GUIDE TO WRITING, ORGANIZING AND PRESENTING RESEARCH PAPERS

Paper Layout

The following sections, in order, constitute the paper. Details of these, plus exceptions and variations, are discussed in separate sections below.

- ☆ Title page . . . . . (unnumbered)
- ☆ Abstract page ii
- ☆ Table of Contents (optional, see below) iii
- ☆ List of Figures (optional, see below) iv
- ☆ Introduction . . . . . 1...n [1]
- ☆ Materials and Methods
- ☆ Results and Interpretations
- ☆ Discussion
- ☆ Conclusions
- ☆ Bibliography
- ☆ Appendices

Be Sure You Do or Check the Following Before Turning in the Final Draft

- ❑ All text must be double spaced (1.5 spacing is acceptable).
- ❑ All pages to have 1 inch margins all around.
- ❑ PAGE NUMBERING:
  - ◊ Title Page is the first page, but is unnumbered. The Abstract, Table of Contents, and List of Figures are lower case Roman numbered at the page bottom center. Word processors will do this automatically.
  - ◊ Beginning with the Introduction page numbering is Arabic, top center, except the first page of the Introduction which is left unnumbered.
- ❑ HEADERS at the top of all pages after the first page of the Introduction. The left header is your name and date. The right header is a title summary of the paper.

[1] The first page of the Introduction should not be numbered, or may be numbered on the bottom of the page rather than the top as the remaining pages are.

Your Name, April, 1995	2	Brief summation of title

Example of Header/Page number format.

- ❑ FIGURES:
  - ◊ All figures must be numbered in the order in which they are discussed in the paper.
  - ◊ All figures must have captions.
  - ◊ All text figures must fit within the standard page format with one inch margins all around. Exceptions are allowed for special cases. See your research advisor for permission and guidance on how to do it.
  - ◊ Figures may be your own, or figures taken from papers you have researched. Figures not your own must be identified by author and date (like any reference) at the end of the caption.
  - ◊ You may insert figures within the text, or you may group them all in order at the back, after the text.

- ❑ Be sure you run the final draft though a spell checker.

- ❑ FINAL PRINTING must be a very high quality copy. Have it laser printed;

- ❑ BINDING: All final papers are bound. It may be spiral or paper binding. Kinkos, Staples, JMU Copy Center etc. can do this for you for a nominal fee.
  - ◊ The covers may be either card stock, or clear plastic.
  - ◊ If the cover is card stock then the title page should be printed on the cover. You still must have a title page as the first page of the manuscript.
  - ◊ If the cover is clear plastic so that the title page shows through then no further cover label is necessary.

Format and Organization

The standard sections of a scientific paper, and what they contain, are discussed below under "Formats For Scientific Papers". The following discusses the format and sequence of preliminary parts of the paper.

- ❑ **TITLE PAGE:** The first page of the manuscript is to be the title page, containing the following information (see format, page 4).
  - ◊ Title of your research project.
  - ◊ Your name below the title.
  - ◊ Below your name, the month and year of the paper.
  - ◊ Below the date your faculty advisors.
  - ◊ At bottom of page: the course number under which the research was done.

- ❑ **ABSTRACT PAGE:** The abstract should be by itself on the second page. It also requires the following information (see format, page 4).
  - ◊ The heading "Abstract" in the top center of the page.
  - ◊ Title of research paper
  - ◊ Your name and the date of the paper
  - ◊ Your professional affiliation: Department of Geology and Environmental Studies, James Madison University
  - ◊ The body of the abstract.
  - ◊ Small Roman numeral ii (or more if necessary).

- ❑ **TABLE OF CONTENTS:** If the paper is long, or it has non-standard sections, then include a Table of Contents (see format on page 4). If unsure whether to do it, ask your advisor.
  - ◊ Small Roman numeral iii (or more if necessary).

- ❑ **LIST OF FIGURES:** If you have more than a few figures, add a "List of Figures" section after the "Table of Contents" page. Figure numbers are followed by the figure caption (see example on page 4). If the figure is not yours then include the author and date in standard reference format.
  - ◊ Small Roman numeral iv (or more if necessary).

- ❑ The other parts of the paper beginning with the Introduction should follow in order, as outlined on the first page.
  - ◊ Start each section of the paper on a new page.
  - ◊ Do everything to make the presentation pleasing to view, and easy to use. If you have questions or special problems, see your advisor.
  - ◊ Begin headers and Arabic numbering with 2 on second page of Introduction.

Number of Copies

It is a courtesy to provide all your advisors or others who helped you in significant ways with a copy of the paper. And, of course, keep a copy for yourself.

Title of Paper

Author Name

April, 1995

Faculty Advisors
Course Advisor: _____
Library Advisor: _____
Subject Advisor: _____

Geology 491
Geological Literature Research

Title page layout

ABSTRACT

Title of Research
Author Name
December, 1993
Department of Geology and Geography
James Madison University

Body of text

ii

Abstract page layout

Table of Contents

iii

Table of Contents layout

List of Figures

iv

List of Figures page layout

Guidance and Assistance

If you are unsure how to proceed on some things, or are unsure of your writing skills, there are a number of things you can do. Pursue as many of these as you require to turn in a perfect paper.

☺ FACULTY ADVISOR(S): Ask your faculty advisor to read a near final draft of your paper for accuracy and suggestions on how to write it better. Be sure to give them plenty of time.

☺ WRITING GUIDES: Look up answers to questions about writing styles, do's and don't's in the many grammars, dictionaries, handbooks and other guides to authors which now exist. A few good ones are listed on the last page. We have copies of a few of these handbooks stored in the seminar room for your reference and use; please do NOT remove them from that room.

☺ COLLEAGUE EDITORS: Make arrangements with student colleagues to act as editors for each other's paper. The more people who can carefully read your work and make comments the better your final draft will be. This procedure is quite common. Most people ask a friend to review a manuscript before sending it off for public view.

☺ GRAMMAR CHECKERS: Run your paper through a grammar checker if you have access to one. Grammar-checker programs are becoming more common and they can help to clean up writing. WordPerfect 6.0 comes with a grammar checker.

Formats for Scientific Papers

(Follow these procedures precisely)

All scientific papers follow a format which, in general, contain the following sections.

Title

Abstract

Introduction

Materials and Methods

Results and Interpretation

Conclusions

Literature Cited

Appendices

The sections listed are for papers describing laboratory experiments. Papers describing non-laboratory studies modify this format. Some sections appear in virtually all scientific papers; those in boxes in the list above. It is the main body of the paper that varies, and there you can organize your paper in a way which suits your purposes. To find a suitable format examine several published papers in the discipline your research is in until you find one which suits you, or select your own organization with the help of your advisor.

Title

Choose a title that briefly but fully describes what is in the paper. Things to consider are

- ◊ Topic
- ◊ Type of study
- ◊ Any special conditions or restrictions on the study.

Abstract

A brief statement (usually <200 words but many are longer) presenting the major points and conclusions of the study. Abstracts are not a summary of what you did, like, "First we did this, then we did that, and then we will tell you what the conclusions are."[2] Abstracts contain factual, scientific information; the quintessential conclusions of the study.

Ideally abstracts are written last, after all your results and conclusions, but sometimes this is not possible, especially if you must turn one in early for a symposium. An Abstract should be able to stand alone since often this is the only part of a paper read; it is a summary which tells a person if the paper contains the information they want.

Good abstracts are carefully and logically organized. Read pages 34-37 in Cochran, et.al., 1974, Geowriting, and read a few published abstracts in reference papers. Not all published abstracts are good but the better ones can help you write a good one.

Introduction

The Introduction explains what the paper is about, the nature and importance of the study, where it fits into the state of scientific knowledge at the time of writing, and how it adds to or changes that understanding. That is, why you bothered to do the research and write the paper.

An Introduction should also capture the imagination of the reader and make them want to read the paper; it should explain why and how this study is important. You must convince the reader they will be better off for having read this paper, that they will see this subject in a new way which will change their understanding.

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[2] This is an example of a very poor Abstract. Don't do this!

"A partial biography of the writer is given. The inadequate abstract is discussed. What should be covered by an abstract is considered. The importance of the abstract is described." (from Cochran, et.al. 1974)

This Abstract gives the reader no useful information. Don't just list the subjects, transmit as much useful information as possible.

Materials and Methods of Study

All the methods, techniques, experiments, equipment you used, described in enough detail that someone else could redo the experiment or the study from your descriptions. One of the hallmarks of scientific knowledge is its repeatability; the idea that someone else could run the same experiment and get the same results.

Results

Here you describe the outcome of your study; an analysis of what you have learned. It may include descriptions, tables of data, graphs and charts of experimental results, etc. This is a dispassionate, factual presentation of data, without a lot of interpretation.

The data should be laid out clearly and fully enough that someone who knows the discipline could interpret it without even looking at your interpretations in the Discussion section. And you hope, of course, that another person in the field would come to the same conclusions you did, or that you will be able to persuade them with your research results that your interpretation is the best.

Discussion

Here you discuss the results of your research, how it fits in with other related research, and its implications for future research. It is as important in this section as other sections of the paper to be objective, but this is where you finally get a chance to speak your mind.

Discussion of results explains what your data means, how it all fits together, and how interpretations logically follow from the data. You must be as objective and unbiased as possible here. You are essentially saying what any knowledgeable person in the field could deduce from the data themselves. This is also where you tell a novice to the discipline the significance of the data, while at the same time not insulting the intelligence of the expert.

Fit with related research puts your results in the context of the discipline and field. How do your results compare with similar studies done by others, past and present? Where do you agree or disagree with the conclusions of others, and why? What new things have come out of your study that were not known before? This section requires that you have searched the literature in the field, and know it history and significance. This is also where you give credit where

credit is due to the researchers who have preceded you, and on whose shoulders you have stood.

Discussion of the implications of the research is where you finally make the transition from the researcher (gatherer of data, runner of experiments, and interpreter) to the scientist. This part of the discussion section is where you make personal comments about the topic you researched. You may have special insights into the meaning of your study, or you may have formed unique opinions about the results of the research, or you may have thoughts about the implications of your results for the particular situation you studied, or the discipline as a whole. Even though this is largely opinion, it must be well supported.

Conclusions

Briefly discuss or list the most important conclusions of your paper. And remember, often the only parts of a paper someone will read are the Abstract and Conclusions, so these sections should be internally consistent and self sufficient. Like the abstract this part is one of the last written.

Bibliography or alternatively Literature Cited

There are two ways to present this part of the paper. A Literature Cited lists only the papers referenced directly in the text. A Bibliography lists all the literature pertinent to the topic.

In most cases you will be presenting a Bibliography since you will likely list pertinent papers to the subject which you will not necessarily discuss or use directly. Or there may be papers you just list the author and date for as examples of a phase of research, or a type of research. Or you may present a list of all the significant papers on a particular aspect of the topic, but only directly discuss one or two as examples.

The normal procedure is to put the author's name and date of publication in the text, e.g.:

Reineck and Singh (1975, page) explain that this structure is produced...

"It is widely accepted that eolian sands are positively skewed with a tail of fines (Folk, 1966, p. 88, Folk 1977)"

References are listed alphabetically by author, and by date for each author, at the end of a paper. Below are typical examples from a [1] journal, [2] GSA Special Paper, [3] Masters Thesis, [4] book, [5] government publication, and [6] USGS Professional Paper. Construct references for other sources in a similar manner.

NOTE: you are likely to discover that in past publications abbreviations of journal names, etc. are commonly used. Since the abbreviations were often cryptic it was sometimes impossible to construct the whole journal name (unless you already knew the journal), and thus difficult or impossible to find the article. As a result, the use of abbreviations in literature citations is no longer done.

[1] JOURNAL:

Dott, R.H. Jr., and Bourgeois, Joanne, 1982, Hummocky stratification: Significance and its variable bedding sequences: Bulletin Geological Society of America, v. 93, p. 663-680.

[2] GSA SPECIAL PAPER:

McCave, I.N., 1968, Shallow and marginal marine sediments associated with the Catskill complex: Geological Society of America Special Paper 106, p. 75-107.

[3] MASTER'S THESIS:

McDowell, R. J., 1988, Depositional environments of the Upper Chemung and Lower Hampshire Formations of east-central West Virginia: M.S. thesis, West Virginia University, 168 p.

[4] BOOK:

Meckel, L.D., 1970, Paleozoic alluvial deposition in the Central Appalachians; A summary: in Fisher, G. W., Pettijohn, F.J., Reed, J.C. Jr., and Weaver, K.N., Studies of Appalachian Geology, Central and Southern: Interscience Publishers.

[5] US GOVERNMENT PUBLICATION:

Wilson, Frederic H., 1985, The Alaska Peninsula Terrane: A Definition: Department of the Interior, U.S. Geological Survey, Reston, Virginia.

[6] U.S. GEOLOGICAL SURVEY BULLETIN

Cavaroc, V.V. and R.M. Flores, 1991, Red Beds of the Triassic Chugwater Group, Southwestern Powder River Basin, Wyoming: U.S. Geological Survey Bulletin 1917-E, Washington D.C.

Other types of references may require special formats. Ask.

References: Some Special Cases

- If an author, or group of authors, have more than one paper published in the same year, the papers are distinguished by a letter, e.g. 1956a, 1956b, etc.

- Abstracts should not contain reference citations.

- Direct quotes always require page numbers along with the author and date.

- If you use a direct quote or some specific use of material from a paper, but you got that information from another work, the citations goes like this: "Original Author, Date, in, Your Source, Date, Page."

- If a reference is used more than once in a paragraph the reference citation need be given only once in the paragraph, the first time it is used (although you may refer to the author's work by the author's name(s) as often as you wish). If the reference is referred to again in another paragraph, even the next one, its citation must be given again.

- Referencing articles or other publications without an assigned author.
  - ☺ Anonymous (Anon.). The reference can be listed under "A" for anonymous.
  - ☺ If the publication is sponsored by an organization, such as NASA (National Aeronautics and Space Administration), but does not have an author it can be listed under the organization name as an author.

- Missing date: Although this should be rare, if an article has no copyright date then place in parentheses after the author's name (no date).

- et. al. If the paper you are referencing has a lot of authors (like 3 or more), in the body of the paper you may reference the paper with the first author, followed by "et. al." ("and others"), and the date.