

Biological Scientific Writing (BIOL 825)

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[Course Webpage](#)

Lecture Notes — *IMRaD Format and Publication Process*

Based, in part, on the recommended text by Robert A. Day and Barbara Gastel. 2006. *How to Write and Publish a Scientific Paper, 6th edition.*

READING SCIENTIFIC LITERATURE

Primary Literature, Secondary Literature, and Gray Literature

- Primary literature is the first publication of original research in a journal or other widely available publication that has undergone independent (typically anonymous) peer review and is sufficiently documented to allow others to repeat the experiments and verify the results (i.e., the methods and results are fully documented).
- Secondary literature is a summary based on other literature sources and includes textbooks, review papers, articles in popular magazines, etc.
- Gray literature can be based on original research or secondary sources, but it has not gone through the peer review that manuscripts undergo when submitted to most professional journals, and it often is not widely available. This typically includes reports submitted to governmental agencies and private organizations.

Getting Started

- Although your research project will be relatively specific and narrow in scope, it is important to understand both the broader context into which your research will fit and what your project can and should include (or exclude). This will help you select the appropriate articles and other literature you will need to read for your research.
- Obtain background knowledge on the subject from texts, review papers, M.S. theses, etc.
- Consult with your advisor and others about good background sources.

Reading Journal Articles and Book Chapters

- Read the abstract first (if there is one).
 - It will explain the basic goals and conclusions of the study.
 - It will help you decide whether to read the article.
- Read the introduction.
 - This should provide an overview of previous research. You might want to read some of these sources.
 - It should include the hypotheses being tested, and help you place this study in the context of your research.
- Unless you have a specific reason for focusing on methods, give the Methods (Study Area) section a quick read initially.
 - Get a general idea of the experimental design, techniques, etc. Usually, you do not need understand the full details to understand the results and discussion.
 - Come back to this section later, if necessary.

- Read the Results twice.
 - Initially focus on qualitative results -- the overview.
 - On the second reading, focus on quantitative results (e.g., statistical analyses).
- Read the Discussion
 - How do the conclusions relate to your research project (your hypotheses)?
 - In addition to publications that agree with your hypotheses (and eventually, perhaps, your conclusions), you should include research with conclusions that are contrary to your hypotheses (or conclusions).
- Check the Literature Cited section for other publications that might be useful to you.
- Reread important papers later in your research process.
 - You might gain a better (perhaps different) understanding of the information in a publication as you continue to learn about your research topic.
- For relevant publications you have read, record complete bibliographical information and obtain a copy of the article or chapter.
 - Do NOT mark in or remove pages of journals, books, or other publications that do not belong to you.

Keys to Successful Scientific Writing

- Obtain a copy of the ‘instructions for authors’ for the journal and follow the instructions.
- Think about where you are going before you begin to write.
- Write to illuminate, not to impress. Use simple but informative words and sentences.
- Make a statement and support it with your results or literature sources.
- Stick to the point.
- Make smooth transitions within and between paragraphs. Create a flow of words and ideas.
- Do not make the reader work hard.

NOT GOOD: The difference in absorption rates is shown in Table 1.

[Reader has to stop and look at Table 1.]

BETTER: Alcohol is more readily absorbed into the bloodstream from distilled beverages than from brewed beverages (Table 1).

[Reader knows what Table 1 documents and can look at it later for details.]

- Do not plagiarize.
 - Paraphrase information from other sources and cite them appropriately within your sentence or at the end of your sentence.
 - Simply replacing a few words without altering sentence structure or simply transposing clauses or phrases within a sentence are considered inappropriate in scientific writing, even if the original source is cited.
 - Use quotes around substantial phrases or sentences that do not differ from the original source, but keep in mind that direct quotes are rarely used in scientific writing.
 - Always cite the original source.
- Do not be teleological.

- Proofread *carefully*. Use the spell-checker, but do not rely on it entirely (e.g., two be or not too bee careful). Consider the following:

Aoccdrnig to rscheearch at Cmabrigde Uinervtisy, it deosn't mtttaer in waht oredr the ltteers in a wrod are, the only iprmoentn tihng is taht the frist and lsat ltteer be at the rghit pclae. The rset can be a total mses and you can sitll raed it wouthit porbelm. This is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe.

- Be neat; appearances count.
- Keep copies of everything you submit.
- Be clear and concise!

ORGANIZATION of SCIENTIFIC PAPERS

Title and Key Words [also see Day and Gastel, 2006:39-44]

- Be specific and concise. This will attract readers to your manuscript.
 - More people will read your title than read your abstract, and more people will read your abstract than read your article. Your title and abstract are important in encouraging people to read your article.
- Do not begin a title with 'a', 'an', 'the'
- Do not begin a title with superfluous phrases, such as 'Observations on' or 'Notes on', that can be omitted without any loss of clarity.

Authors and Addresses [also see Day and Gastel, 2006:45-51]

- Decide well in advance who will be an author and make sure it is clear to all parties.
- The address you use should be the address of your employer or the department in which you were a student at the time you conducted the research.
 - Most journals also allow you to list your present address.

Abstract (past tense) [also see Day and Gastel, 2006:52-55]

- Brief (< 250 words) summary of IMRaD.
- Does not include literature citations or statistical values (e.g., probability values).
- Printed first, but written last.
- This is what potential readers will use to decide whether to read your manuscript.

Introduction (present tense and past tense) [also see Day and Gastel, 2006:56-59]

- Should be written before research is conducted.
 - You should not begin your research until you thoroughly understand what has already been done and what your research will contribute to this body of knowledge.
- Serves three main purposes:
 1. describes the nature and scope of the problem,
 2. reviews the literature, and
 3. states the hypothesis (or hypotheses) of current research.

Methods (primarily past tense) [also see Day and Gastel, 2006:60-65]

- Detailed description of methods (including statistics) and materials used in study (research must be reproducible).

Widely used statistics (e.g., chi-square test) do not need to be described in detail.

- Some citations are possible, but generally describe their methods, too.
- Acknowledge manufacturers when using proprietary names.

Provide company name, city, state, and possibly country in parentheses after proprietary name, or use appropriate symbols for trademarks, etc. as required by journal.

- In some journals, this section might include a description of the study area.

Results (past tense) [also see Day and Gastel, 2006:66-68]

- “Just the facts, ma’am.” [Sgt. Joe Friday, LAPD]

- Some results are presented in their entirety.

- Some results are summarized, perhaps statistically.

Include all appropriate values (e.g., P , n , SE , SD , df).

- Some results are summarized in tables, graphs, or images.

Tables and graphs should only be used when information cannot be conveyed clearly and concisely in text.

Discussion [also see Day and Gastel, 2006:69-72]

- Discuss, do not recapitulate, the results.
- Explain how your results agree or contrast with other studies.
- Point out exceptions or unsettled points.
- Discuss the implications or applications of your work.

Acknowledgments [also see Day and Gastel, 2006:73-74]

Include 1) those who helped with fieldwork, statistics, and other essential parts of your research; 2) sources of funding, equipment, and other logistical support; and 3) reviewers (including anonymous reviewers, but not editors).

Literature Cited [also see Day and Gastel, 2006:75-82]

- Avoid common mistakes.
 - ALWAYS carefully check the content of each citation against the *original* publication.
 - ALWAYS carefully check each citation in the text against the citations listed in the Literature Cited section. Are there any missing citations or any extra citations not included in the text?

- Using the name and year system in text.
 - ...Eberle (2002). [If the name of the author is part of the sentence.]
 - ...(Eberle 2002). [If the name of the author is not part of the sentence.]
 - or ...(Eberle, 2002) [Use of comma depends on journal.]

 - Listed chronologically in text in most journals to acknowledge priority (some journals use alphabetical sequence):
 - ...(Williams 1987a, 1987b; Ernsting 1989; Eberle and Schmidt 1997, 2000; Eberle et al. 1998; Eberle 2002). [Some journals now replace 'et al.' with 'and others'.]

 - Listed alphabetically in Literature Cited section (some variation in style among journals; follow journal style):
 - Eberle, M. E. 2002.
 - Eberle, M. E., N. D. Lambrecht, and M. E. Schmidt. 1998.
 - Eberle, M. E., and M. E. Schmidt. 1997.
 - Ernsting, G. W. 1989.
 - Williams, K. J. 1987.
 - Williams, K. J. 1988. [Listed chronologically when the authors are the same.]
 - Using a superscript number used in text to refer to citation.
 - Earlier studies documented the presence of Topeka shiners throughout the region^{1,2}.

Alphabetical-number system (listed alphabetically regardless of when they first appear in text).

 1. Eberle....
 2. Lambrecht....
 3. Schmidt....

Citation-order system (listed in the sequence in which they appear in text).

 1. Lambrecht....
 2. Eberle....
 3. Schmidt....

Personal note: the citation-order system should be abolished!
 - For each literature source that you cite in your text, be sure to obtain the following information for use in the Literature Cited section of your manuscript:
 - Author(s).
 - Year of publication.
 - Title of article, note, book chapter, entire book, thesis, dissertation, etc.
 - Journal name, publisher (and city, state, and country for books, reports, etc.), or university name (and city, state, and country for theses and dissertations).
 - Volume number (and issue number if each issue in a volume begins with page 1).
 - Page numbers of the article, note, or chapter (some journals also require the total page numbers for books, even if only a chapter is cited).
 - Editor(s) of books with chapters by several authors (but not the editors of journals).
 - Translator(s), if a publication (usually a book) was translated from its original language.
 - Report these items as required by the specific journal (or thesis guidelines).

[Comments on citing internet sources and unpublished \(gray\) literature.](#)

Appendixes

Appendixes (appendices) typically come at the end of a manuscript, and summarize lists of essential documentation, such as specimens examined, localities, etc., that do not fit in the main text.

Tables — see handouts [also see Day and Gastel, 2006:85-91] [Table Creation Exercise \(pdf file\)](#)

- Do not use tables, unless absolutely necessary; they cost more to publish than text.
- Table legends are written to stand alone; the reader should not have to refer back to the text.

Similarly:

- Be sure to spell out names of genera and other abbreviations, even if they have been used in the text.
- Be sure to include relevant locations, dates, etc. that were included in the text.
- Use horizontal lines to separate the table header row from the data.
- Do not use lines to separate rows or columns of data in tables.
- Elements should read down columns, not across rows.
- Do not use shading or bold font; they might not publish or photocopy clearly.

Figures — see handouts [also see Day and Gastel, 2006:92-104]

- Figures are more expensive to reproduce than text, so the smallest possible image will be published to conserve space (and costs).
- Check a reduction of your figure to be certain that lines and text are readable if it is reduced to fit the journal page or a single column on a page.
- Figure legends are written to stand alone; the reader should not have to refer back to the text.

Similarly:

- Be sure to spell out names of genera and other abbreviations, even if they have been used in the text.
- Be sure to include relevant locations, dates, etc. that were included in the text.
- High contrast is important in black-and-white illustrations.
- Shades of gray and patterns (used, for example, on bar graphs and maps) are difficult to reproduce clearly in a journal, especially when the figure is reduced to fit the journal page or a single column on a page. They also do not photocopy clearly.
- If electronic copies of figures are required, they should be high-resolution files, such as TIFF (for halftones or detailed line drawings) or EPS files (for line drawings), not JPG or other files that look sharp on a computer screen, but are not as sharp on a journal page. Images in Word or PowerPoint also are difficult formats for publishers to use.

PUBLICATION PROCESS

Relative 'prestige' of journals

1. *Nature* and *Science*
2. International and national journals in each field
3. Regional journals (e.g., [*Southwestern Naturalist*](#))
4. State journals (e.g., [*Transactions of the Kansas Academy of Science*](#))

Choose the most appropriate journal where you will submit your manuscript

- Choose only one journal; submitting your manuscript to 2 or more journals simultaneously is not acceptable.
- Choose the most 'prestigious' journal that publishes similar manuscripts and is likely to reach the audience you want to reach.
 - If your research includes information essentially of 'local' interest, it will not be accepted by a journal with an international audience.
 - If your research simply confirms studies done elsewhere, it likely will be accepted only by a regional or state journal.
- Consider the possible backlog of manuscripts and lag time for publication of an accepted manuscript.
- Follow all of the instructions provided for the journal submission process

Review process, proofs, and reprints

- Always endeavor to be courteous to an editor; many are unpaid and are working as editors in addition to their paid employment.
- Managing editors record tracking information on the submitted manuscript and direct it to the appropriate associate editor.
- Associate editors:
 1. arrange for (usually) 2 anonymous reviewers (perhaps 3, if the first 2 disagree),
 2. decide whether to accept or reject a manuscript (rejection rates are highest for more prestigious journals, typically exceeding 50%),
 3. work with the authors on revisions.
 - You must make changes suggested by the editor and reviewers or explain in a cover letter why you feel such changes are inappropriate.
 - Major changes might cause the editor to return the manuscript to the initial reviewers for a follow-up review.
 - A common change following the review process is shortening the manuscript, sometimes substantially, perhaps even changing a feature article to a note.
 - Return your revised manuscript within the deadline (unless you choose to submit it elsewhere).

- Managing editors (possibly assisted by Copy Editors) deal with publishing accepted manuscripts.
 - Additional modifications probably will be made by the managing editor.
 - Galley proofs are returned to the author for a final check of the version to be published.
 - Galley proofs are copies (usually a pdf) of your accepted manuscript as it will be published in the journal.
 - The cost of changes made on galley proofs by authors can be charged to the author, so carefully check the galleys.
 - Late corrections made by the editor or the printer are not charged to authors.
- Publication costs (page charges) sometimes are charged to authors.
 - Current page charges for our regional journals range from \$40 to \$80 per page.
 - Additional charges might be applied to cover the cost of tables and figures (and the cost of changes to galley proofs).
 - Some society journals subsidize publication costs, paying all or a portion of the costs if one or more authors are members of the society.
- Reprints typically are provided as pdf files from the publisher or society.