INSTRUCTIONS FOR THE PREPARATION OF A TECHNICAL ESSAY

INTRODUCTION

The technical essay is a review paper that synthesizes and interprets work on a particular subject area. Therefore, the format is not as standardized as that of a research paper. By bringing together the most pertinent findings of numerous papers from diverse journals, a review paper serves as a valuable summary of research. In writing your essay, interpret the primary journal article in a series of paragraphs that build on your discussion, giving particular attention to the problem or topic posed in your introduction. In addition, relate your findings to previous observations or experiments from the supplemental references that you have chosen. Discuss briefly any logical implications of the journal articles for practical application or future studies. A good review paper not only synthesizes information; it also provides a critical overview of an important scientific problem.

After you have finished your first draft of your essay, review the structure of your manuscript. Are the sections arranged in logical sequence? After you are satisfied with the structure of your essay manuscript, attend to the details: the paragraphs, the sentences, and the words. Expect to do several drafts of your paper before you are satisfied with the final product. Good writing is generally the product of careful *rewriting* or *revising* in which you evaluate your attempts at organizing and expressing your ideas. In the process you end up scrutinizing the ideas themselves, as well as your own mastery of the subject.

CITING REFERENCE MATERIALS

The text of a biological paper usually contains numerous literature citations, or references, to the published studies of other authors. This is because scientists rarely work in a vacuum; hypotheses are developed, tested, and evaluated in the context of what other scientists have written and discovered. Thus, careful documentation, or acknowledgment of the work of others, is essential to good scientific writing. Biologists also need to provide literature citations because, like other writers, they have an ethical and legal obligation to give credit to others for material that is not their own. Such material includes not only direct quotations, but also findings or ideas that stem from the work of someone else.

Unlike writers in the humanities and social sciences, biologists rarely use footnotes or endnotes to acknowledge sources. Instead, they insert literature citations directly in the text, either by giving the last name of the author(s) and the year of publication (name-and-year method), or by referring to each source by a number method. Such rules, even if they seem arbitrary, make the reporting of

references an orderly activity, minimizing confusion for writers, readers, editors, and publishers.

In this course, the name-and-year method, also known as the Harvard method, will be used for literature citations. Cite each reference by giving the last name(s) of the author(s) followed by the year in which the material was published.

Work by One Author
For each citation, use parentheses to enclose the name and the date.

Example: The most recent study of sexual dimorphism in this species (Jackson 1976) fails to account for…

If the author's name appears as part of the sentence, put just the date in parentheses.

Example: Black-horned locusts were first reported in Iowa by Blum (1914).

Work by Two Authors
Put the senior authors name first. The senior author is the one whose name appears first after the title.

Example: In a study by Rutowski and Abrams (1963)

Work by Three or More Authors
Here, you may cite the senior author's name followed by the abbreviation *et al.* (from the Latin phrase *et alia*, meaning "and others").

Example: White-lined bark beetles are attracted to the odor of rotting wood (Bateson et al. 1972)

Whichever documentation system you use, put each citation close to the information you wish to acknowledge. Do not automatically put cited material at the end of every sentence. Citations allow you to acknowledge the work or ideas of others, and they also inform the reader. Do not pack your text with citations simply to demonstrate that you've done your homework and are intimately familiar with the literature. If certain material is well known and fundamental to a particular field, it is not necessary to cite sources.

PREPARING THE LITERATURE CITED SECTION

The Literature Cited section of a biological paper contains only the literature (sources) that have been cited (referred to) in the text of your technical essay. Even if you have acquired useful background knowledge by reading several articles and books, do not list any of these in the Literature Cited section unless you have specifically mentioned them in the text. Bibliographies, lists of all sources mentioned along with additional references on the topic, are not generally part of scientific papers.

Biological journals have adopted various formats for the Literature Cited section of papers. Prospective authors prepare this section by carefully following the guidelines prescribed by the journal for which they are writing. Your instructor, like a journal editor, has certain preferences. The following examples illustrate the style used by the Council of Biological Editors (CBE) Style Manual (Third Edition).

Journal Article with Single Author

Grand, P. R. 1981. Speciation and the adaptive radiation of Darwin's finches. Am. Sci. 69:653-663.

Wolfram, S. 1984. Computer software in science and mathematics. Sci. Am. 251(3):188-203.

Journal Article with Multiple Authors

Via, S. and R. Lande. 1985. Genotype-environmental interaction. Evolution 3 :505-522.

Book, Number of Pages Given

Schwarts, R. J. 1955. The complete dictionary of abbreviations. Thomas Crowel Co., New York. 211 pp.

Book, Part of

Overstreet, H. A. 1925. The psychology of effective writing. Pages 87-101 in H. A. Overstreet, Influencing human behavior. W. W. Norton & Co., New York.

Technical Report

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979 Dec. Classification of wetlands and deepwater habitats of the United States. Washington: Fish and Wildlife Service. Report nr FWS/OBS/-79/31. 103 pp.

MANUSCRIPT FORMAT

After making final revisions on your paper, you may feel that all the work is over. You will need to produce a neat, clean manuscript. A sloppily presented paper, such as one with page numbers missing, margins askew, and the type barely visible, will not show off your prose to good advantage. Such details affect the reader's overall impression of your work.

Use an 8.5-by-11-inch white bond paper (not erasable bond or onionskin), a dark ink cartridge on your printer, and a standard typeface (not script type or all capitals). Print on only one side of the paper. Leave two spaces after each period and a single space after each comma. Indent each paragraph five spaces. *Double-space* the entire manuscript, including the abstract (if you have one), the Literature Cited section (between adjacent references as well as between the lines of a single reference), table titles, figure legends, and any indented quotations in the text. Leave margins of 1-1.5 inches on all sides of the page. Number the pages consecutively beginning with the title page (which does not actually carry a number, but is still counted). Use only Arabic numerals (1, 2, 3,…) and put the numbers in the *upper right-hand corner* of each page.

An acceptable format for the technical essay calls for the following information on the title page: title of paper, author, course information, and date. Center each line on the page, and capitalize the first letter of all important words.

Typographical errors, misspelled words, missing commas or periods, irregular spacing, and other minor errors distract the reader and undermine your authority as a writer. The aim of proofreading is to eliminate such mistakes from the final draft of the manuscript.

Finally, use a staple to fasten everything together; a separate folder is not necessary. In case your instructor misplaces the paper, keep a copy of the original manuscript.