

The Practice of Science 2009 - an Annotated Bibliography

I've focused on print resources and some of the more obscure or older but still useful resources to complement your web search for useful information on careers and career guidance.

* consider the starred articles as essential reading early in your career (or now if they're new to you). Sample the remainder as time, interest and need—or need of diversion—dictate.

A. Getting Started - Choice of problem and direction

- *1. Kahn, C.R. (1994) Picking a research problem: the critical decision. *New Eng. J. Med.* 330:1530-1533 (excellent advice in the form of 10 easily digested guidelines).
- *2. Davis, M.M. (2000) How to ask questions (in 10 easy steps). *Current Biology* 10:R771. (a complement to Kahn, keyed to quotes from Bob Dylan songs among others).

two interesting perspectives on the vexing issue of choice of a lab are given in: Holden, C. 'Eight attributes of highly successful postdocs', and Vogel, G. 'A day in the life of a topflight lab' (Bob Langer's lab at MIT), both in the 3 Sept 1999 issue of *Science*.

3. Medawar, P.B. (1979) *Advice to a Young Scientist*. Harper & Row, New York. 109pp. (see especially Chapter 3. A very useful and mature perspective from an exceptionally accomplished scientist-writer. Reissued in paperback).
4. Cajal, S. Ramón y (1999) *Advice For A Young Investigator*. MIT Press, Cambridge, MA. 150 pp. (reissue of Cajal's 1897 'career guide'. Includes such interesting chapters as 'Beginner's Traps' and 'Diseases of the Will'. Remarkably prescient! Cajal was a great Spanish neuroanatomist).
5. **series in-print:** the 'Caveman/Sticky Wicket' series in *Journal of Cell Science* is very entertaining, very funny and (usually!) anonymous. What redeems this often-biting series is the skillful use of humor to address important topics in science and science or graduate training. Alas, even the Brits seem to be losing their sense of humor, as this series has been appearing with distressingly decreasing frequency!
6. **series on-line:** *Science Magazine's* 'Science Careers' site has many interesting articles and series covering a wide range of career advice and having an excellent collection of on-line resources.
7. **HHMI short course:** The HHMI funds a series of soon-to-be faculty bootcamps at many institutions including the UW. Sign up if at all possible both for the resources and opportunity to compare notes with other trainees and faculty. For those without access, see the following listing, an attempt by the HHMI to capture a portion of this in useful-free!-form.

B. Getting Stuff Done - I

8. Burroughs Wellcome/HHMI (2006) *Making the Right Moves: A Practical Guide to Scientific Management for Postdocs and New Faculty. 2nd Edition* (a 250 pp guide that can be requested free from HHMI or downloaded and printed from the HHMI website where you'll find additional resources: <http://www.hhmi.org/grants/office/graduate/labmanagement.html>. Includes excerpts from the Barker books noted below as well. Very useful advice and free to boot!).

9. Barker, Kathy (2002,2005) *At the Helm* and *At the Bench: Laboratory Navigator*. Cold Spring Harbor Laboratory Press. (two useful guides, one now in 2nd edition, by Kathy Barker of ISB on setting up and running your lab. *At the Helm* is the more useful of the two for senior students, post-docs and new faculty).
10. Bliss, E.C. (1976) *Getting Things Done*. Bantam Books, New York. (73 short chapters with a few amusing little drawing on how to tackle daily life. Got me to throw out all the other time management books I bought, but was procrastinating about reading!).
11. Allen, D. (2001) *Getting Things Done: The Art of Stress-free Productivity*. Penguin Books. (Useful advice on mastering workflow and managing projects. A short gloss is provided by James Fallows in the July/Aug 2004 Atlantic Monthly, entitled 'Organize your life!' pp.171-176).

C. Getting Stuff Done II - Design and conduct of experiments

- *12. Platt, J.R. (1964) Strong inference. *Science* **146**:347-353. (required reading - exposition of the method of multiple working hypotheses and the role of disproof in the progress of science).
13. Hawkins, C. and Sorigi, M. (1985) *Research: How to Plan, Speak and Write About It*. Springer-Verlag, Berlin. 184pp. (8 useful chapters on research from start to finish).
14. Littlefield, J.W. (1984) On the difficulty of combining basic research and patient care. *Am. J. Hum. Genet.* **36**:731-735. (Littlefield's useful advice on how to combine work on clinical and basic aspects of disease).
15. National Academy Press (1995 +) *On Being a Scientist: Responsible Conduct in Research*, 2nd and subsequent editions. (Responsible conduct of research, and dealing with the ethical dilemmas posed by science, are part of all of our lives. This short booklet has case studies and a good bibliography. You'll receive additional training as part of your graduate career).

D. Essential Skills - Reading, writing and the presentation of science

16. Warren, K., ed. (1981) *Coping with the Biomedical Literature*, Praeger, New York (useful compilation of articles, with the most useful-and least dated-those of how to approach 'the literature').
17. Fawcett, P.J. (1978) Personal filing systems revisited. *Ear Nose & Throat J.* **57**:82-89. (an unlikely place for a small gem to appear - timeless principles still applicable in our computer-supported or -dependent Age of Information).
18. Strunk, W. and White, E.B. (1999) *The Elements of Style*. MacMillan, New York. 85pp. (recently revised and updated writer's "bible" - buy it, read it, use it!).
19. Williams, J.M. (2005) *Style: Ten Lessons in Clarity and Grace*. 8th Edition. Pearson-Longman, New York. 274pp. (Very useful small book of advice that's directly and continuously applicable. Expensive, but worth it).
20. Thomas, F-N. and Turner, M. (1994) *Clear and Simple as the Truth: Writing Classic Prose*. Princeton University Press, Princeton, NJ. 225 pp. (one of the few recent books that addresses style as other than a 'technical' aspect of writing - includes a useful 'Museum' of examples and good bibliography).

21. Medawar, P. (1982/1990) *Pluto's Republic and The Threat and the Glory*, Oxford U.P. and Harper Collins. (Medawar and Thomas (see below) were two of the most engaging and elegant stylists writing science in any century. Both are models of high intelligence, clarity and enthusiasm in presenting science and medicine to the public).
22. Thomas, L. (1974/79) *Lives of a Cell and The Medusa and the Snail*. Viking Press. (see note above. The first of these books was collected from a very unusual (for the time) column Thomas wrote for the New England Journal of Medicine entitled 'Notes of a Biology Watcher').
23. Williams, R. (~1990 on) *The PC (or Mac) is not a Typewriter* series. Peachpit Press, Berkeley. (very useful series of books that provide a nearly painless introduction to typography and will guide you through the use any word processor/graphics program to produce words/figures that look good on the page and are a pleasure to read. Word processing programs have had the paradoxical effect of institutionalizing lots of typographical mistakes and errors. Use these books to spot and correct the more egregious, or to achieve special effects. Little 'how-tos' that make the difference! See also Tufte books below).
24. Calnan, J. and Barabas, A. (1981) *Speaking at Medical Meetings*, 2nd Ed. Heinemann, London. 184pp. (a wide range of useful advice covering many different aspects of speaking. Great figures and cartoons are all illuminated with apt quotes from Shakespeare).
25. Bailey, N.T.J. (1995) *Statistical Methods in Biology*, 3rd Ed. Cambridge University Press, Cambridge. 255pp. (Everyone needs a 'statistical crutch' - this is mine, and you need to find yours. Good introductions to simple concepts and their application, with a Summary on what approach or test to choose as a function of distribution, sample size and type of comparison. Needs to be used with software, and a biostatistician you can trust and work with).
26. Swinscow, TDV (200) *Statistics at Square One*. 9th Ed. Revised by MJ Campbell. BMJ Press. (very useful introductory text that first appeared as an articles series in the BMJ. Now available in print or on-line at the BMJ website: <http://www.bmj.com/collections/statsbk/>).
27. Tufte, E.D. (1983/2001) *The Visual Display of Quantitative Information*. 1st/2nd Editions. Graphics Press, Cheshire, CT. 197pp. (Stunning! Most useful work on graphical excellence in theory and practice. After reading this you'll never look at a multicolor, overproduced 3D Powerpoint slide again without weeping at the lost opportunity to accurately and economically convey *information!* See also Tufte's 3 sequels, all equally useful and enjoyable as well as stunningly produced).
28. Gladwell, M. (2002) The social life of paper. New Yorker 25 March issue. (The real skinny on paper, and why it's so useful: paper is a remarkably efficient and versatile, low cost, low tech but 'high-touch' crutch to support the life of the mind. This article starts with air traffic controllers, who use small scraps of paper to track and clear even very busy flight schedules. Available free at the author's website: www.gladwell.com).

E. Style in Science/The Wellsprings of Creativity

29. Holton, G. (1978) Fermi's group and the recapture of Italy's place in physics, Chapter 5 in *The Scientific Imagination: Case Studies*. Cambridge University Press, Cambridge. 382pp. (Fermi was the last great physicist to be equally adept and accomplished as a theoretician and experimentalist. A good account of Fermi's work habits are given in Platt, J.R. (1962) *The Excitement of Science*, Houghton-Mifflin, Boston, Chs. 7 and 8).

30. Macfarlane, G. (1979) *Howard Florey: The Making of a Great Scientist*. Oxford University Press, Oxford. 396pp. (Fermi's biological counterpart - a great 20th century experimental pathologists, the developer of penicillin and the founder of the Dunn School of Pathology at Oxford).
31. Kanigel, R. (1986) *Apprentice to Genius: The Making of a Scientific Dynasty*. MacMillan, New York. 271pp. (the engaging and well-written story of the scientific dynasty that started with Steve Brodie is traced through Julius Axelrod, Sol Snyder and Candace Pert. Includes a good informal history of the NIH).
32. Fisher, D. (2003). The Henry Kunkel Legacy: through the eyes of his last graduate student. *Lupus* 12:172-174. (another dynasty, this one in a family and based at Rockefeller. David's article captures the essence of Henry as a mentor: the creative spark for your science *must* come from you; smart people will *always* see an interesting angle on any solid result; and the way to build a big, interesting and potentially important story is with that first small, solid experimental result. So get started!).
33. Austin, J.H. (1977) *Chase, Chance and Creativity: The Lucky Art of Novelty*. Columbia University Press, 237pp. (Austin was the long-time Chair of Neurology at Colorado, more recently famous for his excursions into cognitive neuroscience (see also his '*Zen and the Brain*' MIT Press, 1999, 834pp. and sequels). This earlier work is a much more accessible look at the episodes from the author's career, and how a combination of opportunity and insight were leveraged to good advantage. Certainly not the weightiest of works on creativity, but enjoyable. Recently reprinted).
34. Tharp, T. (2003) *The Creative Habit: Learn It and Use It for Life*. Simon and Schuster, 243pp. (very interesting statement on creativity and the conditions that foster creative thinking from one of the giants of 20th century American modern dance. This book aims to be a practical guide, and is made all the more interesting by where its coming from and by focusing on what promotes creativity across a wide range of disciplines).

F. The Larger World, and a few just for fun...

35. Frisch, O. (1979) *What Little I Remember*. Cambridge University Press, Cambridge. 227pp. (best title of any set of reminiscences, by a physicist who enjoyed enormously the science he was doing and the company it allowed him to keep. Great informal history of 20th century physics, illustrated with many photos and author's sketches).
36. Feynman, R.P. (1985) *Surely You're Joking, Mr. Feynman!: Adventures of a Curious Character*. W.W. Norton, New York. 350pp. (Feynman's autobiography in the form of a collection of great stories he told his drumming buddy and fellow physicist Ralph Leighton. A gentle reminder that life and science are supposed to be fun).
37. Dyson, F.J. (1988 on) *Infinite In All Directions*. Perennial/Harper & Row, New York. (these and subsequent lectures in *From Eros to Gaia* (1992), *Imagined Worlds* (1997), and *The Sun, The Genome and The Internet* (1999) are great fun to read for Dyson's intellectual breadth and adventurousness, and his exemplary prose. All in paperback with his reissued autobiography).
38. Langmuir, I. (1989) Pathological science. *Physics Today*, October 1989 issue pp.36-48. (transcript of a famous talk given by Nobel Laureate Langmuir at GE in 1953 on pseudoscience and self-delusional thinking. This formerly lost classic was unearthed, transcribed and edited by Robert Hall in 1966).

see also: Rousseau, D.L. (1992) Case studies in pathological science. *Amer. Scientist* 80:54-63. (This includes the story of the disproof of 'polywater' by use of a sweaty post-handball T-shirt as lab material - this was included as part of what is still probably the best 'Methods' note ever published by Science). In the same vein is the recently published '*Why People Believe Weird Things*' by Michael Shermer (WH Freeman, 1997, recently updated). Shermer has also written the 'Skeptic' column for *Scientific American*.

39. Weatherall, D. (1995) *Science and The Quiet Art: The Role of Medical Research in Health Care*. Norton, New York. 378pp. (Excellent introduction history and defense of the role of basic research in medicine. Regrettably now out of print).

*40. A good history of whatever field you're working in. You need to know the context in which you're working. The best short introductions to the history of pathology include: Maulitz, R.C. (1993) The pathological tradition, chapter 9 pp.169-191 in Bynum, W.F. and Porter, R., eds. *Companion Encyclopedia of the History of Medicine*, Routledge, London; and Florey, H.W. (1958) The history and scope of pathology, chapter 1, pp.1-20 of *General Pathology*, 2nd edition, H. Florey, Editor, WB Saunders, Philadelphia (a more magisterial and illustrated, though older, short introduction. Both include additional suggestions for reading).

41. Hessenbruch, A., Editor (2000) *A Reader's Guide to the History of Science*. Fitzroy Dearborn Publishers, London. 934pp. (great compendium of short articles and annotated bibliographies on important areas and figures in the history of science).

42. Lazebnik, Y. (2002) Can a biologist fix a radio? - Or, what I learned while studying apoptosis. *Cancer Cell* 2:179-182. (amusing meditation on the coming tide of systems thinking as applied to biology. As is often the case, the most useful commentary is again here delivered with a small dose of humor).

43. Not just for women only: Fiona Watt's series of interviews with prominent women in science ran in the *Journal of Cell Science* from 2003. Almost all address or illuminate issues women face and feel more often than men (sexism, exclusivity, demands of family and children), and often provide trenchant advice.

G. The University of Washington Research Funding Service: The UW's Research Funding Service, located in the Health Sciences Library, is a remarkable local resource for students and investigators. The RFS provides an excellent series of handouts and seminars on the very practical issue of locating support for your research, and can help you locate funding sources specific to your situation or nationality. A portion of what the RFS provides can be found at their website: <http://healthlinks.washington.edu/rfs/>

Help us with the 2010 Edition! We're especially interested in your resources on computation and systems issues as applied to biomedical research and training. Send your additions, corrections and suggestions. Any we use will be fully credited!

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