

CAREERS

DIVERSITY ADVOCATE Astrophysicist sends message to US Supreme Court **p.245**

FACULTY MEMBERS Tips for effective mentoring go.nature.com/6g4bnp

NATUREJOBS For the latest career listings and advice www.naturejobs.com

DMITRI GUZHANIN/GETTY



COLUMN

A bridge to business

PhD holders should not underestimate their value to industry and the business sector, says **Peter Fiske**.

The glossy poster at my university career planning and placement centre both intrigued and perplexed me: “PhDs: come learn about a career in management consulting — recruiting reception tonight!”

As a PhD student in geology, I was dimly aware of the name of the consulting firm that had organized the event; one of my friends had accepted a position with the firm after he graduated. I had heard that he was earning a great salary and travelling a lot, and that he was aiming to go back for a master's degree in business administration (MBA). Until I saw the poster, I had no idea that a strategic-management-consulting firm would even consider hiring non-MBA types, let alone recruit PhDs specifically.

I applied for a position and landed a series of interviews that culminated in a day of them at the company's offices in Los Angeles, California. I did not receive an offer in the end, but it was an illuminating experience. Mostly, I was surprised that someone with a freshly minted PhD could immediately earn US\$160,000. And that was in 1994.

Fast forward 22 years. Now, as the chief executive of a US technology company, I have recruited PhDs for both technical and business positions. I have found across all scientific disciplines that those with doctoral degrees possess many of the skills that are in highest demand in today's economy. If you have earned a PhD, you know, for example, how to analyse data. You also understand how to examine those results to gain insights. In some important ways, you are better prepared than MBA holders to make valuable contributions to the business world. You have learned resilience in the face of uncertainty and with limited resources.

Yet you and many other PhD graduates — along with the programmes that trained you — remain largely unaware of or uninterested in opportunities outside academia. In turn, only a few companies, such as the consulting firm whose recruiting poster I saw 20 years ago, have pre-emptively recognized the value that you and your colleagues can bring — and they are reaping a harvest of talent as a result.

You are doing yourself a disservice. As a doctoral degree-holder, you need to appreciate your degree programme for the transferable skills that it confers (see “Top transferable skills for business”), and recognize that those skills provide you with significant and immediate advantages over your business-school counterparts. You do not need a business degree or substantial extra training to secure satisfying and highly ►

► compensated work in the business sector.

Need more convincing? Let's examine the differences between the training components of each degree programme.

In a typical MBA scheme, students listen to lectures, work on projects and learn about business-friendly topics such as economics, finance, accounting, organizational behaviour and law. Fundamentally, the MBA is a conventional, curriculum-led educational experience. Although internships and student-led organizations provide opportunities for direct work experience, success in business school is largely a function of earning good grades. Students graduate after two years or so, and top performers can land jobs that start at \$150,000 or more.

Most doctoral programmes also require a large body of course work. But as a PhD student, you probably spent more time 'doing', rather than studying or passively listening. You conducted original scientific research, which may have included fieldwork, you taught younger students and you were possibly involved with at least one manuscript.

DATA DELUGE

Science PhD students particularly benefit from near-constant immersion in emerging technologies and, especially, in data analysis and hypothesis testing. This is a huge advantage in the business world: every industrial sector and

type of business is more reliant on technology and data now than ever before. And in today's economy, the volume and complexity of the information that businesses use require managers and executives to understand the basics of data analysis and statistics — and to have a deeper ability to construct and test hypotheses and to build and validate models.

And science-PhD holders have a further advantage. Not only is technological innovation a key to the development of products and services, but the tools that are used to run businesses have science and technology embedded in them. Customer-relations management software, for example, uses advanced statistical algorithms that analyse trends and identify important variables such as user behaviour and pricing trends.

MBA graduates do not routinely encounter such training or confront these requirements in their degree programme, whereas they are an integral component of the PhD programme.

In short, the PhD experience is much more like the real world of business than is the MBA programme. If educational institutions were to train MBA students in the same way that they train PhD students, they would require business students to complete all the required course work — and to launch a successful business.

Given that the PhD is such a powerful

training foundation for success in the private sector, one might presume that this value would be reflected in the salaries of PhD graduates as compared to those of their MBA counterparts. Unfortunately, the opposite is true.

For example, a PhD-trained biochemist with five years' work experience after their PhD who is employed as a 'PhD biochemist III' (a typical job title in industry) in the United States has an average annual salary of roughly \$68,000, according to salary.com, a major salary database. In contrast, a person with the title 'market-research supervisor III', who also has five years' work experience and an MBA, is likely to earn \$91,000.

Both jobs require an ability to analyse data, synthesize technical information, perform tests to validate hypotheses and supervise a team. But whereas the market-research supervisor almost certainly could not walk into the PhD biochemist's position, the biochemist could easily perform all the duties of the research supervisor — with just a small amount of tailored training.

BRIDGE THE GAP

But therein lies the glitch. If a PhD provides graduates with such a range of strengths and transferable skills, why don't doctorate holders immediately command higher salaries? Part of the problem is that PhD students do not routinely receive such tailored training in the skills that are highly valued in the business sector. Practical professional skills such as negotiation, communication, business strategy, basic economics and marketing are all abundantly represented in the curricula of leading MBA programmes.

Yet only a handful of research universities train PhD students in the basics of business. Some institutions, such as Princeton University in New Jersey, have begun to provide professional-development curricula to those in PhD programmes. It is likely that graduates from these places will face better professional and economic prospects than those without such training, because they are better prepared to compete for a broad range of professional opportunities.

There may be a disincentive for science and engineering education programmes (and the agencies that fund them) to support the implementation of such professional-development classes or initiatives. The research enterprise thrives on an abundant reservoir of highly talented, highly motivated PhD students and recent graduates, and does not want to lose them to the business sector.

Greater competition for PhD-trained talent from the private sector, however, would invariably raise salaries for entry-level PhD graduates. Furthermore, science-funding agencies rely on PhD programmes and individual advisers to provide the bulk of professional development to their students. Many research faculty members lack sufficient

THE TALENT WITHIN

Top transferable skills for business

If you have earned a science PhD, you were probably told by mentors, advisers and career-development specialists that you will need to develop a lot of new skills to succeed in any sector outside academia. But your PhD programme has already conferred many skills that are important, even crucial, in the business world, and that are comparable to — and in some cases superior to — the talents acquired in a graduate-level business programme. Here are some examples.

● **Data analysis** You were trained to gather, evaluate, synthesize and present data, and to uncover relationships, correlations and trends. The business world increasingly relies on the same methodologies to develop strategies and identify opportunities.

● **Resourcefulness** You probably had to create experiments, methodologies and analyses with limited resources and under tight time constraints. Successful business people are often challenged to develop a product or service while facing the same difficulties.

● **Technological awareness** You were trained to understand the fundamentals of a range of technologies. Many of these

technologies are at the heart of products and services in the private sector.

● **Resilience** You may have encountered unexpected setbacks in your research or studies, yet powered through to reach your goals. This resilience in the face of challenge often separates the most successful entrepreneurs from the rest.

● **Project management** Completing a PhD typically requires the coordination and scheduling of disparate resources and individuals — as well as thinking through all aspects of a complex project or activity. The same course of action is a core component of the business world.

● **Problem-solving** You had to use novel thinking and innovative frames of reference to identify and solve technical problems. The ability to reframe problems to identify novel solutions is a key skill in business.

● **English proficiency** You are probably skilled in English, the most prevalent language of international business.

● **Written communication** PhD holders often have extensive experience in writing and describing complex ideas and methodologies. Effective written communication is crucial to business success. **PF**

industry or professional-development experience to provide the sort of training that MBA students receive as a customary part of their degree.

If a greater proportion of PhD graduates were to transition into the business sector, however, it could create pressure on universities to provide such training and on funding agencies to require it.

In the meantime, this training gap can easily be filled by taking short courses or programmes in business skills. Many are available online as massive open online courses, and some offer certifications.

Still, even more so than the paucity of professional-development programmes for PhD students, the greatest barrier to a high-paying position in the business sector is your personal beliefs about what you are qualified to pursue.

As someone with a PhD background, you probably view yourself foremost — even solely — as

a research scientist. **“The business world is full of delicious, complex, intellectually exciting problems.”**

developed while in graduate school go largely unrecognized and unarticulated within the academy. Most PhD graduates restrict their job searches to what they feel qualified to do, rather than exploring what they are capable of doing.

And as a PhD graduate, you may believe that academia is the only sector in which you can enjoy intellectual freedom and work on challenging problems. This is incorrect. The business world is full of delicious, complex, intellectually exciting problems. Their resolution can yield enormous value, both to those who solve the problems and to society.

Some people are beginning to recognize this reality. Graduate students and postdocs are organizing their own professional-development programmes, sometimes recruiting business-school professors to help them (see *Nature* **485**, 269–270; 2012).

And more businesses, especially technology-related companies, are either being launched by graduates of doctoral programmes or have a PhD holder on the founding team.

As more PhD students and graduates learn about these opportunities from their brethren, we can expect further interest in, and greater pursuit of, business careers by doctorate holders. MBAs, beware. ■

Peter Fiske is chief executive of PAX Water Technologies in Richmond, California, and author of *Put Your Science to Work* (American Geophysical Union, 2001).

TURNING POINT

Diversity ruling

Lia Corrales, a postdoctoral researcher at the Massachusetts Institute of Technology (MIT) in Cambridge, is fighting for equality in astronomy — a field that has been plagued by allegations of harassment and low diversity. Last December, Corrales and her colleagues wrote an open letter to the US Supreme Court after some judges questioned whether a federal policy known as ‘affirmative action’ has helped people from minority groups to become scientists.

What happened at the Supreme Court?

The justices were debating the merits of affirmative action, which aims to protect against discrimination on the basis of race or gender, in higher education. Justice Antonin Scalia noted that some people contend that the policy does not benefit African Americans because they do better at a less-advanced, slower-track school. And the chief justice, John G. Roberts Jr, asked what “unique perspective” a minority student could bring to a physics class.

Why did you write an open response?

I was angry that the justices’ comments implied that affirmative action has no value, and knew that friends were upset, too. Astrophysicist Josh Tan, a colleague of mine, and I discussed writing a letter because, as physicists and astronomers who care about diversity, we’re not doing our job if we don’t stand up for affirmative action. In the end, five of us wrote it. I put the letter online at eblur.github.io/scotus and mailed printed copies to the justices on the case. We gathered more than 2,400 signatures.

Describe your pursuit of astronomy.

As a kid, I loved black holes and thought Stephen Hawking was the coolest, so it seemed natural to study physics and astronomy. While I was an undergraduate at Harvey Mudd College in Claremont, California, roughly one-third of the students there — but probably half of my physics class — were women. And there were plenty of women at Columbia University in New York, where I earned my PhD studying interstellar dust. But when I came to MIT, where only 3 or 4 of about 30 postdocs at my institute were women, it became apparent how few of ‘me’ there were.

When did you first work on diversity issues?

As an undergraduate. The diversity office at Harvey Mudd College asked me to help start a branch of the US Society of Hispanic Professional Engineers. But I also wanted to make a difference to aspiring university students, so we connected with a preparatory programme



for students who would be the first in their family to attend university. I now realize that I’m passionate about this issue because of my own Latin-American background and my angst about affirmative action.

You are part of a Facebook group called Equity and Inclusion in Physics and Astronomy. Can you tell us more about it?

I’m not a founder, but it started out as a ‘Women in Astronomy’ group on Facebook, and evolved into something that was about more than just gender. There are many ways in which people experience discrimination, so now it’s more of an umbrella group to increase diversity.

What else have you been involved with?

Last summer, an Inclusive Astronomy conference was held at Vanderbilt University in Nashville, Tennessee — an institution where several faculty members have tackled diversity issues. It was an amazing event. There was so much acceptance that we must confront stereotypes and move beyond the ways in which we allow or contribute to discrimination.

Are things beginning to change in astronomy?

There is a critical mass of people who are talking about diversity and inclusivity. One recommendation from the conference was to stop the requirement for minimum test scores for admission to US graduate schools. This stance has already been adopted by the American Astronomical Society — a step forward. There’s still a long way to go, but I feel more inspired and empowered than I have in a really long time. ■

INTERVIEW BY VIRGINIA GEWIN

This interview has been edited for length and clarity.