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MARLENE AWAAD/BLOOMBERG/GETTY

2017, found that 75% of respondents wanted to work in academia after graduation, although a significant portion of those reported equivalent interest in the industry sector, suggesting indecision (C. Woolston *Nature* 550, 549–552; (2017). Clearly, the desire to pursue academia is not universal among PhD students. Furthermore, tenure-track job openings are a rare find: a study of job availability carried out in 2014 concluded that only 13% of PhD graduates can attain academic positions in the United States (R. C. Larson *et al. Syst. Res. Behav. Sci.* 31, 745–750; 2014).

ADDRESS THE AUDIENCE

Despite the lack of exclusive interest in academic careers and the low demand for professors, PhD programmes are designed to accommodate students with their sights set on academia. This fact is evident in the requirements that PhD students must meet to earn their doctoral degree, as well as the events hosted and sponsored by science departments.

Research is of course at the heart of a PhD, and assessment of productivity through a qualifying exam and thesis defence is needed to bestow a doctorate. But the goal of an original research proposal, such as the one my committee member was holding, isn't to evaluate progress, but rather to serve as practice for developing exploratory project ideas and securing funding for them — skills most relevant to future professors.

This agenda isn't hidden: the reminder that a great proposal could be used later in faculty applications was dangled in front of my colleagues and I as a largely inapplicable and therefore ineffective incentive to put in the work.

Also, the majority of events hosted by science departments — seminars given by professors, lunches with professors, panels of professors — are of greatest value to students taking an academic route.

There are typically more opportunities for non-academic professional development outside of a candidate's department of study, such as science-journalism and business-certification courses. But a lack of department promotion and sponsorship of these programmes means that students are often either unaware of their existence or feel discouraged from participating.

Research proposals are one example in which PhD programme requirements could be better tailored to the career goals of each individual student. Those interested in science communication shouldn't waste their time producing ▶

Industrial settings are now common destinations for PhD graduates.

COLUMN

Make PhD courses more relevant

Postgraduate programmes should not cater solely for students bound for academia, says **Sarah Anderson**.

My committee member looked up from the document in his hand, which detailed my ideas for my research proposal. He cleared his throat: “You know, when you apply for faculty positions...” he began. I gave a quick, impulsive nod in response, but thought to myself,

“That's never going to happen.”

I'm a PhD candidate in chemistry with no intention of pursuing a career in academia, and I'm certainly not alone: out of 81 students in my programme, only 40% plan to go into academia. A more comprehensive survey of 5,700 science doctoral students worldwide, conducted in

► a proposal for research they're not interested in performing. They could instead write a piece on their research targeted at a non-expert audience, for example. Similarly, those planning to enter industry could pitch a new product, and those aiming to become lecturers could participate in and report on a teaching internship. Choosing a career track with corresponding requirements could become as standard as selecting an inorganic, organic, physical or biological chemistry tracks.

The events hosted and sponsored by science departments are an area in which graduate school could become more inclusive and beneficial to students pursuing careers beyond academia. There are many professionals in industry and non-conventional fields who could occupy some slots on the department calendar. Furthermore, by promoting external programmes aimed at non-academic-career preparation, science departments could ensure that students are aware of such opportunities and display public support for their participation.

MINDSET SHIFT

To successfully implement these changes, we must first subvert the assumption on which PhD programmes seem to be built: that their participants plan to pursue academia. This mindset is in part a consequence of PhD programmes being crafted by professors who used their own career trajectory as a template.

But I suspect it's also a product of the unfortunate reality that PhD advisers simply do not view non-academic careers with the same degree of admiration. The fact that multiple people have written articles on how to break the apparently devastating news to your adviser that you aren't following in their footsteps speaks volumes. If academia can't appreciate the inherent value of professions beyond 'research professor', then maybe it can at least recognize the benefits it gains from having PhD-trained scientists in roles outside academia.

For example, science communicators create crucial dialogue between scientists and the public, helping to establish a wider audience for researchers' work and prevent misinterpretation of findings. Those in the field of science policy help to inform important regulations that affect national agencies funding academic research. High-school science teachers, lecturers and lab instructors are training the next generation of graduate students who will work in university labs. Hopefully, the PhD programmes that these students experience help them to feel validated in and prepared for whatever career path they choose. ■

Sarah Anderson is a PhD candidate in the chemistry department at Northwestern University in Evanston, Illinois.

Q&A

Developing cancer drugs from African plants



MANSURAH ABDULAZEEZ

Mansurah Abdulazeez is a molecular biologist at the Center for Biotechnology Research, Bayero University Kano, Nigeria. Her research aims to identify potent anticancer agents in African plants. Last November, the government of Spain awarded her their Science by Women Fellowship. And in June, she won a Nigerian National Research Grant of 31 million naira (US \$86,000) from the Tertiary Education Trust Fund. Nature asked Abdulazeez about her life and research.

What can you tell us about your scientific background?

Growing up, I always enjoyed science. I originally wanted to become a medical doctor, but I ended up studying biochemistry during my undergraduate studies at Ahmadu Bello University in Zaria, Nigeria. I got my master's degree, and then my PhD there, studying antihypertensive and anticancer activities of African plants. I was also a visiting scholar at Chiang Mai University in Thailand for six months as part of my PhD research.

What does your research focus on?

My research is aimed at identifying potent, safe and effective anticancer agents from Nigerian plants. We have screened and confirmed the cytotoxic activities of extracts of the drumstick (*Moringa oleifera*) and soursop (*Annona muricata*) trees as well as the native Nigerian shrub *Peristrophe bicalyculata* on cervical carcinoma and fetal lung carcinoma cell lines.

We also studied what anticancer mechanisms these plants exhibit. We found that these plants act in the body through a variety of mechanisms — there is no single mode of action for all plants (A. A. Mansurah *et al.* *Rom. Biotechnol. Lett.* **18**, 7995–8006; (2013).

Why is the study of African plants important for cancer research?

It is well documented that these plants have an enormous, largely unstudied anticancer potential (V. Kuete & T. Efferth *Biomed. Res. Int.* **2015**, 914813; 2015). Research into herbs such as *Guiera senegalensis*, which is used by traditional African healers and known as 'Sabara' by locals, has led to the discovery of several anticancer drugs. In my view, this demonstrates how the study of African plants can result in the development of valuable drugs.

What is your advice to young African women who want to pursue science?

Participate in local and international conferences that are relevant to your fields of study, so as to keep yourself updated on cutting-edge research tools, methodologies and funding opportunities. Always ask for support from senior colleagues — and family members — whenever you need it. Remain focused, tenacious and hard working. ■

INTERVIEW BY ABDULLAHI TSANNI

This interview has been edited for length and clarity.