Academic Scientists at Work

Second Edition

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TABLE OF CONTENTS

Introduction

Welcome to the world of Academic Science. Academic Scientist careers are challenging, ever changing, exciting, and can be extraordinarily rewarding. The career path requires a long-term education commitment that focuses on asking the right questions, outlining the right experiments, performing experiments to perfection, and presenting the information to the scientific community. The career path also requires that you become proficient in procuring funding for your research projects and maybe your own salary. Unfortunately, most training programs do not focus on how to effectively and efficiently manage a lab or a career. Because scientists entering an academic career find themselves as independent businesspersons, poor career and lab management choices have pronounced effects on their ability to succeed. The beginning Academic Scientist needs a working knowledge of how the system functions and what is expected. This book attempts to provide the reader with a working knowledge of how academic science is conducted, how to approach the various tasks of academic life, and how faculty members are evaluated.

The chapters take the reader along the academic path beginning from the near completion of the postdoctoral fellowship through the promotion and tenure process of the Assistant Professor. There are five sections. Using an analogy to horse racing, *Part I — The Starting Gate* focuses on beginning a career as an Academic Scientist. Approaches to seeking and negotiating a job, managing a lab, writing grants, and interacting with colleagues are presented. *Part II — Down the Stretch* presents approaches to being successful in the three major areas by which Academic Scientists are reviewed: Scholarship, Teaching, and Service. Dubbed the *Finish Line*, *Part III* focuses on the promotion and tenure process. Included in this section is the chapter *Survey Says*, which presents the data and information collected from a national survey of Academic Scientists about the academic processes discussed in the book. Comments from survey respondents

are provided in this chapter, as well as throughout the book with the "Survey Says" heading.

This second edition includes updates to all of the topics presented. Following publication of *Academic Scientists at Work*'s first edition, the authors have been writing career advice columns for *Science*'s *Next Wave* on-line website. Because the topics covered by these articles parallel the mission of this book, these 12 columns are now included in this second edition as *Part IV — The Extras Section* (*Daily Double*) to provide additional insight and depth to the reader. Of course the reader can go directly to the *Next Wave* site to read or print the articles directly (http://nextwave.sciencemag.org/cdc/index.shtml).

A diverse set of appendices comprises *Part V* (*The Winner's Circle*). Included are a series of worksheets designed for the reader to ask and, of course, answer many of the questions that come up when looking for a job and making lab and career management decisions. Sample letters, curriculum vitas, Specific Aims pages, which are diagrammed to explain how they were composed, are also included. Blank copies of the worksheets and databases are included in the CD-ROM that accompanies this book. All of the above documents were formatted as Microsoft Word™ files. Some contain fillable text to allow the user to "tab" through the document and fill in the fields. Microsoft Excel™ files to aid in budgeting are also included. Additionally, six FileMaker™ Pro databases are included which are designed to organize and keep track of a variety of reagents in the laboratory. Each of the databases has been used in the authors' laboratory, some for over 15 years.

THE AUTHORS

Jeremy M. Boss, PhD

Dr. Boss received his bachelor's degree from the State University of New York at Albany. He joined the graduate program in the Biology Department of that school and completed his doctoral dissertation with Dr. Richard S. Zitomer on the regulation of the yeast cytochrome c genes. He continued his training at Harvard University in the Department of Biochemistry and Molecular Biology with Dr. Jack L. Strominger. During this time period, he participated in projects to clone and characterize human major histocompatibility complex (MHC) class II genes. Towards the end of his training with Dr. Strominger he began to study the regulation of MHC class II genes. In 1986, Dr. Boss joined the faculty of the Department of Microbiology and Immunology at Emory University. In 1992, he was promoted to Associate Professor with tenure and in 1997 to Professor.

Scholarship: Dr. Boss' research focuses on understanding the molecular mechanisms that regulate immune system genes. He has contributed to our understanding of how the MHC class II genes are regulated and how genes are regulated by tumor necrosis factor. Dr. Boss has published more than 85 peer-reviewed research articles and has been funded from federal agencies for the last 18 years.

Teaching: Including his current students and fellows, Dr. Boss has supervised the training of 18 graduate students and 16 postdoctoral fellows. He has served on 71 PhD thesis committees (YIKES!). Dr. Boss has taught in a variety of immunology and genetics related graduate and medical school courses, including one that he created called EGOR (Eukaryotic Gene Organization and Regulation). He was also the course director for the

Microbiology and Immunology course provided for the physician assistant program at Emory for seven years. He is currently the course director for an introductory immunology graduate course.

Service: As an Assistant Professor Dr. Boss became involved in the administration of the bioscience graduate programs at Emory. This experience began as a graduate student recruiter for his departmental program. He was then elected by his colleagues to serve as the Director of Graduate Studies for an interdepartmental program in Genetics and Molecular Biology. After four years at that post he was elected to serve as the Program Director of the graduate program in Genetics and Molecular Biology and has served in this post for 9 years now. Dr. Boss also served on over 50 committees in the medical school, including membership on the ad hoc Tenure and Promotions committee and later as a charter member of the standing committee on Tenure and Promotions. In the School of Medicine, he has also served on the Research Advisory Committee to Dean's office, as well as on the Postdoctoral Fellow Advisory Committee.

Dr. Boss has also served on a variety of grant review panels. These have included membership status on two American Cancer Society review panels and an NIH review panel. He has also served as an ad hoc reviewer for the NIH over the last 15 years on various regular and special study section panels. He reviews approximately 20 manuscripts each year for a number of journals. Handling more than 15 manuscripts a week, Dr. Boss is currently a Deputy Editor for his field's society journal: *The Journal of Immunology*.

Susan H. Eckert, PhD

Dr. Eckert is Associate Dean for Administration at the Emory University School of Nursing, and has responsibility for the School's finance, grants administration, research compliance, human resources, and administrative planning activities. She participates in a wide range of University services, including faculty and administrative search committees, sponsored program compliance groups, human resource policy committees, financial review groups, and other committees that exist either to relieve or beleaguer Academic Scientists. Dr. Eckert is a member of the Board of Directors of DeKalb Technical College in Clarkston, Georgia, and is on the Board of Directors of the Emory University Credit Union.

She received her doctorate in Higher Education Policy from Georgia State University, where the focus of her doctoral research was leadership factors affecting research-intensive basic science departments in medical schools. She learned everything she knows that is worthwhile about the business of science and the values of a meritocracy during two decades as administrator of the Department of Microbiology and Immunology at Emory University.

CAST OF CHARACTERS

Throughout, the authors have used (or attempted to use) humor to portray events, situations, and problems that occur in the life of an Academic Scientist. While the sections may appear funny (or not), they all have a point and all address important issues.

Additionally, a number of fictitious characters were created to play specific protagonist and antagonist roles in this book. While the authors' colleagues have tried to guess whom they represent, we are sorry to say that they do not represent anyone in particular. The characters are the best and worst of all scientists' personalities and behaviors. The characters include:

Dr. Ima Starr — is the rising superstar looking for her first faculty position. She will encounter all of the problems associated with managing her career and laboratory discussed in the book. As described in her CV and Specific Aims, she studies the biology of Ohmygaud and Blahdeblahs.

Dr. Kneematoad — is the major antagonistic character. He exists in all walks of life. Dr. Kneematoad's ambitions are to make everyone do his work while promoting his own goals and abilities at every opportunity. In case you were wondering, he does not work on nematodes.

Dr. Mary Musculus — is the caring chair of Dr. Starr's department. Her role is to make sure that the faculty are supported and mentored so that Dr. Starr and all her faculty can be the best that they can be.

Drs. Brillodooz, Pat I. Ence, Rekinwith, and Dewit Miweigh — represent everyday colleagues with the usual science personalities and hairstyles.

The graduate student with the curly red hair — is Dr. Boss as his own worst nightmare.

There are other students, fellows, and research technicians whose names appear in the appendices strictly for amusement.

LEXICON

This glossary provides definitions to some of the terms (real and made up) used in the book. The terms are arranged by subject. The chapters where the term was used most are indicated.

Tenure-Related Terms:

Clinical Track (*Chapters 1 & 10*): Faculty level appointment for physicians or physician scientists. Clinical-track positions are typically renewable each year and do not usually have tenure associated with them.

Research Track (*Chapter 1*): Faculty level appointment for researchers that is renewable each year. Research track appointments are not eligible for tenure. Research-track positions are used throughout academia. Often such positions allow young investigators the opportunity to apply for and procure their own funding.

Tenure (*Chapters 1, 2, & 10*): Thanks to the continuing efforts of the American Association of University Professors (AAUP), tenured faculty in higher education have a degree of certainty regarding their continued employment. The award of tenure is a significant event because it usually means that the faculty member has a job until retirement or resignation from that college or university. Tenure is an important part of the system of

values in colleges and universities not only because of the sense of security that tenured faculty enjoy, but also because it signifies that the faculty member has been evaluated by his or her peers and found to be a valuable colleague. Tenure can be lost if the faculty member misbehaves egregiously, resigns and goes to another institution, or if the University goes broke.

Tenure Track (*Chapters 1 & 10*): This is the "path" to a tenured position. If a position is described as tenure track, then the incumbent needs to know how long she can remain "on track" and stay employed before getting tenure. It is important to know whether or not a position can lead to tenure because only positions that clearly state that they are tenure track can be assumed to lead to tenure. The time to tenure varies with each institution.

Tenure Clock (*Chapters 1, 2, & 10*): Positions that are on tenure track also are "on the clock," because there is a finite time period for a junior faculty member to establish his or her value to the institution. Each university has its own policies about when the clock starts ticking after the initial appointment, and when the alarm sounds that the time has run out.

Up or Out (*Chapters 1 & 10*): This term relates to the tenure clock and when the alarm will go off that the time on the tenure track has run out. The policies of the university are usually very clear about this. For example, an Assistant Professor on seven-year tenure track may be able to stay in that position for a total of 7 years. Because faculty usually get an entire year of notice that their jobs won't be continued, and because it takes nearly a year to conduct the tenure evaluation, it means that the tenure review must be completed for the Assistant Professor no later than the end of the 6th year in tenure track. That is the move "up" or get ready to go "out" year.

Job-Related Terms:

Job Talk (*Chapter 1*): The formal seminar presentation given by a faculty candidate on his or her first visit.

Chalk Talk (*Chapter 1*): Job candidates may also be asked to present a less formal talk to the faculty on either their first or second visits during the interview process. While the setting of the chalk talk may be more casual, the content of the talk typically focuses on current work in progress and future goals and plans.

CV (*Chapter 1*): Curriculum Vitae. This is the paper representation of an individual's career in academe. In the non-academic world, this document is called a resume, but is much less detailed. The CV presents the specifics of academic work, including education, publications, funding, and presentations, a chronology of academic jobs, research interests, service activities, memberships in professional organizations, etc. Keeping this document up to date helps an Academic Scientist remain prepared for opportunities and saves time.

The Macon Test (*Chapter 1*): Originally coined by our colleague Dr. Gordon Churchward, the Macon Test is the mental calculation a faculty member employs to determine if he or she would like to have a faculty candidate as a companion on a three-hour road trip to some town like Macon, Georgia (scientists in the Northeast might use Poughkeepsie as the destination). This quick test is based on our first impressions of the people we meet. In this case, we, the faculty, ask ourselves if the prospective candidate would be good company over the long haul of an academic lifetime, or if he would be an annoying or boring

passenger on the trip. In the latter case, the candidate flunks the Macon Test, and might not get a job offer.

Parking Committee (*Chapter 9*): Although serving on such a committee is a thankless job because someone's gotta do it, junior faculty members should avoid at all costs serving on committees that do not focus on research.

Second Visit (*Chapter 1*): This term refers to the pleasant occurrence when a faculty candidate receives an invitation to return to a campus for another series of interviews (or perhaps even to talk to a real estate agent!). Being invited for a second visit signifies that the candidate's name has probably been put on the "short list" among the other candidates.

Grant- and Money-Related Terms:

Banking and Discretionary Funds (*Chapters 1 & 4*): Many universities provide funded investigators some return on the indirect costs that are generated by their research grants. Regardless of how the funds are generated, the money typically can be carried forward to future years and may be unrestricted in its use to support the faculty member's research program.

Carry Forward (*Chapter 4*): Funds that can be transferred from one fiscal year to the next.

Direct and Indirect Costs (*Chapters 1 & 4*): These terms apply to extramural grant money. The "direct costs" are for the investigator and the direct expenses of the project, and the "indirects" are for the institution. At some universities there may be a plan for funded investigators to share in the indirect costs (see banking and discretionary) and use a portion of these funds to support the specific project or other projects.

Funding/Granting Agencies (*Chapter 3*): Public and private organizations that accept applications for grants. Each has its own regulations, application forms, and calendars of deadlines and award dates. Federal granting agencies include the National Institutes of Health (NIH), National Science Foundation (NSF), Department of Defense (DOD), etc. There are scores of private foundations and organizations that have grant funding programs, including the American Cancer Society; American Heart Association; American Lung Association; Multiple Sclerosis Society; AMFAR (American Foundation for AIDS Research), etc.

Grantsmanship (*Chapter 3*): The skills associated with the grant application and award processes. These skills are learned, sometimes through trial and error experiences, but can be taught to those Academic Scientists who are open to the advice of their experienced colleagues.

Hard Money vs. Soft Money (*Chapters 1 & 3*): Hard money refers to the annually recurring funds that come from the University, via its endowment income or, in state institutions, from the state government. Soft money refers to the funds that are garnered from grants or contracts, and which have to be competitively renewed to continue past their initial term. Normally, Academic Scientist salaries are composed of a combination of both hard and soft money to reflect the dual commitments both to the university (teaching and service) and to the research enterprise.

HIC, Human Investigations Committee and Institutional Review Boards (IRB) (*Chapter 3*): These are standing committees of the university or institute that are responsible for

reviewing all protocols and procedures that involve human subjects in research. No research involving humans at a university or other institution can be undertaken until these committees approve the procedures. The sanctions for proceeding without such approval can include being banished from receiving future grant funds.

IACUC, Institutional Animal Care and Usage Committee: This is also a standing committee in a research institution. It reviews all the protocols and procedures that involve the use of animals in research. The committee consists of scientists, veterinarians, and lay people.

Principal Investigator (*Chapter 3*): The lead investigator of a grant. A grant can only have one Principal Investigator, but may have several co-investigators.

Program Director (*Chapter 3*): This term has several meanings. A program director is the principal investigator of a multi-component grant, such as a program project or training grant. Program Directors are also the officials at the NIH who coordinate the extramural funding programs. They are the people who will award you money.

Request for Applications (*Chapter 3*): Funding agencies announce "Requests for Applications (RFAs)" with specific information about a topic/disease/system that the agency is targeting for funding. Submitting grant applications in a targeted area of funding is a very good way to obtain money from federal sources in such fields as infectious diseases and bioterrorism. Information about upcoming RFAs is available through the websites of the funding agencies and from the university-sponsored programs offices.

Streamlining (*Chapter 3*): This is the term used by the NIH for the process by which 50% of the grant applications are removed from the number of grants to be discussed by a review panel/study section. This process, which used to be called "triaging," allows the group to focus on the most competitive grant applications, and returns the least competitive applications back for retooling.

Study Section or Peer Review Group (*Chapter 3 & 6*): A meeting where grant reviewers convene to discuss and rank a series of grant applications.

Research and Publication Terms:

Fishing Trip (*Chapter 8*): This is the informal term for high-risk projects in which the investigator is searching for a small number of items among a very, very large number. If successful, fishing trips can lead to significant discoveries that have a big payoff. If the fishing trip yields no "catches," then the cost of materials and the people-power that was lost to the trip are the downsides. Also, if a graduate student is sent on such a trip, with the idea that it could result in a spectacular thesis project, then it should be understood that an unproductive fishing trip could delay the student's completing his degree. Therefore, knowing when to "punt" is a valuable trait.

Magnum Opus Syndrome (*Chapter 6*): When an investigator delays publishing his or her work until an entire system is solved. While complete stories are favored, waiting too long or waiting until your work is good enough for the Top-of-the-Heap journals can be a problem for the young investigator on a tenure clock. A side effect of this syndrome is Bin Scooped Disease.

Minimal Publishable Unit (MPU) (*Chapter 6*): An MPU is a manuscript that contains the smallest number of experiments that tests the hypothesis or answers the questions that are posed. While one should not fill one's CV or scientific reputation with MPUs, sometimes the data and results are clearly an MPU and should be published as such. A compromise between the Magnum Opus Syndrome and an MPU is recommended.

Orthololegous Protocols (*Chapter 4*): This is the term that describes the situation when a lab uses a wide variety of protocols to accomplish the same goal. This can be problematic, because having too many protocols for the same purpose usually leads to many variations in the quality of the data or reagents being produced. It is better to have a small number of protocols that everyone uses so that they can be more readily evaluated when experiments do not work.

Pink Sheet (*Chapter 3*): Now called the Summary Statement, the pink sheet is the documentation of the review of an NIH grant application. The pink sheet (which used to arrive by mail on pink paper) includes the score of the application, the percentile ranking, and a narrative synopsis of the comments made about the grant application by the study section reviewers. Nowadays, the summary statement arrives as a PDF in your email. But you can still print it on pink paper if you so desire.

Protocol Drift (*Chapter 4*): A procedure that becomes altered as it is passed down through the personnel of a laboratory. This becomes an issue when the "drift" takes a perfectly good procedure through an evolutionary process that makes it a procedure that doesn't work at all. Having written protocols for laboratory assays and procedures and implementing a policy that prevents lab members from casually changing the protocols is the remedy to protocol drift.

Punting (*Chapter 6*): A strategy used both in football and in research. In research terms, punting occurs when a project is deep in the hole and the Principal Investigator realizes that it is time to abandon the project and move on to other more promising projects. The key issues in deciding whether or not to punt are: Why? When? and How?

Society-Level Journals (*Chapter 6*): These are peer-review journals that are published by the various scientific societies and represent that specialty of science. Work published in these journals is considered important for the advancement of a field.

Sub-Specialty Journals (*Chapter 6*): These are peer-review journals that are field oriented. They represent the largest class of journals. Work published in these journals will have a lesser impact on the broad discipline that they represent.

Top-of-the-Heap Journals (*Chapter 6*): This refers to the small number of journals that have the highest academic ranking and prestige. Publications in these journals are cited frequently.

'Tweener (*Chapters 6 & 10*): All middle authors on scientific papers. Irrespective of what they actually did to justify their names on a scientific paper, 'tweeners do not get full credit for the work.

Lab Management and Other:

Bench Warp Shuffle (*Chapter 4*): The movement of individual workspaces within the laboratory to increase productivity. This drastic maneuver can separate two contrasting

personalities, or remove one individual from an environment where he/she is overly distracted or distracting.

DuPlex (*Chapters 1, 2, and 4*): A large scientific instrument company or a two-family house.

GammaZoid (*Chapters 1, 2, and 5*): Name given to an essential laboratory instrument with no known function. A GammaZoid is the latest model of the former BetaZoid.

House of Pain (*Chapter 8*): From the student's point of view, the house of pain is the practice of actually sitting there and watching his mentor edit his paper. While the process is slow and potentially boring, it is an excellent way for trainees to learn how to write and edit a manuscript. This phrase was coined by students in Jack Strominger's group some 20 years ago.

Solo and Mini Groups (*Chapter 4*): are approaches to organizing and assigning research projects to the members of your laboratory. While the solo strategy assigns separate projects to each lab member, the mini-group approach attempts to take full advantage of the strengths of the small laboratory by organizing the tasks of a project through the use of groups. Most labs use a combination of both strategies.

TriPlex (*Chapters 1, 2, & 5*): A smaller scientific instrument company or a three-family house.

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Many of the problems and issues that are addressed in the book have been encountered by the authors over the years. We thank the individuals for creating these issues, as well as ALL of the faculty and administrators that have provided advice on how to solve them. In particular, we thank Drs. Charles Moran, Gordon Churchward, Dean Danner, Steven Warren, and John Spitznagel for their eagerness to provide insightful comments on life in science. We also thank the many individuals who have provided comments on the various chapters of the book. Special thanks go to Dr. James Austin, who served as *Science*'s editor for our *Next Wave* articles. Lastly, we are grateful to those scientists who took the time to answer our survey or to participate in one-on-one interviews with us.

Good luck and enjoy!