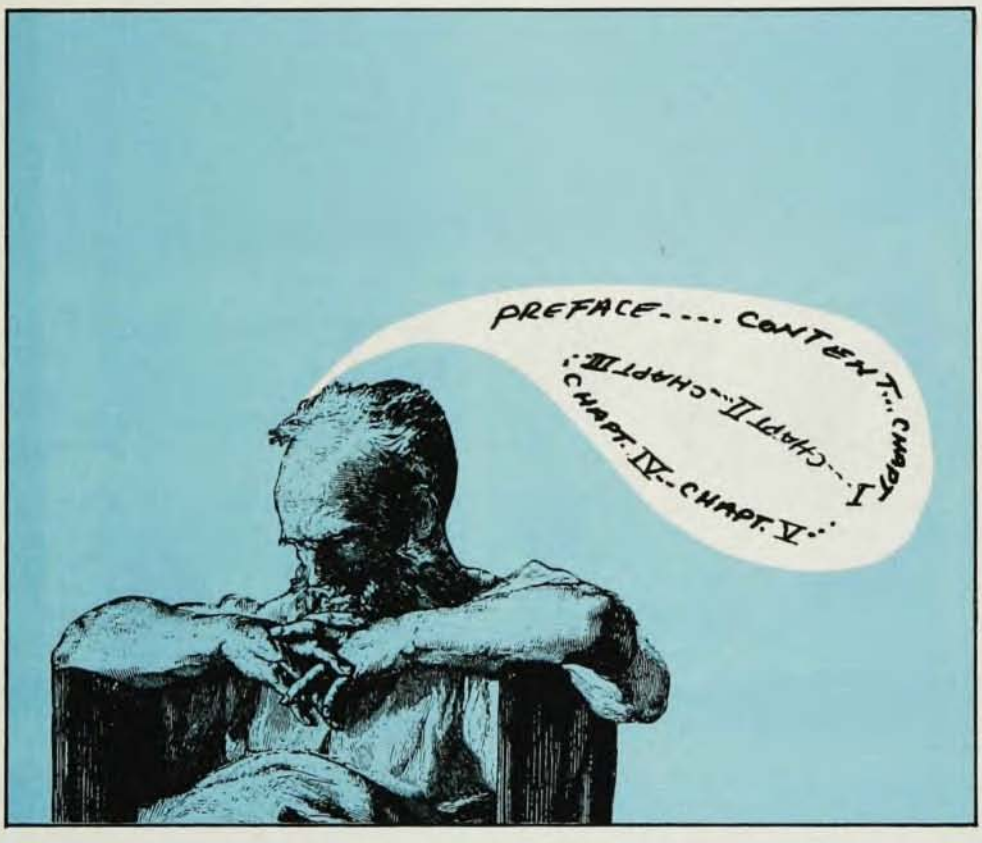
How to write a book

Oliver C. Wells



Writing a book on a technical subject as a part-time project can be very laborious. It can easily go on for ten years or even longer. It is, of course, easy enough to say that the basic principles are: First, keep the effort at a level and on a subject that are compatible with your employment; second, arrange matters so that you will have something to show for your efforts at every stage; and third (most important of all), maintain an understanding with yourself that you can abandon the project without regrets if it does not seem to be working out. But how is this to be done? In this article I would like to offer some practical suggestions that are based on my own experiences while writing a book[1] and that I hope will be helpful to anyone who is considering a similar plan.

Stages in writing a book. Writing a book can be divided into three stages. During the first phase, you are collecting material, trying to identify the important parts, doing a bit of writing and trying to figure out why the subject is of any interest anyway. During the second phase, you will try to put your chapters together. (Also, during this second phase, you will begin to develop an improved appreciation of books written by other people.) Sooner or later you will undergo a mental phase-change after which you will be willing to put your chapters into final form.

Bibliography. There are several very good reasons why you should start work on the bibliography as soon as you can, even before you have decided on the outline of your book. A copy of every reference should be filed by author and year, and the important parts of every article (which might typically be only a few percent of the whole) underlined in red. Although this might appear to be (and in fact is) really rather laborious, it will repay the effort many times over as the work proceeds.

A useful activity is to try to discover that *extra* useful item in every publication, which need not be related to the main topic, but which always seems to be hiding in there somewhere. It is surprising how useful such extra information can be. For example, while browsing through a paper on the scanning electron microscopy of metal fractures I found a magnificent comparison pair of micrographs taken at different accelerating potentials, which was of far greater interest to me than the subject of the paper itself.

You should also obtain copies of all the "famous" papers that everyone cites but which very few people have read. You will find, for example, that it can be a rare occasion when a reference will actually contain only the information which causes it to be cited again and again in paper after paper. David Langmuir's 1936 paper,[2] for example, is frequently cited in connection with the brightness relationship in electron optics. It turns out that Langmuir never used the word brightness. Of greater interest, perhaps, is the appendix to this paper which contains a simple derivation of the spherical aberration of a uniform accelerating field, which imposes a fundamental limit on the resolution of the emission microscope.

Information retrieval schemes can be a great disappointment at this stage. This is because they will provide you with too many references to look up and make copies of individually. Far better, in my opinion, is to make copies of all of the papers which you find to be interesting, look up the references cited in these papers, make copies of them, and add them to your collection.

Dry runs. When you have made a good start on the bibliography, it is time to start on dry runs for your various chapters. The purpose of the introductory chapter is to survey the field and act as an introduction to the other chapters in the book. There are various journals and conference proceedings which publish survey articles, and preparing one of these can provide a useful rehearsal for writing the first

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chapter for your book.

Another useful procedure is to publish annotated bibliographies of the various sections of the subject (with a request, of course, that authors should send you reprints for updated versions). This again allows you to rehearse for writing chapters for your book, whilst having something to show for your efforts at every stage.

On the subject of writing style, I am frequently horrified to discover that I quite simply cannot understand even the first paragraph of a technical article on a subject quite close to my own major area of interest. To avoid such a problem with your own writing, I would most strongly recommend that you follow the "grandmother principle," according to which the first page of every chapter, the first paragraph of every section, and the first sentence of every paragraph should be comprehensible to your grandmother. This principle is based on the observation that if these introductory statements are incomprehensible to a person of normal intelligence and interest not involved in your field, then it is most unlikely that the rest of your writing will be comprehensible to anyone at all.

Citation of references. Here, I believe that it is generally more useful in a review article to cite a reference by author and year rather than by a number. A sentence which says "Person (year) did this" is more agreeable than a sentence which makes a statement and then puts in a string of numbers in supposed substantiation of that statement. For example, it is probably better to say "Knoll (1935) built a scanning electron microscope (SEM) in which the electron column was a modified cathode-ray tube" than to say "The earliest SEM was built with a glass envelope (Knoll 1935)". This is because in the second case, you do not know whether Knoll had conducted the experiment, was an onlooker, was a promoter of the local glassmaking industry, or whatever.

An additional advantage of citing the references by author and year in alphabetical order and with the full title is that the bibliography then becomes something that has value as a separate entity from the main paper itself.

Technical points. Some points that are important in the final assembly of a book:

▶ Chapter length. The temptation is to make the chapters too long. Typically in your initial plans, each chapter might consist of four or five sections with ten or twenty diagrams or photographs in each. Don't do it. Divide them into as many separate chapters as you can. First of all, it is very much easier to put short chapters into final form. Second, it is easier to run corrections through to the end of a short chapter. Finally, you will retain the option (up to the page proof stage, in fact) of adding final sections to the chapters to cover the inevitable all-important topics that you had forgotten until the last moment.

▶ Figures. Resist the temptation to combine, say, the first four pictures into Figure 1 and call them Figures 1(a), 1(b), 1(c), and 1(d). It is better to call them Figures 1, 2, 3 and 4. This is because you will almost certainly find extra diagrams that must be inserted at a later date, and it is far easier to do this if you have kept a few numbers in hand. An important part of any book on an experimental technique (microscopy, for example) is a collection of micrographs to show what the method can do. Here, I prefer the comparative approach, in which, for example, two or more micrographs of the same area (but obtained by different methods) are mounted side by side. I personally found it agreeable to obtain micrographs from as wide a range of workers in the field as I could, and then to make the micrographs, the caption, and the reference as a self-contained "package" that can be studied without an absolute need to read the text. (Of course, the reference should be cited by name and year in the caption in such a case.) In my opinion, a good collection of micrographs or diagrams can considerably enhance the value of a book.

▶ Errors. You must prepare yourself for the fact that you will make mistakes. A misprint is bad enough, but far worse is an error that makes it perfectly clear that you do not understand some fairly simple aspect of the subject—confusing the distance of closest possible approach in Rutherford scattering with the impact parameter, for example (I removed this error at the second printing of my book).

The only defense against this sort of misfortune is to seek as many independent reviewers as you can; but even so, you must recognize that beyond a certain point it will serve no purpose to continue searching for mistakes. One of my friends, after checking every detail, was unpleasantly surprised when one of the diagrams in his book was printed upside down. Sometimes, you just can't win.

References

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2. D. B. Langmuir, Theoretical limitations of cathode-ray tubes, Proc. IRE, **25**, 977–991 (1936).
3. A. E. Conrady, Star discs, Mon. Not. Roy. Astr. Soc., **79**, 575–593 (1919). □