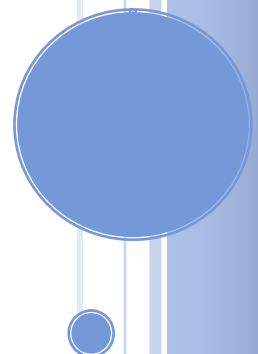




# Beyond The PhD

## *A Research Symposium*

*Vanderbilt University*  
*September 5-7, 2019*





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Career Goals: While it has become conventional wisdom that most STEM postdocs do not end up in academic careers, it is not the case that this is due to lack of interest in one. More than 80% of our respondents say they are strongly considering an academic career.

Academic Entrepreneurship: Characteristics associated with entrepreneurship—innovativeness, tolerance for ambiguity, optimism, competitiveness—are also associated with science identity, efficacy, and motivations to do science. We suspect interest in academia is tied to these entrepreneurial orientations.

The Postdoc Career: We consider high school, undergraduate, and doctoral/professional degree training to be a staged process. Similarly, a successful postdoctoral appointment likely has a minimum number of years required to accomplish its goals. We recommend a minimum of three years for maximum effect.

(Dis)Amenities of Academic Careers: While postdocs agree that academic careers come with more respect, autonomy, and opportunity to have an impact, they also agree that academic careers come with worse pay, work-life balance, and job security. Which (dis)amenities matter more when choosing careers?

Trailing Spouses: More than 75% of our respondents are in committed relationships. Whether partners also have post-bacc degrees and understand academic work culture are important components of STEM postdocs' decisions to pursue an academic career. They don't make career decisions alone.

STEM Teaching: We look at the relationship between more than 200 different variables and interest in academic careers. One of the strongest relationships is the one between teaching experience and interest in an academic career. Only 9% of STEM postdocs have that experience.

Race and Gender: Demographic characteristics shape postdoc's experiences, expectations, and outcomes. There are a number of ways that a gender and race factor into the experiences postdocs have in their assignments and the decisions they make about what will follow.

Work-Life Balance: In spite of working with R1 faculty who teach only about 6 hours a week and have more control over how many hours they work than in any other STEM environment, postdocs insist that people in industry/government have more work-life balance than faculty. Why do they believe this?

Problematic Principal Investigators: Most postdocs come to campus assigned to or selected by a lead researcher on a project. Faculty in those roles often have priorities that are contrary to those of the trainee, the postdoc office, and funding agencies. Some of this is ignorance of the role of the postdoc as a *trainee*.

The Ideal Job: Both graduate students and postdocs buy into the claim that they will never get a job because there aren't enough of them. It isn't a shortage of jobs that's the problem. It's a shortage of perfect (location, pay, demographics, tenure expectations) jobs that fit the person's individual wish list.

## MEETING AGENDA

### Context

The Social Science Research Strand (Beyond The PhD) of the NSF AGEP Collaborative Bridging the PhD to Postdoc to Faculty Transitions is at the midpoint of its data collection process. This two-day meeting is planned as a forum to engage the findings from our three year investigation.

### Goals

Today we convene a group of directors and managers of postdoctoral offices to discuss research findings related to the experiences and career goals of postdoctoral associates in STEM disciplines.

The meeting will pursue three goals:

- Introduce you to the major insights we have gained about (STEM) postdocs. In particular, we will focus on what we see as the top ten findings (attached) from our investigation.
- To engage in a series of discussions about those findings, inviting you to comment on and critique them.
- We plan to write a major report and series of white papers that will describe the findings, but also identify a set of strategies stakeholders in the mission to broaden participation in academic STEM careers can consider going forward. You will help us generate those strategies.

### Agenda

#### *Thursday, September 5, 2019*

5:30 pm            **Shuttle to Dinner/Reception**

06:00 – 08:30 pm   **Dinner and Reception**

Location: Buttrick Hall Atrium

*Opening Remarks - Dr. Clare McCabe, Associate Dean, Graduate School*

#### *Friday, September 6, 2019*

08:15 am            **Shuttle to Breakfast**

08:30 – 9:15 am    **Breakfast**

Location: 206 Alumni Hall Reading Room

09:15 – 9:30 am    **Welcome and Remarks**

*Dr. Mark Wallace, Dean of the Vanderbilt University Graduate School*

09:30 – 10:00 am   **Introductions and Overview of Academic Pathways Initiative**

*Dr. Clare McCabe, Associate Dean, Graduate School*

*Dr. Richard Pitt, Associate Professor of Sociology*

- 10:00 – 11:45 am **Session I: Emerging Insights**  
Location: 206 Alumni Hall  
*In this session, we will discuss major insights from our research. The ten issues to be addressed are summarized in the attached white paper briefs.*
- 11:45 – 01:15 pm **Technical Working Lunch Session (Digesting Findings)**  
Location: 206 Alumni Hall and Graduate School Conference Room  
*In this small group session, we will invite visitors to comment on and critique the results from Session I. Do these findings resonate with your experiences? Are there other issues that our findings leave unexamined?*
- 01:15 – 01:30 pm **Break**
- 01:30 – 02:00 pm **Session II: Why Academic Careers Matter**  
Location: 206 Alumni Hall  
*In this session, we will (re)consider why it matters that we strategize ways to encourage STEM postdocs, particularly URM and women, to pursue academic research careers, rather than either research-intensive careers in industry and government or non-research-intensive careers*
- 02:00 – 04:00 pm **Technical Working Session (Considering Solutions)**  
Location: 206 Alumni Hall and Graduate School Conference Room  
*Continuing the conversation from Session II, we ask you to consider possible solutions to the issues assigned to your group. The goal is not to generate a comprehensive list of solutions, but rather to identify a small set of strategies with measurable outcomes.*
- 04:00 – 05:30 **Session III: Review of Recommendations and Solutions**  
Location: 206 Alumni Hall  
*In this final session, we will discuss recommendations developed from the technical working sessions' deliberations. We will ask participants to identify one strategy they hope to employ at their institutions.*
- 05:30 – 06:00 pm **Walk To Dinner (approx. 1/5 mile, 10 minutes)**
- 06:00 – 09:00 pm **Dinner**  
Location: Amerigo Restaurant • 1920 West End Avenue  
*Closing Remarks - Dr. Richard Pitt and David Siegfried (IBP)*

### **Acknowledgements**

This meeting is made possible due to the generous support of the National Science Foundation, Grant #HRD-1647196. The findings presented are those of the BTPHD research group and do not necessarily reflect the views of the NSF. The BTPHD Group would like to thank Wake Forest University and our collaborator, Dani Parker, for their assistance with planning for this meeting.

## **MEETING LOGISTICS**

### **Getting To Nashville By Air**

Nashville is served by the Nashville International Airport (BNA). The leading domestic carriers are American, Delta, Frontier, Jet Blue, Southwest, and United. Please make your own travel arrangements. We encourage you to do so by August 20 to receive the best rates. We reimburse the actual cost of an advance-purchase, direct, economy-class ticket, up to \$450. If you find this limit inadequate to cover your actual cost, please let us know before making a purchase and we will discuss further arrangements. At the meeting, we will show you how to complete the necessary paperwork and the University will reimburse you, usually within two weeks. A receipt that shows proof of payment will be needed. For tickets ordered online, the method of payment must be indicated on the receipt that shows the full flight itinerary. *Please email Richard Pitt your arrival/departure times, flight number, and the amount of the ticket as soon as possible.* We cannot reimburse fees associated with airline ticket cancellations or changes.

### **Transportation From The Airport**

The Hampton Inn West End does not have a shuttle. The Hampton Inn shuttle advertised at the airport would take you to the Hampton Inn near the airport only. The average rideshare charge is \$20 for a one-way trip from the Nashville Airport to the university area; a taxi is usually \$30. Please use whichever is most convenient for you. Please save your receipt so that we can reimburse you for this expense. We will cover the cost for an airport shuttle or taxi, but cannot reimburse for a rental car or parking unless you are driving to the meeting rather than flying.

### **Hotel Accommodations**

We have reserved a mixture of king/double-queen rooms at the Hampton Inn Vanderbilt located just two blocks east of Vanderbilt's campus (1919 West End Avenue). Each room includes a coffeemaker, hairdryer, iron and ironing board, high-speed Internet access and local phone calls, cable TV, and a complimentary On the House hot breakfast buffet. Music Row is around the corner and all of our downtown attractions such as the Country Music Hall of Fame, the Ryman Auditorium, and others are easily accessible if you plan to experience the city. Each visitor's room is reserved with their name. You will be required to submit a credit card for incidentals, but the room itself will be direct billed to Vanderbilt.

### **Meals**

Vanderbilt will provide the following meals:

- Dinner on Thursday
- Breakfast, Lunch, and Dinner on Friday

### **Emergency Contacts**

Richard Pitt: 615-497-6275 (cell), 615-322-7530 (office)

Sandy Cherry: 615-322-7500 (office)

# LIST OF PARTICIPANTS

## HOSTS

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### **Keivan Stassun**

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Institute To Broaden Participation  
AGEP Grant Evaluator

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## VISITORS

### **Christine Holmes**

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Director, Office of Postdoctoral Education

### **Jana Stone**

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University of Pittsburgh  
Asst. Director, Office of Postdoctoral Affairs

## ABOUT THE ACADEMIC PATHWAYS INITIATIVE

The Academic Pathways program is designed to prepare recently graduated doctoral students (Ph.D., Ed.D., etc.) and/or a law degree (J.D.) for competitive academic careers. The need is particularly acute to develop faculty candidates who come from diverse racial, ethnic and other backgrounds and experiences, as differing experiences, views and perspectives are of exceptional value for academic institutions in their research and educational roles.

Academic institutions, including Vanderbilt, have made great strides in recruiting and training undergraduate and graduate students coming from diverse groups that are underrepresented in the educational arena. Institutions have been less successful in attracting these students into postdoctoral training positions, and the challenge becomes particularly acute at the transition to the faculty level. To continue to make strides on our campus in the education of the best and brightest students from all backgrounds and settings, and to embrace the diversity that makes Vanderbilt a leader in research and scholarship and a unique training environment for the next generation of thinkers and scholars, we must support the career development of future academics that reflect the diversity of our society.

The Academic Pathways Postdoctoral Fellowship creates a bridge between academic training and entry-level faculty positions at colleges and universities throughout the United States. Essential elements of the program include the creation of substantial “protected time” for the pursuit of the fellow’s academic and scholarly objectives, the construction of a robust mentoring architecture, and the development of the “soft skills” so important for success in today’s academic setting. Specific elements of the program include: leadership training, grant and manuscript writing and preparation, a multi-level mentoring framework, and connections to relevant resources and training across campus. These opportunities are individualized based on the academic discipline of fellows with similar formats for the humanities, social science, and life/physical/biomedical science areas.

This program is sponsored by Vanderbilt’s Office of the Provost with additional funding from the Alliances for Graduate Education and the Professoriate of the National Science Foundation.

## ABOUT THE BEYOND THE PHD RESEARCH GROUP (<http://beyondthephd.org>)

Our research group analyzes career motivations, academic and professional identities, and graduate and postdoctoral experience, to understand and forestall what is, essentially, the atrophy of academic research identity among many women and URMs in STEM. The project attempts to understand the phenomena and uncover the mechanisms that may handicap the impact of current and future interventions. This research seeks to understand the ways in which academic-professional cultures in STEM departments, postdocs’ social relationships, institutional contexts, and the intersection between “science identity” and other important social identities (e.g., race) either promote or hinder the development of a professional research identity among URM postdocs, and especially among women of color. Our analysis is based on cross-sectional surveys, three years of longitudinal surveys, and a series of one-on-one interviews in order to gain a comprehensive understanding of the processes that facilitate, sometimes inadvertently, the kinds of choices women and URMs are making. Our aims are:

**Aim #1.** To examine potential **gender and race differences** in the meaning of, salience of, and origins of “science identity” and how those differences may interact with other important social identities (e.g., socioeconomic) to produce interests in non-research related careers.

**Aim #2.** To examine how **social relationships** either promote or hinder the continuing development of an academic research-scientist identity among female and URM postdocs.

**Aim #3.** To understand how the **academic-professional culture** in which these postdocs are embedded will make academic-research careers more or less attractive to them.

**Aim #4.** To examine the influence of **institutional context** on processes shaping the development of an academic research-scientist identity.



# Career Aspirations



A Beyond The PhD White Paper

## Understanding Career Paths

Any efforts to broaden participation in the sciences, generally, and increase the representation of women and underrepresented minorities in academic STEM positions, specifically, must start with an understanding of the current landscape and what these populations say they want to do with their doctoral degrees.

### Career Pathways Defined

#### (A) CADEMIA

Research-intensive (no teaching) bench scientist, research/teaching intensive faculty, and teaching intensive faculty in academic settings

#### (I) INDUSTRY

Research-intensive or science-business-related (e.g., business development) positions in industry

#### (G) GOVERNMENT

Research-intensive, management, and regulatory positions in government and public health agencies

#### (O) OTHERS

Science education (general public & schools), science writing, science policy, and law-related careers



**“I’ve always wanted to be a professor.”**

**“Sometimes industry is seen as selling out, but learning more about it made it a more appealing option.”**

## Career Goals Beyond The Postdoc Appointment

**While the majority (58%) of postdocs do not get hired into tenure-track (TT) and non-tenure-track (NTT) research positions in academic institutions, a 2012 AAAS survey suggests that fewer STEM postdocs either expect or are interested in those careers than in the past. While this may be a chicken-and-egg issue—i.e., aspirations have de-created as their opportunities have decreased—it remains important to continue documenting interest in various careers and how they may differ among key demographic groups.**

While we might assume that all STEM postdocs would be interested in research-intensive careers, we found that 20% of postdocs plan to pursue non-research-intensive careers.

Most postdocs (81%) indicated a strong interest in an academic career and 64% indicated a definite interest in one. About a third of those were interested in NTT research-scientist positions in academic setting. About 20% of postdocs interested in academic careers said this preference changed since beginning their

postdoctoral assignment. Many are likely to be disappointed.

Careers in industry were also an option, with 71% of postdocs saying they would consider a job in that area. Only 18% said, if forced to choose, that’s the route they would go. The remaining 18% said they are likely to pursue jobs in government, science education, science policy and writing, etc.

### **Do these preferences differ by discipline?**

Biologists are the most interested (23%) and physical scientists (e.g., chemists) are the least interested (9%) in industry positions.

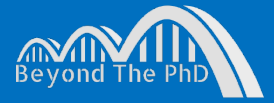
### **Do these preferences differ by gender?**

No. Women are as likely as men to prefer jobs in the academy (61%), in industry (15%), and in government or other settings (24%).

### **Do these preferences differ by race? Yes!**

More White postdocs (67%) than non-White ones (52%) prefer jobs in the academy; much of this is driven by differences between White and Asian postdocs. While Whites don’t differ from non-Whites in their interests in industry jobs, the difference for other settings is 2:1 with 30% of non-Whites indicating them as their preference.

# Entrepreneurship?



A Beyond The PhD White Paper

## Academic Entrepreneurs

We contend that the work academic scientists do is entrepreneurial because they are, like other entrepreneurs, in the business of discovering, evaluating, and exploiting opportunities to create new products/services that some set of consumers might acquire. Academic scientists are in the business of *knowledge production*.

### Entrepreneurial Traits

#### INNOVATIVENESS

An inclination to view situations and approach existing practices in new and unique ways

#### DISPOSITIONAL OPTIMISM

An inclination to have favorable expectations for one's future, regardless of the odds

#### TOLERANCE OF AMBIGUITY

An inclination to interpret ambiguous situations and uncertainty as non-threatening or even desirable

#### INTERNAL LOCUS OF CONTROL

An inclination to assume that one's outcomes are a function of their own behaviors rather than external influences

#### COMPETITIVENESS

A drive to be seen as more capable, knowledgeable, or generally better than others



**“I do think that the academy is very much like running a small business. You are 100% in control of what you’re doing.”**

## Academic Entrepreneurship & Science Careers

**There are social psychological traits considered key predictors of pursuit of and persistence in STEM careers in academia. We find that many of these traits—STEM identity, STEM efficacy, motivation to do science, a sense of belonging in the STEM community—are associated with five entrepreneurial traits. We believe strengthening postdocs’ holdings of these entrepreneurial traits will lead to greater success as academic scientists and the inclination to pursue science careers.**

Probably the most important trait when it comes to predicting desire to pursue a research-intensive career (in or out of the academy) is the degree to which someone considers “being a scientist” as important to their understanding of themselves. A person with above-average STEM identity is twice as likely to pursue a research career than their peers. We find that the higher a STEM postdoc is on each of the entrepreneurial orientations, the higher they are in STEM identity. These orientations are also associated with other important predictors of

interests in academic and other research-intensive STEM careers. Therefore, we believe it is important that postdocs score high on these entrepreneurial orientations.

Unfortunately, only 11-21 percent of STEM postdocs score “very high” in each of the five entrepreneurial traits; no post-docs score very high on all of them. Optimism and an internal locus of control (which are related in some ways) are the most commonly held of the dispositions. Innovation is the least commonly held, which is surprising given its more obvious association with the work postdocs and scientists more generally engage in.

Postdocs generally agree that their doctoral training did not train them for the day-to-day work involved in running a knowledge production enterprise. In their postdocs, they come to discover what being an academic principal investigator (PI) actually involves, from developing an innovative research agenda to having to compete for grants and publication space. Without the kind of traits we have discussed, some postdocs may opt into careers with more certainty, more supervision, and fewer demands to compete for resources.

# The Postdoc Career



A Beyond The PhD White Paper

## Why Analyze The Postdoc Career?

Postdoc appointments are nearly becoming a requirement for access to tenure-track jobs at Research 1 universities in some STEM fields. A lack of consensus on what this time is for, how long it should last, and what should be accomplished in it creates at least three problems for postdocs considering academic careers:

1. Postdocs gain experience managing someone else's research group, but they may not gain the experience or confidence needed to start and sustain their own.
2. Some PIs do not think ahead about the postdoc's career trajectory. As a result, they operate in ways that stifle postdocs' abilities to exhibit independence.
3. Overemphasis on grants and publications often leaves other important professional skills unaddressed. Teaching and lab management are often learned "on the job" as new faculty . . . and it shows.

**When unaddressed, these issues can leave postdocs feeling frustrated and under-prepared despite the time they have invested.**



*"My expectations were—from the practical research side—to get into the field and learn some new lab techniques and I guess get some more mentoring experience from a more senior faculty member."*

## Postdoc Appointments As Short Training Careers

**In the same way we consider high school, undergraduate, and doctoral training to be staged process, a successful postdoctoral appointment likely has a minimum number of years typically required to accomplish its goals. Our findings suggest a minimum of 3 years is needed for maximum effect.**

The first year of the postdoc appointment is often a transition period. It provides time to finish up work from graduate school and the opportunity to navigate learning curves if broadening one's skill set or area of expertise. Most postdocs move to a new city; this adjustment also takes time.

Year two is often characterized by accomplishments that benefit from relationship-building (e.g., collaborative conference presentations and publications). Postdocs report having worked on papers and grants with their current PIs. Second-year postdocs are also more likely to report having a faculty mentor who has shared details of their career path.

By the time the third year rolls around, postdocs have usually identified at least one faculty mentor who is invested in their professional

development. This is critical as they prepare for the next step in their careers. By the third year, postdocs should have published and presented their work.

This three-year time frame should theoretically provide postdocs with what they need—publications and professional development—from this training period. While we argue that three years is a minimum time frame, in reality, the length, training experiences, and outcomes of postdoc appointments vary depending on the discipline, PI, and postdoc. Some research takes longer to conduct; in these cases, longer appointments make more sense. But the potential for such extensions should be factored in when planning the postdoc. We argue that considering the possibility of a longer appointment should start at its initiation rather than when its end is in sight.

Although publications and grants are the currency of the academic job market, efforts towards these goals should not eclipse the development of other professional skills (like teaching & lab management) that will sustain future faculty in their new careers. PIs should view postdocs as future peers rather than as temporary research personnel.

# Why (Not) Academia?



A Beyond The PhD White Paper

## The Perks of Academic Careers

STEM postdocs believe that careers in academia are best for:

**93%**

Gaining respect as an expert

**89%**

Autonomy in work activities and schedule

**83%**

Opportunities to pursue research passions

**74%**

A rewarding career

**71%**

Broad impact and reach of research

**69%**

A strong professional network

**63%**

Access to organizational resources

Postdocs are also drawn to the intellectual community found in university settings.

Teaching is often described as one way to make important and rewarding societal contributions in an academic career.



*"People that really seem like they fit in academia: the science part of their brain can be on 100% of the time and they'll still be happy. I'm happy doing this. I just don't want to feel like I need to sacrifice other pieces of my personality on the altar of academic science."*

## Amenities and Disamenities of Academic Careers

While STEM postdocs agree that academic careers come with more respect (93%), autonomy (89%), and opportunity to have an impact (71%), they also agree that academic careers come with worse pay (96%), work-life balance (74%), and less job security in early stages of the career (67%).

Positive impressions of life in academia largely stem from postdocs' personal experiences. Interestingly, when examining the cons of academia, more postdocs tend to base their impressions on others' experiences working outside of the academy. When considering whether careers in or outside of academia pay more, almost 70% of respondents who indicate that pay is better outside of academia look to others' experiences in non-academic careers to inform this response. Roughly 57% of the postdocs who believe that careers in academia come with less job security say that they get this impression from personal experiences outside of academia. Meanwhile, about 69% of those who feel like there's less job security outside of academia draw this opinion from others in non-academic careers.

Although the majority of STEM postdocs believe that work-life balance is better outside of academia, the source of this impression is divided down the middle: approximately 36% of respondents look to personal experiences in academia to explain their answer, and 36% look to others' experiences outside of academia.

Interviews provide greater insight into how and why people are forming these impressions, and how they may be influencing the career decision-making process. The time it takes to achieve tenure and the financial and job security that come with it are definitely a barrier for some, particularly for individuals who are first generation PhDs, dealing with educational debt or living in expensive cities. Overall, however, we find that most postdocs are not pursuing this career path for the money.

The flexible work schedule that's largely seen as a benefit is a double-edged sword: freedom to work around the clock often leaves postdocs feeling that doing so is required to succeed in academia. When looking to PhDs in industry or government careers, some envy these scientists' ability to disengage from work during evenings and weekends.

# Trailing Spouses

A Beyond The PhD White Paper



## What Is A Trailing Spouse?

For our purposes, we consider someone to have a trailing spouse if they are in a committed relationship (i.e., more than non-monogamous dating) whether they are married or not. According to that definition, 75% of our postdocs have trailing spouses.

## SPOUSE STATS

**Most (80%) of these relationships are older than 3 years.**

**The majority (60%) of partners have more than a BA and 25% also have a PhD.**

**Twenty percent of partners are working toward a degree.**

**Eighty percent of partners are working full-time.**

**There are no gender differences in the likelihood of being coupled.**



**“It was a difficult conversation. He had gotten situated in a nicer job than he’d had in years, but I had to present it as I’m going to be held back professionally [if we stay here]”**

## Trailing Spouses May Be An Issue For Postdocs

**Most postdocs are in committed relationships. Whether partners also have post-baccalaureate degrees, are willing to move (again) after the postdoc appointment ends, and whether they understand academic work culture are important components of STEM postdocs’ decisions to pursue an academic career.**

The median age of our postdocs is 31 with most of them being between 28 and 35 years of age. If coupled, their partners are also in this same age group. In terms of life staging, this is the prime time for well-educated men and women to be settled into a career. The disruption in the “normal” life course represented by an advanced degree extends this staging, often producing what sociologists refer to as (objective) “off-time” pathways toward adulthood.

Statistically, having a partner seems mostly irrelevant in decision-making. It is unrelated to a definite interest in an academic job, but coupled postdocs are more likely than single ones to have definite interests in industry. Of the

coupled postdocs who say they are willing to take a job in any part of the country, 85% say their partner is willing to do the same. This is stable even when the partner has a PhD (creating a two-body issue) or a full-time job.

The interviews tell a different story. Postdocs spoke of partner-related factors that constrained their ability to leave the city where the postdoc was or to take advantage of (any) opportunity available in a different location:

- Convincing their partner that their job is “more portable” than an academic career.
- Planning to follow their partner’s more lucrative career (or medical residency)
- Dealing with spouses who were more selective than they were about where they could live
- Managing the impatience of a spouse who had delayed their career during the postdocs’ PhD training and was ready to begin “their turn” in the workforce
- Having a two-body academic problem to manage

While partners can be a great source of support (many reported this), they can also be stressors if they do not understand the academic career which, if unmanaged, can take over the postdoc’s life outside of the lab. This leads to the myth of academia stunting work-family balance and disinterest in the career itself.

# STEM Teaching

A Beyond The PhD White Paper



## Postdoctoral Accomplishments In the Last 6 Months

Either Solo or Co- Authored A Paper

76%

Gave A Talk As Solo Or Co-Author

61%

Published A Solo or Co-Authored Paper

69%

(Co-)Authored A Proposal For Grant Funding

60%

## TAUGHT A STEM COURSE

9%

Only 13% of postdocs who want to have academic research & teaching careers have taught a STEM course during their postdoc



“In the classroom setting, there’s that instance where everyone understands the new concept and you see it kind of click with them. That’s a very satisfying feeling.”

## Few STEM Postdocs Have Teaching Experience

A 2014 study of faculty time-use showed that, on average, 40% of faculty time is spent on teaching-related tasks. It’s the most time-intensive part of the faculty job. Amazingly, while the majority of postdocs had accumulated the base credentials (written and published papers, conference presentations, grant proposals) during their postdoc careers, virtually none of them had served as instructor of record for the kinds of courses they would be responsible for in an academic job.

Very few postdocs report having any responsibility to teach a STEM course during their postdoc. This did not differ by postdoc year, gender or race, or postdoc discipline.

We find a strong correlation between interest in an academic career among those postdocs who have teaching experience and those who don’t. Experienced teachers are four times more likely to state a definite interest in an academic career than postdocs without teaching experience.

Of those postdocs who did not teach a course as one of their postdoctoral duties, 53% said

they would have liked to have this opportunity. Oddly, of the 47% that did not say they would like teaching experience, 40% said that they were definitely interested in an academic career with a heavy emphasis on both teaching and research. This begs the question: why would scientists with no teaching experience who are interested in academic careers not be interested in accumulating teaching experience?

We asked postdocs how appealing certain aspects of a science career might be to them. The opportunity to train/mentor students scored higher than both prestige and the ability to have work-life balance. Forty-six percent of the postdocs said mentoring future scientists was “absolutely” appealing to them. Of those, 83% indicated an exclusive interest in academia.

In our interviews, we discovered that for some postdocs, being able to mentor and train young scientists—including graduate students—outside of the classroom (i.e., in the PI’s labs, tutoring) was sufficient “teaching” experience. Some also had experience TA-ing courses, which included grading assignments, overseeing experiments, and creating problem sets for exams. Is this enough?

# Race and Gender



A Beyond The PhD White Paper

## Doctorate Recipients In STEM Fields\*

### Agriculture

Women – 50%  
Non-Whites – 25%

### Biological Sciences

Women – 53%  
Non-Whites – 31%

### Physical Sciences

Women – 33%  
Non-Whites – 24%

### Math & Computer Sc

Women – 25%  
Non-Whites – 32%

### Engineering

Women – 25%  
Non-Whites – 35%

### STEM Education

Women – 80%  
Non-Whites – 27%

\* 2017 Survey of Earned Doctorates (race % are US citizens & permanent residents only)



**“As a Black woman, even though I went to a southern PWI for undergrad and grad school, I felt alone and crazy when I started my postdoc. You build up this wall of armor.”**

## Race and Gender Shape Postdoc Experiences

**Despite considerable investments aimed at increasing the numbers of URM and female academic scientists, many of the students that are recruited into (and successfully graduated from) STEM PhD programs are choosing non-academic and even non-STEM (20%!) careers. This project seeks to understand what variables can be adjusted to forestall what is, essentially, the atrophy of an academic scientist identity in these populations.**

While women have reached parity with men in some STEM disciplines (agriculture, biological and biomedical sciences), they still lag well behind them in the physical, computer, and engineering science disciplines. Conversely, non-White US citizens and permanent residents make up only 24-35% of the disciplines we study. Of these, only 17% of non-White doctorates in STEM are held by African-Americans.

We were surprised, again and again, by the fact that—at least for postdocs—gender was rarely a factor in our analyses. Women were not different from men in their (dis)interest in academ-

ic careers. Other than publishing papers (60% of women did, 74% of men did), women were as successful as their male counterparts. Their science identity, sense of science efficacy, and sense of belonging to the science community was as strong as men's.

We measure discrimination two ways in our data. One is a general measure of recognition of patterns of discrimination in the postdocs environment. The other was a specific measure of perceived experiences with discrimination. As we'd expect, women were more likely than men to recognize that the context they were in benefitted the opposite gender. But surprisingly, we found that women weren't anymore likely than men to say they were discriminated against personally.

Race differences were clearer. Non-Whites (mainly because of Asian-Americans) were less likely to pursue academic jobs. They were less likely to feel like part of the science community, less likely to feel hireable at the universities they were interested in, much less likely to have a mentor who shared their race, less healthy. They were more likely to feel stereotype threat and to recognize their context as discriminatory.

# Work-Life Balance



A Beyond The PhD White Paper

## Expected Findings

- STEM postdocs are learning about work life in academia vicariously. For the most part, they are basing their expectations on the experiences of their PIs and/or junior faculty members
- Some STEM postdocs feel that the current perks of their postdoc (like a good work-life balance) will go away once they become R1 faculty

## Surprises Along the Way

- Having worked outside of academia as a primary source of income reinforces desires to obtain careers in academia for some STEM postdocs in our sample
- STEM postdocs' views of work-life balance possibilities in academia are often tied to funding (hard versus soft money) expectations



*"I see so many younger PIs struggling. I just don't know that I want a job that's gonna have to consume my entire life for 10 years or so, until you get tenure. So it's more just the lifestyle that I'm not super attracted to."*

## Postdocs Believe Academia Has Poor Work-Life Balance

**In spite of working with R1 faculty who teach only about 6 hours a week and have more control over hours worked than in any other STEM environment, most postdocs insist that people in industry/government have more work-life balance than faculty. Only 15% of postdocs have non-academic work experience in their fields. Where are the other 85% getting this idea?**

The perceived absence of work-life balance in academia is closely tied to at least three interrelated characteristics of R1 academic life described by postdocs in our sample: time constraints due to multiple responsibilities; high amounts of input required for success; and flexible work schedules. Although PIs may only teach for 6 hours a week and be free from grading through the use of TAs, they are often described as "wearing many hats". Postdocs note how grant-writing and lab management responsibilities as well as departmental or university service requirements often consume their PI's time. Given that success in research requires a heavy time commitment, these other demands typically mean that benchwork and

sometimes even mentoring is outsourced to lab technicians and postdocs in order for the research group to continue running smoothly. For postdocs who love doing science, this reality leaves them with the disappointing sense that PI's do not have as much control over their schedules as one might assume.

Furthermore, since success in science requires ongoing effort and time commitments, productivity lost due to competing responsibilities needs to be recouped somehow. Considering that so few PIs mention or discuss their lives outside of their work with their postdocs, many postdocs assume that their personal lives are subordinated to their work. For some disciplines in particular, the expectation that truly committed scientists will be in lab when their experiment requires it does little to counter this belief.

For postdocs who view a career in academia as having better work-life balance than careers in government or industry, flexibility and control over one's work schedule is often the reason why. Particularly for those who are not tied to benchwork in a lab or who can work remotely, the ability to fit work around personal commitments is a major appeal of academia.



# Problematic PI's

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## STEM Postdocs' Mentoring Experiences

Over half of the postdocs in our sample received the following from their faculty mentor to a "large" or "very large" extent:

**68%**

Encouragement to Prepare for Next Career Steps

**67%**

Challenging Assignments to Gain New Skills

**66%**

A Faculty Role Model

**66%**

Respect

**57%**

Empathy for Discussed Concerns

**56%**

An Advocate Who Has Gone Out of Their Way to Promote the Postdoc's Academic Interests

These are the types of experiences that we hope postdocs are having with their faculty mentors. Unfortunately, however, PIs are not inherently mentors. Being assigned to a PI does not necessarily translate into the receipt of these perks.



*"When you think about the postdoc, we say it's for training... but as a PI, you write postdocs into a grant if you want someone to do almost exclusively research—the training is not necessarily part of that."*

## Principal Investigators (PIs) Can Be A Problem For Postdocs

**Most postdocs come to campus and work with a lead researcher on a project. Faculty in those roles often have priorities that are contrary to those of the trainee, the postdoc office, and funding agencies. Some of this is ignorance of the role of the postdoc as a trainee. Individual Development Plans (IDPs) do not resolve these problems.**

We find that PIs tend to be a problem for postdocs' professional growth in two ways. First, too many PIs tend to treat their postdocs like research personnel rather than future colleagues in training. PIs who behave in these ways operate more like a supervisor and less like a mentor. As a result, postdocs may not see themselves as having access to a faculty mentor who offers professional support and guidance despite working regularly with a PI.

PIs are not inherently mentors; this reality highlights the importance of communication and/or training with faculty members who take on postdocs. IDPs may help PIs become aware of professional development requirements that postdocs need to fulfill. But if postdocs do not

feel free to take advantage of those opportunities without pushback from their PI, they may be less inclined to.

The second way that PIs tend to present a problem is in their unprofessional behavior and lack of lab management that affects working conditions. Some postdocs cited seeing their PIs and other faculty members behaving in hostile ways towards each other as a major turnoff when considering whether or not they wanted to pursue science research within the academy. Although politics are likely to come into play in every work environment, multiple STEM postdocs mentioned how shocked they were to see infighting and sometimes sabotage seemingly go unchecked.

Similarly, problematic PIs' lack of effective lab management impacts interpersonal dynamics within labs/research groups. PIs who turn a blind eye to inappropriate behavior or problems that arise leave trainees feeling frustrated and unsure of whom to turn to for a resolution. Although postdocs observe these problems with rogue individuals, the fact that they do not see structural supports for addressing these issues leaves them disillusioned with academia in general.

# The Ideal Job

A Beyond The PhD White Paper



## The Academic Job Search

### STEM Postdocs Care Most About:

The University's Location

**88%**

Resources for Faculty

**87%**

Emphasis on Research

**60%**

Professional Development Opportunities

**51%**

### STEM Postdocs Care Less About:

The University's Prestige

**25%**

Established Relationships with Colleagues

**30%**

Emphasis on Teaching

**38%**

The Department's Rank

**47%**



*"Research was always sort of my plan, but I've struggled with feeling like I would have to sell out to get funding. Ultimately, I was like, 'I don't want to do this. I don't want to compromise my interests and pursue this funding.' So I took this teaching position, even though I was not trained in teaching at all."*

## A Lack of Available Academic Jobs for STEM PhDs?

**Many postdocs believe that they will never get an academic job because there aren't enough of them. It isn't a shortage of jobs that's the problem, per se. It's a shortage of perfect (e.g., demographics, location, pay, prestige, tenure expectations) jobs that fit the person's individual wish list.**

The academic job market is undeniably competitive for PhDs and postdocs alike. Furthermore, it is likely that the number of academic positions available at any given time is smaller than the number of PhDs produced by doctoral programs nationwide each year. These realities, however, do not necessarily translate into a shortage of academic jobs for PhDs in STEM fields. Rather, job market conditions in terms of meeting their personal preferences tend to be a source of disillusionment for STEM trainees' views of their academic career prospects.

Our survey finds that the majority of postdocs care most about their future university's location. Interviews reveal that this preference has a lot to do with coordinating job searches with romantic partners/spouses. Some postdocs

also mentioned the importance of being in a location that provided proximity to other family members, as well as access to leisure activities that are likely to help them achieve a healthy work-life balance.

STEM postdocs are attracted to academia because of their love of scientific research. Their graduate and postdoc training experiences typically involve a heavy emphasis on research activities, grant writing, and publishing. This being the case, many prefer academic positions that facilitate these endeavors through resources for faculty (e.g., start-up packages, lab space), emphasis on research over teaching, and professional development opportunities to assist with training gaps in teaching and grant-writing. Research universities are more likely to offer these amenities compared to teaching-focused universities or community colleges, creating a demand for jobs at R1 institutions.

One's first faculty appointments is not permanent and positions in non-ideal locations are arguably valuable stepping stones for longterm academic careers. However, when other aspects of life are taken into account, the prospect of repeated moves does not appeal to most.