*Essentials of Writing Biomedical Research Papers.* Mimi Zeiger. New York: McGraw-Hill, Health Professions Div., 1991.

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This is an in-depth study of a very specific genre, the biomedical research paper. Growing out of courses Zeiger has taught to graduate students, postdoctoral fellows, and practising researchers at the Cardiovascular Research Institute at the University of California, San Francisco, and at various medical schools around the world, it is designed to be a textbook in courses for writers of biomedical journals, such as the New England Journal of Medicine, or Circulation, or Cell Tissue Research. As well as being ideal for such a course, this text could be used very successfully by individuals who want to study on their own, provided they have sufficient motivation to persist with the very challenging tasks the books sets.

As the author says in the preface, the aim of the book is "to explain and illustrate what a clearly written biomedical paper is." Although methods papers -- "papers that report new or improved methods, apparatus, or materials" -- receive some attention, the focus is "the journal article that reports results of original research." Theoretical papers, case reports, and review articles are excluded. This textbook differs from similar books in the specificity and thoroughness of its approach and in being based so fully on actual biomedical papers, published papers as well as drafts of papers that were subsequently published.

Each of the twelve chapters includes a clear and thorough explanation of principles, many examples of research papers and of portions of research papers to illustrate the principles, exercises to

practice the application of the principles, and checklists of the guidelines proposed. The pedagogy of this book rests primarily on the analysis of examples, on the use of examples as models to emulate, and on the revision of drafts of papers written by others.

The very carefully chosen examples serve as models of good biomedical writing, but also as illustrations of weaknesses that can be overcome in revision. The analysis of these examples uses three complementary techniques:

1. marginal comments about structure, usually keyed to particular sentences,
2. summary lists of strengths,
3. general discussion of the selection.

As well, underlining and boldface highlight particular words or passages within the examples. Since all the examples are taken from biomedical papers, the terminology can be forbidding for anyone without a strong background in the life sciences, but then the textbook is not designed for such an audience.

The exercises, which have been tested repeatedly with classes taught by Zeiger and others, are the other central feature of the book. Exercises that ask the reader to check whether the guidelines have been applied in a sample passage encourage the reader to notice details of structure and to review and apply the guidelines discussed in the chapter. Other exercises ask the reader to list the strengths and weaknesses of a passage; these are particularly useful as the basis for a subsequent class discussion of the passage. Most of the exercises, though, ask the student to rewrite a passage so as to improve it. Answers for all the exercises are provided at the back of the book, though Zeiger is very clear about there not being only one appropriate response to most of the exercises. Since in general the exercises use actual passages of papers or of drafts of papers, they have the advantage of the student working with the kind of complexity that real passages present. As the author says, "Some of the exercises are rather difficult." (p. 8)

The layout and design are excellent and certainly enhance the author's work. The large pages (21.5 cm by 28 cm), crisp print, and generous use of white space help to make this a very readable and easily used textbook. The generous left margins accommodate major headings and marginal analyses of examples, and also provide room for the student's notes.

The chapters are arranged into four sections. Section I, The Building Blocks of Writing, includes chapters on word choice, sentence structure, and paragraph structure. The strongest chapter is the one on paragraph structure.

Section II, The Text of the Biomedical Research Paper, is the longest and most central section, for its four chapters discuss in detail the four components of the research paper: the Introduction, Materials and Methods, Results, and Discussion. Each chapter is organized into the following subsections: functions, content, organization, length, and "details," which usually addresses special language problems presented in that component of the paper. The chapters on the Introduction and on the Discussion are outstanding.

Section III, Supporting Information, consists of a very detailed, thorough, and sophisticated chapter on figures and tables and a rather brief one on references that presents some guidelines on using references, explains the Vancouver style, and very sensibly refers the reader to the style guidelines of the journal to which a particular paper is to be submitted.

Section IV, The Overview, includes thorough chapters on the abstract, and the title, and a final chapter, called "The Big Picture." The chapter on abstracts discusses abstracts of results papers, methods papers, and ones written for meetings. The final chapter consists of a lengthy checklist of techniques and signals to use within a paper to provide the reader with an overview of its structure. The reader is then asked to use this checklist to assess and then revise a complete 14-page paper.

The twelve chapters are flanked by a brief introduction and a very brief section on process. The introduction defines the purpose, scope, and approach of the book, and then provides a brief overview of the components of the research paper. The section on process concentrates only on writing the draft and on revising.

While this is clearly a fine textbook for writers of biomedical research papers, what does it offer readers of Technostyle? First, it is a book to which we can refer graduate students, postdoctoral fellows, and colleagues in the life sciences. Second, it is a textbook we can use if we are called on to teach a course in medical writing; however, I would warn prospective teachers of such a course that even with this excellent book in hand, most of use would have to engage in extensive and difficult preparation to take on a class of serious students in this subject. Third, it is a book that can introduce us to the biomedical research article, and by extension to the scientific article. In other words, it could be a resource for self-education in this specific genre about which most of us know very little indeed. It would at least serve to show how scientific research papers differ from the laboratory reports written for university courses and from the kinds of articles published in Scientific American or Science. Section II would be particularly interesting for readers who are not very familiar with the structure of the scientific research paper. The chapters on the Introduction, on the Discussion, on abstracts, and on titles could also benefit any researcher, in the humanities as well as the sciences. If nothing else, this book convinces the reader that writing biomedical research papers is a complex task that can be simplified if one approaches it systematically and follows the guidelines this book provides.

This is a serious book for serious people. It is authoritative, meticulous, and well tested with students and instructors. However, it is not an easy read. Although the explanations are extremely clear and readably written, the reader is expected to work, and to work very hard, to analyze the examples and do the exercises; without considerable effort, the reader will gain little of what the book can offer. It is primarily a specialist's book that could serve as a model for texts designed to teach other subgenres.