this is because I think -- at least for me growing up, I always had my uncle there, who is a scientist. He was always telling me, like, interesting new things. I think for new scientists coming up, they really need that sort of guidance.

Both respondents idealize the faculty role as a chance to teach. Brandon sees research as a way to construct pedagogical tools, and notes in the interview that he is following the lead of a mentor from his undergraduate liberal arts institution in constructing his vision of good teaching. Similarly, Lawrence takes inspiration from a family member to construct his own calling as a science teacher. Like many other idealist students, teacher idealists construct their ideals of teaching based on the influence of a scientific mentor or role model. Teacher idealists are well-versed in the structure of academic life and the distribution of time and energy between teaching and research that is normally required of faculty. However they are

often vague on demonstrating an understanding of the range of academic research positions and the varieties of colleges and universities that employ scientific researchers with varied expectations for teaching and research.

The “pure” researcher idealists, those students that see the pursuit of science for its own sake, were rare and from high cultural capital backgrounds. Much more common were tempered idealists, students who value the research aspects of an academic career, but who also consider the obstacles facing academic scientists. Tempered idealists represented various racial and socioeconomic backgrounds.

**4.1.4 Politicized Perspectives**—In contrast to the tempered idealists, some students hold negative views of the scientific career, and discuss the entanglements of grant money, bureaucracies, and hierarchies that restrict the freedom of scientists. Nearly every student in the overall sample mentioned grant writing and funding as part of the life of today’s scientist, but some students express a deeper sense of caution. This study describes these cautionary perspectives as “politicized” – views that frame the power relations and status hierarchies in academia as challenges to the pursuit of scientific research. Politicized discussions of the academic research field appear only among women in our sample. These women are different from the tempered idealists in that they did not discuss the fulfilling aspects of the academic career, and instead spoke in terms of the challenges. The following statements represent the views of three women from various racial backgrounds and who come from families in which one or both parents possesses a bachelor’s degree or higher.

One female, Hispanic student, Chelsea, sees political issues as timeless, as built into the fabric of the modern scientific vocation, while others see these concerns as becoming graver in a changing occupational landscape.

I don’t like the way funding is run in modern scientific endeavors. You kind of have to please a lot of people and really restrict yourself as to what you can use to apply to this grant and can’t use to apply to that same grant. I feel like it’s hard to really be honest about what you want to research and still get funding for it. You have to be really safe and very pleasing to a lot of people. And I think that restricts a lot of directions that science can go.

Chelsea is not reflecting so much on the current state of the occupational field as she is on science in general, or on the state of “modern science” as bound by a system where principal investigators seek out funding independently and remain tethered to those sources.

Others perceive a more immediate problem with an increasingly challenging labor market. Specifically, Cindy, an Asian female student, observed that:

[It] is very hard to get a job and tenure is very competitive...especially the grant writing...I assume it is very hard to get grants. It is like not knowing where your next paycheck is coming [from], because if you don’t get it, you are responsible for a couple of people. It is like running a business. If you can’t pay them, you have to find some way to help them leave your lab if you don’t get funding.

While Brandie, a White female student, pointed out that:

It is getting really hard to get a postdoc, and it's getting more competitive. Jobs are dwindling and the money from NSF is getting lower and lower so everything is being cut back. There is a lot more pressure to have a more competitive thesis and have the better paper in Nature. There is a lot more pressure for the requirements needed for postdocs for a job.

Both Cindy and Brandie reflect on what they see as a difficult academic labor market, and one that appears to be becoming more competitive. Students with politicized perspectives believe that the scientific world functions like a bureaucracy, where accountability among individual actors is blurred and the rules of how to succeed are increasingly vague and political. These students would benefit from more knowledge about the history of how scientific institutions and organizations formed, and they would benefit from gaining a better understanding of the ways in which scientific organizations do and do not function like bureaucracies. Like the tempered idealists, they would also benefit from concrete strategies or best practices for how to succeed in the academic workforce.

**4.1.5 Undeveloped Perspectives**—Five students exhibit undeveloped or inaccurate knowledge of the trajectory leading to a career as an academic researcher and of the content of the career itself. The students who exhibit undeveloped perspectives are all URM women and first generation college graduates. In some cases, these students' statements reflect a mismatch between the skills they expect to acquire in graduate school, the training structure of the doctoral programs, and the content of the career. As well, in contrast to many others in our sample, they do not articulate the potential career contingencies facing PhD researchers. Students who exhibit undeveloped perspectives do not lack confidence in their abilities to obtain their PhDs and move on to a career; more accurately, they are confident that they will obtain information about potential career paths during the course of graduate training, though they have little information about the career trajectory at the start of the PhD. For example, the following statement by Nikki, a first-generation African-American college graduate, is typical of students with undeveloped long-term plans and perspectives on academic careers:

I know that I don't even have half of what my career opportunities are after I graduate. But, um, but I know that I'll be exposed to it and so I'm not – not too worried...I'm not really worried about, like, what's going to happen after I graduate right now.

Students with undeveloped perspectives display a lack of information about the content of academic careers at the start of graduate school. In the following excerpt, another first-generation African American college graduate, Candace, is figuring out the nature of an academic career, and her statement of "I don't know" reflects her confusion from the mixed messages she has received.

Right now, um, I want to go into academia...Talking to a few of the graduate students, they were like well, once you get high up there you're not really gonna be doing much research and you don't have time for it and you're just gonna be teaching and I always thought, oh, yeah, teaching will be nice. In college. I wouldn't want to teach high school or anything but I could teach some, like, at a



university...Talking to some of the grad students, it's like, oh, this is going to be a lot less research than, um, than teaching. But, I don't know, looking at some of the profess— at least the younger, um, faculty they're still really involved in their research so I think it just depends on what you do or [where]you end up. I don't know. It depends on you personally.

In thinking about working in academia, Candace is not aware of the connection between research and teaching nor how the institutional setting could affect these aspects of the career. Again, we see lack of accurate knowledge about the academic career path in the next quotation from Chanel, who is also a female, African-American, first-generation college graduate:

I think academia is for when I want to retire. I really do because I feel like I would want that industry approach...Academia really doesn't pay much. I would like to get myself in industry and be more polished and then maybe come back to academia.

Chanel does not know that movement to an academic career after retirement from industry is not a standard or even plausible career path.

Though our group of students with undeveloped perspectives is small, it is striking (but perhaps not surprising) that all of these students are female, URM, and first generation college graduates. It seems clear that race, gender, and family education background are indeed mediating the knowledge that students have about academic careers. Students' familial education backgrounds are correlated with how they view academic research careers. Compared with other students sampled for the study, the students with undeveloped perspectives are much less grounded in a point of view or oriented toward a vision of what life post-graduate school might look like. Furthermore, in contrast to students narrating from other perspectives across the sample, the students with undeveloped long-term perspectives are much less likely to mention scientific role models as the source of information about academic careers, which further suggests that a dearth of resources or previously acquired knowledge is affecting some students' experiences at the start of graduate training. One of the major characteristics of students who fall into this category is that they lack a long-term perspective on a career plan. Most of these students who display these views towards the academic career were part of structured undergraduate intervention programs prior to entering the PhD, which suggests that these undergraduate research programs may not be imparting complete information about the trajectory of academic careers. Furthermore, mentors and graduate school directors need to be aware that not all graduate students enter programs with a clear idea of what the academic career trajectory entails and what their career options are.

**4.1.6 Intersecting and Overlapping Perspectives**—Students sometimes demonstrate multiple perspectives in their narratives. For students with work-family balance or otherness perspectives, identity and personal concerns dominate or overshadow other perspectives, with the details of the career constructed in terms of those identities. However in some instances those students set aside identity narratives and incorporate aspects of the careerist narratives into their discussions, with the tempered idealist perspective being most common

across the sample. Similarly, students with strongly career based perspectives sometimes narrated from the perspective of work-family balance or gender or race when probed. The following quotations show how students may reflect more than one perspective, and demonstrate the complexity of students' experiences.

Cassie, the White female student who spoke at length about being a woman in science, reflected on her enjoyment of teaching, based on her experiences as a tutor while in college:

I like teaching more than I think I like being in a lab...I think I would like working with students and the mentoring that is involved in teaching more than just straight lab research and grant writing and all that stuff. In my idea of going into academia I would go back probably to like a liberal arts type setting in comparison to maybe most people who are looking to go to academia to start their own lab, but I did a lot of tutoring when I was in college and I really like to do that.

Bill, the White male who represented a researcher idealist perspective, spoke hypothetically about work-family balance, arguing that a family is something that is grounding, but that could potentially take time away from science.

Science is all consuming. You have to work at it for very long periods of time and on top of that you have to think about it all the time. Family can really, really help someone because it is something else to think about, it is something else to care about. It is another source of value. But, the downside is by having another source of value, having another thing to care about, diminishes the amount of attention and devotion you can focus on science.

Bill is not concerned about career expectations or the undue burdens of raising children in his short family narrative. His main concern is the literal balance between family as an added value, which helps to ground or center the scientist, and the extent to which family takes away from science time.

Many students are aware of the political and bureaucratic hazards of academic careers, but their narratives are undercut with idealist currents, and tempered with optimism or an outlook that is less strongly politicized than the ones represented by those students with politicized perspectives. Ana, who spoke from the perspective of a teacher idealist, and Tyrone, the first-generation African-American male who spoke about altering the landscape in science for underrepresented minorities, both discussed the bureaucracies of science.

Ana, Female, White: Every job has these politics involved that – you know you just want to be there because you want to teach, or you want to do your work, and you always have to deal with those things no matter where you are. And so that's one thing that I learned for sure which, you know, kind of – if you ever had the image in your mind of being just like this noble professor, that you just teach people, and you impart knowledge and that's all you do. That kind of comes crashing down when you realize that you have to deal with all these things. That's not necessarily a bad thing. I mean I just – it's – it's more information for you to say, "You know what, this may be – maybe this is what I want to do, but I do have to - I would have to deal with those things."

For Ana, the ideal of teaching is not lost entirely due to the politics of academia; rather, the discovery of academia's politics and bureaucracy may be an obstacle, but they are to be dealt with as normal features of the occupation and not as a stop sign.

Like many other students, Tyrone discussed grant writing as a challenge not to be regarded as an unsurpassable roadblock but as an occupational contingency.

For any PI, there's the challenge of funding. That's an inherent challenge of the field and I think, you know, it's critical -- it will be critical for me to develop my sort of grantsmanship in some ways and the ability to communicate scientific knowledge, communicate ideas, communicate scientific perspective. And so that's something that I'll actively work on as a graduate student and then actively pursue mentors who are invested in developing a student's ability to do that. So those are challenges that will come as I develop my research program, as I go along throughout my training that I'll have to face.

Tyrone identifies some of the same material challenges as those who used political frames, but he identifies resources and solutions in mentors, and does not see the challenges as hindrances. His views in the above statement are similar to those of the tempered idealists.

## 5. DISCUSSION AND CONCLUSIONS

The research conducted in this study shows that students' perspectives on academic careers do vary based on gender, race, and family education background. The "normative structure" of science expects assimilation to the practice of committing to science above all else (Merton, 1942), and demands that scientists set aside personal and identity concerns for the sake of research. Only a small fraction of the students in our sample are able and willing to commit all of their energies to academic research without consideration of other concerns like work-family balance, diversity service work, or even direct experiences of racial and gender discrimination. Students from groups traditionally underrepresented in the sciences have concerns and needs that demand attention from those in positions to affect the information, resources, and support that students receive upon entering graduate school.

This study shows that women of all racial and ethnic backgrounds, URM students, and first generation college graduates are more likely to hold perspectives that reflect a position of being "outside" of the norm of the standard scientific practitioner even at this early stage of scientific development. Even among students from higher family education backgrounds, the interviews found that gender and race often "trump" the influence that family background variables have in shaping a straightforward pathway in the sciences. Coming from a family in which one or both parents hold college degrees is associated with advantages like keen knowledge of the structure of academic life, but for some students from these backgrounds concerns about work-family balance or discrimination interfered with their outlooks on what to expect along the career pathway. Having resources does not eliminate concerns about racial prejudice along the science trajectory that might interfere with their experiences, due to discrimination or to the cognitive strains posed by prejudice. For those students who are first generation to college and are from marginalized racial and gender groups, the effects on

perspectives were notable: all of the students who represent undeveloped perspectives on the scientific career are URM women and first-generation college graduates.

As the labor market for tenure-track science positions grows increasingly difficult to navigate for all new PhD scientists, our findings suggest that URM students, White and Asian women, and students from lower family education backgrounds are facing challenges at the outset of graduate training, which will continue to lead to disparities in academia in the years to come. At present, underrepresented racial and ethnic minorities and White and Asian women comprise a smaller proportion of tenure-ranked faculty in the biomedical sciences than White and Asian men. The problem of persistence into academic careers among underrepresented racial and ethnic minority men and women of all racial and ethnic backgrounds must be addressed beginning in graduate school, the time at which students form their initial impressions of career options and develop mentoring relationships. To paraphrase one of the respondents, “changing the landscape” of the professoriate in the biomedical sciences requires attention to the needs and concerns of the current generation of students entering graduate programs. As this analysis is part of a longitudinal study, future research will explore the extent to which students in this sample retain their perspectives on academia careers, and the extent to which their perspectives inform their career decision-making towards or away from academic science.

This research raises a series of questions about the kinds of challenges that graduate students are facing from a very early point in their education. First, and most importantly, how will these students’ perspectives changes or evolve in the future? For those students with explicit identity concerns around work-family balance and gender and racial discrimination, ongoing reinforcement of their sense of belonging and the provision of additional strategies to navigate potentially hostile or isolating environments are necessary for their persistence in graduate school and towards the academic career. Short of structural and institutional level changes to promote faculty and student diversity, current graduate students need intensive mentors who are sensitive and attuned to the environmental factors that affect student and faculty experiences. A large proportion of our population was categorized as some form of science “idealist” – a person who narrated their view of the academic career based on a love of discovery or communicating science. But only three students are researcher idealists who do not acknowledge the possibility that they may face serious roadblocks in terms of funding in their future careers. The tempered idealists, who comprise the largest sub-sample of students, readily acknowledge and speak of the recent decline in funding resources, with some stating that it is difficult to maintain a successful lab at an elite university. How will the views of these students evolve over time, and what kinds of resources do they need while in graduate school? Might the researcher idealists need more accurate information about the financial aspects of scientific research, and more guidance in grant writing to better facilitate their entrance into an academic career? Do tempered idealists need more explicit mentoring that allows them to see how obtaining an academic career is possible, and that helps them to develop grant writing and time management strategies to promote their success? Similarly, do the students who hold politicized perspectives need explicit strategies to manage the stress of funding constraints and administrative bureaucracies?

The perspectives of students presented in our sample can serve as “sensitizing” frames to better understand and interpret the experiences of beginning graduate students, particularly those from traditionally underrepresented backgrounds and who represent multiple underrepresented groups (e.g., minority women). Our findings are supported by students’ interview responses, even though the frequency of these perspectives across all biomedical PhD students cannot necessarily be inferred from this sample. Our findings have implications for faculty, administrators and programs seeking to increase diversity and improve the graduate school experience for all students. Although students from different racial/ethnic and family education backgrounds tended overall to have different perspectives on academic careers, these findings should not be used to predict a student’s perspective or experience based on their family’s education background. Students who fit into different perspective groups have different needs and may need different supports, regardless of their gender, race/ethnicity, and family education background.

Students with underdeveloped perspectives on academic careers, who in our sample were female, URM, and first-generation college graduates, need access to and knowledge about the unwritten, unofficial, and often unintended, lessons, values, and perspectives that make up the “hidden curriculum” in graduate education, and more specifically biomedicine. Specifically, students should be guided to learn the factors to consider in laboratory selection, choice of project and advisor, details about the traditional “path” to the academic career and the tenure track, and proper planning for careers outside of academia. These students may benefit especially from career orientation programs or help selecting a mentor willing to provide them with the information they need.

In contrast, the research idealist group in our sample was male, non-URM, and continuing-generation college graduates. Although they demonstrated keen knowledge of academic research careers, in some cases they also held unrealistic expectations of conducting very high impact research early in their careers. Although high impact research is important for securing and succeeding in academic positions, the research idealists will need ongoing mentoring and guidance on balancing high-risk/high-reward projects with other projects to ensure they demonstrate sustained research productivity.

Students seeking teaching-intensive academic careers often have fewer resources for career development and mentorship than research-oriented students. These students interested in teaching would benefit from opportunities to teach and improve their instruction as well as better information about how to become competitive for a teaching-intensive position upon graduation. Students with politicized perspectives may also benefit from sustained mentoring and career counseling, so that they are able to develop strategies for understanding and succeeding within the competitive and bureaucratic norms in science.

These findings provide a useful framework for exploring graduate students’ perspectives on academic research careers. These insights are especially useful for understanding how students from traditionally underrepresented backgrounds, including racial and ethnic minorities, women, and first-generation college graduates frame the benefits and drawbacks to an academic research career and perceive potential challenges in obtaining one. Future work will track the consistency of students’ perspectives over time with the objective of

better understanding how a student's perspective on academia at the beginning of graduate school relates to their career thinking as they progress.

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**TABLE 1**

Population by race/ethnicity, gender, college generation, and desire for academic career

| Race/<br>Ethnicity             | Interest in academic career |           |                   |          |           |           |
|--------------------------------|-----------------------------|-----------|-------------------|----------|-----------|-----------|
|                                | Women                       | Men       | First generation* |          |           |           |
|                                |                             |           | Women             | Men      | Women     | Men       |
| Black/<br>African-<br>American | Yes                         |           | 3                 | 1        | 2         | 1         |
|                                | Undecided                   | 5         |                   | 1        | 1         | 1         |
|                                | No                          | 9         | 1                 |          | 2         | 1         |
| Asian                          | Yes                         |           |                   | 1        |           | 3         |
|                                | Undecided                   | 4         | 6                 |          | 4         | 1         |
|                                | No                          |           |                   |          |           | 1         |
| White                          | Yes                         |           | 1                 | 2        | 6         | 4         |
|                                | Undecided                   | 16        | 11                | 2        | 5         | 2         |
|                                | No                          |           | 1                 |          | 1         | 3         |
| Hispanic/<br>Latino            | Yes                         |           | 1                 | 2        | 1         | 1         |
|                                | Undecided                   | 4         | 4                 |          | 1         | 1         |
|                                | No                          |           |                   |          | 1         |           |
| No Response                    | Yes                         |           |                   |          |           |           |
|                                | Undecided                   | 1         | 0                 |          | 1         |           |
|                                | No                          |           |                   |          |           |           |
| <b>Totals</b>                  | <b>34</b>                   | <b>26</b> | <b>9</b>          | <b>7</b> | <b>25</b> | <b>19</b> |

\* First generation refers to first generation college graduates, in which neither parent has obtained a bachelor's degree. Continuing generation refers to continuing generation college graduates, in which one or both parents have obtained a bachelor's degree.



TABLE 2

## Summaries of Perspectives

| Perspective                      | Description of perspective   | Perspective demographics  |
|----------------------------------|--|---|
| Researcher Idealist Perspective  | Focus on the pursuit of an original and significant scientific idea; desire to work in a large and prestigious research university   | <i>N</i> =3 Male White or Asian students from high family education backgrounds   |
| Tempered Idealist Perspective    | Researcher ideals tempered by recognition of career contingencies, including labor market competition  | <i>N</i> =25 Male and female students from various racial and family educational backgrounds                                  |
| Teacher Idealist Perspective     | Idealize the craft of teaching; seek a position where teaching is a significant component, or value their research as a pedagogical tool   | <i>N</i> =11 Male and female students from various racial and family educational backgrounds                                  |
| Politicized Perspectives         | Cautionary view of the scientific career, focused on the entanglements of grant money, bureaucracies, and hierarchies that could restrict a scientist's freedom                              | <i>N</i> =3 Women from various racial and family educational backgrounds  |
| Work-Family Balance Perspectives | Have future work-family balance concerns including career interruption and timing and concerns about discussing work-family balance with mentors   | <i>N</i> =10, Male and female students from predominately White and Asian backgrounds and high family educational backgrounds |
| Otherness Perspectives           | Views the scientific landscape as filled with challenges for underrepresented students<br>Trying to change the composition of the scientific field to include more underrepresented students | <i>N</i> =3, male and female African-American students from various family educational backgrounds                            |
| Undeveloped Perspectives         | Exhibits little information about the process or trajectory leading to a career as a biomedical researcher   | <i>N</i> =5, women, URM Students who are first generation college graduates   |