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## Introduction

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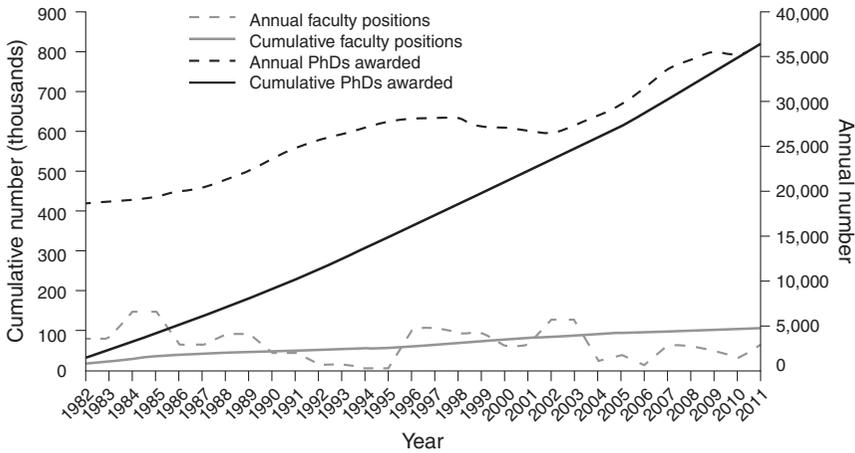
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A PhD and postdoctoral work were once considered to be a training route to a permanent academic position, a journey that would culminate in a tenure-track position and, ultimately, stability as a principal investigator at a university or research institute. Some might falter along the way or rethink their career, but most scientists expected to tread the same path that their predecessors trod to tenure.

This is no longer the reality for most science graduates. Universities are awarding more PhDs than ever before, and more than half of these individuals will become postdocs (Cyranoski et al. 2011). However, there has been no equivalent increase in the number of tenured faculty positions at universities and research institutes (Fig. 1). In the 1960s, most scientists who obtained a PhD could expect a permanent academic position. In contrast, only approximately one in four PhDs in the U.S. now translate to a tenure-track position, and even fewer will ultimately result in tenure (National Institutes of Health 2012). In other words, the majority of PhD students will never obtain the tenured post for which many initially believed they were being trained.

Fortunately, there is now increasing recognition within academia that career options once labeled as “alternative” are not in fact the alternative but the norm. Most mentors now also accept that many of their scientific progeny will pursue such options—not because they fail on the road to tenure but because they actively choose careers that offer a different experience and the chance to develop other skills. A PhD is still training for a scientific career but not one as narrowly defined as a research faculty position.

Turning off the track to tenure remains a daunting prospect, however, and there are few ways of finding out about the many other career options available. Scientific societies and institutions occasionally organize career



**Figure 1.** (Black) The increase in the number of PhDs awarded in science and engineering in the U.S. compared with (gray) changes in the number of faculty positions over the same period. (Reproduced from Schillebeeckx et al. 2013, with permission from Macmillan Publishers Ltd.)

discussion sessions or host speakers who have made the transition, but in this book, we comprehensively examine the career options available to biomedical scientists, gathering the perspectives of a group of scientifically trained individuals who have had great success in numerous different professions.

The experiences of the contributors range from jobs that in some respects resemble traditional scientific positions, such as teaching, grant administration, and core facility management, to jobs that require additional formal training, such as patent law, or, in cases such as management consultancy, can take one away from science entirely. In all of the professions featured in the book, individuals who hold PhDs in biomedical sciences are common and, in many of the careers discussed, a PhD and postdoctoral experience are advantageous if not essential qualifications. Nevertheless, it is worth paying close attention to the specifics of each case. Staying on for a postdoc could be an advantage if you wish to work as a journal editor, for example, and it keeps your options open, but it will put you 3–8 years behind many of your new peers if ultimately what you want to be is a journalist.

The first chapters of this book—teaching in liberal arts colleges, core facility management, and academic administration—describe careers that resemble and are related to traditional academic careers in many respects but have a different primary emphasis: the interests of students, a facility,

or a department or educational institute as a whole. Those who work for foundations or scientific societies or in science policy or grant administration, the subject of the four subsequent chapters, share some overlap in their activities, but because the missions and constituencies of these organizations differ, the work required does as well. In patent law and management consulting, these interests are clients; in start-ups, they are customers and investors. As the chapters on these subjects make clear, this changes the nature of the work significantly. The last three chapters of this book deal with careers in communication, covering medical communications, science journalism, and scientific publishing. Superficially similar, these all involve writing about science, but the purpose and audience are different in each case; so too are the skills required.

Despite the differences among these professions, however, several common themes emerge. Perhaps most importantly, it is clear that the skills developed in the course of a PhD/postdoc are not wasted: They are directly applicable to these other careers. Critical thinking, problem solving, and the ability to sift through and make sense of a variety of data are as essential to a patent lawyer or a management consultant as they are to a principal investigator. Digesting complex scientific concepts, identifying flaws in the logic of a study, and communicating them effectively are as critical a part of the job of a journal editor as a research professor. And rigorous evaluation of proposed lines of scientific enquiry is just as important to a grant-giving organization as it is to the head of a lab. Job candidates should always remember these parallels. In most cases, when you leave the bench and apply for your first job in a new profession, you will have little or no demonstrable direct experience. But if you can convince an interviewer that your skills are transferable, you will have a foot in the door.

Another common theme throughout the book is that these careers are neither second rate nor second choice. Teaching science at a liberal arts college, for example, is not a consolation for lack of success in research (a strong research program is often essential) but a choice for people who wish to put more time into teaching. Working for a journal or scientific society requires you to increase the breadth of your scientific knowledge, not reduce it. And no one should imagine that mastering the law in addition to molecular biology and genomics makes being a patent attorney an easy way out. All of the professions represented here are extremely competitive, with tens to hundreds of applicants for every entry-level position. Those charged with selecting from this rich pool are disinclined to consider candidates who appear simply to be looking for an easier alternative to life at the bench. For those

displaying genuine interest and ability, however, there are opportunities to join organizations that typically provide excellent training and working environments staffed by kindred spirits who have lost none of their love of science.

What should be most encouraging to readers is that the contributors to this book find their jobs so exciting and rewarding. One hears this time and time again from those who have taken these different scientific paths. They delight in their work and rarely express any regret. We hope that this book will help other scientists to choose paths that suit them and that they enjoy similarly fulfilling careers.

## REFERENCES

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