



Jennifer Flexman

## climbing the ladder in academia

If you are a student doing research in biomedical engineering, following a career into academia is a natural path. This article will help you to navigate your academic career.

### What Are Graduate Admissions Committees Looking For?

The first major step toward a career in academia is to apply to graduate school. Different graduate schools offer varied experiences, and a key aspect of both applying and selecting a program is whether or not you will be a *good fit*. It's more than a nice pair of jeans—graduate school admissions committees want to recruit students that they think will stick around and blossom.

While some of the criteria for admission may seem obvious, some may be more difficult to attain and convey. Clearly, academic performance and quality of undergraduate education are strongly considered by admissions committees. Research and work experience are major assets in an application. Prof. Nitish Thakor at Johns Hopkins University and Prof. Ahmed Morsy at Cairo University stressed that a demonstrated ability to work independently and a persistent and optimistic attitude are elements they look for in prospective students. Prof. Jorge Monzon at Northeastern National University indicated that students should possess a “demonstrated interest in academia and flexibility to interact with both contemporary colleagues and with young students,” which goes back to being a good fit in the program.

Prof. Robert Butera at the Georgia Institute of Technology gave some specific advice on aspects of your application. He stresses that reference letters

are “the only piece of the application that provides the committee with qualitative judgments about you, your work ethic, time management skills [and] intellectual ability,” adding “we are looking for predictors of success.” He feels that prior research experience is a must for competitive programs, which should be described in your personal statement, and notes that “nothing kills an application faster than an applicant making a superficial attempt to demonstrate they know something about a field of research.” While expressing enthusiasm for a specific area of research is encouraged as a sign of focus, do not give the impression that you are simply paraphrasing someone's Web page!

### Preparing for an Academic Career...Early

It's never too early to start preparing for your career in academia. Since success in academia largely depends on publishing research in peer-reviewed journals, doing this as often as possible early in your career is the best strategy. “Publish, publish, publish!” suggested Prof. Peter Hunter at the University of Auckland for gearing up for an academic career. Publishing a paper in a journal reflects a host of skills, from writing to planning and executing well-structured experiments or designs. Prof. Henrietta Galiana at McGill University emphasizes that research planning and grant-writing experience will help provide you with essential tools as well as participating in all aspects of article publication, such as writing, reviewing, and revising.

Developing teaching skills as a student is usually not overtly required in a

graduate program, but it will form a key part of your faculty application. “Although these assistantships [such as teaching] are usually perceived as extracurricular and time-demanding activities,” commented Prof. Monzon, “they provide students with valid experience.” Taking on a teaching assistantship as a graduate school can provide students not only with a source of funding but also the confidence to stand in front of a class and communicate. Try to get as much experience beyond grading as you can, such as giving guest lectures and designing laboratory activities.

While still in graduate school, it can be challenging to gain solid skills in grant writing, article writing and review, independent teaching, and communication. A breadth of experience can also be acquired by developing relationships with professors and other leaders in the field. Prof. Morsy at Cairo University suggests “building a network” to prepare for your academic career. Prof. Thakor thoughtfully states that “careful career development [can be accomplished] through original research, its public presentation and dissemination, and networking among prominent academic and scientific leaders for earning eventual recognition and promotion.”

### To Post-Doc or Not to Post-Doc? That Is the Question

Those nearing the end of graduate school with the intention to pursue an academic career inevitably face the question of whether to continue with a post-doctoral fellowship. The post-doc is becoming a virtual requirement in some fields, and, as Prof. Hunter points out, “We would seldom take someone

into a faculty position without post-doc experience.” Prof. Butera echoes this notion by stating, “It is almost required nowadays to post-doc for one to three years to obtain a position in a [biomedical engineering] department.”

The disadvantages of electing to start a post-doc are in essence taking a lower salary and delaying the start of your independent research career. A loss of independence while a post-doc was cited as a career risk by all interviewed. Fellows “often [have] no freedom in picking the research topic,” commented Prof. Galiana. Of course, every lab is different, and a careful selection of opportunities can minimize this risk.

A post-doc does not typically have a required teaching load and so provides an excellent “opportunity to develop a publication record,” says Prof. Hunter. The post-doc can continue to gain “hands on experience and diversification into one more area,” notes Prof. Thakor. Prof. Butera reflected on his own post-doc experience and felt it was “a period where I matured greatly as a researcher, in terms of my ability to identify/critique a research problem and formulate a grant proposal.” Experience in grant writing is a chance to test the waters before being thrown into a faculty career.

### Industrial Experience

Many individuals pursuing academic careers have gained work experience at various points in their lives, but how is this valued by the ivory tower? Prof. Monzon considered work experience an asset and emphasized that industrial experience “is certainly a plus. Such personal experience for the teacher will lead to the teaching of real-world situations. Teachers must be connected to the outside world, where the actual biomedical engineering needs are exposed. No teacher can ignore what those requirements are, in order to prepare students for professional jobs.” Prof. Thakor echoed this sentiment, adding “Such an experience is useful in negotiating industrial projects and advising students on industrial careers.”

While industry *connections* are desirable in academia, prospective departments do not always value work experience. “For a junior faculty position it is a typically a minus, unless a proportionate number of publications were generated during time in industry,” wrote Prof. Hunter, “This is rarely the case.” Prof. Galiana reinforced this opinion, stating “It’s a plus if the target is an engineering position, but not for basic science. The important issue will always be demonstration of original thinking, usually through publications. This is difficult in IP [intellectual property]-protected industrial work.”

### The Big Challenges

While being a professor is immensely rewarding, it is not without challenges. The life of an academic is diverse and unique among professions. It is largely independent, involves teaching and research proficiency, and requires that you generate your own income to some extent. Those I interviewed indicated two main areas as the biggest challenges: acquiring grant funding and transferring knowledge to students.

“Getting my first salary award and personal research grant to maintain access to tenure” were Prof. Galiana’s primary challenges, while “networking and learning the nuances of the promotion process” topped Prof. Thakor’s list. Balancing expectations early in your academic career wasn’t easy, reflected Prof. Hunter, citing as his major challenge the “development of a reasonable publication record while carrying a very high teaching load as a young academic.” This challenge can present itself throughout your career. Prof. Butera felt that time management was a difficult skill to master, in other words, “how to balance teaching, research, service [and] student advising.”

Working with students can be one of the highlights of working in higher education, but one challenge is “keeping students interested and motivated no matter how dry the subject [matter]!” commented Prof.

Morsy. Indeed, Prof. Monzon summarized it nicely by reflecting, “to being able to transmit knowledge and experience to every single student is indeed a major challenge.”

Where there are great challenges, there are great rewards—and I wish you all success in the pursuit of your academic career!

For further reading, see *Tomorrow’s Professor: Preparing for Academic Careers in Science and Engineering*, by Richard Reis (Wiley-IEEE Press, 1997).

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**Prof. Jorge Monzon** is a full professor at Northeastern National University (UNNE) in Argentina.

**Prof. Ahmed Morsy** was an assistant professor of biomedical engineering at Cairo University and now works at the Cairo Microsoft Innovation Center in Egypt.

**Prof. Nitish Thakor** is a professor of biomedical engineering at Johns Hopkins University in the United States.

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