Improving the STEM PhD's Transition into a Private Sector Career

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ABSTRACT

Significant attention has been paid to the general need for STEM degree recipients to develop non-technical skills, often referred to as 'soft skills,' in order to be effective in the private sector careers that the majority will pursue. The unique challenges that PhD recipients face when transitioning into the private sector after years spent in academic research has received far less attention.

My experience indicates that many of the thinking and working habits developed through earning a PhD are actually counterproductive in an industry setting. This perspective has been obtained through working in the private sector for more than 20 years, as well as numerous interviews of industry managers and early career STEM PhDs who have made the transition out of academia. All too often, the time spent conducting dissertation research places a heavy emphasis on sole responsibility for a multi-year project, and trains one to be very thorough and withhold judgement until sufficient data and analysis support a conclusive recommendation.

This practice does not align well with the quick-paced nature of the private sector, where projects must advance at a rapid pace and decisions must be made quickly with less certainty than may be desired. Teamwork is essential, and one must regularly rely on the expertise of others.

I will discuss training approaches that help early career PhDs understand the behaviors that will bring success in their industry careers. The significant role that research groups that collaborate with industry play in preparing PhDs for industry will also be reviewed.

Keywords: PhD in industry, industry careers, PhD work habits

1. INTRODUCTION

Although statistics vary, the consensus is that more than 80% of current STEM PhD recipients are expected to find their careers outside of academia.[1-10] This is due largely to the number of STEM PhD degrees awarded in the U.S. increasing significantly over the last two decades,[3-5] as well as tenure track positions being less available than ever. The latest studies suggest that 15% - 18% of science PhDs are expected to secure tenure-track jobs.[1,6,7] Of those not pursuing academic careers, the majority will build their careers in the private sector.[3,8]

An outdated perception still persists among a majority of university faculty that the most qualified PhD students in the sciences should pursue faculty careers, and that this traditional tenure-track career path will provide the best job satisfaction.[5] This is not consistent with job satisfaction reports from PhDs in non-academic careers, as PhDs who are well into their private sector careers report them to be exciting and rewarding.[11]

There is a growing realization that the technical skills developed by STEM PhDs are easily transferrable to non-academic careers and bring significant value to non-academic employers. However, the outdated perception that that majority of STEM PhDs will pursue academic careers results in a lack of important non-technical skills in graduating PhDs., as well as a lack of clarity on how to translate their research career into a career outside of academia.[12] A study of biological sciences PhDs revealed that the continuing focus on training for academic careers results in a 'mismatch between that training and their career prospects.'[1] The authors go on to state that 'The focus of young scientists on securing an academic research faculty position can lead them to overlook opportunities as independent researchers in other areas, such as in startup and established industries, foundations, and government. Significantly, these opportunities may require training experiences different from those associated with traditional academic careers'

A recent study by the NIH highlighted this widened gap in training of PhDs for the biomedical workforce and recommended that the NIH create a program to encourage universities to 'provide additional training and career-development experiences to equip students for carious career options.'[13,14] There are publications aimed specifically at helping PhDs understand how to plan their careers beyond the academic world, and universities are increasingly

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providing more developed career planning resources for scientists.[15-18] However, many of these programs do not address the real needs. A recent poll of over 300 graduate students in biomedical departments in universities in Berlin, Stockholm, Silicon Valley, and Tel Aviv found that most students who received advice from the university career development office were 'given advice almost exclusively for academic research careers.'[12]

My own experience, gained from 23 years in the private sector and 10 years teaching STEM PhDs to build careers in the private sector careers, suggests that different training experiences are absolutely needed. The biggest gaps in training are not in how and where to find jobs, which are usually the gaps that are most visible to the graduating PhD. The biggest gaps are in habits and behaviors that are frequently picked up during graduate school that turn out to be counterproductive in a private sector career. The result is that STEM PhDs very often graduate lacking a clear knowledge of what is needed to be successful in the private sector.

2. WHAT IS STILL MISSING?

The difficulties facing a PhD scientist entering the private sector stem from being trained in academic research setting. Academic research is very different than product development, which is the ultimate goal of nearly all technical work in the private sector. Table 1 outlines the primary differences in these two environments.

Table 1: Comparison of the priorities of academic research and the private sector

	Academic Research	**Private Sector R&D**
What's created:	Knowledge	Profit
What's pursued:	Understanding	Results
What's rewarded:	Accuracy	Speed

Science research is fundamentally a quest for new knowledge. Researchers may spend years or even decades investigating a new concept in a pursuit for complete understanding of that concept. The results are documented in journals or books, and accuracy is of utmost importance. Researchers will collect enough data and do enough analysis that they have a very high degree of accuracy and certainty in their results before publishing, and PhD students will do the same before standing up to defend their theses.

The private sector, on the other hand, is focused on creating profit. Company employees must be focused on results that ultimately satisfy a paying customer, and speed is critical in order to stay ahead of competition and changing markets.

These different priorities result in different behaviors required for success. When a student completes a PhD, they are typically nearly 30 years old and emerge with a sense of independence gained from completing their own research project. They then tend to head out into a career in the private sector thinking they know how to be independent and successful, only to slowly realize that some of the behaviors they learned are counterproductive in their new work environment.

2.1 The Job Seekers' Perspective

Many PhD scientists looking for careers in the private sector observe a resistance to hiring PhDs from the companies they pursue. The PhD Plus 10 Study conducted by the American Institute of Physics tracked the careers of physics PhDs 10 years into their careers to learn about the success factors and barriers to PhD scientists building private sector careers.[19] Many of the interviewees reported encountering negative attitudes toward PhDs when applying and interviewing. Below are some of the quotes reported:

"Physics degree seen as an overqualified 'brain in a jar' by the business world."

"The general perceptions of academic science that accompany a doctorate in physics is a huge barrier. I was once told by a manager in the aerospace industry that I had 'no useful skills for the aerospace industry and I should go find a place with white lab coats.'"

"Many feel I'm 'too smart' to even hire me for a job in the first place."

"Having a Physics PhD was a hinderance in my early career. I asked an acquaintance, once, why I wasn't getting any responses from my job submissions. I was told, point blank, that many companies don't want to bring on PhDs as they can be 'too disruptive.' It is perceived that they will be difficult, too smart, or too bored."

It's hard to know if the reasons given to the candidates told the complete story. It seems unlikely that a candidate would truly be 'too smart,' as intelligence is considered an advantage in all aspects of business. The claims of 'no useful skills' and 'too disruptive' may hold more helpful clues as to the real reasons for the resistance to hiring PhDs. To answer this, it's helpful to speak directly with managers who have worked with PhDs on their staff to get their impressions.

2.2 The Hiring Managers' Perspective

In more than 20 years working in industry myself, in a variety of technical and management roles, I've seen first-hand many of the challenges that PhD scientists face when transitioning in the private sector careers. In developing the content for our private sector career workshops, we've interviewed many industry managers and find that many complain about the PhDs they have hired. Many stated they are hesitant to hire a PhD, and some stated they will not hire another PhD.

Here are specific quotes from the industry managers we've interviewed:

"We have a number of PhDs on the team, but they just don't understand what we do here. We don't hire many PhDs anymore."

"The PhDs I've had on my team always want to keep working on the product, developing it and making it better, even after they've met the specification. But the customer won't pay for "better", so I don't want to pay the PhD to keep working on it. Why can't they understand when the product is good enough?"

"We have hired quite a few Ph.D. scientists over the years, but we generally don't have as much success with them as we do with masters and bachelors trained people." [20]

"I've had too many problems with PhDs who spend too much time chasing things they are curious about and aren't focused enough on the problems we have to solve. I won't hire another PhD."

"90% of PhDs are worthless!"

The sentiments expressed by these managers are very unfortunate, given the alignment of PhD technical skills and private sector needs that was described above. These comments also do not apply to all PhD scientists, as there are many who are successful in the private sector.[11,21] Many even go on to become executives in successful technical companies.

3. UNPRODUCTIVE PHD BEHAVIORS

Clearly there is a problem, and PhDs frequently see it themselves once they get into a private sector job:

"I felt totally unprepared! And rightfully so, because I was unprepared! Nothing in my previous education gave me much exposure to the product-focused mindset that is the norm in industry. I had to engage in an accelerated crash course training on the job, which meant talking to people, trying, failing, and waking up in the middle of the night because I thought I had screwed up." [22]

What is the difference between a successful and an unsuccessful PhD scientist in industry? Digging further into the interviews we've done with industry managers we have arrived at three key behaviors that mangers see as problematic in the PhD scientists they've worked with:

3.1 Lack of focus

The first major complaint from industry managers is that the PhDs they've worked with show a lack of focus on work that will deliver the results that the company needs. The lack of focus tends to appear in two general areas:

- PhD scientists have a strong tendency to head off on a tangent, exploring an interesting new idea that is not directly relevant to the products that the company develops.
- PhD scientists have a tendency to keep working on a product even if it already meets the product specification. They seem to be driven to continuously improve the product, 'making it better and better.'

This behavior is understandable, because research is often open ended, and value often comes from following a new idea to see where it leads. In a profit-driven environment of the private sector, the lack of focus leads to slower progress at a higher cost. This can be frustrating for the manager, as indicated by the following quotes:

> "There's a stereotype of PhD scientists by many in industry that they're kind of useless because they get 'analysis paralysis' and can't make any decisions, or else they want to keep making things better and don't know when to stop and move on to something else. And this stereotype is often true because, in academia, you're taught to stick with a problem until you get it 100% solved. In the real world, no one has time for that. Figure out when it's 80% done and then stop working on it!" [23]

> "The employees with PhDs seem to be more interested in chasing an interesting problem until it is fully understood, which is just what they had to do to complete their degree. It's hard to have the discipline to turn your back on an interesting problem and focus on the customer's needs instead. In some cases, you may never understand exactly why what you are doing is working. That's a difficult thing for inquisitive minds." [20]

From the PhDs perspective, this is often a very different focus than the more open and curious environment they enjoyed in graduate school:

> "A really big difference (transitioning to industry) was recognizing the cost of my time. The cost-benefit analysis of how you spend your time changes dramatically between graduate school and an industry job. As a graduate student I just worked long days and it didn't really matter how much time I spent on any specific problem. Suddenly, I was working in a company, and it mattered how much time I spent on each project." [24]

3.2 Smartest in the room

The second major complaint is that PhDs are perceived as driven by a need to always be right, and the 'smartest one in the room.' Here is how one CEO put it:

> "One of the real hang-ups that scientists and engineers have is they feel like they have to be the expert and be able to provide all the answers." [25]

In an industry team environment, this often shows up as the PhD scientist suggesting that their knowledge and expertise are superior to others on the team, such as the engineers, who have been trained in a specific discipline. This is frustrating to the other team members who may have years of training in their specific discipline and may resent being told a better way to do their job by a newly minted PhD scientist. As expressed by one industry manager:

> "Just because you 'played an engineer on TV' as a grad student does not mean you're a real engineer. You have your expertise, and you have to rely on your colleagues to be good based on their own expertise. You may have an expert in mechanical engineering and another expert in electrical engineering and another expert in software, and you can't be going around telling them how to do their jobs." [23]

This behavior is perhaps somewhat understandable, because academia rewards intelligence and having the right answer. In addition to more years in academia than most others on an industry team, PhD candidates are judged on their ability to work alone and be the experts on every aspect of their projects. But this behavior can limit one's performance on a team and can be a significant barrier to a successful industry career. As described by one industry manager:

> "Working in teams to solve scientific problems is an essential skill many PhDs are lacking. This lack of experience causes significant transition hurdles when moving into industry, where these skills are part of everyone's tool kit. Without them, your career progression in industry can be slowed down. You'll have to learn these skills on the job, which means a company will have to invest time and money into your education." [22]

3.3 Difficulty making decisions

The third major complaint is that PhDs frequently want to continue studying a problem and doing more analysis in an effort to be absolutely certain before they will make a decision or a recommendation. But an R&D group in the private sector does not typically have the time for such thorough analysis. Here is the story told by one PhD scientist:

> "I remember early on I was in our office kitchen and I was explaining to the CEO of the company how a particular project was going. I was outlining the details of every single approach I was considering, giving him the pros and cons of each option. He finally got fed up and said "Just pick a direction and go with it! You need to move forward!" That really stuck with me." [23]

This behavior is also understandable, as the process of publishing peer-reviewed research encourages academic researchers to hold off on submitting results until they are very certain it is accurate. This practice is further reinforced in the PhD dissertation defense, as no candidate would stand up to defend her thesis without being absolutely sure they could justify the results.

But technical companies in the private sector are about taking science developed in a lab and selling it to customers outside of the controlled environment of a laboratory. Customer demand is never certain, vendors who are needed to supply critical materials can run in the business problems of their own, there are uncertain macro-economic conditions to consider. In addition, a company is a collection of human beings with their own private lives, each with variables that cannot be predicted. This involves so many uncertainties that a "right answer" rarely if ever exists. In environment where there is no right answer, there's a limit to the amount of data collection and analysis that is productive. Product development teams frequently have to move forward never knowing for sure if the path they choose is right. As described by one CEO:

> "Scientists come from a culture where technical accuracy is absolutely paramount. It completely frames all discussion. When they move into an industry environment they see teams implementing imperfect technical solutions and making imperfect choices, and they simply don't understand. Their natural tendency is to say the problem needs more study, but this is often impractical. The whole world of business is about tradeoffs and the time value of making a decision now versus later. The fact is, at a certain point you have to make a decision based on incomplete data and move on." [25]

As scientists we learn that in the lab results can be predicted if the proper models are used and enough information is collected. But in the world of product development, predicting outcomes is not nearly as successful, and experienced business leaders learn that there quickly comes a point when further analysis is not productive, and action must be taken.

4. HABITS THAT SUCCESSFUL INDUSTRY SCIENTISTS LEARN QUICKLY

There are habits that are much better than the three described in the previous section, and they can be learned. Some PhDs have been lucky enough to have patient managers to mentor them and help them develop new habits:

> "I had those same habits, and it took me time to make this transition as well. I'm eternally grateful to my bosses, the founders of the company, who put up with me and took the time to train me, because I was not very effective when I first started." [23]

Many PhDs are not so lucky as to have such patient managers who will take the extra time to mentor them on productive behaviors. To begin with, being an effective manager does not necessarily make one a good mentor. In addition, many technical companies have managers with business, marketing, or business development backgrounds. They likely cannot identify with the PhD scientists' struggles and don't understand how to best help them transition into the product development environment.

In the private sector career workshops that we run for PhD scientist and engineers, we focus on teaching participants habits that are critical to success in the private sector. We call these the "Habits that scientists who are successful in industry learn quickly." Here are the three we've found to be the most important:

4.1 Focus on how your work helps the company make money

The primary goal of any company is to make a profit. A PhD who can identify exactly how their efforts help the company be more profitable is a far more valuable employee, and their job will be much more secure. Projects that help the company make money include developing a new product, adding features that customers will pay for, reducing manufacturing costs, improving test yield, or minimizing product returns.

Developing a new technology that has no clear product or clearly defined market, on the other hand, is not advised. Neither is spending time to better understand a problem that is not actively impacting product performance, just because it is interesting. The PhD scientist who spends their time pursuing a problem they personally find interesting or novel, or one who spends weeks attempting to improve the performance of a product beyond the specifications the customer is paying for, may be satisfying their own curiosity or drive, but they are not helping the company that employs them. Well run companies will not put up with this kind of behavior for a long.

4.2 Be effective, not smart

The wording of this habit is a bit tongue-in-cheek, but it is a good reminder to the PhD to focus on achieving the desired outcome, rather than on proving they are smart. In the profit driven world of the private sector, speed is essential. Companies build teams of people with widely diverse skill sets because it's much faster than for a few people to try to become experts in many disciplines. Working in this environment frequently requires one to admit they don't have an answer and need to rely on the help of others. The important thing is that the team solves the problem as a group, not that every member of the team is always right.

I tell people who work on my team "When you work for me, I don't necessarily care if you don't know the answer to a problem we are struggling with. What I care about is that you can find the answer to the problem. If that means you need to ask someone else in the company, or even hire a consultant to get the right answer, that's much better and waiting for you to become an expert yourself."

4.3 Make decisions quickly, with limited data

In an environment where results matter and speed is critical, decisions must often be made quickly, without the time to do excessive analysis to determine the absolute best option. As discussed in the previous section, most of the time there is no 'right answer' anyway.

This third habit is often reported by PhD scientists as the most challenging to adopt, because they have been trained to be accurate and complete in their work. Failure to be accurate or complete leads to failure in academia, and this could range from failure to get research results published to failure to pass a dissertation defense. But the private sector is a different environment, as described by the following manager:

> "I would say that in most things it's really okay to be wrong and it's okay to fail. In fact, an example of a very effective staff member is someone who makes a mistake and then very quickly says, "Oh, I was wrong. We need to try a different approach." No one has any ill will towards that person. No one says, "I can't believe you made a mistake," because that's how you make progress." [23]

Making decisions based on limited information is not particularly easy for anyone, and it is particularly difficult for scientists. In our workshops we encourage the following technique: If you have two or three options and you aren't sure which to choose:

Make a decision and then work to make your choice the right decision.

This has been a very effective principle of my own career. I particularly like this technique because it reminds me of two things:

> **Reminder 1:** I'm not as good at predicting the future as I'd like to think I am. The factors that will determine success are very hard to predict accurately. Delaying a decision hoping that I will figure out the right answer in advance amounts to procrastination.
>
> **Reminder 2:** Once I made a decision, the problems I encounter are real problems that I can try to solve, rather than hypothetical problems I'm trying to anticipate correctly. I don't know how to solve hypothetical problems. But with a good team and a persistent attitude, we can probably solve the real problems we encounter.

5. THE R&D MINDSETS

The term Research & Development (R&D) is common in the private sector. The two elements of this, 'Research' and 'Development' are quite different activities. The majority of the work that might be termed R&D in the private sector is actually development, as investment in basic research has been cut back severely in recent decades. Still, both activities are likely to be part of the private sector career path of the PhD scientist. Here's how one scientist turned R&D manager described their perspective:

> "One of the biggest challenges (of my transition to industry) was understanding the difference between a research project and product development. The term Research & Development used in Industry suggests that both of these are done in tight conjunction. However, that does not mean the activities are similar. They involve very different processes and mindsets that often conflict with one another. The cool part is, once a scientist knows their way around Research AND Development, they turn into absolute power players." [22]

For a successful transition into industry, we propose that PhDs understand the two different mindsets: The Research Mindset, which is focused on generating new knowledge, and The Development Mindset, which is focused on quick progress towards a profitable solution.

A full discussion of these two is beyond the scope of this paper, but a summary of the key features is listed here:

Table 2: The Research Mindset vs the Development Mindset

Research Mindset	Development Mindset
Pursue novelty/new knowledge	Focus on creating profit
Pursue complete understanding	Pursue fast results
Strive for high accuracy	Decide quickly and test your choice

We suggest that PhD candidates be taught these two different mindsets during their PhD training. Both habits are applicable in both academic and industry settings, although the Research Mindset is certainly more applicable in academic research environment, and the 'Development Mindset' is much more applicable in industry. Practicing both while in university will help PhD scientists determine when each is appropriate in their private sector careers, and they will be more valuable as members of an industry R&D team.

6. HOW CAN ADVISORS HELP?

While the Research Mindset is important to successful academic research, the Development Mindset can be valuable in many instances. In fact, among the industry PhD scientists I've interviewed, the ones who reported the easiest transitions into industry reported acquiring the Development Mindset during their graduate studies. Two such scientists came from Nobel Prize winning groups, and reported that their advisors strongly encouraged the habits that make up the Development Mindset because they were in competition to be the first to demonstrate a particular result:

> "Above all I learned the value of working quickly. My advisor used to say, "Any job worth doing well is worth doing fast." I have had people debate me on that, but if you get the result you want, any more time spent on it is wasted. This also pushes you to explore the parameter space of failure, because no matter how smart you are, you are more likely to fail than you are to succeed. Work quickly and figure out what doesn't work, so you can find out what does." [26]

Clearly an academic research group can benefit significantly from a Development Mindset. Here are some specific things PI's can do to encourage the Development Mindset in their PhD students:

6.1 Think of your research group like a company

The focus of a university research group is typically not profit, but they are organizations with a team of people focused on a common set of goals. If a PhD develops the habit of thinking about how their work helps the group, rather than just how it helps their individual project, this habit will translate well into the private sector environment. Once they are working for a company, they will continue to focus on what their organization most needs from them, and this will encourage activity that drives profitability.

In addition, there are private sector practices PhD candidates can incorporate into their academic research projects that will provide useful training and benefit their projects as well:

Require project plans: We suggest that PhD candidates be required to develop a detailed plan for their research project. This could include a schedule, resource plan, and spending projections to include labor hours, expenses and capital equipment. Review performance against this plan monthly. The simple habit of thinking about the value of their time and the resources they use is a good practice and will translate well into the private sector.

Talk about money: In our workshops we tell participants that math is the language of science and engineering, but finance is the language of business. If they want to be successful in an environment where a different language is spoken, it pays to understand a bit of the language. Why not draft a research group profit and loss statement for the year? This will help the team see where their money is going and perhaps make adjustments to fit long-term goals. Advisors

who involve their students in funding decisions and accounting of the group finances are doing them a great service. There are many books and online courses that teach enough finance basics to be useful in a private sector technical career. An MBA is not necessary.

Estimate Return on Investment: The Return on Investment, known by the acronym ROI in the private sector, is a process by which most decisions about new projects are evaluated in industry. An ROI involves predicting the new money that a project will bring in and comparing it to the anticipated costs. It is a great tool for evaluating whether a particular project is worth pursuing or for comparing multiple candidate projects. Why not develop a practice of estimating ROI for new projects in your research group? Academic research groups do not typically aim to earn revenue, but successful research, publications, and other accomplishments can absolutely increase the chances of winning new grants. This approach may require a bit of creativity, but the habit the PhD candidate develops of thinking about the potential return on the time and money they invest is an excellent exercise and will help focus them on the Development Mindset.

6.2 Encourage teamwork

In important aspect of earning a PhD is the independent completion of a challenging project, but a PhD candidate can benefit from teamwork and still have full ownership of their project. Leveraging others in the team to complete tasks that they deem critical to success is a great way to encourage both teamwork and a focus on applying available resources where they can be most effective. These are important skills for an industry team manager. Here are some ideas for developing these practices in your own group:

Identify specializations: Look for opportunities for members of the group to contribute to other projects in ways they are particularly skilled at. You might try to identify a specialization for each member of the group and let them be the expert in the group on that technique. Each PhD applicant will still need to answer for the work that was done on their project, but there will be more opportunities for working with others. In addition, it will encourage more attention is given to resource requirements, working with others' schedules, and negotiating for assistance from busy coworkers. These are all very useful skills for a private sector career.

Mix disciplines: Projects that cross the classic scientific discipline boundaries are an excellent way to encourage PhD candidates to ask others for help and not try to be the expert in everything themselves. These cross-disciplinary projects are becoming more common as photonics technologies find valuable applications in the life sciences and biology and chemistry become more closely intertwined in the study of human physiology. [27]

Mix basic and applied research: Blending both fundamental research and applied research is an excellent way to expose science PhD candidates to practical applications for basic research. It also helps prevent the tendency scientists have to view basic research as more valuable than applied work.

We've interviewed several scientists who came from research groups that contained scientists and engineers all working together on a blend of basic and applied research. They credit this experience with easing their transition into the private sector and helping them appreciate and communicate with team members who have different backgrounds and interests:

> "The Optoelectronics Research Centre at Southampton was set up in 1989. There was a strong laser team in the Physics Department and a strong optical communications team in the Electronics and Computer Science Department, so they brought those two teams together as an interdisciplinary research center. This removed the somewhat artificial barrier between what was a physics topic and what was an electrical engineering topic in optoelectronics.
>
> I started off with a bit of an elitist view that the problems solved by physicists were much more fundamental and important than the problems solved by engineers. I absolutely do not have that view now. You can find problems that are worthwhile and extremely challenging in both academia and industry, although they may be challenging for different reasons." [28]

A great way to blend basic and applied research is to develop collaborations with companies who can value from the expertise and capabilities in your group. In addition to providing opportunities for additional research funding, it offers valuable industry exposure for PhD candidates. A more complete discussion of this option can be found in the reference by Giltner and Gramlich.[29]

6.3 Encourage quick decision making

Final results need to be carefully analyzed and verified before submission for publishing, of course, but not all work in an academic research lab requires a high degree of certainty before action is taken. You may identify many opportunities to follow the advice in the quote from Section 5, 'Work quickly and figure out what doesn't work, so you can find out what does.' In the private sector, the concepts of prototyping and the Minimum Viable Product (MVP) follow this line of thinking. In academic research, the selection of experiment designs may fall into this category.

Encourage quick decision making when the consequences of the wrong choice are not dire, and you may find that you have a more productive research group and graduate PhDs who are better prepared for private sector careers.

6.4 Acknowledge the value of industry careers in industry

Participants in our private sector career workshops frequently indicate that the faculty in their university science departments do not speak highly of industry careers. While it's understandable that many advisors would enjoy seeing their best students follow in their own footsteps into the career of a tenured professor, this just simply isn't the ideal career for everyone. Giving a negative impression for the career paths that the majority of graduating PhDs will ultimately follow is not productive. The private sector is where science finds its greatest value, as the most novel and interesting discoveries. 'Turning science into things people need' provides exciting, rewarding, and very respectable career opportunities for scientists, and it makes the world a better place as well.

7. HOW CAN UNIVERSITIES HELP?

Universities can take steps to help their science professors better support their PhD graduates who will be building their careers in the private sector. This support will help the graduates build better careers and also make them more productive, which reflects positively on the university. Here are three things universities can do:

7.1 Provide private sector career training from people who actually have industry experience

Many university career centers provide support on topics such as writing a resume, crafting a cover letter, or improving professional interviewing skills. However, few of these career planning professionals have ever held the kinds of industry jobs that the PhD scientists will pursue when they graduate. This means they are not able to fully prepare PhD students for the behaviors they will need to be successful in the private sector. They can't help them understand the academic stereotypes that exist in industry, or more importantly, how to show a hiring manager that they are not the stereotypical PhD. People who have spent time as a technical manager in a private sector environment are able to provide this support, and there are many trainers around the world with the background and training curriculum to do just this.

7.2 Encourage cross disciplinary collaboration

The last section described the value of cross-disciplinary research projects, but there are challenges to making it successful.[27] Universities can help by identifying the barriers to cross-disciplinary collaboration in their institution and working to lower them. In addition to helping the PhD graduates, the improved collaboration is widely regarded to result in better research.[30]

7.3 Encourage industry collaboration

Collaboration with industry also has its own challenges, including negative perceptions from fellow professors and, at some institutions, the exclusion of private sector funding from tenure requirement considerations. These factors significantly reduce the incentives for early career professors to pursue such collaborations. Universities can encourage industry collaboration by acknowledging the value of such collaborations in their science departments and working to identify and mitigate the barriers to industry collaboration.[31]

8. CONCLUSION

The model where universities produce PhDs for the primary purpose of producing academic researchers is outdated. The majority of STEM PhDs produced today will build their careers in the private sector, and these provide exciting and rewarding careers for many. However, the tendency for PhD scientists to receive career guidance based on the outdated model results in a lack of preparation for the careers they will actually have. The most problematic thing missing is an understanding of the work behaviors and habits that are critical to success in the private sector. These habits comprise

what we call the 'Development Mindset', in contrast to the 'Research Mindset' that is far more common in academic research. Both can be valuable in academic research, but the 'Development Mindset' is often not encouraged in PhD training. In addition to complicating a PhD scientist's transition into their career, it frustrates their industry managers, leading to the unfortunate outcome of managers who avoid hiring PhDs. There are practices that can be implemented in academic research groups that help cultivate the Development Mindset in PhD candidates, and help them understand when each mindset is required, thus creating a more versatile and industry-ready PhD scientist.

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