1 What Is an 'Effective' Scientist?

The more I have tried to answer this question, the more it has eluded me. Before I even venture an attempt, it is necessary to distinguish the more esoteric term 'effective' from the more pedestrian term 'success'. Even 'success' can be defined and quantified in many different ways. Is the most successful scientist the one who publishes the most papers, gains the most citations, earns the most grant money, gives the most keynote addresses, lectures the most undergraduate students, supervises the most PhD students, and appears on the most television shows, or is it the one whose results improves the most lives? The unfortunate and wholly unsatisfying answer to each of those components is 'yes', but neither is the answer restricted to the superlative of any one of those. What I mean here is that you need to do reasonably well (i.e., relative to your peers, at any rate) in most of these things if you want to be considered 'successful'. The relative contribution of your performance in these components will vary from person to person, and from discipline to discipline, but most undeniably 'successful' scientists do well in many or most of these areas.

Most of these success measures are easily quantifiable: we can sum up the number of papers you publish, citations they acquire, grant monies you win, students you lecture and supervise, presentations you give, and times you appear on television and are mentioned in the newspapers. But the scientist who spends more time in front of the television camera to the detriment of publishing articles in peer-reviewed scientific journals would not be considered 'successful' by her scientist peers, nor would a highly published scientist be considered 'successful' if none of those articles was cited. So, dominance in one category that comprises success ends up being a curse elsewhere,

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just as mediocre performance in all these aspects will also compromise at least the appearance of success.

So, being successful in science is achievable if you work hard, follow some basic guidelines, and have at least a modicum of organisational skill (the latter is possibly the most elusive for many scientists I know, including me). In fact, many of the following chapters of this book will describe ways to maximise your potential success. To me, being 'effective' means that you must not only be successful, but that you must also do more than what is normally considered part of the scientist's remit. If your academic measures of success do not extend beyond academia, one could argue that your scientific contributions to society are minimal. This distinction therefore implies that effectiveness has a utilitarian aspect beyond mere academic accolades, but it encompasses a wide array of applications. I am certainly not suggesting that only the classically 'applied' sciences allow the derived knowledge or facts to be 'effective' (Chapter 23), for even purely theoretical disciplines can have huge benefits to society (even if they are not necessarily obvious at the time). Moreover, many of these societal benefits cannot be quantified easily, for one usually cannot measure the benefits of a good education (e.g., the capacity to think logically, to make more evidence-based decisions in life, to be more open-minded, etc.), so the essential role of direct lecturing and mentoring the next generation of thinkers is beyond doubt.

But merely supervising PhD students or lecturing undergraduates does not guarantee a societal benefit, for you might end up producing nothing more than other people capable of performing within the expectations of academia. To go beyond academia is not simple; to catch the attention of people outside of your particular scientific speciality – let alone non-scientists (i.e., the general public) – is an enormous challenge even if the scientific results are exciting to you. We must compete in an age of on-tap information, most of which is either meaningless drivel or utter nonsense. To *market* your scientific discoveries is something for which most scientists are not trained, and so a good deal of this book aims to assist you in this endeavour.

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But even marketing is insufficient if your ultimate aim is to improve society, so useful application remains the greatest challenge for any scientist. Irrespective of your chosen scientific discipline, I hope to give you a few additional tools to improve the odds that your science extends past the tip of the academic nose.

This book therefore takes an all-encompassing approach to improving the scientist's career, divided into five thematic parts for a total of 25 chapters. Part I focusses on writing and publishing – a scientist's most important weapon in the academic arsenal. I start with advice on how to be more than just a writer of mundane scientific prose (Chapter 2), to tips on good writing practices (Chapter 3), and article-writing strategies (Chapter 4). From there we head into the murky realm of co-authorship (Chapter 5), and how to choose the best outlets to maximise your publication track record (Chapter 6). Next is a chapter discussing strategies for dealing with rejection and peer criticism (Chapter 7), and I round off the part by delving into the delicate art of peer review and constructive editorship (Chapters 8–9).

Part II deals with the numerical aspects of being an effective scientist, from good analytical skills (Chapter 10), to efficient data management (Chapter 11) in this age of exponentially increasing data generation and availability, and finally, how to obtain and manage your research monies (Chapter 12). Part III is focussed on running an efficient lab, which includes the politics of good lab relationships (Chapter 13), the quality of mentoring students and staff (Chapter 14), actively promoting gender equality and your lab's cultural diversity (Chapter 15), suggestions for efficient time management (Chapter 16) and practicable work–life balance (Chapter 17), and finally, how to reduce the inevitable stress that will threaten your mental health by following all the recommendations in the previous chapters (Chapter 18).

Part IV covers the more entertaining aspects of being an effective scientist, from the best practices for making scientific presentations that people will stay awake for and remember (Chapter 19), making the most of scientific conferences (Chapter 20), getting

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your scientific messages out to the rest of the (non-scientist) world (Chapter 21), and tips for dealing with the press (Chapter 22). Part V raises some more philosophical aspects of a scientist's moral duties and societal role, including an exposé on making your science as useful as possible to society (Chapter 23), the touchy subject of science and advocacy (Chapter 24), and some final thoughts on what being a scientist is all about anyway (Chapter 25).

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