How to Write a Research Paper

This is a brief series of notes on how to write a research paper. Many of these notes are from a small paperback entitled *How to Write and Publish a Scientific Paper*, by Robert A. Day, second edition, ISI Press, 1983.

Most of us find it hard to write. As Charles Darwin said, ``a naturalist's life would be a happy one if he had only to observe and never to write.''

However, the task is much easier once you discover that there is a prescribed organization.

``The well-written scientific paper should report its original data in an organized fashion and in appropriate language.'' [How to Write and Publish a Scientific Paper, by Robert A. Day, second edition, ISI Press, 1983, page 5] ``In short, I take the position that the preparation of a scientific paper has almost nothing to do with literary skill. It is a question of organization. A scientific paper is not ``literature.'' The preparer of a scientific paper is not really an ``author'' in the literary sense. In fact, I go so far as to say that, if the ingredients are properly organized, the paper will virtually write itself.''

``Good organization is the key to good writing.''

Below are the parts of a research paper.

**Parts of a Research Paper**

**Title**

``What is a good title? I define it as the fewest possible words that adequately describe the contents of the paper.''

``In preparing the title for a paper, the author would do well to remember one salient fact: That title will be read by thousands of people. Perhaps few people, if any, will read the entire paper, but many people will read the title, either in the original journal or in one of the secondary (abstracting and indexing) services. Therefore, all words in the title should be chosen with great care, and their association with one another must be carefully managed. Perhaps the most common error in defective titles, and certainly the most damaging in terms of comprehension, is faulty syntax (word order).''[Day, page 9]. For example, either there are some really smart dogs or ``using'' is misused in this title: ``Using a fiberoptic bronchoscope, dogs were immunized with sheep red blood cells.''

[Day, page 12]
Authors and Addresses

List the author's name and professional address. You should include the author's email address. For example, Bart Simpson, Department of Confusing Science, Bucknell University, Lewisburg, PA 17837, bart@bucknell.edu.

Date

For example, ``November 29, 2007.''

Keywords and Phrases

These keywords and phrases will be used to index the article.

Abstract

``An Abstract can be defined as a summary of the information in a document.''

[Day, page 22] It should be a single paragraph of 100 to 200 words. The Abstract along with the title should be done after you write the paper. The most famous Abstract is also the shortest: ``E=MC²'' by Albert Einstein.

``When writing the Abstract, remember that it will be published by itself, and should be self contained. That is, it should contain no bibliographic, figure, or table references ... The language should be familiar to the potential reader. Omit obscure abbreviations and acronyms. Write the paper before you write the Abstract, if at all possible.''

[Day, page 23]

``A well-prepared Abstract enables readers to identify the basic content of a document quickly and accurately, to determine its relevance to their interests, and thus to decide whether they need to read the document in its entirety. The Abstract should not exceed 250 words and should be designed to define clearly what is dealt within the paper.''

[Day, page 22]

``The Abstract should (i) state the principle objectives and scope of the investigation, (ii) describe the methodology employed, (iii) summarize the results, and (iv) state the principle conclusions. The importance of the conclusions is indicated by the fact that they should be said three times: once in the Abstract, again in the Introduction, and again (in more detail probably) in the Discussion.''

[Day, page 23]

Acknowledgements

Give credit to individuals who have helped you.

Body of Paper

Introduction

Answer the question ``What was the problem?'' Why is it important? [What was your problem area?]

``The purpose of the Introduction should be to supply sufficient background information to allow the reader to understand and evaluate the results of the
present study without needing to refer to previous publications on the topic. The Introduction should also provide the rationale for the present study. Above all, you should state briefly and clearly your purpose in writing the paper. Choose references carefully to provide the most important background information."[Day, page 23]

Background

Answer the question ``What have others done on the problem?"

Resources and Methods
Answer the question ``How did you study the problem?"

Results
Answer the question ``What did you find?"

Discussion
Answer the question ``What do these findings mean?"

Conclusions
Answer the question ``What do you conclude?'' What actions need to be taken?

Bibliography

Use standard bibliographic style. See elsewhere for details.

Form

Many journals have a standard ``Instructions to Authors'' which you must follow. If none is available, you should use the following.

Use one inch margins on standard 8.5 by 11 inch paper. Use 12 point type and double space the text. Center the page numbers at the bottom of the pages. Place footnotes at the bottom of the page.

Article by Dan Hyde, Computer Science Department, Bucknell University